

POACEAE (GRAMINEAE)

禾本科 he ben ke

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Annual or perennial herbs, or tall woody bamboos. Flowering stems (culms) jointed, internodes hollow or solid; branches arising singly from nodes and subtended by a leaf sheath and 2-keeled prophyll, often fascicled in bamboos. Leaves arranged alternately in 2 ranks, differentiated into sheath, blade, and an adaxial erect appendage at sheath/blade junction (ligule); leaf sheath surrounding and supporting culm-internode, split to base or infrequently tubular with partially or completely fused margins, modified with reduced blade in bamboos (culm sheaths); leaf blades divergent, usually long, narrow and flat, but varying from inrolled and filiform to ovate, veins parallel, sometimes with cross-connecting veinlets (especially in bamboos); ligule membranous or a line of hairs. Inflorescence terminal or axillary, an open, contracted, or spike-like panicle, or composed of lax to spike-like racemes arranged along an elongate central axis, or digitate, paired, or occasionally solitary; axillary inflorescences often many, subtended by spatheoles (specialized bladeless leaf sheaths) and gathered into a leafy compound panicle; spikelets often aggregated into complex clusters in bamboos. Spikelets composed of distichous bracts arranged along a slender axis (rachilla); typically 2 lowest bracts (glumes) empty, subtending 1 to many florets; glumes often poorly differentiated from accompanying bracts in bamboos. Florets composed of 2 opposing bracts enclosing a single small flower, outer bract (lemma) clasping the more delicate, usually 2-keeled inner bract (palea); base of floret often with thickened prolongation articulated with rachilla (callus); lemma often with apical or dorsal bristle (awn), glumes also sometimes awned. Flowers bisexual or unisexual; lodicules (small scales representing perianth) 2, rarely 3 or absent, 3 to many in bamboos, hyaline or fleshy; stamens 3 rarely 1, 2, 6, or more in some bamboos, hypogynous, filaments capillary, anthers versatile; ovary 1-celled, styles (1 or) 2 (rarely 3), free or united at base, topped by feathery stigmas, exerted from sides or apex of floret. Fruit normally a dry indehiscent caryopsis with thin pericarp firmly adherent to seed, pericarp rarely free, fleshy in some bamboos; embryo small or large; hilum punctate to linear.

About 700 genera and 11,000 species: widely distributed in all regions of the world; 28 tribes, 226 genera (seven endemic), and 1795 species (809 endemic) in China.

Grasses are present throughout China, but the largest area of natural grassland lies in the northern part of the country, forming part of the temperate Eurasian steppe. Much of this area has now been converted from rangeland into farmland with wheat (*Triticum*) as the major food crop. The moister grasslands of northeast China support forest steppe, the dominant natural grasses being *Leymus chinensis* and *Stipa grandis*. The climate becomes progressively drier eastward, supporting steppe and semidesert steppe. Species of *Stipa* are dominant, with *Agropyron*, *Cleistogenes*, *Koeleria*, and *Leymus*. Common grasses of the dry alpine steppe of the high Xizang-Qinghai Plateau include species of *Elymus*, *Festuca*, *Leymus*, *Poa*, *Puccinellia*, and *Stipa*. Desert grasses of northwest China include sand-binding species of *Aeluropus*, *Cleistogenes*, and *Orinus*.

In warm, subtropical areas of southern China widespread tropical genera are well represented, including *Cymbopogon*, *Digitaria*, *Eulalia*, *Paspalum*, *Pennisetum*, and *Setaria*. The major food crop here is rice (*Oryza*). Other tropical genera with their center of distribution in southeast Asia extend into China, including *Arundinella*, *Isachne*, and *Microstegium*. Extensive pure stands of *Phacelurus latifolius* are found in coastal salt marshes, as are introduced species of *Spartina*. *Phragmites* species form large colonies in the shallow margins of inland lakes and rivers.

The subfamilies of Poaceae are not included here, as they are largely based on non-morphological characters that are not readily available for identification purposes. However, the traditional grass tribes, as broadly accepted over the last two decades, do mainly have a morphological expression, backed up by characteristics of anatomy, embryology, and other cryptic characters. With practice and increasing familiarity with the family, it is usually possible to assign an unknown grass to a tribe without undue difficulty. The tribe is therefore taken as the primary division here.

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Modern molecular systematic studies are providing new insights into grass relationships. This new information has been incorporated where it has proved possible to link it to morphology, mainly by the separation of *Danthoniaceae* from *Arundineae* and the repositioning of a few individual genera. However, where the new information leads to the redefinition of tribes, or the genera within them, on grounds not easily expressed morphologically, the traditional treatment has been retained. *Aveneae* are upheld as distinct from *Poeae*, and *Eragrostideae* as distinct from *Cynodonteae*, because they are usually easily recognizable and hence useful for identification. Grass taxonomy is at present undergoing a period of rapid modification. The incorporation of molecular data into the classification scheme is incomplete, alterations are ongoing, and a new system with overall acceptance has not yet emerged. The primary purpose of a Flora is to provide an identification guide, usually for the non-specialist, and it must therefore be based mainly on morphology. Those interested in the latest research and new ideas on grass relationships can find more detailed information in the taxonomic literature. The following is recommended: Columbus, J. T. et al., eds. 2006. Monocots: comparative biology and evolution. [Aliso, 2 volumes]. Rancho Santa Ana Botanic Garden, Claremont.

Extensive use has been made of *Genera Graminum* by Clayton and Renvoize (1986) during the preparation of this volume. In particular, Chen Shouliang and Sylvia Phillips have used the key to tribes and the tribal descriptions there as the basis for those in this volume.

The names of the Chinese agrostologists Sun Bixing and Liu Liang are abbreviated as “B. S. Sun” and “L. Liu” in this volume, but the alternative abbreviations “B. X. Sun” and “L. Liou” occur sometimes in other literature. The bamboo specialist Xue Jiru (Hsueh Chi-ju) is abbreviated as “Hsueh” in this volume because he always gave his name as “Hsueh” as the author of plant names, regardless of any different spelling used for him as the author of the works in which the names were published.

Wang Zhengping, Ye Guanghan, Yang Yaling, Yu Zehua, Hu Chenhua, Geng Bojie, Feng Xuelin, Jia Liangzhi, Xia Nianhe, Li Dezhu, Zhang Weiping, Xue Jiru, Zhu Zhengde, Zhao Qiseng, Chen Shouliang, Sheng Guoying, Chen Shaoyun, Yao Changyu, Lu Jionglin, Sun Jiliang, Lin Wantao, Yi Tongpei, Zhao Huiru, Wen Taihui & Dai Qihui. 1996. Gramineae (Poaceae) (1). *In*: Geng Bojie & Wang Zhengping, eds., Fl. Reipubl. Popularis Sin. 9(1): 1–704; Liu Liang, Zhu Taiping, Chen Wenli, Wu Zhenlan & Lu Shenglian. Gramineae (Poaceae) (2). *In*: Liu Liang, ed., Fl. Reipubl. Popularis Sin. 9(2): 1–405; Lu Sheng-lian, Sun Yong-hua, Liu Shang-wu, Yang Yong-chang, Wu Zhen-lan, Kuo Pen-chao, Yang Hsi-ling, Wang Chao-pin & Tsui Nai-ran. 1987. Gramineae (3). *In*: Kuo Pen-chao, ed., Fl. Reipubl. Popularis Sin. 9(3): 1–329; Chen Shouliang, Jin Yuexing, Zhuang Tide, Fang Wenzhe, Sheng Guoying, Liu Liang, Wu Zhenlan, Lu Shenglian, Sun Bisin, Hu Zhihao, Wang Song, Sun Xiangzhong, Wang Huiqin, Yang Xilin, Wang Chaopin, Li Binggui & Wen Shaobin. 1990. Gramineae (Poaceae) (4). *In*: Chen Shouliang, ed., Fl. Reipubl. Popularis Sin. 10(1): 1–401; Chen Shouliang, Zhuang Tide, Fang Wenzhe, Sheng Guoying, Jin Yuexing, Liu Liang, Sun Bisin, Hu Zhihao & Wang Song. 1997. Gramineae (Poaceae) (5). *In*: Chen Shouliang, ed., Fl. Reipubl. Popularis Sin. 10(2): 1–301.

Glossary of botanical terms used in the Poaceae

Adapted from the glossary in *Flora of Ethiopia and Eritrea*, vol. 7 (1995).

aristate – with an awn

aristulate – diminutive of aristate

auricle – an earlike lobe or appendage at the junction of leaf sheath and blade

auriculate – with an auricle

awn – a bristle arising from a spikelet part

callus – a hard projection at the base of a floret, spikelet, or inflorescence segment, indicating a disarticulation point

caryopsis – a specialized dry fruit characteristic of grasses, in which the seed and ovary wall have become united

collar – pale or purplish zone at the junction of leaf sheath and blade

column – the lower twisted portion of a geniculate awn, or the part below the awn branching-point in *Aristideae*

compound – referring to inflorescences made up of a number of small constituent inflorescences (as in some *Andropogoneae*), or a raceme with some secondary branching

culm – the flowering stem of a grass plant

culm sheath (bamboos) – modified, often non-photosynthetic, culm leaf with an expanded sheath and much reduced blade, usually deciduous as the culm matures

diffuse (bamboos) – culms arising singly from long slender rhizomes.

extravaginal – branching in which the young shoot breaks through the base of the leaf sheath

floret – the individual unit of a spikelet, comprising a lemma and palea with enclosed reproductive organs

glume – one of a pair of empty scales at the base of a grass spikelet

heterogamous spikelets – the paired spikelets found in most *Andropogoneae*, where one spikelet of the pair is sessile and produces a caryopsis, and the other spikelet is pedicelled, of different form, and staminate or sterile

hilum – the scar on the caryopsis marking the site of the attachment of the pericarp and testa, found on the opposite side from the embryo

homogamous spikelets – in *Andropogoneae* the paired spikelets sometimes present at the base of the raceme, of similar appearance and not producing any caryopses, often resembling the pedicelled spikelets or assuming a protective involucre function

intravaginal – branching in which the young shoot grows up inside the leaf sheath, emerging at the sheath mouth

iterant (bamboos) – inflorescence with pseudospikelets with glumes subtending axillary buds capable of partial or extensive spikelet ramification

leaf blade – the distal expanded part of a grass leaf

leaf sheath – the basal part of the grass leaf which normally encloses a culm internode

lemma – the lower of the two bracts enclosing the grass flower and together with the palea comprising a floret

leptomorph (bamboos) – rhizome monopodial, elongated, more slender than culms

ligule – a membrane or line of hairs on the inner (adaxial) side of the junction of the leaf sheath and leaf blade; bamboos sometimes have an external ligule on the abaxial side of the junction

lodicule – a small scale-like or fleshy structure at the base of the stamens in a grass floret, usually 2 in each floret (often 3 or more in bamboos); they swell at anthesis, causing the floret to gape open

oral setae – marginal setae inserted at junction of leaf sheath and blade, on the auricles when these are present

pachymorph (bamboos) – rhizome sympodial, thicker than culms

palea – the upper and inner scale of the grass floret which encloses the grass flower, usually 2-keeled

panicle – in grasses, an inflorescence in which the primary axis bears branched secondary axes with pedicellate spikelets

pedicel – in grasses, the stalk of a single spikelet within an inflorescence

peduncle – the stalk of a raceme or cluster of spikelets

pluricaespitose (bamboos) – culms arising in a series of clusters along a long slender rhizome

prophyll – in grasses, a 2-keeled, hyaline, modified leaf, placed within a leaf sheath on the adaxial side of a branch

pseudopetiole – the narrow basal portion of some leaf blades, resembling a petiole

pseudospikelet (bamboos) – spikelet in which the outer glumes or bracts subtend axillary buds which can develop to form lateral spikelets or branches

raceme – in grasses, an unbranched axis bearing spikelets; racemes may be solitary, digitate, or scattered

raceme base – short stalk beneath the individual racemes of a pair in some *Andropogoneae*

raceme pair – pairs of racemes supported by spatheoles in the compound panicles of some *Andropogoneae*

rachilla – the central axis of the spikelet which bears the florets

rachilla extension – a prolongation of the rachilla beyond the uppermost (or single) floret

rachis – the axis of a raceme

secondary spathe – spathe supporting a second tier of branching within the compound panicle of some *Andropogoneae*

semelauctant (bamboos) – inflorescence with glumes not subtending viable buds or branches

sinus – the space between two projecting lobes or teeth

spathate – with spathes

spathe – a bract or modified bladeless leaf subtending the inflorescence or part of it

spatheole – the uppermost spathe supporting the racemes within the compound inflorescence of some *Andropogoneae*

spikelet – the basic unit of a grass inflorescence; usually composed of two glumes and one or more florets on a rachilla

spikelet pair – the arrangement of one sessile and one pedicelled spikelet arising from the same node characteristic of the *Andropogoneae*

tiller – a leafy non-flowering shoot

triad – a group of three spikelets borne together

unicaespitose (bamboos) – culms all arising in a single clump from pachymorph rhizomes

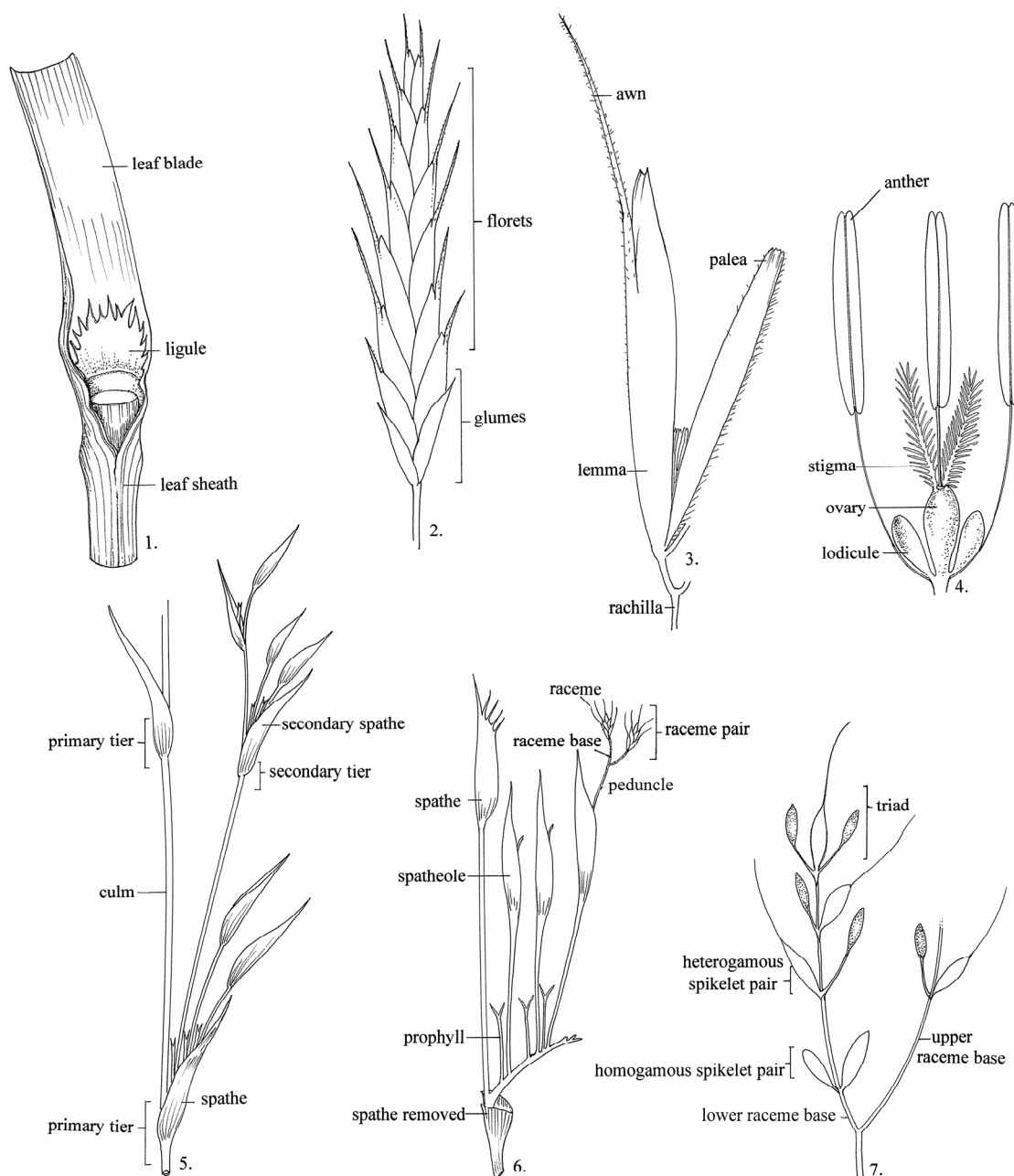


Figure 1. 1–4. Parts of a typical grass (based on *Bromus*). —1. Portion of leaf. —2. Spikelet. —3. Floret. —4. Flower. 5–7. Compound panicle and raceme pair structure in *Andropogoneae* (based on *Hyparrhenia*). —5. Compound panicle with primary and secondary tiers. —6. Compound panicle with primary tier showing raceme pair. —7. Diagram of raceme pair structure. Drawn by Yevonn Wilson-Ramsey.

Systematic list of tribes and genera

● indicates endemic genera

1. Bambuseae (p. 7)

1. *Bambusa*
2. *Thyrsostachys*
3. *Dendrocalamus*
4. *Gigantochloa*
5. *Melocalamus*
6. *Bonia*
7. *Schizostachyum*
8. *Cephalostachyum*
9. *Pseudostachyum*
10. *Melocanna*
11. *Neomicrocalamus*
12. *Yushania*
13. *Thamnocalamus*
14. *Fargesia*
15. *Drepanostachyum*
16. *Himalayacalamus*
17. *Ampelocalamus*
18. *Chimonocalamus*
19. ● *Gaoligongshania*
20. *Acidosasa*
21. *Sasa*
22. *Arundinaria*
23. *Pseudosasa*
24. *Pleioblastus*
25. ● *Oligostachyum*
26. ● *Gelidocalamus*
27. ● *Ferocalamus*
28. *Indocalamus*
29. *Indosasa*
30. *Sinobambusa*
31. *Semiarundinaria*
32. *Chimonobambusa*
33. ● *Shibataea*
34. *Phyllostachys*

2. Phareae (p. 180)

35. *Leptaspis*

3. Ehrharteae (p. 181)

36. *Ehrharta*

4. Oryzeae (p. 181)

37. *Oryza*
38. *Leersia*
39. *Chikusichloa*
40. *Hygroryza*
41. *Zizania*

5. Brachyelytreae (p. 187)

42. *Brachyelytrum*

6. Phaenospermateae (p. 187)

43. *Phaenosperma*

7. Stipeae (p. 188)

44. *Stephanachne*
45. *Trikeria*
46. ● *Sinochasea*
47. *Duthiea*
48. *Psammochloa*
49. *Piptatherum*
50. *Stipa*
51. *Ptilagrostis*
52. *Achnatherum*
53. *Orthoraphium*

8. Brylkinieae (p. 212)

54. *Brylkinia*

9. Meliceae (p. 212)

55. *Glyceria*

56. *Melica*

57. *Schizachne*

10. Diarrheneae (p. 223)

58. *Diarrhena*

11. Poeae (p. 224)

59. *Festuca*
60. *Vulpia*
61. *Lolium*
62. *Scolochloa*
63. *Cynosurus*
64. *Puccinellia*
65. *Briza*
66. *Poa*
67. *Dactylis*
68. *Aniselytron*
69. *Milium*
70. *Colpodium*
71. *Catabrosa*
72. *Sclerochloa*
73. *Pseudosclerochloa*
74. *Parapholis*

12. Aveneae (p. 316)

75. *Helictotrichon*
76. *Arrhenatherum*
77. *Avena*
78. *Trisetum*
79. *Koeleria*
80. *Deschampsia*
81. *Holcus*
82. *Aira*
83. *Phalaris*
84. *Anthoxanthum*
85. *Coleanthus*
86. *Agrostis*
- 86a. × *Agropogon*
87. *Deyeuxia*
88. *Calamagrostis*
89. *Polypogon*
90. *Cinna*
91. *Cyathopus*
92. *Beckmannia*
93. *Alopecurus*
94. *Phleum*

13. Brachypodieae (p. 368)

95. *Brachypodium*

14. Bromeae (p. 370)

96. *Littledalea*
97. *Bromus*

15. Triticeae (p. 386)

98. *Leymus*
99. *Psathyrostachys*
100. *Hordeum*
101. *Hystrix*
102. *Elymus*
103. *Pseudoroegneria*
104. *Elytrigia*
105. *Kengyilia*
106. *Agropyron*
107. *Eremopyrum*
108. *Secale*
109. *Triticum*
110. *Aegilops*

16. Centotheceae (p. 444)

111. *Centotheca*

112. *Lophatherum*

17. Thysanolaeneae (p. 446)

113. *Thysanolaena*

18. Arundineae (p. 447)

114. *Molinia*
115. *Arundo*
116. *Phragmites*

19. Danthoneae (p. 449)

117. *Cortaderia*
118. *Elytrophorus*
119. *Danthonia*
120. *Schismus*

20. Aristideae (p. 452)

121. *Aristida*
122. *Stipagrostis*

21. Pappophoreae (p. 456)

123. *Enneapogon*

22. Eragrostideae (p. 457)

124. *Aeluropus*
125. *Neyraudia*
126. *Cleistogenes*
127. *Orinus*
128. *Tripogon*
129. *Leptochloa*
130. *Dinebra*
131. *Eragrostis*
132. *Eragrostiella*
133. *Harpachne*
134. *Desmostachya*
135. *Dactyloctenium*
136. *Acrachne*
137. *Eleusine*
138. *Sporobolus*
139. *Crypsis*
140. *Muhlenbergia*

23. Cynodonteae (p. 487)

141. *Lepturus*
142. *Chloris*
143. *Enteropogon*
144. *Eustachys*
145. *Microchloa*
146. *Cynodon*
147. *Spartina*
148. *Bouteloua*
149. *Buchloe*
150. *Tragus*
151. *Zoysia*
152. *Perotis*

24. Paniceae (p. 499)

153. *Pseudechinolaena*
154. *Oplismenus*
155. *Ichnanthus*
156. *Panicum*
157. *Hymenachne*
158. *Sacciolepis*
159. *Ottochloa*
160. *Cyrtococcum*
161. ● *Setiacis*
162. *Acroceras*
163. *Echinochloa*
164. *Alloteropsis*
165. *Brachiaria*
166. *Urochloa*

167. *Eriochloa*

168. *Thuarea*
169. *Paspalum*
170. *Axonopus*
171. *Setaria*
172. *Paspalidium*
173. *Stenotaphrum*
174. *Melinis*
175. *Digitaria*
176. *Pseudoraphis*
177. *Pennisetum*
178. *Cenchrus*
179. *Spinifex*

25. Isachneae (p. 554)

180. *Isachne*
181. *Coelachne*
182. *Sphaerocaryum*

26. Eriachneae (p. 561)

183. *Eriachne*

27. Arundinelleae (p. 561)

184. *Garnotia*
185. *Arundinella*

28. Andropogoneae (p. 570)

186. *Spodiopogon*
187. *Saccharum*
188. *Miscanthus*
189. *Imperata*
190. *Eulalia*
191. *Pseudopogonatherum*
192. *Pogonatherum*
193. *Eulaliopsis*
194. *Polytrias*
195. *Microstegium*
196. *Apocopis*
197. *Germania*
198. *Sorghum*
199. *Pseudosorghum*
200. *Chrysopogon*
201. *Dichanthium*
202. *Capillipedium*
203. *Bothriochloa*
204. *Sehima*
205. *Ischaemum*
206. *Apluda*
207. *Dimeria*
208. *Arthraxon*
209. *Schizachyrium*
210. *Andropogon*
211. *Cymbopogon*
212. *Hyparrhenia*
213. *Themeda*
214. *Heteropogon*
215. *Pseudanthistiria*
216. *Phacelurus*
217. *Hemarthria*
218. *Mnesithea*
219. *Rottboellia*
220. *Eremochloa*
221. *Hackelochloa*
222. *Ophiuros*
223. *Coix*
224. *Chionachne*
225. *Polytoca*
226. *Zea*

Keys to tribes**Key 1**

- 1a. Bamboos, culms woody; lower culm sheaths broad with rudimentary blades 1. *Bambuseae* (p. 7)
- 1b. Herbs, occasionally reeds or culms canelike; lower culm sheaths with normal blades.
 - 2a. Spikelets arranged in pairs (rarely triads) on fragile racemes; raceme rachis breaking up into segments bearing a sessile and pedicelled spikelet Key 2
 - 2b. Spikelets arranged singly in panicles or racemes (occasionally raceme fragile but spikelets single; or spikelets paired but raceme tough).
 - 3a. Spikelets with strictly 2 florets and no rachilla extension; lower floret staminate or barren, sometimes reduced to an empty lemma, upper floret fertile Key 2
 - 3b. Spikelets with 1 to many florets (if 2 florets, then both fertile, or the lower fertile, or rachilla extension present).
 - 4a. Spikelets with 2 or more fertile florets Key 3
 - 4b. Spikelets with 1 fertile floret, sometimes with additional staminate or barren florets Key 4

Key 2

- 1a. Spikelets disarticulating at maturity above glumes.
 - 2a. Spikelets disarticulating above glumes; lemmas both orbicular to broadly elliptic, awnless; leaf blades lanceolate to ovate 25. *Isachneae* (p. 554)
 - 2b. Spikelets disarticulating below fertile (upper) floret; lower lemma resembling upper glume, persistent, upper lemma terete, often awned; leaf blades linear 27. *Arundinelleae* (p. 561)
- 1b. Spikelets falling entire at maturity, either singly or with other spikelets and inflorescence parts attached.
 - 3a. Spikelets single, or if paired both spikelets alike; glumes thinner than fertile floret, lower glume short or even suppressed; fertile floret papery to crustaceous or leathery, awnless 24. *Panicaceae* (p. 499)
 - 3b. Spikelets paired, usually one sessile and the other pedicelled, often dissimilar and arranged in fragile racemes; glumes as long as spikelet, tougher than and enclosing hyaline florets; fertile floret often with geniculate awn (spikelets rarely single or both pedicelled, but then either in fragile racemes or geniculately awned) 28. *Andropogoneae* (p. 570)

Key 3

- 1a. Inflorescence of one or more racemes.
 - 2a. Ligule a line of hairs; lemmas 1–3-veined 22. *Eragrostideae* (p. 457)
 - 2b. Ligule membranous; lemmas 5 or more veined.
 - 3a. Leaf sheaths tubular, margins joined for most or all of length 9. *Meliceae* (p. 212)
 - 3b. Leaf sheaths not tubular, margins free.
 - 4a. Spikelets placed broadside to rachis; both glumes present; ovary with hairy apical appendage.
 - 5a. Spikelets shortly pedicellate, usually terete or almost so; lemmas 7–9-veined 13. *Brachypodieae* (p. 368)
 - 5b. Spikelets sessile, laterally compressed (if rarely pedicellate, lemmas 5-veined) 15. *Triticeae* (p. 386)
 - 4b. Spikelets placed edgewise to rachis; lower glume absent (except terminal spikelet); ovary glabrous 11. *Poeae* (61. *Lolium*: p. 243)
 - 1b. Inflorescence a panicle, open, contracted, or dense and spike-like.
 - 6a. Spikelets with 2 florets, rachilla extension absent; one or both florets usually indurated.
 - 7a. Lemmas entire, awnless, glabrous or puberulous 25. *Isachneae* (p. 554)
 - 7b. Lemmas 2-toothed, awned from sinus, densely hispid 26. *Eriachneae* (p. 561)
 - 6b. Spikelets with several florets, or if 2 then rachilla extension present.
 - 8a. Lemmas deeply cleft into 7–9 awns 21. *Pappophoreae* (p. 456)
 - 8b. Lemmas awnless or 1-awned.
 - 9a. Leaf sheaths tubular, the margins joined for most or all of length 9. *Meliceae* (p. 212)
 - 9b. Leaf sheaths not tubular, margins free.
 - 10a. Culms reedlike, usually tall; panicle large, plumose 18. *Arundineae* (p. 447)
 - 10b. Culms mostly slender, if tall then not reedlike; panicle not large and plumose (if plant a large tussock with serrate leaf blades and plumose panicle, see 113. *Cortaderia*).
 - 11a. Ligule a line of hairs.
 - 12a. Basal internodes swollen; leaf blades articulated with sheath 18. *Arundineae* (114. *Molinia*: p. 447)
 - 12b. Basal internodes not swollen; leaf blades persistent 22. *Eragrostideae* (p. 457)
 - 11b. Ligule membranous.
 - 13a. Pericarp thickened into a pale beak or knob at grain apex 10. *Diarrheneae* (p. 223)
 - 13b. Pericarp not thickened.
 - 14a. Leaf blades with obvious cross veins, broad 16. *Centothecaeae* (p. 444)

- 14b. Leaf blades without cross veins.
 - 15a. Lemmas 3-veined; spikelets in dense globular clusters on an elongate axis 18. *Arundineae* (118. *Elytrophorus*: p. 450)
 - 15b. Lemmas 5 or more veined; spikelets not in globular clusters.
 - 16a. Glumes usually as long as spikelet, always longer than lowest lemma.
 - 17a. Ligule a line of hairs; awn, when present, arising from sinus of 2-lobed apex 19. *Danthonieae* (p. 449)
 - 17b. Ligule membranous; awn, when present, arising from lemma back 12. *Aveneae* (p. 316)
 - 16b. Glumes shorter than spikelet, usually shorter than lowest lemma; lemmas awnless or a straight awn arising at or near apex.
 - 18a. Ovary glabrous or hairy, styles arising from its apex; lemmas awnless or awned from apex (awn rarely subapical, but then leaf sheaths glabrous and palea keels scabrid) 11. *Poeae* (p. 224)
 - 18b. Ovary with a hairy apical appendage, styles arising beneath it; lemmas awned from just below apex; leaf sheaths hairy; palea keels ciliate 14. *Bromeae* (p. 370)

Key 4

- 1a. Glumes absent or both very short.
 - 2a. Spikelets in umbellate clusters; dwarf ephemeral 12. *Aveneae* (85. *Coleanthus*: p. 340)
 - 2b. Spikelets in a panicle; annual or perennial.
 - 3a. Palea 3–7-veined, 1-keeled; anthers often 6; caryopsis not beaked 4. *Oryzeae* (p. 181)
 - 3b. Palea 2-veined, convolute; anthers 2; caryopsis beaked 5. *Brachyelytreae* (p. 187)
- 1b. Glumes well developed, at least the upper.
 - 4a. Spikelets unisexual; female spikelet inflated, shell- or urn-shaped 2. *Phareae* (p. 180)
 - 4b. Spikelets bisexual, not shell- or urn-shaped.
 - 5a. Leaf blades with cross veins, broadly linear to ovate.
 - 6a. Pedicel falling with spikelet; spikelets very small, numerous in a large panicle; florets 2; lower floret sterile, upper floret fertile, its lemma with ciliate margins 17. *Thysanolaeneae* (p. 446)
 - 6b. Pedicel persistent; florets 1 or more; lowest floret fertile when more than 1.
 - 7a. Leaf blades broadly linear with twisted pseudopetiole; grain globose with thick loose pericarp 6. *Phaenospemateae* (p. 187)
 - 7b. Leaf blades lanceolate to ovate, not pseudopetiolate or twisted; grain an ovoid to trigonous caryopsis.
 - 8a. Glumes persistent; lemma 3–9-veined 16. *Centothecaeae* (p. 444)
 - 8b. Glumes deciduous; lemma 1-veined; low trailing annual 25. *Isachneae* (182. *Sphaerocaryum*: p. 560)
 - 5b. Leaf blades without cross veins, usually narrow.
 - 9a. Inflorescence composed of one or more racemes.
 - 10a. Spikelets in triads 15. *Triticeae* (100. *Hordeum*: p. 395)
 - 10b. Spikelets single.
 - 11a. Rachis fragile; glumes placed side by side 11. *Poeae* (74. *Parapholis*: p. 315)
 - 11b. Rachis tough; glumes opposite.
 - 12a. Lemma 5-veined; spikelets orbicular with gibbously inflated glumes enclosing floret 12. *Aveneae* (92. *Beckmannia*: p. 364)
 - 12b. Lemma 1–3-veined; spikelets not as above 23. *Cynodonteae* (p. 487)
 - 9b. Inflorescence an open, contracted or spikelike panicle.
 - 13a. Spikelets with 2 florets, lower floret staminate or barren, awned from low on back, upper floret fertile 12. *Aveneae* (76. *Arrhenatherum*: p. 322)
 - 13b. Spikelets with 1 to several florets (if 2 florets, lower floret fertile).
 - 14a. Ligule a line of hairs.
 - 15a. Lemma cleft into 7–9 awns 21. *Pappophoreae* (p. 456)
 - 15b. Lemma with 1 or 3 awns, or awnless.
 - 16a. Awns 3, or combined into a single 3-branched awn 20. *Aristideae* (p. 452)
 - 16b. Lemma awnless 22. *Eragrostideae* (p. 457)
 - 14b. Ligule membranous (sometimes with shortly ciliate margin).
 - 17a. Lemma indurated at maturity, terete, often enclosing palea; spikelets strictly 1-flowered without rachilla extension; awned from apex 7. *Stipeae* (p. 188)

- 17b. Lemma not indurated, palea exposed.
 - 18a. Spikelets with 3 florets, 2 sterile lemmas below fertile floret.
 - 19a. Spikelets falling entire together with pedicel; caryopsis with apical caplike appendage 8. *Brylkinieae* (p. 212)
 - 19b. Spikelets disarticulating above glumes; caryopsis without apical cap.
 - 20a. Lower lemmas enclosing fertile floret, epaleate, often transversely wrinkled, upper hooked at base 3. *Ehrharteae* (p. 181)
 - 20b. Lower lemmas short and subulate, or longer and sometimes staminate, often pubescent, not wrinkled or hooked 12. *Aveneae* (p. 316)
- 18b. Spikelets with 1 floret.
 - 21a. Spikelets falling entire.
 - 22a. Spikelets dorsally compressed; base of spikelet often shortly bearded; lemma 1–3-veined 27. *Arundinelleae* (184. *Garnotia*: p. 562)
 - 22b. Spikelets laterally compressed; base of spikelet glabrous; lemma (3–)5-veined 12. *Aveneae* (p. 316)
 - 21b. Spikelets disarticulating above glumes.
 - 23a. Glumes (1–)3–9-veined; lemma deeply 2-lobed, awned from sinus 7. *Stipeae* (p. 188)
 - 23b. Glumes 0–3-veined; lemma entire or shortly 2-toothed, awnless or awned from apex or back.
 - 24a. Lemma 3-veined.
 - 25a. Lemma awned 22. *Eragrostideae* (140. *Muhlenbergia*: p. 486)
 - 25b. Lemma awnless 11. *Poeae* (70. *Colpodium*: p. 311)
 - 24b. Lemma 5-veined.
 - 26a. Glumes shorter than floret; lemma awnless or with terminal straight awn 11. *Poeae* (68. *Aniselytron*, 70. *Colpodium*: pp. 310, 311)
 - 26b. Glumes longer than floret, or lemma with dorsal or geniculate awn 12. *Aveneae* (p. 316)

1. Tribe BAMBUSEAE

簕竹族 le zhu zu

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Rhizomes pachymorph (branching sympodial) or leptomorph (branching monopodial). Culms perennial, woody, diffuse (culms solitary), pluricaespitose (culms in a series of clumps connected by rhizomes) or unicaespitose (culms in a single dense clump), self-supporting, scrambling, or rarely climbing; internodes usually hollow, terete, or quadrangular, sometimes flattened or grooved above branch clusters; nodes level or raised at supra-nodal ridge or sheath base, basal nodes often with ring of aerial roots or rarely with hardened root thorns. Culm branches solitary to very many densely fasciculate at nodes, basal branch sheathing often reduced, bud scales variously derived, reduced, or absent. Leaves on most of culm except apex usually deciduous, modified into culm sheaths with a supportive and protective role: sheath thickened, blade much reduced, thickened, generally not photosynthetic; oral setae often well developed, on auricle margins when auricles present. Foliage leaf sheath with interior ligule and a less distinct external ligule, often with well-developed auricles and/or oral setae; blade deflexed, broad, roughly linear-lanceolate, base narrowed into pseudopetiole, articulating and eventually separating from persistent sheath, transverse veinlets often forming distinctly tessellate venation. Inflorescences (more correctly synflorescences) aggregations of sessile florets in spikelets or pseudospikelets, branching absent to compound, bracteate or ebracteate; spikelets prophyllate or not, glumes often poorly distinguished from basal bracts and lemmas, not subtending viable buds or branches (semelauctant), or in pseudospikelets subtending axillary buds capable of partial or extensive spikelet ramification (iterauctant); lodicules absent to very many, usually 3, usually ciliate, veined, posterior lodicule usually narrower than anterior pair. Stamens usually (2 or)3(or 4) or (5 or)6(or 7), rarely very many. Style short or long; stigmas 1–3. Fruit usually a dry caryopsis, sometimes succulent with a thickened, fleshy pericarp. Several South American genera are morphologically rather more diverse.

About 88 genera and ca. 1400 species: Asia, South America, Pacific Islands, N Australia, Africa, especially Madagascar, Central and North America; 34 genera (five endemic, one introduced) and 534 species (469 endemic, three introduced) in China.

Woody bamboos are found extensively in most of southern, central, and southwestern China and are also found in northern China as far north as Beijing. They have been a significant natural resource throughout China's history, providing food and raw materials for construction and manu-

facturing. Domestic and exported bamboo products remain important to China's national economy. Cultivation of bamboos of Chinese origin on a commercial scale in other countries is currently restricted to immediately neighboring countries, but is likely to expand. Many Chinese bamboos are of importance in western horticulture, and numerous species with horticultural potential remain poorly known.

The taxonomy of China's bamboos still remains in a largely unrevised state. The majority of the species has been described since 1980, frequently without knowledge of the flowers, due to the often very long flowering cycles (up to 150 years). Generic delimitation has often been highly speculative and remains controversial. The large number of endemic species, along with the susceptibility of their natural forest habitats to destruction or degradation, and their inherent inability to reproduce and disperse, make the group of particular conservation concern. *In situ* conservation is essential because of the infrequent flowering of bamboos and the short viability of bamboo seeds. There is a pressing need to refine the classification of Chinese bamboos, to ascertain conservation status, and to safeguard threatened species.

Many taxa described as forms are not known in the wild, and they would be more appropriately known as cultivars. They often represent clones with variegated leaves or colored culms, selected for ornamental purposes. These arise spontaneously among the normal population, with a tendency to appear around the time of flowering, and others appear as abnormal seedlings. Such names are largely excluded from this account, and only the more important cultivars are mentioned in comments.

1a. Rhizome pachymorph, thicker than culm.

2a. Higher orders of inflorescence branching with subtending bracts greatly reduced or absent; spikelets pedicellate; stamens 3(–5); subtropical or temperate bamboos 1–12 m tall, leaf venation mostly distinctly tessellate.

3a. Mid-culm branch 1 per node, about as thick as culms 19. *Gaoligongshania*

3b. Mid-culm branches 3 to very many per node, much smaller than culms.

4a. Inflorescence condensed, racemose.

5a. Buds at culm nodes lanceolate, branches ca. 5, subequal; culm sheath blade erect 13. *Thamnocalamus*

5b. Buds at culm nodes ovate, branches 10–20, central dominant, culm sheath blade reflexed 16. *Himalayacalamus*

4b. Inflorescence open, paniculate or fasciculate.

6a. Lower culm nodes with thorns 18. *Chimonocalamus*

6b. Lower culm nodes without thorns.

7a. Leaf blades with prominently tessellate venation; bamboos of temperate habitats.

8a. Rhizomes consistently long necked or both short and long necked, culms solitary or forming a series of small clumps 12. *Yushania*

8b. Rhizomes consistently short necked, culms always forming a single clump 14. *Fargesia*

7b. Leaf blades without prominently tessellate venation; bamboos of subtropical habitats.

9a. Culms self-supporting, nodal sheath scars without corky collar; spikelets not pendulous; culm sheath adaxially distally scabrid 15. *Drepanostachyum*

9b. Culms subscandent, nodal sheath scars often with corky collar; spikelets pendulous; culm sheaths adaxially distally glabrous 17. *Ampelocalamus*

2b. Inflorescence branches all subtended by large bracts; spikelets sessile; stamens 6; tropical and subtropical bamboos (1–)7–30 m tall; leaf venation not distinctly tessellate.

10a. Spikelets 1-flowered; ovary appendage long, stiff, tapering, hollow.

11a. Culms unicaespitose, rhizome neck to 50 cm; fruit a small, dry caryopsis, pericarp thin.

12a. Spikelets in loose, spicate clusters; palea not keeled; lodicules absent (to 3); glumes usually absent; rachilla internodes usually disarticulating 7. *Schizostachyum*

12b. Spikelets in very dense heads; palea keeled; lodicules 3; glumes 2 or 3; rachilla internodes not disarticulating 8. *Cephalostachyum*

11b. Culms diffuse; rhizome neck to 3 m; fruit large, pericarp fleshy or crustaceous.

13a. Culms to 2 cm in diam.; fruit globose, less than 2 cm 9. *Pseudostachyum*

13b. Culms 3–7 cm in diam.; fruit pear-shaped, 5–13 cm 10. *Melocanna*

10b. Spikelets (1- to) many flowered; ovary with short, solid, apical appendage.

14a. Inflorescence a spikelet with basal bracts not subtending buds 11. *Neomicrocalamus*

14b. Inflorescence a pseudospikelet with basal bracts subtending buds.

15a. Mid-culm branches 1 per node, about as thick as culm 6. *Bonia*

15b. Mid-culm branches several to many per node, much smaller than culms.

16a. Caryopsis globose, 10–20 mm, pericarp fleshy 5. *Melocalamus*

16b. Caryopsis cylindrical, rarely spherical, 3–10 mm, pericarp thin.

17a. Palea prominently bifid, cleft to 1/3 of its length 2. *Thyrsostachys*

17b. Palea undivided or shortly bifid.

18a. Inflorescence subtended by a broad, 2-keeled prophyll; rachilla internodes usually distinct and disarticulating 1. *Bambusa*

18b. Inflorescence subtended by a narrow, 1-keeled prophyll; rachilla internodes usually obscure and not disarticulating.

- 19a. Palea of uppermost or only floret not keeled or slightly 2-keeled; filaments free 3. *Dendrocalamus*
- 19b. Palea of all florets 2-keeled; filaments connate 4. *Gigantochloa*
- 1b. Rhizome leptomorph, thinner than culm; culms solitary or pluricaespitose.
 - 20a. Inflorescence branches with or without subtending bracts, bracts usually well developed; spikelets sessile.
 - 21a. Stamens 6 29. *Indosasa*
 - 21b. Stamens 3.
 - 22a. Culm strongly flattened above branches.
 - 23a. Mid-culm branches 2, unequal, with secondary branching 34. *Phyllostachys*
 - 23b. Mid-culm branches 4 or 5; subequal, without secondary branching 33. *Shibataea*
 - 22b. Culm nearly terete or slightly quadrangular, not flattened or grooved above branches.
 - 24a. Culm sheath blade very small, less than 1 cm 32. *Chimonobambusa*
 - 24b. Culm sheath blade large, more than 1 cm.
 - 25a. Inflorescence with leafy bracts; spikelets laterally compressed; branches 3–9 per node; buds open 31. *Semiarundinaria*
 - 25b. Inflorescence with small bracts; spikelets terete; branches consistently 3 per node; buds closed 30. *Sinobambusa*
 - 20b. Higher orders of inflorescence branching with subtending bracts greatly reduced or absent; spikelets pedicellate.
 - 26a. Mid-culm branch 1(–3) per node; branch and leaves often very large relative to culm size.
 - 27a. Stamens 6, leaf blade margins bleached in winter, terminal blade often at right angle (90°) to shoot 21. *Sasa*
 - 27b. Stamens 3, leaf blade margins not bleached in winter, terminal blade parallel to shoot.
 - 28a. Fruit a small, dry caryopsis, pericarp thin 28. *Indocalamus*
 - 28b. Fruit large, berrylike, pericarp fleshy 27. *Ferocalamus*
 - 26b. Mid-culm branches (1–)3 to several per node; branches and leaves small to medium relative to culm size.
 - 29a. Stamens 6 20. *Acidosasa*
 - 29b. Stamens 3 (*Arundinaria* s. l.)
 - 30a. Mid-culm branches 7–12 per node, without secondary branching; florets 0.5–1.4 cm ... 26. *Gelidocalamus*
 - 30b. Mid-culm branches 1–7 per node, with secondary branching; florets (1–)1.5–8(–20) cm.
 - 31a. Culm internodes strongly flattened above branches; culm supra-nodal ridge substantially raised 25. *Oligostachyum*
 - 31b. Culm internodes ± terete; culm supra-nodal ridge not substantially raised.
 - 32a. Culm buds always open at front 22. *Arundinaria*
 - 32b. Culm buds initially closed at front.
 - 33a. Culm sheaths late deciduous, mid-culm branches consistently 3 per node 23. *Pseudosasa*
 - 33b. Culm sheaths very persistent, mid-culm branches 1 to many per node.
 - 34a. Mid-culm internodes terete or rarely slightly sulcate above single branches 23. *Pseudosasa*
 - 34b. Mid-culm internodes slightly grooved above 1–9 branches 24. *Pleiblastus*

1. BAMBUSA Schreber, Gen. Pl. 236. 1789, nom. cons.

簕竹属 le zhu shu

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Arundarbor Kuntze; *Bambos* Retzcius, nom. rej.; *Bambus* Blanco; *Bambus* J. F. Gmelin.

Arborescent bamboos, occasionally shrubby or scrambling, 1–20 m. Rhizomes short necked, pachymorph. Culms unicaespitose, erect to pendulous, rarely subscandent; internodes terete; nodes not raised. Branches several to many, often 1–3 dominant (subequal in *Bambusa* subg. *Lingnania*), branchlets of lower branches sometimes forming tough or weak thorns. Culm sheaths deciduous, rarely persistent; auricles usually conspicuous, always with marginal oral setae; blade usually erect. Leaf blade variable in size, transverse veins inconspicuous. Inflorescence iterant, fully bracteate, subtended by a broad 2-keeled prophyll; pseudospikelets rarely solitary, usually several to many clustered to capitate on flowering branches. Pseudospikelets prophyllate; florets 2 to many, terminal floret sterile or imperfect, sessile; fertile glumes preceded by 1 or more gemmiferous, glumaceous, or spathaceous bracts and/or 1–3 empty glumes; rachilla internodes usually distinct and usually disarticulating with florets, falling separately; lemma broad, many veined; palea 2-keeled, apex acute or shortly bifid; lodicules 3 or 2. Stamens 6; filaments free. Ovary usually stalked, apex thickened and hairy; style solid, usually short; stigmas (1–)3, long, hairy, plumose. Caryopsis terete, apex hairy; pericarp slightly thickened.

More than 100 species: tropical and subtropical Asia; pantropical in cultivation; 80 species (67 endemic) in China, mainly in the south and southwest.

Most species in this genus are very useful cultivated plants, with no known or only limited wild populations. *Bambusa lapidea*, *B. pervariabilis*, *B. rigida*, *B. sinospinosa*, and *B. tuldoidea* are used for building construction and scaffolding; *B. albolineata*, *B. lenta*, and *B. textilis* are split for woven bamboo goods; the shoots of *B. gibboides* and *B. variostrata* are edible; *B. multiplex*, *B. ventricosa*, and *B. vulgaris* are very famous ornamental bamboos.

- 1a. Culm sheath blade narrow, base only 1/3 width of sheath apex; culm internodes usually longer than 30 cm, with thin walls often less than 8 mm thick 3. *B.* subg. *Lingnania*
- 1b. Culm sheath blade broad, base 1/2–3/4 width of sheath apex; culm internodes shorter than 30 cm, with thick walls to 2 cm thick.
 - 2a. Culm sheath auricles small, rounded; spikelets dense at maturity 4. *B.* subg. *Dendrocalamopsis*
 - 2b. Culm sheath auricles large, rounded or irregular, or absent; spikelets loose at maturity, with broad florets on short rachilla segments.
 - 3a. Branchlets of lower branches specialized into tough or weak leafless thorns; culm sheath blade persistent 1. *B.* subg. *Bambusa*
 - 3b. Branchlets of lower branches normal, leafy; culm sheath blade deciduous 2. *B.* subg. *Leleba*

1. *Bambusa* subg. *Bambusa*

籐竹亚属 le zhu ya shu

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Bambusa subg. *Ischurochloa* (Buse) P. C. Keng; *Ischurochloa* Buse.

Culm internodes mostly shorter than 30 cm; wall to 2 cm thick; branches usually arising from basal, mid-culm, and apical nodes, usually 3 co-dominant; branchlets of lower branches specialized into tough or weak thorns. Culm sheaths thickly leathery; auricles large, rounded or irregular, or absent; blade persistent, broad, base 1/2–3/4 width of sheath apex. Pseudospikelets loose at maturity, with broad florets on short rachilla segments.

More than 35 species: widely distributed in tropical and subtropical Asia; widely planted in other parts of the world; 27 species (24 endemic) in China, mainly in the south, some in the southwest.

- 1a. Branches on lower nodes of culms densely interwoven, with many, tough, sharp thorns.
 - 2a. Culm sheaths pubescent only near base.
 - 3a. Lower internodes of culms glabrous; culm sheath apically subtruncate; auricles subequal, usually reflexed 3. *B. sinospinosa*
 - 3b. Lower internodes of culms with longitudinally arranged, stiff hairs; culm sheath apically broadly arched; auricles dissimilar, not reflexed 4. *B. funghomii*
 - 2b. Culm sheaths pubescent on basal half to entire sheath.
 - 4a. Lower nodes of culms usually with a ring of silky white hairs below and above sheath scar; culm sheaths densely stiffly hairy; auricles usually crescent-shaped, reflexed 1. *B. blumeana*
 - 4b. Lower nodes of culms without silky hair rings or with only a ring of brown hairs below sheath scar.
 - 5a. Culm sheath apically broadly concave, with a triangular protuberance on each shoulder; auricles tiny or absent, narrowly filiform if present 2. *B. flexuosa*
 - 5b. Culm sheath apically broadly convex, without protuberance on each shoulder; auricles well developed, ovate-oblong to ovate-lanceolate 4. *B. funghomii*
- 1b. Branches on lower nodes of culms with tough and/or weak thorns but not densely interwoven.
 - 6a. Culm sheath auricles large, to 2 cm wide.
 - 7a. Culm sheath blade width 2/3–3/4 width of sheath apex.
 - 8a. Lowest internodes of culms usually with purple streaks; nodes with a ring of brown silky hairs below and above sheath scar; culm sheaths uniformly hairy, apex nearly truncate, ligule ca. 3 mm 24. *B. insularis*
 - 8b. Lowest internodes without purple streaks; nodes with a ring of gray-white hairs below and above sheath scar; culm sheaths only hairy at central base, apex broadly convex, ligule ca. 7 mm 25. *B. xiashanensis*
 - 7b. Culm sheath blade width 2/5–3/5 width of sheath apex.
 - 9a. Lower culm internodes densely hairy; culm sheath apically subtruncate, larger auricles nearly 3 × size of smaller ones 11. *B. rutila*
 - 9b. Lower culm internodes glabrous; culm sheath apically usually broadly convex, sometimes subtruncate, larger auricles to 2 × size of smaller ones.
 - 10a. Basal culm internodes with pale green stripes; leaf blade abaxially glabrous 12. *B. lapidea*
 - 10b. Basal culm internodes without stripes; leaf blade abaxially pubescent.

- 11a. Culm sheaths glabrous, ligule ca. 6 mm 10. *B. macrotis*
- 11b. Culm sheaths with dense, stiff, brown hairs, ligule ca. 2 mm 13. *B. latideltata*
- 6b. Culm sheath auricles small, less than 1 cm wide.
- 12a. Culm sheath ligule 5–8 mm.
- 13a. Culm sheath apically obliquely truncate, with unequal, triangular protuberance on each shoulder and white stripes 5. *B. chunii*
- 13b. Culm sheath apically obliquely asymmetrically arched, with neither protuberance on each shoulder, nor white stripes.
- 14a. Culm sheath auricles very unequal, usually wrinkled; basalmost culm internodes sometimes with pale yellow stripes 8. *B. dissimulator*
- 14b. Culm sheath auricles subequal; culm internodes with purple stripes initially 15. *B. longipalea*
- 12b. Culm sheath ligule 0.5–3(–4) mm.
- 15a. Culm sheath blade base more than 4/5 width of sheath apex.
- 16a. Culm sheaths hairy at least near base, rarely glabrous.
- 17a. Lower culm nodes with a ring of stiff, pale brown hairs below and above sheath scar, basal ca. 3 nodes with a ring of gray-white silky hairs above sheath scar; culm sheaths with stiff, appressed, dark brown hairs 23. *B. diaoluoshanensis*
- 17b. Lower culm nodes with a ring of gray-white silky hairs below and above sheath scar; culm sheaths with hairs absent, pale, or restricted to base.
- 18a. Culm sheath apically slightly asymmetrically arched-convex, usually glabrous or with stiff, dark brown hairs near base 14. *B. indigena*
- 18b. Culm sheath apically \pm truncate, distal half with deciduous, stiff, appressed, pale hairs 16. *B. cornigera*
- 16b. Culm sheaths glabrous throughout.
- 19a. Culms both normal and abnormal, internodes of normal culms terete, lower internodes of abnormal culms greatly shortened and swollen; culm sheath ligule 0.5–1 mm 21. *B. ventricosa*
- 19b. Culms all normal, internodes terete; culm sheath ligule 3(–4) mm.
- 20a. Culm sheaths with 1 or 2 pale yellow stripes near outer margin, apex slightly asymmetrical, broadly triangular or broadly arched.
- 21a. Lower culm internodes hairy; leaf blade linear-lanceolate to lanceolate, 1.3–1.7 cm wide 14. *B. indigena*
- 21b. Lower culm internodes glabrous; leaf blade narrow, linear-lanceolate, 1–1.3 cm wide 17. *B. subaequalis*
- 20b. Culm sheaths without stripes, apex subtruncate or obliquely truncate.
- 22a. Basal nodes with a ring of gray-white silky hairs below and above sheath scar; culm sheath apically subtruncate, with a protuberance on one shoulder 22. *B. corniculata*
- 22b. Basal nodes with a ring of gray-white silky hairs below sheath scar only; culm sheath apically obliquely truncate, without protuberance on shoulders 27. *B. ramispinosa*
- 15b. Culm sheath blade base less than 3/4 width of sheath apex.
- 23a. Culm sheaths obliquely truncate, or obliquely truncate and convexly arched, or slightly asymmetrical and concavely arched.
- 24a. Culm sheaths with a triangular protuberance on higher shoulder, blade not narrowed at base 18. *B. gibba*
- 24b. Culm sheaths without a protuberance on higher shoulder, blade basally narrowed and incurved.
- 25a. Culm sheaths hairy 20. *B. angustiaurita*
- 25b. Culm sheaths glabrous.
- 26a. Culms 3–7 m, 1.5–4 cm in diam., culm sheath ligule ca. 1 mm 7. *B. glabrovagina*
- 26b. Culms 8–10 m, 4–6 cm in diam., culm sheath ligule 3–4 mm 19. *B. malingensis*
- 23b. Culm sheaths symmetrical, apex convexly or triangularly arched, or asymmetrically triangular.
- 27a. Culm sheaths with stiff, dark brown hairs only near base, apex symmetrical, ligule 3–4 mm; foliage leaf blade abaxially densely pubescent 26. *B. prominens*
- 27b. Culm sheaths glabrous or only hairy below blade, apex asymmetrically triangular; ligule 1–2 mm; foliage leaf blade abaxially sparsely villous or subglabrous.
- 28a. Basal culm nodes with rings of gray-white to pale brown silky hairs below and above sheath scars; culm sheaths hairy below blade; auricles long decurrent, ca. 3 mm wide; ligule finely dentate, fimbriate 6. *B. angustissima*

- 28b. Basal culm nodes glabrous; culm sheaths glabrous; auricles not decurrent, ca. 5 mm wide; ligule entire, very shortly ciliolate 9. *B. aurimuda*

1. *Bambusa blumeana* J. H. Schultes in Schultes & J. H. Schultes, Syst. Veg. 7(2): 1343. 1830.

籐竹 le zhu

Bambusa spinosa Blume ex Nees, Flora 8: 580. 1825, not Roxburgh (1814); *B. stenostachya* Hackel; *B. teba* Miquel; *Ischurochloa stenostachya* (Hackel) Nakai.

Culms 15–24 m, 8–15 cm in diam., apically nodding; basal internodes slightly flexuose, green, 25–35 cm, distally initially sparsely strigose, later glabrous; wall 20–30 mm thick; each node of lower culm with a ring of aerial roots or root primordia, with a gray or brown sericeous ring below and above sheath scar. Branches to base, solitary on lower nodes, with branchlets usually forming tough, sharp, curved thorns and densely interwoven. Branches 3 to several on upper nodes, central markedly longer and thicker. Culm sheaths tardily deciduous, apex broadly convex or concave, with a triangular protuberance on each shoulder, densely stiffly brown hairy; auricles usually reflexed, crescent-shaped, linear-oblong, slightly unequal; oral setae dense, pale brown, curved, long, thick; ligule 4–5 mm, lacinate, fimbriate; blade usually reflexed, ovate to narrowly ovate, abaxially strigose, adaxially densely stiffly dull brown hairy, base ca. 2/5 as wide as sheath apex, margins ciliate. Ultimate branches with 5–9 leaves; leaf blade linear-lanceolate to narrowly lanceolate, 10–20 × 1.2–2.5 cm, both surfaces scabrid, mainly subglabrous but abaxially densely villous near base. Pseudospikelets 2 to several, clustered at nodes of flowering branches. Spikelets pale purple-green, linear, 2.5–4 × 0.3–0.4 cm; florets 4–12, central 2–5 perfect. Glumes 2, ca. 2 mm, glabrous; lemma ovate-oblong, 6–9 × 2.5–4 mm, glabrous, 9–11-veined, margins glabrous, apex acute; palea ca. 7 × 1.8 mm, 3-veined between and 3-veined on either side of keels, apex bifid. Filaments separate, 6–7 mm; anthers yellow, 3–4 mm. Ovary narrowly ovoid, 1.2–2 mm; style short; stigmas 3. New shoots Jun–Sep, fl. spring.

Probably introduced, cultivated on river banks and around villages; below 300 m. Fujian, Guangxi, Taiwan, Yunnan [Indonesia, Malaysia, Philippines, Thailand, Vietnam].

Bambusa blumeana 'Wei-fang Lin' (Guihaia 8: 122. 1988) was cultivated in Taiwan. It is characterized by the golden yellow culm and branch internodes, which turn orange with deep green stripes.

The culms are used for scaffolding.

2. *Bambusa flexuosa* Munro, Trans. Linn. Soc. London 26: 101. 1868.

小籐竹 xiao le zhu

Bambusa scabriculum W. T. Lin.

Culms 6–7 m, 3.5–6 cm in diam., basally flexuose, apically nodding; internodes 20–30 cm, sparsely stiffly brown strigose, with a ring of silky brown hairs below each node; wall thick. Branches to base, solitary at lower nodes, flexuose, densely interwoven, branchlets specialized into tough thorns, higher nodes with 3 to several branches. Culm sheaths tardily

deciduous, leathery, prominently ribbed-striate when dry, sparsely stiffly dark brown strigose, apex concave with a triangular protuberance on each shoulder; auricles narrowly filiform or absent; ligule 4–5 mm, dentate or lacinate, fimbriate; blade erect or recurved, ovate-lanceolate to lanceolate, base ca. 1/2 as wide as sheath apex. Leaf blade narrowly lanceolate to lanceolate, 7–11 × 1.2–1.6 cm, both surfaces glabrous. Pseudospikelets solitary or clustered, slightly compressed, 2–3 cm, gemmiferous bracts ca. 4; florets 8–12 with middle florets perfect; rachilla flexuose, internodes flat, 2–2.5 mm, hispid. Glumes usually absent; lemma oblong-lanceolate, 8–10 mm, apex acute; palea usually shorter than lemma, keels ciliate; lodicules 3, subequal, margins long ciliate, apex obtuse. Filaments enlarged at base; anther obtuse at apex. Style short; stigmas 3.

- Hills, river banks. Guangdong, Hainan.

Bambusa flexuosa is usually planted as a thorny hedge to keep out animals. It has been named incorrectly by some authors as *Bambusa bambos* (Linnaeus) Voss.

3. *Bambusa sinospinosa* McClure, Lingnan Sci. J. 19: 411. 1940.

车筒竹 che tong zhu

Culms 15–24 m, 8–14 cm in diam., apically slightly drooping; internodes 20–26 cm, mainly glabrous but with a ring of gray silky hairs below basal 1 or 2 nodes; wall 10–30 mm thick; branching to base. Branches usually solitary at lower nodes, with tough thorns; branchlets interwoven; branches 3 to several above lower nodes. Culm sheaths tardily deciduous, leathery, densely stiffly dark brown hairy toward base, apex truncate; auricles usually reflexed, oblong to obovate, subequal, rugose, adaxially densely strigose, margin with undulate or erect setae; ligule 3–5 mm, dentate, fimbriate; blade erect or recurved, base ca. 1/2 width of sheath apex. Leaf blade linear-lanceolate, 7–17 × 1.2–1.6 cm, both surfaces glabrous or abaxially proximally pilose. Pseudospikelets solitary or several clustered at each node of flowering branch, linear to linear-lanceolate, slightly compressed, to 4 cm, prophylls obtuse, keels ciliate; gemmiferous bracts 3–5, narrowly triangular or subovate, glabrous, obtuse; fertile florets 6–12; rachilla internodes 2–4 mm. Glumes usually absent; lemma ovate-oblong, 5–9.5 mm, many veined, apex obtusely acute or acute with fine tip; palea usually slightly longer than lemma, keels ciliate, 3–5-veined between keels; lodicules 3, unequal, obovate, ca. 1.4 mm, obtuse, margins ciliate. Filaments distinct; anther obtuse at apex. Ovary narrow, apex thickened and hispidulous; style slender, hispidulous; stigmas 3. New shoots May–Jun, fl. Aug–Dec.

- Riversides, near villages. Guangdong, Guangxi, Hainan.

The correct position of *Bambusa sinospinosa* var. *inermis* Keng & P. C. Keng is not known, and it is included with the *taxa incertae sedis* at the end of the genus.

This species is planted along rivers to protect the banks, and the culms are used for construction.

4. *Bambusa funghomii* McClure, Lingnan Sci. J. 19: 535. 1940.

鸡窝箭竹 *ji dou le zhu*

Culms 13–15 m, 6–7 cm in diam., basally flexuose, apically erect or slightly drooping; internodes slightly curved, 25–32 cm, not white powdery, lower internodes stiffly longitudinally dark brown strigose; wall 1–1.5 cm thick; branching to base. Branches solitary at lower nodes, 3 to several at upper nodes; lower branches densely interwoven with branchlets specialized into sharp, tough thorns. Culm sheaths tardily deciduous, leathery, abaxially white powdery, lower half sparsely stiffly dark brown hairy, margins white ciliolate or glabrous, apex broadly convex; auricles well developed, extremely unequal, ovate-oblong to ovate-lanceolate, undulate, wrinkled, inflated, both sides strigose; oral setae pale, ca. 1 cm, undulate; ligule 5–7 mm, dentate or lacinate, with unequal fimbriae; blade erect or those on upper nodes recurved, ovate-triangular to broadly lanceolate, base 1/3 width of sheath apex or broader, abaxially glabrous, adaxially stiffly dark brown hairy between veins, margin strongly involute, apex acuminate. Leaf blade linear-lanceolate, 6–15 × 0.6–1.6 cm, both surfaces glabrous or adaxially pubescent near base. Inflorescence unknown.

- Open places on hills or around villages. Guangdong, Guangxi.

Bambusa funghomii is usually grown as a hedge, and the culms are used for scaffolding and poles.

5. *Bambusa chunii* L. C. Chia & H. L. Fung, Kew Bull. 37: 593. 1983.

焕铺箭竹 *huan yong le zhu*

Culms 10–12 m, 4.5–6.5 cm in diam., basally flexuose, apically drooping; internodes slightly curved, 25–30 cm, very thinly white powdery, very sparsely stiffly hairy, with a ring of gray hairs below each node; wall thick; branching to base. Branches at lower nodes usually solitary, with tough, sharp thorns, at upper nodes 3 to several with central 3 longer and thicker. Culm sheaths tardily deciduous, with several marginal white stripes on each side, leathery, glabrous, apex obliquely truncate with unequal, triangular protuberance on each shoulder; auricles unequal, linear-lanceolate, small, usually wrinkled, abaxially hispidulous; oral setae well developed, 5–10 mm, undulate, hispidulous at base; ligule 5–7 mm, margin irregular, dentate, lacinate; blade erect, broadly lanceolate, abaxially glabrous, base nearly 1/2 width of sheath apex. Leaf blade lanceolate, 9.5–19 × 1.5–2 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

- Cultivated around villages. Hong Kong.

The origin of this plant is not known.

6. *Bambusa angustissima* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 367. 1981.

狭耳箭竹 *xia er le zhu*

Culms to 9 m, ca. 5 cm in diam., basally slightly flexuose, apically slightly drooping; internodes ca. 25 cm, glabrous; wall thick; nodes toward base with a ring of gray-white to pale brown silky hairs below and above sheath scar; sheath scar with

a persistent ring of stiff, brown hairs; branching to base. Branches at lower nodes usually with branchlets specialized into tough or weak thorns; from mid-culm nodes upward usually many and clustered with central 3 dominant. Culm sheaths somewhat persistent, ribbed-striate when dry, mostly glabrous, pubescent only below blade, apex asymmetrically triangular; auricles unequal, narrowly linear and extremely decurrent, small, slightly wrinkled, margin with both long and short setae 1–3 mm; ligule 1–2 mm, sparsely dentate or shortly fimbriate; blade erect, narrowly triangular, with stiff, brown hairs at joint with sheath, base nearly 1/2 as wide as sheath apex. Leaf blade lanceolate to narrowly lanceolate, 6–9 × 1.1–1.5 cm, abaxially subglabrous, adaxially glabrous. Inflorescence unknown.

- River banks. S Guangdong (Gaozhou).

7. *Bambusa glabrovagina* G. A. Fu, Acta Phytotax. Sin. 20: 489. 1982 [*“glabro-vagina”*].

光鞘石竹 *guang qiao shi zhu*

Culms 3–7 m, 1.5–4 cm in diam.; internodes 21–27 cm, initially thinly white powdery, glabrous; wall thick; branching to base. Branches 3 to several at each node, clustered, central 3 dominant; branchlets at lower nodes sometimes forming tough, curved thorns. Culm sheaths deciduous, glabrous, apex slightly inclined to outer side and asymmetrical, broadly convex or subtruncate; auricles unequal, linear-lanceolate or oblong, less than 3 mm wide, margin with curved setae; ligule ca. 1 mm, margin irregular, finely dentate; blade erect, ovate to ovate-lanceolate, base ca. 3/5 width of sheath apex, abaxially glabrous, adaxially slightly scabrid near base, apex acuminate. Leaf blade linear-lanceolate to lanceolate, 5–12 × 0.8–1.7 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets several, clustered at each node, linear-lanceolate to lanceolate, 1.5–2 cm; prophylls ovate, 3–3.5 mm, 2-keeled; gemmiferous bracts 2 or 3, ovate-elliptic to ovate-oblong, 3–3.5 mm, apex obtuse to acute, very shortly mucronate; florets 6 or 7, middle 3 or 4 perfect; rachilla segments flat, 2–3 mm, apex inflated and cupular. Glumes absent; lemma ovate-oblong, 7.5–8 mm, glabrous, 9–11-veined, apex acute, mucronate; palea linear-lanceolate, slightly longer than lemma, 4-veined between and 2-veined on either side of keels, apex with a cluster of white hairs; lodicules 3, unequal; anterior oblique, ca. 2 mm, margins long ciliate; posterior subobovate, ca. 1.2 mm. Filaments slender; anthers ca. 4 mm. Ovary ovoid, ca. 0.4 mm, base with stalk ca. 1 mm, apex thickened and hispidulous; style ca. 0.2 mm; stigmas 3, ca. 0.8 mm. Mature caryopsis unknown.

- Low hills, around villages. Hainan (Dunchang).

8. *Bambusa dissimulator* McClure, Lingnan Sci. J. 19: 413. 1940 [*“dissemulator”*].

坭箭竹 *ni le zhu*

Culms 10–18 m, 4–7 cm in diam., basally slightly flexuose, apically suberect or slightly drooping; internodes 25–35 cm, sometimes several at base with pale yellow stripes, initially thinly white powdery, usually glabrous; wall thick; basal nodes sometimes with short aerial roots; branching to base. Branches solitary at basal nodes, 3 to several at higher nodes, with central

3 dominant; branchlets at lower nodes usually condensed into tough or weak thorns. Culm sheaths deciduous, leathery, subglabrous or inconspicuously strigose, apex asymmetrical, arched-concave; auricles unequal, usually wrinkled; larger auricle oblong to oblanceolate, 4–5 mm wide; smaller auricle ovate to elliptic, 3–4 mm wide; oral setae undulate; ligule 5–7 mm, dentate, lacinate, shortly white fimbriate; blade erect, ovate-triangular to ovate-lanceolate, base nearly 1/2–3/5 width of sheath apex, abaxially glabrous, adaxially stiffly dark brown hairy, margins with undulate setae near base. Leaf blade linear-lanceolate to lanceolate, 7–18 × 1–1.8 cm, abaxially sparsely pubescent, adaxially glabrous. Flowering branches with pseudospikelets solitary or clustered at each node, lanceolate, ca. 3 cm, compressed; prophylls 2-keeled; gemmiferous bracts usually 2, ovate, apex obtuse; fertile florets 4 or 5, apical 2 to several florets sterile; rachilla segments 2–3 mm, apex inflated and ciliate. Glumes 1 or sometimes absent, similar to lemma but shorter; lemma lanceolate, to 1.2 cm, base glabrous, veins inconspicuous, base rounded or broadly cuneate, margins ciliate near apex, apex obtuse or acute with a subulate tip; palea keels strongly folded near apex, ciliate or scabrous, 5-veined between keels, apex usually penicillate; lodicules 3, subequal, ovate or obovate, margins long ciliate. Filaments distinct; anthers apex obtuse, slightly concave. Ovary obovoid or ovoid, stalked, apex thickened and strigose; style solitary, very short, hairy; stigmas 3. New shoots Jul–Aug, fl. Mar–Apr.

- Open fields, hills, cultivated around villages. Guangdong.

- 1a. Culm internodes glabrous 8a. var. *dissimulator*
 1b. Culm internodes hairy.
 2a. Lower culm internodes with a ring
 of gray silky hairs below and above
 sheath scar 8b. var. *albinodia*
 2b. Culm nodes, internodes, and abaxial
 surfaces of culm sheaths obviously
 strigose 8c. var. *hispida*

8a. *Bambusa dissimulator* var. *dissimulator*

坭筋竹(原变种) ni le zhu (yuan bian zhong)

Culms internodes glabrous.

- Guangdong.

8b. *Bambusa dissimulator* var. *albinodia* McClure, Lingnan Sci. J. 19: 415. 1940.

白节筋竹 bai jie le zhu

Lower culm internodes with a ring of gray silky hairs below and above sheath scar.

- Usually cultivated around villages. Guangdong.

8c. *Bambusa dissimulator* var. *hispida* McClure, Lingnan Sci. J. 19: 415. 1940.

毛筋竹 mao le zhu

Culm nodes, internodes, and abaxial surface of culm sheaths evidently strigose.

- Cultivated around villages. Guangdong.

9. *Bambusa aurinuda* McClure, Lingnan Univ. Sci. Bull. 9: 3. 1940.

裸耳竹 luo er zhu

Culms 5–10 m, ca. 2.5 cm in diam., basally nearly straight, apically slightly drooping; internodes ca. 30 cm, basal nodes sometimes with short aerial roots, glabrous; branching to base or 2nd node. Branches 3 to many, clustered on each node; branchlets on lower nodes usually specialized into thorns; central 3 branches dominant. Culm sheaths slightly persistent, ribbed-striate when dry, glabrous, margins ciliate, apex asymmetrically triangular; auricles unequal; larger auricle oblong, ca. 2 × 0.5 cm; smaller auricle obovate to elliptic, ca. 1 × 0.5 cm; oral setae usually absent or 1 or 2 at distal nodes, deciduous, pale yellow or brown-yellow, 5–10 mm, undulate; ligule arched, ca. 2 mm, entire, very shortly white ciliate; blade erect, ovate-triangular to ovate-lanceolate, base nearly 2/3 width of sheath apex, abaxially glabrous, apex subulate, abruptly acuminate. Leaf blade linear-lanceolate to oblong-lanceolate, 8.5–14 × 0.8–1.2 cm, abaxially initially sparsely pilose, adaxially glabrous or subglabrous. Pseudospikelets linear, 4.5–5 cm; basal rachilla very short, glabrous; gemmiferous bracts usually 2, ovate, obtuse; fertile florets 5–12, distal 2 or 3 and sometimes proximal 1 sterile; rachilla segments 2–3 mm, nearly 1/4–1/3 length of palea. Glumes 1, similar to lemma, 5–6(–8) mm, glabrous; lemma navicular, to 1 cm, papery, glabrous, with many pale purple veins, apex acute with fine tip; palea nearly as long as lemma, keels sparsely ciliate, apex penicillate; lodicules 3, subequal, ovate-lanceolate, margins ciliate, apex obtuse. Anthers yellow, apex obtuse. Ovary hispidulous at apex; style short, slightly thickened, hispidulous; stigmas 3. Fruit unknown.

Forest margins, riversides. S Guangxi [Vietnam].

10. *Bambusa macrootis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 371. 1981.

大耳坭竹 da er ni zhu

Culms 6–7 m, to 6 cm in diam., basally slightly flexuose, apically drooping; internodes glabrous; wall slightly thick; lower nodes usually with a ring of gray-white silky hairs above sheath scar; branching to base. Culm sheaths rather tardily deciduous, glabrous, apex slightly asymmetrical, broadly arched; auricles unequal, strongly wrinkled; larger auricle ovate-elliptic, ca. 3 × 1.5 cm, smaller auricle elliptic, ca. 2 × 1 cm; oral setae undulate; ligule ca. 6 mm, dentate with ca. 2 mm fimbriae; blade erect, narrowly ovate to ovate-triangular, base nearly 1/2 as wide as sheath apex. Leaf blade linear-lanceolate, 5–10 × 0.7–0.9 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

- Riversides. Guangdong (Qingyuan).

Bambusa macrootis is similar to *B. rutila*, but has glabrous culm internodes and culm sheaths, a slightly asymmetrical, broadly arched culm sheath apex, and narrower leaf blades.

11. *Bambusa rutila* McClure, Lingnan Sci. J. 19: 533. 1940.

木竹 mu zhu

Bambusa shuangliuensis T. P. Yi.

Culms 8–12 m, 4–6 cm in diam., basally slightly flexuose, apically slightly drooping; internodes 30–35 cm; wall thick; lower internodes usually initially densely stiffly dark brown strigose, basal internodes sometimes with several inconspicuous pale yellow stripes; nodes with a ring of gray-white silky hairs below and above sheath scar and a ring of stiff, brown hairs on sheath scar, several basal nodes usually with short aerial roots; branching from 3rd or 4th node up. Branches usually 3–12 on mid-culm and basal nodes; central 3 dominant, reflexed; those on lower nodes usually with branchlets specialized into weak or tough thorns. Culm sheaths tardily deciduous, ribbed-striate when dry, glabrous or with stiff, dark brown hairs near margins and base, apex slightly oblique and truncate; auricles extremely unequal, abaxially densely hispidulous; larger auricle ovate-oblong, oblong, or narrowly reniform, inflated outward, undulate, wrinkled, ca. 1.5 cm wide; smaller auricle subovate or elliptic, ca. 1 cm wide, undulate, wrinkled; ligule 4–5 mm, dentate, fimbriate; blade persistent, erect, subtriangular or ovate, base nearly 2/5 as wide as sheath apex. Leaf blade linear-lanceolate to narrowly lanceolate, usually 10–18 × 1–1.7 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets linear-lanceolate, compressed, to 3 cm; prophylls obtuse at apex, keels ciliate; gemmiferous bracts 3–8, ovate, 1–4 mm, margins ciliate or subglabrous near apex, apex obtuse and finely tipped; florets ca. 9, apical 1 or 2 florets sterile; rachilla segments 2–3 mm, apex ciliate. Glumes absent; lemma ovate-lanceolate, to 8 mm, abaxially glabrous, many veined, margins ciliate near apex, finely tipped, apex obtuse or acute and scabrous; palea longer or shorter than lemma, keels ciliate or scabrous at apex, 2- or 3-veined between keels, apex penicillate; lodicules 3, subequal, ovate or obovate, margins ciliate. Anther obtuse at apex. Ovary obovoid, apex thickened and hairy; style very short; stigmas 3, scabrid. Fl. Oct–Dec.

• Open fields, around villages. Fujian, Guangdong, Guangxi, Sichuan.

The culms are used for poles and scaffolding, and the young shoots are edible.

12. *Bambusa lapidea* McClure, Lingnan Sci. J. 19: 531. 1940.

油簕竹 you le zhu

Bambusa miyiensis T. P. Yi.

Culms 7–17 m, 4–7 cm in diam., basally straight, apically slightly drooping; internodes 20–35 cm, obviously shorter and slightly swollen near base and sometimes inconspicuously pale green striped and purple streaked, glabrous; wall 1–2 cm thick; nodes with a ring of gray-white silky hairs below and above sheath scar, several basal nodes usually with short aerial roots, lower ones with a ring of silky hairs above sheath scar; branching from basal 3rd or 4th node up. Branches usually several to many, clustered at mid-culm and basal nodes, central 3 codominant; branchlets usually specialized into weak or tough thorns. Culm sheaths tardily deciduous, leathery, glossy when fresh, ribbed-striate when dry, glabrous or stiffly hairy at basal margins only, apex subtruncate or slightly asymmetrical, arched; auricles undulate, wrinkled, inflated outward, densely hispidulous or subglabrous abaxially, unequal; larger auricle slightly decurrent, orbicular or ovate, 3.5–4 × 1–1.5 cm; small

ones oblong or ovate, ca. 3 × 1–1.5 cm; ligule 4–5 mm, margin nearly entire and densely fimbriate; blade persistent, erect, inflated outward, ovate to oval, base slightly narrowed and then extended toward both sides and joined to auricles, apex abruptly acuminate, sharply tipped. Leaf blade linear-lanceolate to lanceolate, usually 8–23 × 1–2 cm, both surfaces glabrous. Pseudospikelets linear, compressed, more than 2 cm; gemmiferous bracts 2–4; fertile florets 5 or 6, then 2 sterile florets; rachilla segments usually fistulose, ca. 2.5 cm, apex ciliate. Glumes absent; lemma to 8.5 mm, abaxially glossy and glabrous, many veined, margins glabrous, apex obtuse or acute and finely tipped; palea slightly shorter than lemma, keels ciliate near apex, 2-veined between and scabrous on either side of keels, apex obtuse or sometimes emarginate; lodicules 3, subequal, ovate or obovate, ca. 1.5 mm, margins ciliate, apex obtuse. Anthers ca. 4 mm, apex obtuse. Ovary narrowly obovoid, apex thickened and scabrous; style very short, scabrous; stigmas 3. New shoots Oct, fl. Aug–Sep.

• Plains, hills, riversides, around villages. Guangdong, Guangxi, Sichuan, Yunnan.

The culms are used for scaffolding and construction.

13. *Bambusa latideltata* W. T. Lin, J. Bamboo Res. 13(2): 15. 1994.

软簕竹 ruan le zhu

Culms 4–8 m, 2–5 cm in diam.; internodes 25–30 cm, glabrescent; wall 1–1.2 cm thick; nodes with a pale hispid ring below and above sheath scar. Branches usually arising from basal culm node upward, clustered, central 3 dominant, lower branchlets sometimes shortened into weak or tough thorns. Culm sheaths deciduous, densely stiffly brown hairy, margins ciliate, apex asymmetrically convex; auricles unequal, larger auricle ca. 2.5 × as large as smaller one; oral setae angular; ligule ca. 2 mm, margin dentate; blade erect, broadly triangular. Leaf blade linear, 4–18 × 0.7–1.6 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

• Guangdong (Foshan).

Bambusa latideltata is similar to *B. lapidea*, but has branches from the culm base, green culms, lower internodes with stiff, gray-white hairs, culm sheaths with dense, brown hairs, and shorter, dentate ligules.

14. *Bambusa indigena* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 370. 1981.

乡土竹 xiang tu zhu

Bambusa dissimilis W. T. Lin.

Culms 10–14 m, 4.5–7 cm in diam., basally slightly flexuose, apically slightly drooping; internodes slightly curved, 25–35 cm, initially thinly white powdery, sparsely stiffly white strigose; wall thick; nodes each with a persistent ring of deciduous, stiff, brown hairs, lower ones with a ring of gray-white silky hairs below and above sheath scar. Branches usually solitary on basal ca. 2 nodes, 3 to many from 3rd node upward, 3 dominant branches longer and thicker, branchlets on lower nodes usually specialized into a few weak thorns. Culm sheaths deciduous, thick, leathery, with 1 very narrow pale yellow

stripe near outer margin, usually glabrous or with dark brown hairs near base, apex slightly asymmetrical, broadly arched; auricles small, unequal; larger auricle elliptic or suboblong, ca. $1 \times 0.6-0.7$ cm; smaller auricle contiguous with blade, subelliptic, ca. $1/3$ size of larger one; oral setae slender, undulate; ligule 3–4 mm, sparsely dentate or shortly fimbriate; blade erect, asymmetrical, triangular or narrowly triangular, base to $9/10$ width of sheath apex. Leaf blade linear-lanceolate to lanceolate, $6.5-12 \times 1.3-1.7$ cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets linear, 2–3 cm; prophyll keels ciliate; gemmiferous bracts 3–5, 2.5–3.5 mm, 7–9-veined, obtuse or mucronate; florets 5–12, apical ones sterile; rachilla segments flat, 3–3.5 mm, apex inflated and cupulate with ciliolate margins. Glumes 1, ovate-elliptic, ca. 5 mm, 11-veined, apex acute, mucronate; lemma 9–11 mm, glabrous, 13–15-veined, apex acuminate; palea nearly as long as lemma or slightly longer, keels glabrous, 6-veined between and 2-veined on either side of keels, apex penicillate; lodicules 3, ca. 1.5 mm, long ciliate, anterior 2 oblique, posterior broadly obovate. Filaments slender; anthers ca. 4 mm. Ovary broadly ovoid, ca. 0.5 mm, base stalked, apex thickened and hispid; style ca. 0.3 mm, hispid; stigmas 3, ca. 1.5 mm.

- Low hills, around villages. Guangdong (Guangzhou).

Bambusa indigena is similar to *B. diaoluoshanensis* but has more glabrous culm sheaths with smaller auricles.

15. *Bambusa longipalea* W. T. Lin, Acta Phytotax. Sin. 26: 224. 1988.

紫斑簕竹 *zi ban le zhu*

Culms to 8 m, to 6 cm in diam.; basally \pm flexuose; internodes deep green, initially with purple stripes, 25–34 cm; nodes glabrous. Branches usually arising from 1st or 2nd node up, central 3 dominant, lower branchlets sometimes shortened into weak thorns. Culm sheaths deciduous, glabrous, apex obliquely asymmetrical arched; auricles subequal, elliptic, margin ciliate; ligule ca. 8 mm, denticulate; blade triangular. Leaf blade linear-lanceolate, $6.5-20 \times 0.5-1.8$ cm, abaxially pubescent, adaxially glabrous. Pseudospikelets 4–5 cm; gemmiferous bracts 4–7; florets 7 or 8; rachilla segments 3.5–4 mm, apices pubescent; glumes absent or 1; lemma 1–1.1 cm, subglabrous; palea longer than lemma, pubescent, keels ciliate toward apex, 6-veined between keels; lodicules 3–3.5 mm, margins ciliate; anterior 2 obliquely obovate, posterior oblong. Anthers ca. 5 mm. Ovary obovoid. Fruit unknown.

- Guangdong (Guangzhou).

Bambusa longipalea is similar to *B. indigena* but has internodes deep green, initially with purple stripes, glabrous nodes, and subequal culm sheath auricles.

16. *Bambusa cornigera* McClure, Lingnan Univ. Sci. Bull. 9: 7. 1940.

牛角竹 *niu jiao zhu*

Culms 8–13 m, 6–8 cm in diam., basally straight or flexuose, apically pendulous; internodes slightly curved, often swollen near base, 24–28 cm, glabrous, initially thinly white powdery; basal nodes with rings of gray-white silky hairs below

and above sheath scar. Branches usually arising from 2nd node upward, primary branches longer and thicker; branchlets of lower branches sometimes specialized into fine, weak thorns. Culm sheaths deciduous, ribbed-striate when dry, with deciduous, stiff, appressed, pale hairs on upper half, apex \pm truncate; auricles equal, oblong, small; oral setae fine; ligule to 3 mm, entire, ciliate; blade erect, triangular to narrowly triangular. Leaf blade lanceolate to oblong-lanceolate, $12-20 \times 2-3$ cm, abaxially pubescent. Inflorescence unknown.

- Riversides. Guangxi (Changwu).

17. *Bambusa subaequalis* H. L. Fung & C. Y. Sia, Acta Phytotax. Sin. 19: 374. 1981.

锦竹 *jin zhu*

Culms 8–12 m, 4–6 cm in diam., basally straight, apically drooping; internodes 40–50 cm, initially thinly white powdery, glabrous; wall rather thick; nodes glabrous; branching to base. Branches 1–3 on lower nodes, nearly horizontal; branchlets on lower nodes usually specialized into weak thorns, on middle and upper nodes many, clustered. Culm sheaths deciduous, usually with 1 or 2 pale yellow-green stripes near outer margin, glabrous, apex somewhat broadly triangular or broadly arched; auricles inconspicuous, usually joined to base of blade; ligule ca. 3 mm, margin finely ciliate; blade persistent, erect, subtriangular, base nearly as wide as sheath apex, extending outward to form inconspicuous auricles, margin involute, apex sharp. Leaf blade linear, usually $9-16 \times 1-1.3$ cm, abaxially pilose, adaxially glabrous. Inflorescence unknown.

- Hills, around villages. Guangdong (cultivated), Sichuan.

Bambusa subaequalis differs from *B. indigena* by its more slender culms with longer internodes, glabrous nodes, inconspicuous culm sheath auricles, and narrower leaf blades.

18. *Bambusa gibba* McClure, Lingnan Univ. Sci. Bull. 9: 10. 1940.

坭竹 *ni zhu*

Culms 7–10 m, 3.5–6 cm in diam., basally flexuose, apically suberect; internodes 30–40 cm, inflated near base, initially white powdery, basal internodes initially sparsely stiffly gray-white or brown strigose; wall 3–5 mm thick; nodes glabrous; branching to base. Branches usually 3 at lower nodes with branchlets sometimes specialized into weak thorns; several on middle and upper nodes, 3 central branches dominant. Culm sheaths deciduous, ribbed-striate when dry, glabrous, apex obliquely truncate, with a triangular protuberance on higher shoulder; auricles obviously unequal, sometimes weak; larger auricle ovate-lanceolate or narrowly oblong, 5–6 mm; smaller auricle ovate or elliptic, 2–3 mm; oral setae slender, undulate; ligule arched, 2–3 mm, finely dentate and fimbriate; blade deciduous, erect, narrowly triangular, base not narrowed, nearly $2/3$ as wide as sheath apex. Leaf blade linear-lanceolate to narrowly lanceolate, $8.5-14.5 \times 0.8-1.3$ cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets linear, 2–3 cm; prophylls ovate, ca. 1.5 mm, keels ciliate, apex obtuse; gemmiferous bracts 4, ovate, 1.5–3.5 mm, apex obtuse and mucro-

nate; florets 4–8; rachilla segments flat, ca. 3.5 mm, slightly hairy, apex inflated and ciliolate. Glumes 1, ovate-elliptic, 6–6.5 mm, 15-veined, apex acute, mucronate; lemma ovate-oblong, ca. 1.1 cm, 17-veined, apex acute, mucronate; palea nearly as long as lemma or shorter, keels glabrous, 3-veined between and on either side of keels, apex obtuse with a cluster of white hairs; lodicules 3, subequal, ca. 1.5 mm, margins long ciliate toward apex, base thickened, anterior 2 broadly elliptic, posterior ovate. Anther obtuse at apex. Ovary ovoid, ca. 0.5 mm, base stalked, apex hairy; style ca. 0.5 mm; stigmas 3. Fruit unknown.

Low hills, around villages. Fujian, Guangdong, Guangxi, Hainan, Jiangxi [Vietnam].

This species was misidentified as *Bambusa tulda* by Merrill and Chun (Sunyatsenia 2: 207. 1935).

19. *Bambusa malingensis* McClure, Lingnan Univ. Sci. Bull. 9: 11. 1940.

马岭竹 *ma ling zhu*

Culms 8–10 m, 4–6 cm in diam., basally straight or slightly flexuose, apically suberect or slightly drooping; internodes 25–30 cm, initially thinly white powdery, glabrous except for basal ca. 5 nodes with rings of gray-white silky hairs below sheath scar; wall thick; branching from ca. 2nd node up. Branches usually solitary at basal nodes, 3 to many at mid-culm and distal nodes, central 3 branches dominant; branchlets on lower branches usually forming weak or sometimes sharp, tough thorns. Culm sheaths slightly persistent, ribbed-striate when dry, abaxially glabrous, apex obliquely truncate and arched; auricles unequal, oblong or sometimes narrowly lanceolate, adaxially and marginally with undulate slender setae; larger auricle slightly slanted downward and extending downward, ca. 5 mm, ca. 2 × size of smaller one; ligule arched or subtruncate, 3–4 mm, margin irregularly dentate and ciliolate; blade deciduous, erect, triangular or narrowly triangular, base slightly arched, narrowed, to 2/3 width of sheath apex. Leaf blade narrowly lanceolate, 8–15 × 1–1.7 cm, abaxially very sparsely pubescent or subglabrous, adaxially glabrous. Inflorescence unknown.

• Open fields on hills. Guangdong (cultivated), Hainan.

20. *Bambusa angustiaurita* W. T. Lin, Bamboo Res. 1983(2): 52. 1983.

狭耳坭竹 *xia er ni zhu*

Culms 8–10 m, 3–6 cm in diam., basally slightly flexuose, apically slightly drooping; internodes ca. 30 cm, initially stiffly dull brown hairy; wall thick; basal ca. 3 nodes with persistent ring of gray-white silky hairs above sheath scar; branching from 2nd to 5th node up. Branches solitary or 3 to several per node, dominant 3 longer and thicker; branchlets of those on lower nodes sometimes forming weak thorns. Culm sheaths deciduous, thickly leathery, ribbed-striate when dry, uniformly stiffly dull brown hairy or hairy only near base, apex subtruncate or slightly asymmetrical, broadly arched; auricles unequal, linear; larger auricle 1.5–2 × ca. 0.3 cm; smaller auricle ca. 1 × 0.2 cm; oral setae ca. 3 mm, undulate; ligule 3–4 mm, dentate, shortly fimbriate; blade erect, narrowly ovate to ovate-lanceolate, base

slightly arched, narrowed, nearly 1/2 width of sheath apex, apex acuminate, sharply tipped. Leaf blade linear-lanceolate to lanceolate, 8–16 × 1.3–2.3 cm, both surfaces glabrous. Inflorescence unknown.

• Low hills, around villages. Guangdong (Huaiji).

21. *Bambusa ventricosa* McClure, Lingnan Sci. J. 17: 57. 1938.

佛肚竹 *fo du zhu*

Leleba ventricosa (McClure) W. C. Lin.

Culms dimorphic; normal culms 8–10 m, 3–5 cm in diam., basally flexuose, apically slightly drooping; internodes 30–35 cm, basally slightly swollen, not white powdery, initially glabrous; lower nodes with rings of gray-white silky hairs below and above sheath scar; branching from 3rd or 4th node up, basal 1 or 2 nodes also with short aerial roots; branches 1–3 on lower nodes; branchlets of these sometimes condensed into weak thorns; branches several to many at mid-culm and upper nodes, with central 3 slightly longer and thicker. Abnormal culms (usual in potted plants) 25–50 cm, 1–2 cm in diam., internodes shortened and swollen at base, branch internodes also shortened and swollen; branches only on upper nodes, usually solitary, without thorns. Culm sheaths deciduous, obviously ribbed-striate, glabrous, apex nearly symmetrical, broadly arched or subtruncate; auricles unequal; larger auricle narrowly ovate to ovate-lanceolate, 5–6 mm; smaller auricle ovate, 3–5 mm; oral setae curved; ligule 0.5–1 mm, very shortly finely fimbriate; blade deciduous, erect or recurved, ovate to ovate-lanceolate, base slightly arched, narrowed, slightly narrower than sheath apex. Leaf sheath glabrous; ligule subtruncate, very short; auricles ovate or falcate; oral setae several, curved; blade linear-lanceolate to lanceolate, 9–18 × 1–2 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets solitary or many clustered on each node, linear-lanceolate, slightly compressed, 3–4 cm; prophylls oval, 2.5–3 mm, 2-keeled, apex obtuse; gemmiferous bracts 1 or 2, narrowly ovate, 4–5 mm, 13–15-veined, apex acute; florets 6–8, basal 1 or 2 and apical 2 or 3 usually sterile; rachilla segments flat, 2–3 mm, apex inflated and cupular. Glumes absent or 1, ovate-elliptic, 6.5–8 mm, 15–17-veined, apex acute; lemma ovate-elliptic, 9–11 mm, glabrous, 19–21-veined, apex acute; palea nearly as long as lemma, ciliolate near apex, 4-veined between and on either side of keels, apex acuminate with a cluster of white hairs; lodicules 3, ca. 2 mm, margins long ciliate, anterior 2 slightly asymmetrical, posterior broadly elliptic. Filaments slender; anthers yellow, ca. 6 mm, apex obtuse. Ovary broadly ovoid, 1–1.2 mm, stalked, apex thickened and hairy; style very short, hairy; stigmas 3, ca. 6 mm. Fruit unknown.

• Guangdong.

Widely cultivated in S China as an ornamental potted plant, this bamboo is sometimes considered to be a cultivar of *Bambusa tuldoidea*, but the flowering material on which that decision was based, collected in the United States, may not represent this species. Moreover, in China the culm sheath of *B. ventricosa* is substantially different from that of *B. tuldoidea*.

22. *Bambusa corniculata* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 368. 1981.

东兴黄竹 *dong xing huang zhu*

Culms to 8 m, 4–7 cm in diam., basally slightly flexuose, apically drooping; internodes 20–32 cm, those at base markedly shorter, usually flat and shallowly grooved above branches, white powdery, sparsely deciduously stiffly strigose; wall thick; basal nodes with rings of gray-white silky hairs below and above sheath scar and with short aerial roots; branching from 2nd or 3rd node up. Branches solitary on lower nodes, lower branchlets usually shortened into weak, curved thorns, 3 to several per node at mid-culm with primary dominant. Culm sheaths deciduous, glabrous, apex subtruncate, with a triangular protuberance on one shoulder; auricles unequal, larger auricle to $3 \times$ size of smaller one, oblong or elliptic, ca. 8 mm; oral setae ca. 1 cm, undulate; ligule ca. 3 mm, shortly fimbriate, densely strigose; blade erect, triangular or narrowly ovate, base $4/5$ width of sheath apex. Leaf blade linear-lanceolate to lanceolate, usually $13\text{--}20 \times 1\text{--}2$ cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

- Hills, around villages. Guangxi (Dongxing).

23. *Bambusa diaoluoshanensis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 369. 1981.

吊罗坭竹 *diao luo ni zhu*

Culms ca. 10 m, 4–5 cm in diam., basally slightly flexuose, apically pendulous; internodes 25–30 cm, initially stiffly brown strigose; wall thick; lower nodes with rings of stiff, pale brown hairs and white powder below sheath scar, basal ca. 3 nodes also with a ring of gray-white silky hairs and sometimes aerial roots above sheath scar; branching from base. Branches solitary at basal ca. 3 nodes, 3 on mid-culm, many on upper culms with primary dominant; branchlets of lower branches sometimes shortened into weak thorns. Culm sheaths deciduous, stiffly dark brown hairy, apex asymmetrical, broadly arched; auricles extremely unequal; larger auricle to $4 \times$ size of smaller one, narrowly oblong, ca. 5 mm; smaller auricle subelliptic, usually covered or pressed against base of blade; oral setae undulate; ligule ca. 3 mm, finely dentate, shortly fimbriate; blade erect, narrowly triangular, base rounded, to $8/9$ width of sheath apex. Leaf blade linear-lanceolate to lanceolate, usually $7.5\text{--}16 \times 1.3\text{--}1.8$ cm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

- Margins of montane forests. Hainan.

Bambusa diaoluoshanensis is similar to *B. ramispinosa*, but has hairs on the culm internodes and sheaths and an asymmetrical culm sheath apex with more unequal auricles.

24. *Bambusa insularis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 370. 1981.

黎庵高竹 *li an gao zhu*

Culms 8–10 m, 4–5 cm in diam., basally slightly flexuose, apically slightly drooping; internodes 30–35 cm, basal ca. 3 usually with purple streaks, with rings of brown silky hairs below and above sheath scars; wall thick; branching from base. Branches solitary on basal nodes, 3 to many on other nodes;

branchlets of lower branches sometimes shortened into weak thorns. Culm sheaths deciduous, ribbed-striate when dry, densely stiffly dark brown strigose, apex usually subtruncate; auricles unequal, larger auricle to $1.5 \times$ size of smaller one, elliptic, usually wrinkled, ca. 1 cm; oral setae ca. 1 cm; ligule ca. 3 mm, finely dentate and fimbriate; blade erect, ovate-triangular to narrowly ovate, base ca. $3/4$ width of sheath apex, glabrous or abaxially sparsely stiffly dark brown strigose. Leaf blade linear-lanceolate, $8\text{--}14 \times 1.1\text{--}1.5$ cm, abaxially densely pubescent, adaxially sparsely pilose near base. Inflorescence unknown.

- Low hills. Hainan.

25. *Bambusa xiashanensis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 374. 1981.

霞山坭竹 *xia shan ni zhu*

Bambusa sanzaoensis W. T. Lin.

Culms 12–13 m, 4.5–5.5 cm in diam., basally slightly flexuose, apically slightly drooping; internodes usually grooved above branches, 35–45 cm, glabrous; wall thick; nodes usually with a persistent ring of stiff, gray-white hairs, basal ca. 4 nodes with a ring of gray-white silky hairs below and above sheath scar, basal node sometimes with short aerial roots; branching from base. Branches solitary on basal 2 nodes, 3 to many on other nodes with primary dominant; dominant branches usually inflated at base and flexuose, lower branchlets sometimes shortened into weak thorns. Culm sheaths deciduous, apex slightly asymmetrical, broadly arched, stiffly dark brown strigose near central base; auricles unequal, larger auricle to $1.5 \times$ size of smaller one, ascending, broadly elliptic, ca. 1.5 cm; oral setae undulate; ligule ca. 7 mm, dentate, shortly fimbriate; blade erect, triangular to ovate-triangular, base ca. $2/3$ width of sheath apex. Leaf blade lanceolate to linear-lanceolate, $10\text{--}20 \times 1.5\text{--}2$ cm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

- Low hills and plains. Guangdong (Zhanjiang).

Bambusa xiashanensis is similar to *B. rutila*, but has culm sheaths with central rather than marginal hairs, a more symmetrical apex with more equal auricles, a broader blade, and a taller ligule.

26. *Bambusa prominens* H. L. Fung & C. Y. Sia, Acta Phytotax. Sin. 19: 372. 1981.

牛儿竹 *niu er zhu*

Culms 10–15 m, 5–7 cm in diam., basally slightly flexuose, apically drooping; internodes 40–50 cm, usually grooved above branches, initially white powdery, glabrous; wall thick; basal nodes with rings of pale brown silky hairs below and above sheath scar and with short aerial roots, with a ring of stiff, dull brown hairs shortly after falling of sheaths; branching from base. Branches many, clustered, central dominant; branchlets of lower branches sometimes shortened into weak thorns. Culm sheaths tardily deciduous, stiffly dull brown strigose near basal margin, apex symmetrical, broadly arched, with a triangular protuberance on one shoulder; auricles unequal, larger auricle to $2 \times$ size of smaller one, oblong; oral setae undulate; ligule 3–4 mm, fimbriate; blade persistent, erect, subtriangular,

base slightly rounded, nearly 3/4 width of sheath apex. Leaf blade linear-lanceolate, usually 15–25 × 2–2.5 cm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

- Hills, riversides. Sichuan.

Bambusa prominens differs from *B. tuldoidea* by the culm sheaths having a triangular apical protuberance and dull brown hairs near the basal margin, and the presence of weak thorns.

27. *Bambusa ramispinosa* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 373. 1981.

坭黄竹 ni huang zhu

Culms ca. 8 m, to 3.8 cm in diam., basally slightly flexuose, apically drooping; internodes ca. 30 cm, initially white

powdery, glabrous; several basal nodes with rings of gray-white silky hairs below sheath scars, branching from 3rd node up. Branches many at mid-culm, central 3 dominant, swollen at base, branchlets of lower branches sometimes shortened into weak thorns. Culm sheaths deciduous, glabrous, apex obliquely truncate; auricles unequal, larger auricle to 2 × size of smaller one, narrowly oblong, ca. 5 mm; oral setae fine, ca. 5 mm; ligule ca. 3 mm, irregularly dentate, very shortly ciliate or subglabrous; blade erect, narrowly triangular, base nearly 6/7 width of sheath apex. Leaf blade linear-lanceolate to lanceolate, usually 9.5–13 × 1.1–1.6 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

- Plains, slopes. Guangxi (Bobai).

2. *Bambusa* subg. *Leleba* (Rumphius ex Nakai) P. C. Keng ex L. C. Chia & X. L. Feng, Fl. Reipubl. Popularis Sin. 9(1): 75. 1996.

孝顺竹亚属 xiao shun zhu ya shu

Xia Nianhe (夏念和), Jia Liangzhi (贾良智 Chia Liang-chih); Chris Stapleton

Leleba Rumphius ex Nakai, Fl. Sylv. Kor. 20: 13. 1933; *Tetragonocalamus* Nakai.

Culm internodes mostly shorter than 30 cm; wall to 2 cm thick; branchlets of lower branches never specialized into tough or weak thorns. Branches usually absent toward culm base, usually 3 co-dominant. Culm sheaths thickly papery; auricles large, rounded or irregular, or absent; blade deciduous, broad, base 1/2–3/4 width of sheath apex. Pseudospikelets loose at maturity, with broad florets on short rachilla segments.

More than 35 species: widely distributed in tropical and subtropical Asia; widely planted in other parts of the world; 30 species (22 endemic) in China, mainly in the south, some in the southwest.

Bambusa crispaurita (species no. 37) could not be included in the following key because the available description is inadequate.

- 1a. Culm sheath auricles to 1 cm or wider, or if less than 1 cm then branches arising from lower nodes (sometimes from basal node), or leaf blade abaxially glabrous and culm internodes 20–30 cm.
- 2a. Culm sheath blade nearly 1/2 width of sheath apex or narrower.
 - 3a. Culm sheath auricles unequal; sheaths apically asymmetrical broadly arched, with short, stiff hairs near inner margin 38. *B. rigida*
 - 3b. Culm sheath auricles subequal; sheaths apically convex and undulate, uniformly hairy.
 - 4a. Culm sheaths with pale brown or white silky hairs; auricles 2.5–3 cm; ligule 7–8 mm; leaf blade abaxially densely pubescent at least when young 28. *B. polymorpha*
 - 4b. Culm sheaths with stiff, dark brown hairs; auricles 0.8–1 cm; ligule 3–4 mm; leaf blade abaxially glabrous 41. *B. vulgaris*
- 2b. Culm sheath blade more than 1/2 width of sheath apex.
 - 5a. Culm sheath blade joined with auricles for 1–1.3 cm.
 - 6a. Culm sheath apically arched, broadly symmetrically triangular; ligule 1.5–2 mm 30. *B. teres*
 - 6b. Culm sheath apically asymmetrical, arched or truncate; ligule 3–5 mm.
 - 7a. Culm sheaths broadly triangular, length less than 1/2 basal width, apex very broadly arched-convex or subtruncate; auricles ± horizontal 29. *B. tulda*
 - 7b. Culm sheaths triangular, length more than 1/2 basal width, apex asymmetrically arched, convex; larger auricle slanted downward along sheath margin.
 - 8a. Culm internodes subsolid; culm sheath blade broadly lanceolate to triangular-ovate, ligule entire, white ciliate; leaf blade abaxially glaucous 31. *B. burmanica*
 - 8b. Culm internodes hollow; culm sheath blade triangular to narrowly triangular, ligule dentate, fimbriate; leaf blade abaxially green 32. *B. eutuldoides*
 - 5b. Culm sheaf blade joined with auricles for 3–7 mm.
 - 9a. Culm sheath apically subtruncate; ligule 1.5–2 mm 36. *B. subtruncata*
 - 9b. Culm sheath apically asymmetrical or broadly arched, sometimes obliquely truncate; ligule 3–5 mm.
 - 10a. Culm sheaths ± pubescent.
 - 11a. Larger culm sheath auricle slanted downward along sheath margin, gradually tapering 33. *B. pervariabilis*
 - 11b. Larger culm sheath auricle not slanted downward, not tapering 40. *B. dolichoclada*

- 10b. Culm sheaths glabrous.
 - 12a. Lower culm internodes without colored stripes 35. *B. tuldoidea*
 - 12b. Lower culm internodes with yellow-green or pale green stripes.
 - 13a. Branches arising from basal node up; larger auricle of culm sheath obovate-oblong or oblanceolate, tapering 33. *B. pervariabilis*
 - 13b. Branches arising from basal 3rd or 4th node up; larger auricle of culm sheath oblong, not tapering 34. *B. longispiculata*
- 1b. Culm sheath auricles less than 1 cm wide, or if ca. 1 cm, then culm blade base less than 1/3 width of sheath apex.
 - 14a. Leaf blade abaxially pale and glaucous.
 - 15a. Culm sheath auricles very small or inconspicuous 57. *B. multiplex*
 - 15b. Culm sheath auricles well developed.
 - 16a. Culm sheath auricles obviously unequal, usually partially covered by base of blade; sheaths asymmetrical, apex broadly convex 39. *B. boniopsis*
 - 16b. Culm sheath auricles subequal, not covered by base of blade; sheath apically subtruncate 46. *B. pallida*
 - 14b. Leaf blade abaxially green or pale green.
 - 17a. Culm sheath blade base narrower than 1/2 width of sheath apex.
 - 18a. Culm sheath auricles extremely unequal, larger to 3.5 × size of smaller; ligules ca. 1 mm; base of culm sheath blade nearly 3/7 width of sheath apex 53. *B. mollis*
 - 18b. Culm sheath auricles less unequal, larger to 2 × size of smaller; ligules ca. 2 mm; base of culm sheath blade ca. 1/4 width of sheath apex 54. *B. contracta*
 - 17b. Culm sheath blade base wider than 1/2 width of sheath apex.
 - 19a. Culm sheath auricles inconspicuous; sheath apex truncate 56. *B. truncata*
 - 19b. Culm sheath auricles well developed; sheath apex asymmetrically arched, broadly arched, or shallowly undulate, subtruncate.
 - 20a. Culm sheath apically subtruncate, sometimes also extremely broadly arched.
 - 21a. Culm sheaths stiffly hairy near margins and base; auricles subequal; ligules ca. 1 mm 47. *B. duriuscula*
 - 21b. Culm sheaths stiffly hairy near base or inner margin but not both; auricles obviously unequal, larger at least 2 × size of smaller; ligules 2–3 mm.
 - 22a. Branches usually arising from 1st or 2nd node; culm sheaths pubescent only near base 43. *B. gibboides*
 - 22b. Branches usually arising from 8th to 10th node; culm sheaths pubescent only near inner margin 51. *B. lenta*
 - 20b. Culm sheath apically asymmetrically arched, broadly arched, or shallowly undulate.
 - 23a. Culm sheath ligule ca. 5 mm 42. *B. utilis*
 - 23b. Culm sheath ligule 1–3 mm.
 - 24a. Culm sheaths substantially pubescent; ligule 0.6–1 mm.
 - 25a. Culm sheaths white pubescent, auricles falcate and cupped 49. *B. amplexicaulis*
 - 25b. Culm sheaths stiffly brown hairy, auricles not falcate.
 - 26a. Culm sheaths densely and uniformly dull brown hairy; auricles not covered by blade 48. *B. pachinensis*
 - 26b. Culm sheaths ± brown hairy; auricles usually partly covered by blade 50. *B. semitecta*
 - 24b. Culm sheaths glabrous or pubescent only near margins; ligule (<1–)1–3 mm.
 - 27a. Culm nodes glabrous; usually branching from 7th to 11th node up 55. *B. textilis*
 - 27b. Basal culm nodes usually with a ring of gray-white silky hairs above sheath scar; usually branching from 4th to 6th (rarely 7th) node up.
 - 28a. Culm sheaths with stiff marginal hairs; ligule 1–1.5 mm 45. *B. albolineata*
 - 28b. Culm sheaths glabrous; ligule 2–3 mm.
 - 29a. Culm sheath auricles never covered by blade base, the larger oblanceolate and tapering 44. *B. piscatorum*
 - 29b. Culm sheath auricles partly covered by blade base, the larger oblong with rounded ends 52. *B. mutabilis*

28. *Bambusa polymorpha* Munro, Trans. Linn. Soc. London
26: 98. 1868.

灰秆竹 hui gan zhu

Culms 15–20 m, 7–15 cm in diam., apically nodding; internodes gray-green, 40–65 cm, initially with white powdery chaff; wall thick; nodes slightly prominent, several basal nodes with rings of aerial roots; branching only from mid-culm up.

Branches many, clustered, arched, slender. Culm sheaths quite persistent, short, broad, leathery, rigid, densely pale brown or silky white hairy, apex curved-truncate; auricles subequal, not slanted downward, projecting up or down, falcate, broadly belt-shaped, 7–8 × 2.5–3 cm, strongly wrinkled; oral setae dense, 1–1.5 cm, thick, scabrous; ligule 7–8 mm, shortly fimbriate; blade erect, nearly symmetrical, broadly lanceolate, base slightly narrowed and joined to auricles for ca. 2.5 cm, ca. 1/3 width of sheath apex, abaxially brown silky hairy, apex acute, sharply tipped. Leaf blade linear to narrowly lanceolate, 15–20 × 0.9–1.5 cm, both surfaces initially pubescent, later adaxially hairy near base and abaxially along midrib. Pseudospikelets embraced by sheathlike bracts; bracts terete, 1–1.5 cm, glossy; florets 2 or 3, apical one sterile; rachilla segments flat, glabrous. Glumes 3, ovate, apex mucronate; lemma ovate, many veined, apex mucronate; palea lanceolate, about as long as or slightly longer than lemma, keels glabrous, apex acute; lodicules 3, posterior 1 smaller, suborbicular, 3–5-veined, margins ciliate. Anthers purple, apex obtuse, sometimes finely tipped. Ovary ovoid, apex hairy; style short; stigmas 3, white hairy. Caryopsis obovoid, unilaterally compressed, ca. 5 mm, apex hairy, with persistent style base.

Montane forests. S Yunnan [Bangladesh, India, Myanmar, Thailand].

29. *Bambusa tulda* Roxburgh, Fl. Ind., ed. 1832, 2: 193. 1832.

俯竹 fu zhu

Culms to 14 m, 7–8 cm in diam., apically slightly drooping; internodes 30–35 cm, initially white powdery, lower internodes slightly flexuose, basal internodes often with 2 or 3 faint yellow stripes; wall very thick; nodes with rings of gray-white silky hairs below and above sheath scar, basal nodes with short aerial roots; branching from ca. 4th node up. Branches many, clustered, central 3 dominant. Culm sheaths deciduous, usually less than 1/2 as wide as long at base, leathery, densely stiffly dull brown strigose, apex subtruncate; auricles unequal, not slanted downward along sheath margin, 1.5–2.5 × 1.3–1.5 cm, one tall and ovate, one low and oblong, undulate, wrinkled; oral setae long, undulate; ligule ca. 5 mm, dentate, shortly fimbriate; blade erect, slightly asymmetrical, broadly triangular, base slightly narrowed and joined to auricles for ca. 1 cm, nearly 3/4 width of sheath apex, both surfaces stiffly pale hairy, apex acutely acuminate. Leaf blade broadly linear or linear-lanceolate, 15–19 × 1.4–1.7 cm, abaxially pale gray, densely villous, adaxially deep green, glabrous. Inflorescence unknown from China.

Slopes. Yunnan [Bangladesh, Bhutan, India, Nepal, Thailand, Vietnam].

Often misidentified as *Bambusa nutans* subsp. *cupulata* (*B. teres* in this account), *B. tulda* is distinguished by its smaller, more erect auricles, brown rather than black culm sheath hairs, persistent, uncupped culm sheath blade, and shorter, thicker walled culms with stripes on the basal internodes. It was treated as *B. nutans* Munro in FRPS (9(1): 78. 1996).

30. *Bambusa teres* Buchanan-Hamilton ex Munro, Trans. Linn. Soc. London 26: 95. 1868.

马甲竹 ma jia zhu

Bambusa lixin Hsueh & T. P. Yi; *B. nutans* Munro subsp. *cupulata* Stapleton.

Culms 8–20 m, 5–7 cm in diam., basally very straight, apically slightly drooping; internodes 40–46 cm, initially white powdery; wall thick; nodes flat, basal several with rings of gray-white silky hairs above sheath scar and with aerial roots; branching from basal node up. Branches several to many, clustered, central 3 dominant, lower branches bent downward, middle branches horizontal. Culm sheaths deciduous, convex, thickly leathery, initially white powdery, densely deciduously stiffly black strigose, later dark brown strigose, margin ciliate, apex asymmetrically triangular; auricles obviously unequal, strongly undulate and wrinkled, larger ones conspicuously slanted downward to 1/3 of height of sheath, narrowly reniform or obovate-lanceolate, 4.5–5 × ca. 1.5 cm; oral setae curved; ligule 1.5–2 mm, entire, glabrous or very shortly ciliate; blade deciduous, nearly symmetrical, broadly triangular-ovate and acuminate, base broadly cordate and inflated, extending to both sides to join auricles for 1–1.3 cm, base ca. 5/8 as wide as sheath apex, abaxially glabrous, adaxially strigose or scabrous. Leaf blade broadly linear to linear-lanceolate, 15–20 × 1.5–2.5 cm, abaxially pale green, densely pubescent, adaxially glabrous or sometimes hispidulous near base. Pseudospikelets solitary or 2–5 clustered at each node of flowering branches. Spikelets linear to linear-lanceolate, 2.5–7.5 × ca. 0.5 cm; florets 4–6, apical 1 or 2 sterile; rachilla segments clavate, striate, apex ciliate. Glumes 1 or 2, many veined, apex acute; lemma ovate to oblong, 1.2–2.5 × ca. 0.8 cm, glabrous, many veined, margin ± slightly ciliate, apex acute or acuminate and finely tipped; palea slightly shorter than lemma, keels ciliate, 5–7-veined between keels, apex penicillate; lodicules 3, ca. 3.8 mm, anterior 2 thickened at base, 5-veined, margins long ciliate, posterior 1 not thickened at base. Anthers purplish red, 7.5–10 mm, apex obtuse or emarginate. Ovary obovate or ovate-ellipsoid, apex thickened and long hispid; style very short, long hispid; stigmas 3. Caryopsis ellipsoid, ca. 7.5 mm, apex long hispid.

Open fields, riversides, around villages. Guangdong, Guangxi, SE Xizang [Bangladesh, Bhutan, India, Myanmar, Nepal].

Bambusa teres is not recognized as a separate species in S Asia, where the name *B. nutans* subsp. *cupulata* is used instead, partially because the name *B. teres* was long overlooked, while this bamboo became widely known as *B. nutans*, the type of which, from Kathmandu in Nepal, represents a contiguous allopatric, very similar bamboo from the western Himalayas to E Nepal. The inclusion of *B. lixin* requires critical investigation.

This species was treated as *Bambusa tulda* in FRPS (9(1): 80. 1996).

31. *Bambusa burmanica* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 35. 1896.

缅甸竹 mian dian zhu

Culms 7–8 m, 2.5–3.5 cm in diam., subsolid; internodes green, ca. 30 cm, initially sparsely brown strigose, yellow and glabrous when old; nodes slightly prominent, with rings of gray-white or yellow-white silky hairs below and above sheath scar, several basal nodes with short aerial roots. Culm sheaths deciduous, short, broad, height more than 1/2 of basal width,

both surfaces distally with erect or appressed, stiff, brown hairs, apex slightly asymmetrical, arched; auricles unequal, slightly wrinkled; larger auricle slightly slanted downward to 1/5 of sheath height, oblong to oblong-lanceolate, 3–3.5 × ca. 1 cm, ends extending outside sheath margin, smaller auricle elliptic, ca. 1 × 0.8 cm; oral setae well developed; ligule ca. 3.5 mm, finely serrulate, very shortly ciliate; blade erect, slightly asymmetrical, triangular-ovate, base cordate and joined with auricles for ca. 1 cm, ca. 5/7 width of sheath apex, adaxially with pale stiff hairs between veins, apex sharply pointed. Leaf blade linear-lanceolate, 16–25 × 1.5–3 cm, abaxially glaucous, densely pubescent, adaxially glabrous. Inflorescence unknown.

Yunnan [Malaysia, Myanmar, Thailand].

The Chinese material included here is possibly distinct from true *Bambusa burmanica*.

32. *Bambusa eutuldoides* McClure, Lingnan Univ. Sci. Bull. 9: 8. 1940.

大眼竹 da yan zhu

Culms 6–12 m, 4–6 cm in diam., basally straight, apically slightly drooping; internodes 30–40 cm, fistulose, initially thinly white powdery, sometimes sparsely deciduously stiffly hairy below nodes; wall ca. 5 mm thick; nodes slightly prominent, basal several with rings of gray-white silky hairs below and above sheath scar; branching from 2nd or 3rd node up. Branches several or many, clustered, central 3 dominant. Culm sheaths deciduous, triangular to narrowly triangular, leathery, glabrous or sometimes very sparsely stiffly strigose, apex long slanted along one side, extremely asymmetrical, arched; auricles extremely asymmetrical, of various shapes, rigid, wrinkled; larger auricle extremely decurrent, oblanceolate to narrowly oblong, 5–6.5 × ca. 1.5 cm; smaller auricle suborbicular or oblong, ca. 1 cm in diam., or sometimes thoroughly joined to blade base; oral setae undulate; ligule 3–5 mm, irregularly dentate or lacinate, shortly fimbriate; blade deciduous, erect, asymmetrical, triangular to narrowly triangular, base slightly narrowed and then extending outward to join auricles, nearly 3/5 width of sheath apex, abaxially sparsely stiffly deciduous-hairy. Leaf blade abaxially green, lanceolate to broadly lanceolate, usually 12–25 × 1.4–2.5 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets sessile, clustered at each node of flowering branches and branchlets, linear, 2.5–5.5 cm, with several bud-bearing bracts at base; florets 5 or 6; rachilla segments flat, 3–4 mm, apex inflated and ciliate. Glumes 1, with very small purple spots, oblong, 9–10 mm, 11-veined, glabrous, apex acute, apiculate; lemma similar to glumes, oblong, 1.2–1.3 cm, 13–15-veined; palea lanceolate, ca. 1.1 cm, keels ciliate toward tip, 4-veined between and 2-veined on either side of keels; lodicules 3, unequal, anterior 2 narrow, ca. 2 mm, apex long ciliate, posterior 1 larger, broadly ovate or suborbicular, ca. 2 mm. Anthers ca. 5 mm, apex bifid. Ovary subglobose, ca. 1 mm in diam., apex hispidulous; style very short, hispidulous; stigmas 3. Caryopsis initially nearly obovoid, ca. 5 mm, apex hispidulous with persistent style base.

• Usually cultivated along river banks and around villages. Guangdong, Guangxi.

- 1a. Culm internodes uniformly green; culm sheath auricles slightly wrinkled 32a. var. *eutuldoides*
- 1b. At least lower culm internodes with colored stripes; culm sheath auricles strongly wrinkled.
 - 2a. Culm internodes and abaxial surface of culm sheaths green, with yellow-white stripes 32b. var. *basistriata*
 - 2b. Culm internodes yellow with green stripes, abaxial surface of culm sheaths green with yellow stripes 32c. var. *viridivittata*

32a. *Bambusa eutuldoides* var. *eutuldoides*

大眼竹(原变种) da yan zhu (yuan bian zhong)

Culm internodes uniformly green. Culm sheath auricles slightly wrinkled.

• Usually cultivated along river banks and around villages. Guangdong, Guangxi.

32b. *Bambusa eutuldoides* var. *basistriata* McClure, Lingnan Univ. Sci. Bull. 9: 9. 1940.

银丝大眼竹 yin si da yan zhu

Culm internodes and abaxial surface of culm sheaths green, with yellow-white stripes. Larger culm sheath auricles strongly wrinkled.

• Guangdong; cultivated in Guangxi.

32c. *Bambusa eutuldoides* var. *viridivittata* (W. T. Lin) L. C. Chia, Guihaia 8: 123. 1988 [*“viridi-vittata”*].

青丝黄竹 qing si huang zhu

Bambusa viridivittata W. T. Lin, Bamboo Res. 1983(2): 54. 1983 [*“viridi-vittata”*].

Culm internodes yellow, with green stripes. Culm sheaths initially green, with yellow stripes. Larger culm sheath auricles shorter, strongly wrinkled.

• Cultivated for ornament. Guangdong.

33. *Bambusa pervariabilis* McClure, Lingnan Univ. Sci. Bull. 9: 13. 1940.

撑篙竹 cheng gao zhu

Culms 7–10 m, 4–5.5 cm in diam., basally straight, apex suberect; internodes straight, ca. 30 cm, basal internodes with yellow-green stripes, initially thinly white powdery or strigose; nodes slightly prominent, basal nodes with rings of gray-white silky hairs below and above sheath scar; branching from basal node up. Branches several to many, clustered, with central 3 dominant. Culm sheaths deciduous, initially with yellow-green stripes, thinly leathery, abaxially glabrous or sometimes strigose, apex asymmetrically arched; auricles unequal, undulate, wrinkled; larger auricle slanted along 1/6–1/5 of sheath margin, obovate-oblong to oblanceolate, 3.5–4 × ca. 1 cm, attenuate; smaller auricle suborbicular or elliptic, ca. 1.5 × 0.8 cm; oral setae fine, undulate; ligule 3–4 mm, irregularly dentate or some-

times lacinate, shortly fimbriate; blade deciduous, erect, nearly symmetrical, initially abaxially yellow-green striped, narrowly ovate-acuminate, base rounded and then extending outward and joined with auricles for 3–7 mm, nearly 2/3 width of sheath apex. Leaf blade linear-lanceolate, usually 10–15 × 1–1.5 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets linear, 2–5 cm, gemmiferous bracts 2 or 3; florets 5–10; rachilla segments ca. 4 mm. Glume 1, oblong, ca. 6 mm, 9-veined, glabrous, apex acute; lemmas oblong-lanceolate, 1.2–1.4 cm, glabrous, 13–15-veined, apex acute; palea nearly as long as or slightly shorter than lemma, ciliate toward apex, 6-veined between and 3-veined on either side of keels; lodicules 3, unequal; anterior 2 oblique, ca. 2.7 mm, margins long ciliate, posterior larger, obovate-oblong, ca. 3 mm. Filaments short; anthers ca. 5 mm. Ovary ellipsoid, ca. 1 mm, apex hispidulous; style ca. 1 mm, hispidulous; stigmas 3, ca. 3 mm, hairy. Young caryopsis broadly ovoid, ca. 1.5 mm, apex hispidulous, remains of style base persistent.

- River banks, around villages. Guangdong, Guangxi.

Two varieties may be recognized in China. In addition, *Bambusa pervariabilis* var. *multistriata* W. T. Lin (J. Bamboo Res. 16(3): 25. 1997) was described from cultivated, sterile material from Guangdong (Guangzhou).

- 1a. Basal culm internodes green, with pale yellow stripes 33a. var. *pervariabilis*
- 1b. All internodes of culms and branches yellow, with green stripes 33b. var. *viridistriata*

33a. *Bambusa pervariabilis* var. *pervariabilis*

撑篙竹(原变种) cheng gao zhu (yuan bian zhong)

Basal several culm internodes green, with yellow white stripes.

- River banks, around villages. Guangdong.

33b. *Bambusa pervariabilis* var. *viridistriata* Q. H. Dai & X. C. Liu, Acta Phytotax. Sin. 24: 395. 1986 [“*viridi-striata*”].

花撑篙竹 hua cheng gao zhu

All internodes of culms and branches yellow, with green stripes.

- Cultivated. Guangxi (Nanning).

This variety is cultivated for ornament.

34. *Bambusa longispiculata* Gamble in Brandis, Indian Trees 668. 1906.

花眉竹 hua mei zhu

Culms 8–12 m, 4–5 cm in diam., basally slightly flexuose, apically erect or slightly drooping; internodes ca. 30 cm, initially thinly white powdery, glabrous, lower ones with yellow-green or pale green stripes; wall thick; nodes flat, lower ones with a ring of gray-white silky hairs below and above sheath scar, basal 1 or 2 nodes with short aerial roots; branching from 3rd or 4th node up. Branches several to many per node with central dominant. Culm sheaths deciduous, leathery, ribbed-striate when dry, glabrous, margins densely ciliate, apex slightly asymmetrical, broadly arched; auricles unequal, undulate,

wrinkled; larger auricle slightly slanted downward for 1/7–1/6 of sheath, oblong, 2.5–3 × ca. 1 cm, ends subrounded; smaller auricle suborbicular, ca. 1/2 size of larger; oral setae slender, undulate, densely covering margins of auricles; ligule 4–5 mm, margin irregular, finely dentate and lacinate, densely ciliate; blade erect, slightly asymmetrical, ovate-triangular, base slightly rounded, then extending outward and joined with auricles for 4–5 mm, base nearly 2/3 as wide as sheath apex. Leaf blade linear or linear-lanceolate, 9–15 × 1–1.5 cm, abaxially densely pubescent, adaxially glabrous. Inflorescence not known from China.

Cultivated. Guangdong [native to Bangladesh and Myanmar].

The determination of Chinese gatherings as this species is doubtful.

The culms are used for scaffolding.

35. *Bambusa tuldoidea* Munro, Trans. Linn. Soc. London 26: 93. 1868.

青秆竹 qing gan zhu

Bambusa angulata Munro; *B. breviflora* Munro; *B. fauriei* Hackel; *B. flavonoda* W. T. Lin; *B. longiflora* W. T. Lin; *B. parvifolia* W. T. Lin; *Chimonobambusa angulata* (Munro) Nakai; *Leleba fauriei* (Hackel) Nakai; *L. tuldoidea* (Munro) Nakai; *Tetragonoclamus angulatus* (Munro) Nakai.

Culms 6–10 m, 3–5 cm in diam., apically slightly drooping; internodes 30–36 cm, initially thinly white powdery; wall thick; nodes slightly prominent, basal 1 or 2 with rings of gray-white silky hairs below and above sheath scar; branching from base up. Branches several to many, clustered, central 3 dominant. Culm sheaths deciduous, convex and slanted along outer margin for 1/10–1/8 of length of sheath, with 1–3 pale yellow stripes toward outer margin, glabrous, apex asymmetrically arched; auricles unequal, outer one larger, ovate to ovate-elliptic, ca. 2.5 × 1–1.4 cm, slightly wrinkled; inner one smaller, ovate to elliptic, ascending, ca. 1/2 size of larger; oral setae slender, undulate; ligule 3–4 mm, lacinate, densely fimbriate; blade deciduous, erect, asymmetrically ovate-triangular to narrowly triangular, sparsely deciduously stiffly brown or pale brown strigose, base slightly rounded and then extending outward to join auricles for 5–7 mm, nearly 2/3–3/4 width of sheath apex, margin slightly wrinkled near base and fringed, apex subulate, acuminate. Leaf blade lanceolate to narrowly lanceolate, 10–18 × 1.5–2 cm, abaxially densely pubescent, adaxially glabrous or sparsely pilose near base. Pseudospikelets several at each node of flowering branches, pale green, linear-lanceolate, slightly flat, 2–3 × 0.3–0.4 cm; prophylls 2-keeled, keels ciliate, subtended by sheathlike bracts; gemmiferous bracts 2, glabrous, apex obtuse; florets 6 or 7, proximally and distally sterile; rachilla segments flat, 3–4 mm, apex inflated and cupular, hairy. Glume 1, ovate-oblong, ca. 8.5 mm, glabrous, apex acute; lemma ovate-oblong, 1.1–1.4 cm, ca. 19-veined, glabrous, apex obtuse, mucronate; palea about as long as or slightly shorter than lemma, 4-veined between and 4-veined on either side of keels, penicillate; lodicules 3, anterior 2 obovate, oblique, short, ca. 2.5 mm, broad, margins long ciliate; posterior one long, ca. 3 mm, narrow. Anthers ca. 3 mm, apex emarginate.

Ovary obovoid, ca. 1.2 mm, stalked, apex thickened and hispid; style ca. 0.7 mm, hispid; stigmas 3, ca. 5.5 mm. Caryopsis terete, slightly curved, ca. 8 mm, ca. 1.5 mm in diam., apex obtuse and thickened, hispid, with remains of style.

• Low hills, river banks, commonly cultivated around villages. Guangdong, Guangxi.

Bambusa tuldoidea 'Swollen Internode' (鼓节竹 *gu jie zhu*), with culm internodes shortened and swollen at base, is frequently found in gardens. The compression of its internodes is weaker than in *B. ventricosa*.

This species was misidentified as *Bambusa tulda* by Benth and as *B. blumeana* by Hooker and Arnott.

36. *Bambusa subtruncata* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 378. 1981.

信宜石竹 *xin yi shi zhu*

Culms 4–5 m, 2–2.5 cm in diam., basally nearly straight, apically slightly drooping; internodes 25–30 cm, initially thinly white powdery, several lower internodes striped yellow-green; wall thick; nodes slightly prominent; basal ca. 3 nodes with rings of gray-white silky hairs below and above sheath scars; usually branching from 3rd or 4th node up. Branches many, clustered, nearly horizontal, central dominant. Culm sheaths deciduous, initially yellow-green striped, glabrous or with stiff, brown hairs near inner margin and base, apex subtruncate; auricles unequal, larger auricle nearly $2.5 \times$ as large as smaller one, broadly elliptic or elliptic, ca. 2×1.3 cm, wrinkled; oral setae undulate; ligule 1.5–2 mm, margin ciliate; blade deciduous, erect, triangular to narrowly triangular, base slightly rounded extending outward to join auricles for 6–7 mm, nearly $3/5$ as wide as sheath apex. Leaf blade linear-lanceolate, 8–15 \times 0.9–1.3 mm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

• Slopes, around villages. Guangdong (Xinyi).

Bambusa subtruncata is similar to the Chinese form of *B. longispiculata*, but differs in its truncate culm sheath apex with larger, broadly elliptic or elliptic auricles, 1.5–2 mm ligules, and narrower blade base, only $3/5$ as wide as the sheath apex.

37. *Bambusa crispiaurita* W. T. Lin & Z. M. Wu, J. S. China Agric. Univ. 13(2): 81. 1992.

皱耳石竹 *zhou er shi zhu*

Culms to 8 m, 2–6 cm in diam.; internodes 15–25 cm, upper parts \pm uniformly stiffly brown strigose; wall thick; nodes slightly prominent, usually with rings of pale silky hairs below and above sheath scar. Branches usually from 1st or 2nd nodes up, dominant ones longer and thicker. Culm sheaths deciduous, sparsely stiffly brown hairy, margins ciliate, apex truncate; auricles subequal, narrowly oblong, wrinkled, margin with a few bristles; ligule 4–5 mm, denticulate; blade erect, ovate-lanceolate, base as wide as sheath apex. Leaf blade linear-lanceolate, 8–17 \times 0.8–1.8 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

• Slopes of low hills. Guangdong (Guangning).

38. *Bambusa rigida* Keng & P. C. Keng, J. Wash. Acad. Sci. 36(3): 81. 1946.

硬头黄竹 *ying tou huang zhu*

Bambusa stipitata W. T. Lin.

Culms 5–12 m, 2–6 cm in diam., basally upright, apically slightly arched; internodes 30–45 cm, initially thinly white powdery, glabrous; wall 1–1.5 cm thick; nodes slightly prominent, sometimes basal node with a ring of gray-white silky hairs above sheath scar; branching from basal or 2nd node up. Branches several to many, clustered, central dominant, 4–6 mm in diam. Culm sheaths deciduous, leathery, basally stiffly deciduously dull brown strigose on inner margin, apex slanted outward and slightly asymmetrical, broadly arched; auricles deep brown, unequal, slightly wrinkled; larger auricle usually ovate, ca. 2.5×1.5 cm, those on upper culms nearly oblong or lanceolate; smaller auricle ovate or suborbicular, ca. $2/3$ size of larger one; oral setae ca. 1 cm, undulate; ligule 2.5–3 mm, lacinate, fringed; blade deciduous, erect, nearly symmetrical, ovate-triangular to ovate-lanceolate, base rounded and extending outward to join auricles for 3–4 mm, nearly $2/5$ width of sheath apex, abaxially very sparsely stiffly brown hairy, adaxially densely stiffly brown hairy near base, distally scabrid, apex acuminate, apiculate. Leaf blade linear-lanceolate, 7.5–18 \times 1–2 cm, abaxially densely pubescent, adaxially glabrous or sparsely hairy near base. Pseudospikelets solitary, or several to many clustered at each node of flowering branches, clustered ones usually sterile, solitary ones usually fertile, fertile pseudospikelets 3–4.5 cm; florets 3–7, preceded by several gemmiferous bracts; rachilla segments flat, 2–4 mm, glabrous, apex thickened and cupular. Glumes elliptic, 6–7 mm, many veined, apex acute; lemma oblong-lanceolate, 1–1.5 \times 0.4–0.8 cm, many veined, apex mucronate; palea slightly shorter than lemma, ciliate toward apex, 5-veined between keels; lodicules 3, 1.5–3 mm, upper margins long ciliate; anterior 2 subspatulate; posterior 1 slightly longer, obovate-lanceolate. Anthers 4–6 mm, apex penicillate. Ovary 3-ribbed, ovoid, 2–2.5 mm with stalk, apex hispidulous; style hairy, 1.5–2 mm; stigmas 3, shortly hairy, less than 1 mm. Mature caryopsis unknown.

• Usually cultivated along riversides and around villages of the Sichuan basin. Sichuan.

39. *Bambusa boniopsis* McClure, Lingnan Univ. Sci. Bull. 9: 7. 1940.

妈竹 *ma zhu*

Bambusa fecunda McClure.

Culms 3–6 m, 1–2.5 cm in diam., basally erect, apically suberect; internodes slightly curved or straight, 23–30 cm, initially thinly white powdery, glabrous; wall slightly thick; nodes flat, from mid-culm upward with a ring of white powder above sheath scar; branching from 3rd to 5th node up. Branches several to many, clustered, central dominant. Culm sheaths deciduous, rigid when dry, glabrous, apex slightly slanted outward and asymmetrically broadly arched; auricles unequal, minutely wrinkled, usually partly covered by blade base; larger auricle usually elliptic to broadly elliptic, 1–1.3 \times 0.7–0.8 cm; smaller auricle usually elliptic, ca. 0.4×0.2 cm; oral setae very fine, curved; ligule ca. 1.5 mm, margin erose, very fine ciliate; blade deciduous, erect, asymmetrically ovate-lanceolate,

longer than sheath, abaxially initially thinly white powdery, glabrous, base rounded, swollen on one side, obviously narrower than sheath apex. Leaf blade linear-lanceolate, 10–16 × 1.4–2 cm, abaxially glaucous, densely pubescent, adaxially sparsely deciduously long hispid. Pseudospikelets solitary or in clusters of 2 or 3 at each node of flowering branches, linear or linear-lanceolate, 2–3 × 0.5–0.7 cm; prophylls 2-keeled; basal bracts gemmiferous; florets 3–7, middle 2 or 3 fertile; rachilla segments flat, 3–4 mm, apex thickened and cupular, hairy. Glumes 1, ovate-oblong, 6.5–7 mm, 11–13-veined, glabrous, acute; lemma with very small purple spots, oblong-lanceolate, 1.2–1.5 cm, glabrous, 17–19-veined, apex acute, mucronate; palea 1–1.2 cm, ciliate toward apex, 4-veined between and 3-veined on either side of keels, apex penicillate; lodicules 3; anterior 2 narrow and oblique, ca. 4 mm, margins long ciliate; posterior 1 nearly oblong, apex 3-toothed. Anthers yellow, ca. 4.5 mm, apex retuse. Ovary very broadly ovoid, stalked, apex thickened and hispidulous; style ca. 0.8 mm, hispidulous; stigmas 3, ca. 2 mm, plumose. Caryopsis initially obconiform, ca. 7 mm, apex hispidulous, style base persistent.

- Ravines, forests, around villages. Hainan.

40. *Bambusa dolichoclada* Hayata, Icon. Pl. Formosan. 6: 144. 1916.

长枝竹 *chang zhi zhu*

Leleba dolichoclada (Hayata) Odashima.

Culms 10–15 m, 4.5–8 cm in diam., basally erect, apically slightly drooping; internodes 30–45 cm, initially thinly white powdery; wall slightly thick; nodes flat, lower several with rings of gray-white silky hairs; branching from basal node up. Branches 3 to many per node, central 3 dominant. Culm sheaths deciduous, leathery, thinly white powdery, densely shortly stiffly brown hairy around apex and upper parts of both sides, apex slightly slanted along one side and slightly asymmetrical, broadly arched, sometimes subtruncate; auricles usually slightly wrinkled with obtuse ends, obviously unequal; larger auricle oblong or narrowly ovate, 2–2.5 × 0.8–1 cm, smaller auricle ovate or elliptic, to 1/3 size of larger one; oral setae undulate, densely covering margins and adaxial surface; ligule 3–4 mm, slightly dentate, fringed with hairs ca. 5 mm; blade deciduous, erect, asymmetrically ovate-triangular, base slightly narrowed and then joined with auricles for 3–5 mm, nearly 2/3 width of sheath apex, abaxially sparsely stiffly dull brown hairy, adaxially densely stiffly pale brown hairy between veins, apex acuminate, apiculate. Leaf blade linear to linear-lanceolate, 10–26 × 1–2.3 cm, abaxially pubescent, adaxially glabrous and glossy. Pseudospikelets in clusters of 3–9 at nodes of flowering branches. Spikelets linear, 3–4 × 0.6–0.8 cm; florets 4–12 preceded by several gemmiferous bracts. Glumes 2, ovate or oval, 2–4.5 mm, 14-veined, apex acute; lemma ovate, ca. 9 mm, 18–20-veined, apex acute; palea ca. 8.5 mm, keels densely ciliate. Anthers yellow, ca. 4.5 mm, apex emarginate. Ovary obovoid, ca. 2 mm, apex sparsely hispidulous; style very short; stigmas 3.

- Forest margins, around villages; below 300 m. Fujian, Taiwan.

A cultivar, *Bambusa dolichoclada* 'Stripe' (条纹长枝竹 *tiao wen*

chang zhi zhu) is cultivated in S Taiwan. This differs from the typical plant by its yellow-green culms and branches, later becoming pale yellow with deep green stripes, and its pale green culm sheaths, initially with several fine milky-yellow stripes.

41. *Bambusa vulgaris* Schrader ex J. C. Wendland, Coll. Pl. 2: 26. 1810.

龙头竹 *long tou zhu*

Bambusa auriculata Kurz; *B. humilis* Reichenbach ex Ruprecht; *B. madagascariensis* Rivière & C. Rivière; *B. sieberi* Grisebach; *B. striata* Loddiges ex Lindley; *B. surinamensis* Ruprecht; *B. thoursii* Kunth; *B. vulgaris* var. *striata* (Loddiges ex Lindley) Gamble; *B. vulgaris* var. *vittata* Rivière & C. Rivière; *Leleba vulgaris* (Schrader ex J. C. Wendland) Nakai; *L. vulgaris* var. *striata* (Loddiges ex Lindley) Nakai.

Clumps rather open. Culms 8–15 m, 5–9 cm in diam., basally straight or flexuose, apically drooping; internodes deep green, 20–30 cm, initially thinly white powdery, stiffly pale brown strigose; wall slightly thick; nodes slightly prominent, basal several with aerial roots and rings of grayish white silky hairs below and above sheath scar; usually branching from lower nodes. Branches several to many, clustered, central dominant. Culm sheaths deciduous, ribbed-striate when dry, densely stiffly deciduously dark brown hairy, apex arched below blade, concave below auricles; auricles conspicuous, ascending, nearly equal in shape and size, oblong or reniform, 8–10 mm; oral setae curved, fine; ligule 3–4 mm, serrate, very shortly white ciliate; blade deciduous, erect or deflexed, broadly triangular to triangular, base slightly rounded, ca. 1/2 width of sheath apex, abaxially sparsely stiffly dull brown hairy, adaxially densely stiffly dull brown hairy between veins, apex involute, sharply apiculate. Leaf blade narrowly lanceolate, 10–30 × 1.3–2.5 cm, both surfaces glabrous. Pseudospikelets several, clustered at nodes, narrowly lanceolate to linear-lanceolate, slightly flattened, 2–3.5 × 0.4–0.5 mm, apparently bifid; gemmiferous bracts several; florets 5–10; rachilla segments 1.5–3 mm. Glumes 1 or 2, abaxially shortly hairy near apex, apex apiculate; lemma 8–10 mm, abaxially shortly hairy near apex, apex apiculate; palea slightly shorter than lemma, keels ciliate; lodicules 3, 2–2.5 mm, margins long ciliate. Anthers ca. 6 mm, apex penicillate. Style 3–7 mm, slender; stigmas 3, short.

Riversides, open forests. Yunnan [SE Asia; pantropical].

Two cultivars, *Bambusa vulgaris* 'Vittata' (黄金间碧竹 *huang jin jian bi zhu*), with culm internodes yellow with green stripes, and *B. vulgaris* 'Wamin' (大佛肚竹 *da fo du zhu*), with culm internodes shortened and basally swollen, are widely cultivated in gardens and parks. Although they have been given varietal or even specific status elsewhere, they are recognized as cultivars here.

This species was incorrectly named by Aiton as *Bambusa arundinacea* Willdenow.

42. *Bambusa utilis* W. C. Lin, Bull. Taiwan Forest. Res. Inst. 98: 2. 1964.

乌叶竹 *wu ye zhu*

Culms 3–14 m, 2–7 cm in diam.; internodes 15–50 cm; wall rather thick; nodes slightly prominent; branching from

basal nodes up. Branches several to many, clustered, central 3 dominant. Culm sheaths deciduous, leathery, asymmetrical, broadly arched, densely stiffly brown hairy, distal margins initially ciliolate, apex slightly slanted along outer side; auricles unequal, not slanted, slightly wrinkled; larger auricle oblong to lanceolate, ca. 1.5×0.7 cm; smaller auricle narrowly ovate to ovate-lanceolate, ca. 1/3 size of larger one; oral setae undulate, brown; ligule ca. 5 mm, finely dentate, ciliolate; blade erect, slightly asymmetrically triangular, base slightly rounded and joined to auricles for ca. 2 mm, ca. 5/6 width of sheath apex, abaxially sparsely stiffly dull brown hairy or glabrous; adaxially scabrous or densely stiffly dull brown hairy between veins, apex shortly acuminate, apiculate. Leaf blade linear, $10-25 \times 1.2-2.5$ cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets solitary or many and clustered at each node of flowering branches, linear, $2.5-4 \times 0.5-0.7$ cm; florets 4-6. Glumes 2, subovate, ca. 5 mm, 9-11-veined, apex acute, mucronate; lemma ovate-lanceolate, ca. 1.3 cm, 17-20-veined, apex acute, mucronate; palea lanceolate, ca. 1 cm, keels ciliolate, 7-veined between and 2-veined on either side of keels, apex truncate; lodicules 3, nearly broadly elliptic, ca. 1.8 mm, margins long ciliate. Anthers ca. 6 mm. Ovary obovoid; style short; stigmas 3. Caryopsis unknown.

- Low hills, around villages; below 300 m. Taiwan.

43. *Bambusa gibboides* W. T. Lin, Acta Phytotax. Sin. 16(1): 70. 1978.

鱼肚脯竹 yu du nan zhu

Culms 10-12 m, 5-7 cm in diam., basally flexuose, apically drooping; internodes slightly curved, basally slightly swollen, 40-47 cm, initially thinly white powdery, stiffly brown strigose; wall slightly thick; nodes slightly prominent, basal 2 usually with rings of gray-white silky hairs; branching from basal or 2nd node up. Branches solitary on basal nodes, several to many at mid-culm and distal nodes, central obviously dominant. Culm sheaths deciduous, ribbed-striate when dry, with appressed, dull brown hairs near base, apex subtruncate; auricles unequal, horizontal along both sides of sheath apex, larger ones oblong to narrowly oblong, ca. $2 \times 0.5-0.6$ cm, smaller auricle elliptic, ca. 1/2 size of larger one; oral setae undulate; ligule 2-3 mm, dentate, shortly fringed; blade erect, narrowly ovate to ovate-triangular, ca. 1/2 as long as sheath, base slightly rounded and joined to auricles for ca. 3 mm, ca. 2/3 width of sheath apex. Leaf blade linear-lanceolate to narrowly lanceolate, $10-20 \times 1.3-2$ cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets several, clustered at nodes of flowering branches, linear-lanceolate, slightly flat, 3-4 cm; prophylls ovate, keels ciliolate toward apex, apex obtuse; gemmiferous bracts usually 2, ovate; florets 5-7, apical 1 or 2 usually sterile; rachilla segments flat, 3-4 mm, apex inflated and hairy. Glumes 1, ovate, 6-8 mm, many veined, apex mucronate; lemma ovate-elliptic, 1-1.4 cm, glabrous, many veined, apex acute, mucronate; palea slightly longer than lemma, sparsely very shortly ciliolate near apex or sometimes subglabrous, 6- or 7-veined between and 3- or 4-veined on either side of keels, apex obtuse; lodicules 3, unequal, posterior 1 slightly larger, obovate, base thickened, margin finely ciliate. Filaments short; anthers yellow, apex obtuse. Ovary ovoid,

apex hispidulous; style very short; stigmas 3. Caryopsis unknown.

- Cultivated. Guangdong.

The shoots are edible.

44. *Bambusa piscatorum* McClure, Lingnan Univ. Sci. Bull. 9: 14. 1940 [*"piscaporum"*].

石竹仔 shi zhu zi

Culms 6-10 m, 2.5-3.5 cm in diam., apically suberect; internodes 50-60 cm, initially thinly white powdery, glabrous; wall rather thin; nodes flat, basal node with a ring of gray-white silky hairs below and above sheath scar, 2nd node with a ring of gray-white silky hairs above sheath scar; branching from 4th to 6th node up. Branches many, clustered, central slightly longer and thicker. Culm sheaths deciduous, thickly leathery, rigid, glossy, glabrous, apex slightly asymmetrically arched; auricles unequal, minutely wrinkled with obtuse ends; larger auricle oblanceolate, ca. 1.5×0.5 cm; smaller auricle usually pressed against blade base and wrinkled, or narrowly obovate, ca. 2/5 size of larger one; oral setae dense, deciduous, curved; ligule 2-3 mm, dentate, fringed or glabrous; blade persistent, erect, asymmetrically ovate-triangular to narrowly ovate-triangular, base slightly rounded and joined with auricles for ca. 5 mm, ca. 4/5 width of sheath apex, apex subulate, acuminate. Leaf blade linear-lanceolate to lanceolate, $8-16(-20) \times 1.2-1.6(-2)$ cm, abaxially densely villous, adaxially glabrous. Inflorescence unknown.

- Around villages. Hainan.

Bambusa piscatorum is very similar to *B. mutabilis*, but has thicker culm sheaths with smaller, rigid auricles usually pressed against the blade base and not partly covered, the larger auricle oblanceolate, the smaller narrowly ovate, both with obtuse tips.

45. *Bambusa albolineata* L. C. Chia, Guihaia 8: 121. 1988 [*"albo-lineata"*].

花竹 hua zhu

Bambusa textilis McClure var. *albostrata* McClure, Lingnan Univ. Sci. Bull. 9: 15. 1940 [*"albo-striata"*]; *B. albostrata* (McClure) Ohrnberger, nom. superfl.

Culms 6-8 m, 3.5-5.5 cm in diam., apically drooping; internodes 40-60(-80) cm, basal 1st to 4th (to 6th) internodes with pale yellow stripes; wall slightly thin; nodes flat, basal 1st to 4th nodes usually with a ring of gray-white silky hairs above sheath scar; branching from 4th to 6th node up. Branches many, clustered, central 3 dominant. Culm sheaths deciduous, leathery, rigid, apex slightly asymmetrical, arched or shallowly undulate, abaxially with yellow-white stripes, both sides sparsely stiffly dull brown strigose, sparser to nearly absent abaxially, denser adaxially, sheaths on basal 2 nodes densely hairy on lower half; auricles unequal, minutely wrinkled, margin sparsely thickly shortly setose near ends, larger ones oblong or nearly oblanceolate, ca. $1.5 \times 0.5-0.7$ cm, smaller usually continuous with blade base, oblong-oblanceolate if separated from blade, 1/3-1/2 size of larger one; ligule 1-1.5 mm, shortly dentate, very shortly fringed; blade erect, asymmetrically ovate to

narrowly ovate-triangular, those on lower nodes usually with yellow-white stripes, base slightly rounded and joined to auricles for 4–5 mm, ca. 5/7 width of sheath apex, apex acuminate, apiculate. Leaf blade linear, 7–15(–24) × 0.9–1.5(–2.2) cm, abaxially pilose, adaxially scabrous. Pseudospikelets usually in clusters of 3–5 at nodes of flowering branches, linear-lanceolate, 2–2.5 × 0.4–0.5 cm; prophylls ca. 3 mm, 2-keeled, keels ciliolate; gemmiferous bracts subovate, ca. 4.5 mm, glabrous, 15-veined, apex obtuse and mucronate; florets 5–7, apical one sterile; rachilla segments flat, ca. 3 mm, glabrous, margin erose, apex enlarged. Glumes 1, oval, ca. 5 mm, 15–17-veined, glabrous, apex obtuse and mucronate; lemma elliptic, 7–9 mm, glabrous, 17–19-veined, apex obtuse, mucronate; palea linear-lanceolate, 7.5–9.5 mm, keels glabrous, 8-veined between and 2-veined on either side of keels, margin very shortly ciliolate, bifid with apices of keels extended and deflexed, apex subtruncate; lodicules 3, unequal; anterior 2 oblique, ca. 3 mm, margins long ciliate; posterior 1 nearly obovate-elliptic, ca. 2 mm. Anthers ca. 4 mm. Ovary broadly ovoid, ca. 1 mm, base stalked, apex thickened and hispidulous; style very short, 0.4–0.5 mm, hispidulous; stigmas 3, ca. 6 mm. Mature caryopsis unknown.

• Cultivated on low hills, plains, and along riversides. Fujian, Guangdong, Jiangxi, Taiwan, Zhejiang.

The *nomen novum* *Bambusa albolineata* was published in the belief that the original epithet “*albostrata*” was blocked by the earlier but not validly published *nomen nudum* “*B. albostrata* Hort. ex Lavalée” (Arbor. Segrez. 306. 1877). Nevertheless, *B. albolineata* is legitimate because of the change in rank.

46. *Bambusa pallida* Munro, Trans. Linn. Soc. London 26: 97. 1868.

大薄竹 da bao zhu

Bambusa critica Kurz.

Culms to 15 m, 5.5–7.5 cm in diam.; internodes 30–57 cm, initially thinly white powdery and stiffly gray hairy; wall thin; nodes flat, basal nodes usually with a ring of gray-white silky hairs and short aerial roots when old; branching from 6th or 7th node up. Branches many, clustered, central 3 dominant. Culm sheaths deciduous, attenuate, broadly trapezoid, leathery, initially white powdery, glabrous or sparsely deciduously dull brown strigose, apex subtruncate; auricles spreading, subequal, broadly elliptic or suborbicular, small, 5–6 mm wide; oral setae present; ligule very short; blade erect, narrowly triangular, usually longer than sheath, base slightly rounded, slightly narrower than sheath apex, sparsely stiffly deciduously dull brown hairy. Leaf blade linear-lanceolate, 10–20 × 1.2–2 cm, abaxially chalky-white. Pseudospikelets in capitate clusters, glaucous, 2.5–3 cm, gemmiferous bracts present; florets 7–14, basal 1 male, apical 3–5 imperfect; rachilla segments clavate, apex enlarged and ciliate. Glumes 1 or 2, ovate, apex acute; lemma ovate, abaxially glabrous, many veined, adaxially slightly hairy, apex acute, mucronate; palea obviously shorter than lemma, keels ciliate, 3–5-veined between keels; lodicules 3, oblong or narrowly obovate, base thickened, margin ciliate, anterior 2 slightly asymmetrical, posterior symmetrical and smaller. Ovary oblong, tapering; stigmas 3.

Open areas; 100–2000 m. SW Yunnan [Bangladesh, India, Myanmar, Thailand].

47. *Bambusa duriuscula* W. T. Lin, Bull. Bot. Lab. N.-E. Forest. Inst., Harbin 1980(6): 87. 1980.

蓬萊黃竹 peng lai huang zhu

Bambusa breviligulata L. C. Chia & H. L. Fung.

Culms suberect, 6–7 m, 3–4 cm in diam.; internodes straight, 38–55 cm, sparsely stiffly dull brown hairy, initially partly white powdery below sheath scar but powder not in rings; wall slightly thin; nodes flat, glabrous; branching from 5th or 6th node up. Branches many, clustered, horizontal, central slightly dominant. Culm sheaths deciduous, glossy, abaxially and near margins ± stiffly dull brown hairy, apex subtruncate; auricles subequal, narrowly oblong, ca. 1.5 × 0.6–0.7 cm; oral setae undulate; ligule ca. 1 mm, erose, very shortly ciliolate; blade deciduous, erect, ovate-triangular, nearly as long as or slightly shorter than sheath, base ca. 2/3 width of sheath apex. Leaf blade linear, 9–14 × 0.8–1.2 cm, abaxially subglabrous, adaxially pubescent near base. Pseudospikelets 2 or 3 clustered on each node of flowering branches, linear-lanceolate, 2–3 cm; gemmiferous bracts 2 or 3, ovate, ca. 5 mm, 13-veined, base cordate, apex acute; florets 6 or 7, apical one sterile; rachilla segments flat, 2–4 mm, subglabrous. Glumes absent; lemma oblong, ca. 1.2 cm, slightly asymmetrical, 21-veined, apex acute; palea narrow, longer than or about as long as lemma, keels sparsely ciliolate near apex, 5-veined between and 3-veined on either side of keels; lodicules 3, unequal, anterior 2 oblique, ca. 2 mm, margins long ciliate, posterior narrowly obovate, ca. 1.5 mm. Anthers ca. 5 mm, apex retuse. Ovary subglobose, ca. 1 mm in diam., stalked, apex hispidulous; style hairy, ca. 1.5 mm; stigmas 3, ca. 5 mm. Mature caryopsis unknown. New shoots May–Oct.

• Usually cultivated, slopes near villages. Hainan.

Bambusa duriuscula is similar to *B. pachinensis*, but has shorter internodes, the culm sheath with hairs only near the base and margins, the apex subtruncate, the blade nearly as long as the sheath proper, and the leaf blade narrower and abaxially glabrous. The paratype *W. T. Lin 31826* should be excluded from this species.

48. *Bambusa pachinensis* Hayata, Icon. Pl. Formosan. 6: 150. 1916.

米篩竹 mi shai zhu

Culms 3–8 m, 1–4.5 cm in diam., apically slightly drooping; internodes 30–70 cm, initially thinly white powdery, sparsely stiffly pale or dark brown strigose; wall thin; nodes flat, basal 5 nodes usually with rings of gray-white silky hairs below and above sheath scar; branching from 8th to 10th node up. Branches several to many, clustered, 3 central dominant. Culm sheaths deciduous, leathery, rigid, broadly arched, uniformly stiffly dull brown strigose, apex slanted on outer side, asymmetrical; auricles unequal, slightly wrinkled, larger ones oblong or lanceolate, 1–1.5 × 0.4–0.5 cm, ends subrounded and slanted downward, smaller auricle subovate, ca. 1/3 size of larger one, ends slightly ascending; oral setae fine, curved, long; ligule ca. 1 mm, irregularly dentate or long fimbriate; blade

erect, slightly asymmetrically ovate to ovate-triangular, 1/3–1/2 length of sheath, base slightly cordate, narrowed and joined with auricles for 2–3 mm, abaxially very sparsely brown hairy, adaxially scabrous, apex acuminate, apiculate. Leaf blade linear to lanceolate, 8–18 × 1–2 cm, abaxially densely villous, adaxially glabrous. Pseudospikelets lanceolate to linear-lanceolate, 2–3.5 × 0.4–0.5 cm; prophylls ca. 2.5 mm, keels ciliate; gemmiferous bracts 2 or 3, ovate, to 7 mm, glabrous, 15–17-veined, apex obtuse and mucronate. Lemma ovate-elliptic, ca. 1.2 cm, glabrous, 17–19-veined, apex acute, mucronate; palea lanceolate, ca. 1.1 cm, slightly shorter than lemma, keels not ciliate, 5- or 6-veined between and 3- or 4-veined on either side of keels, margin irregularly dentate, apex 3-fid and with a cluster of white long hairs; lodicules 3, unequal, anterior 2 spatulate, ca. 3 mm, margins long ciliate, posterior 1 nearly obovate-elliptic, ca. 1.6 mm. Filaments slender; anthers ca. 4 mm. Ovary ovoid, ca. 1.5 mm, base stalked, apex thickened and hispid; style ca. 0.5 mm, hispid; stigmas 3, ca. 5 mm. Mature caryopsis unknown.

• Usually cultivated, river banks, low hills, around villages. Fujian, Guangdong, Guangxi, Jiangxi, Taiwan, Zhejiang.

- 1a. Culm sheath ligule irregularly dentate 48a. var. *pachinensis*
 1b. Culm sheath ligule long fimbriate, fimbriae 5–10 mm 48b. var. *hirsutissima*

48a. *Bambusa pachinensis* var. *pachinensis*

米筛竹(原变种) *mi shai zhu* (yuan bian zhong)

Bambusa beisitiku (Odashima) P. C. Keng; *Leleba beisitiku* Odashima; *L. pachinensis* (Hayata) Nakai.

Culm sheath ligule irregularly dentate.

• Usually cultivated, river banks, around villages. Fujian, Guangdong, Guangxi, Jiangxi, Taiwan, Zhejiang.

48b. *Bambusa pachinensis* var. *hirsutissima* (Odashima) W. C. Lin, Bull. Taiwan Forest. Res. Inst. 98: 21. 1964.

长毛米筛竹 *chang mao mi shai zhu*

Leleba beisitiku Odashima var. *hirsutissima* Odashima, J. Soc. Trop. Agric. 8: 58. 1936; *Bambusa textilis* McClure var. *fusca* McClure; *Leleba pachinensis* (Hayata) Nakai var. *hirsutissima* (Odashima) W. C. Lin.

Culm sheath ligule with long fimbriae, 5–10 mm.

• Usually cultivated, low hills, around villages. Fujian, Guangdong, Guangxi, Taiwan, Zhejiang.

49. *Bambusa amplexicaulis* W. T. Lin & Z. M. Wu, Bull. Bot. Res., Harbin 12: 349. 1992.

抱秆黄竹 *bao gan huang zhu*

Culms to 3 m, to 2.5 cm in diam., basally slightly flexuose; internodes 13–31 cm, glabrous; nodes slightly prominent, branching from 3rd node up. Culm sheaths deciduous, apically arched-convex, white pubescent, margins ciliate; auricles unequal, falcate, cupped, deflexed; oral setae subulate, 6–8 mm; ligule 0.6–1 mm, margin nearly entire; blade deciduous, erect,

ovate-triangular, base slightly rounded, ca. 3/5 width of sheath apex. Leaf blade linear-lanceolate, 3–11 × 0.4–1.2 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

• Bases of hills, open fields. Guangdong.

50. *Bambusa semitecta* W. T. Lin & Z. M. Wu, J. S. China Agric. Univ. 14(3): 111. 1993.

掩耳黄竹 *yan er huang zhu*

Culms 2–3 m, 1–1.5 cm in diam.; internodes 20–30 cm, glabrous; nodes slightly prominent, branching from 7th to 8th node up. Culm sheaths deciduous, ± stiffly brown hairy, margins glabrous, apex convex; auricles unequal, oblong, ends ascending, usually partly covered by blade; ligule ca. 1.5 mm, denticulate, ciliate; blade deciduous, erect, base slightly rounded, ca. 1/4 × as wide as sheath apex. Leaf blade linear-lanceolate, 5.5–21 × 0.8–1.8 cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

• Low hills. Guangdong (Guangning).

This species is inadequately known.

51. *Bambusa lenta* L. C. Chia, Guihaia 8: 125. 1988.

藤枝竹 *teng zhi zhu*

Culms 5–10 m, 4–4.5 cm in diam., apically slightly drooping; internodes 35–50 cm, basal internodes swollen on alternate sides, initially thinly white powdery, stiffly dull brown hairy; wall slightly thin; nodes flat, basal 3 usually with rings of gray-white silky hairs above sheath scar, higher nodes initially with white powdery rings, sometimes also with rings of gray-white silky hairs below sheath scar; branching from 8th to 10th node up. Culm sheaths deciduous, leathery, rigid, usually sparsely stiffly dull brown hairy toward inner margin, apex slightly slanted at outer side, subtruncately broadly arched; auricles ascending, unequal, slightly wrinkled, larger one suboblong, ca. 8 × 6 mm, ends exserted beyond margin, smaller auricle subelliptic, 1/4–1/3 size of larger one, usually partly covered by blade base; oral setae fine, undulate; ligule 2–3 mm, finely dentate, shortly fringed at both sides; blade erect, slightly asymmetrical, triangular to narrowly triangular, base rounded, joined to auricles for 2–3 mm, ca. 3/4 × as wide as sheath apex, abaxially glabrous, adaxially scabrous. Leaf blade linear, 9–17 × 1.2–2 cm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

• Cultivated, along rivers, around villages; low elevations. S Fujian.

52. *Bambusa mutabilis* McClure, Lingnan Univ. Sci. Bull. 9: 12. 1940.

黄竹仔 *huang zhu zi*

Culms 5–7 m, 2.5–3.5 cm in diam., apically suberect; internodes 40–50 cm, initially thinly white powdery, lower ones with many purple streaks, and with a ring of white powder below sheath scar, glabrous or sometimes very sparsely stiffly strigose; wall rather thin; nodes slightly prominent, basal ca. 3 nodes with a ring of gray-white silky hairs above sheath scar, only basal node with a ring of gray-white silky hairs below sheath scar; branching usually from 5th to 7th node upward.

Branches many, clustered, central branch slightly longer and thicker. Culm sheaths deciduous, glossy, with many purple streaks, leathery, rigid, initially thinly white powdery, glabrous, apex slightly asymmetrically arched; auricles unequal, oblong, minutely wrinkled, partly covered by blade base, ends suborbicular, larger ones $1-1.4 \times 0.3-0.4$ cm, smaller auricle usually $1/2$ size of larger one; oral setae dense, deciduous, curved; ligule ca. 2 mm, dentate, shortly fringed or glabrous; blade deciduous, erect, slightly asymmetrically ovate to narrowly ovate, base narrowed and slightly cordate, ca. $2/3 \times$ as wide as sheath apex, abaxially with many purple streaks, apex acuminate, apiculate. Leaf blade linear-lanceolate to lanceolate, $8.5-15.5(-20) \times 1.1-1.6(-2)$ cm, abaxially densely villous, adaxially glabrous. Inflorescence unknown.

- Open fields on hills, riversides, forest margins. Hainan.

53. *Bambusa mollis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 377. 1981.

拟黄竹 ni huang zhu

Culms 5–8 m, 2.5–3.5 cm in diam., apically drooping; internodes 35–40 cm, initially sparsely white hispid; wall thin; basal 2 nodes usually with rings of gray-white silky hairs above sheath scar; branching from 3rd to 5th node up. Culm sheaths deciduous, glabrous, apically asymmetrically arched, one side slanted, other side arched; auricles obviously unequal, larger one slanted downward, lanceolate to oblong-lanceolate, ca. $1.5 \times 0.5-0.7$ cm, ca. $5 \times$ size of smaller one, smaller one oblong with ends ascending; oral setae undulate; ligule ca. 1 mm, subentire; blade deciduous, erect, ovate-lanceolate, to $1/2$ length of sheath, base slightly rounded and extending outward to join auricles for 2–3 mm, nearly $3/7 \times$ as wide as sheath apex. Leaf blade linear-lanceolate, $11-16 \times 1.5-2$ cm, abaxially pubescent, adaxially glabrous. Inflorescence unknown.

- Open fields, hills, around villages. Guangxi (Beiliu).

54. *Bambusa contracta* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 19: 376. 1981.

破篾黄竹 po mie huang zhu

Culms 5–6 m, 2–3 cm in diam., apically drooping; internodes 40–57 cm, initially thinly white powdery, sparsely long, white hispid; wall thin; nodes flat, glabrous, branching from 4th to 6th node up. Culm sheaths deciduous, thinly white powdery, usually glabrous or with appressed or erect, stiff, dull brown hairs near base, apex slanted and asymmetrically arched; auricles unequal, oblong to lanceolate, undulate, wrinkled, larger auricle slightly slanted downward, ca. $3 \times 0.7-1$ cm, ca. $2 \times$ as large as smaller; oral setae undulate; ligule ca. 2 mm, sparsely dentate; blade erect, narrowly ovate, nearly $2/5$ as long as sheath, base rounded and joined to auricles for 2–3 mm, ca. $1/4 \times$ as wide as sheath apex, apex involute, apiculate. Leaf blade linear to linear-lanceolate, $10-15 \times 1.3-1.5$ cm, abaxially densely pubescent, adaxially glabrous. Inflorescence unknown.

- Bases of hills, around villages. Guangxi (Dongxin).

Bambusa contracta is similar to *B. textilis*, but the culm sheaths have larger auricles and a shorter, narrower, basally more cordate blade.

55. *Bambusa textilis* McClure, Lingnan Univ. Sci. Bull. 9: 14. 1940.

青皮竹 qing pi zhu

Culms 8–10 m, 3–5 cm in diam., apically slightly drooping; internodes green, 40–70 cm, initially thinly white powdery, \pm stiffly pale brown hairy; wall 2–5 mm thick; nodes flat, glabrous; branching from 7th to 11th node upward. Culm sheaths deciduous, leathery, rigid, slightly glossy, basally stiffly dull brown strigose, apex slightly slanted and asymmetrical, broadly arched; auricles unequal, ends not decurrent, larger one narrowly oblong to lanceolate, slightly slanted, ca. $1.5 \times 0.4-0.5$ cm, smaller one oblong, not slanted, ca. $1/2$ size of larger; oral setae slender, undulate; ligule ca. 2 mm, dentate or sometimes lacinate, ciliolate; blade deciduous, erect, narrowly ovate-triangular, ca. $2/3$ as long as sheath, abaxially sometimes stiffly hairy between veins, basally sparsely dull brown hairy, adaxially scabrid, base slightly cordate, narrowed, nearly $2/3$ as wide as sheath apex. Leaf blade linear-lanceolate to narrowly lanceolate, $9-17 \times 1-2$ cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets solitary or several to many, clustered at each node of flowering branches, dull purple when fresh, bronze-colored when dry, linear-lanceolate, slightly curved, $3-4.5 \times 0.5-0.8$ cm; prophylls ovate, ca. 3 mm, keels glabrous; gemmiferous bracts 2 or 3, ovate, 3–4.5 mm, glabrous, apex acute, mucronate; florets 5–8, apical one sterile; rachilla segments subterete or flat, ca. 4 mm, apex enlarged. Glumes 1, ovate, ca. 6 mm, ca. 20-veined, glabrous, apex acute, mucronate; lemma elliptic, 1.1–1.4 cm, glabrous, ca. 25-veined, apex acute, mucronate; palea lanceolate, 1.2–1.4 cm, slightly longer than lemma, keels glabrous, ca. 10-veined between and 4-veined on either side of keels; lodicules unequal; anterior 2 subspatulate, ca. 3 mm, margins long ciliate; posterior obovate-elliptic, ca. 2 mm. Filaments slender; anthers yellow, ca. 5 mm. Ovary broadly ovoid, ca. 2 mm in diam., base stalked, apex thickened and hispidulous; style ca. 0.7 mm, hispidulous; stigmas 3, 6–7 mm. Mature caryopsis unknown.

- Usually cultivated, riversides, around villages; low elevations. Anhui, Guangdong, Guangxi.

- 1a. Culm sheath blade ca. $2/3$ as long as sheath proper or longer, base \pm cordate; ligule ca. 2 mm 55a. var. *textilis*
- 1b. Culm sheath blade less than $1/2$ length of sheath proper, base slightly rounded; ligule 1–1.5 mm.
 - 2a. Culm sheaths glabrous 55b. var. *glabra*
 - 2b. Culm sheath base and margins with sparse, stiff, dull brown hairs 55c. var. *gracilis*

55a. *Bambusa textilis* var. *textilis*

青皮竹(原变种) qing pi zhu (yuan bian zhong)

Bambusa annulata W. T. Lin & Z. J. Feng; *B. glaucescens* (Willdenow) Merrill var. *annulata* (W. T. Lin & Z. J. Feng) N. H. Xia; *B. minutiligulata* W. T. Lin & Z. M. Wu; *B. textilis* var. *maculata* McClure; *B. textilis* var. *persistens* B. M. Yang; *B. textilis* var. *pubescens* B. M. Yang; *B. textilis* var. *purpurascens* N. H. Xia; *B. varioaurita* W. T. Lin & Z. J. Feng.

Culms 3–5 cm in diam. Culm sheath blade ca. 2/3 as long as sheath proper or longer, base \pm cordate; ligule ca. 2 mm.

• Usually cultivated, along rivers, around villages; low elevations. Anhui, Guangdong, Guangxi.

Two cultivars *Bambusa textilis* 'Maculata' and *B. textilis* 'Purpureascens' are found in gardens. The former is distinguished by several basal culm internodes and sheaths having purple-red spots and streaks, whereas the culm internodes of the latter have purple-red stripes.

55b. *Bambusa textilis* var. *glabra* McClure, Lingnan Univ. Sci. Bull. 9: 16. 1940.

光秆青皮竹 *guang gan qing pi zhu*

Culms 3–5 cm in diam.; internodes and sheaths glabrous. Culm sheath blade nearly 1/2 as long as sheath proper, base slightly rounded; ligule 1–1.5 mm.

• Usually cultivated in gardens. Guangdong, Guangxi.

55c. *Bambusa textilis* var. *gracilis* McClure, Lingnan Univ. Sci. Bull. 9: 16. 1940.

崖州竹 *ya zhou zhu*

Culms slender, less than 3 cm in diam. Culm sheath with sparse, stiff, dull brown hairs near both sides and base, blade to 1/2 as long as sheath proper, base slightly rounded; ligule ca. 1 mm.

• Cultivated in gardens. Guangdong, Guangxi.

56. *Bambusa truncata* B. M. Yang, Acta Sci. Nat. Univ. Norm. Hunan. 12: 337. 1989.

平箨竹 *ping tuo zhu*

Culms to 7 m, to 4.5 cm in diam.; internodes 22–35(–44) cm, initially thinly white powdery, glabrous. Branches usually arising from mid-culm, central branch longer and thicker. Culm sheaths deciduous, sparsely brown strigose, apex truncate; auricles inconspicuous; oral setae absent; ligule truncate, ca. 1.5 mm, margin dentate and ciliolate; blade erect, narrowly triangular, base nearly as wide as or slightly narrower than sheath apex. Leaf blade oblong-lanceolate, 8–14 \times 0.9–1.5 cm, both surfaces glabrous. Inflorescence unknown.

• Cultivated, river banks, around villages. Hunan (Lingling).

Further work is required on this species.

57. *Bambusa multiplex* (Loureiro) Raeuschel ex Schultes & J. H. Schultes in Roemer & Schultes, Syst. Veg. 7(2): 1350. 1830.

孝顺竹 *xiao shun zhu*

Culms suberect or apically slightly drooping, 1–7 m, (0.3–) 1.5–2.5 cm in diam.; internodes 30–50 cm, thinly white powdery, distally stiffly deciduously brown or dull brown hairy, especially densely so below nodes; wall usually rather thin, solid in var. *riviereorum*; nodes slightly prominent, glabrous; branching from 2nd or 3rd node up. Branches several to many, clustered, subequal or central slightly dominant. Culm sheaths deciduous, trapezoid, initially thinly white powdery, glabrous, asymmetrically arched, apex slanted along outer side; auricles very small to inconspicuous, oral setae few; ligule 1–1.5 mm,

irregularly dentate; blade deciduous, erect, narrowly triangular, base nearly as wide as sheath apex, abaxially with scattered, stiff, dull brown hairs, adaxially scabrous, apex acuminate. Leaves 5–26 per ultimate branch; leaf blade abaxially pale glaucous, adaxially bright green, linear, 1.6–16 \times 0.3–1.6 cm, abaxially densely pubescent, adaxially glabrous. Pseudospikelets solitary or several clustered at nodes of flowering branches, linear to linear-lanceolate, 3–6 cm; prophylls ca. 3.5 mm, 2-keeled, keels ciliolate; gemmiferous bracts usually 1 or 2, ovate to narrowly ovate, 4–7.5 mm, glabrous, 9–13-veined, apex obtuse or acute; florets (3–)5–13, middle ones fertile; rachilla segments flat, 4–4.5 mm, glabrous. Glumes absent; lemma asymmetrical, oblong-lanceolate, ca. 1.8 cm, glabrous, 19–21-veined, apex acute; palea linear, 1.4–1.6 cm, keels ciliolate, 6-veined between and 4-veined on one side and 3-veined on other side of keels, apex subtruncate, ciliolate, with a fine hairy tip on each side; lodicules 3, anterior 2 subovate, 2.5–3 mm, posterior narrowly lanceolate, 3–5 mm, margins glabrous. Filaments 0.8–1 cm; anthers purple, ca. 6 mm, apex penicillate. Ovary ovoid, ca. 1 mm, base with stalk ca. 1 mm, apex thickened and hispidulous; stigmas 3 or variable in number, ca. 5 mm, directly exerted from ovary apex. Mature caryopsis unknown.

Wild and cultivated, fields, mountains, low hills, riversides. Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [SE Asia].

Among the several names applied to these bamboos, *Bambusa multiplex* and *B. glaucescens* are most widely used. The application of the name *B. glaucescens* has been disputed and cannot be verified from type material or from the protologue.

Most taxa are beautiful ornamental bamboos, but their identification, classification, and nomenclature remain complex and controversial. Many varieties, forms, and cultivars have been published, given new status, and variously combined under the species recognized by different authorities. Therefore, a comprehensive synonymy is not possible in this abbreviated account.

- 1a. Culms 1–3 m, ultimate branches with 13–26 leaf blades; leaf blade 1.6–3.2 \times 0.3–0.7 cm 57c. var. *riviereorum*
- 1b. Culms 4–7 m, ultimate branches with 5–12 leaf blades; leaf blade 5–16 \times 0.7–1.6 cm.
 - 2a. Culm sheaths nearly symmetrical, apex arched-convex 57d. var. *shimadae*
 - 2b. Culm sheaths slanted along one side, apex asymmetrically arched-convex.
 - 3a. Culm sheaths abaxially glabrous 57a. var. *multiplex*
 - 3b. Culm sheaths abaxially strigose 57b. var. *incana*

57a. *Bambusa multiplex* var. *multiplex*

孝顺竹(原变种) *xiao shun zhu* (yuan bian zhong)

Arundo multiplex Loureiro, Fl. Cochinch. 1: 58. 1790; *Arundinaria glaucescens* (Willdenow) P. Beauvois; *Bambusa albofolia* T. H. Wen & Hua; *B. alphonso-karrii* Mitford ex Satow ["*Alphonse Karri*"]; *B. caesia* Siebold & Zuccarini ex Munro; *B. dolichomerithalla* Hayata; *B. glauca* Loddiges ex

Lindley; *B. glaucescens* (Willdenow) E. D. Merrill; *B. glaucescens* f. *alphonso-karrii* (Mitford ex Satow) Hatusima; *B. glaucescens* f. *solida* K. J. Mao & C. H. Zhao; *B. liukuensis* Hayata; *B. multiplex* var. *nana* (Roxburgh) P. C. Keng; *B. multiplex* var. *solida* B. M. Yang; *B. nana* Roxburgh; *B. nana* var. *alphonso-karrii* (Mitford ex Satow) Latour-Marliac ex E. G. Camus; *B. nana* var. *variegata* E. G. Camus; *B. sterilis* Kurz ex Miquel; *B. viridiglaucescens* Carrière; *Ischurochloa floribunda* Buse ex Miquel; *Leleba dolichomerithalla* (Hayata) Nakai; *L. elegans* Koidzumi; *L. liukuensis* (Hayata) Nakai; *Ludolfia glaucescens* Willdenow.

Culms 4–7 m, 1.5–2.5 cm in diam., internode walls rather thin. Culm sheaths abaxially glabrous, slanted along one side, apex asymmetrically arched, convex. Ultimate branches with 5–12 leaves; blade 5–16 × 0.7–1.6 cm.

Wild or cultivated. Guangdong, Guangxi, Hainan, Yunnan [SE Asia].

57b. *Bambusa multiplex* var. *incana* B. M. Yang, J. Hunan Teachers' Coll. (Nat. Sci. Ed.) 1983(1): 77. 1983.

毛凤凰竹 mao feng huang zhu

Bambusa glaucescens (Willdenow) Siebold ex Munro var. *pubivagina* (W. T. Lin & Z. J. Feng) N. H. Xia; *B. glaucescens* var. *strigosa* (T. H. Wen) L. C. Chia; *B. multiplex* var. *pubivagina* W. T. Lin & Z. J. Feng; *B. pubivagina* W. T. Lin & Z. M. Wu; *B. strigosa* T. H. Wen.

Culms 4–7 m, 1.5–2.5 cm in diam., internode walls rather thin. Culm sheaths abaxially strigose, apex asymmetrically

arched, convex. Ultimate branches with 5–12 leaves; blade 5–16 × 0.7–1.6 cm.

• Open fields, riversides. Hunan, Jiangxi.

57c. *Bambusa multiplex* var. *riviereorum* Maire, Fl. Afrique N. 1: 355. 1952.

观音竹 guan yin zhu

Bambusa glaucescens (Willdenow) Siebold ex Munro var. *riviereorum* (Maire) L. C. Chia & H. L. Fung.

Culms 1–3 m, 3–5 mm in diam.; internodes solid. Branches usually bent downward, bow-shaped. Culm sheath slanted along one side, apex asymmetrically arched-convex. Ultimate branches with 13–23 leaves; blades small, 1.6–3.2 × 0.3–0.7 cm.

• Low hills, riversides, widely cultivated as potted plants. Guangdong.

57d. *Bambusa multiplex* var. *shimadae* (Hayata) Sasaki, Trans. Nat. Hist. Soc. Taiwan 21: 118. 1931 [*“shimadai”*].

石角竹 shi jiao zhu

Bambusa shimadae Hayata, Icon. Pl. Formosan. 6: 151. 1916 [*“shimadai”*]; *B. glaucescens* var. *shimadae* (Hayata) L. C. Chia & But; *Leleba shimadae* (Hayata) Nakai.

Culms 4–7 m, 1.5–2.5 cm in diam., internode walls rather thin. Culm sheaths nearly symmetrical, broadly arched. Ultimate branches with 5–12 leaves.

• Usually cultivated in fields or mountains. Guangdong, Taiwan.

3. *Bambusa* subg. *Lingnania* (McClure) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 213. 1980.

簕竹亚属 dan zhu ya shu

Li Dezhu (李德铎); Chris Stapleton

Lingnania McClure, Lingnan Univ. Sci. Bull. 9: 34. 1940; *Neosinocalamus* P. C. Keng.

Culm internodes usually 30–110 cm; wall often less than 8 mm thick, but sometimes to 2 cm thick. Branchlets of lower branches never specialized into thorns. Branches usually absent on lower culm, usually subequal. Culm sheaths thickly papery; auricles small or absent, often narrowly oblong; blade deciduous, narrow, only ca. 1/3 width of sheath apex. Pseudospikelets purple-brown or bronze-colored.

About 14 species: S China, N Vietnam; 14 species (12 endemic) in China.

1a. Central branches dominant; culm wall usually more than (6–)8 mm thick.

2a. Culm wall 15–20 mm thick.

3a. Young culm internodes thinly white powdery, sparsely deciduously white hairy; culm sheath blade abaxially glabrous 58. *B. intermedia*

3b. Young culm internodes pubescent only; culm sheath blade both strigose and pubescent 59. *B. wenchouensis*

2b. Culm wall 6–10 mm thick.

4a. Culm sheath blade abaxially hispid 67. *B. emeiensis*

4b. Culm sheath blade abaxially glabrous.

5a. Young culm internodes with brown longitudinally arranged hairs; nodal sheath scars glabrous; culm sheath blade reflexed 60. *B. remotiflora*

5b. Young culm internodes sparsely glaucous hairy; nodal sheath scars hairy; culm sheath blade erect 61. *B. surrecta*

1b. Branches subequal; culm wall 2–5(–8) mm thick.

6a. Culms scrambling 68. *B. hainanensis*

6b. Culms erect to pendulous, never scrambling.

7a. Culms apically long pendulous 67. *B. emeiensis*

7b. Culms apically erect to nodding.

- 8a. Young culms glabrous.
 9a. Culm sheath asymmetrical, one side smooth, the other rugate, apex with unequal rounded shoulders 71. *B. rugata*
 9b. Culm sheath symmetrical.
 10a. Culm sheaths hispidulous; blade adaxially glabrous 62. *B. cerosissima*
 10b. Culm sheaths silky hairy; blade adaxially hispidulous 63. *B. chungii*
 8b. Young culms hairy.
 11a. Young culms hispidulous, concavely tuberculate, white powdery 64. *B. distegia*
 11b. Young culms tuberculate-hairy, not white powdery or only in rings below nodes.
 12a. Culm sheaths symmetrical, apex truncate or slightly concave.
 13a. Leaf blade 0.8–1.6 cm wide; culm sheath, blade reflexed 65. *B. guangxiensis*
 13b. Leaf blade 2.4–2.8 cm wide; culm sheath blade erect; ligule margin dentate and long ciliate; leaf sheath glabrous or glabrescent 69. *B. fimbriiligulata*
 12b. Culm sheaths asymmetrical, apex concave.
 14a. Culm sheath ligule margin serrulate; leaf blade glabrous adaxially 66. *B. papillata*
 14b. Culm sheath ligule margin long ciliate; leaf blade hispidulous between veins adaxially 70. *B. papillatoides*

58. *Bambusa intermedia* Hsueh & T. P. Yi, J. Bamboo Res. 3(1): 43. 1984.

绵竹 mian zhu

Culms to 10(–15) m, to 10 cm in diam.; internodes deep green, 35–45(–55) cm, initially thinly white powdery, sparsely deciduously white hairy; wall to 2 cm thick; nodes flat, white tomentose; branching from basal nodes up. Branches many, main mid-culm branch to 2 cm in diam. Culm sheaths deciduous, ca. 1/2 as long as internodes, leathery, with yellow and brown hairs, apex truncate or slightly concave; auricles small; oral setae several; ligule 2–3 mm, fimbriate; blade reflexed or spreading, abaxially glabrous, base ca. 1/3 as wide as sheath apex. Leaf sheaths glabrous; ligule truncate; auricles narrowly ovate; oral setae deflexed; blade lanceolate, 7–18 × 1–2.5 cm. Pseudospikelets 2–4 cm; gemmiferous bracts progressively larger; florets 7–11. Glumes 1 or 2; lemma 0.7–1 cm; palea longer than lemma, narrow, apex obtuse; lodicules 3. Anthers 4–5 mm. Ovary pubescent at apex; stigmas 3. Caryopsis unknown.

• Widely cultivated in river valleys and hilly areas; 500–2300 m. Guizhou, Sichuan, C and S Yunnan.

This species is intermediate between *Bambusa* subg. *Leleba* and *B.* subg. *Lingnania*, with inflorescences typical of the former and culm sheaths typical of the latter.

59. *Bambusa wenchouensis* (T. H. Wen) P. C. Keng ex Y. M. Lin & Q. F. Zheng, Fl. Fujian. 6: 45. 1995.

温州箬竹 wen zhou dan zhu

Lingnania wenchouensis T. H. Wen, J. Bamboo Res. 1(1): 32. 1982.

Culms to 12(–16) m, 8–12 cm in diam.; internodes 37–50 cm, initially pubescent; wall 1.6–2 cm thick; nodes flat, tomentose; branching from base. Branches many, dominant ones to 1.8 cm in diam. Culm sheaths deciduous, ca. 1/2 as long as internodes, leathery, brown hairy, apex slightly concave; auricles small; oral setae several; ligule ca. 2 mm, serrulate; blade strongly reflexed, both strigose and pubescent, base ca. 1/3 as wide as sheath apex. Leaf sheaths initially pubescent; ligule slightly prominent; auricles ovate; oral setae recurved; blade

broadly lanceolate, 9–16 × 1.2–2 cm. Pseudospikelets to 3.3 cm; florets 9–13. Glumes 2–4; lemma ca. 0.8 cm; palea longer than lemma; lodicules ovate. Anthers ca. 6 mm. Ovary elliptical, ca. 1 mm, apically pubescent; stigmas 3, ca. 3 mm. Caryopsis unknown.

• River banks, around villages; 200–500 m. Fujian, Zhejiang.

The shoots are bitter but edible after treatment.

60. *Bambusa remotiflora* (Kuntze) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 214. 1980.

甲竹 jia zhu

Arundarbor remotiflora Kuntze, Revis. Gen. Pl. 760. 1891; *Bambusa lingnanioides* W. T. Lin; *Lingnania fimbriiligulata* McClure; *L. parviflora* McClure; *L. remotiflora* (Kuntze) McClure.

Culms 8–12 m, 5–7.5 cm in diam.; internodes 30–40 cm, initially with brown, longitudinally arranged hairs; wall 6–9 mm thick; nodes flat, initially with a ring of yellow tomentum; sheath scars glabrous; branching from base. Branches many, central branches dominant. Culm sheaths deciduous, thickly leathery, dark brown hispid, apex truncate or slightly concave; auricles narrowly oblong, oral setae several; ligule convex, 2–3 mm, fimbriate; blade reflexed, base ca. 1/3 as wide as sheath apex, adaxially strigose. Leaf sheaths glabrous; ligule fimbriate, 2–3 mm; auricles deciduous, small; oral setae straight; blade lanceolate, 9–20 × 1–3 cm. Pseudospikelets 1–2.4 cm; florets 4–7. Glumes 1 or 2, 3.5–5.5 mm; lemma ca. 9 × 5–6 mm; palea about as long as lemma. Anthers ca. 4 mm. Stigmas 3. Caryopsis unknown.

Lowland river banks; 200–500 m. Guangdong, Guangxi, Hainan [Vietnam].

The culms are used for weaving.

61. *Bambusa surrecta* (Q. H. Dai) Q. H. Dai, Fl. Reipubl. Popularis Sin. 9(1): 119. 1996.

油竹 you zhu

Lingnania surrecta Q. H. Dai, Acta Phytotax. Sin. 20: 213. 1982.

Culms 6–10 m, 3–6 cm in diam.; internodes 40–50 cm, sparsely glaucous-hairy; wall 6–10 mm thick; nodes flat; sheath scars with a densely strigose ring; branching from base. Branches many, central branches slightly dominant. Culm sheaths deciduous, thickly leathery, densely hispid, apex slightly concave; auricles narrowly ovate; oral setae recurved; ligule ca. 3–5 mm, fimbriate; blade erect, base ca. 1/3 as wide as sheath apex, adaxially strigose. Leaf sheaths glabrous; ligule fimbriate, ca. 1 mm; auricles deciduous, small; oral setae absent; blade lanceolate, 12–18 × 1–3 cm. Inflorescence unknown.

- River banks, near villages; 100–300 m. Guangxi.

The culms are very good for weaving.

62. *Bambusa cerosissima* McClure, Lingnan Sci. J. 15: 637. 1936.

簕竹 dan zhu

Lingnania cerosissima (McClure) McClure, Lingnan Univ. Sci. Bull. 9: 35. 1940.

Culms 3–7(–15) m, 2–5 cm in diam.; internodes 30–60 cm or longer, densely white powdery; wall 2–4 mm thick; nodes flat; sheath scars corky; branching absent from lower nodes. Branches many, subequal. Culm sheaths late deciduous, thickly papery, much shorter than internodes; densely glaucous, hispidulous, apex slightly concave; auricles narrowly oblong, oral setae long, slender; ligule ca. 2 mm, slightly convex, fimbriate; blade strongly reflexed, base 1/4–1/3 as wide as sheath apex, adaxially glabrous. Leaf sheaths glabrous; ligule ca. 1 mm; auricles conspicuous, occasionally absent; oral setae straight; blade narrowly lanceolate, 16–20 × 1.5–3 cm. Glumes 1 or 2; lemma ca. 1 cm; palea about as long as lemma, apex obtuse or truncate. Style 1–2 mm; stigmas 3. Caryopsis triangular.

Farmlands, roadsides; 100–200 m. Guangdong, Guangxi [N Vietnam].

63. *Bambusa chungii* McClure, Lingnan Sci. J. 15: 639. 1936.

粉簕竹 fen dan zhu

Lingnania chungii (McClure) McClure; *L. chungii* var. *petilla* T. H. Wen.

Culms 5–10(–18) m, 3–5(–7) cm in diam.; internodes 30–45(–100) cm, initially white powdery, glabrous; wall 3–5 mm thick; nodes flat; sheath scars corky, initially with a ring of dense, brown hairs; branching from distal nodes only. Branches many, subequal. Culm sheaths deciduous, thinly leathery, initially white powdery, silky hairy, apex later glabrous, concave; auricles narrowly oblong, glossy; ligule ca. 1.5 mm, serrulate or long fimbriate; blade deciduous, strongly reflexed, base 1/5–1/3 as wide as sheath apex, adaxially hispidulous. Leaf sheaths glabrous; auricles usually developed; oral setae straight; blade lanceolate, 10–16(–20) × 1–2(–3.5) cm. Pseudospikelets ca. 2 cm; gemmiferous bracts 1 or 2; florets 4 or 5. Glumes 1 or 2; lemma 9–12 mm; palea about as long as lemma. Styles 1–2 mm; stigmas 3 or 2. Caryopsis triangular, 8–9 mm.

• Lowland hilly areas; 100–500 m. Fujian, Guangdong, Guangxi, S Hunan, SE Yunnan.

The culms are used for weaving and papermaking. The species is also planted as an ornamental because of the dense, persistent, white wax on the culms.

64. *Bambusa distegia* (Keng & P. C. Keng) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 213. 1980.

料慈竹 liao ci zhu

Sinocalamus distegius Keng & P. C. Keng, J. Wash. Acad. Sci. 36: 76. 1946; *Bambusa yunnanensis* N. H. Xia; *Lingnania distegia* (Keng & P. C. Keng) Keng; *Schizostachyum annulatum* Hsueh & W. P. Zhang.

Culms 5–10 m, 3–5 cm in diam.; internodes 20–50 cm, initially white powdery, hairy, later concavely tuberculate; wall 5–8 mm thick; nodes flat; sheath scars corky, initially with a ring of dense, brown hairs. Branches many from distal nodes, subequal. Culm sheaths deciduous, ca. 1/2 as long as internodes or less, leathery, finely white powdery, initially minutely golden or brown hispid, apex truncate; auricles minute; oral setae 3–5 mm; ligule 1–2 mm, serrulate; blade reflexed or horizontal, base ca. 1/3 as wide as sheath apex, adaxially hispidulous. Leaf sheaths glabrous; auricles usually minute; oral setae minute; blade lanceolate, 5–16 × 0.8–1.6 cm. Pseudospikelets 1.3–1.8 cm; florets 4–6. Glumes 1 or 2; lemma 8–10 × 8–10 mm; palea about as long as lemma. Anthers 5–6 mm. Ovary ca. 2.5 mm, pubescent; styles 2–3 mm; stigmas 1–3, 5–9 mm. Caryopsis ca. 8 mm. New shoots Sep–Oct, fl. Sep–Oct.

- Hilly areas, streams; 300–500 m. Sichuan.

The culms are used for weaving.

65. *Bambusa guangxiensis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 214. 1980.

桂簕竹 gui dan zhu

Lingnania funghomii McClure, Lingnan Univ. Sci. Bull. 9: 36. 1940, not *Bambusa funghomii* McClure (1940).

Culms 2–5 m, 1.5–3 cm in diam., apically pendulous; internodes 40–60 cm, initially with bulbous-based hairs, papillate in age; wall 2–4 mm thick; nodes flat; sheath scar with a densely brown hirsute ring. Branches many, subequal. Culm sheaths deciduous, leathery, initially with dense, brown tuberculate hairs, apex truncate or slightly concave; auricles minute; oral setae 3–5 mm; ligule ca. 1 mm, serrulate; blade reflexed, base 1/4–1/3 as wide as sheath apex, both surfaces glabrous. Leaf sheaths silky hairy; auricles uniform; oral setae 6–8 mm; blade narrowly lanceolate, 8–16 × 1–1.5 cm. Inflorescence unknown.

- River valleys, lowland areas; 300–500 m. Guangxi.

The culms are split for weaving and tying.

66. *Bambusa papillata* (Q. H. Dai) K. M. Lan, Fl. Guizhou. 5: 281. 1988.

水簕竹 shui dan zhu

Lingnania papillata Q. H. Dai, Acta Phytotax. Sin. 20: 213. 1982.

Culms 3–6 m, 2–4 cm in diam., apically pendulous; internodes 30–60 cm, initially with bulbous-based hispid hairs, papillate in age; wall 2–3 mm thick; nodes flat; sheath scar with

a densely brown hirsute ring, distal to a white powdery ring. Branches many, subequal. Culm sheaths deciduous, asymmetrical, leathery, initially with brown tuberculate hairs, apex concave; auricles minute; oral setae 3–5 mm; ligule ca. 1 mm, serrulate; blade erect, base 1/4–1/3 as wide as sheath apex, both surfaces glabrous. Leaf sheaths weakly hispid; auricles minute; oral setae 8–12 mm; blade narrowly lanceolate, 8–19 × 1–1.5 cm. Inflorescence unknown.

- River valleys, hilly areas; 100–500 m. Guangxi.

67. *Bambusa emeiensis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 214. 1980.

慈竹 ci zhu

Dendrocalamus affinis Rendle, J. Linn. Soc., Bot. 36: 447. 1904, not *Bambusa affinis* Munro (1868); *Lingnania affinis* (Rendle) P. C. Keng; *Neosinocalamus affinis* (Rendle) P. C. Keng; *Sinocalamus affinis* (Rendle) McClure.

Culms 5–10(–12) m, 5–8 cm in diam., apically long pendulous; internodes 15–30(–60) cm, initially stiffly pale brown strigose; wall 8–12 mm thick; nodes flat. Branches absent from lower nodes, many from mid-culm, central ones slightly prominent. Culm sheaths deciduous, leathery, both pale pubescent and dark brown spinous-hairy, apex concave; auricles minute or absent; ligule 2–5 mm, fimbriate; blade reflexed or horizontal, base 1/3–1/2 as wide as sheath apex, both surfaces hispid. Leaves variable in size; sheaths glabrous; ligule truncate, 1–1.5 mm; auricles and oral setae absent; blade narrowly lanceolate, 10–30 × 1–3 cm. Pseudospikelets 1.2–1.5 cm; prophylls 1-keeled; bracts 2 or 3; florets 3–5, with a terminal sterile floret. Rachilla internodes abbreviated, apical ones ca. 2 mm, falling together. Glumes absent or 1, 6–7 mm; lemma 0.8–1 cm; palea 7–9 mm; lodicules 3(or 4). Anthers 4–6 mm. Ovary ca. 1 mm; styles to 4 mm; stigmas 2–4, 3–5 mm. Caryopsis 7–8 mm. New shoots Jun–Sep, fl. Jul–Sep. $2n = 76^*$.

- River valleys, hilly areas; 800–2100 m. Guizhou, W Hunan, Sichuan, Yunnan.

This is the most common species of bamboo cultivated on the Yunnan Plateau and adjacent provinces. It has been used for various purposes, from household weaving to agricultural tools, and for ornamental and soil-protection purposes. It is also of great systematic interest, with vegetative parts typical of *Bambusa* subg. *Lingnania*, while the spikelet structure differs from the rest of the subgenus, having characteristics of *B.* subg. *Dendrocalamopsis*.

68. *Bambusa hainanensis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 213. 1980.

籐箬竹 teng dan zhu

Lingnania scandens McClure, Lingnan Univ. Sci. Bull. 9: 38. 1940, not *Bambusa scandens* Blume ex Nees (1824).

Culms scrambling; internodes 20–30 cm, stiffly strigose; wall less than 8 mm thick. Branches many, subequal. Culm sheaths imperfectly known. Leaf sheaths glabrous; auricles and oral setae absent; blade lanceolate, 16–25 × 2–3 cm. Pseudospikelets few flowered. Lemma ca. 1 cm; palea longer than lemma; lodicules 3, brown, hirtellous. Ovary oblong, apex hirtellous; stigmas (2 or) 3. Caryopsis unknown.

- Tropical forests. Hainan.

This imperfectly known species requires further investigation.

69. *Bambusa fimbriligulata* McClure, Lingnan Univ. Sci. Bull. 9: 10. 1940.

流苏箬竹 liu su dan zhu

Culms usually ca. 6 m tall, ca. 3 cm in diam.; internodes upward strigose at first, later hairs deciduous; nodes slightly prominent. Culm sheaths deciduous, brown hispid abaxially; auricles narrow, glabrous, apex truncate; oral setae sparse, very weak; ligules ca. 1.5 mm tall in middle, margin dentate and long ciliate; blades erect, deciduous, lanceolate, apex long attenuate, nearly glabrous abaxially, slightly scabrous adaxially. Branches many, subequal. Leaf sheaths glabrous or glabrescent; auricles and oral setae weakly developed; ligules scarcely exerted, apex concave, petioles slightly scabrous on both sides; blades 13.5–17.5 × 2.4–2.8 cm, oblong-lanceolate, glabrous adaxially, puberulous abaxially, transverse veinlets inconspicuous. Inflorescence unknown.

- Riversides. Guangxi (Quangxian).

This imperfectly known species requires further investigation.

70. *Bambusa papillatoides* Q. H. Dai & D. Y. Huang, Acta Phytotax. Sin. 36: 279. 1998.

细箬竹 xi dan zhu

Culms erect or suberect, usually 3–6 m tall, 1–3 cm in diam.; internodes terete, 30–50 cm, densely white hispid, papillate after hairs falling, white powdery below nodes; wall 2–5 mm thick; basal intranodes grayish white lanuginous; sheath scars dense pale brown hairy. Branches many, main one longer than lateral ones. Culm sheaths deciduous, oblong, green when fresh, brittle, margin papery, apex very concave, asymmetrical; densely brown or grayish white hispidulous; auricles long ovate or elliptic, oral setae many, well developed, ca. 5 mm, white, erect; ligules ca. 1 mm, margin white ciliate, cilia ca. 5 mm; blades erect, ovate-lanceolate, base constricted, glabrous abaxially, hispidulous between veins adaxially. Leaves 7–10 on ultimate branches; leaf sheaths 3–4 cm, hispidulous at first, margin ciliate; ligules ca. 1 mm; auricles falcate or absent, oral setae 3–5, grayish white, 10–12 cm, radiate, deciduous; blades lanceolate, 10–15 × 1–2 cm, fine white hairy along veins abaxially, secondary veins 4–6 pairs. Inflorescence unknown.

- Cultivated. Guangxi (Nanning).

71. *Bambusa rugata* (W. T. Lin) Ohrnberger, Bamboos World Introd. 4: 19. 1997.

皱纹箬竹 zhou wen dan zhu

Lingnania rugata W. T. Lin, J. Bamboo Res. 12(3): 2. 1993.

Culms 3–4 m tall, 1.3–3 cm in diam.; internodes 25–38 cm, glabrous, with a ring of white powder below nodes; wall 2–3 mm thick; nodes not prominent; sheath scar slightly prominent, ± yellow hispid. Branches many, subequal. Culm sheath

deciduous, one side smooth and flat, the other side rugate, abaxially \pm hispid at base, apex concave, unequal, 2 shoulders rotund; auricles narrow; oral setae present, erect; ligules ca. 1 mm, margin fimbriate; blades reflexed, lanceolate. Leaves 3 or 4 in ultimate branches; leaf sheaths glabrous, auricles falcate,

small, oral setae radiate; blades $3.5\text{--}15 \times 0.8\text{--}2.5$ cm, glabrous adaxially, white puberulous abaxially; secondary veins 4–6 pairs. Inflorescence unknown.

• Guangdong (Zhuhai).

4. *Bambusa* subg. *Dendrocalamopsis* L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 214. 1980.

绿竹亚属 lǜ zhu ya shu

Li Dezhu (李德铸); Chris Stapleton

Dendrocalamopsis Q. H. Dai & X. L. Tao.

Culm internodes usually 30–110 cm; wall usually thin, often less than 8 mm thick, but sometimes to 2 cm thick. Branches usually absent in lower culm, usually subequal. Branchlets of lower branches never specialized into thorns. Culm sheaths thickly papery; auricles absent or small, often narrowly oblong; blade deciduous, narrow, only ca. 1/3 width of sheath apex. Pseudospikelets purple-brown or bronze-colored.

Ten species: E and S China, Myanmar (*Bambusa copelandii* Brandis); nine species (all endemic) in China.

The genus *Dendrocalamopsis* was validly published when *D. grandis* was published, as its description satisfies the criteria for a *descriptio generico-specifica* (Stapleton & Xia, Taxon 53: 526–528. 2004).

- 1a. Culm sheaths apically narrow; blade recurved to reflexed; spikelets ovate, sometimes bilaterally compressed.
- 2a. Culms with abbreviated basal internodes; branching from basal nodes; stigma 1 79. *B. bicicatricata*
- 2b. Culms without abbreviated basal internodes, not branching from basal nodes; stigmas 1–3.
- 3a. Culm sheath blade base ca. 1/3 of sheath apex 77. *B. stenoaurita*
- 3b. Culm sheath blade base not much narrower than sheath apex.
- 4a. Culms initially pubescent; culm sheaths with minute auricles; stigmas (1 or) 2–4 76. *B. beecheyana*
- 4b. Culms initially hispid; culm sheaths with small, reflexed auricles; stigma 1 78. *B. grandis*
- 1b. Culm sheaths apically broad; blade erect; spikelets slender, subulately terete or ovate, usually not bilaterally compressed.
- 5a. Culm sheath auricles absent 80. *B. xueana*
- 5b. Culm sheath auricles slightly conspicuous, oblong, ovate or rounded.
- 6a. Culm sheaths with unequal auricles, larger auricle ca. $2 \times$ size of smaller one 75. *B. basihirsuta*
- 6b. Culm sheaths with similar-sized auricles.
- 7a. Culm sheath ligule 3–9 mm; culms pubescent, initially with lilac stripes 72. *B. variostrata*
- 7b. Culm sheath ligule ca. 1 mm; culms glabrous, green.
- 8a. Spikelets slender, $3\text{--}3.7 \times 0.5$ cm, 8–13-flowered; culm sheath base outer margin usually with an arrowlike expansion below point of attachment 73. *B. odashimae*
- 8b. Spikelets ovate, $2.7\text{--}3 \times 0.7\text{--}1$ cm, 5–9-flowered; culm sheath base without expansion 74. *B. oldhamii*

72. *Bambusa variostrata* (W. T. Lin) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 215. 1980 [*vario-striata*].

吊丝箬竹 diao si dan zhu

Sinocalamus variostratus W. T. Lin, Acta Phytotax. Sin. 16(1): 66. 1978 [*vario-striatus*]; *Dendrocalamopsis variostrata* (W. T. Lin) P. C. Keng; *Neosinocalamus variostratus* (W. T. Lin) J. F. Zhuo.

Culms 5–12 m, 4–7 cm in diam., apically long pendulous; internodes initially with lilac stripes, 15–30 cm, initially pubescent; wall 8–10 mm thick; nodes flat; branching from culm base up. Branches many, main ones slightly dominant at mid-culm. Culm sheaths deciduous, leathery, with deciduous, yellow, spinous hairs; auricles slightly conspicuous, oblong; oral setae few, 4–6 mm; ligule 3–9 mm, entire or serrulate; blade erect, base ca. 1/2 as wide as sheath apex, adaxially hispid. Leaf sheaths subglabrous; ligule truncate, ca. 1 mm; auricles minute; oral setae few; blade narrowly lanceolate, $13\text{--}26 \times$

$1.6\text{--}3$ cm. Pseudospikelets 3–5 cm; bracts 3–5; florets 5 or 6 plus terminal sterile floret; rachilla not disarticulating, internodes 2–3 mm. Glumes 1, ca. 1 cm; lemma ca. 1.5 cm; palea ca. 1.5 cm; lodicules 3, 4–5 mm. Anthers ca. 7 mm. Ovary ovoid, ca. 2.5 mm; styles ca. 5 mm; stigmas 3. Caryopsis unknown.

• Lowlands, hilly areas. Guangdong.

73. *Bambusa odashimae* Hatusima, Fl. Okinawa, rev. ed., 128. 1967.

乌脚绿竹 wu jiao lü zhu

Leleba edulis Odashima, J. Trop. Agric. 8: 59. 1936, not *Bambusa edulis* Carrière (1866); *B. taiwanensis* L. C. Chia & H. L. Fung; *Dendrocalamopsis edulis* (Odashima) P. C. Keng; *Sinocalamus edulis* (Odashima) P. C. Keng.

Culms to 20 m, 7.5–13 cm in diam.; internodes 20–35 cm; wall 1–1.8 cm thick; nodes flat. Branches many from basal

nodes, main ones slightly dominant at mid-culm. Culm sheaths deciduous, leathery, hispid, base of outer margin usually with an arrowlike expansion below point of attachment; auricles small; oral setae few; ligule ca. 1 mm, entire or ciliate; blade erect, base ca. 1/2 as wide as sheath apex, adaxially hispid. Leaf sheaths glabrous; auricles minute; oral setae few, 7–10 mm; ligule truncate, ca. 1 mm; blade oblong-lanceolate or narrowly lanceolate, 20–34 × 3–5 cm. Pseudospikelets slender, 3–3.7 × ca. 0.5 cm; florets 8–13, with 2 or 3 terminal florets sterile; rachilla not disarticulating, internodes 2–3 mm. Glume 1, 0.8–1 cm; lemma 0.8–1.3 cm; palea 0.6–1 cm; lodicules 2 or 3, 1.5–2 mm. Anthers 4–4.5 mm. Ovary oblong, 1.5–2 mm; styles ca. 2 mm; stigmas 3. Caryopsis unknown.

- Lowlands, hilly areas. Taiwan.

This species has delicious shoots and is widely cultivated in N Taiwan.

74. *Bambusa oldhamii* Munro, Trans. Linn. Soc. London 26: 109. 1868 [*“oldhami”*].

绿竹 lǜ zhu

Bambusa atrovirens T. H. Wen; *Dendrocalamopsis atrovirens* (T. H. Wen) P. C. Keng ex W. T. Lin; *D. oldhamii* (Munro) P. C. Keng; *Leleba oldhamii* (Munro) Nakai; *Sinocalamus oldhamii* (Munro) McClure.

Culms 6–12 m, 3–9 cm in diam.; internodes slightly flexuose, 20–35 cm, initially white powdery, glabrous; wall 4–12 mm thick; nodes flat. Branches many from mid-culm up, 3 dominant. Culm sheaths deciduous, leathery, dark brown spinous-hairy, soon glabrescent; auricles small, rounded, ciliate; ligule ca. 1 mm, subentire; blade erect, base ca. 1/2 as wide as sheath apex. Leaf sheaths initially hispid; ligule truncate, ca. 1 mm; auricles suborbicular; oral setae few; blade oblong-lanceolate, 15–30 × 3–6 cm. Pseudospikelets 2.7–3 × 0.7–1 cm; bracts 3–5; florets 5–9; rachilla not disarticulating, internodes 2–3 mm. Glumes 1, 0.9–1 × ca. 0.8 cm; lemma similar to glumes, ovate, ca. 1.7 × 1.3 cm; palea ca. 1.3 cm; lodicules 3, ca. 3.5 mm. Anthers ca. 8 mm. Ovary ovoid, ca. 2 mm; style ca. 5 mm; stigmas 3. Caryopsis unknown. New shoots May–Nov, fl. summer–autumn.

- Plains. Fujian, Guangdong, Guangxi, Hainan, Taiwan, S Zhejiang.

Bambusa oldhamii is commonly cultivated in Taiwan for its very high-quality shoots.

75. *Bambusa basihirsuta* McClure, Lingnan Univ. Sci. Bull. 9: 6. 1940.

扁竹 biān zhu

Bambusa prasina T. H. Wen; *Dendrocalamopsis basihirsuta* (McClure) P. C. Keng & W. T. Lin; *D. prasina* (T. H. Wen) P. C. Keng.

Culms 7–12 m, 4–9 cm in diam.; internodes 22–35 cm, initially thickly white powdery, sparsely hispid; nodes flat. Branches many from mid-culm up, 3 dominant. Culm sheaths deciduous, leathery, initially brown spinous-hairy, glabrescent;

auricles unequal, ciliate, larger one ca. 5 mm, smaller ca. 3 mm; ligule ca. 2 mm, ciliate; blade erect, triangular, glabrous, base ca. 1/2 as wide as sheath apex. Leaf sheaths initially hispid; ligule truncate, ca. 1 mm; auricles suborbicular; oral setae few; blade oblong-lanceolate, 13–25 × 2.5–5 cm. Pseudospikelets ca. 2.4 × 0.7 cm, subtended by a prophyll; florets 5–7; rachilla not disarticulating, internodes ca. 2 mm. Glumes 1 or 2; lemma ca. 1.6 × 1 cm; palea ca. 1.4 cm. Lodicules 3, ciliate. Anthers ca. 7 mm. Ovary ovoid, ca. 2 mm; styles ca. 5 mm; stigmas 3, 4–6 mm. Caryopsis unknown.

- Low-lying areas. Guangdong, Zhejiang.

The bitter shoots are not eaten.

76. *Bambusa beecheyana* Munro, Trans. Linn. Soc. London 26: 108. 1868.

吊丝球竹 diào sī qiú zhū

Culms to 16 m, 9–10 cm in diam., apically pendulous or long pendulous; internodes 34–41 cm, initially thickly white powdery, sparsely pubescent; wall 1.5–2 cm thick; nodes flat. Branches several, 1–3 dominant. Culm sheaths deciduous, leathery, initially with uneven, dark brown, spinous hairs; auricles small at lower nodes, larger at distal nodes; oral setae present or absent; ligule 2–4 mm, ciliate; blade recurved, triangular, base 1/2–4/5 as wide as sheath apex, adaxially hirtellous. Leaf sheaths initially hirtellous; ligule truncate, 0.5–1 mm; auricles absent or minute; oral setae scarce or absent; blade oblong-lanceolate, 11–28 × 1.5–3.5 cm. Pseudospikelets 1.5–2 × 0.5–0.8 cm; florets 6–8; rachilla not disarticulating, internodes ca. 2 mm. Glumes 2, cordate, 4–5 mm, ciliate; lemma ca. 0.9 × 0.9 cm; palea 4–8 mm; lodicules 3, ciliate. Anthers ca. 5 mm. Ovary ovoid, ca. 1.5 mm; styles 3–4 mm; stigmas (1 or) 2–4, ca. 6 mm. Caryopsis unknown. New shoots Jun–Jul, fl. Sep–Dec.

- Plains. Guangdong, Guangxi, Hainan, Taiwan.

Bambusa beecheyana is commonly cultivated in S Guangdong for its slightly bitter shoots.

- 1a. Culms apically long pendulous, without a brown pubescent ring below nodes; basal nodes without branches; stigmas 2–4 76a. var. *beecheyana*
- 1b. Culms apically pendulous, with a brown pubescent ring below nodes; basal nodes with branches; stigmas 2 76b. var. *pubescens*

76a. *Bambusa beecheyana* var. *beecheyana*

吊丝球竹(原变种) diào sī qiú zhū (yuan bian zhong)

Dendrocalamopsis beecheyana (Munro) P. C. Keng; *Neosinocalamus beecheyanus* (Munro) P. C. Keng & T. H. Wen; *Sinocalamus beecheyanus* (Munro) McClure.

Culms apically long pendulous; without a brown pubescent ring below nodes; basal nodes without branches. Palea abaxially hirtellous, apex acuminate or obtuse; stigmas 2–4.

- Guangdong, Guangxi, Hainan.

76b. *Bambusa beecheyana* var. *pubescens* (P. F. Li) W. C. Lin, Bull. Taiwan Forest. Res. Inst. 6: 1. 1964.

大头典竹 *da tou dian zhu*

Sinocalamus beecheyanus var. *pubescens* P. F. Li, Sunyatsenia 6: 205. 1946; *Dendrocalamopsis beecheyana* var. *pubescens* (P. F. Li) P. C. Keng; *Neosinocalamus beecheyanus* var. *pubescens* (P. F. Li) P. C. Keng & T. H. Wen; *Sinocalamus pubescens* (P. F. Li) P. C. Keng.

Culms apically recurved, with a brown pubescent ring below nodes; basal nodes with branches. Palea densely pubescent abaxially, apically 2-cleft; stigmas 2.

• Guangdong, Taiwan.

77. *Bambusa stenoaurita* (W. T. Lin) T. H. Wen, J. Bamboo Res. 10(1): 22. 1991.

黄麻竹 *huang ma zhu*

Sinocalamus stenoauritus W. T. Lin, Bull. Bot. Lab. N.-E. Forest. Inst., Harbin 1980(6): 89. 1980; *Dendrocalamopsis stenoaurita* (W. T. Lin) P. C. Keng ex W. T. Lin; *Neosinocalamus stenoauritus* (W. T. Lin) W. T. Lin.

Culms pendulous, to 10 m, ca. 7 cm in diam.; internodes 22–32 cm, glabrous; wall ca. 1 cm thick; nodes flat. Branches several from middle nodes of culms, central slightly dominant. Culm sheaths deciduous, leathery, initially brown spiny-strigose; auricles reflexed, linear, small; ligule ca. 3 mm, serrulate; blade recurved or reflexed, triangular, base ca. 1/3 as wide as sheath apex. Leaf sheaths subglabrous; auricles absent or minute, with or without few oral setae; ligule truncate, 0.5–1 mm; blade oblong-lanceolate, 13–25 × 2–2.5 cm. Pseudospikelets 2–2.5 cm; bracts 1 or 2; florets ca. 6; rachilla not disarticulating, internodes ca. 2 mm. Glumes 1 or 2, ciliate; lemma 1–1.2 cm; palea about as long as lemma; lodicules 3, ca. 3.5 mm, ciliate. Anthers 8–10 mm. Ovary ovoid; styles 3–4 mm; stigmas (1 or) 2–4. Caryopsis unknown. New shoots Jul–Oct.

• River valleys. Guangdong.

Bambusa stenoaurita may be more appropriately placed in *Dendrocalamus*.

This species is cultivated in some areas of Guangdong for its shoots.

78. *Bambusa grandis* (Q. H. Dai & X. L. Tao) Ohrnberger, Bamboos World Introd. 4: 18. 1997.

大绿竹 *da lu zhu*

Dendrocalamopsis grandis Q. H. Dai & X. L. Tao, Acta Phytotax. Sin. 20: 210. 1982; *D. daii* P. C. Keng, nom. illeg. superfl.; *Neosinocalamus grandis* (Q. H. Dai & X. L. Tao) T. H. Wen.

Culms 10–15 m, 8–10 cm in diam., apically recurved; internodes 30–40 cm, basally slightly swollen, initially sparsely hispid; wall 2–2.5 cm thick; nodes flat. Branches several, central dominant. Culm sheaths deciduous, leathery, initially with dark brown, spiny hairs; auricles reflexed, linear, small; ligule 3–5 mm, serrulate; blade recurved, occasionally erect,

ovate to lanceolate, base ca. 4/5 as wide as sheath apex. Leaf sheaths hirtellous; ligule truncate, 1–1.5 mm; auricles and oral setae absent; blade lanceolate, 15–20 × 3–5 cm. Pseudospikelets 1.5–2 cm; 4–8-flowered, plus a sterile terminal floret; rachilla not disarticulating, internodes ca. 2 mm. Glumes 1, ciliate; lemma 1–1.2 cm, ciliate; palea 0.8–1 cm; lodicules 3. Anthers ca. 6 mm. Ovary obovoid; styles ca. 4 mm; stigma 1. Caryopsis unknown. New shoots Jul–Oct.

• River banks, near villages. Guangxi.

The name used in FRPS (9(1): 149. 1996), *Dendrocalamopsis daii*, was published in the belief that *D. grandis* was not validly published. However, the latter name is validly published as it fulfills the requirements for a *descriptio generico-specifica* (Stapleton & Xia, Taxon 53: 526–528. 2004).

This species is cultivated in Guangxi for its shoots and culms.

79. *Bambusa bicatratricata* (W. T. Lin) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 214. 1980.

孟竹 *meng zhu*

Sinocalamus bicatratricatus W. T. Lin, Acta Phytotax. Sin. 16(1): 68. 1978; *Dendrocalamopsis bicatratricata* (W. T. Lin) P. C. Keng; *Neosinocalamus bicatratricatus* (W. T. Lin) W. T. Lin.

Culms ca. 10 m, 5.5–7.5 cm in diam., apically recurved; basal internodes normally 20–36 cm, on abnormal culms very short, ca. 1 cm; wall ca. 1.5 cm thick; nodes level; branching to base. Branches several, central dominant. Culm sheaths deciduous, leathery, initially with dark brown, spiny hairs; auricles reflexed, linear, small; ligule 4–5 mm, serrulate; blade recurved or reflexed, ovate-lanceolate, base 1/2–4/5 as wide as sheath apex. Leaf sheaths subglabrous; ligule truncate, 1.5–2 mm; auricles tiny; oral setae developed; blade lanceolate, 9–22 × 2–4 cm. Pseudospikelets 1.7–1.8 cm; florets 6–8, apical 2 sterile. Rachilla internodes ca. 2 mm. Glumes 2 or 3, subcordate, ca. 5 mm, glabrous; lemma 7–8 mm, ciliate; palea 7–8 mm; lodicules 3. Anthers ca. 3.5 mm. Ovary ca. 3.5 mm; stigmas 1. Caryopsis unknown. New shoots Jun–Oct, fl. winter.

• Roadsides, margins of villages, cultivated. Hainan.

80. *Bambusa xueana* Ohrnberger, Bamboos World Introd. 4: 19. 1997.

疙瘩竹 *ge da zhu*

Neosinocalamus yunnanensis Hsueh & J. R. Hsueh, Acta Phytotax. Sin. 29: 274. 1991; *Bambusa tengchongensis* D. Z. Li & N. H. Xia, nom. illeg. superfl.; *B. yunnanensis* (Hsueh & J. R. Hsueh) D. Z. Li (1994), not N. H. Xia (1993).

Culms 8–12 m, 4–7 cm in diam., apically pendulous; internodes 40–50 cm, initially gray-white or brown pubescent, with brown tomentose rings below nodes, wall ca. 15 mm thick; nodes flat; branches many, central dominant. Culm sheaths slowly deciduous, leathery, abaxially densely brown strigose; auricles absent; ligule ca. 2 mm, serrulate; blade erect, triangular or long-triangular, base as wide as sheath apex. Leaves 5–9 per ultimate branch; sheaths glabrous; ligule ca. 0.5 mm; auricles absent; blade 12–25 × 1–2.5 cm, base broadly cuneate,

lateral veins 5–9-paired. Pseudospikelets 1–3(to many) per node of inflorescence, yellow-green or slightly lilac, ca. 2×0.7 cm, somewhat patent when mature; florets 5–8; rachilla disarticulating, joined to florets. Glumes 1 or 2, yellow, leathery; lemmas broadly ovate, ca. 14×1.1 cm, 14–16-veined, apex

mucronate; palea narrow, keels pilose, 5–7-veined. Lodicules 2 or 3, transparent, ciliate. Filaments 1(–10) mm; anthers yellow, ca. 6 mm. Ovary pyriform, densely pilose; stigmas 2 or 3.

- 1700–1800 m. W Yunnan (Tengchong).

Taxa incertae sedis

Bambusa basisolida W. T. Lin (J. Bamboo Res. 16(3): 23. 1997) was described from sterile material from Guangdong (Yangchun). In the protologue it was compared with *B. subtruncata*.

Bambusa concava W. T. Lin (J. Bamboo Res. 16(3): 24. 1997) was described from sterile material from Hainan (Haikou). In the protologue it was compared with *B. duriuscula*.

Bambusa multiplex (Loureiro) Raeuschel ex Schultes & J. H. Schultes var. *lutea* T. H. Wen (J. Bamboo Res. 1(1): 31. 1982) was described from Zhejiang. The holotype (*X. Q. Hua et al. 81901*, ZJFI) has an abaxially pale green leaf blade, glabrous culm internodes, subfalcate culm sheath auricles, and abaxially glabrous culm sheath blades. Because these characters are so different from those of *B. multiplex*, it is not reasonable to recognize it as a variety of that species. According to field records, its culms are up to 3 m high and 1–2 cm in diam. As the holotype is fragmentary and very difficult to identify, further investigations are required to place this taxon effectively.

Bambusa rongchengensis (T. P. Yi & C. Y. Sia) D. Z. Li (Acta Bot. Yunnan. 16: 41. 1994; *Dendrocalamus rongchengensis* T. P. Yi & C. Y. Sia, J. Bamboo Res. 7(4): 20. 1988) was described from Sichuan.

Bambusa sinospinosa McClure var. *inermis* Keng & P. C. Keng (J. Wash. Acad. Sci. 36: 80. 1946; *Bambusa inermis* (Keng & P. C.

Keng) T. P. Yi; *Dendrocalamus inermis* (Keng & P. C. Keng) T. P. Yi) was described from Sichuan. The correct position of this taxon is not known.

Bambusa valida (Q. H. Dai) W. T. Lin (Guihaia 10: 15. 1990; *Dendrocalamopsis valida* Q. H. Dai, Acta Phytotax. Sin. 24: 393. 1986, “*validus*”) was described from material cultivated at the Guangxi Institute of Forestry, Nanning.

Lingnania transvenula W. T. Lin & Z. J. Feng (J. S. China Agric. Univ. 13(2): 82. 1992) was described from Guangdong.

Neosinocalamus rectocuneatus W. T. Lin (Acta Phytotax. Sin. 26: 228. 1988; *Sinocalamus rectocuneatus* (W. T. Lin) W. T. Lin) was described from Guangdong. This species is a member of *Bambusa* subg. *Dendrocalamopsis*.

Sinocalamus concavus W. T. Lin & Z. M. Wu (J. S. China Agric. Univ. 13(2): 82. 1992) was described from Guangdong.

Sinocalamus suberosus W. T. Lin & Z. M. Wu (J. S. China Agric. Univ. 13(2): 83. 1992) was described from Guangdong.

Sinocalamus triramus W. T. Lin & Z. M. Wu (J. S. China Agric. Univ. 15(2): 78. 1994) was described from Guangdong.

2. THYRSOSTACHYS Gamble, Indian Forester 20: 1. 1894.

泰竹属 tai zhu shu

Li Dezhu (李德铎); Chris Stapleton

Arborescent bamboos, moderately sized; clumps very dense. Rhizomes short necked, pachymorph. Culms unicaespitose, erect; internodes terete. Branches several to many, 1 dominant. Culm sheaths persistent, thickly papery; ligule short; auricles absent or small without bristles; blade recurved or erect, triangular. Leaf sheath blade small to moderate-sized; ligule short; auricles absent. Inflorescence iterant, fully bracteate, comprising a cluster of 1–3 fertile pseudospikelets and 1 or 2 sterile ones subtended by a spatheform 2-keeled prophyll, sessile upon a branch node. Pseudospikelets with prophyll, 1–3 florets plus a fertile terminal one and a rachilla extension, falling together, not disarticulating; rachilla hairy. Glumes 2–4; lemma papery; palea 2-cleft for ca. 1/3 of its length; lodicules absent to 3, ciliate. Stamens 6, long exserted; anthers apiculate. Ovary turbinate, stalked; style long; stigmas 1–3, feathery. Caryopsis terete, smooth, glabrous, with persistent style base. $2n = 76^*$.

Two species: China, Myanmar, Thailand; two species in China.

- 1a. Culm sheath apically straight-truncate; leaf blade $17\text{--}20 \times 1.2\text{--}2$ cm; spikelets 1.5–2.5 cm; culms densely caespitose 1. *T. oliveri*
- 1b. Culm sheath apically triangular-truncate; leaf blade $7\text{--}15 \times 0.7\text{--}1.2$ cm; spikelets 1.2–1.4 cm; culms very densely caespitose 2. *T. siamensis*

1. *Thyrsostachys oliveri* Gamble, Indian Forester 20: 1. 1894.

大泰竹 da tai zhu

Culms to 20 m, to 7.5 cm in diam.; internodes initially bright green, becoming dull green, 30–50 cm; wall rather thick; nodes slightly prominent. Branches several, main mid-culm ones to 1.5 cm in diam. Culm sheaths orange to brown, ca. 3/4 as long as internodes, papery, margins ciliate, apex rounded; auricles and oral setae absent; ligule ca. 2.5 mm, serrulate; blade reflexed, narrow, to 20 cm, base ca. 1/3 width of sheath

apex. Leaf sheaths hairy; ligule short, pubescent; blade linear-lanceolate, $17\text{--}20 \times 1.2\text{--}2$ cm. Pseudospikelets 1.5–2.5 cm; prophylls to 1 cm; gemmiferous bracts 2 or 3; empty glumes 1 or 2; fertile florets 2 or 3; fertile lemma 1.2–1.6 cm; palea 1.4–1.8 cm, narrow, bifid for 1/4–1/3 of its length; lodicules 2 or 3. Anthers yellow, apiculate. Ovary turbinate; style 1, ca. 1.5 cm; stigmas 3. Caryopsis ca. 1 cm.

Forests on low hills, open areas; 500–700 m. S Yunnan [Myanmar].

2. *Thyrsostachys siamensis* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 59. 1896, nom. cons.

泰竹 tai zhu

Bambusa regia Thomson ex Munro, nom. rej.; *Thyrsostachys regia* (Thomson ex Munro) Bennet, nom. rej.

Culms to 12 m, to 6 cm in diam.; internodes initially green, becoming gray-green, 20–30 cm; wall thick; nodes slightly thickened, with a white ring below. Branches several, main mid-culm ones to 1 cm in diam. Culm sheaths pale brown, 3/4–1 × as long as internodes, papery, appressed pubescent, margins ciliate, apex truncate; ciliate; auricles small; ligule ca. 1 mm; blade erect, base ca. 3/4 width of sheath apex. Leaf sheaths white pubescent and ciliate; ligule very short, pubes-

cent; blade linear, 7.5–15 × 0.7–1.2 cm. Pseudospikelets 1.2–1.4 cm; prophylls to 0.8 cm; gemmiferous bracts 2 or 3; glumes 2 or 3; fertile florets 1–3. Fertile lemma 1–1.3 cm; palea slightly longer than lemma, narrow, bifid for 1/3 of its length; lodicules absent to 3. Anthers pale yellow, apex purple, apiculate. Ovary ovoid to turbinate; style 1, ca. 1.2 cm; stigmas 1–3. Caryopsis ca. 0.6 cm. $2n = 76^*$.

River valleys to hilly forested areas; 500–1000 m. S Yunnan [Myanmar, N Thailand].

This species is one of the most beautiful ornamental bamboos in the tropics of SE Asia, long cultivated in SE China, and recently found wild in Yunnan. The widespread use and economic importance of the name *Thyrsostachys siamensis* justified its conservation against the earlier name, *Bambusa regia* (1868).

3. DENDROCALAMUS Nees, Linnaea 9: 476. 1835.

牡竹属 mu zhu shu

Li Dezhu (李德铎); Chris Stapleton

Arborescent bamboos, large-sized; clumps dense. Rhizomes short necked, pachymorph. Culms unicaespitose, erect, or occasionally scrambling, apex usually pendulous; internodes terete. Branches several to many, none to 3 dominant. Culm sheaths deciduous; ligule conspicuous; auricles often absent or small; blade usually recurved, or erect. Leaf blades usually large; ligule conspicuous; auricles usually absent; venation not tessellate. Inflorescence iterant, fully bracteate, subtended by a narrow single-keeled prophyll, pseudospikelets clustered in soft or spiky globose mass at nodes of leafless flowering branches. Pseudospikelets prophyllate, (1 or) 2–8-flowered, with or without rachilla extension and rudiment, sessile, fertile glumes preceded by 1 or more gemmiferous bracts and 0–2 empty glumes. Prophyll narrow, single-keeled. Rachilla internodes usually abbreviated and not disarticulating; florets falling together. Lemma broad, nearly equal to palea, many veined, sometimes long mucronate; palea of lower florets 2-keeled, but rounded or imperfectly keeled in terminal floret if rachilla extension small or absent, apex acute or shortly bifid; lodicules absent or variably 1–3. Stamens 6; filaments usually free, rarely united into a loose tube. Ovary stalked, apex thickened and hairy; style very short, solid; stigmas 1(–3), long, hairy, plumose. Caryopsis terete, apex hairy; pericarp slightly thickened. $2n = 76^*$.

Forty species: subtropical and tropical Asia; 27 species (15 endemic) in China, mostly in the southwest.

- 1a. Culms usually apically nodding, basal nodes with branches, 1–3 branches dominant; spikelets light yellow-green, usually in spiny globose mass; florets (1 or) 2–4 1. *D.* subg. *Dendrocalamus*
- 1b. Culms apically pendulous, basal nodes without branches, midculm branches subequal; spikelets yellow-brown, usually in soft globose mass; florets 2–8 2. *D.* subg. *Sinocalamus*

1. *Dendrocalamus* subg. *Dendrocalamus*

牡竹亚属 mu zhu ya shu

Culms apically nodding, not pendulous (except in *Dendrocalamus hamiltonii* and *D. semiscandens*); wall thick; branching from lower nodes. Branches unequal, 1–3 dominant. Culm sheaths thickly papery. Leaves small; auricles small. Pseudospikelets usually many, clustered on each node of flowering branches into a spicate globose mass. Lemma mucronate or long mucronate.

About 20 species: widely distributed in tropical Asia; 16 species (eight endemic) in China.

Dendrocalamus parishii (species no. 16) could not be included in the following key because its culm sheaths are not known.

- 1a. Culm sheath blade erect, triangular, base about as wide as apex of culm sheaths; auricles absent, ligule short; dominant branches 3; pseudospikelets 1–10 per fascicle, not in globose head; lemma shortly mucronate.
 - 2a. Culms 12–25 m, 12–18 cm in diam.; branching from 9th to 14th node up; lemma apically obtuse 6. *D. tibeticus*
 - 2b. Culms 7–15 m, 6–8 cm in diam.; branching from ca. 4th node up; lemma apically deeply cleft 5. *D. bambusoides*
- 1b. Culm sheath blade reflexed or erect, when erect apex of culm sheaths broadly ovate; mouth and base of culm sheath narrow; dominant branches none or 1 (but 3 in *D. brandisii*); pseudospikelets many, clustered, globose; glumes and lemma long mucronate.
 - 3a. Culm sheath blade reflexed, ligule well developed, marginal cilia or bristles 1.5–2 cm; spikelets flat on both sides, apex obtuse; florets separate from each other and each opening when mature; lemmas all 2-keeled; lodicules absent or 2; stigmas 1, rarely 3.

- 4a. Culm sheath auricles obvious; oral setae 5–10 mm; ligule 2–3 mm, marginal cilia or setae 1.5–2 cm 10. *D. liboensis*
 4b. Culm sheath auricles reduced or absent; oral setae to 3 mm; marginal cilia usually to 1 cm.
 5a. Culm sheath ligules 4–10 mm; leaf sheaths initially hispid 7. *D. farinosus*
 5b. Culm sheath ligules 2–4 mm; leaf sheaths glabrous.
 6a. Culm internodes initially sparsely white powdery, wall very thin (1–4 mm); culm sheath ligule
 ca. 2 mm, with marginal cilia 5–10 mm 8. *D. tsiangii*
 6b. Culm internodes initially densely white powdery, wall thick; culm sheath ligule ca. 4 mm,
 fimbriate or with marginal cilia 1–2 mm 9. *D. pulverulentus*
 3b. Culm sheath blade erect or reflexed; ligule short, to 10 mm, marginal cilia or bristles absent or to 1 cm;
 spikelets rounded, apex acute; florets not separate from each other and remaining closed when mature;
 lemma of upper floret not 2-keeled; lodicules absent; stigmas 1 (but 2 in *D. brandisii*).
 7a. Culm sheath blade erect; ligule 2–3 mm.
 8a. Cavity of culm narrow, or absent in basal internodes; pseudospikelets rigid, usually ciliate; glume and
 lemma both long mucronate 1. *D. strictus*
 8b. Cavity of culm broad; pseudospikelets soft, usually glabrous; glume and lemma usually shortly
 mucronate.
 9a. Culms nodding, internodes partially covered with gray scurfy stripes initially; pseudospikelets
 globose, 1–2 cm in diam. 11. *D. hamiltonii*
 9b. Culms pendulous, but because of developed main branch (sometimes as robust as culm) upper
 part of culm climbing; internode completely covered with gray cilia, cilia not in stripes;
 pseudospikelets globose, 1.9–3.2 cm in diam. 12. *D. semiscandens*
 7b. Culm sheath blade reflexed (but erect in *D. brandisii*); ligule (2–)3–10 mm.
 10a. Culm sheath auricles and oral setae inconspicuous.
 11a. Internodes white powdery, without hairs; pseudospikelets usually glabrous; leaves
 thin 2. *D. membranaceus*
 11b. Internodes white hairy; pseudospikelets usually ciliate.
 12a. Internodes with stripes of gray cilia, dominant branches developed or not, other
 branches on same node slender and surrounding culm; culm sheath ligule ca. 10 mm;
 culm 20–40 m, 12.5–20 cm in diam. 13. *D. brandisii*
 12b. Internodes with uniformly distributed, gray cilia, cilia not in stripes; dominant branches
 3, other branches on same node not enclosing culm; culm sheath ligule 4–5 mm; culms
 7–10 m, to 8 cm in diam. 4. *D. birmanicus*
 10b. Culm sheath auricles obvious, oral setae well developed, 5–8 mm.
 13a. Leaves 1–2 cm wide, secondary veins 5- or 6-paired 3. *D. barbatus*
 13b. Leaves (1.5–)3–7 cm wide, secondary veins 7–13-paired.
 14a. Internodes white powdery, glabrous; leaf blade 15–30 × 3.8–7 cm, secondary veins
 10–12-paired; culm sheath auricles obvious 14. *D. sikkimensis*
 14b. Internodes very thinly white powdery, brown setose; leaf blade 20–35 × 3–5 cm,
 secondary veins 7–11-paired; culm sheath auricles inconspicuous 15. *D. asper*

1. *Dendrocalamus strictus* (Roxburgh) Nees, Linnaea 9: 476. 1834.

牡竹 mu zhu

Bambos stricta Roxburgh, Pl. Coromandel. 1: 58. 1798;
Bambusa stricta (Roxburgh) Roxburgh.

Culms 7–17 m, (3–)6–10 cm in diam.; internodes 30–45 cm, white powdery; wall thick, culm often solid. Branches several, main mid-culm ones 3. Culm sheaths deciduous, orange-brown, ca. 3/4 as long as internodes, thickly papery, margins ciliate, apex rounded; auricles absent; ligule 1–3 mm, serrulate; blade erect, narrowly triangular. Leaf sheaths initially sparsely hairy, becoming glabrous; ligule short, serrulate; blade usually narrowly lanceolate, 5–30 × 1–3 cm. Pseudospikelet clusters 2.5–5 cm in diam. Spikelets 8–15 mm, usually densely pubescent; fertile florets 2–4. Glumes 2 or more, 6–8 mm, long mucronate; lemma 9–10 mm, apex long mucronate; palea 8–9 mm. Anthers yellow, ca. 5 mm, connective apically produced.

Ovary turbinate; style ca. 6.5 mm; stigmas 1. Caryopsis 6–8 mm.

Cultivated. Guangdong, Taiwan [India].

2. *Dendrocalamus membranaceus* Munro, Trans. Linn. Soc. London 26: 149. 1868.

黄竹 huang zhu

Bambusa membranacea (Munro) Stapleton & N. H. Xia.

Culms 8–15 m, 7–10 cm in diam.; internodes 34–42 cm, initially thinly white powdery, becoming glossy; wall thick to thin. Branches from culm base, 3 to several, subequal, main mid-culm ones 3, central not dominant. Culm sheaths deciduous, initially orange-green, elliptical to oblong, usually longer than internodes, papery, margins ciliate; auricles small; oral setae short; ligule 8–10 mm, serrulate; blade reflexed, linear-lanceolate, 30–40 × 2–3 cm. Leaf sheaths initially sparsely hairy, becoming glabrous; ligule short, serrulate; blade lanceo-

late, 12.5–25 × 1.2–2 cm. Pseudospikelet clusters dense, 2.5–5 cm in diam., prophylls broad, 2-keeled. Spikelets 8–15 mm, glabrous; fertile florets 2–5. Glumes 2 or more, 8–9 mm, long mucronate; lemma 9–10 mm, apex long mucronate; palea 7–8 mm. Anthers yellow or purple, 4–5 mm, apex apiculate. Ovary turbinate; style 5–6 mm; stigma purple. Caryopsis 6–8 mm.

River valleys to hilly forested areas; 500–1000 m. S Yunnan [Laos, Myanmar, N Thailand, N Vietnam].

This species has also been placed in *Bambusa* because of its vegetative characters and 2-keeled inflorescence prophyll, but it has a more capitate inflorescence than other *Bambusa* species.

It is the most important and most extensive wild species of bamboo in subtropical China, found in pure bamboo forest or mixed with broad-leaved trees.

3. *Dendrocalamus barbatus* Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 4. 1988.

小叶龙竹 xiao ye long zhu

Culms 15–18 m, 10–15 cm in diam., tip slightly drooping; internodes 26–32 cm; wall thick. Branches several, main mid-culm ones 3. Culm sheaths deciduous, orange-brown, ca. 3/4 as long as internodes, leathery, margins ciliate, apex rounded; auricles 5–15 mm; oral setae present or absent; ligule 5–8 mm, serrulate; blade reflexed, glabrous or densely bearded at base. Leaf sheaths sparsely hairy; auricles inconspicuous, sparsely hairy; ligule ca. 1 mm; blade narrowly lanceolate, 10–15 × 1–2 cm. Pseudospikelet clusters 1–2.2 cm in diam. Spikelets 6–8.5 mm, nearly glabrous; fertile florets usually 2. Glumes 2 or 3; lemma 6–7 mm, apex shortly mucronate; palea 5–6 mm. Anthers yellow, becoming purple when dry, ca. 6 mm. Pistil 6–7.5 mm; ovary, style, and stigma all hairy; stigmas solitary. Fruit unknown.

● Mostly in cultivation; 300–1100 m. S Yunnan.

- 1a. Culm sheath auricles with oral setae;
blade with basal beard 3a. var. *barbatus*
1b. Culm sheath auricles without oral setae;
blade glabrous 3b. var. *internodiradicatus*

3a. *Dendrocalamus barbatus* var. *barbatus*

小叶龙竹(原变种) xiao ye long zhu (yuan bian zhong)

Culm sheath auricles with oral setae; blade with basal beard.

● Mostly in cultivation; 300–1100 m. S Yunnan.

3b. *Dendrocalamus barbatus* var. *internodiradicatus* Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 6. 1988 [“*internodiradicatus*”].

毛脚龙竹 mao jiao long zhu

Culm sheath auricles without oral setae; blade glabrous.

● Cultivated. S Yunnan (Menglun Tropical Botanical Garden).

4. *Dendrocalamus birmanicus* A. Camus, Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 1044. 1932.

缅甸龙竹 mian dian long zhu

Culms 7–10 m, to 8 cm in diam.; internodes 20–28 cm. Branches several, main mid-culm ones 3. Culm sheaths deciduous, shorter than internodes, leathery or thickly papery; auricles small; ligule 3–4 mm, serrulate; blade reflexed, 6–10 cm, adaxially setose. Leaf sheaths thinly white powdery, glabrous; ligule ca. 1 mm; serrulate; blade 16–20 × 1.5–2.5 cm. Pseudospikelet clusters 1–1.8 cm in diam. Spikelets 7–8 mm; fertile florets 2 or 3. Glumes 2, 4–4.5 mm, margins ciliate; lemma 5.5–7 mm, apex long mucronate; palea 5.5–7 mm. Anthers 3–4 mm. Style glabrous; stigma 1, about as long as style. Fruit unknown.

Yunnan [Myanmar].

5. *Dendrocalamus bambusoides* Hsueh & D. Z. Li, J. Bamboo Res. 6(2): 16. 1987.

椅子竹 yi zi zhu

Sellulocalamus bambusoides (Hsueh & D. Z. Li) W. T. Lin.

Culms 7–15 m, 6–8 cm in diam.; internodes 26–34 cm; wall 1.4–2.8 cm thick. Branches several, main mid-culm ones 3. Culm sheaths deciduous, thickly papery to leathery, abaxially yellow hispid or glabrous, apex slightly arched; auricles absent; ligule ca. 2 mm; blade erect. Leaf sheaths glabrous, margins ciliate; ligule ca. 1 mm; blade narrowly lanceolate, (5–)14–17 × 0.8–1.6 cm. Pseudospikelets subtended by 1–5 bracts, 8–16 mm; fertile florets 3 or 4. Glumes 1 or 2, 5–7 mm, margins ciliate; lemma 7–13 mm, apex mucronate; palea 6–14 mm. Anthers yellow, 4–6 mm. Pistil 1.3–1.7 cm; stigma 1. Fruit unknown.

● S Yunnan.

6. *Dendrocalamus tibeticus* Hsueh & T. P. Yi, J. Bamboo Res. 2(1): 31. 1983.

西藏牡竹 xi zang mu zhu

Sellulocalamus tibeticus (Hsueh & T. P. Yi) W. T. Lin.

Culms 12–25 m, 12–18 cm in diam.; internodes (30–)40–45(–60) cm; wall thick, 6–12 mm. Branching usually from ca. 9th node up, usually with central branch slightly dominant. Culm sheaths initially orange-brown, leathery, abaxially usually with dark brown setae, adaxially glabrous; auricles absent; ligule 2–4 mm; blade erect or slightly reflexed. Leaf sheaths 6–11 mm, glabrous; ligule truncate, 1–1.5 mm; blade broadly lanceolate, 10–32 × 2.2–4.5 cm. Pseudospikelets 2–10 per cluster, 1–1.2 cm, with 3 or 4 florets, basal one sterile; fertile florets 2–3. Glumes 1, ca. 7 × 5 mm, margins ciliate, mucronate; lemma 6–18 mm, margins ciliate, apex obtuse or acute; palea 5–7 mm. Anthers yellow, 5–6 mm. Ovary ovoid; style 5–8 mm; stigmas 1, 2–3 mm. Fruit unknown.

● Broad-leaved forests; 1200–1700 m. Xizang, NW Yunnan.

7. *Dendrocalamus farinosus* (Keng & P. C. Keng) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 215. 1980.

大叶慈 da ye ci

Sinocalamus farinosus Keng & P. C. Keng, J. Wash.

Acad. Sci. 36(3): 79. 1946; *Dendrocalamus ovatus* N. H. Xia & L. C. Chia; *Lingnania farinosa* (Keng & P. C. Keng) P. C. Keng; *Neosinocalamus farinosus* (Keng & P. C. Keng) P. C. Keng & T. H. Wen.

Culms 7–12 m, 4–8 cm in diam.; internodes 20–45 cm; wall 4–10 mm thick. Branches from ca. 10th node up; dominant branches distinct, 1–2.5 m, 4–12 mm in diam. Culm sheaths initially orange-brown, becoming brown, oblong-triangular, about as long as internodes, thickly papery or leathery, margins ciliate, apex truncate or concave; auricles absent; ligule ca. 1.3 cm, with setae; blade reflexed, narrowly lanceolate. Leaf sheaths initially hispid; ligule 1–1.5 mm; blade lanceolate, 9–33 × 1.5–6 cm. Pseudospikelets 7–20 per node, 8–14 mm; florets 3–5. Glumes 2 or more, 6–8 mm, long mucronate; lemma 7–10 mm, apex mucronate; palea ca. 7 mm. Anthers yellow, 3–5 mm, connectives aristate. Ovary ovoid, style ca. 1 mm; stigmas 1–3, 2–3 mm. Caryopsis yellow, glabrous, apex beaked.

• Guangxi, Guizhou, Sichuan, Yunnan.

8. *Dendrocalamus tsiangii* (McClure) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 216. 1980.

黔竹 qian zhu

Lingnania tsiangii McClure, Sunyatsenia 6(1): 41. 1941; *Dendrocalamus ronganensis* Q. H. Dai & D. Y. Huang; *D. textilis* N. H. Xia, L. C. Chia & C. Y. Xia.

Culms 6–8 m, 3–4 cm in diam.; internodes 20–30(–40) cm; wall 1–4 mm thick. Branches usually from 7th–11th node up, several, dominant branches longer and thicker. Culm sheaths deciduous, thickly papery, abaxially appressed setose; auricles absent; ligule ca. 2 mm, margin setaceous; blade reflexed. Leaf sheaths glabrous; ligule 1–2 mm, serrulate or crinkled; blade oblong-lanceolate, 6–16 × 1–2 cm. Inflorescence unknown.

• Guangxi, Guizhou, Sichuan.

An ornamental cultivar, *Dendrocalamus tsiangii* 'Viridistriatus' (花黔竹 hua qian zhu) is distinguished by its yellow culms with green stripes.

9. *Dendrocalamus pulverulentus* L. C. Chia & But, Kew Bull. 43: 115. 1988.

粉麻竹 fen ma zhu

Culms to 8 m, 4–6 cm in diam.; internodes 25–30 cm; wall thick. Branches usually from ca. 10th node upward, several, dominant branches longer and thicker. Culm sheaths deciduous, abaxially appressed brown setose; auricles small or absent; ligule ca. 4 mm, margin hairy, apex arched; blade reflexed, lanceolate. Leaf sheaths glabrous; ligule ca. 1 mm, serrulate; blade lanceolate to oblong-lanceolate, 13–20 × 2.5–3.3 cm. Inflorescence unknown.

• Cultivated. Guangdong.

10. *Dendrocalamus liboensis* Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 37. 1989.

荔波吊竹 li bo diao zhu

Dendrocalamus exilis N. H. Xia & L. C. Chia; *D. guiyangensis* N. H. Xia & L. C. Chia.

Culms (8–)12–15 m, (4–)6–9 cm in diam.; internodes (26–)32–36 cm, initially densely white powdery; wall 8–13 mm thick. Branches usually from 6th or 7th node up, central branch dominant, 3–5 m. Culm sheaths deciduous, leathery, abaxially appressed black-brown setose; auricles undulate; oral setae 5–10 mm; ligule 2–4 mm, margin fringed or with setae ca. 1 cm; blade reflexed, lanceolate, 9–12 cm. Leaf sheaths glabrous; ligule ca. 1 mm; blade 8–40 × 1.5–8.5 cm. Inflorescence unknown.

• Guizhou.

11. *Dendrocalamus hamiltonii* Nees & Arnott ex Munro, Trans. Linn. Soc. London 26: 151. 1868.

版纳甜龙竹 ban na tian long zhu

Sinocalamus hamiltonii (Nees & Arnott ex Munro) T. Q. Nguyen.

Culms 12–18 m, 9–13 cm in diam., often very pendulous; internodes 30–50 cm, persistently densely white to brown scurfy; wall 1.2–2 cm thick. Branches several, dominant central branch very well developed, especially on older pendulous culms where branches can approach size of culm. Culm sheaths deciduous, initially with patches or stripes of dark brown hairs, margins ciliate, apex slightly arched; auricles absent but with a delicate, naked, triangular protuberance to 1 cm on each side; ligule 1–3 mm, apex somewhat undulate and dentate; blade erect, 3–7 cm, narrow. Leaf sheaths yellow setose; ligule 1.5–2 mm; blade variable, largest ca. 38 × 7 cm. Pseudospikelets 10–25 per node, clusters 1–4 cm in diam. Spikelets dark purple, 8–10 × 3–5 mm, glabrous; fertile florets 2–4. Glumes 1 or 2; lemma 5–7 × 6–7 mm, apex long mucronate; palea about as long as lemma, apex bifid. Anthers yellow or red-purple, apex apiculate. Style ca. 4.5 mm; stigmas 1–3, red-purple. Caryopsis brown, ± spherical.

Yunnan [Bhutan, India, Laos, Myanmar, Nepal].

12. *Dendrocalamus semiscandens* Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 28. 1989.

野龙竹 ye long zhu

Culms (7–)10–18 m, (6–)10–15 cm in diam.; internodes 29–35(–60) cm. Branches several, central dominant. Culm sheaths deciduous, leathery, abaxially brown hairy, apex rounded; auricles absent; ligule ca. 1 mm; blade erect. Leaf sheaths white hairy; ligule 3–5 mm; blade 25–35 × 3–4.5 cm. Pseudospikelets 30–40 per node; clusters (1–)1.9–3.2 cm in diam. Spikelets obovate-triangular, 10–13 × 4–7.5 mm; florets 4 or 5. Glumes 1–3; lemma 8.5–9.5 × 5–6 mm, apex long mucronate; palea 7.5–8 mm. Filaments ca. 7 mm; anthers yellow, ca. 3.7 mm, apiculate. Style purple, ca. 6 mm; stigma 1. Caryopsis golden, with a beak ca. 1.5 mm, basally glabrous, distally including beak white pubescent.

• 500–1000 m. Yunnan.

This bamboo is not yet well distinguished from the widely distributed and variable *Dendrocalamus hamiltonii*.

13. *Dendrocalamus brandisii* (Munro) Kurz, Prelim. Rep. Forest Pegu, 94. 1875.

勃氏甜龙竹 *bo shi tian long zhu*

Bambusa brandisii Munro, Trans. Linn. Soc. London 26: 109. 1868; *Sinocalamus brandisii* (Munro) P. C. Keng.

Culms 10–15 m, 10–12 cm in diam.; internodes 34–43 cm; wall ca. 3 cm thick. Branches several, dominant branches well developed. Culm sheaths deciduous, orange-brown to bright yellow, leathery; auricles small; ligule ca. 1 mm, margin deeply dentate; blade reflexed or nearly erect. Leaf sheaths white hairy; ligule 1.5–2 mm; blade variable, 23–30 × 2.5–5 cm. Pseudospikelets 5–25 per node, clusters 1.3–1.8 cm in diam. Spikelets ovate-orbicular, 7–9 × 4–5 mm; florets 2–4. Glumes 1 or 2, apex acute; lemma 5–6 mm; palea 2-keeled, keels ciliate, 3-veined between keels, acute or mucronate. Filaments short; anthers green-yellow, ca. 3 mm, apiculate. Ovary ovoid; style ca. 3 mm; stigmas 1 or 2. Caryopsis ovoid, 1.5–5 mm, distally hairy, apex beaked.

Cultivated around villages. Yunnan [native to Laos, Myanmar, Thailand, and Vietnam; cultivated in India].

14. *Dendrocalamus sikkimensis* Gamble ex Oliver, Hooker's Icon. Pl. 18: t. 1888. 1770.

锡金龙竹 *xi jin long zhu*

Culms 10–18 m, 10–13 cm in diam.; internodes becoming orange, 46–56 cm; wall 1–2.5 cm thick. Branches several, sometimes 1 branch dominant. Culm sheaths deciduous, leathery, very densely dark brown velvety; auricles reflexed, broad, 0.5–2 × 0.2–0.5 cm; oral setae orange, curved, long; ligule ca. 5 mm, serrulate; blade strongly deflexed, 10–18 cm. Leaf sheaths appressed white hairy; auricles and oral setae prominent; ligule ca. 1 mm; blade variable, 15–30 × 3.8–7 cm. Pseudospikelet clusters ca. 4 cm in diam. Spikelets lanceolate, 1.2–1.8 cm; florets 2 or 3. Glumes 3 or 4, ovate; lemma ovate, margins ciliate, apex acute or mucronate; palea keels ciliate, many veined. Anthers apiculate at apex. Ovary spherical. Caryopsis obovoid, apex beaked.

100–600 m. S Yunnan [Bhutan, India (Sikkim)].

15. *Dendrocalamus asper* (Schultes & J. H. Schultes) Backer ex K. Heyne, Nutt. Pl. Ned.-Ind., ed. 2, 1: 301. 1927.

马来甜龙竹 *ma lai tian long zhu*

Bambusa aspera Schultes & J. H. Schultes, Syst. Veg. 7: 1352. 1830; *Dendrocalamus flagellifer* Munro; *Gigantochloa aspera* (Schultes & J. H. Schultes) Kurz; *Sinocalamus flagellifer* (Munro) T. Q. Nguyen.

Culms 15–20 m, 6–10(–12) cm in diam.; internodes 30–50 cm. Branches from ca. 9th node up, central branch dominant. Culm sheaths deciduous, initially light green, leathery, apex rounded; ligule 7–10 mm, margin with brown setae; auricles linear, ca. 20 × 7 mm, margin undulate; oral setae present; blade reflexed, lanceolate. Leaf sheaths initially sparsely hairy, becoming glabrous; ligule truncate, ca. 2 mm, entire or serrulate; blade variable, lanceolate or oblong-lanceolate, (10–)20–30(–35) × (1.5–)3–5 cm. Spikelets 6–9 mm; florets 4 or 5, apical one sterile. Glumes 1 or 2, ovate-lanceolate; lemma broadly ovate, margins ciliate; palea about as long as lemma, keels and margins ciliate, 1–3-veined between and 2-veined on either side of keels. Anthers 3–5 mm, apex apiculate. Ovary hairy; style hairy; stigmas 1. Fruit unknown.

Hong Kong, Taiwan, Yunnan [Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand].

16. *Dendrocalamus parishii* Munro, Trans. Linn. Soc. London 26: 149. 1868.

巴氏龙竹 *ba shi long zhu*

Dendrocalamus hookeri Munro var. *parishii* (Munro) Blatter; *Sinocalamus parishii* (Munro) W. T. Lin.

Culms to 10 m, to 10 cm in diam. Culm sheaths unknown. Leaf sheaths glabrous; ligule ca. 2 mm; blade ca. 17 × 3 cm, glabrous. Pseudospikelets 20–35 per node, clusters 2.5–3.2 cm in diam. Spikelets ovoid, ca. 13 × 5 mm; florets 2 or 3. Glumes 1 or 2, apex mucronate; lemma 10–12 × 7.5–8.5 mm, margins ciliate, apex long mucronate; palea 5–9 mm, 2-keeled, keels sparsely ciliate, apex obtuse. Anthers 3–5 mm, apex apiculate. Pistil 0.8–1 cm; stigmas 1 or 2. Fruit unknown.

Yunnan [India, Pakistan].

The identification of this bamboo appears somewhat speculative.

2. *Dendrocalamus* subg. *Sinocalamus* (McClure) Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 9. 1988.

麻竹亚属 *ma zhu ya shu*

Sinocalamus McClure, Lingnan Univ. Sci. Bull. 9: 66. 1940.

Culms apically pendulous, basally without branches, dominant branches none or 1. Culm sheaths thickly leathery. Leaves usually large. Pseudospikelets 1 to several on nodes of flowering branches, yellow-brown; florets 2–8. Lemma not mucronate; lodicules absent to 1. Stigmas 1.

About 25 species; mainly distributed in SE Asia; 11 species (seven endemic) in China.

1a. Culm 15–25(–30) m, 10–20(–30) cm in diam.; spikelets acute, with 5–8 florets, florets inseparable and each floret usually closed when mature (open in *D. fugongensis*).

2a. Culm sheath blade reflexed or nearly erect; apex of palea bifid.

3a. Basal culm internodes normal; culm sheath blade reflexed; spikelet 1–1.5 cm; 2-veined between 2 keels of palea

17. *D. giganteus*

- 3b. Basal culm internodes congested; culm sheath blade nearly erect; spikelet 3–3.5 cm; 5-veined between 2 keels of palea 18. *D. sinicus*
- 2b. Culm sheath blade erect; apex of palea obtuse.
- 4a. Culm initially white ciliate; bracts basal to inflorescence obviously shorter than pseudospikelets 19. *D. calostachyus*
- 4b. Culm initially white powdery, not ciliate; bracts basal to inflorescence nearly as long as pseudospikelets 20. *D. fugongensis*
- 1b. Culm 15–20 m (to 25 m in *D. yunnanicus* and *D. latiflorus*), 10–18 cm in diam.; spikelets obtuse or acute, truncate, with 2–8 florets, florets slightly separable from each other and each floret usually open when mature (closed in *D. pachystachys*).
- 5a. Culm sheath setaceous, or setaceous and tomentose; spikelets 0.5–1.2 × 0.4–0.8 cm, with 4 or 5 florets.
- 6a. Culm internodes glabrous, white powdery initially; abaxial surface of culm sheath with appressed brown setae 25. *D. minor*
- 6b. Culm internodes with setae or tomentose, without powder.
- 7a. Culm sheath with dense black-brown setae and white to light brown tomentum scattered and not clustered into spots; spikelets obovate-triangular, 10–12 × 5–8 mm 26. *D. peculiaris*
- 7b. Culm sheath with black-brown tomentum and spots of white tomentum; spikelet oblong-ovate, ca. 5 × 4.5 mm 27. *D. tomentosus*
- 5b. Culm sheaths glabrous or with readily deciduous setae, becoming glabrous; spikelet 1–1.6(–2.8) × 0.5–1.3 cm, with 5–8 florets.
- 8a. Culms white ciliate or glabrous.
- 9a. Ligule 3–4 mm; spikelet 1.7–2.8 × 0.5–1 cm, apex acute; florets inseparable from each other and each floret closed when mature, floret white ciliate 21. *D. pachystachys*
- 9b. Ligule 1–2 mm; spikelet 1.2–1.5 × 0.7–1.3 cm, apex obtuse; florets partially separable from each other, each open when mature, only upper floret yellow-brown ciliate 22. *D. latiflorus*
- 8b. Culms with appressed setae, or tomentose, or with sparse white powder.
- 10a. Apex of culm sheath truncate or projected at center, 6–11 cm wide; ligule 1–4 mm; internodes of flowering branches white-brown or yellow-brown tomentose 23. *D. jianshuiensis*
- 10b. Apex of culm sheath depressed, 3–7 cm wide; ligule 5–8 mm; internodes of flowering branches yellow-brown ciliate 24. *D. yunnanicus*

17. *Dendrocalamus giganteus* Munro, Trans. Linn. Soc. London 26: 150. 1868.

龙竹 long zhu

Sinocalamus giganteus (Munro) A. Camus, Rev. Int. Bot. Appl. Agric. Trop. 29: 551. 1949.

Culms 20–30 m, 20–30 cm in diam.; internodes 30–45 cm; wall 1–3 cm thick. Branches several. Culm sheaths deciduous, initially purple, thickly leathery, brown hairy; margins broadly rounded; auricles reflexed, wavy; oral setae absent; ligule 6–12 mm, serrulate; blade reflexed, ovate-lanceolate, 13–38 cm. Leaf sheaths glabrous; ligule 1–3 mm, serrulate; blade usually oblong-lanceolate, to 45 × 10 cm. Inflorescence branches pendulous, long. Pseudospikelets 4–12(–25) cm. Spikelets 10–15 × 3–4 mm; florets 5–8, apical one sterile. Glumes 2, 3–4 mm; lemma broadly ovate, margins ciliate, apex mucronate; palea about as long as lemma, 2-keeled, keels ciliate, 2-veined between and 1-veined on either side of keels. Anthers ca. 6.5 mm, apex apiculate. Pistil ca. 1 cm, shortly hairy. Ovary ovoid; style long; stigma 1, purple. Caryopsis oblong, apex obtuse, plumose.

Yunnan; cultivated in Taiwan [Myanmar; cultivated in Malaysia and Thailand].

18. *Dendrocalamus sinicus* L. C. Chia & J. L. Sun, Bamboo Res. 1(1): 10. 1982.

歪脚龙竹 wai jiao long zhu

Culms 20–30 m, 20–30 cm in diam.; internodes 17–22 cm.

Culm sheaths deciduous or persistent, initially yellow-green, thickly leathery; auricles absent; ligule ca. 6 mm; blade erect. Leaf sheaths initially slightly hairy, becoming glabrous; ligule 1.5–2 mm; blade 20–40 × 4–6.5 cm. Pseudospikelets 1 or more. Spikelets 30–35 × 6.5–7.5 mm; florets 5 or 6. Glumes 1.2–1.5 cm, abaxially slightly hairy, apex mucronate; lemma 17–25 mm; palea 5-veined between keels, apex bifid. Filaments 1.5–3 cm; anthers 8–12 mm. Style long; stigma 1. Fruit unknown.

• 600–1000 m. Yunnan.

19. *Dendrocalamus calostachyus* (Kurz) Kurz, Prelim. Rep. Forest Pegu, 94. 1875.

美穗龙竹 mei sui long zhu

Bambusa calostachya Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 247. 1873; *Sinocalamus calostachyus* (Kurz) P. C. Keng.

Culms tall. Culm sheaths leathery, apex truncate; ligule 1–2 mm, rounded or serrulate; auricles absent; blade erect. Leaf sheaths glabrous, margins long ciliate, apex truncate; ligule 1–2 mm, rounded or serrulate; blade variable, broadly lanceolate, 23–30 × 2.5–6.5 cm, apex acute. Pseudospikelets 1–5. Spikelets 1–1.5 cm; florets 4–6. Glumes 2 or 3, broadly ovate, margins ciliate, apex mucronate; lemma 9–11 × 6–9 mm; palea 6–7 mm, 3–5-veined between and 1-veined on either side of keels, apex acuminate. Filaments slender; anthers yellow, ca. 5.5 mm; Pistil ca. 1.1 cm; ovary ovoid or orbicular; style 1; stigma 1. Fruit unknown.

Yunnan [Myanmar; cultivated in India].

20. *Dendrocalamus fugongensis* Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 9. 1988.

福贡龙竹 *fu gong long zhu*

Culms to 20 m, 10–15 cm in diam.; internodes 35–46 cm; wall ca. 2 cm thick. Branches several, central branch dominant. Culm sheaths deciduous, yellow-green when dry, leathery; auricles absent; ligule ca. 3 mm, serrulate; blade erect. Leaf sheaths glabrous, margin ciliate; ligule 1.5–2 mm; auricles small; blade 18–25 × 3–4.2 cm. Pseudospikelets 6–14 per node, clusters 1–1.5 cm in diam. Spikelets 10–13 × 3–4 mm; florets 4. Glumes 1 or more, 8–10 × 6–8 mm, long mucronate; lemma 1–1.2 cm, long mucronate; palea 7–9 mm. Anthers yellow or purple. Style 6–7 mm; stigma 1. Fruit unknown.

• NW Yunnan.

21. *Dendrocalamus pachystachys* Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 25. 1989.

粗穗龙竹 *cu sui long zhu*

Culms 10–12 m, to 10 cm in diam.; internodes 39–47 cm; wall to 2 cm thick. Branches several, dominant branch well developed. Culm sheaths deciduous, initially yellow-green, leathery or thickly leathery, glabrous; auricles absent; ligule ca. 3 mm, serrulate; blade erect, 6–12 cm. Leaf sheaths brown hairy; ligule 3–5 mm, serrulate; blade to 40 × 12 cm. Pseudospikelets 1 or more per node. Spikelets 17–24 × 5–10 mm; florets 5–8. Glumes 2 or 3, apex mucronate; lemma 7.5–12.5 mm, leathery, apex mucronate; palea about as long as lemma or slightly longer, 4- or 5-veined between keels, apex bifid. Filaments 7–11 mm; anthers yellow, 6–7 mm. Pistil 1.2–1.7 cm; stigma 1. Fruit unknown.

• Yunnan.

22. *Dendrocalamus latiflorus* Munro, Trans. Linn. Soc. London 26: 152. 1868.

麻竹 *ma zhu*

Bambusa latiflora (Munro) Kurz; *Dendrocalamus latiflorus* var. *lagenarius* W. C. Lin; *Sinocalamus latiflorus* (Munro) McClure; *S. latiflorus* var. *magnus* T. H. Wen.

Culms 20–25 m, 15–30 cm in diam.; internodes 45–60 cm; wall 1–3 cm thick. Branches several, central branch dominant. Culm sheaths deciduous, thickly leathery; auricles small; ligule 1–3 mm, serrulate; blade reflexed, ovate to lanceolate. Leaf sheaths initially slightly hairy, becoming glabrous; ligule 1–2 mm, serrulate; blade oblong-lanceolate, 15–35(–50) × 2.5–7 cm. Pseudospikelets 1–7 or more per node. Spikelets 12–15 × 7–13 mm; florets 6–8. Glumes 2 or more, ca. 5 mm, margins ciliate; lemma 12–13 × 7–16 mm; palea 7–11 × 3–4 mm. Anthers yellow, 5–6 mm, apex mucronate. Ovary broadly ovoid; style white hairy; stigma 1. Caryopsis 8–12 mm.

Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan; cultivated in SW Jiangsu and S Zhejiang [Myanmar, Vietnam].

Two cultivars occur in Taiwan: *Dendrocalamus latiflorus* 'Subconvex' (葫芦麻竹 *hu lu ma zhu*), distinguished by its much smaller culms, 5–10 m, 4–12 cm in diam., with internodes 10–30 cm, basally

congested and pear-shaped; and *D. latiflorus* 'Mei-nung' (美浓麻竹 *mei nong ma zhu*), with culms and branches yellow-green with green stripes and culm sheaths yellow-green to brown-green with several narrow, yellow stripes.

23. *Dendrocalamus jianshuiensis* Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 14. 1988.

建水龙竹 *jian shui long zhu*

Culms 17–18 m, 10–12 cm in diam.; internodes 25–37 cm; wall 1.2–2 cm thick; branching from 8th–9th node up, central branch dominant. Culm sheaths deciduous, about as long as internodes, thickly leathery, apex truncate; auricles small, 0.5–2 cm; ligule 1–4 mm, serrulate; blade reflexed, 10–20 × 3.5–7.5 cm. Leaf sheaths glabrous; ligule ca. 2 mm; blade 20–38 × 3.5–8.5 cm. Pseudospikelets 1 or more per node. Spikelets 10–18 × 5–10 mm, apex obtuse; florets 6 or 7. Glumes 1–3, 5–8 mm, abaxially slightly hairy, apex mucronate; lemma and glumes 7–12 × 5–10 mm; palea 6–9 mm. Filaments 1–1.4 cm; anthers yellow, 4–6 mm, apex mucronate. Pistil 1–1.5 cm, white hairy; stigma 1. Fruit unknown.

• Yunnan.

24. *Dendrocalamus yunnanicus* Hsueh & D. Z. Li, J. Bamboo Res. 7(4): 17. 1988.

云南龙竹 *yun nan long zhu*

Culms 18–25 m, 11–18 cm in diam.; internodes 42–52 cm; wall 1–2 cm thick. Branches several. Culm sheaths deciduous, leathery to thickly so, depressed, apex narrow; auricles small; ligule 5–8 mm, serrulate; blade reflexed, 9–18 × 3–9 cm, adaxially brown hairy. Leaf sheaths white hairy; ligule 1.5–2 mm; blade 25–35 × 4.5–6.5 cm, abaxially glabrous. Pseudospikelets 1 or more per node. Spikelets 1–1.6 cm, apex acute; florets 5–7. Glumes 2 or more, 2–4 mm, abaxially slightly hairy, apex acute; lemma 5–9 mm, long mucronate; palea 4–8 mm, 4- or 5-veined between keels, apex depressed. Anthers yellow, 3–4 mm, apex mucronate. Style ca. 4 mm; stigma 1. Fruit unknown.

Yunnan [Vietnam].

25. *Dendrocalamus minor* (McClure) L. C. Chia & H. L. Fung, Acta Phytotax. Sin. 18: 215. 1980.

吊丝竹 *diao si zhu*

Culms 5–12 m, (3–)6–8 cm in diam.; internodes green or yellow with green stripes, 30–45 cm; wall 5–5.6 mm thick. Branches several. Culm sheaths deciduous, initially grass-green, leathery, initially appressed brownish hispid, becoming glabrous; auricles small; ligule 3–8 mm, fimbriate; blade reflexed, ovate-lanceolate or lanceolate, abaxially glabrous. Leaf sheaths initially slightly hairy, becoming glabrous; ligule ca. 1 mm, serrulate; blade oblong-lanceolate, 10–25 × 1.5–3 cm, base rounded, apex acute. Pseudospikelets 5–10 per node. Spikelets ca. 1.2 cm; florets 4 or 5. Glumes usually 2(or 3), ca. 6 mm, margins ciliate; lemma 9–11 mm, glabrous, margins ciliate, apex acute, mucronate; palea 6–8 mm, 2-keeled, 3-veined between keels, apex acuminate or bifid. Anthers yellow, 5–6 mm, apex mucronate. Ovary ovoid; style slender; stigma 1. Caryopsis ca. 5 mm.

- Low hills. Guangdong, Guangxi, Guizhou.

- 1a. Culms 6–12 m, to 8 cm in diam., internodes green; glumes 2, palea apically acuminate 25a. var. *minor*
- 1b. Culms 5–8 m, 4–6 cm in diam.; internodes slightly yellow with 5–8 deep green stripes; glumes 3, palea apically bifid 25b. var. *amoenus*

25a. *Dendrocalamus minor* var. *minor*

吊丝竹(原变种) diao si zhu (yuan bian zhong)

Sinocalamus minor McClure, Sunyatsenia 6(1): 47. 1941;
Dendrocalamus sapidus Q. H. Dai & D. Y. Huang.

Culms 6–12 m, to 8 cm in diam., internodes green. Glumes 2; palea acuminate at apex.

- Guangdong, Guangxi, Guizhou.

25b. *Dendrocalamus minor* var. *amoenus* (Q. H. Dai & C. F. Huang) Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 39. 1989.

花吊丝竹 hua diao si zhu

Sinocalamus minor McClure var. *amoenus* Q. H. Dai & C. F. Huang, Acta Phytotax. Sin. 19: 261. 1981.

Culms 5–8 m, 4–6 cm in diam.; internodes slightly yellow, with 5–8 deep green stripes. Glumes 3; palea bifid at apex.

- Low hills. Guangxi.

26. *Dendrocalamus peculiaris* Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 32. 1989.

金平龙竹 jin ping long zhu

Culms 13–18 m, 10–15 cm in diam.; internodes 36–43 cm; wall 3–3.5 cm thick. Culm sheaths deciduous, orange-brown, leathery; auricles absent; ligule 6–10 mm, serrulate; blade reflexed. Leaf sheaths initially slightly hairy, becoming glabrous, margins ciliate; ligule ca. 1 mm; blade 25–40 × 3–5.5 (–10) cm. Pseudospikelets 2–15 per node. Spikelets 1–1.2 cm; florets 4 or 5. Glumes 2; lemma 7–11 mm, margins undulate, apex mucronate; palea 6–8 mm, 2-keeled, 2-veined between keels, apex acute. Anthers yellow, 3–3.5 mm, apex mucronate. Pistil ca. 1 cm; stigma 1. Fruit unknown.

- Yunnan.

27. *Dendrocalamus tomentosus* Hsueh & D. Z. Li, J. Bamboo Res. 8(1): 34. 1989.

毛龙竹 mao long zhu

Culms to 20 m, 9–12 cm in diam.; internodes 29–42 (–55) cm; wall ca. 2 cm thick. Branches several, dominant branches well developed, 5–6 m. Culm sheaths deciduous, leathery; auricles absent; ligule 5–7 mm; blade reflexed, abaxially setaceous. Leaf sheaths initially thinly white powdery, becoming black; ligule ca. 1 mm; blade 25–34 × 2.5–4.2 cm. Pseudospikelets 6–8 per node, clusters 7–11 mm in diam. Spikelets ca. 5.5 mm; florets 4 or 5. Glumes 1 or 2; lemma 4–5 mm, slightly hairy; palea ca. 4 mm, apex obtuse or depressed. Anthers yellow, 2.5–3 mm, apex mucronate. Pistil ca. 6 mm; stigma 1. Fruit unknown.

- Broad-leaved forests; 800–900 m. Yunnan.

4. *GIGANTOCHLOA* Kurz ex Munro, Trans. Linn. Soc. London 26: 123. 1868.

巨竹属 ju zhu shu

Li Dezhu (李德铎); Chris Stapleton

Arborescent bamboos, large-sized; clumps dense. Rhizomes short necked, pachymorph. Culms unicaespitose, erect, pendulous at apex; internodes green initially, often with yellow stripes, terete. Branches several, 1 dominant. Culm sheaths deciduous, very broad, densely hairy; ligule conspicuous; auricles absent or small; blade recurved or erect. Leaves usually large, base cuneate; auricles usually absent; ligule conspicuous; blade cuneate at base, venation not tessellate. Inflorescence iterant, fully bracteate, subtended by a narrow single-keeled prophyll, pseudospikelets clustered in soft or spiky globose mass at nodes of leafless flowering branches. Pseudospikelets sessile, prophyllate; florets (1 or) 2–5, with a sterile terminal floret with lemma only, sessile. Fertile glumes preceded by 1 or more gemmiferous bracts and 0–2 empty glumes; rachilla very short, obscure, not disarticulating; lemma broad, many veined; palea strongly 2-keeled; lodicules absent. Stamens 6; filaments united into a firm tube; anthers apiculate. Ovary stalked, apex thickened and hairy; stigma 1, long, hairy, plumose. Caryopsis terete, apex hairy; pericarp slightly thickened. $2n = 76^*$.

About 30 species: tropical Asia; six species (two endemic) in China.

There are several to possibly many further entities not yet properly identified, some of which might represent new taxa.

“*Gigantochloa menlunensis*” (B. Wen, J. Bamboo Res. 20(2): 10. 2001) was not validly published because no type was indicated.

- 1a. Leaf sheath ligule 5–10 mm; culm sheath initially densely white hispid 4. *G. verticillata*
- 1b. Leaf sheath ligule 1–4 mm; culm sheath where known brown hispid or strigose.
 - 2a. Leaf sheath ligule ca. 1 mm.
 - 3a. Leaf sheath gray setose, blade 1.8–3 cm wide; culm sheath brown setose, auricles conspicuous, undulate 1. *G. levis*
 - 3b. Leaf sheath initially sparsely pubescent, blade 3–5 cm wide; culm sheath densely dark brown hispid, auricles minute 2. *G. nigrociliata*
 - 2b. Leaf sheath ligule 1.5–4 mm.
 - 4a. Leaf blade 1.5–2.5 cm wide, ligule 1.5–3.5 mm; culm sheath initially sparsely dark brown hispid, later glabrous 3. *G. albociliata*

4b. Leaf blade 3.5–6 cm wide, ligule 3–4 mm; culm sheath not seen.

5a. Leaf blade 30–45 × 4.5–6 cm 5. *G. felix*

5b. Leaf blade 16–28 × 3.5–4 cm 6. *G. parviflora*

1. *Gigantochloa levis* (Blanco) Merrill, Amer. J. Bot. 3: 61. 1916.

毛笋竹 mao sun zhu

Bambusa levis Blanco, Fl. Filip. 272. 1837.

Culms 8–15 m, 9–13 cm in diam.; apically drooping; internodes 30–45 cm, initially with brown to white hairs; wall ca. 2.5 mm thick. Culm sheaths deciduous, broadly flabellate, thickly leathery, apex narrow, brown setose; auricles conspicuous, undulate; oral setae 5–7 mm; ligule 6–15 mm, serrulate; blade usually reflexed, ovate-triangular, 9–13 cm, basally with brown setae on both sides. Ultimate branches with 6–10 leaves. Leaf sheath gray setose; ligule ca. 1 mm; blade 15–25 × 1.8–3 cm, abaxially glabrous, adaxially white hairy. Inflorescence unknown.

Riversides, valleys; 500–1000 m. S Yunnan; cultivated in Taiwan [Malaysia, Philippines].

2. *Gigantochloa nigrociliata* (Buse) Kurz, Natuurk. Tijdschr. Ned.-Indië 27: 226. 1864.

黑毛巨竹 hei mao ju zhu

Bambusa nigrociliata Buse, Pl. Jungh. 3: 389. 1854; *Oxytenanthera nigrociliata* (Buse) Munro; *Pseudoxytenanthera nigrociliata* (Buse) T. Q. Nguyen.

Culms 8–15 m, 4–10 cm in diam.; internodes 36–46 cm, yellow striate, brown hispid; wall thick. Branches several, central ones prominent. Culm sheaths deciduous, brown, 18–22 cm, leathery, densely dark brown hispid; auricles minute; ligule ca. 4 mm, serrulate; blade recurved. Ultimate branches with ca. 11 leaves. Leaf sheath initially sparsely pubescent; ligule ca. 1 mm; blade 19–36 × 3–5 cm. Pseudospikelets in heads ca. 2.5 cm in diam. Spikelets 1–1.2 × 0.2–0.3 cm; florets 2. Glumes 2 or 3, ovate, dark brown ciliate; lemma margins dark brown ciliate; palea shorter than lemma. Anthers yellow. Ovary ovoid; style 6–7 mm; stigmas 1. Caryopsis unknown.

Tropical rain forests; 500–800 m. Hong Kong, S Yunnan [India, Indonesia, Myanmar, Thailand].

3. *Gigantochloa albociliata* (Munro) Kurz, Prelim. Rep. Forest Pegu, App. A: 136. 1875 [*“albo-ciliata”*].

白毛巨竹 bai mao ju zhu

Oxytenanthera albociliata Munro, Trans. Linn. Soc. London 26: 129. 1868 [*“albo-ciliata”*]; *Dendrocalamus albociliatus* (Munro) J. L. Sun; *Pseudotenanthera albociliata* (Munro) R. B. Majumdar; *Pseudoxytenanthera albociliata* (Munro) T. Q. Nguyen.

Culms 6–10 m, 2–5 cm in diam.; internodes 20–35 cm, white hispid; wall thick. Branches several, subequal. Culm sheaths deciduous, brown, 18–22 cm, leathery, initially sparsely dark brown hispid, glabrous in age; auricles absent; ligule 10–25 mm, irregularly serrate; blade erect. Ultimate branches with

ca. 11 leaves. Leaf sheath initially pubescent, glabrous in age; ligule 1.5–3.5 mm, ciliate; blade 15–20 × 1.5–2.5 cm. Inflorescence on leafless branches. Pseudospikelets 10–20 per head. Spikelets 1.5–2 × 0.1–0.15 cm; florets 1 or 2. Glumes 2 or 3, ovate, white ciliate; lemma margins white ciliate; palea shorter than lemma. Anthers yellow. Ovary narrowly ovoid; style 6–7 mm; stigmas 1 (or 2). Caryopsis unknown.

Tropical rain forests; 500–800 m. S Yunnan [India, Myanmar, Thailand].

4. *Gigantochloa verticillata* (Willdenow) Munro, Trans. Linn. Soc. London 26: 123. 1868.

花巨竹 hua ju zhu

Bambusa verticillata Willdenow, Sp. Pl. 2: 245. 1799; *Arundo maxima* Loureiro (1790), not Forsskål (1775); *B. maxima* (Loureiro) Poiré; *B. pseudoarundinacea* Steudel; *Gigantochloa maxima* (Loureiro) Kurz; *G. pseudoarundinacea* (Steudel) Widjaja.

Culms 8–15 m, 7–10 cm in diam.; internodes yellow striate, 28–42 cm, white or brown hispid; wall ca. 1.6 cm thick. Branches several, central dominant. Culm sheaths deciduous, green, yellow striate initially, later brown, leathery, initially densely white hispid, margins ciliate; auricles minute, inconspicuous; oral setae absent; ligule ca. 3 mm, irregularly serrate or fimbriate; blade reflexed. Leaf sheath initially pubescent; ligule 5–10 mm, entire; blade 24–47 × 3.5–7 cm. Inflorescence unknown.

Tropical rain forests; 500–800 m. Hong Kong, S Yunnan [India, Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

The application of names to this bamboo has been contentious and it is widely known as *Gigantochloa pseudoarundinacea*. Further study of types is required.

This species is widely planted as an ornamental.

5. *Gigantochloa felix* (Keng) P. C. Keng, J. Bamboo Res. 3(1): 24. 1984.

滇竹 dian zhu

Oxytenanthera felix Keng, J. Wash. Acad. Sci. 30: 425. 1940.

Culms to 9 m; internodes unknown. Culm sheaths unknown. Leaf sheath initially pubescent; glabrous in age; ligule concave, 3–4 mm; blade 30–45 × 4.5–6 cm. Inflorescence on leafless branches. Pseudospikelets in heads to 5 cm in diam. Spikelets 1.6–2.2 cm; florets 4. Glumes 1–3, ovate, white ciliate or glabrous; lemma 1.1–1.7 cm, ciliate or glabrous; palea 11–15 cm, uppermost one rounded. Filament tube ca. 1.5 cm; anthers 4–7 mm. Ovary narrowly ovoid; style ca. 1 cm; stigmas 1, ca. 9 mm. Caryopsis unknown.

• Riversides, valleys; 1200–1400 m. S Yunnan.

This imperfectly understood species is known only from its type

gathering. It may represent one of many little-known, cultivated *Gigantochloa* species of S Yunnan, or it may perhaps have become extinct in the wild.

6. *Gigantochloa parviflora* (P. C. Keng) P. C. Keng, J. Bamboo Res. 3(1): 24. 1984.

南峽滇竹 *nan qiao dian zhu*

Oxytenanthera parviflora P. C. Keng, Acta Phytotax. Sin. 6: 358. 1957.

Culms and culm sheaths unknown. Leaf sheath ligule trun-

cate, ca. 3.5 mm; blade 16–28 × 3.5–4 cm. Inflorescence on leafless branches. Pseudospikelets in heads to 4 cm in diam. Spikelets 1–1.5 cm; florets 3. Glumes 2, ovate, 2–3 mm, glabrous; lemma 8–14 mm, ciliate; palea equal to lemma, uppermost one rounded. Filament tube ca. 0.8 cm; anthers 4–8 mm. Ovary ca. 1.5 cm. Caryopsis unknown.

• River valleys; ca. 1400 m. S Yunnan.

This imperfectly understood species is known only from its type gathering, and it may perhaps have become extinct in the wild.

5. MELOCALAMUS Benth in Benth & J. D. Hooker, Gen. Pl. 3: 1212. 1883.

梨簾竹属 *li teng zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Clump-forming climbing bamboo, tall, with slender culms. Rhizomes short necked, pachymorph. Culms flexuose, nearly solid; nodes slightly prominent. Branch complements several to many, 1 dominant and sometimes about as thick as and replacing main culm. Culm sheaths persistent, leathery; auricles present, sometimes very small; ligule short, inconspicuous; blade erect or reflexed, large. Leaf blade large or medium sized, lanceolate to oblong-lanceolate, rounded at base. Inflorescence iterant, glomerate, on large leafless flowering branches, subtended by 1-keeled prophylls. Spikelets 2-flowered, with rachilla extension, small, to 4 mm. Glumes 2, ovate, glabrous; lemma similar to glumes. Palea 2-keeled, equal to or slightly longer than lemma. Lodicules 3, glabrous, ciliate on margin. Stamens 6; filaments free. Ovary stalkless, glabrous; style very short; stigmas 2 or 3, plumose. Caryopsis berrylike, globose, 1.5–2 cm, with fleshy pericarp, without endosperm, sometimes viviparous.

About five species: Bangladesh, S China, India (Assam), Myanmar; four species (three endemic) in SW China.

In addition to the species treated below, *Melocalamus ningmingensis* Ohmberger (Bamboos World Introd. 4: 19. 1997) was published as a *nomen novum* for *M. gracilis* W. T. Lin (J. S. China Agric. Univ. 14(3): 110. 1993, not R. B. Majumdar, 1989), which was described from sterile material from Guangxi (Ningming).

1a. Culm sheath auricles conspicuous.

2a. Culm sheath apically truncate, symmetrical; internodes 25–35 cm, solid or subsolid 1. *M. compactiflorus*

2b. Culm sheath apically oblique, asymmetrical; internodes 45–50 cm, hollow, wall ca. 5 mm thick 2. *M. scandens*

1b. Culm sheath auricles absent or inconspicuous.

3a. Culm internodes 70–120 cm; culm sheath apically with thin projection 1–2 cm on each side 3. *M. elevatissimus*

3b. Culm internodes 20–40(–60) cm; culm sheath apically truncate 4. *M. arrectus*

1. *Melocalamus compactiflorus* (Kurz) Benth, Gen. Pl. 3: 1212. 1883.

梨簾竹 *li teng zhu*

Culms to 40 m, 1.5–5 cm in diam.; internodes initially green, becoming gray-green, 25–35 cm, solid or nearly so; wall thick; nodes slightly thickened, each with a white ring below. Branches several, main mid-culm ones to 10 m. Culm sheaths pale brown, ca. 1/2 as long as internodes, leathery, appressed pubescent, margins ciliate, apex truncate; auricles conspicuous; ligule 1–5 mm, ciliate or fimbriate; blade recurved, base ca. 3/4 as wide as sheath apex. Leaf sheaths white pubescent, margins ciliate; ligule very short, pubescent; auricles and oral setae conspicuous; blade lanceolate, 7.5–15 × 0.7–1.2 cm. Pseudospikelets 1.2–1.4 mm; prophylls to 0.8 mm; gemmiferous bracts 2 or 3; fertile florets 1–3. Glumes 2 or 3; fertile lemma 1–1.3 mm; palea slightly longer than lemma, narrow, bifid for 1/3 length. Lodicules absent to 3. Anthers pale yellow, apex purple, apiculate. Ovary ovoid to turbinate; style 1, ca. 1.2 mm; stigmas 1–3. Caryopsis 2–4 cm. $2n = 76^*$.

River valleys in tropical rain forests, forested hills; 400–1700 m. S Yunnan [Bangladesh, NE India, Myanmar].

1a. Culm sheath ligule not fimbriate ... 1a. var. *compactiflorus*

1b. Culm sheath ligule fimbriate 1b. var. *fimbriatus*

1a. *Melocalamus compactiflorus* var. *compactiflorus*

梨簾竹(原变种) *li teng zhu* (yuan bian zhong)

Pseudostachyum compactiflorum Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 252. 1873; *Dinochloa compactiflora* (Kurz) McClure.

Plant taller, with thinner culms. Culm sheath ligule much shorter, not fimbriate; leaves smaller.

River valleys in tropical rain forests; 400–1000 m. S Yunnan [Bangladesh, NE India, Myanmar].

1b. *Melocalamus compactiflorus* var. *fimbriatus* (Hsueh & C. M. Hui) D. Z. Li & Z. H. Guo, Acta Bot. Yunnan. 23: 178. 2001.

流苏梨簾竹 *liu su li teng zhu*

Melocalamus fimbriatus Hsueh & C. M. Hui, Acta Phytotax. Sin. 30: 167. 1992.

Plant shorter, with thicker culms. Culm sheath ligule much longer, fimbriate; leaves larger.

- Forested hills; 1000–1700 m. S Yunnan.

2. *Melocalamus scandens* Hsueh & C. M. Hui, Acta Phytotax. Sin. 30: 166. 1992.

大吊竹 da diao zhu

Culms to 20 m, 2–4 cm in diam.; internodes 45–50 cm; wall ca. 5 mm thick; nodes flat, each with a brown tomentose ring above and below. Branches several, dominant ones to 6 m. Culm sheaths brown, asymmetrical, leathery, initially minutely powdery, apex oblique; auricles asymmetrical, with some oral setae; ligule ca. 1 mm, entire; blade erect, triangular, base about as wide as sheath apex. Leaf sheaths glabrous; auricles minute; ligule ca. 1 mm; blade lanceolate, 15–25 × 1.5–2.5 cm. Inflorescence unknown.

- Broad-leaved montane forests; 700–1000 m. S Yunnan.

3. *Melocalamus elevatissimus* Hsueh & T. P. Yi, J. Bamboo Res. 2(1): 28. 1983.

西藏梨簾竹 xi zang li teng zhu

Culms to 20 m, 1.5–3 cm in diam.; internodes 40–70 (–120) cm, initially hispid; wall 4–10 mm thick; nodes flat, each with a brown tomentose ring below. Branches several, main mid-culm ones to 6 m. Culm sheaths dark brown, 24–38 cm, leathery, with appressed, minute, yellow spiny hairs, apex with thin projections 1–2 cm on each side; auricles absent; ligule depressed, ca. 1 mm; blade erect, linear-lanceolate, base articulate. Leaf sheaths glabrous; auricles absent; ligule ca. 1 mm; blade oblong-lanceolate, 20–40 × 3–9 cm. Inflorescence unknown.

- Broad-leaved montane forests; 900–2000 m. SE Xizang.

This species appears very similar to *Cephalostachyum latifolium*.

4. *Melocalamus arrectus* T. P. Yi, Acta Bot. Yunnan. 10: 440. 1988.

澜沧梨簾竹 lan cang li teng zhu

Culms 10–15 m, 2–4 cm in diam.; internodes 20–40 (–60) cm, initially pubescent; wall rather thick; nodes prominent, each with a ring of white powder and tomentum below. Branching from 2nd to 3rd nodes upward, 1–3 dominant, to 8 m. Culm sheaths pale brown, ca. 1/3 as long as internodes, leathery, appressed pubescent, apex truncate; auricles minute; oral setae few, deciduous; ligule ca. 1 mm, ciliate; blade erect, triangular or ovate-triangular. Leaf sheaths glabrous; ligule ca. 1 mm; auricles absent; oral setae absent to 2, minute; blade lanceolate, 12–22 × 2.2–4 cm. Flowering branches leafy or leafless; internodes densely pubescent. Pseudospikelets minute. Glumes 2, 1.5–2 mm; rachilla internodes ca. 0.5 mm; lemma ca. 2 mm; palea membranous. Lodicules linear-lanceolate, 1–1.5 mm. Anthers ca. 1 mm. Ovary ovoid, glabrous. Caryopsis globose, ca. 2 cm.

- Tropical rain forests, secondary forests; 700–1900 m. S Yunnan.

This species was previously referred to by the name “*Dinorchloa bambusoides*” (Q. H. Dai, Bamboo Spec. & Cultivation Guangxi, 9. 1987), which was not validly published.

6. *BONIA* Balansa, J. Bot. (Morot) 4: 29. 1890.

单枝竹属 dan zhi zhu shu

Xia Nianhe (夏念和); Chris Stapleton

Monocladus L. C. Chia et al.

Clump-forming scrambling bamboos, small to medium sized. Rhizomes short necked, pachymorph. Culms solid or nearly so; nodes slightly prominent. Branches solitary, nearly as thick as culms. Culm sheaths persistent, leathery; auricles subfalcate to broadly falcate, large; ligule short; blade erect. Leaf blade lanceolate to linear-lanceolate, usually large, base truncate; venation not tessellate. Inflorescence iterant, fully bracteate, arising from axil of persistent spathiform bracts; prophylls 2-keeled, gemmiferous, inserted at point of branching, closely followed by 2 or 3 closely spaced, gemmiferous bracts. Pseudospikelets 3–9-flowered, uppermost floret imperfect; first fertile lemma separated from gemmiferous bracts by rachilla segment to 1 cm. Rachilla disarticulating between florets, internodes to 1 cm. Lemma subleathery; palea of lowest floret slightly longer than lemma, subleathery; palea of other florets much shorter than lemma, membranous; lodicules 3, glabrous. Stamens 6; filaments free. Ovary glabrous; style very short; stigmas 3, plumose. Caryopsis terete, glabrous.

Five species: S China, Vietnam; four species (all endemic) in China.

- 1a. Culm sheath auricles inconspicuous 4. *B. parvifloscula*
- 1b. Culm sheath auricles well developed.
 - 2a. Ligules of culm sheath and leaf sheath long ciliate 1. *B. saxatilis*
 - 2b. Ligules of culm sheath and leaf sheath entire.
 - 3a. Culm sheath blade obliquely cordate, amplexicaul; leaf blade abaxially glaucous, pubescent; culm internodes white powdery, sparsely brown strigose 3. *B. amplexicaulis*
 - 3b. Culm sheath blade nearly rounded, not amplexicaul; leaf blade abaxially pale green, glabrous; culm not white powdery, glabrous 2. *B. levigata*

1. *Bonia saxatilis* (L. C. Chia et al.) N. H. Xia, Kew Bull. 51: 567. 1996.

单枝竹 dan zhi zhu

Culms 1–4 m, 4–8 mm in diam.; internodes 25–40 cm, glabrous, initially white powdery. Branches 0.5–1.5 m. Culm sheaths shortly tomentose and stiffly dull brown hairy, or gla-

brous; auricles subfalcate, amplexicaul; oral setae ca. 1 cm; ligule margin with 5–10 mm cilia; blade reflexed, lanceolate, base cordate. Leaf sheaths distally white powdery and shortly tomentose, sometimes stiffly dull brown hairy; auricles subfalcate; oral setae ca. 1 cm; ligule margin with cilia 5–10 mm; blade usually 20–35 × 3.5–6 cm, abaxially glaucous, subglabrous. Pseudospikelets 2–3 cm; prophylls 2-keeled, ca. 8 mm, keels ciliate; gemmiferous bracts ovate-elliptic, ca. 9-veined, abaxially slightly hairy. Spikelets with 5–9 florets, first floret longest; first internode of rachilla longest, 7–10 mm, terete, angular, apex slightly hairy, other internodes progressively shorter and flattened on one side. Glumes lanceolate, ca. 11-veined, apex mucronate, lower glume ca. 1 cm, upper ca. 1.2 cm; lemma ovate-lanceolate, ca. 1.3 cm, 9–11-veined, apex acute or mucronate. Palea narrowly lanceolate, 2-keeled, brown hairy, 4-veined between keels, 2-veined on each side of keels, apex obtuse. Lodicules 3, heteromorphic, ca. 1 mm. Anthers 2–3 mm; filaments very short. Ovary ellipsoid, ca. 0.7 mm; stigmas 3, 1.5–1.8 mm. Fruit unknown.

• Limestone hills and mountains. Guangdong, Guangxi.

- 1a. Culm sheaths shortly tomentose with stiff, dull brown hairs 1a. var. *saxatilis*
 1b. Culm sheaths abaxially glabrous 1b. var. *solida*

1a. *Bonia saxatilis* var. *saxatilis*

单枝竹(原变种) dan zhi zhu (yuan bian zhong)

Monocladus saxatilis L. C. Chia et al., Acta Phytotax. Sin. 26: 213. 1988.

Culm sheaths shortly tomentose, also with longer, stiff, dull brown hairs.

• Limestone mountains. Guangdong, Guangxi.

The culms are used for papermaking.

1b. *Bonia saxatilis* var. *solida* (C. D. Chu & C. S. Chao) D. Z. Li, Acta Bot. Yunnan. 22: 44. 2000.

箭秆竹 jian gan zhu

Indocalamus solidus C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 18: 26. 1980; *Bonia solida* (C. D. Chu & C. S. Chao) N. H. Xia; *Monocladus saxatilis* var. *solidus* (C. D. Chu & C. S. Chao) L. C. Chia.

Culm sheaths abaxially glabrous.

• Limestone hills. Guangxi.

2. *Bonia levigata* (L. C. Chia et al.) N. H. Xia, Kew Bull. 51: 568. 1996.

响子竹 xiang zi zhu

Monocladus levigatus L. C. Chia et al., Acta Phytotax. Sin. 26: 216. 1988.

Culms 1–5 m, 0.6–1 cm in diam.; internodes 25–35 cm, glabrous, without white powder. Branches 1–3 m. Culm sheaths shortly tomentose, stiffly dull brown hairy; auricles broadly falcate; oral setae ca. 2 mm bristles; ligule entire; blade ovate-lanceolate, base subcordate. Leaf sheaths white powdery, with stiff, dull brown hairs; auricles oblong or reniform; oral setae 5–7 mm; ligule entire; blade usually 20–35 × 4–6 cm, abaxially pale green. Inflorescence unknown.

• Forests; 200–700 m. Hainan.

3. *Bonia amplexicaulis* (L. C. Chia et al.) N. H. Xia, Kew Bull. 51: 568. 1996.

芸香竹 yun xiang zhu

Monocladus amplexicaulis L. C. Chia et al., Acta Phytotax. Sin. 26: 215. 1988.

Culms 2–5 m, 0.5–1.5 cm in diam.; internodes 30–50 cm, initially white powdery, with stiff, brown or pale hairs. Branches 0.5–3 m. Culm sheaths shortly tomentose, mixed with longer, stiff, dull brown hairs; auricles broadly falcate, one usually covered by base of blade; ligule entire; oral setae 1.5–2 mm; blade oblique, cordate to narrowly oblique-cordate, amplexicaul. Leaf sheaths slightly hairy and stiffly dull brown hairy; auricles ascending, broadly ovate, usually swollen on one side; oral setae ca. 6 mm; ligule entire; blade usually 25–40 × 4.5–8 cm, glaucous, abaxially pubescent. Inflorescence unknown.

• Limestone hills; 300–500 m. Guangxi.

The culms are used for papermaking.

4. *Bonia parvifloscula* (W. T. Lin) N. H. Xia, Novon 15: 601. 2005.

小花单枝竹 xiao hua dan zhi zhu

Monocladus parviflosculus W. T. Lin, J. Bamboo Res. 12(3): 3. 1993.

Culms 1–1.2 m, 4–6 mm in diam., solid or subsolid; internodes 16–39 cm, initially hispidulous, becoming glabrous; nodes flat. Culm sheaths tardily deciduous, abaxially sparsely hispid; auricles inconspicuous or small; oral setae absent; ligule ca. 0.8 mm, denticulate; blade suberect or deflexed, linear-lanceolate, base narrowed. Ultimate branchlets with 5–7 leaves. Leaf blade 11–22 × 1.5–3.2 cm, abaxially glaucous and pubescent. Pseudospikelets 1.7–2 cm; bracts 2 or 3; florets 4–6. Glumes absent; lemma 6–8 mm, abaxially sparsely hispidulous. Palea shorter than lemma, keels ciliolate, 1- or 2-veined between and 2-veined on either side of keels. Rachilla segments 3–5 mm. Lodicules unequal, 1.5–2.5 mm, glabrous, apex emarginate. Ovary ellipsoid, ca. 1 mm; style ca. 0.5 mm; stigmas 3. Fruit unknown.

• Limestone hills. Guangdong (Zhaoqing).

7. SCHIZOSTACHYUM Nees in Martius et al., Fl. Bras. Enum. Pl. 2: 535. 1829.

箬竹属 si lao zhu shu

Xia Nianhe (夏念和); Chris Stapleton

Leptocanna L. C. Chia & H. L. Fung.

Arborescent bamboos, sometimes shrubby or scrambling. Rhizomes short necked, pachymorph. Culms erect, pendulous, or clambering, straight or slightly flexuose; internodes terete, distally often white powdery; wall usually thin; nodal ridge not prominent; sheath scar prominent. Branches many, subequal. Culm sheaths deciduous, leathery to thickly papery, usually rigid, white powdery, apex truncate or concave, sometimes with subcircular projection at base of one margin; auricles usually inconspicuous; oral setae usually developed; ligule short, truncate, margin serrulate or fimbriate; blade usually reflexed, adaxially densely hispid, apex usually involute. Leaf sheaths usually grooved; auricles usually inconspicuous; blade large, transverse veins partially visible abaxially. Inflorescence fully bracteate, iterant; with several to many sessile pseudospikelets in loose, spicate clusters on leafy or leafless flowering branches. Pseudospikelet prophyll triangular to linear-lanceolate; gemmiferous bracts 1 to several; fertile florets 1 or 2, or florets 3 or 4 with only terminal or subterminal floret fertile; rachilla usually disarticulating (not in *S. chinense*), extending beyond fertile floret, glumes usually absent (2 in *S. chinense*); lemma convolute; palea similar to lemma, but longer, not keeled; lodicules usually absent, sometimes 1–3. Stamens 6. Ovary stalked; style 1; stigmas 3, plumose. Caryopsis fusiform, apex with persistent style base.

About 50 species: SE Asia; nine species (five endemic) in China.

In addition to the species treated below, *Schizostachyum brachycladum* (Munro) Kurz (*Melocanna zollingeri* (Steudel) Kurz ex Munro var. *brachyclada* Munro) was included in FRPS (9(1): 23. 1996), but it is only of limited cultivation and does not merit a full treatment here. *Schizostachyum subvexorum* Q. H. Dai & D. Y. Huang (J. Bamboo Res. 16(3): 27. 1997) was described from cultivated material from Guangxi (Nanning). In the protologue it was compared with *S. funghomii*.

- 1a. Culm sheath blade erect; spikelets with glume and sterile lemma; rachilla not disarticulating 1. *S. chinense*
- 1b. Culm sheath blade reflexed; spikelets without glume and sterile lemma; rachilla disarticulating.
 - 2a. Culms self-supporting, apically suberect, 4–10 cm in diam. 8. *S. funghomii*
 - 2b. Culms apically subscandent or long pendulous, 0.5–4(–5) cm in diam.
 - 3a. Culm sheaths basally with rounded projection on outer margin.
 - 4a. Culm 0.5–1.1 cm in diam., internodes to 60 cm; leaf sheath 2–3.5 cm, oral setae 3–5 mm 5. *S. dumetorum*
 - 4b. Culm 2–5 cm in diam., internodes 70–90 cm; leaf sheath 4–10 cm, oral setae 6–18 mm.
 - 5a. Culm walls 3–5 mm thick; culm sheath yellow-brown, hairs brown, ligule margin with fimbriae 8–12 mm 4. *S. hainanense*
 - 5b. Culm walls 1–2 mm thick; culm sheath green, hairs white, ligule margin with fimbriae 1.5–2 mm 7. *S. auriculatum*
 - 3b. Culm sheaths basally truncate without projection.
 - 6a. Culm sheaths apically truncate.
 - 7a. Culm sheaths with deciduous, red-brown, stiff hairs, ligule fimbriate 2. *S. jaculans*
 - 7b. Culm sheaths with white strigose hairs, ligule ciliate 6. *S. pseudolima*
 - 6b. Culm sheaths apically concave.
 - 8a. Culm sheaths stiffly brown hairy; leaf blade 1.5–2.5 cm wide, base rounded 3. *S. diffusum*
 - 8b. Culm sheaths yellow-brown tomentose; leaf blade 4–5 cm wide, base cuneate 9. *S. sanguineum*

1. *Schizostachyum chinense* Rendle, J. Linn. Soc., Bot. 36: 448. 1904.

薄竹 bao zhu

Leptocanna chinensis (Rendle) L. C. Chia & H. L. Fung.

Culms 5–8 m, 2–3 cm in diam.; internodes straight, 30–45 cm, scabrous, white powdery, initially distally white pubescent, later glabrous. Branching from ca. 3rd node up, nearly horizontal. Culm sheaths initially purple-red, later straw-colored, triangular, usually ca. 1/2 as long as internodes, initially stiffly white hairy, later scabrous and white powdery, apex nearly truncate or concave; auricles very narrowly linear; ligule ca. 1 mm, subentire; blade erect, narrowly triangular, base ca. 1/3 as wide as apex of sheath, margin apically partly involute, apex long acuminate. Leaf sheaths apically purple-red, glabrous; auricles and oral setae absent; ligule subtruncate, ca. 1 mm, subentire; petiole purple-red, ca. 5 mm, glabrous; blade lanceolate to oblong-lanceolate, 15–26 × 3–4.5 cm, abaxially scabrous, adaxially glabrous. Ultimate flowering branches 5–10 cm; sheaths amplexicaul, glabrous, apex attenuate into a slender mucro; pseudospikelets to 1.4 cm, apex acuminate; prophylls linear-lanceolate, 6–8 mm, apex acute or obtuse, keels 2; bracts

ovate-lanceolate to linear-lanceolate, 7–11 mm, apex usually mucronate; rachilla not disarticulating. Glumes 2, ovate-lanceolate to broadly lanceolate, 7–9 mm, apex acute or obtuse; fertile lemma ovate-lanceolate, 1–1.1 cm, 15-veined; palea 9–12 mm, 6-veined, apex acuminate with a cluster of short hairs; lodicules 3, 0.5–2 mm, margin ciliate, ventral 2 oblanceolate, apex obtuse, dorsal subovate, apex acute. Anthers 4–9 mm, base unequally bifid. Ovary clavate; stigmas short, plumose. Fruit unknown.

• Evergreen broad-leaved forests; 1500–2000 m. S Yunnan (Jinping, Mengzi, Pingbian).

2. *Schizostachyum jaculans* Holttum, Kew Bull. [8] 1953: 494. 1954.

岭南簕竹 ling nan si lao zhu

Culms to 15 m long, to 1.5 cm in diam., apex long pendulous or clambering; internodes terete, to 72 cm, lower half glossy, glabrous, initially white powdery distally, with appressed red-brown hairs; wall ca. 1.5 mm thick. Branches 40–50 cm. Culm sheaths deciduous, oblong, with deciduous, stiff, red-brown hairs, base without a projection, margins glabrous, apex truncate or nearly so; auricles usually inconspicuous; oral setae 1–2 mm;

ligule 1–2 mm, margin with fimbriae 8–15 mm; blade reflexed, linear-lanceolate, less than 1/2 length of sheath, abaxially glabrous, adaxially densely strigose, apex involute to acicular. Leaves 5–9 per ultimate branch; leaf blade linear-lanceolate or lanceolate, 5.5–15 × 0.6–1 cm, abaxially subglabrous, adaxially stiffly white hairy, margins glabrous, base rounded, apex acuminate. Inflorescence unknown.

Primary and secondary forests. Hainan [Malaysia].

3. *Schizostachyum diffusum* (Blanco) Merrill, Amer. J. Bot. 3: 62. 1916.

筳簹竹 sha le zhu

Bambusa diffusa Blanco, Fl. Filip. 269. 1837; *Dinorchloa diffusa* (Blanco) Merrill.

Culms flexuose, slender, to 40 m long, 0.5–1.5 cm in diam., apically clambering; internodes 15–60 cm, with ring of white powder below node; wall 2–4 mm thick. Culm sheaths deciduous, leathery, rigid, with stiff, brown hairs, base without a projection, margins ciliate, apex concave; auricles inconspicuous; oral setae well developed, curved; ligule short or inconspicuous; blade reflexed, linear-lanceolate, apex involute to aciculate. Leaves 5–12 per ultimate branch; sheaths 5–12 cm, glabrous, outer margin ciliate; auricles inconspicuous; oral setae well developed, initially white, becoming brown; ligule suborbicular or subtruncate, dentate; petiole short; blade oblong-lanceolate, 10–25 × 1.5–2.5 cm, abaxially glabrous, margin densely scabrous to setaceous, base rounded, apex acute. Pseudospikelets 1.8–2.8 cm; bracts 2, oblong-lanceolate, ca. 1 cm, glabrous, many veined; rachilla disarticulating. Glumes absent; lemma ovate-oblong, ca. 14 × 6 mm, glabrous, many veined. Palea ca. 19 × 6 mm, many veined, apex shortly bifid, not keeled; lodicules 2, elliptic-lanceolate, membranous. Filaments long; anthers ca. 9 mm. Ovary glabrous; stigmas 3, short, plumose. Caryopsis obovate, 2–4 mm in diam., glabrous, apex with persistent style base. New shoots May–Aug.

Primary forests; 200–1200 m. E and S Taiwan [Philippines].

The identification of Chinese material as *Schizostachyum diffusum* requires further study.

This species is grown as an ornamental.

4. *Schizostachyum hainanense* Merrill ex McClure, Lingnan Sci. J. 14: 591. 1935.

山骨罗竹 shan gu luo zhu

Culms ascending, 8–30 m long, 2–3(–5) cm in diam., apically long pendulous or clambering; internodes to 75 cm or longer, smooth and glabrous near base, other portions white powdery and appressed stiffly hairy; wall 1.5–2 mm thick. Branches 40–80 cm. Culm sheaths deciduous, asymmetrical, pruinose, with appressed, stiff, brown hairs, base of outer margin usually with a conspicuous, subcircular projection below point of attachment, both sides of apex rounded and extending upward but unequal, yellow-brown; auricles absent; oral setae well developed, to 2.4 cm; ligule 1.5–2 mm, margin with fimbriae 8–12 mm; blade reflexed, more than 1/2 length of sheath

proper. Leaves 5–10 per ultimate branch; sheaths 4–9 cm; auricles usually inconspicuous; oral setae numerous, pale, 6–18 mm; ligule ca. 1 mm; blade oblong-lanceolate or linear-lanceolate, 6–27 × 0.6–3.7 cm. Pseudospikelets fusiform, 1.2–1.5 cm; prophylls ovate-lanceolate, ca. 2.5 mm; bracts 3 or 4, ovate or ovate-lanceolate, margin ciliate or glabrous, apex obtuse to acute or mucronate. Glumes absent; lemma ovate-lanceolate, ca. 1.3 cm, margin with or without cilia, involute, many veined, apex acuminate, mucronate; palea to 1.4 cm, markedly involute, papery, lower portion pellucid, apex mucronate; lodicules absent. Filaments white, ca. 1.4 cm, basally connate in pairs; anthers yellow-brown, ca. 6 mm. Ovary ovoid, glabrous, stalked; stigmas 3, purple, 1–1.5 mm. Fruit unknown.

Primary tropical forests. Hainan [Vietnam].

The culms are split for weaving baskets, mats, etc.

5. *Schizostachyum dumetorum* (Hance ex Walpers) Munro, Bot. Voy. Herald 424. 1857.

苗竹仔 miao zhu zi

Culms flexuose, 3–10 m long, 0.5–1.1 cm in diam., apically clambering; internodes to 60 cm, smooth and glabrous near base, otherwise white powdery and white strigose; wall ca. 1 mm thick. Branches ca. 40 cm. Culm sheaths deciduous, abaxially slightly hairy or glabrous, base of outer margin usually with a conspicuous subcircular expansion below point of attachment, apex truncate with equal sides; auricles usually inconspicuous; oral setae many, straight, 5–7 mm; ligule less than 1 mm, glabrous, margin undulate; blade reflexed, those on lower nodes of culm less than 1/2 length of sheath, those on upper nodes of culm longer. Leaves 5–7 per ultimate branch; sheaths 2–3.5 cm, glabrous; auricles usually inconspicuous; oral setae several, 3–5 mm; ligule less than 1 mm; blade lanceolate, 5–18 × 1.2–7 cm. Pseudospikelets fusiform, 1–2.2 cm; prophylls small; bracts 4–6, navicular, 1–5.5 mm, papery, rigid, keeled, apex obtuse; rachilla disarticulating. Glumes absent; lemma oblong-lanceolate, 1.2–1.4 cm, involute, many veined, apex acute, mucronate; palea oblong-lanceolate, to 1.5 cm, markedly involute, thinly papery, apex truncate or emarginate; lodicules absent. Filaments white, ca. 2 cm, base ± connate; anthers yellow, 5–6 mm. Ovary ovoid, glabrous, stalked; style purple; stigmas 3, purple-red, 3–5 mm, plumose. Caryopsis fusiform, 10–13 × ca. 1.5 mm, glabrous, apex beaked.

• Thickets, forests; 100–200 m. Guangdong, Jiangxi.

This species is grown as an ornamental.

- 1a. Culm sheaths glabrous 5a. var. *dumetorum*
 1b. Culm sheaths stiffly yellow-brown
 hairy 5b. var. *xinwuense*

5a. *Schizostachyum dumetorum* var. *dumetorum*

苗竹仔(原变种) miao zhu zi (yuan bian zhong)

Bambusa dumetorum Hance ex Walpers, Ann. Bot. Syst. 3: 781. 1853.

Culm sheaths glabrous.

• Guangdong.

5b. *Schizostachyum dumetorum* var. *xinwuense* (T. H. Wen & J. Y. Chin) N. H. Xia, J. Trop. Subtrop. Bot. 1: 7. 1993.

火筒竹 *huo tong zhu*

Schizostachyum xinwuense T. H. Wen & J. Y. Chin, J. Bamboo Res. 1: 28. 1982.

Culm sheaths stiffly yellow-brown hairy.

• Jiangxi (Xunwu).

6. *Schizostachyum pseudolima* McClure, Lingnan Sci. J. 19: 537. 1940.

簕筭竹 *si lao zhu*

Culms basally erect or suberect, to 10 m, to 4 cm in diam., apically long pendulous or clambering; internodes terete, straight, to 60 cm, basally glossy and glabrous, distally white powdery and stiffly white hairy; wall 1–2 mm thick. Branches 50(–100) cm. Culm sheaths tardily deciduous, straw-colored, white powdery and stiffly white hairy abaxially, distal margins with cilia 1–2 cm, base without a projection, apex truncate; auricles inconspicuous; oral setae many, 1–1.8 cm; ligule truncate, short, 1–1.5 mm, margin ciliate; blade reflexed, linear-lanceolate, more than 1/2 or 2/3 length of sheath, abaxially glabrous, apex acuminate. Leaves 6–8 per ultimate branch; sheaths 6–9 cm, often white powdery; auricles inconspicuous; oral setae numerous, 2–3 mm; blade oblong-lanceolate or linear-lanceolate, 18–30 × 2–3.5 cm. Pseudospikelets fusiform, 2–3.5 cm, glabrous; prophyll ovate or ovate-lanceolate, 4–8 mm, thin, translucent, apex obtuse, keels 2, ciliate; bracts 1 to several, oblong to oblong-lanceolate, 7–22 mm, papery, many veined, apex obtuse to acute or mucronate; rachilla disarticulating. Glumes absent; fertile lemma oblong-lanceolate, to 2.4 cm, many veined, apex acute, long mucronate, mucro ca. 3 mm; sterile lemma oblong-lanceolate, ca. 1.5 cm, mucro short. Palea to 2.7 cm, involute, papery, many veined, apex bifid; lodicules absent. Filaments to 25 mm, bases often connate; anthers initially dull green, pale yellow when mature, 7–9 mm. Pistil purple, 1.8–2.5 cm. Fruit unknown. New shoots Jul–Aug.

Forests, cultivated near villages. Hainan [Vietnam].

The culms are used for making flutes and walling and are split for weaving.

7. *Schizostachyum auriculatum* Q. H. Dai & D. Y. Huang, J. Bamboo Res. 16(3): 29. 1997.

耳垂竹 *er chui zhu*

Culms erect or suberect, to 10–14 m, 3–5 cm in diam.; internodes terete, straight, 70–90 cm, scabrous, ± white powdery, initially white appressed hispid; wall 3–5 mm. Branches ca. 50 cm. Culm sheaths deciduous, white powdery, stiffly pale yellow hairy, margin white ciliate; base of outer margin usually with a conspicuous subcircular expansion below point of attachment, apex truncate; auricles absent; oral setae many, 1.5–2 cm; ligule ca. 1 mm, with dense fimbriae 1.5–2 mm; blade reflexed, narrowly lanceolate, 14–18 × 1–1.5 cm, abaxially appressed, white hispidulous, adaxially white strigose. Leaves 5–8 per ultimate branch; sheaths 7–10 cm, white stri-

gose; auricles absent; oral setae numerous, erect, straight, to 1 cm; ligule ca. 0.5 mm, white ciliate; blade narrowly lanceolate, 20–25 × 2–3 cm, abaxially white pubescent, lateral veins 6–8 pairs. Inflorescence unknown. New shoots Jun–Sep.

• Cultivated. Guangxi (Nanning).

8. *Schizostachyum funghomii* McClure, Lingnan Sci. J. 14: 585. 1935.

沙罗箬竹 *sha luo dan zhu*

Schizostachyum subvexorum Q. H. Dai & D. Y. Huang.

Culms erect, to 12 m, 4–10 cm in diam., apically suberect; internodes terete, straight, to 67 cm, scabrous, white powdery, initially often strigose; wall ca. 3 mm. Branches 50–70 cm. Culm sheaths tardily deciduous, straw-colored, white powdery, with stiff, pale yellow hairs, margins glabrous, apex truncate or slightly concave; auricles inconspicuous; oral setae many, ca. 5 mm; ligule truncate, short, 1–2 mm, glabrous, margin lobed, with fimbriae 3–5 mm; blade reflexed, linear-lanceolate, less than 1/2 length of sheath, abaxially glabrous, apex acuminate. Leaves 6–9 per ultimate branch; sheaths often white powdery; auricles inconspicuous; oral setae numerous, 5–6 mm; blade oblong-lanceolate or ovate-lanceolate, 20–30 × 2.5–4 cm. Pseudospikelets terete, ca. 3 cm, white villous; prophylls oblong-obovate, 5–7 mm, papery, apex obtuse, keels 2, ciliate; bracts 1 to several, oblong, 6–15 mm, papery, many veined, apex obtuse to acute and mucronate; florets 1 or 2, terminal floret usually fertile; rachilla disarticulating. Glumes absent; lemma oblong-lanceolate, 1.5–1.7 cm, densely white-villous, strongly involute, many veined, apex scabrous, acute, mucronate, mucro ca. 2 mm. Palea to 2.6 cm, base spirally involute, papery, distally obviously grooved, nearly glabrous, white ciliate, many veined, apex bifid (fertile spikelets) or unequally 2-keeled (sterile spikelets); lodicules absent. Filaments to 1.8 cm, bases usually connate in pairs; anthers yellow-brown, to 1.2 cm. Ovary glabrous, shortly stalked; style pale yellow; stigmas 3, purple, plumose. Fruit unknown. New shoots Jul–Aug.

• Hills, forests, cultivated near villages. Guangdong, Guangxi, Yunnan.

The culms are used for making paper pulp and are split for weaving. The species is also grown as an ornamental.

9. *Schizostachyum sanguineum* W. P. Zhang, Bamboo Res. 1989(4): 12. 1989.

红毛簕竹 *hong mao si lao zhu*

Culms 5–7 m, 2–3 cm in diam., apically scrambling; internodes 25–35 cm, scabrous, white powdery; wall thin; nodes flat, with a white powdery ring below sheath scar. Culm sheaths deciduous, suboblong, shorter than internodes, densely yellow-brown tomentose, base without a projection, apex arched-concave; auricles absent; ligule short, margin with brown cilia ca. 2 mm; blade reflexed, linear-lanceolate, abaxially with sparse, stiff hairs, adaxially densely yellow-brown tomentose, apex rugose. Leaves 4–6 per ultimate branch; leaf blade ovate-lanceolate, 18–20 × 4–5 cm, base cuneate, apex long acuminate. Inflorescence unknown.

• Forests; ca. 1600 m. SE Yunnan (Malipo).

8. CEPHALOSTACHYUM Munro, Trans. Linn. Soc. London 26: 138. 1868.

空竹属 kong zhu shu

Li Dezhu (李德铎); Chris Stapleton

Arborescent or shrubby bamboos. Rhizomes short necked, pachymorph. Culms straight, pendulous, or occasionally clambering; internodes terete, smooth, usually glabrous; wall usually thin; nodal ridge not prominent; sheath scar prominent. Branches many, subequal or occasionally with a dominant branch replacing main culm. Culm sheaths deciduous, thickly papery to leathery, usually rigid, apex truncate or concave; auricles usually conspicuous; oral setae usually developed, often fimbriate; ligule truncate, short, serrulate; blade reflexed, sometimes erect. Leaf sheaths pubescent; auricles usually conspicuous; blade lanceolate or ovate-elliptical, variable in size, transverse veins scarcely visible. Inflorescence fully bracteate, iterant, initially densely glomerate with many pseudospikelets, terminal to a leafy shoot, later spicate, lateral to leafless flowering branches, subtended by several large bracts. Spikelets 1-flowered, with a rachilla extension. Glumes 2 or 3, long mucronate or awned; lemma similar to glumes, convolute. Palea thin, 2-keeled. Lodicules 3. Stamens 6; filaments free. Ovary stalked; style long, hollow; stigmas 2 or 3, plumose. Caryopsis nutlike, terete, apex with persistent style base.

About nine species: S and SE Asia; six species in China (Xizang, Yunnan).

Several early names were based on fragmentary material collected in NE India and Myanmar. The Chinese specimens cannot be reliably identified until better gatherings have been made both in China and in neighboring countries.

- 1a. Culms climbing; culm sheath blade erect, not articulate with sheaths.
 - 2a. Culm internodes solid; culm sheaths abaxially sparsely white hairy, centrally and on distal margins brown hirsute 1. *C. mannii*
 - 2b. Culm internodes with narrow cavity; culm sheaths abaxially dark brown or black tomentose 2. *C. scandens*
- 1b. Culms erect; culm sheath blade reflexed, articulate with sheaths.
 - 3a. Culm sheaths thickly leathery, brown, smooth, glossy, with dark brown hairs; culm internodes glaucous, white hispid 3. *C. pergracile*
 - 3b. Culm sheaths papery to leathery, yellow, grooved, dull, pubescent or hirsute.
 - 4a. Leaf blade ovate to elliptical, 8–10 cm wide; culm sheath apically projecting upward on each side of blade 4. *C. latifolium*
 - 4b. Leaf blade lanceolate, 2–5 cm wide; culm sheath apically truncate.
 - 5a. Culms 1.5–2.5 cm in diam., culm sheaths pale pubescent 5. *C. pallidum*
 - 5b. Culms 5–10 cm in diam.; culm sheaths yellow hispid 6. *C. virgatum*

1. *Cephalostachyum mannii* (Gamble) Stapleton & D. Z. Li, Kew Bull. 52: 700. 1997.

独龙江空竹 du long jiang kong zhu

Arundinaria mannii Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 26. 1896; *Neomicrocalamus mannii* (Gamble) R. B. Majumdar.

Culms 12–20 m, 1.5–2.5 cm in diam., apically scrambling; internodes usually flexuose, 30–45 cm, solid. Branches many, central dominant. Culm sheaths persistent, base very tough, thinly white tomentose, brown hirsute centrally and on distal margins; auricles and ligule absent; blade erect, triangular, not articulate with sheath. Leaves 3–5 per ultimate branch; oral setae more than 10, brown hispid, 5–10 mm; ligule conspicuous; blade 12–15 × 1.5–2 cm, glabrous, base arched, apex acute. Inflorescence unknown.

Forests; 1300–1400 m, NW Yunnan [NE India].

The identification of Chinese material as this species is still rather speculative.

2. *Cephalostachyum scandens* Bor, Kew Bull. [12] 1957: 419. 1958.

真麻竹 zhen ma zhu

Cephalostachyum scandens Hsueh & C. M. Hui (1997),

not Bor (1958); *Schizostachyum scandens* (Bor) H. B. Naithani & Bennet.

Culms climbing, 20–30(–50) m, 1–3.5 cm in diam., internodes 50–80(–120) cm, apically brown setose, thickly walled but hollow. Branches many, dominant branch often replacing main culm. Culm sheaths persistent, shorter than internode, base very tough, apex papery, with stiff, dark brown or black, appressed hairs; auricles absent; ligule truncate, ca. 1 mm; blade erect, not articulate with sheath, ciliate. Leaves 4 or 5 per ultimate branch; sheaths glabrous; auricles with setae 5–10 mm; ligule truncate, less than 1 mm; pseudopetiole ca. 5 mm; blade 17–25 × 2–3 mm, apex caudate. Inflorescence capitate, solitary at tip of leafy branch, subtended by several bracts; bracts marginally ciliate, long mucronate or awned. Glumes 2 or 3, long mucronate or awned; lemma similar to glume, margins distally ciliate; lodicules 3, conspicuous; membranous. Stamens 6; filaments long. Ovary broadly globose, stalked; style small. Fl. Mar–Apr.

Broad-leaved forests; 1600–2000 m. NW Yunnan [N Myanmar].

Bor described this species from Myanmar (where further gatherings are required). Hsueh and Hui were apparently unaware of Bor's name when they described the same species from Yunnan and coincidentally gave it the same name.

3. *Cephalostachyum pergracile* Munro, Trans. Linn. Soc. London 26: 141. 1868.

香糯竹 xiang nuo zhu

Schizostachyum pergracile (Munro) R. B. Majumdar.

Culms erect, 9–12 m, 5–7.5 cm in diam., apically drooping; internodes 30–45 cm, initially densely appressed setose; wall thin. Culm sheaths tardily deciduous, brown, shorter than culms, 10–15 × 15–20 cm, thickly leathery, smooth, densely glossy black-brown setose; auricles rounded, undulate, hirsute near margins; ligule inconspicuous; blade reflexed, ovate-acuminate, ca. 5 cm, articulate with sheath, adaxially densely hairy. Leaf sheath margins ciliate; ligule ciliate; blade narrowly lanceolate, 15–35 × 2.5–3.8(–6) cm, base rounded. Inflorescences capitate, at nodes of leafless branch, 1.5–3 cm in diam., subtended by bracts. Pseudospikelet 1.2–2 × ca. 0.2 cm, densely yellow hirtellous, rachilla extended, 5–6 mm. Glumes 2 or 3, 0.6–1.1 cm; lemma 1.3–1.8 cm, densely hairy, apex long mucronate or awned; palea about as long as or longer than lemma, apex bifid; lodicules lanceolate, narrow, membranous, apex acute. Anthers purple. Stigmas 3. Caryopsis 6–8 × 2–3 mm, glabrous, apex with persistent style base.

Hills; 500–1200 m. S Yunnan [Myanmar].

4. *Cephalostachyum latifolium* Munro, Trans. Linn. Soc. London 26: 140. 1868.

空竹 kong zhu

Cephalostachyum fuchsianum Gamble; *Schizostachyum fuchsianum* (Gamble) R. B. Majumdar; *S. latifolium* (Munro) R. B. Majumdar.

Culms erect, 16–20 m, 3–3.5 cm in diam.; internodes 50–80 cm, smooth, glabrous; wall thin; nodal ridge not prominent. Branches many, clustered at each node, subequal. Culm sheaths deciduous, yellow, 20–38 cm, papery, densely brown ciliate, apex rounded and projecting upward on both sides of blade; auricles conspicuous; oral setae developed; ligule short; blade reflexed, narrowly lanceolate, to 25 cm, papery, articulate with sheath, adaxially ciliate, apex acute. Leaf sheaths 7–8 cm, pubescent, auricles inconspicuous; ligule truncate, short; blade ovate-elliptic, 25–30 × 8–10 cm, glabrous. Inflorescence capitate, solitary at tip of leafy branch, 2.5–5 cm in diam., subtended by bracts. Pseudospikelet 2–2.5 × 0.3–0.4 cm, with a rachilla extension. Glumes 1.5–2 cm, long mucronate or awned; lemma similar to glumes; palea slightly longer than lemma, membranous; lodicules 3, lanceolate, apex ciliate. Stamens 6; anthers yellow. Ovary ovoid; style 1; stigmas 2 or 3, plumose. Caryopsis nutlike, shortly apiculate.

1200–2000 m. Yunnan [Bhutan, NE India, Myanmar].

Cephalostachyum fuchsianum was described from older material of *C. latifolium*, most of which lacked the distinctive but soon deciduous oral setae. This description from Chinese material is not entirely consistent with typical *C. latifolium*.

5. *Cephalostachyum pallidum* Munro, Trans. Linn. Soc. London 26: 139. 1868.

小空竹 xiao kong zhu

Culms 6–12 m, 1.5–2.5 cm in diam., subscandent; internodes 50–80 cm, smooth; wall thin; nodal ridge not prominent; sheath scar prominent. Branches many, clustered at each node, subequal. Culm sheaths deciduous, yellow, oblong-lanceolate, 15–20 cm, thickly papery, abaxially appressed ciliate, apex truncate; ligule short; blade reflexed, narrowly lanceolate, 5–10 × 1–3 cm. Leaf sheaths pubescent; ligule conspicuous; blade ovate-lanceolate, 15–25 × 2–4 cm. Inflorescence capitate, solitary at tip of leafy branch, 1.5–2.5 cm in diam., subtended by many bractlets. Pseudospikelet 1.2–1.7 × 0.3–0.4 cm. Glumes ovate, long mucronate or awned; lemma similar to glumes; palea thin; lodicules 3, apex ciliate. Ovary ovoid-coniform; stigmas 2. Caryopsis ovoid, apex with persistent style base.

Broad-leaved forests; 1200–2000 m. Xizang, Yunnan [India, Myanmar].

This species was misidentified as *Cephalostachyum capitatum* Munro in Fl. Xizang. (5: 55. 1987).

6. *Cephalostachyum virgatum* (Munro) Kurz, Prelim. Rep. Forest Pegu, App. A: 137. 1875.

金毛空竹 jin mao kong zhu

Melocanna virgata Munro, Trans. Linn. Soc. London 26: 133. 1868.

Culms erect, 12–15 m, 5–10 cm in diam.; internodes 50–88 cm, with white, appressed setae and powder, becoming smooth and glabrous; wall thin. Culm sheaths deciduous, triangular, 15–20 cm, thinly leathery to leathery, densely yellow hirsute, mouth truncate; auricles conspicuous; oral setae developed; ligule short, fimbriate; blade reflexed or erect, triangular, 10–12.5 cm, adaxially with appressed bristles. Leaf sheaths smooth; auricles inconspicuous; ligule short, fimbriate; blade oblong-lanceolate to linear-lanceolate, 15–30 × 2–4.5 cm. Pseudospikelets glomerate at tips of leafy branches, 1.5–2 cm in diam., subtended by membranous bracts. Spikelets 1.25–1.5 cm, hispidulous; rachilla smooth. Glumes ovate, long mucronate or awned; lemma ca. 1 cm, hispidulous, apiculate. Palea slightly longer than lemma, nearly glabrous, weakly 2-keeled. Lodicules lanceolate, apex ciliate. Anthers narrow, apex obtuse. Ovary ovoid, glabrous; style robust; stigmas 2 or 3, purple, plumose. Fruit unknown.

Hills; 700–1000 m. Yunnan [India, Myanmar].

9. PSEUDOSTACHYUM Munro, Trans. Linn. Soc. London 26: 141. 1868.

泡竹属 pao zhu shu

Xia Nianhe (夏念和); Chris Stapleton

Shrubby bamboo. Rhizome long necked, pachymorph. Culms diffuse, basally erect with pendulous or clambering tips; internodes terete, glabrous; wall very thin; nodal ridge and sheath scar flat. Branches many, clustered at each node, subequal. Culm

sheath deciduous, shorter or longer than internode, basally initially with dense, deep brown, bristly hairs, apex truncate or shallowly arched-concave; auricles very small; ligule short; blade deciduous, usually erect. Leaf blade large, transverse veins scarcely visible abaxially. Inflorescence fully bracteate, iterant, subtended by scaly bracts. Pseudospikelets solitary or several clustered in axils of bracts, small, with 1 fertile floret. Rachilla extending beyond palea of fertile floret, with 1 sterile floret. Glume 1, long mucronate to awned; lemma similar to glume. Palea thin, 2-keeled. Lodicules 3–5, persistent. Stamens 6; filaments free; anthers apiculate at apex. Ovary stalked, glabrous; style long, hollow; stigmas 2. Fruit globose, base with persistent glume, lemma, palea, and lodicules, beaked at apex; pericarp crustaceous, readily separable from endosperm.

One species: Bhutan, China, NE India, Myanmar, Vietnam.

1. *Pseudostachyum polymorphum* Munro, Trans. Linn. Soc. London 26: 142. 1868.

泡竹 pao zhu

Schizostachyum leviculme McClure.

Rhizome neck to 1 m, to 1 cm in diam. Culms 5–10 m, 1.2–2 cm in diam.; internodes straight, 13–20 cm or longer, initially glaucous, with white powdery ring below node; nodes with level supra-nodal ridge and sheath scar; intranode ca. 3 mm; branching from ca. 5th node up. Branches ca. 50 cm. Culm sheaths broadly triangular, rather thin, proximally dark brown strigose, apex shallowly concave or truncate; auricles absent or very small; oral setae erect or curved; ligule short, ciliate, denticulate; blade narrowly triangular, striate, with some transverse veinlets. Leaf sheaths initially white powdery to slightly pubescent, glabrescent; auricles inconspicuous or

absent; oral setae few or absent; ligule short; petiole 3–6 mm, glabrous; blade oblong-lanceolate, ca. 12.5 × 2–6.8 cm, glabrous, base subrounded to cuneate, asymmetrical, apex acuminate with twisted strigose tip. Pseudospikelets in axil of narrow bracts. Spikelets ca. 5 mm; rachilla extending beyond palea of fertile floret and with a sterile or incomplete floret; fertile floret 1. Glumes large, usually 7-veined, apex mucronate; lemma similar to glume, upper margin ciliate; palea margin strongly involute; lodicules (3 or)4(or 5), large, margin ciliate. Filaments short, separate; anthers apiculate. Ovary narrowly ellipsoid; style long, hollow, apex bifid. Fruit compressed-globose; pericarp crustaceous, readily separable from endosperm.

Forest understories on slopes and hills; 200–1200 m. Guangdong, Guangxi, Yunnan [Bhutan, India, Myanmar, Vietnam].

The rhizomes are used for weaving sieves for selecting young fish; the culms are split for weaving fences.

10. MELOCANNA Trinius in Sprengel, Neue Entdeck. Pflanzenk. 2: 43. 1820 [“1821”].

梨竹属 li zhu shu

Xia Nianhe (夏念和); Chris Stapleton

Arborescent bamboo, moderately sized. Rhizome long necked, pachymorph. Culms diffuse or in open clumps, erect; internodes terete; wall thin; nodal ridge not prominent. Branches many, subequal. Culm sheaths persistent, shorter than internodes, distally corrugate, with external ligule; auricles absent; blade erect or basally erect, distally reflexed, sword-shaped, long. Leaves large, glabrous, transverse veins visible abaxially. Inflorescence fully bracteate, iterant, terminal. Pseudospikelets slightly compressed bilaterally, in clusters of 2–4 on flowering branches, with 1 fertile floret and 1 to several sterile florets. Rachilla articulate. Glumes 2–4, gemmiferous; lemma similar to glumes, ovate-lanceolate. Palea convolute, rounded. Lodicules 2. Stamens 6; filaments free or irregularly connate; anthers obtuse at apex. Ovary glabrous; style long, hollow; stigmas 2–4. Fruit pear-shaped, large, 5–13 cm, long beaked at apex; pericarp thick, fleshy, without endosperm, usually viviparous.

Two species: Bangladesh, India, Myanmar; one species (introduced) in China.

1. *Melocanna humilis* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42: 251. 1873.

梨竹 li zhu

Melocanna arundina C. E. Parkinson, nom. illeg. superfl.

Rhizome terete, to 5 m long, ca. 2.5 cm in diam., solid. Culms upright, with nodding tip, 8–20 m, 3–7 cm in diam.; internodes green initially, straw-colored when old, terete, (12–) 20–50 cm, slightly white powdery and pubescent initially, glabrous when old; wall 5–7.5 mm thick; nodal ridge not prominent; sheath scar evident. Branches many at upper nodes. Culm sheaths initially yellow-green, 10–15 cm, apex broadly concave, rigid, leathery, with deciduous, appressed, stiff, short, white hairs; uppermost part inflated; auricles inconspicuous; oral setae well developed; ligule short, serrulate at margin;

blade erect, linear-triangular, 10–30 cm, base ca. 2.5 cm wide. Leaf sheaths glabrous; auricles tiny, usually absent; oral setae 8–10 per side, deciduous, white, undulate or curved, 8–15 mm; blade lanceolate to oblong-lanceolate, 15–24(–35) × 2.5–3.5 cm. Pseudospikelets in clusters of 3 or 4 in axils of bracts, ca. 1.3 cm, glabrous; bracts 2–4, lanceolate. Lemma ovate-lanceolate; palea convolute, not keeled; lodicules 2. Ovary globose, glabrous; style slender; stigmas 2–4, outcurved. Fruit pear-shaped, large, 4.5–12.5 × 5–7 cm, fleshy, apex with a long, curved beak.

Cultivated. Guangdong, Guangxi, Taiwan [native to Myanmar].

The only difference from *Melocanna baccifera* Kurz is apparently stature: *M. baccifera* is larger than *M. humilis*, although internode length and leaf sheath auricles also require comparison. *Melocanna humilis* was misidentified in FRPS (9(1): 13. 1996) as *M. baccifera*, for

which name *M. bambusoides* is a widely used synonym. *Melocanna baccifera* is also in cultivation in Guangzhou.

The culms are used for pulping and are split for weaving, the leaves are used for making wine, and the fruit is edible.

11. NEOMICROCALAMUS P. C. Keng, J. Bamboo Res. 2(2): 10. 1983.

新小竹属 *xin xiao zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Microcalamus Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59: 207. 1890, not Franchet (1889).

Climbing or scrambling bamboos. Rhizomes short necked, pachymorph. Culms uniaespirate, scrambling, slender, hollow to solid; internodes terete, long, very smooth; nodes level to slightly raised with persistent sheath-base collar. Branches many, central dominant, approaching size of culm, others short and subequal. Culm sheaths deciduous after branching, narrowly triangular, basally very tough, apically papery; ligule inconspicuous, auricles and oral setae absent; blade erect, acicular, short. Leaves broadly linear-lanceolate, small, venation indistinct, apex acicular. Inflorescence bracteate, lateral spikelets subtended by a bract and basally prophyllate. Prophyll and glumes not subtending buds. Spikelets sessile, several flowered, followed by a terminal incomplete floret. Rachilla disarticulating and florets separately deciduous. Glumes 1, or absent in terminal spikelets; lemma glabrous. Palea 2-keeled, usually equal in length to lemma. Lodicules 3. Stamens 6; filaments free. Ovary oblong or ovate, upper portion pubescent or glabrous; style 1; stigmas 3. Caryopsis shortly terete, grooved.

About five species: Bhutan, SW China, NE India, Vietnam; two species (one endemic) in China.

Although *Neomicrocalamus* has often been synonymized within the Malesian genus *Racemobambos* Holttum, there are substantial differences in vegetative and floral morphology, and molecular evidence has confirmed that they are not closely related.

In addition to the species treated below, *Neomicrocalamus microphyllus* Hsueh & T. P. Yi (in C. Y. Wu, Fl. Xizang. 5: 50. 1987) was described from SE Xizang (Médog). This name was previously published by the same authors (J. Bamboo Res. 2(1): 35. Jan 1983), but not validly so because the generic name was not validly published until July 1983. The new combination "*Racemobambos microphylla*" (P. C. Keng & T. H. Wen, J. Bamboo Res. 5(2): 13. 1986) was not validly published because its basionym was not validly published until 1987.

- 1a. Culm internodes glabrous; leaf sheaths glabrous, oral setae absent 1. *N. prainii*
 1b. Culm internodes white pubescent; leaf sheaths pubescent, with ciliate margins, oral setae present 2. *N. yunnanensis*

1. Neomicrocalamus prainii (Gamble) P. C. Keng, J. Bamboo Res. 2(2): 10. 1983.

新小竹 *xin xiao zhu*

Arundinaria prainii Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 21. 1896; *Racemobambos prainii* (Gamble) P. C. Keng & T. H. Wen; *Thamnocalamus prainii* (Gamble) E. G. Camus.

Culms scrambling, 6–20 m, 5–25 mm in diam.; nodes level; internodes 20–50 cm, solid or nearly so on smaller culms, glabrous. Dominant branches equal in size to culm. Culm sheaths retrorsely brown scabrous, distally purple-brown spotted, lower portion very tough, upper papery and thin, margins glabrous; ligule inconspicuous, auricles and oral setae absent; blade persistent, erect, acicular, short, to ca. 1 cm. Leaf sheaths 2–4 cm, glabrous or slightly pubescent; ligule 1–1.5 mm; auricles and oral setae absent; blade lanceolate, 4–12 × 0.5–2 cm, apex softly acicular. Spikelets 3–6-flowered, 2–3.5 cm; prophylls to 0.5 cm. Lemma 5–7 mm; palea equal to lemma, obtuse; lodicules 1.5–2 mm. Anthers purple, 3–4 mm. Ovary oblong, upper portion pubescent; style short; stigma plumose. Caryopsis falcate, 4–5 mm, glabrous. Fl. Apr–Jun.

Mountain forests, river banks, rocks; 1200–2600 m. S Xizang, W Yunnan [India (Meghalaya), Myanmar].

2. Neomicrocalamus yunnanensis (T. H. Wen) Ohrnberger, Bamboos World Introd. 4: 19. 1997.

云南新小竹 *yun nan xin xiao zhu*

Racemobambos yunnanensis T. H. Wen, J. Bamboo Res. 5(2): 11. 1986.

Culms scrambling, 6–15 m, 5–10 mm in diam.; internodes 20–60 cm, smaller culms solid or nearly so, white pubescent, densely so below corky nodes. Dominant branches equal in size to culm. Culm sheaths brown scabrous, distally purple-brown spotted, lower portion very tough, upper papery and thin, margins glabrous; ligule inconspicuous, auricles and oral setae absent; blade persistent, erect, acicular, short, ca. 1 cm. Leaf sheaths slightly pubescent, margins ciliate; ligule 1–1.5 mm; auricles absent; oral setae erect to spreading, short; blade lanceolate, 4–7 × 0.8–1.3 cm, glabrous, without tessellation. Flowers unknown.

• S Yunnan (Jinping).

12. YUSHANIA P. C. Keng, Acta Phytotax. Sin. 6: 355. 1957.

玉山竹属 *yu shan zhu shu*

Li Dezhu (李德铎), Guo Zhenhua (郭振华); Chris Stapleton

Burmabambus P. C. Keng; *Butania* P. C. Keng; *Monospatha* W. T. Lin.

Shrubby spreading bamboos, sometimes subarborescent. Rhizomes facultatively long necked, pachymorph, neck to (0.3–)0.5 (–2) m, solid or hollow. Culms pluricaespitose or diffuse, erect or ascending; internodes terete, often scabrous, usually without prominent vertical ridges; wall thick; nodes (supra-nodal ridges) slightly prominent; buds lanceolate or rarely ovate, with reduced sheathing. Branches often 1 at lower nodes, initially 5–7(–12) at middle nodes, 9–11(–45) at upper nodes, on promontory, erect or deflexed, subequal or central branch strongly dominant at lower nodes; internodes \pm terete. Culm sheaths tardily deciduous or persistent, usually initially setose, usually shorter than internodes; ligule usually truncate; blade usually reflexed, lanceolate or triangular. Leaves usually small to medium-sized; blade with prominent transverse veins. Inflorescence ebracteate, semelauctant, open, usually paniculate. Spikelets robust, long pedicellate, several to many flowered, apical floret sterile. Glumes 2; lemma mucronate or rarely obtuse, many veined; palea equal to or shorter than lemma, 2-keeled, obtuse; lodicules 3, transparent. Stamens 3; filaments free, long exerted; anthers yellow. Ovary appendage absent or inconspicuous; style 1, short or absent; stigmas usually 2, plumose.

About 80 species: Africa, E, S, and SE Asia; 58 species (57 endemic) in China.

Because of the poor knowledge of many taxa and their relatively recent description, often from a limited number of sterile gatherings, certain critical characteristics, notably rhizome neck lengths and culm and leaf proportions, are not accurately known, and many species boundaries remain untested.

In addition to the species treated below, *Yushania pingshanensis* T. P. Yi (J. Bamboo Res. 19(1): 21. 2000) was described from sterile material from Sichuan (Pingshan). In the protologue it was compared with *Y. straminea*. *Yushania pubescens* T. P. Yi (J. Bamboo Res. 19(1): 24. 2000) was described from sterile material from Sichuan (Pingshan). In the protologue it was compared with *Y. pingshanensis*.

- 1a. Culms with 5–9 branches or more per mid-culm node (often fewer in *Y. canoviridis*).
- 2a. Culm sheath auricles present.
 - 3a. Culms 1.2–3 cm in diam.; culm sheaths equal in length to internodes or slightly longer, apex acuminate narrowly triangular 1. *Y. vogens*
 - 3b. Culms less than 1.7 cm in diam.; culm sheaths much shorter than internodes, apex arcuate or broadly triangular.
 - 4a. Culm sheaths with dense, dark brown blotches or spots.
 - 5a. Culms 2–2.5 m, 5–10 mm in diam., internodes with purple spots when young; culm sheaths proximally sparsely pale fulvous setose 2. *Y. brevipaniculata*
 - 5b. Culms 3–7 m high, 9–17 mm in diam., internodes without purple spots when young; culm sheaths glabrous.
 - 6a. Leaf sheath auricles oblong or falcate, petiole abaxially pubescent; leaf blade (7–)11–17 mm wide, abaxially pallid 3. *Y. glauca*
 - 6b. Leaf sheath auricles absent, petiole glabrous; leaf blade 4–11 mm wide, abaxially bright green 4. *Y. lineolata*
 - 4b. Culm sheaths without blotches or spots.
 - 7a. Culm internodes initially setose; leaf blade abaxially initially pubescent 5. *Y. hirticaulis*
 - 7b. Culm internodes glabrous; leaf blades abaxially glabrous.
 - 8a. Culms 2–2.5(–3.5) m, internodes 20–80 cm; branches to 15 per node; culm sheaths proximally nearly smooth; leaf sheath auricles well developed, oral setae radiating 6. *Y. falcataurita*
 - 8b. Culms to 1.6 m, internodes 15–25 cm; branches (1 or)2–6 per node; culm sheaths conspicuously longitudinally ribbed; leaf sheath auricles absent or fairly small, oral setae erect 7. *Y. canoviridis*
- 2b. Culm sheath auricles absent.
 - 9a. Rhizome necks hollow.
 - 10a. Culm sheaths hairy (sometimes glabrous in *Y. weixiensis* and *Y. qiaojiaensis* var. *nuda*); leaf sheath auricles present, oblong or minute.
 - 11a. Rhizome necks thick, 7–10 mm in diam.; culm sheath blades reflexed; leaf blades glabrous, delicate ... 8. *Y. weixiensis*
 - 11b. Rhizome necks thin, 5–7 mm in diam.; culm sheath blades erect; leaf blades adaxially sparsely pubescent, tough 9. *Y. qiaojiaensis*
 - 10b. Culm sheaths glabrous; leaf sheath auricles absent.
 - 12a. Culm sheath apically rounded, longitudinal ribs inconspicuous; culm sheath blades erect; leaf blades thick, with densely tessellate venation 10. *Y. cava*
 - 12b. Culm sheath apically acuminate, longitudinal ribs prominent; culm sheath blades reflexed; leaf blades thin, with sparsely tessellate venation 11. *Y. yadongensis*
 - 9b. Rhizome necks solid.
 - 13a. Culm sheaths nearly as long as internodes or longer (rarely only 1/2 internode length in *Y. exilis* and *Y. varians*).
 - 14a. Culm internodes initially entirely or distally setulose.
 - 15a. Culms to 2 m; internodes with fine prominent ridges 12. *Y. violascens*
 - 15b. Culms to 5 m, internodes smooth.
 - 16a. Culm internodes not pruinose; culm sheaths with conspicuous longitudinal ribs, tessellate venation not evident; leaf sheath oral setae 1.5–3 mm 13. *Y. crassicollis*
 - 16b. Culm internodes densely pruinose; culm sheaths with conspicuous longitudinal ribs, tessellate venation distinct; leaf sheath oral setae to 6 mm 14. *Y. bojieiana*

- 14b. Culm internodes glabrous.
- 17a. Culm internodes proximally flattened above branches.
- 18a. Culms to 4.5 m; leaf blades to 14 cm, with 4 or 5 pairs of secondary veins (E Guizhou) 15. *Y. complanata*
- 18b. Culms to 1.5 m; leaf blades to 9 cm, with 3 or 4 pairs of secondary veins (N Fujian) 16. *Y. longissima*
- 17b. Culm internodes not proximally flattened above branches.
- 19a. Culms to 5 m; culm sheaths densely setose 17. *Y. flexa*
- 19b. Culms to 2.5 m; culm sheaths sparsely setose.
- 20a. Culm internodes to 28 cm; branches 1–1.5 mm thick, apically pendulous; culm sheath oral setae 4–6; culm sheath blades revolute; leaf sheath auricles absent, oral setae erect; leaf blades to 8 mm wide 18. *Y. exilis*
- 20b. Culm internodes to 15 cm; branches to 3.5 mm thick, erect; culm sheath oral setae absent to 2; culm sheath blades usually erect; leaf sheath auricles oblong, oral setae radiating; leaf blades to 12 mm wide 19. *Y. varians*
- 13b. Culm sheaths less than 1/2(–3/5) internode length (to 2/3 in *Y. baishanzuensis*).
- 21a. Culm internodes initially apically pubescent or setose.
- 22a. Culm internodes solid or subsolid, cavity to 1/3 culm wall thickness.
- 23a. Culm sheaths cartilaginous, with dense purple-brown spots, glabrous or sparsely brown ciliate at base 20. *Y. maculata*
- 23b. Culm sheaths leathery, without spots, gray or fulvous setose or thickly hairy.
- 24a. Culm internodes initially apically densely pruinose and sparsely gray setose below nodes; leaf blade to 2 cm wide, tessellation distinct; lemma glabrous 21. *Y. longiuscula*
- 24b. Culm internodes densely pruinose, sparsely brown setose below nodes; leaf blade to 1.2 cm wide, tessellation indistinct; lemma initially sparsely pubescent 22. *Y. crispata*
- 22b. Culm internodes hollow, cavity more than 1/2 culm wall thickness.
- 25a. Leaf blade abaxially gray pubescent 23. *Y. lacera*
- 25b. Leaf blade abaxially glabrous.
- 26a. Culms 4–7 m, to 3(–6) cm in diam.; culm sheaths densely fulvous setose, especially at base; leaf sheath oral setae absent to 3; leaf blade secondary veins 2- or 3-paired 24. *Y. elevata*
- 26b. Culms 1.5–2 m, to 0.5 cm in diam.; culm sheaths sparsely white setose toward margins; leaf sheath oral setae more than 10; leaf blade secondary veins 4-paired 25. *Y. baishanzuensis*
- 21b. Culm internodes apically glabrous (sometimes setose in *Y. mitis* and *Y. xizangensis*).
- 27a. Culms to 7 m, to 3 cm in diam.
- 28a. Culm internodes with fine ridges, hollow.
- 29a. Culm internodes initially pruinose; branches 3–7 per node; culm sheaths densely purple-brown blotched; pseudopetioles glabrous 29. *Y. mitis*
- 29b. Culm internodes of young culms not pruinose; branches 10–19 per node; culm sheaths without blotches; pseudopetioles adaxially slightly setose 30. *Y. xizangensis*
- 28b. Culm internodes smooth, solid or subsolid.
- 30a. Culm sheaths densely brown to black setose, not striped, oral setae absent or scarce 26. *Y. farcticaulis*
- 30b. Culm sheaths glabrous or with adnate fulvous seta at base, initially with sporadic longitudinal stripes, oral setae absent.
- 31a. Culm internodes solid; leaf blades to 10(–12.5) cm, secondary veins 3–5-paired 27. *Y. levigata*
- 31b. Culm internodes hollow; leaf blades to 7.5 cm, secondary veins 2-paired 28. *Y. ailuopodina*
- 27b. Culms to 3(–4) m, to 1 cm in diam.
- 32a. Leaf blade abaxially proximally pale pubescent initially.
- 33a. Culms 4–6 mm in diam.; internodes terete; culm sheaths glabrous or basally yellow-brown setose; leaf blades 9–13 mm wide, with 3 or 4 pairs of secondary veins 31. *Y. brevis*
- 33b. Culms 10–13 mm in diam.; internodes flattened above branches; culm sheaths more uniformly yellow-brown setose; leaf blades 14–23 mm wide, with 4 or 5 pairs of secondary veins 32. *Y. menghaiensis*
- 32b. Leaf blades completely glabrous.
- 34a. Culm internodes with fine conspicuous ridges; leaf sheaths 4.2–6 cm 33. *Y. collina*
- 34b. Culm internodes smooth or with inconspicuous fine ridges; leaf sheaths no longer than 5 cm.
- 35a. Culm sheaths persistently retrorsely setose, oral setae ca. 5; leaf blades with 4–6 pairs of secondary veins 34. *Y. farinosa*
- 35b. Culm sheaths glabrous or rarely gray setose, oral setae absent to 2; leaf blades with 3 or 4 pairs of secondary veins.
- 36a. Culm internodes hollow; branches 5–9 per node; culm sheath margins glabrous, ligules 1–1.4 mm; leaf sheath margins glabrous, auricles ca. 1 mm, leaf blade basally cuneate 35. *Y. laetevirens*

- 36b. Culm internodes solid or subsolid; branches (3–)8–30(–45) per node; culm sheath margins glabrous or initially ciliate; leaf sheath margin initially gray ciliate, auricles ca. 0.3 mm, leaf blade basally broadly cuneate or suborbicular 36. *Y. multiramea*
- 1b. Culms with 1 branch per mid-culm node, or 1 branch on lower nodes and 3–5(–8) on mid-culm and upper culm regions, rarely branches absent.
- 37a. Culm sheath auricles conspicuous.
- 38a. Culm internodes initially distally pubescent or setose.
- 39a. Leaf blades abaxially glabrous.
- 40a. Culms 4–8 mm in diam., branches with secondary branching 37. *Y. mabianensis*
- 40b. Culms 1.5–2.5 mm in diam., branches absent or solitary and without secondary branching 38. *Y. andropogonoides*
- 39b. Leaf blades abaxially pubescent.
- 41a. Branches solitary at all nodes; leaf sheath auricles and oral setae absent 39. *Y. grammata*
- 41b. Branches 3(–5) per node on upper culm; leaf sheath auricles conspicuous, oral setae radiating.
- 42a. Culm internodes to 25(–37) cm, initially with dense purple spots; culm sheaths with longitudinal ribs inconspicuous or distally conspicuous, oral setae 2–5 mm 40. *Y. polytricha*
- 42b. Culm internodes to 15(–37) cm, without spots; culm sheaths with longitudinal ribs conspicuous, oral setae 4–15 mm 41. *Y. basihirsuta*
- 38b. Culm internodes glabrous.
- 43a. Branches 1.5–3 mm in diam.; leaf blade 1.2–1.7 cm wide, secondary veins 4- or 5-paired 42. *Y. longiaurita*
- 43b. Branches 3–8(–12) mm in diam.; leaf blade 3–5.7 cm wide, secondary veins 7–11-paired.
- 44a. Branches always 1 per node; leaf blade (13–)19–26(–33) cm 43. *Y. chingii*
- 44b. Branches several per node on upper culm; leaf blade 7–19 cm.
- 45a. Culm sheaths densely setose.
- 46a. Culm internodes without spots; culm sheath oral setae to 2 cm; pseudopetioles villosulous, leaf blade secondary veins (3 or)4- or 5(or 6)-paired, tessellations rectangular 46. *Y. straminea*
- 46b. Culm internodes initially purple spotted; culm sheath oral setae 3–6 mm; pseudopetioles glabrous, leaf blade secondary veins 5–9-paired, tessellations square.
- 47a. Culms to 2.5 m, internodes 16–22 cm; oral setae 2–7 mm 44. *Y. auctiaurita*
- 47b. Culms to 3(–4) m, internodes to 32 cm; oral setae 10–12 mm 45. *Y. dafengdingensis*
- 45b. Culm sheaths glabrous.
- 48a. Culms to 4.5 m; leaf sheath oral setae 3–5 mm; pseudopetiole 7–9 mm; leaf blade 3.6–4 cm wide ... 47. *Y. oblonga*
- 48b. Culms to 2.5 m; leaf sheath oral setae 4–14 mm; pseudopetiole 2–3.5 mm; blade 1.8–2.8 cm wide 48. *Y. cartilaginea*
- 37b. Culm sheath auricles absent or reduced to small protuberances.
- 49a. Culm sheaths glabrous or basally yellow-gray setose.
- 50a. Culm internodes without purple spots when young; branches solitary at lower nodes, 3–5 at upper nodes.
- 51a. Culms to 10 mm in diam., internodes hollow, initially thickly pruinose below nodes and distally with siliceous stubble, longitudinal ribs inconspicuous; branchlets with 6–8 leaf blades; leaf sheaths 2.5–4 cm; blades to 13 cm 49. *Y. wuyishanensis*
- 51b. Culms 4–5 mm in diam., internodes subsolid, initially pruinose under nodes and distally villosulous, longitudinal ribs conspicuous; branchlets with 1–3 leaf blades; leaf sheaths 4–9 cm; blades to 19(–27) cm 50. *Y. glandulosa*
- 50b. Culm internodes with purple blotches when young, branches solitary at nodes.
- 52a. Culm shoots pruinose, brown setose at base; leaf blade oblong-lanceolate or ovate-elliptical, 3–5 cm wide, conspicuously rugose when dried 51. *Y. rugosa*
- 52b. Culm shoots not pruinose, glabrous; leaf blade lanceolate, 1.5–2.6 cm wide, usually flat when dried 52. *Y. uniramosa*
- 49b. Culm sheaths setose or initially so.
- 53a. Culm internodes terete.
- 54a. Culm internodes uniformly pruinose; sheath scars yellow setose initially; leaf blades 0.6–1.5(–2.1) cm wide, abaxially proximally gray-yellow pubescent by midrib and on pseudopetiole 53. *Y. confusa*
- 54b. Culm internodes only apically pruinose; sheath scars glabrous; leaf blades 1.5–2.2(–2.8) cm wide, glabrous.
- 55a. Culms to 3.5 m; culm sheaths cartilaginous, with erect setae; branchlets with 2–5 blades 54. *Y. pauciramificans*
- 55b. Culms to 1.8 m; culm sheaths leathery, with sparse, appressed setae; branchlets with 4–9 blades 55. *Y. punctulata*
- 53b. Culm internodes grooved above branches, especially in lower culm.
- 56a. Culm internodes glabrous 56. *Y. pachyclada*
- 56b. Culm internodes initially hispidulous.
- 57a. Leaf sheath distally villosulous, oral setae present, brown, 2–4 mm; leaf blade glabrous, 0.3–1.3 cm wide, secondary veins 2–4-paired 57. *Y. niitakayamensis*

- 57b. Leaf sheaths glabrous, oral setae absent (rarely 1–3, erect); leaf blade abaxially initially villousulous, 1–2.5 cm wide, secondary veins 4–8-paired 58. *Y. suijiangensis*

1. *Yushania vigens* T. P. Yi, J. Bamboo Res. 5(1): 40. 1986.

长肩毛玉山竹 chang jian mao yu shan zhu

Rhizome neck ca. 50 cm. Culms 2.5–7 m, 1.2–3 cm in diam.; internodes green, rarely light yellow striped, terete, 20–23 cm, glabrous, smooth, solid or nearly so; nodes with level supra-nodal ridge; sheath scar prominent with or without persistent remains of sheath base. Branches 5–9, roughly horizontal. Culm sheaths persistent, narrowly triangular, equal to or longer than internodes, basally cartilaginous, distally leathery, abaxially densely brown or dark brown setose, margins densely brown ciliate initially; auricles dark purple, triangular or elliptic; oral setae dense; ligule purple, arcuate, densely ciliate initially; blade erect, linear-lanceolate, glabrous. Leaves 3–5 per ultimate branch; leaf sheath margins glabrous; auricles absent; oral setae few, light yellow, 4–9 mm; ligule purple, arcuate, glabrous; blade linear-lanceolate, 8.5–19 × 1–1.6 cm, glabrous, secondary veins 5-paired, transverse veins indistinct, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots Jul–Aug.

- 1900–2500 m. W Yunnan.

The culms are used for weaving.

2. *Yushania brevipaniculata* (Handel-Mazzetti) T. P. Yi, J. Bamboo Res. 5(1): 44. 1986.

短锥玉山竹 duan zhui yu shan zhu

Arundinaria brevipaniculata Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 57: 237. 1920; *A. chungii* Keng; *Sinarundinaria brevipaniculata* (Handel-Mazzetti) Keng ex P. C. Keng; *S. chungii* (Keng) P. C. Keng; *Yushania chungii* (Keng) Z. P. Wang.

Rhizome neck to 20 cm. Culms 2–2.5 m, 5–10 mm in diam.; internodes initially purple-brown spotted, terete, ca. 32 cm, densely white powdery, glabrous; wall ca. 2.5 mm thick; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent, initially brown setulose. Branches 3–7. Culm sheaths persistent, abaxially spotted, narrowly rounded, ca. 1/3 as long as internodes, cartilaginous, basally sparsely light yellow setulose, margins apically light yellow-brown ciliate; auricles very strongly developed, purple, falcate; oral setae radiating, 7–8 mm; ligule arcuate, ca. 4 mm, glabrous; blade linear-lanceolate, revolute, glabrous. Leaves ca. 3 per ultimate branch; leaf sheath glabrous; auricles brown, falcate, oral setae radiating, yellow-brown, 2–5 mm; ligule arcuate, 1–2 mm, glabrous; blade lanceolate, 7–12 × 0.8–1.6 cm, glabrous, secondary veins 3–5-paired, base cuneate or broadly cuneate, margins spinescent-serrulate. Inflorescence paniculate; pedicel with axillary verruculose glands. Spikelets more than 20, 2.5–5 cm; rachilla 5–8 mm, hairy; florets 4–7, purple. Lemma purple, hairy at base, apex obtuse or acuminate; palea keels hairy. Caryopsis dark brown, trilateral, with persistent style base. New shoots Jun–Aug.

- 1800–3800 m. W Sichuan.

The shoots are edible and are an important food for the giant panda.

3. *Yushania glauca* T. P. Yi & T. L. Long, J. Bamboo Res. 8(2): 33. 1989.

白背玉山竹 bai bei yu shan zhu

Rhizome neck 15–45 cm. Culms 3–7 m, 1.1–1.7 cm in diam.; internodes terete, 26–33 cm, initially thickly white powdery, glabrous; wall 2.5–5 mm thick; nodes with weakly prominent supra-nodal ridge; sheath scar prominent, woody. Branches 3–5, roughly horizontal. Culm sheaths persistent, abaxially purple spotted, narrowly rounded, 1/3–1/2 as long as internodes, cartilaginous, glabrous, longitudinal ribs purple, margins glabrous; auricles prominent, purple-red, falcate; oral setae many, radiating, 3–4 mm; ligule arcuate, 1–4 mm; blade erect, triangular or lanceolate, glabrous, base excurrent. Leaves 1–5 per ultimate branch; leaf sheath margins glabrous; auricles gradually deciduous, oblong or falcate; oral setae present; ligule inclined, 1–2 mm; blade abaxially pale, lanceolate, 4–13.5 × (0.7–)1.1–1.7 cm, glabrous, secondary veins 3–5-paired, transverse veins dense, thin, tessellate, base cuneate or broadly cuneate, margins serrulate. Inflorescence unknown. New shoots May.

- 2500–3200 m. S Sichuan.

This species would appear to be very similar to the preceding one.

The shoots are an important food for the giant panda.

4. *Yushania lineolata* T. P. Yi, J. Bamboo Res. 4(2): 31. 1985.

石棉玉山竹 shi mian yu shan zhu

Rhizome neck 9–16 cm. Culms ca. 3.5 m, 9–15 mm in diam.; internodes terete, 16–24 cm, initially densely white powdery, glabrous; wall 2–3 mm thick; nodes with level supra-nodal ridge; sheath scar prominent, initially yellow-brown setulose. Branches 3–7. Culm sheaths gradually deciduous, brown spotted, narrowly rounded, ca. 2/3 as long as internodes, cartilaginous, glabrous, margins gray-yellow ciliate; auricles falcate; oral setae radiating, yellow-brown or purple, 4–9 mm; ligule arcuate, 2–3 mm; blade linear-lanceolate, revolute, initially apically sparsely setulose. Leaves 1–3 per ultimate branch; leaf sheath glabrous; auricles absent; oral setae present or absent; ligule truncate or arcuate, ca. 1 mm; blade abaxially bright green, lanceolate, 3.5–9.5 × 0.4–1.1 cm, glabrous, secondary veins 3- or 4-paired, transverse veins prominent, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence paniculate; pedicels without glands. Spikelets 6–12, 2.4–4 cm; rachilla 4–5 mm, hairy, margins densely ciliate, apex swollen; florets 3–7, purple. Glumes 2, unequal; lemma purple, hairy at base, margins ciliate, apex obtuse or acuminate; palea keels ciliate. Ovary ovoid, glabrous. Caryopsis unknown. New shoots May–Jun.

- 2600–2700 m. SW Sichuan.

The shoots are edible and are an important food for the giant panda.

5. *Yushania hirticaulis* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 94. 1981.

毛竿玉山竹 *mao gan yu shan zhu*

Culms 0.7–3 m, 0.45–1 cm in diam.; internodes terete, 12–20 cm, initially densely white powdery, later basally white powdery only below nodes, initially setose; wall 1.2–2 mm thick; nodes with weakly prominent supra-nodal ridge; sheath scar prominent, initially densely yellow-brown setose with persistent remains of sheath base. Branches 3 to many, thickly white powdery below nodes. Culm sheaths persistent or gradually deciduous, triangularly narrowly rounded, shorter than internode, leathery, brown setose, especially densely so at base, margins densely brown ciliate; auricles elliptic, narrowly triangular, or falcate, small, puberulous; oral setae erect, yellow-brown, to 1.5 cm; ligule dark purple, arcuate, abaxially slightly hairy and white powdery; blade erect, triangular or linear-triangular, glabrous. Leaves 3–5 per ultimate branch; leaf sheath apically hairy; auricles small or obscure, subcircular or triangular; oral setae several, light yellow, 5–12 mm; ligule arcuate, glabrous; blade linear-lanceolate, 5–12 × 0.5–1 cm, abaxially initially pubescent, secondary veins 3–5-paired, transverse veins obscure, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots May.

• 1300–2000 m. E Jiangxi.

6. *Yushania falcataurita* Hsueh & T. P. Yi, J. Bamboo Res. 5(1): 22. 1986.

粉竹 *fen zhu*

Culms 2–3.5 m, 0.8–1.5 cm in diam.; internodes 20–28 cm, flattened, grooved, thickly white powdery below nodes, nearly solid; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent, with persistent remains of sheath base. Branches 5–15, deflexed. Culm sheaths gradually deciduous, ca. 1/2 as long as internodes, conspicuously longitudinally ribbed only toward their apex, cartilaginous, gray or yellow-gray setose, margins densely yellow-brown setulose; auricles falcate, unequal; oral setae yellow-brown, 2–7 mm; ligule arcuate, short; blade erect, linear-lanceolate, glabrous. Leaves 2–4 per ultimate branch; leaf sheath initially gray setose, margins densely gray-yellow ciliate; auricles developed, purple, falcate; oral setae several, radiating, yellow-brown, 5–12 mm; ligule truncate or arcuate; blade lanceolate, 2–8.5 × 0.5–1.3 cm, glabrous, secondary veins 3–5-paired, transverse veins slightly visible, base nearly rounded or broadly cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots May–Jun.

• About 1200 m. W Yunnan.

The culms are split for weaving.

7. *Yushania canoviridis* G. H. Ye & Z. P. Wang, Acta Phytotax. Sin. 27: 228. 1989.

灰绿玉山竹 *hui lü yu shan zhu*

Monospatha canoviridis (G. H. Ye & Z. P. Wang) W. T. Lin; *M. triloba* W. T. Lin.

Rhizome neck 20–50 cm. Culms ca. 1.6 m, 4–5 mm in diam.; internodes terete, 15–25 cm, initially slightly white

powdery, glabrous, nearly solid. Branches (1 or) 2–6, deflexed; nodes with weakly prominent supra-nodal ridge; sheath scar prominent, glabrous. Culm sheath persistent, cartilaginous, narrowly rounded, 2/5–1/2 as long as internodes, abaxially gray or yellow-gray adnately clavate-setose, setae especially dense at base, longitudinal ribs prominent, margins densely ciliate, apex rounded; auricles falcate, with 5–15 oral setae 5–16 mm; ligule arcuate, short; blade erect or reflexed, linear-lanceolate or striped. Leaves 2–5 per ultimate branch. Leaf sheath purple, glabrous; auricle absent or small, oral setae 3–5, erect, 3–6 mm; ligule arcuate, ca. 0.2 mm; blade linear-lanceolate, 4.5–10 × 0.5–0.9 cm, glabrous, secondary veins 3- or 4-paired, transverse veins prominent, base cuneate. Inflorescence unknown. New shoots Jun.

• About 1100 m. NW Hunan.

8. *Yushania weixiensis* T. P. Yi, J. Bamboo Res. 5(1): 42. 1986.

竹扫子 *zhu sao zi*

Rhizome neck 20–50 cm; internodes 7–10 mm in diam., hollow. Culms 1–2 m, 3–10 mm in diam.; internodes terete, 18–25 cm, initially white powdery, white-gray setulose; wall ca. 2 mm thick; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent, initially yellow-brown setose. Branches 3–7. Culm sheath persistent, narrowly rounded, glabrous or sparsely yellow-brown setose, longitudinal ribs prominent; auricles and oral setae absent; ligule truncate or arcuate, ca. 0.5 mm, glabrous; blade conical or linear-lanceolate, revolute. Leaves 3–5 per ultimate branch; sheath margins glabrous; auricles absent; oral setae 3–5, yellow, 1–4 mm; ligule truncate or arcuate, glabrous; blade narrowly lanceolate, 3.4–7 × 0.3–0.6 cm, glabrous, secondary veins 2- or 3-paired, transverse veins slightly visible, base broadly cuneate, margins smooth. Inflorescence unknown. New shoots Jul.

• 2300–2600 m. W Yunnan.

9. *Yushania qiaojiaensis* Hsueh & T. P. Yi, J. Bamboo Res. 5(1): 8. 1986.

海竹 *hai zhu*

Rhizome neck 15–40 cm. Culms 0.5–3.1 m, to 1.5 cm in diam.; internodes terete, to 11 cm, glabrous, initially white powdery, longitudinal ribs prominent; wall 1–1.5 mm thick; pith membranous; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent. Branches 5 or 6. Culm sheath deciduous, narrowly triangular, shorter than internodes, thickly papery, retrorsely gray-yellow setose or glabrous, longitudinal ribs prominent; auricles and oral setae absent; ligule truncate or arcuate, ca. 0.5 mm, glabrous; blade erect, linear-triangular, glabrous. Leaves 1–3 per ultimate branch; sheath margins glabrous; auricles absent; oral setae 1–5, yellow, 1–2 mm; ligule purple-brown, truncate or irregularly fissured, glabrous; blade lanceolate or linear-lanceolate, 1.7–3.2 × 0.3–0.6 cm, abaxially glabrous, adaxially sparsely white-gray pubescent, secondary veins 2- or 3-paired, transverse veins slightly distinct, base broadly cuneate or nearly rounded, one margin densely serrulate, other margin nearly smooth. Inflorescence unknown. New shoots May or Aug.

• 2000–3100 m. NE Yunnan.

- 1a. Culms 0.5–0.6 m, to 0.4 cm in diam.; culm sheath retrorsely gray-yellow setose or glabrous; new shoots May 9a. var. *qiaojiaensis*
 1b. Culms 2–3.1 m, to 1.5 cm in diam., culm sheath glabrous; new shoots Aug 9b. var. *nuda*

9a. *Yushania qiaojiaensis* var. *qiaojiaensis*

海竹(原变种) *hai zhu* (yuan bian zhong)

Culms 0.5–0.6 m, to 0.4 cm in diam. New shoots May.

- About 3100 m. NE Yunnan.

9b. *Yushania qiaojiaensis* var. *nuda* (T. P. Yi) D. Z. Li & Z. H. Guo, stat. nov.

裸箨海竹 *luo tuo hai zhu*

Basionym: *Yushania qiaojiaensis* f. *nuda* T. P. Yi, J. Bamboo Res. 9(3): 42. 1990.

Culms 2–3.1 m, to 1.5 cm in diam., culm sheaths glabrous. New shoots Aug.

- 2000–2100 m. NE Yunnan.

The shoots are edible, and the culms provide material for weaving.

10. *Yushania cava* T. P. Yi, J. Bamboo Res. 4(2): 33. 1985.

空柄玉山竹 *kong bing yu shan zhu*

Rhizome neck 14–42 cm, internodes and nodes hollow. Culms 3.5–6 m, 6–15 mm in diam.; internodes terete, 14–34 cm, with white powdery ring below nodes, glabrous; wall 1.5–2.5 mm; pith initially lamellate, later granular; nodes with level or weakly prominent supra-nodal ridge; sheath scar weakly prominent. Branches 4–9 with white powdery internodes. Culm sheaths deciduous, narrowly rounded, shorter than internodes, inconspicuously longitudinally ribbed, cartilaginous, glabrous, abaxially waxy, margins initially white-gray ciliate; auricles absent; oral setae absent to 3, yellow-brown, 1–6 mm; ligule 1–1.5 mm, convex, margins initially ciliate; blade erect, linear-triangular or linear-lanceolate, glabrous. Leaves 2–5 per ultimate branch; sheath margins initially gray ciliate; auricles absent; oral setae 5–7, yellow, 1.5–7 mm; ligule truncate, glabrous; blade linear-lanceolate, 3.3–5 × 0.5–0.6 cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots May–Jun.

- 2000–2600 m. N Sichuan.

Yushania cava is an important food for the giant panda.

11. *Yushania yadongensis* T. P. Yi, J. Bamboo Res. 4(2): 33. 1985.

亚东玉山竹 *ya dong yu shan zhu*

Yushania longissima T. P. Yi, J. Bamboo Res. 2(2): 46. 1983, not K. F. Huang & Q. F. Zheng (1982); *Fargesia longissima* T. P. Yi, nom. illeg. superfl.

Rhizome neck 11–65 cm, internodes hollow. Culms to 4 m, 1–2 cm in diam.; internodes terete, 21–34 cm, white powdery in ring below nodes, slightly setulose initially; wall 2–3

mm; longitudinal ribs prominent; nodes with weakly prominent supra-nodal ridge; sheath scar level, glabrous. Branches 3–7. Culm sheath gradually deciduous, rectangular, conspicuously longitudinally ribbed, leathery, abaxially glabrous and waxy, margins dark gray ciliate; auricles and oral setae absent; ligule truncate, ca. 0.5 mm, glabrous; blade linear-triangular, adaxially yellow-brown hairy proximally, revolute. Leaves 2 or 3 per ultimate branch; sheath apically puberulous with glabrous margins; auricles absent; oral setae gray, 3–4 mm; ligule truncate, glabrous; blade lanceolate, 3.3–6 × 0.5–0.8 cm, basally broadly cuneate or rounded, abaxially gray pubescent, secondary veins 2-paired, transverse veins distinct, margins scabrous. Inflorescence unknown. New shoots May–Jun.

Forests, pastures; 2000–2800 m. S Xizang [Bhutan].

12. *Yushania violascens* (Keng) T. P. Yi, J. Bamboo Res. 5(1): 45. 1986.

紫花玉山竹 *zi hua yu shan zhu*

Arundinaria violascens Keng, J. Wash. Acad. Sci. 26(10): 396. 1936; *Sinarundinaria violascens* (Keng) P. C. Keng.

Rhizome neck 18–60 cm. Culms 1.5–2 m, 5–10 mm in diam.; internodes terete, 15–28 cm, initially densely white powdery, apically sparsely white or yellow-brown setose; wall 2–4 mm thick; nodes with level supra-nodal ridge; sheath scar prominent, initially light yellow setulose. Branches 7 or 8, nearly solid. Culm sheath gradually deciduous, green or purple striped, nearly as long as internodes or longer, conspicuously longitudinally ribbed, leathery, sparsely light yellow setose, margins initially ciliate; auricles small; oral setae 3–6, yellow-brown, curved, 3–8 mm; ligule purple, truncate, ca. 1 mm, apically puberulous; blade revolute or rarely erect, linear-lanceolate, margins serrulate, rolled when dry. Leaves 2–4 per ultimate branch; sheath margins yellow-brown ciliate; auricles absent; oral setae present, 1–2.5 mm; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 4.5–8.5 × 0.5–0.9 cm, glabrous, secondary veins 3- or 4-paired, transverse veins well-defined, base cuneate, margins spinescent-serrulate or one margin smooth. Inflorescence racemose. Spikelets 3–5, 2.7–4 cm; rachilla ca. 4 mm, apex pubescent; florets 5–9, dark purple. Glumes 2, unequal, slightly hairy apically; lemma hairy, apex mucronate or acuminate. Palea bifid, keels ciliate. Lodicules 3, margins fimbriate. Anthers yellow. Ovary fusiform; styles 2–4, very short; stigma plumose; caryopsis unknown. New shoots Jun–Jul.

- 2400–3400 m. W Sichuan, NW Yunnan.

13. *Yushania crassicollis* T. P. Yi, Bull. Bot. Res., Harbin 8(4): 68. 1988.

粗柄玉山竹 *cu bing yu shan zhu*

Rhizome neck 26–62 cm. Culms 3–5 m, 1–2.5 cm in diam.; internodes terete, 15–24 cm, initially gray or light yellow clavate-setose, solid or nearly so; nodes ridged, prominent, with prominent sheath scar. Branches 6–11, solid, 1–3 dominant, setose at base of internodes and sheath scar. Culm sheaths persistent, narrowly triangular, longer than internodes, abaxially variably yellow or yellow-brown adnately clavate-setose, promi-

nently longitudinally ribbed, cross veinlets obscure, margins yellow-brown setose, apex narrowly triangular; auricles absent; oral setae 3–7, white-gray, 2–7 mm; ligule short, convex, glabrous; blade erect or revolute, linear-lanceolate, glabrous, rugose, margins revolute, serrulate. Leaves 3–6 per ultimate branch; sheath purple, glabrous; auricles absent; oral setae 3–5, gray, 1.5–3 mm; ligule very short, glabrous; blade lanceolate, 3–11 × 0.5–1.3 cm, glabrous, secondary veins 2–4-paired, transverse veins slightly visible, base cuneate or broadly cuneate, one margin serrulate, other margin obscurely so. Inflorescence unknown. New shoots Aug.

• 2400–2600 m. W Yunnan.

The shoots are edible, and the split culms are used for weaving.

14. *Yushania bojiciana* T. P. Yi, J. Bamboo Res. 5(1): 8. 1986.

金平玉山竹 jin ping yu shan zhu

Rhizome neck 15–50 cm. Culms 3–5 m, 1–1.5 cm in diam.; internodes terete, 23–32 cm, initially basally densely white powdery and brown setose; wall 1.5–5 mm thick; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent. Branches 6–8. Culm sheath persistent, narrowly triangular, shorter than internode but at least 3/5 as long, thinly leathery, abaxially sparsely yellow or yellow-brown setose, setae especially dense at base, margins densely yellow or yellow-brown setose apically, longitudinal ribs and cross veinlets very prominent, apex triangular; auricles absent; oral setae deciduous, absent or light yellow; ligule truncate, ca. 1 mm, initially ciliate; blade linear or linear-lanceolate, glabrous, revolute. Leaves 3–6 per ultimate branch; sheath glabrous or basally yellow setose; auricles absent; oral setae 3–9, gray-yellow, ca. 6 mm; ligule truncate, ca. 0.5 mm, glabrous; blade lanceolate, 4.3–9.2 × 1–1.5 cm, glabrous, secondary veins 4- or 5-paired, transverse veins slightly distinct, base broadly cuneate or rounded, one margin serrulate, other obscurely so. Inflorescence unknown. New shoots Sep.

• 2100–2300 m. S Yunnan.

15. *Yushania complanata* T. P. Yi, J. Bamboo Res. 5(1): 15. 1986.

梵净山玉山竹 fan jing shan yu shan zhu

Rhizome neck more than 15 cm; internodes solid. Culms 3–4.5 m, 0.5–1.2 cm in diam.; internodes terete, 16–24 cm, longitudinally ribbed, flattened above branches, initially densely waxy, white powdery, glabrous; wall 1.5–2 mm; supra-nodal ridge weakly prominent; sheath scar prominent. Branches 3–6. Culm sheath deciduous, triangular-rectangular, longer than internode, thinly leathery, with sparse adnate light yellow or yellow-brown setae, apical margins densely yellow-brown setulose, longitudinal ribs greatly prominent; auricles absent; oral setae present initially; ligule convex, irregularly fissured, initially ciliate; blade linear-triangular or linear-lanceolate, glabrous, revolute. Leaves 5–7 per ultimate branch; sheath glabrous; auricles absent, oral setae absent or present initially; ligule truncate, glabrous; blade lanceolate, 7–14 × 1–1.6 cm, glabrous, secondary veins 4- or 5-paired, transverse veins well-defined, one margin serrulate, other obscurely so. Inflorescence unknown. New shoots Apr.

• 2100–2400 m. E Guizhou.

16. *Yushania longissima* K. F. Huang & Q. F. Zheng, Wuyi Sci. J. 2(2): 20. 1982.

长鞘玉山竹 chang qiao yu shan zhu

Rhizome neck ca. 30 cm; internodes solid. Culms to 1.5 m, to 1.2 cm in diam.; internodes terete, ca. 13 cm, longitudinally ribbed, flattened above branches, initially with white powdery ring below node, glabrous; wall 1.5–3 mm thick; supra-nodal ridge weakly prominent; sheath scar prominent, with persistent remains of sheath base. Branches 3–7. Culm sheath gradually deciduous, narrowly triangular, longer than internodes, brown setulose, apically more densely so, longitudinal ribs greatly prominent, margins ciliate; auricles absent or small; oral setae initially 3 or 4, 8–10 mm; ligule arcuate, ca. 5 mm, margin glabrous; blade linear-lanceolate, glabrous, revolute. Leaves 5 or 6 per ultimate branch; sheath glabrous; auricles absent, oral setae 1–4, erect, yellow-brown, 2–5 mm; ligule truncate, ca. 0.5 mm, glabrous; blade linear-lanceolate, 4–9 × 0.5–0.9 cm, glabrous, secondary veins 3- or 4-paired, transverse veins not distinct, base cuneate, one margin serrulate, other obscurely so, apex acuminate. Inflorescence unknown.

• About 2100 m. N Fujian.

17. *Yushania flexa* T. P. Yi, Acta Phytotax. Sin. 25: 480. 1987.

弯毛玉山竹 wan mao yu shan zhu

Rhizome neck more than 37 cm; internodes solid, 6–10 mm in diam. Culms 3–5 m, 1–2.5 cm in diam.; internodes terete, 25–40 cm, not ribbed, initially thickly white powdery below nodes, glabrous, nearly solid; supra-nodal ridge weakly prominent; sheath scar prominent. Branches 5–8, deflexed. Culm sheaths persistent, triangularly narrowly rounded, shorter than internodes, prominently longitudinally ribbed, leathery, with densely appressed brown clavate-setose, margins glabrous; auricles absent; oral setae absent or present; ligule convex or truncate, 1–3 mm, sparsely ciliate; blade easily deciduous, linear-lanceolate, glabrous, margins serrulate, revolute. Leaves 4–6 per ultimate branch; sheath purple or purple-green, glabrous; auricles absent; oral setae absent or rarely present; ligule arcuate, 1–2 mm, glabrous; blade lanceolate, 7.5–15.5 × 1.2–2.1 cm, glabrous, secondary veins 3–5-paired, transverse veins slightly visible, base cuneate, one margin serrulate, other obscurely so. Inflorescence unknown. New shoots Aug–Sep.

• 2100–2300 m. S Yunnan.

The culms are used for weaving, furniture, and farm tools.

18. *Yushania exilis* T. P. Yi, J. Bamboo Res. 5(1): 20. 1986.

沐川玉山竹 mu chuan yu shan zhu

Rhizome neck ca. 50 cm; internodes less than 8 mm in diam., solid. Culms 1.5–2.5 m, 5–8 mm in diam.; internodes initially purple spotted, terete, 25–28 cm, white powdery especially below nodes, glabrous, not ribbed; wall 1.5–2 mm; nodes with level or weakly prominent supra-nodal ridge; sheath scar prominent. Branches 1–8, pendent toward apex. Culm sheaths persistent, purple-brown, narrowly triangular, shorter than or equal to internodes, leathery, sparsely brown setulose,

margins initially brown setulose, longitudinal ribs prominent; auricles absent; oral setae 4–6, erect, 5–12 mm; ligule purple-brown, truncate, 1–2 mm, glabrous; blade linear-lanceolate, glabrous, margins serrulate, rolled, revolute. Leaves 4–6 per ultimate branch; sheath glabrous; auricles absent; oral setae 1–3, erect, gray-brown or brown, 2–5 mm; ligule arcuate, ca. 1 mm, glabrous; blade linear-lanceolate, $2.3\text{--}9.5 \times (0.35\text{--})0.5\text{--}0.8$ cm, glabrous, secondary veins 3-paired, transverse veins visible, base cuneate, margins serrulate. Inflorescence unknown. New shoots May.

- 1200–1500 m. S Sichuan.

19. *Yushania varians* T. P. Yi, J. Bamboo Res. 5(1): 38. 1986.

庐山玉山竹 lu shan yu shan zhu

Rhizome neck more than 21 cm; internodes solid, less than 8 mm in diam. Culms 1–2 m, 3–8 mm in diam.; internodes terete, 8–15 cm, initially white powdery, densely so below nodes, glabrous, not ribbed; wall 1.5–2 mm thick; supra-nodal ridge level or prominent; sheath scar prominent, yellow-brown setose. Branches 1–7, erect or ascending. Culm sheath persistent, purple-brown, narrowly rounded-triangular, ca. 1/2 as long as internodes to equal in length, leathery, sparsely appressed brown setose, setae especially dense at base, margins glabrous or initially brown setulose, longitudinal ribs prominent; auricles absent; oral setae absent or present; ligule arcuate or truncate, 1–1.5 mm, glabrous; blade erect or rarely revolute, linear-lanceolate, glabrous. Leaves 2–7 per ultimate branch; sheath glabrous; auricles erect, narrowly rounded or small; oral setae 2–4, radiating, purple or yellow, 2–5 mm; ligule truncate, ca. 1 mm, glabrous; blade linear-lanceolate, $6\text{--}11.5 \times 0.8\text{--}1.2$ cm, glabrous, secondary veins 3–5-paired, transverse veins distinct, base cuneate, one margin densely serrulate, other sparsely so, apex long acuminate. Inflorescence unknown. New shoots May–Jul.

- About 1400 m. N Jiangxi.

20. *Yushania maculata* T. P. Yi, J. Bamboo Res. 5(1): 33. 1986.

斑壳玉山竹 ban ke yu shan zhu

Rhizome neck ca. 40 cm; internodes solid. Culms 2–3.5 m, 0.8–1.5 cm in diam.; internodes terete, 30–40 cm, initially densely white powdery, with gray or light yellow setae; wall 2–3 mm thick; supra-nodal ridge level or weakly prominent; sheath scar prominent, initially densely brown setose. Branches 7–12. Culm sheaths persistent, dark purple-brown spotted, oblong-triangular, ca. 1/3 as long as internodes, cartilaginous, mainly glabrous but sparsely brown setose at base, margins initially brown setulose, longitudinal ribs prominent; auricles absent; oral setae 3–5, erect, purple, 5–10 mm; ligule truncate, 1–2.5 mm; blade linear-lanceolate, glabrous, revolute. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent; oral setae 3–5, erect, purple, 4–7 mm; ligule truncate or arcuate, ca. 1 mm, glabrous; blade linear-lanceolate, $9\text{--}15 \times 0.9\text{--}1.1$ cm, glabrous, secondary veins 4-paired, transverse veins not distinct, base cuneate, margins initially serrulate, apex long acuminate. Inflorescence unknown. New shoots Aug.

- 1800–3500 m. SW Sichuan, NE Yunnan.

21. *Yushania longiuscula* T. P. Yi, J. Bamboo Res. 5(1): 30. 1986.

蒙自玉山竹 meng zi yu shan zhu

Rhizome neck ca. 50 cm; internodes solid. Culms 4–5 m, 1–2 cm in diam.; internodes terete, 32–45 cm, thickly white powdery below nodes, distally sparsely gray setulose, solid or nearly so; supra-nodal ridge weakly prominent; sheath scar prominent. Branches 8–13, deflexed. Culm sheaths persistent, narrowly rounded-triangular, ca. 1/2 as long as internodes, leathery, sparsely brown setose, margins apically yellow-brown setulose; auricles absent or small; oral setae deciduous; ligule truncate or convex, ca. 1 mm; blade deciduous, linear-lanceolate, glabrous, revolute. Leaves 2–4 per ultimate branch; sheath initially white powdery, glabrous; auricles absent; oral setae present; ligule truncate or convex, ca. 1 mm; blade lanceolate, $7.2\text{--}19 \times (1.2\text{--})1.5\text{--}2$ cm, glabrous, secondary veins 4- or 5-paired, transverse veins conspicuous, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence paniculate. Spikelets purple-red, 2–4 cm, robust; rachilla 3.5–5 mm, apically pubescent and swollen; florets 4–10, terminal one sterile. Glumes 2, unequal, glabrous; lemma glabrous, lowermost 1–1.6 cm, apex acuminate; palea keels ciliate, apex bifid. Ovary ovoid. Caryopsis unknown. New shoots Aug.

- 2100–2800 m. S Yunnan.

22. *Yushania crispata* T. P. Yi, J. Bamboo Res. 10(1): 26. 1991.

波柄玉山竹 bo bing yu shan zhu

Rhizome neck 7–60 cm; internodes solid. Culms 2–7 m, 1–3 cm in diam.; internodes terete, 30–35 cm, nearly solid, initially densely white powdery and sparsely brown setose below nodes, longitudinal ribs prominent; nodes with level supra-nodal ridge; sheath scar prominent. Branches 5–15, subequal, nearly solid. Culm sheaths persistent, shorter than internode, leathery, rigid, sparsely gray-yellow or brown setose, margins initially yellow-brown setulose, apex narrowly rounded; auricles absent; oral setae 8–15; ligule truncate or arcuate, 1–1.5 mm, glabrous; blade deciduous, linear-lanceolate, slightly hairy, margins serrulate, revolute. Leaves 2–5 per ultimate branch; sheath apically white powdery, glabrous or densely yellow setose, margins initially ciliate; auricles absent; oral setae present; ligule truncate or convex, ca. 1 mm, glabrous; blade lanceolate, $5\text{--}16 \times 0.7\text{--}1.2$ cm, glabrous, secondary veins 3–5-paired, transverse veins obscure, base cuneate, margins spinescent-serrulate. Inflorescence paniculate. Spikelets purple-green or purple, 1.6–4 cm, slender; rachilla 2–5 mm, apically pubescent and swollen, margins ciliate; florets 4–14, terminal one sterile. Lemma abaxially pale hairy, hairs deciduous, to 8–11 mm, apex acuminate; palea apically bifid, 2-keeled, keels ciliate; lodicules 3, margins apically ciliate. Anthers yellow. Ovary ovoid, yellow-brown; style 1; stigmas 3, plumose. Caryopsis oblong, ventrally grooved, with persistent style. New shoots Jun.

- 2100–3400 m. SW Sichuan.

23. *Yushania lacera* Q. F. Zheng & K. F. Huang, Acta Phytotax. Sin. 22: 218. 1984.

撕裂玉山竹 si lie yu shan zhu

Rhizome neck ca. 27 cm; internodes solid. Culms to 2 m, to 0.8 cm in diam.; internodes terete, 11–23 cm, distally white setulose with a thickly white powdery ring below each node; wall 1.5–2.2 mm thick; nodes with weakly prominent supra-nodal ridge; sheath scar prominent. Branches 3–6. Culm sheath gradually deciduous or persistent, shorter than internode, thinly leathery, purplish setulose, margins purplish ciliate, longitudinal ribs greatly prominent; auricles absent or small; oral setae absent; ligule ca. 1.5 mm, fissured, tomentulose, purple ciliate; blade linear-lanceolate, revolute. Leaves 3–8 per ultimate branch; sheath glabrous; auricles absent or small; oral setae 2–6, easily deciduous, erect, 3–8 mm; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 4.5–13 × 1–1.2 cm, abaxially gray pubescent, secondary veins 4- or 5-paired, transverse veins not distinct, base cuneate or broadly cuneate, one margin densely serrulate, other margin sparsely so, apex acuminate. Inflorescence unknown. New shoots May.

● 1700–1800 m. N Fujian.

24. *Yushania elevata* T. P. Yi, J. Bamboo Res. 5(1): 17. 1986.

腾冲玉山竹 teng chong yu shan zhu

Rhizome neck to 70 cm; internodes solid. Culms 4–7 m, 1.4–6 cm in diam.; internodes terete, 24–60 cm, initially brown setulose below nodes; wall 4–8 mm thick; nodes with weakly prominent to prominent supra-nodal ridge; sheath scar initially brown setose. Branches 10–20, solid or nearly so. Culm sheaths gradually deciduous, narrowly triangular, shorter than internodes, leathery to cartilaginous, densely yellow-brown woolly setose, margins densely brown setose, longitudinal ribs prominent; auricles absent; oral setae gradually deciduous; ligule convex or rarely truncate, ca. 1 mm, glabrous; blade linear-lanceolate, revolute, glabrous. Leaves 4–6 per ultimate branch; sheath glabrous; auricles absent; oral setae absent or few, erect, brown, 0.5–1 mm; ligule convex, ca. 0.5 mm, glabrous; blade narrowly lanceolate, 4.5–9.5 × 0.4–0.9 cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin smooth, apex acuminate. Inflorescence unknown. New shoots Jul.

● 2000–2300 m. W Yunnan.

25. *Yushania baishanzuensis* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1983(3): 494. 1983.

百山祖玉山竹 bai shan zu yu shan zhu

Rhizome neck ca. 25 cm; internodes solid. Culms 1.5–2 m, to 0.5 cm in diam.; internodes terete, ca. 19 cm, initially sparsely setose, thickly white powdery below nodes; wall 1.5–2 mm thick; nodes with weakly prominent supra-nodal ridge; sheath scar weakly prominent. Branches 3 to many. Culm sheaths gradually deciduous, 1/2–2/3 as long as internodes, abaxially or marginally sparsely white setose; auricles absent or obscure; oral setae absent or few, erect, purple; ligule convex or truncate, ca. 1 mm, ciliate; blade erect, linear or conical, glabrous. Leaves 3–5 per ultimate branch; sheath glabrous, ini-

tially white powdery; auricles absent or obscure; oral setae 5–8, erect, 0.5–1 mm; ligule truncate or convex, ca. 0.5 mm, glabrous; blade linear-lanceolate, 6–14 × 0.7–1.2 cm, glabrous or abaxially hairy at base, secondary veins 4-paired, transverse veins slightly obscure, one margin serrulate, other margin smooth. Inflorescence unknown. New shoots Apr–May.

● 1000–1100 m. S Zhejiang.

26. *Yushania farcticaulis* T. P. Yi, J. Bamboo Res. 5(1): 24. 1986.

独龙江玉山竹 du long jiang yu shan zhu

Rhizome neck to 70 cm; internodes solid. Culms 4–7 m, 1–2 cm in diam.; internodes purple spotted when dry, terete, 32–45 cm, solid or nearly so, glabrous; supra-nodal ridge level or weakly prominent; sheath scar prominent, initially yellow-brown setose. Branches many. Culm sheaths persistent, triangularly narrowly rounded, 1/2–3/5 as long as internodes, leathery, prominently longitudinally ribbed, densely brown to dark brown setose, margins densely yellow-brown setulose; auricles absent; oral setae few, gradually deciduous, erect, yellow, 2–6 mm; ligule truncate or arcuate, ca. 1 mm, initially ciliate, later slightly fissured; blade reflexed, linear-lanceolate, glabrous, margins serrulate. Leaves 4–6 per ultimate branch; sheaths sometimes gray-brown setose; auricles absent; oral setae few, erect, brown, 3–5 mm; ligule truncate, glabrous; blade lanceolate, 5–15 × 0.6–1.2 cm, abaxially sparsely gray pubescent, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate, apex acuminate. Inflorescence unknown. New shoots Aug.

● 1900–2000 m. W Yunnan.

27. *Yushania levigata* T. P. Yi, J. Bamboo Res. 5(1): 27. 1986.

光亮玉山竹 guang liang yu shan zhu

Rhizome neck to 62 cm; internodes solid. Culms 2–4.5 m, 1–3 cm in diam.; internodes terete, 16–40 cm, initially white powdery, glabrous, nearly solid; supra-nodal ridges level; sheath scar prominent. Branches 3–15 per node, erect or deflexed. Culm sheaths persistent, dark purple or with light yellow stripes, narrowly rounded-triangular or narrowly triangular, 2/5–1/2 as long as internodes, cartilaginous, glabrous or basally yellow-brown setulose, margins initially setulose; auricles and oral setae absent; ligule truncate or convex, glabrous; blade reflexed, linear-lanceolate, glabrous, margins initially serrulate. Leaves 3–5 per ultimate branch; sheath margins glabrous or initially ciliate; auricles absent; oral setae present or absent; ligule truncate, glabrous; blade lanceolate or linear-lanceolate, 3–12.5 × 0.7–1.2 cm, glabrous, secondary veins 3–5-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin smooth. Inflorescence a panicle or raceme. Spikelets 2–12, dark purple, 2.2–7 cm; rachilla 3–4 mm, margins densely ciliolate, apically setulose and swollen; florets 4–9, terminal one sterile. Lemma mucronate or acuminate at apex; palea 2-keeled, keels ciliolate, apically bifid. Ovary ovoid; style 1. Caryopsis purple, oblong, with persistent style base. New shoots Sep.

● 2300–3000 m. SW Yunnan.

The culms are split for weaving.

- 28. *Yushania ailuropodina*** T. P. Yi, J. Bamboo Res. 15(3): 6. 1996.

紫斑玉山竹 *zi ban yu shan zhu*

Rhizome neck (10–)20–45 cm; internodes solid. Culms 3–4(–5) m, 0.8–1.5 cm in diam.; internodes terete, 22–26(–36) cm, glabrous, white powdery and with purple spots when young; wall 2–3 mm thick; sheath scar prominent, brown, glabrous. Branches 6–10. Culm sheaths persistent, with dense, brown to deep purple spots, narrowly rounded, 1/3–1/2 as long as internodes, cartilaginous, adaxially glabrous; auricles and oral setae absent; ligule purple, truncate, 1–2 mm; blade reflexed, linear-lanceolate, (4–)10–40 × 1.5–2.5 mm, glabrous. Leaves 2–4(or 5) per ultimate branch; sheath 2–3 cm, glabrous; auricles absent; oral setae absent to 3; ligule truncate, glabrous; blade linear-lanceolate, 4–7.5 × 0.5–0.7 cm, glabrous, secondary veins 2-paired, transverse veins distinct, base cuneate, margin initially serrulate. Inflorescence unknown. New shoots Jun.

- 2600–3000 m. Sichuan.

This species is named after the giant panda, *Ailuropoda melanoleuca*.

- 29. *Yushania mitis*** T. P. Yi, J. Bamboo Res. 9(3): 35. 1990.

泡滑竹 *pao hua zhu*

Rhizome neck 8–40 cm; internodes solid. Culms 3–4.5 m, 1–2 cm in diam.; internodes terete, 18–45 cm, longitudinally ribbed, initially white powdery, glabrous or initially white-gray setose; wall 2–4 mm thick; supra-nodal ridge weakly prominent; sheath scar prominent, initially slightly setose. Branches 3–7. Culm sheath deciduous, densely purple-brown spotted, triangularly narrowly rounded or narrowly triangular, ca. 1/2 as long as internodes, leathery, prominently longitudinally ribbed, sparsely yellow setulose, margins initially yellow-brown ciliate; auricles absent, oral setae absent or 1, ca. 1 cm; ligule truncate, 1.5–4 mm; blade erect or reflexed, linear-triangular or triangular-lanceolate. Leaves 3–6 per ultimate branch; sheath margins initially ciliate; auricles absent; oral setae few, 1–5 mm; ligule truncate or arcuate, external ligule ciliate; blade narrowly lanceolate, 1.2–10.5 × 0.4–0.8 cm, glabrous, secondary veins 2–4-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Apr.

- 1800–2500 m. NE Yunnan.

The culms are used for weaving.

- 30. *Yushania xizangensis*** T. P. Yi, J. Bamboo Res. 2(2): 50. 1983.

西藏玉山竹 *xi zang yu shan zhu*

Rhizome neck 4–20 cm; internodes solid. Culms to 4.5 m, 1–2 cm in diam.; internodes terete, 25–40 cm, glabrous or initially distally brown setulose; wall 2–3.5 mm thick; nodes with level supra-nodal ridge; sheath scar prominent, glabrous or initially slightly setose. Branches 10–19. Culm sheaths gradually deciduous or persistent, triangularly narrowly rounded, shorter than internode, leathery, prominently longitudinally ribbed, brown to dark brown setose, margins densely brown ciliate;

auricles absent; ligule arcuate, ca. 1 mm; blade readily deciduous, revolute. Leaves 2–4 per ultimate branch; sheath glabrous; auricles absent; oral setae few, 2–4 mm; ligule truncate or convex, glabrous, margins slightly fissured; blade narrowly lanceolate, 3–11 × 0.5–0.8 cm, secondary veins 3- or 4-paired, transverse veins distinct, adaxially and basally sparsely setose, base cuneate or broadly so, margins serrulate. Inflorescence unknown.

- About 2400 m. S Xizang.

- 31. *Yushania brevis*** T. P. Yi, J. Bamboo Res. 5(1): 11. 1986.

绿春玉山竹 *lü chun yu shan zhu*

Rhizome neck 4.5–20 cm; internodes solid. Culms 1–2.5 m, 4–6 mm in diam.; internodes terete, 20–30 cm, glabrous, initially with white powdery ring below nodes, nearly solid; supra-nodal ridges level; sheath scar prominent. Branches 1–6 per node. Culm sheaths persistent, narrowly rounded, ca. 1/5 as long as internodes, leathery, slightly prominently longitudinally ribbed, glabrous or basally yellow-brown setose, margins densely brown-ciliate; auricles absent; oral setae few, deciduous; ligule truncate, ca. 0.5 mm, glabrous; blade deflexed or erect, linear-triangular or linear-lanceolate. Leaves 2–6 per ultimate branch; sheath glabrous; auricles absent; oral setae 7–9, yellow, 2–3 mm; ligule truncate or convex, external ligule initially gray-puberulous; blade linear-lanceolate, 4–14.5 × (0.6–)0.9–1.3 cm, glabrous or abaxially proximally sparsely setose, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin smooth. Inflorescence unknown. New shoots Aug–Sep.

- About 2000 m. S Yunnan.

- 32. *Yushania menghaiensis*** T. P. Yi, Acta Bot. Yunnan. 10: 441. 1988.

隔界竹 *ge jie zhu*

Rhizome neck 18–55 cm; internodes solid. Culms 2–3.5 m, 1–1.3 cm in diam.; internodes terete, 23–32 cm, initially thinly white powdery, especially below nodes; wall 2–5 mm thick; supra-nodal ridges level; sheath scar prominent. Branches 5–20 per node. Culm sheath persistent, triangularly narrowly rounded, 1/3–1/2 as long as internodes, thinly leathery, prominently longitudinally ribbed, appressed yellow or brown clavate-setose, margins initially ciliate; auricles absent; oral setae 1 or 2 initially, erect, gray, 3–4 mm; ligule truncate or convex, ca. 1 mm; blade reflexed, triangular or linear, glabrous, margins rolled. Leaves 4–7 per ultimate branch; sheath glabrous; auricles absent or small; oral setae 3 or 4, yellow, 1.5–4 mm; ligule truncate, initially hairy; external ligule initially puberulous; blade lanceolate, 10–24 × (0.8–)1.4–3.1 cm, abaxially densely gray pubescent, secondary veins 4- or 5-paired, transverse veins not prominent, base cuneate, margins serrulate. Inflorescence unknown. New shoots Sep.

- About 2300 m. S Yunnan.

- 33. *Yushania collina*** T. P. Yi, J. Bamboo Res. 5(1): 13. 1986.

德昌玉山竹 *de chang yu shan zhu*

Rhizome neck more than 20 cm; internodes solid. Culms

to 3 m, 0.5–1 cm in diam.; internodes terete, 25–40 cm, conspicuously longitudinally ribbed, glabrous, initially with white powdery ring below each node, nearly solid; supra-nodal ridges weakly prominent; sheath scar weakly prominent. Branches 6–10 per node. Culm sheaths persistent, narrowly triangular, 1/3–1/2 as long as internodes, leathery, conspicuously longitudinally ribbed, glabrous or sparsely brown setulose, margins initially densely brown setulose, longitudinal ribs prominent; auricles absent; oral setae 2–8, erect, yellow-brown, 5–10 mm; ligule truncate or convex, ca. 1 mm, glabrous; blade linear-lanceolate, revolute, glabrous, margins serrulate. Leaves 2–5 per ultimate branch; sheaths glabrous; auricles absent; oral setae absent or initially 1–3, gray, 2–3 mm; ligule truncate, glabrous; blade lanceolate, 11–22.5 × 1.2–1.8 cm, glabrous, secondary veins 4- or 5-paired, transverse veins not prominent, base cuneate, one margin serrulate, other margin obscurely so. Inflorescence unknown. New shoots Jul–Aug.

• About 2200 m. SW Sichuan.

34. *Yushania farinosa* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 93. 1981.

湖南玉山竹 hu nan yu shan zhu

Rhizome neck ca. 22 cm; internodes solid. Culms to 2.5 m, ca. 6 mm in diam.; internodes terete, 12–22.5 cm, obscurely longitudinally ribbed, glabrous, initially thinly white powdery, especially in ring below nodes; wall 1.2–2 mm thick; supra-nodal ridges level or prominent; sheath scar prominent, glabrous or initially gray-yellow hairy. Branches 3 to many per node. Culm sheaths gradually deciduous, triangularly narrowly rounded, shorter than internode, thinly leathery, prominently longitudinally ribbed, appressed yellow-brown clavate-setose, margins yellow-brown ciliate; auricles absent; oral setae ca. 5, readily deciduous; ligule truncate or convex, ca. 1 mm, margin ciliate, ciliae readily deciduous; blade erect or decumbent, narrowly lanceolate or linear, glabrous. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent; oral setae 2–5, yellow, 2–4 mm; ligule arcuate or truncate, glabrous; blade oblong-lanceolate, 9–12 × 1.3–1.6 cm, glabrous, secondary veins 4–6-paired, transverse veins obscure, base cuneate or broadly so, one margin serrulate, other margin smooth. Inflorescence unknown. New shoots May.

• About 1600 m. S Hunan.

35. *Yushania laetevirens* T. P. Yi, J. Bamboo Res. 9(3): 33. 1990.

亮绿玉山竹 liang lü yu shan zhu

Rhizome neck 17–42 cm; internodes solid. Culms 2.5–3.5 m, 6–10 mm in diam.; internodes terete, 20–45 cm, obscurely longitudinally ribbed, initially white powdery, glabrous; wall 1.5–2.5 mm thick; supra-nodal ridges level or prominent; sheath scar prominent. Branches 5–9. Culm sheath persistent, triangularly narrowly rounded, ca. 1/2 as long as internodes, leathery, prominently longitudinally ribbed, glabrous; auricles and oral setae absent; ligule truncate, 1–1.4 mm; blade reflexed, linear-triangular or linear-lanceolate. Leaves 3–9 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule truncate, ca. 1 mm, usually white powdery; blade linear-lan-

ceolate, 7.5–13 × 1–1.3 cm, glabrous, secondary veins 3- or 4-paired, transverse veins slightly distinct, base cuneate, one margin serrulate, other margin smooth. Inflorescence unknown. New shoots Aug.

• 1300–1500 m. NE Yunnan.

36. *Yushania multiramea* T. P. Yi, Bull. Bot. Res., Harbin 8(4): 69. 1988.

多枝玉山竹 duo zhi yu shan zhu

Rhizome neck 20–55 cm. Culms 3–4 m, 5–10 mm in diam.; internodes terete, 24–43 cm, initially white powdery, glabrous, solid or nearly so; supra-nodal ridges level or prominent, initially white powdery; sheath scar prominent, initially purple and white-gray setose, becoming light yellow-brown and glabrous. Branches 3–45. Culm sheaths persistent, triangularly narrowly rounded, 1/3–1/2 as long as internodes, leathery, prominently longitudinally ribbed, abaxially glabrous or gray setose, adaxially waxy, margins glabrous or initially ciliate; auricles absent; oral setae absent to 2, gray, 1–8 mm; ligule truncate or convex, ca. 0.5 mm, glabrous; blade reflexed, linear-lanceolate, glabrous. Leaves 3–6 per ultimate branch; sheath initially slightly hairy; auricles absent; oral setae 3–5, yellow, 1.5–4.5 mm; ligule truncate, glabrous; blade lanceolate, 4.5–13 × 0.8–1.3 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base broadly cuneate or nearly rounded, margins serrulate. Inflorescence unknown. New shoots Aug.

• 2300–2600 m. W Yunnan.

37. *Yushania mabianensis* T. P. Yi, J. Bamboo Res. 5(1): 47. 1986.

马边玉山竹 ma bian yu shan zhu

Rhizome neck 20–35 cm. Culms 1–2 m, 4–8 mm in diam.; internodes initially purple spotted, terete, 17–27 cm, white powdery and gray-brown setulose below nodes, smooth; wall ca. 2 mm; supra-nodal ridges level or prominent; sheath scar weakly prominent, initially densely retrorsely brown setose. Branches 1 at lower nodes to more than 3 at upper nodes. Culm sheaths persistent, yellow-brown, narrowly triangularly rounded, shorter than internodes, leathery, retrorsely yellow-brown setose, margins densely ciliate; auricles falcate; oral setae erect, ca. 5 mm; ligule truncate or arcuate, ca. 0.5 mm, glabrous; blade readily deciduous, reflexed, linear-lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath glabrous or setulose, margins initially ciliate; auricles falcate or elliptic; oral setae ca. 11, radiating, 5–7 mm; ligule truncate or arcuate, glabrous; blade lanceolate or linear-lanceolate, 7–20 × 1.4–2.8 cm, glabrous, secondary veins 5- or 6-paired, transverse veins distinct, base broadly cuneate, one margin densely serrulate, other margin obscurely so. Inflorescence unknown. New shoots Sep.

• 1400–2000 m. S Sichuan.

38. *Yushania andropogonoides* (Handel-Mazzetti) T. P. Yi, J. Bamboo Res. 5(1): 66. 1986.

草丝竹 cao si zhu

Indocalamus andropogonoides Handel-Mazzetti, Anz.

Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 255. 1925; *Arundinaria andropogonoides* (Handel-Mazzetti) Handel-Mazzetti; *Sinarundinaria andropogonoides* (Handel-Mazzetti) Keng ex P. C. Keng.

Rhizome neck 18–38 cm. Culms 0.35–1.1 m, 1.5–2.5 mm in diam.; internodes terete, 12–18 cm, sparsely yellow setose and white powdery below nodes, nearly solid; supra-nodal ridge prominent; sheath scar prominent, initially sparsely retrorsely yellow-brown setose. Branches absent or rarely 1, without secondary branches. Culm sheaths persistent, light yellow-brown, narrowly rounded, leathery, glabrous; auricles purple, falcate; oral setae many, 2–3 mm; ligule truncate, ca. 1 mm, glabrous; blade readily deciduous, reflexed, triangular-lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath margins glabrous; auricles purple, elliptic; oral setae many, yellow-brown, 3–5 mm; ligule truncate, margins slightly fissured; blade lanceolate, 11–16 × 0.9–2.2 cm, glabrous, secondary veins 4–7-paired, transverse veins distinct, base broadly cuneate or rounded, margins serrulate. Inflorescence paniculate; spikelets with 5 or 6 florets; rachilla internodes ca. 1/2 as long as florets, apex puberulous. Lemma scabrous; palea margins ciliate at apex. Anthers white. New shoots Aug–Sep.

- 2000–2300 m. E Yunnan.

The inflorescence details are based on Handel-Mazzetti's type, whereas the vegetative description is based on a non-flowering specimen from the same locality assumed to represent the same species.

39. *Yushania grammata* T. P. Yi, J. Bamboo Res. 9(3): 30. 1990 [*"grammata"*].

棱纹玉山竹 leng wen yu shan zhu

Rhizome neck 20–50 cm. Culms 1.5–3 m, 4–15 mm in diam.; internodes terete, 13–37 cm, longitudinally ribbed, initially white powdery and brown clavate-setulose below nodes; wall 2–3 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 1 per node, about as wide as culm. Culm sheath persistent, narrowly triangularly rounded, short, leathery, densely appressed brown clavate-setose, margins brown ciliate; auricles readily deciduous, elliptic, small; oral setae 2–5, 2–4.5 mm; ligule truncate, ca. 1 mm, slightly hairy; blade reflexed, linear-lanceolate, erect or abaxially slightly hairy at base. Leaves 4–14 per ultimate branch; sheath margins glabrous; auricles absent; oral setae absent or few; ligule truncate; blade lanceolate, 16–25 × 1.6–2.5 cm, abaxially white-gray pubescent, secondary veins 5–7-paired, transverse veins distinct, base cuneate. Inflorescence unknown. New shoots Jul–Aug.

- About 1300 m. NE Yunnan.

40. *Yushania polytricha* Hsueh & T. P. Yi, J. Bamboo Res. 5(1): 58. 1986.

滑竹 hua zhu

Rhizome neck 13–40 cm. Culms 1–2 m, 3–8 mm in diam.; internodes initially densely purple spotted, terete, 13–37 cm, smooth, thinly white powdery and yellow-brown setulose below nodes, solid; supra-nodal ridges weakly prominent or

prominent; sheath scar prominent, initially densely yellow-brown retrorse-setose. Branches 1–5 per node, central branch dominant. Culm sheaths persistent, narrowly triangularly rounded, ca. 2/3 as long as internodes, cartilaginous, yellow-brown setose, margins yellow-brown setose; auricles purple, falcate; oral setae many, radiating, yellow-brown, 2–4 mm; ligule truncate or arcuate, ca. 1 mm, glabrous, margins irregularly fissured; blade reflexed, linear-lanceolate, abaxially sparsely white-gray setose. Leaves 4–6 per ultimate branch; sheath densely brown setose, margins densely yellow ciliate; auricles purple, falcate or elliptic; oral setae several, erect or radiating, yellow-brown, 2–5 mm; ligule truncate, margins initially densely yellow ciliate; blade lanceolate, 9–21 × 1.2–2.5 cm, abaxially gray pubescent, secondary veins 4–6-paired, transverse veins obscure, base broadly cuneate, margins scabrous. Inflorescence unknown. New shoots Aug.

- 1900–2000 m. C and W Yunnan.

The culms are used for making chopsticks.

41. *Yushania basihirsuta* (McClure) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 92. 1981.

毛玉山竹 mao yu shan zhu

Indocalamus basihirsutus McClure, Sunyatsenia 6: 35. 1941; *Sinarundinaria basihirsuta* (McClure) C. D. Chu & C. S. Chao; *S. papillosa* W. T. Lin; *Yushania actinoseta* W. T. Lin & Z. M. Wu; *Y. longipilosa* T. H. Wen & S. C. Chen; *Y. papillosa* (W. T. Lin) W. T. Lin.

Rhizome neck ca. 50 cm. Culms 1.5–3 m, 3–8 mm in diam.; internodes terete, 10–29 cm, white powdery below nodes, initially light yellow setose; wall 1.5–3 mm thick; supra-nodal ridges level; sheath scar prominent, initially densely yellow-brown retrorse-setose, with persistent remains of sheath base. Branches 1 per node at lower nodes and 3 at upper nodes. Culm sheaths persistent, narrowly triangularly rounded, 2/5–2/3 as long as internodes, leathery, densely yellow-brown clavate-setose, margins densely yellow-brown setose; auricles purple, falcate; oral setae many, radiating, yellow-brown, 4–10 mm; ligule truncate or arcuate, ca. 1 mm, initially densely brown ciliate; blade reflexed, linear-lanceolate, margins serrulate. Leaves 5–9 per ultimate branch; sheath retrorsely white setose, margins densely white ciliate; auricles purple, falcate; oral setae many, radiating, yellow-brown, 4–15 mm; ligule truncate, margins ciliate; blade lanceolate, 7–18.5 × 0.7–1.8 cm, abaxially initially gray setose, secondary veins 4–6-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin obscurely so. Inflorescence paniculate; spikelets 12–17, dark purple; rachilla internodes ca. 5 mm, margins gray ciliate, apex swollen. Lemma glabrous, apex acuminate; palea glabrous, apex bifid. Other parts unknown. New shoots Apr.

- 1500–1600 m. N Guangdong, S Hunan.

42. *Yushania longiaurita* Q. F. Zheng & K. F. Huang, Acta Phytotax. Sin. 22: 217. 1984.

长耳玉山竹 chang er yu shan zhu

Rhizome neck ca. 27 cm. Culms to 1.5 m, 4–6 mm in diam.; internodes terete, 9.5–14 cm, initially white powdery below nodes, glabrous; wall ca. 2 mm thick; supra-nodal ridges

prominent or weakly so; sheath scar prominent, glabrous. Branches 1–5 per node. Culm sheath gradually deciduous, shorter than internodes, thickly papery, abaxially glabrous, margins brown ciliate; auricles falcate or subcircular, tomentulose; oral setae radiating, 6–8 mm; ligule arcuate, ca. 1 mm; blade reflexed, narrowly lanceolate, glabrous. Leaves 5–9 per ultimate branch; sheath margins glabrous; auricles falcate or subcircular; oral setae radiating; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 4–12 × 1.2–1.7 cm, glabrous, secondary veins 4- or 5-paired, transverse veins distinct, base broadly cuneate, one margin densely serrulate, other margin obscure so. Inflorescence unknown.

• About 1500 m. SE Fujian.

43. *Yushania chingii* T. P. Yi, J. Bamboo Res. 5(1): 45. 1986.

仁昌玉山竹 *ren chang yu shan zhu*

Rhizome neck 25–45 cm. Culms 1–2.5 m, 3–8 mm in diam.; internodes terete, 15–22 cm, initially with white powdery ring below nodes, glabrous, nearly solid; supra-nodal ridges level or weakly prominent; sheath scar weakly prominent. Branches 1 per node. Culm sheaths persistent, triangularly narrowly rounded, 1/4–1/3 as long as internodes, cartilaginous, glabrous, margins densely yellow-brown setulose; auricles purple, falcate; oral setae 3–5, purple or yellow, 5–8 mm; ligule truncate, glabrous; blade reflexed, linear-lanceolate, glabrous. Leaves 5–13 per ultimate branch; sheath apically white powdery, margins densely yellow-brown ciliate; auricles purple, elliptic; oral setae 7–12, purple or yellow, 5–12 mm; ligule truncate, glabrous; blade lanceolate, (13–)19–26(–33) × 1.2–4 cm, glabrous, secondary veins 7–9-paired, transverse veins distinct, base cuneate, margins serrulate and obscure or one margin prominent, other margin obscurely so. Inflorescence unknown. New shoots Jul.

• 1400–1500 m. W Guangxi, S Guizhou.

44. *Yushania auctiaurita* T. P. Yi, Acta Bot. Yunnan. 13: 145. 1991.

显耳玉山竹 *xian er yu shan zhu*

Rhizome neck 15–35 cm. Culms 1–2.5 m, 3–8 mm in diam.; internodes initially purple spotted, terete, 16–22 cm, white powdery below nodes, glabrous; wall 1–3 mm thick; supra-nodal ridges level or prominent; sheath scars prominent, initially retrorsely brown setose, with persistent remains of sheath base. Branches 1 at lower nodes and more than 3 at upper nodes. Culm sheaths persistent, 1/3–2/5 as long as internodes, cartilaginous, yellow-brown setose, margins densely ciliate; auricles falcate, large; oral setae many, radiating, yellow-brown, 3–6 mm; ligule arcuate, ca. 0.5 mm, glabrous; blade erect or decumbent, narrowly triangular or lanceolate, glabrous, margins serrulate. Leaves 3–8 per ultimate branch; sheath glabrous or gray pubescent, apically white powdery, margins yellow-brown ciliate; auricles purple, falcate; oral setae many, 2–7 mm; ligule arcuate, ca. 1 mm, glabrous; blade lanceolate, 8–16 × 1.3–3 cm, glabrous, secondary veins 5–9-paired, transverse veins distinct, base broadly cuneate, one margin densely serrulate, other margin obscurely so. Inflorescence unknown. New shoots Jul.

• 1700–1800 m. SE Guizhou.

45. *Yushania dafengdingensis* T. P. Yi, J. Bamboo Res. 15(3): 9. 1996.

大风顶玉山竹 *da feng ding yu shan zhu*

Rhizome neck 13–70 cm, 6–11 mm in diam. Culms 2–3 (–4) m, 1.2–1.6(–2) cm in diam.; basal internodes 5–10 cm, upper internodes purple spotted, terete, 18–22(–32) cm, initially white powdery below nodes, glabrous; wall 2.5–5 mm thick; supra-nodal ridges level or prominent; sheath scars prominent, initially purple, gradually brown, glabrous; intranode 4–9 mm. Branches 1 per node, nearly as thick as culm. Culm sheaths persistent, 1/3–1/2 as long as internodes, cartilaginous, glabrous, margins initially purple ciliate; auricles falcate; oral setae many, ca. 1.2 cm; ligule purple, truncate, 1–2.5 mm, glabrous; blade erect, narrowly triangular or linear-lanceolate, 8–25 × 3–6 mm, glabrous. Leaves 3 or 4(–6) per ultimate branch; sheath (4–)6–10 cm, glabrous; auricles purple, falcate; oral setae many, ca. 1 cm; ligule truncate, 1–1.5 mm, glabrous; blade lanceolate, (4.5–)12–18 × (1.2–)2–3.7 cm, glabrous, secondary veins (4 or)5–7(or 8)-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jun–Jul.

• 2200–2600 m. Sichuan.

46. *Yushania straminea* T. P. Yi, J. Bamboo Res. 9(3): 37. 1990.

黄壳竹 *huang ke zhu*

Rhizome neck 17–58 cm. Culms 2–4 m, 0.6–1 cm in diam.; internodes gray-green, terete, 18–29 cm, thinly white powdery, glabrous; wall 2–3 mm thick, rigid; supra-nodal ridges level or weakly prominent; sheath scar prominent, woody, initially retrorsely setose. Branches 1 at lower nodes and more than 3 at upper nodes. Culm sheaths persistent, yellow-brown, narrowly rounded-triangular, 1/3–2/5 as long as internodes, leathery, densely setose, margins densely ciliate; auricles purple, falcate, 6–7 mm, 1.5–3 mm in diam.; oral setae many, ca. 2 cm; ligule 1–2 mm, glabrous; blade erect or decumbent, narrowly triangular or elliptic-lanceolate. Leaves 3–9 per ultimate branch; sheath glabrous, usually white powdery; auricles falcate; oral setae radiating, ca. 6 mm; ligule arcuate, 1–2 mm; blade linear-lanceolate, 7–19 × 1.6–2.6 cm, basally gray hairy, secondary veins 3–6-paired, transverse veins distinct, base cuneate, margins sparsely serrulate. Inflorescence unknown. New shoots Aug.

• 2300–2600 m. NE Yunnan.

The culms are used for weaving.

47. *Yushania oblonga* T. P. Yi, J. Bamboo Res. 5(1): 52. 1986.

马鹿竹 *ma lu zhu*

Rhizome neck 8–40 cm. Culms 3–4.5 m, 1–2 cm in diam.; internodes terete, 28–40 cm, initially white powdery, glabrous; wall ca. 2 mm thick; supra-nodal ridges level or prominent; sheath scar prominent, with persistent remains of sheath base. Branches 1–5 per node. Culm sheaths persistent, rectangular, ca. 2/3 as long as internodes, cartilaginous, rigid, white pow-

dery, glabrous, margins densely yellow setulose; auricles purple, oblong; oral setae 5–8, yellow, 5–10 mm; ligule truncate, ca. 1 mm, glabrous; blade erect, purple-green, sometimes white powdery, linear-lanceolate, margins fissured. Leaves 3–7 per ultimate branch; sheath glabrous, usually initially white powdery; auricles elliptic, small; oral setae 5–12, yellow, 3–5 mm; ligule truncate, glabrous; blade broadly lanceolate, 14–17 × 3.6–4 cm, glabrous, secondary veins 7- or 8-paired, transverse veins obscure, base rounded, margins sparsely serrulate. Inflorescence unknown. New shoots Aug–Sep.

- 2600–3000 m. SE Yunnan.

The shoots are edible and are highly prized; the culms are used for weaving.

48. *Yushania cartilaginea* T. H. Wen, J. Bamboo Res. 3(2): 28. 1984.

硬壳玉山竹 ying ke yu shan zhu

Rhizome neck 16–35 cm. Culms 0.2–2.5 m, 5–7 mm in diam.; internodes terete, 15–17 cm, initially with white powdery ring below nodes, glabrous; wall 2–3 mm thick, pith initially spongy, becoming granular; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 1 at lower nodes and 2 at upper nodes. Culm sheath persistent, triangularly narrowly rounded, 1/2–4/5 as long as internodes, cartilaginous, abaxially glabrous and waxy, margins glabrous or gray ciliate; auricles purple, oblong to falcate; oral setae several, yellow, ca. 7 mm; ligule truncate or convex, ca. 0.25 mm, glabrous; blade erect or reflexed, linear-lanceolate. Leaves 4–6 per ultimate branch; sheath margins gray ciliate; auricles well developed, elliptic to falcate; oral setae 7–11, purple, 4–14 mm; ligule truncate or convex, glabrous, margin fissured; blade broadly lanceolate to oblong, 10–15 × 1.8–2.8 cm, glabrous, secondary veins 5–9-paired, transverse veins distinct, base cuneate or rounded, margins smooth or one margin serrulate. Inflorescence unknown. New shoots Apr.

- About 1700 m. N Guangxi.

49. *Yushania wuyishanensis* Q. F. Zheng & K. F. Huang, Acta Phytotax. Sin. 22: 219. 1984.

武夷山玉山竹 wu yi shan yu shan zhu

Rhizome neck ca. 23 cm. Culms to 4 m, to 1 cm in diam.; internodes terete, 10–30 cm, scabrous, initially thickly white powdery below nodes; wall 1.5–2 mm thick; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 1 at lower nodes, 3–5 at upper nodes. Culm sheaths gradually deciduous or persistent, shorter than internodes, thinly leathery, basally purple setose, margins purple ciliate; auricles absent or small; oral setae few; ligule truncate, 1–1.5 mm, tomentose, margin fissured; blade erect, linear-lanceolate, glabrous. Leaves 6–8 per ultimate branch; sheath margins glabrous; auricles absent; oral setae 4–6, 5–7 mm; ligule truncate, ca. 1 mm, glabrous; blade linear-lanceolate, (4–)6–13 × 0.8–1.2 cm, glabrous, secondary veins 4- or 5-paired, transverse veins obscure, one margin serrulate, other margin obscurely so. Inflorescence unknown. New shoots May.

- About 1800 m. N Fujian.

50. *Yushania glandulosa* Hsueh & T. P. Yi, Bull. Bot. Res., Harbin 8(4): 73. 1988.

盈江玉山竹 ying jiang yu shan zhu

Rhizome neck 14.5–23 cm. Culms 2–3 m, 4–5 mm in diam.; internodes terete, 20–23 cm, with white powdery ring below nodes, initially thinly setulose, nearly solid; supra-nodal ridges prominent; sheath scar prominent. Branches 1 at lower nodes, to 3 at upper nodes. Culm sheaths persistent, triangularly narrowly rounded, leathery, glabrous or yellow setulose at base, margins glabrous or ciliate; auricles and oral setae absent; ligule truncate or convex, ca. 0.5 mm, margins glabrous or ciliate; blade erect or reflexed, linear-lanceolate. Leaves 1–3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule purple, arcuate, 0.5–0.8 mm, glabrous, margin fissured; blade narrowly rounded-lanceolate, (3.5–)8–19(–27) × (1–)1.8–5 cm, glabrous, secondary veins 3–10-paired, transverse veins distinct, base rounded to broadly cuneate, margins serrulate. Inflorescence paniculate; spikelets 13–33, purple, 1.2–2.5 cm; florets 3–5; rachilla internodes 3–3.5 mm, white or yellow setulose. Lemma lanceolate, glabrous or apically ciliate, apex mucronate; palea keels setulose, apex bifid. Anthers yellow. Ovary oblong, glabrous. Caryopsis unknown.

- About 1800 m. W Yunnan.

51. *Yushania rugosa* T. P. Yi, J. Bamboo Res. 5(1): 61. 1986.

皱叶玉山竹 zhou ye yu shan zhu

Rhizome neck 20–40 cm. Culms 1–2 m, 5–8 mm in diam.; internodes initially purple spotted, terete, 12–18 cm, white powdery below nodes, glabrous; wall 1.5–2.3 mm thick; supra-nodal ridges weakly prominent; sheath scar weakly prominent, initially brown setulose. Branches 1 per node, nearly as wide as culm. Culm sheath persistent, triangularly narrowly rounded, leathery, base sparsely purple-brown setose, margins purple setose; auricles purple, small; oral setae 3–5, purple, 2–3 mm; ligule convex, ca. 1 mm; blade reflexed, lanceolate, glabrous, margins slightly serrulate. Leaves 5–9 per ultimate branch; sheath glabrous, initially white powdery; auricles absent; oral setae 3–5, readily deciduous, 2–3 mm; ligule purple, truncate, ca. 1 mm, glabrous; blade broadly lanceolate or ovate-elliptic, 9–20 × 3–5 cm, glabrous, secondary veins 7–9-paired, transverse veins distinct, base rounded or broadly cuneate, margins serrulate. Inflorescence unknown. New shoots Aug.

- 1400–1600 m. NW Guangxi, S Guizhou.

52. *Yushania uniramosa* Hsueh & T. P. Yi, J. Bamboo Res. 5(1): 64. 1986.

单枝玉山竹 dan zhi yu shan zhu

Rhizome neck 20–50 cm. Culms 0.6–1.6 m, 3–5 mm in diam.; internodes initially purple spotted, terete, 8–15 cm, white powdery below nodes, glabrous, nearly solid; supra-nodal ridges level or weakly prominent; sheath scar prominent, glabrous. Branches 1 per node. Culm sheaths persistent, triangularly narrowly rounded, 1/2–2/3 as long as internodes, cartilaginous, glabrous, margins densely brown ciliate; auricles and oral setae absent; ligule truncate or convex, ca. 0.5 mm; blade reflexed or erect, narrowly lanceolate or conical, gla-

brous. Leaves 6–11 per ultimate branch; sheath glabrous, margins sometimes gray ciliate; auricles and oral setae absent; ligule truncate or convex, ca. 0.5 mm, glabrous; blade narrowly lanceolate, 11–22 × 1.5–2.6 cm, glabrous, secondary veins 5–7-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jul.

- 1300–1600 m. N Guizhou.

53. *Yushania confusa* (McClure) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 92. 1981.

鄂西玉山竹 e xi yu shan zhu

Indocalamus confusus McClure, Lingnan Univ. Sci. Bull. 9: 20. 1940; *Sinarundinaria confusa* (McClure) P. C. Keng.

Rhizome neck 10–40 cm, (2–)4–7 mm in diam. Culms 1–2 m, 2–10 mm in diam.; internodes purple spotted, terete, 10–33 cm, initially white powdery, glabrous, nearly solid; supra-nodal ridges level; sheath scar prominent, initially yellow setose. Branches 1 or 2 at lower nodes and 3–5 at upper nodes. Culm sheaths persistent, narrowly triangular, leathery, brown setose, margins setose; auricles absent; oral setae readily deciduous; ligule truncate, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate or linear, basally slightly hairy adaxially, margins serrulate. Leaves 2–5(–7) per ultimate branch; sheath margins white-gray ciliate; auricles absent; oral setae 2–5 mm; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 8–13 × 0.6–1.5(–2.1) cm, abaxially thinly hairy basally, secondary veins 4–6-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin obscurely so. Inflorescence paniculate; spikelet 1.2–3.4 cm; florets 2–6, green-purple; rachilla 3–4 mm, hairy. Lemma lanceolate, margins ciliate; palea keels ciliate, apex bifid. Anthers yellow. Ovary ovoid, glabrous. Caryopsis unknown. New shoots Apr–Aug.

- 1000–2300 m. N Guizhou, W Hubei, W Hunan, SW Shanxi, E Sichuan.

54. *Yushania pauciramificans* T. P. Yi, Bull. Bot. Res., Harbin 8(4): 71. 1988.

少枝玉山竹 shao zhi yu shan zhu

Rhizome neck 14–50 cm, 6–12 mm in diam. Culms 2–3.5 m, 0.6–1.2 cm in diam.; internodes purple, terete, 15–27 cm, initially with a white powdery ring below each node, glabrous; wall 2.5–3.5 mm thick; nodes with weakly prominent supra-nodal ridge; sheath scar greatly prominent, woody, glabrous. Branches 1–3 at lower nodes, ca. 5 at upper. Culm sheaths persistent, triangularly narrowly rounded, 2/5–1/2 as long as internodes, cartilaginous, erectly gray setose, adaxially waxy, margins densely gray-yellow setose; auricles absent; oral setae present initially; ligule truncate or convex, 1–1.5 mm, glabrous; blade linear-lanceolate, glabrous, revolute. Leaves 2–5 per ultimate branch; sheath margins glabrous; auricles absent; oral setae 5–7, gray-yellow, 3–9 mm; ligule truncate, glabrous; blade lanceolate or elliptic-lanceolate, 5.2–16 × 1.1–2.8 cm, glabrous, secondary veins 4–6-paired, transverse veins distinct, base broadly cuneate or rounded, one margin serrulate, other margin obscurely so. Inflorescence unknown. New shoots Aug.

- About 2500 m. C Yunnan.

55. *Yushania punctulata* T. P. Yi, J. Bamboo Res. 5(1): 59. 1986.

抱鸡竹 bao ji zhu

Rhizome neck to 46 cm, 2.5–4.5 mm in diam. Culms 1–1.8 m, 3–5 mm in diam.; internodes initially purple spotted, terete, 18–25 cm, with white powdery ring below each node, glabrous, nearly solid; supra-nodal ridge level or weakly prominent; sheath scar prominent, glabrous. Branches 1 at lower nodes to 3 at upper nodes. Culm sheaths persistent, triangularly narrowly rounded, ca. 1/3 as long as internodes, leathery, sparsely adnately gray setose, becoming glabrous, margins densely yellow-brown setose; auricles absent or small; oral setae radiating; ligule truncate or convex, ca. 0.5 mm, glabrous; blade reflexed, linear-lanceolate, glabrous. Leaves 2–12 per ultimate branch; sheath margins glabrous; auricles absent; oral setae absent or present; ligule truncate or arcuate, glabrous; blade lanceolate, 13–23 × 1.5–2.7 cm, glabrous, secondary veins 5- or 6-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots May.

- 1200–1500 m. S Sichuan.

56. *Yushania pachyclada* T. P. Yi, J. Bamboo Res. 5(1): 54. 1986.

粗枝玉山竹 cu zhi yu shan zhu

Rhizome neck 15–35 cm. Culms 1–2 m, 3–10 mm in diam.; internodes 20–30 cm, grooved or flattened above branches, glabrous, initially with white powdery ring below each node, nearly solid; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 1 at lower nodes, 2–5 at upper nodes. Culm sheaths persistent, narrowly rounded, leathery, usually glabrous, margins glabrous; auricles and oral setae absent; ligule truncate or arcuate, ca. 1 mm, glabrous; blade conical or linear-lanceolate, glabrous, revolute. Leaves 2–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 6–14 × 1.1–2 cm, glabrous, secondary veins 4–6-paired, transverse veins slightly distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jun.

- 1700–1800 m. S Sichuan, NE Yunnan.

57. *Yushania niitakayamensis* (Hayata) P. C. Keng, Acta Phytotax. Sin. 6: 357. 1957.

玉山竹 yu shan zhu

Arundinaria niitakayamensis Hayata, Bot. Mag. (Tokyo) 21: 49. 1907; *A. oiwakensis* Hayata; *Indocalamus niitakayamensis* (Hayata) Nakai; *I. oiwakensis* (Hayata) Nakai; *Pleioblastus niitakayamensis* (Hayata) Ohki; *P. oiwakensis* (Hayata) Ohki; *Pseudosasa oiwakensis* (Hayata) Makino; *Sasa niitakayamensis* (Hayata) E. G. Camus; *S. niitakayamensis* var. *microcarpa* E. G. Camus; *Sinarundinaria niitakayamensis* (Hayata) P. C. Keng.

Rhizome neck ca. 30 cm. Culms 1–4 m, 5–20 mm in diam.; internodes 10–30 cm, grooved or flattened above branches, initially setulose, becoming glabrous and waxy; supra-nodal ridge level; sheath scar with persistent remains of

sheath base. Branches 1 at lower nodes, 3 or 4 at upper nodes. Culm sheaths gradually deciduous or persistent, light brown, leathery, densely setose; auricles small; oral setae brown, ca. 2 mm; ligule truncate, ca. 0.5 mm, margin fissured; blade deciduous, linear, glabrous. Leaves 3–10 per ultimate branch; sheath sparsely hairy on margins and apex; auricles small; oral setae several, 2–3 mm; ligule truncate, ca. 1 mm, margin fissured, ciliate; blade lanceolate, 2–18 × 0.3–1.3 cm, glabrous, secondary veins 2–4-paired, transverse veins distinct, base rounded, one margin serrulate, other margin obscurely so. Inflorescence paniculate; spikelet 2–4 cm; florets 2–7, purple-brown; rachilla internodes ca. 5 mm, hairy. Lemma lanceolate, margins ciliate at apex; palea keels ciliate, apex bifid. Anthers yellow-green. Ovary fusiform, glabrous. Caryopsis olivaceous.

- 1000–3000 m. Taiwan.

58. *Yushania suijiangensis* T. P. Yi, J. Bamboo Res. 9(3): 40. 1990.

绥江玉山竹 *sui jiang yu shan zhu*

Rhizome neck 20–30 cm. Culms 1–2 m, 3–6 mm in diam.; internodes 14–23 cm, grooved or flattened above branches, white powdery in a ring below each node, initially distally gray-yellow setose, nearly solid; supra-nodal ridge weakly prominent; sheath scar prominent, initially setose. Branches 1 at lower nodes, to 3 or 4 at upper nodes. Culm sheaths persistent, triangularly narrowly rounded, 1/3–1/2 as long as internodes, leathery, adnately gray-brown setose; auricles and oral setae absent; ligule truncate, ca. 0.5 mm; blade reflexed, triangular to linear-lanceolate, margins smooth. Leaves 3–11 per ultimate branch; sheath glabrous; auricles absent; oral setae absent or present; ligule truncate, ca. 1 mm; blade narrowly rounded-lanceolate, 4.5–17 × 1–2.5 cm, abaxially slightly hairy initially, secondary veins 4–8-paired, transverse veins easily seen, base cuneate. Inflorescence unknown. New shoots Aug.

- 1300–1500 m. NE Yunnan.

13. *THAMNOCALAMUS* Munro, Trans. Linn. Soc. London 26: 33. 1868.

筱竹属 *xiao zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Shrubby bamboos. Rhizomes short necked, pachymorph, neck to 25(–30) cm. Culms loosely to densely uniaespitose, basally erect, apically nodding to pendulous; internodes ± terete, glabrous, smooth, hollow; nodes prominent; buds ovoid, with complete sheathing, 2 branch initials visible. Branches initially 5 in mid-culm, without promontory, central slightly dominant, deflexed; internodes distinctly flattened; branchlets becoming long pendulous with very many nodes. Culm sheaths deciduous, usually shorter than internodes, apically rounded and narrow; blade usually erect and superficially contiguous with sheath, triangular or lanceolate. Leaves usually small; blade with conspicuous transverse veins. Inflorescence partially ebracteate, semelauant, a partially condensed racemose panicle on leafy or leafless flowering branches, basal branches initially subtended by prominent spathe-like bracts, not unilateral. Spikelets robust, 1- to many flowered, followed by a sterile floret, shortly pedicellate. Glumes 2; lemma many veined, long mucronate or shortly awned. Palea usually shorter than lemma, 2-keeled, obtuse. Lodicules 3, transparent. Stamens 3; filaments free, long exserted; anthers yellow. Ovary appendage absent or inconspicuous; style 1; stigmas usually 3, plumose. New shoots late summer–early autumn, fl. summer–autumn.

Two to four species: Bhutan, China, NE India, Nepal; one species in China.

Other species published in *Fargesia* may also belong in this genus, but insufficient generic characteristics were given in their descriptions.

1. *Thamnocalamus spathiflorus* (Trinius) Munro, Trans. Linn. Soc. London 26: 34. 1868.

筱竹 *xiao zhu*

Rhizome neck 3.5–6 cm, 7–20 mm in diam. Culms 3–4 (–5.5) m, 1–2 cm in diam.; internodes terete or slightly flattened above branches, 15–18 cm, grooved, ridged, initially densely white powdery, glabrous; wall 2–3(–4) mm thick; nodes slightly to distinctly swollen; sheath scar prominent, with persistent remains of sheath base. Branches (1–)3–6, erect or deflexed, densely white powdery, glabrous. Culm sheaths deciduous, narrowly rounded or narrowly triangular-rounded, equal to or slightly longer than internodes, leathery, white powdery, glabrous or densely setose, margins yellow-brown ciliate, longitudinal ribs conspicuous; auricles absent or falcate, oral setae absent or prominent; ligule arcuate, ca. 1 mm, glabrous, margins fissured; blade erect, gray or gray-brown, triangular or linear-lanceolate, glabrous, margins usually rolled, serrulate. Leaves 2–5(or 6) per ultimate branch; sheath glabrous; auricles absent or prominent, oral setae absent, or many

and readily deciduous, gray, 1–1.5 mm; ligule truncate, ca. 1 mm, margins puberulous; blade narrowly lanceolate, 4.5–9 × 0.5–1 cm, glabrous, secondary veins 2-paired, transverse veins distinct, base broadly cuneate or nearly rounded, margins serrulate. Inflorescence unknown from China. New shoots May–Jun.

Coniferous and mixed subalpine forests; 2500–2900 m. S Xizang [Bhutan, NE and NW India, Nepal].

- 1a. Culm nodes only slightly swollen; culm sheaths densely setose; leaf sheath auricles prominent 1a. var. *spathiflorus*
- 1b. Culm nodes distinctly swollen; culm sheaths glabrous; leaf sheath auricles absent 1b. var. *crassinodius*

1a. *Thamnocalamus spathiflorus* var. *spathiflorus*

筱竹(原变种) *xiao zhu* (yuan bian zhong)

Arundinaria spathiflora Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 1:

617. 1835; *A. aristata* Gamble; *Thamnocalamus aristatus* (Gamble) E. G. Camus.

Culm nodes only slightly swollen. Culm sheath densely setose; auricles falcate; oral setae prominent. Leaf sheath auricles prominent; oral setae absent or many.

Coniferous and mixed subalpine forests; 2500–2900 m. S Xizang [Bhutan, NE and NW India, Nepal].

1b. *Thamnocalamus spathiflorus* var. *crassinodus* (T. P. Yi) Stapleton, *Edinburgh J. Bot.* 51: 284. 1994.

粗节筱竹 *cu jie xiao zhu*

Fargesia crassinoda T. P. Yi, *J. Bamboo Res.* 2(2): 24. 1983.

Culms nodes distinctly swollen. Culm sheaths glabrous; auricles absent; oral setae absent or rarely present. Leaf sheath auricles absent; oral setae present.

Coniferous and mixed subalpine forests; 2500–2900 m. S Xizang (Gyirong) [Nepal].

14. *FARGESIA* Franchet, *Bull. Mens. Soc. Linn. Paris* 2: 1067. 1893.

箭竹属 *jian zhu shu*

Li Dezhu (李德铎), Guo Zhenhua (郭振华); Chris Stapleton

Borinda Stapleton; *Sinarundinaria* Nakai.

Small (ca. 1 m) to subarborescent (to 15 m) bamboos. Rhizomes pachymorph, short relative to culm height, 10–30(–50) cm, with short neck. Culms unicaespitose, basally erect, apically nodding to pendulous; internodes terete, smooth or finely ridged; nodes with level or weakly prominent supra-nodal ridge, usually narrower than sheath scar. Buds ovoid to lanceolate, branch sheathing reduced. Branches initially 7–15 per node in mid-culm, above promontory, initially erect, becoming deflexed, subequal. Culm sheaths linear, rounded, or triangular; blade usually reflexed. Leaves small to medium-sized; blades glossy and thickened, or matte and delicate, transverse veins prominent. Inflorescence racemose to paniculate, compressed or open, ebracteate or branches subtended by a series of persistent, small, delicate sheaths, unilateral or not. Spikelets several flowered. Glumes (1 or)2, unequal; lemma apically obtuse or acute, mucronate to awned; palea equal to or shorter than lemma, 2-keeled, apex bifid; lodicules 3. Stamens 3; filaments free, slender; anthers yellow or purple. Style 1 or 2; stigmas 2 or 3, plumose. Caryopsis oblong to ovoid. New shoots May–Sep.

About 90 species: China, E Himalayas, Vietnam; at least 78 species (77 endemic) in China.

Fargesia was originally described for a single species from central China with dense, spathed, unilateral racemes and short rhizomes. Some authors have suggested that on this basis, it should be referred to the earlier, Himalayan genus *Thamnocalamus*, which also has rather dense, initially spathed inflorescences. However, bud and branch morphology and molecular evidence suggest that the genera are not so closely related.

Many species in *Fargesia* lack dense, spathed, unilateral inflorescences. As their flowers have become known, several have been moved into a genus established specifically to accommodate such clump-forming species, *Borinda*. In order for all these species to be listed under the same genus, they are all temporarily maintained under *Fargesia*, as in FRPS (9(1), 1996). The relationships among *Fargesia*, *Thamnocalamus*, *Yushania*, and allies are under investigation (Guo and Li, *Molec. Phylogen. Evol.* 30: 1–12. 2004).

Fargesia brevipes, *F. cuspidata*, *F. unguolata*, and *F. vicina* (species nos. 75–78) could not be included in the following key because of lack of information on their culms and culm sheaths.

- 1a. Culm sheaths deciduous; culm nodes with supra-nodal ridge prominent to very prominent, usually more prominent than sheath scar.
 - 2a. Branches obviously unequal, larger branches 1.5–6 mm in diam., smaller branches 1–1.5 mm in diam. 1. *F. canaliculata*
 - 2b. Branches ± subequal, all 1–1.5 mm in diam.
 - 3a. Internodes 21–25(–30) cm, initially sparsely white powdery; branches 10–40 per node, secondary branching absent or only at basal 1 or 2 nodes of branches; leaves 1 or 2 per ultimate branch 2. *F. stenoclada*
 - 3b. Internodes 10–15 cm, initially densely white powdery; branches 4–8 per node, secondary branching well developed; leaves 2–4 per ultimate branch 3. *F. brevissima*
- 1b. Culm sheaths late deciduous or persistent; culm nodes with supra-nodal ridge level, rarely prominent, usually less prominent than sheath scar.
 - 4a. Culm sheaths oblong or narrowly elliptical, glabrous or sparsely setose, apically rounded, apex as wide as base or nearly so.
 - 5a. Culm sheath blade reflexed.
 - 6a. Culm sheaths sparsely gray-brown setose.
 - 7a. Culm internodes densely white powdery when young, gray-white setose below node, conspicuously finely ridged in, nearly solid, wall 2.5–5.5 mm thick 12. *F. frigidis*
 - 7b. Culms internodes thinly white powdery only below each node, glabrous, obscurely finely ridged, hollow, wall 1.5–2 mm thick 4. *F. zayuensis*
 - 6b. Culm sheaths glabrous.
 - 8a. Internodes to ca. 40 cm, to 2.5 cm in diam.; culms densely white powdery when young 5. *F. orbiculata*
 - 8b. Internodes shorter than 33 cm, not more than 2 cm in diam.; culms sparsely white powdery when young.

- 9a. Culm sheaths distally asymmetrically rounded; leaf sheath oral setae usually present 6. *F. murielae*
 9b. Culm sheaths distally oblong-ovate; leaf sheath oral setae absent 7. *F. denudata*
 5b. Culm sheath blades erect at least on lower nodes, sometimes on all nodes.
 10a. Culm sheath blade base much narrower than culm sheath apex.
 11a. Culm sheath apically broadly triangular or arcuate, shoulders not projecting, ligules truncate 8. *F. similis*
 11b. Culm sheath shoulders projecting, ligules triangular or arcuate.
 12a. Culm sheaths longer than internodes, to 26 cm, very sparsely yellow-brown setose, apex leathery and flat 9. *F. utilis*
 12b. Culm sheaths shorter than internodes, to 14 cm, glabrous, apex papery and undulate when dry 10. *F. extensa*
 10b. Culm sheath blade base widened and nearly as wide as, to as wide as culm sheath apex.
 13a. Culm sheaths glabrous; leaf blade broadly lanceolate, base asymmetrically rounded 11. *F. obliqua*
 13b. Culm sheaths initially gray-white or gray-yellow setulose; leaf blade lanceolate, basally cuneate, nearly symmetrical.
 14a. Culms to 3 cm in diam.; internodes 26–28(–40) cm, initially densely white powdery; culm sheath blade to 22 mm wide; leaf blade abaxially glabrous, secondary veins 3-paired 13. *F. melanostachys*
 14b. Culms to 1.5 cm in diam.; internodes 17–25 cm, initially thinly white powdery or lacking powder, culm sheath blade to 5 mm wide; leaf blade abaxially white pubescent, secondary veins 4-paired 14. *F. scabrida*
 4b. Culm sheaths narrowly triangular or narrowly orbicular-triangular, setose, rarely glabrous, apex triangular or linear, much narrower than base.
 15a. Culm sheath longer than internode.
 16a. Culm sheath apically leathery, broadly triangular, narrowed for distal ca. 1/5 of length.
 17a. Leaf blade abaxially initially \pm gray or gray-brown pubescent, especially proximally.
 18a. Culm sheath red-brown 15. *F. rufa*
 18b. Culm sheath yellow-brown or purple-brown.
 19a. Culm internodes solid or nearly so; leaf sheath auricles absent, oral setae erect or curved 16. *F. dura*
 19b. Culm internodes hollow; leaf sheath auricles triangular or subfalcate (rarely absent in *F. macchureana*), oral setae radiating.
 20a. Culm internodes 18–28(–53) cm, thinly white powdery when young, fine longitudinal ridges prominent 17. *F. macchureana*
 20b. Culm internodes 11–17 cm, densely white powdery when young, fine longitudinal ridges obscure 18. *F. sylvestris*
 17b. Leaf blade abaxially glabrous.
 21a. Culm internodes hollow.
 22a. Culm internodes initially gray-white setose or gray-brown setose, either entirely or only below nodes.
 23a. Culms slightly flexuose, internodes 22–25 cm; leaf sheath 5–6.6 cm, blade 12–16 \times 2–3 cm, secondary veins 4- or 5-paired 19. *F. subflexuosa*
 23b. Culms straight, internodes 15–20 cm; leaf sheath 1.8–3.5 cm, blade 3.5–10.5 \times 0.5–0.9(–1.2) cm, secondary veins 2- or 3-paired 20. *F. mairei*
 22b. Internodes glabrous.
 24a. Culm internodes 20–25(–39) cm; leaf blade 1.3–2.3 cm wide 21. *F. tenuilignea*
 24b. Culm internodes to 20 cm; leaf blade less than 1.3 cm.
 25a. Culm sheaths yellowish; leaf blades not conspicuously tessellate 22. *F. spathacea*
 25b. Culm sheaths purple or purple-brown; leaf blades conspicuously tessellate.
 26a. Culm sheaths sparsely brown setose or rarely glabrous; culm sheath auricles falcate; leaf sheath auricles elliptic 23. *F. qinlingensis*
 26b. Culm sheaths glabrous or sparsely gray-white setose; culm sheaths and leaf sheaths without auricles 24. *F. nitida*
 21b. Culm internodes solid or nearly so.
 27a. Culms to 6 cm in diam.; internodes blue-gray, distally gray-brown to yellow-brown setose when young; leaf blade 10–18 \times 1.6–2.3 cm 25. *F. papyrifera*
 27b. Culms to 2 cm in diam.; internodes often light green, glabrous; leaf blade 3.2–9.5 \times 0.4–1.2 cm.
 28a. Culm sheath oral setae erect, ligule subtruncate, blade reflexed; leaf blade 0.5–1.2 cm wide 26. *F. albocorea*
 28b. Culm sheath oral setae absent, ligule \pm arcuate, blade erect; leaf blade 0.4–0.7 cm wide.
 29a. Culm sheaths uniformly leathery; culms 1–2 cm in diam.; branches deflexed 27. *F. solida*
 29b. Culm sheaths proximally thinly leathery or papery, distally membranous; culms 0.5–1 cm in diam.; branches ascending 28. *F. elegans*
 16b. Culm sheath apically thickly papery, linear or narrowly triangular, narrowed for distal 1/3–1/2 of length.
 30a. Leaf blade abaxially proximally or uniformly gray-white or gray-brown pubescent (sometimes glabrous in *F. edulis*).
 31a. Culm sheaths densely spotted.

- 32a. Culm internodes 35–41 cm, with prominent longitudinal ridge above branching; internode cavity hollow when young, not filled with pith; nodes level, intranode 4–6 mm; leaf blade $3.6\text{--}10 \times 0.3\text{--}0.7$ mm, secondary veins 2- or 3-paired 29. *F. ferax*
- 32b. Culm internodes 20–23(–36) cm, without longitudinal ridge above branching; internode cavity filled with pith when young; nodes slightly to conspicuously prominent, intranode 2–4 mm; leaf blade (7–)10–16 \times 1–1.7 cm, secondary veins 4-paired 30. *F. fungosa*
- 31b. Culm sheaths not densely spotted.
- 33a. Culm internodes with conspicuous fine ridges.
- 34a. Leaf sheath glabrous; leaf blade thick, $8.5\text{--}12(16) \times 0.5\text{--}1(1.4)$ cm, secondary veins 3-paired; leaf blade proximally glabrous; culm sheath oral setae yellow-brown 31. *F. communis*
- 34b. Leaf sheath distally pubescent; leaf blade thin, $3.4\text{--}9.5 \times 0.3\text{--}0.7$ cm, secondary veins 2-paired; pseudopetiole gray-white pubescent when young; culm sheath oral setae white-gray 32. *F. angustissima*
- 33b. Culm internodes smooth, without fine ridges.
- 35a. Culm sheaths yellow, densely brown setose.
- 36a. Culms 5–8 m tall, 2–4 cm in diam., internodes 28–40 cm; first branch ca. 4 mm in diam.; culm sheath ligule ca. 1 mm; leaf sheath oral setae present; leaf blade 10–14(–22) mm wide 33. *F. edulis*
- 36b. Culms to 5 m tall, to 2 cm in diam., internodes ca. 30 cm; first branch ca. 2 mm in diam.; culm sheath ligule ca. 7 mm; leaf sheath oral setae absent; leaf blade 4–9 mm wide 34. *F. jiulongensis*
- 35b. Culm sheaths purple-brown with lighter yellow-brown stripes, sparsely brown setose.
- 37a. Culm internodes hollow; leaf blade with transverse veins distinct; pseudopetiole glabrous 35. *F. gongshanensis*
- 37b. Culm internodes solid or nearly so; leaf blade with transverse veins obscure; pseudopetiole gray-white pubescent when young 36. *F. contracta*
- 30b. Leaf blade abaxially glabrous.
- 38a. Culm internodes hollow, wall much narrower than cavity.
- 39a. Culms 0.5–2 cm in diam.
- 40a. Culm internodes white powdery when young, glabrous; culm sheaths glabrous or apically sparsely brown setose, sometimes purple spotted; leaf sheaths to 5 cm 37. *F. semicoriacea*
- 40b. Culm internodes densely white powdery when young, glabrous or gray-yellow setose below node; culm sheaths yellow-brown setose; leaf sheaths to 7 cm 38. *F. hygrophila*
- 39b. Culms (1.2–)2–6 cm in diam.
- 41a. Culm sheath blade erect; leaf blade 3–6 mm wide 39. *F. sagittatinea*
- 41b. Culm sheath blade reflexed; leaf blade 6–22 mm wide.
- 42a. Culm sheaths purple-brown, sometimes purple spotted 40. *F. altior*
- 42b. Culm sheaths yellow or yellow-brown, not spotted.
- 43a. Culm internodes gray-green, initially gray or gray-yellow setose below nodes; culm sheath ligule 1–6 mm; leaf blade 1.3–2.2 cm wide 41. *F. concinna*
- 43b. Culm internodes green, glabrous; culm sheath ligule to 1 mm; leaf blade 0.8–1.3 cm wide 42. *F. praecipua*
- 38b. Culm internodes solid or nearly so, wall much thicker than any inner cavity.
- 44a. Culm internodes proximally white powdery when young; culm sheath blade erect 43. *F. yuanjiangensis*
- 44b. Culm internodes not white powdery; culm sheath blade reflexed (unknown in *F. perlonga*).
- 45a. Culm sheath auricles small or absent; leaf sheath oral setae scarce; leaf blade thick, $10\text{--}19.5 \times 1.3\text{--}1.7$ cm, secondary veins 5- or 6-paired 44. *F. perlonga*
- 45b. Culm sheath auricles formed by sheath shoulders rolled; leaf sheath oral setae conspicuous, erect; leaf blade thin, $5.5\text{--}14 \times 0.8\text{--}1.5$ cm, secondary veins 3–5-paired 45. *F. circinata*
- 15b. Culm sheath shorter than or about as long as internodes.
- 46a. Culm sheath blade always reflexed.
- 47a. Culm internodes solid or thickly walled, wall thicker than cavity if hollow.
- 48a. Leaf blade abaxially glabrous.
- 49a. Culm internodes initially sparsely white-gray setose; culm sheath distal margins flat; leaf blades 4–8(–15) per twig 46. *F. hsuehiana*
- 49b. Culm internodes glabrous; culm sheath distal margins wrinkled; leaf blades ca. 2 per twig 47. *F. pleniculmis*
- 48b. Leaf blade abaxially densely pubescent at least proximally.
- 50a. Leaf blade $4\text{--}12 \times 0.5\text{--}1.1$ cm, secondary veins 2–4-paired; culms 0.5–1.5 cm in diam.
- 51a. Culms apically pendulous to scrambling; leaf sheath 3–5 cm; leaf blade abaxially glabrous, secondary veins 3- or 4-paired 51. *F. declivis*
- 51b. Culms erect; leaf sheath 1.5–2.5 cm; leaf blade abaxially white pubescent, secondary veins 2- or 3-paired 52. *F. farcta*
- 50b. Leaf blade $12\text{--}21 \times 1.1\text{--}2.3$ cm, secondary veins 4- or 5(or 6)-paired; culms (1–)1.6–5(–6) cm in diam.

- 52a. Shoots usually white powdery; nodal sheath scar glabrous; culm sheaths glabrous or setose in patches 48. *F. yunnanensis*
- 52b. Shoots not white powdery; nodal sheath scar brown setose; culm sheaths densely brown setose.
- 53a. Culm internodes prominently finely ridged, initially black-green; culm sheath ligule ca. 1 mm, truncate or arcuate 49. *F. acuticontracta*
- 53b. Culm internodes obscurely finely ridged, initially; culm sheath ligule ca. 3 mm, serrulate 50. *F. longiuscula*
- 47b. Culm internodes hollow, wall much thinner than central cavity.
- 54a. Leaf blade abaxially entirely or proximally pubescent.
- 55a. Older culm internodes scabrid after setae break off, wall 1–1.5 mm thick; culm sheaths papery ... 65. *F. plurisetosa*
- 55b. Older culm internodes usually smooth and glabrous, wall 2–5 mm thick; culm sheaths leathery.
- 56a. Culm internodes densely white powdery when young.
- 57a. Culm sheaths densely appressed brown setose; leaf sheath oral setae present, persistent 53. *F. adpressa*
- 57b. Culm sheaths glabrous or sparsely yellow-brown setose; leaf sheath oral setae absent 54. *F. pauciflora*
- 56b. Culm internodes not white powdery.
- 58a. Culm sheaths proximally glabrous or setose; culm sheath auricles minute, blade wrinkled 55. *F. grossa*
- 58b. Culm sheath proximally densely brown setose; culm sheath auricles absent, blade flat.
- 59a. Culm internodes glabrous; leaf sheath 1.2–3 cm; leaf blade abaxially proximally pubescent 56. *F. hainanensis*
- 59b. Culm internodes initially distally gray setose; leaf sheath 5.5–7.5 cm; leaf blade abaxially uniformly pubescent 57. *F. porphyrea*
- 54b. Leaf blade abaxially glabrous.
- 60a. Culm internodes not white powdery; leaf blade 1.2–1.6 cm wide 58. *F. lincangensis*
- 60b. Culm internodes initially white powdery; leaf blade 0.4–1.2 cm wide.
- 61a. Culm internodes initially gray-white setose above nodes, usually densely brown setose below node when young 60. *F. strigosa*
- 61b. Culm internodes glabrous.
- 62a. Culm internodes grooved above branches; leaf blades 8–10 per ultimate branch; leaf sheath oral setae absent 62. *F. dulcicula*
- 62b. Culm internodes terete; leaf blades 2–4 per ultimate twig; leaf sheath oral setae present.
- 63a. Culm internode nearly solid or wall 4–8 mm thick; culm sheath densely pale yellow setose; leaf blades 3 or 4 per ultimate branch; leaf sheath to 3.8 cm, pseudopetiole 1.5–2.5 mm; blade 8–12 mm wide; secondary veins 3- or 4-paired 63. *F. wuliangshanensis*
- 63b. Culm internode wall 2–4 mm thick; culm sheath sparsely gray-white to gray-yellow setose; leaf blades 2(or 3) per ultimate branch; leaf sheath to 2.5 cm, pseudopetiole to 1 mm; blade 4–5 mm wide; secondary veins 2-paired 64. *F. glabrifolia*
- 46b. Culm sheath blade erect at least on lower part of culm, sometimes reflexed on upper parts.
- 64a. Leaf sheath auricles present.
- 65a. Culm internodes initially densely gray setose; culm sheath ligule ciliate.
- 65b. Culm internodes glabrous when young.
- 66a. Culm sheath blade much narrower than apex of culm sheath; leaf sheath auricles narrowly elliptic, oral setae terminal 66. *F. dracocephala*
- 66b. Culm sheath blade about as wide as culm sheath apex; leaf sheath auricles nearly circular, oral setae marginal 67. *F. decurvata*
- 64b. Leaf sheath auricles absent.
- 67a. Leaf sheath oral setae present, erect.
- 68a. Culm internodes initially distally white-gray setose, not white powdery; culm sheaths persistent, densely adnately brown-black setose, ligule 2–6 mm 68. *F. conferta*
- 68b. Culm internodes glabrous, white powdery; culm sheaths deciduous, ligule to 2 mm.
- 69a. Leaf sheath to 16 cm, apex broadly triangular; leaves 2–4 per ultimate branch; leaf sheath margins densely ciliate, blade with secondary veins 4–7-paired 69. *F. robusta*
- 69b. Leaf sheath to 27.5 cm, apex narrowly triangular; leaves 7–9 per ultimate branch; leaf sheath margins glabrous, blade with secondary veins 3- or 4-paired 70. *F. caduca*
- 67b. Leaf sheath oral setae absent.
- 70a. Culm internodes setose when young, at least near nodes, culm sheath brown setose.
- 71a. Culm internodes 35–45 cm; leaf blade with both margins spinescent-serrulate 59. *F. yulongshanensis*
- 71b. Culm internodes 18–25 cm; leaf blade with one margin slightly serrulate, other margin smooth 71. *F. emaculata*
- 70b. Culm internodes glabrous; culm sheath glabrous or sparsely setose.
- 72a. Culms 1.2–2(–2.5) m, internodes 8–12 cm; culm sheath persistent 61. *F. funiushanensis*
- 72b. Culms 3–6 m, internodes 14–38 cm; culm sheath deciduous, sometimes gradually so.

- 73a. Culm internodes grooved above branches; culm sheath ligule truncate, lower culm sheath blades erect, upper blades reflexed 72. *F. lushuiensis*
 73b. Culm internodes terete; culm sheath blades always erect.
 74a. Culm sheaths gradually deciduous, ligule not broader than base of sheath blades, arcuate 73. *F. mali*
 74b. Culm sheaths soon deciduous, ligule broader than base of sheath blade, truncate or concave 74. *F. exposita*

1. *Fargesia canaliculata* T. P. Yi, J. Bamboo Res. 4(1): 19. 1985.

岩斑竹 *yan ban zhu*

Rhizome neck 5–15 cm, 1.4–3 cm in diam.; internodes 3–8 mm. Culms 3–5 m, 1–2 cm in diam.; internodes terete, 20 (–25) cm, conspicuously grooved above branches, smooth, very rigid, initially white powdery, especially below nodes, solid or nearly so, cavity filled with lamellate or spongy pith; supra-nodal ridges prominent. Branches 5–7 per node, deflexed, unequal, thickly walled. Culm sheaths soon deciduous, gray-yellow, narrowly triangular, longer than internodes, basally leathery, distally papery, sparsely brown setose, margins densely ciliate; auricles and oral setae absent; ligule convex, irregularly fissured; blade reflexed, linear-lanceolate, glabrous. Leaves 2 or 3 per ultimate branch; sheath glabrous, margin glabrous or ciliolate; auricles and oral setae absent; ligule arcuate or convex, ca. 1 mm; blade linear-lanceolate, 2.8–5 × 0.25–0.5 cm, narrow, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Jun.

• W Sichuan.

The shoots are delicious, and the culms are used for making paper, chopsticks, and farm tools.

2. *Fargesia stenoclada* T. P. Yi, J. Bamboo Res. 8(1): 30. 1989.

细枝箭竹 *xi zhi jian zhu*

Rhizome neck 4–8 cm, 0.8–1.8 cm in diam. Culms 2.5–5.5 m, 1–1.7 cm in diam.; internodes terete, 21–25(–30) cm, smooth, initially sparsely white powdery; wall 3–5 mm thick; nodes and sheath scars weakly prominent. Branches 10–40 per node, subequal, slender, secondary branching only from lowermost branches. Culm sheaths deciduous, narrowly triangular-rounded, 1/2–3/5 as long as internodes, thinly leathery, radially white-gray setose, longitudinal ribs conspicuous, margins densely ciliate; auricles and oral setae absent; ligule arcuate or nearly truncate, 0.5–1 mm; blade erect, triangular to linear-triangular, width nearly equal to apex of culm sheath. Leaves 1 or 2 per ultimate branch; sheath margins ciliolate; auricles absent, oral setae few, 1–2 mm; ligule truncate, ca. 0.4 mm; blade linear-lanceolate, 4–9.4 × 0.5–0.9 cm, glabrous, secondary veins 2- or 3-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Apr–May.

• 1600–1900 m. W Sichuan.

The multiple branches and short buds of this species are atypical for *Fargesia*.

The shoots are edible, and the culms provide weaving material and fishing rods. The species is a source of food for the giant panda.

3. *Fargesia brevissima* T. P. Yi, J. Bamboo Res. 5(4): 128. 1985.

窝竹 *wo zhu*

Rhizome neck 7–14 cm, 1.1–2.5 cm in diam., internodes 2–12 mm. Culms 3–5 m, 1–3 cm in diam.; internodes terete, 10–15 cm, rigid, initially glaucous and densely white powdery, longitudinal ribs obscure; wall 1–4 mm thick; supra-nodal ridge prominent, initially white powdery; sheath scar prominent, sometimes with persistent remains of sheath base. Branches 4–8 per node, deflexed, subequal, slender. Culm sheaths gradually deciduous, distally broadly rounded, cartilaginous, glabrous, white powdery at base, longitudinal ribs conspicuous marginally and distally; auricles and oral setae absent; ligule steeply arcuate, ca. 1 mm, glabrous; blade erect, triangular or linear-lanceolate, glabrous. Leaves 2–4 per ultimate branch; sheath margins yellow-brown ciliolate; auricles and oral setae absent; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 5–11 × 0.7–1.5 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base broadly cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Jun.

• 2000–2400 m. E Sichuan.

The shoots are edible, and the culms are used for weaving.

4. *Fargesia zayuensis* T. P. Yi, J. Bamboo Res. 7(2): 20. 1988.

察隅箭竹 *cha yu jian zhu*

Rhizome neck 3–7 cm, 0.9–1.5 cm in diam., internodes 3–5 mm. Culms to 6 m, to 1.5 cm in diam.; internodes terete, 25–35 cm, initially sparsely white powdery; wall 1.5–2 mm thick; supra-nodal ridges level; sheath scar prominent. Branches 5–10 per node, deflexed, subequal. Culm sheaths gradually deciduous, narrowly rounded, shorter than internode, leathery, abaxially slightly gray-brown setulose, margins brown ciliolate or not, longitudinal ribs conspicuous; auricles absent; oral setae not persistent; ligule truncate, ca. 1 mm, glabrous, margin fissured; blade readily deciduous, reflexed, rarely erect, linear-lanceolate, articulate with apex of culm sheath. Leaves 1–3 per ultimate branch, readily deciduous; sheath glabrous; auricles and oral setae absent; ligule truncate, glabrous; blade lanceolate, 5–8.5 × 0.4–0.6 cm, glabrous, secondary veins 2-paired, transverse veins obscure, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jul–Aug.

• 2500–3000 m. SE Xizang.

The shoots are edible, and the culms are used for weaving and for brooms.

5. *Fargesia orbiculata* T. P. Yi, J. Bamboo Res. 7(2): 22. 1988.

长圆鞘箭竹 *chang yuan qiao jian zhu*

Rhizome neck 5–10 cm, 1–2.5 cm in diam. Culms 4–6 m,

1–2.5 cm in diam.; internodes terete, 28–40 cm, initially densely white powdery, longitudinal ribs conspicuous; wall 2–3 mm thick; supra-nodal ridges level, initially white powdery; sheath scar prominent. Branches 5–18 per node, deflexed, slender, densely white powdery. Culm sheaths persistent, gray-yellow to yellow-brown, distally rounded, leathery, glabrous, longitudinal ribs conspicuous and curved at apex of culm sheath; auricles absent; oral setae usually absent; ligule ca. 1 mm, convex; blade readily deciduous, reflexed, linear-lanceolate, glabrous, usually revolute, articulate with sheath. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule truncate or arcuate, ca. 1 mm; blade lanceolate, 5–8 × 0.8–1.3 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base nearly rounded, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Jul.

- About 3800 m. NW Yunnan.

The shoots are edible, and the culms are used for furniture.

6. *Fargesia murielae* (Gamble) T. P. Yi, J. Bamboo Res. 2(1): 39. 1983.

神农箭竹 shen nong jian zhu

Arundinaria murielae Gamble, Bull. Misc. Inform. Kew 1920: 344. 1920, nom. cons. prop.; *A. sparsiflora* Rendle (1904), nom. rej. prop.; *Fargesia parvifolia* T. P. Yi; *F. maluo* T. P. Yi; *F. sparsiflora* (Rendle) Ohrmberger; *Sinarundinaria murielae* (Gamble) Nakai; *S. sparsiflora* (Rendle) P. C. Keng; *Thamnocalamus murielae* (Gamble) Demoly; *T. sparsiflorus* (Rendle) P. C. Keng.

Culms 1–5 m, 0.5–1.4 cm in diam.; internodes terete, 15–23 cm, initially sparsely white powdery, longitudinal ribs weakly conspicuous; wall 1.5–2.5 mm thick, cavity filled with lamellate pith; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 3–10 per node, deflexed, solid. Culm sheaths deciduous, distally asymmetrically rounded, leathery, glabrous or sometimes distally gray setose, margins initially yellow-brown ciliolate, longitudinal ribs conspicuous; auricles and oral setae absent; ligule arcuate or truncate, 0.5–1 mm, glabrous; blade reflexed, triangular, narrowly triangular, or linear, glabrous, margins level or rolled. Leaves 1 or 2(–6) per ultimate branch; sheath glabrous; auricles absent, oral setae present, yellow-brown; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 6–10 × 0.8–1.2 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base nearly rounded or broadly cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots May.

- 2800–3000 m. Hubei (Shennongjia), Sichuan.

This species is very important in Western horticulture as one of the hardiest bamboos introduced. It was widely cultivated as *Thamnocalamus spathaceus*, after being erroneously placed in synonymy of *Fargesia spathacea*, which was then transferred, also in error, into *Thamnocalamus* (Soderstrom, Brittonia 31: 495. 1979). The earlier name *Arundinaria sparsiflora* is frequently considered conspecific, and the conservation of *A. murielae* against that name has been proposed.

The shoots are edible.

7. *Fargesia denudata* T. P. Yi, J. Bamboo Res. 4(1): 20. 1985.

缺苞箭竹 que bao jian zhu

Rhizome neck 4–13 cm, 7–10 mm in diam., internodes 2–8 mm. Culms 3–5 m, 0.6–1.3 cm in diam.; internodes terete, 15–18 cm, smooth, initially slightly white powdery; wall 2–3 mm thick; nodes with level or prominent supra-nodal ridge on branching nodes; sheath scar prominent. Branches 4–15 per node, slender. Culm sheaths deciduous, light yellow, oblong-ovate, ca. 2/3 as long as internodes, leathery, glabrous, longitudinal ribs conspicuous; auricles and oral setae absent; ligule truncate, ca. 0.7 mm, glabrous; blade reflexed, linear or linear-triangular, glabrous. Leaves 2–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule truncate or arcuate, ca. 1 mm, glabrous; blade linear-lanceolate or lanceolate, 7–11 × 0.4–1 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate or broadly cuneate, margins smooth or spinescent-serrulate initially. Inflorescence racemose, subtended by 1–4 purple spathes; spikelets 5–10, 1.5–2.5 cm, unilateral, rachilla internodes 0.5–1 mm; florets 2–4. Glumes narrowly lanceolate, papery, abaxially puberulous at apex; lemma ovate-lanceolate, puberulous, apex mucronate to long mucronate; palea keels serrulate, apex bifid; lodicules ovate. Anthers yellow. Ovary ovoid, glabrous; style 1; stigmas 3. Caryopsis ovoid. New shoots May.

- 1900–3200 m. S Gansu, N Sichuan.

The shoots are fragrant and are eaten by the giant panda.

8. *Fargesia similaris* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 25. 1988.

秃鞘箭竹 tu qiao jian zhu

Shrubby bamboo. Culms 0.8–1.2 cm in diam.; internodes light yellow, terete, 9.5–18.2 cm, white or black powdery below nodes, longitudinal ribs obscure; wall 2–3 mm thick, cavity filled with lamellate pith; supra-nodal ridges prominent; sheath scar weakly prominent. Branches 3–8(–15) per node, deflexed. Culm sheaths yellow, triangular to narrowly rounded, shorter than internodes, basally cartilaginous, distally leathery, glabrous, longitudinal ribs conspicuous on upper part; margins densely ciliolate, apex slightly white powdery; auricles absent; oral setae few; ligule truncate, ca. 1 mm, glabrous; blade erect, triangular-conical, glabrous. Leaves 2–4 per ultimate branch; sheath purple, glabrous or with white pubescent margins; auricles absent; oral setae few, erect, yellow-brown or gray, 2–4 mm, undulate; ligule truncate, ca. 1 mm, glabrous; blade narrowly lanceolate, 1.3–6.5 × 0.4–0.6 cm, glabrous or abaxially white-gray pubescent, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown.

- Yunnan.

9. *Fargesia utilis* T. P. Yi, J. Bamboo Res. 7(2): 28. 1988.

伞把竹 san ba zhu

Rhizome neck 5–10 cm, 1.8–2.5 cm in diam. Culms to 4 m, 1.5–2.5 cm in diam.; internodes terete, 15–17(–20) cm, initially slightly white powdery, longitudinal ribs absent; wall

2.5–5 mm thick; nodes with level or prominent supra-nodal ridge at branching nodes, slightly white powdery initially; sheath scar prominent, glabrous or initially slightly setose. Branches (3–)7–18 per node, deflexed. Culm sheaths persistent, narrowly triangular to rounded, longer than internodes, leathery, sometimes slightly white powdery and sparsely yellow-brown setose, shoulders with steep triangular projections, longitudinal ribs conspicuous; auricles and oral setae absent; ligule irregular, steeply arcuate, glabrous; blade erect or reflexed, narrowly triangular to linear-lanceolate, glabrous, level. Leaves 1 or 2 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule truncate, glabrous; blade narrowly lanceolate, 4–10 × 0.5–1 cm, secondary veins 2- or 3-paired, transverse veins indistinct, base broadly cuneate, margins serrulate. Inflorescence unknown. New shoots Aug.

- 2700–3700 m. NE Yunnan.

The shoots are edible, and the culms are used for making furniture.

10. *Fargesia extensa* T. P. Yi, J. Bamboo Res. 2(2): 27. 1983.

喇叭箭竹 *la ba jian zhu*

Borinda extensa (T. P. Yi) Stapleton.

Rhizome neck 10–20 cm, 1–2 cm in diam. Culms 4–6.5 m, 1–2.8 cm in diam.; internodes terete, or slightly flattened above branching, 20–32 cm, initially sparsely white powdery, glabrous; wall 3–6 mm thick, cavity filled with lamellate pith; supra-nodal ridges prominent, glabrous. Branches 3–7 per node, deflexed. Culm sheaths rectangular, shorter than internodes, basally leathery, distally papery, undulate and fragile when dry, glabrous, longitudinal ribs greatly conspicuous, apex and 2 shoulders projecting steeply; auricles and oral setae absent; ligule steeply arcuate, ca. 1 mm, glabrous; blade erect, triangular-conical, glabrous. Leaves 3 or 4(–8) per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate, ca. 2 mm, glabrous; blade narrowly lanceolate, 5.5–16.5 × 0.7–1.4 cm, secondary veins 2–4-paired, transverse veins distinct, base broadly cuneate, margins serrulate. Inflorescence unknown. New shoots Aug.

- 2200–2500 m. SE Xizang.

11. *Fargesia obliqua* T. P. Yi, Acta Bot. Yunnan. 8: 48. 1986.

团竹 *tuan zhu*

Rhizome neck 2.5–5 cm, 6–10 mm in diam. Culms 2–4 m, 0.5–1.2 cm in diam.; internodes terete, 18–24 cm, initially slightly white powdery, glabrous; wall 1.5–3.5 mm thick, pith granular; supra-nodal ridges weakly prominent; sheath scar prominent. Branches (1–)3(–5) per node, deflexed. Culm sheaths persistent, narrowly rounded or triangularly narrowly rounded, ca. 1/2 as long as internodes, leathery, glabrous, longitudinal ribs prominent, margins densely gray ciliolate; auricles and oral setae absent; ligule arcuate, ca. 1 mm, glabrous; blade not readily deciduous, erect, triangular or triangular-lanceolate, glabrous, not articulate with sheath. Leaves 2 or 3(or 4) per ultimate branch; sheath glabrous; auricles and oral setae absent or obscure; ligule inclined-truncate, ca. 0.7 mm, glabrous; blade irregular, narrowly ovate-lanceolate, 6.5–9 × 1.2–1.8 cm, second-

dary veins 4-paired, transverse veins obscure, base rounded, margins spinescent-serrulate. Inflorescence unknown. New shoots Jul.

- 2400–3300(–3700) m. N Sichuan.

This species appears similar to *Fargesia frigidis* from Yunnan, but it is not known whether it is also deciduous.

The shoots are an important source of food for the giant panda.

12. *Fargesia frigidis* T. P. Yi, J. Bamboo Res. 7(2): 17. 1988.

凋叶箭竹 *diao ye jian zhu*

Borinda frigidis (T. P. Yi) Stapleton [“*frigidorum*”]; *Fargesia alpina* Hsueh & C. M. Hui.

Rhizome neck 3–7 cm, 1–1.8 cm in diam., internodes 2–5 mm, solid. Culms 1.5–3.5 m, 1–1.7 cm in diam.; internodes terete, 22–24 cm, conspicuously longitudinally ribbed, initially densely white waxy and white-gray setose below nodes, glabrescent, nearly solid; wall 2.5–5.5 mm thick; supra-nodal ridges level; sheath scar very prominent, woody. Branches 4–13 per node, deflexed. Culm sheaths gradually deciduous to persistent, narrowly rounded, 1/5–2/5 as long as internodes, leathery, very sparsely appressed light yellow setulose, upper margins yellow-brown ciliolate initially, longitudinal ribs conspicuous, apex asymmetrical; auricles absent, one shoulder rising to triangular point; oral setae absent; ligule inclined-truncate or truncate, 1–1.5 mm, glabrous, often rising in center; blade readily deciduous, reflexed, triangular to linear-lanceolate, articulating with apex of culm sheath. Leaves 1–4 per ultimate branch, mostly deciduous in winter; sheath glabrous; auricles absent, one shoulder rising to triangular point; oral setae absent or sometimes few; ligule inclined-truncate, ca. 0.4 mm; blade lanceolate, 2.3–5.2 × 0.45–0.7 cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Aug.

- 3100–3700 m. W Yunnan.

The boundaries between this species and the earlier-named *Fargesia melanostachys*, *Arundinaria forrestii*, and *A. acutissima* require clarification. The types lack sufficient vegetative material for satisfactory comparison without revisiting type localities.

The epithet *frigidis* means “from cold places,” whereas the epithet *frigida*, which is sometimes used, implies a subtly different and less appropriate meaning: “cold bamboo.”

The culms are used for weaving and for brooms.

13. *Fargesia melanostachys* (Handel-Mazzetti) T. P. Yi, J. Bamboo Res. 2(1): 39. 1983.

黑穗箭竹 *hei sui jian zhu*

Arundinaria melanostachys Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 23. 1925; *A. acutissima* Keng; *A. forrestii* Keng; *Sinarundinaria acutissima* (Keng) P. C. Keng; *S. forrestii* (Keng) P. C. Keng; *S. melanostachys* (Handel-Mazzetti) Keng ex P. C. Keng.

Culms 4–6 m, 1–3 cm in diam.; internodes terete or slightly flattened, 26–28(–40) cm, ridged, initially densely white powdery, glabrous; wall 2–5 mm thick; supra-nodal ridges

obscure or level; sheath scar prominent. Branches 3–11 per node. Culm sheaths persistent, narrowly rounded to triangularly narrowly rounded, 1/2–3/5 as long as internodes, leathery, glabrous or sometimes white-gray setulose, initially white powdery, longitudinal ribs conspicuous, margins white-gray ciliate; auricles and oral setae absent; ligule ca. 1 mm, triangular, glabrous; blade erect, triangular or narrowly so, glabrous. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate, ca. 1 mm, glabrous; blade lanceolate, 3.5–7.5 × 0.7–1.4 cm, glabrous, secondary veins 3-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence a raceme or simple panicle, with 1 lanceolate or triangular bract at base; spikelets 2–8, 1.8–5 cm, rachilla 4–5 mm; florets 3–8, apical floret sterile, apex densely puberulous. Glumes 2, unequal, glabrous; lemma ovate-lanceolate, abaxially slightly puberulous, apex acuminate; palea keels serrulate, apex bifid; lodicules 3, margins apically ciliate. Anthers yellow. Ovary ovoid, glabrous; styles 2; stigmas 3, white, plumose. Caryopsis unknown. New shoots Jul–Aug.

- 3100–3800 m. W Yunnan.

The boundaries between this species, its synonyms, and the later-named *Fargesia frigidis* and its synonym require detailed investigation through gatherings of new material from type localities.

The culms are used for fishing rods.

14. *Fargesia scabrida* T. P. Yi, J. Bamboo Res. 4(2): 24. 1985.

糙花箭竹 cao hua jian zhu

Rhizome neck 4.5–26 cm, 6–16 mm in diam. Culms 1.8–3.5 m, 0.5–1 cm in diam.; internodes terete, 17–20 cm, initially slightly white powdery or not, glabrous; wall 2–4 mm thick; supra-nodal ridges level or weakly prominent; sheath scar greatly prominent, broad, thick, initially gray setulose. Branches 3–8 per node, erect or deflexed. Culm sheaths persistent, light red-brown, triangular to narrowly rounded, 1/3–1/2 as long as internodes, leathery, abaxially sparsely gray to gray-yellow setulose, longitudinal ribs prominent, margins densely gray-yellow setulose; auricles and oral setae absent or obscure; ligule arcuate, ca. 1 mm, margins densely gray ciliate; blade erect, triangular or linear-triangular, margins usually sparsely setulose. Leaves 2 or 3 per ultimate branch; sheath margins gray-yellow ciliate; auricles and oral setae absent or obscure; ligule truncate, ca. 1 mm, ciliate; blade lanceolate, 12–18 × 1.1–1.8 cm, abaxially pubescent, secondary veins 4-paired, transverse veins obscure, base broadly cuneate, margins spinescent-serrulate. Inflorescence a panicle, initially terminal to a leafy shoot. Spikelets 6–12, 1.5–3 cm, rachilla internodes 1–2 mm; florets 5–7. Glumes 2, setulose, apex long mucronate; lemma lanceolate, setulose, apex long mucronate; palea keels serrulate; lodicule margins sparsely ciliate. Anthers yellow. Ovary oblong, glabrous; styles 2 or 3; stigmas 3. Caryopsis unknown. New shoots late Apr–early May.

- 1500–2000 m. S Gansu, N Sichuan.

This species is somewhat intermediate between *Fargesia* and *Yushania* in having a less condensed inflorescence, suggesting that *Borinda* may be the appropriate genus.

The shoots are sweet and are an important source of food for the giant panda.

15. *Fargesia rufa* T. P. Yi, J. Bamboo Res. 4(2): 27. 1985.

青川箭竹 qing chuan jian zhu

Rhizome neck (6–)10–18 cm, 4–15 mm in diam. Culms 2.5–3.5 m, 0.8–1 cm in diam.; internodes terete, 15–17(–20) cm, smooth, initially slightly white powdery, later white waxy, glabrous; wall 1.5–3.2 mm thick, pith thin and closely adnate to inner wall; supra-nodal ridges weakly prominent; sheath scar greatly prominent as a thick broad ridge, initially brown setose. Branches 6–16 per node, deflexed. Culm sheaths gradually deciduous, red-brown, narrowly triangular, much longer than internodes, basally leathery, distally more papery, sparsely brown setose, longitudinal ribs prominent, margins apically densely gray ciliate; auricles and oral setae absent; ligule truncate or convex, ca. 1 mm, margins usually ciliate; blade readily deciduous, reflexed, linear-lanceolate, glabrous, margins dentate-serrulate. Leaves 2–4 per ultimate branch; sheath abaxially glabrous, ridged, margins gray ciliate; auricles absent; oral setae few, erect, yellow, 1–1.5 mm; ligule arcuate, ca. 1 mm, glabrous; blade linear-lanceolate, 6–10 × 0.6–0.8 cm, proximally often slightly pilose, secondary veins 2- or 3-paired, transverse veins weakly prominent, base cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown. New shoots Jun.

- 1600–2300 m. S Gansu, N Sichuan.

The bamboo cultivated in the West under the cultivar name *Fargesia* ‘Rufa’ is not this species.

Fargesia rufa is an important source of food for the giant panda.

16. *Fargesia dura* T. P. Yi, J. Bamboo Res. 7(2): 34. 1988.

马斯箭竹 ma si jian zhu

Rhizome neck 5–7 cm, 1.6–3 cm in diam. Culms 3–4 m, 1–2 cm in diam.; internodes terete, 20–27 cm, rigid, initially densely white powdery and gray to white setose, waxy when old, longitudinal ribs prominent, solid or nearly so; nodes initially white powdery and sparsely setulose, supra-nodal ridge level or weakly prominent; sheath scar prominent, initially densely brown setulose. Branches 3–7 per node, initially setose. Culm sheaths persistent, narrowly rounded, longer than internodes, leathery, densely brown setulose, longitudinal ribs greatly prominent, margins initially gray ciliate, apex broadly triangular; auricles and oral setae absent; ligule truncate or convex, 1–2 mm, glabrous; blade readily deciduous, reflexed, linear-lanceolate, glabrous or adaxially slightly pilose at base. Leaves 2–6 per ultimate branch; sheath margins initially densely yellow-brown ciliate; auricles absent; oral setae few, erect or curved, 2–4 mm; ligule truncate, ca. 1 mm, initially slightly pilose; blade linear-lanceolate, 4.5–12 × 0.4–0.9 cm, abaxially slightly puberulous, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate, margins spinescent-serrulate, apex acuminate. Inflorescence unknown. New shoots Jul.

- About 3200 m. W Yunnan.

17. *Fargesia macclureana* (Bor) Stapleton, Bamboo Soc. Newslett. 17: 17. 1993.

西藏箭竹 xi zang jian zhu

Arundinaria macclureana Bor, Kew Bull. [12] 1957: 420. 1958; *Borinda macclureana* (Bor) Stapleton; *B. setosa* (T. P. Yi) Stapleton; *Fargesia setosa* T. P. Yi; *Sinarundinaria macclureana* (Bor) C. S. Chao & G. Y. Yang.

Rhizome neck 3–5 cm, 4–20 mm in diam. Culms 1–7 m, 0.5–3.5 cm in diam.; internodes terete, 18–28(–53) cm, initially sparsely white powdery, initially densely brown or gray-brown setose below each node, longitudinal ribs prominent; wall 2–8 mm thick; supra-nodal ridge weakly prominent; sheath scar prominent, initially brown setose. Branches 3–7 per node, deflexed, subequal. Culm sheaths persistent or gradually deciduous, narrowly triangular, slightly longer than internodes, leathery, densely brown-yellow to brown setose, longitudinal ribs prominent, margins brown ciliate or not; auricles absent; oral setae few, deciduous, erect, purple, 3–12 mm, undulate; ligule truncate or convex, 1–1.5 mm, margins usually serrulate, ciliate; blade readily deciduous, reflexed, triangular-linear or linear-lanceolate, adaxially slightly pilose, one margin dentate-serrulate. Leaves 3–5 per ultimate branch; sheath purple-green, puberulous; auricles obscure or absent, purple; oral setae few, deciduous, curved, purple or yellow-brown, 1.5–3 mm; ligule arcuate or truncate, 0.5–1.5 mm; blade lanceolate, 4–17 × 0.4–1.8 cm, abaxially slightly puberulous, secondary veins 3- or 4-paired, transverse veins weakly prominent, base broadly cuneate, margins spinescent-serrulate. Inflorescences terminal on leafy branchlets, open panicles, 9–12 cm. Spikelets 2–3 cm, tinged with purple; glumes 2, florets 5–7 plus a terminal sterile floret; lemmas ca. 1.6 cm, awned, awns ca. 2 mm; palea ca. 11 mm; lodicules 3, ciliate, 2 lateral ones larger; stamens 3, anthers yellow; style 1, stigmas 2. Caryopses unknown. New shoots Jul.

• Dominant bamboo in understory of *Picea* or *Pinus densata* and *Quercus* forests; 2100–3800 m. SE Xizang.

This is the type species of the genus *Borinda*.

18. *Fargesia sylvestris* T. P. Yi, J. Bamboo Res. 7(2): 31. 1988.

德钦箭竹 *de qin jian zhu*

Culms 3–4 m, 0.6–1 cm in diam.; internodes initially gray-green, terete, 11–17 cm, densely white powdery, gray setose; wall 2–3 mm thick; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 6–10 per node, deflexed. Culm sheaths persistent, narrowly rounded, leathery, yellow-brown setose, longitudinal ribs prominent, margins initially ciliate, apex triangular; auricles and oral setae absent; ligule truncate, ca. 1 mm, margins initially densely yellow-brown ciliate; blade readily deciduous, reflexed, linear-lanceolate, glabrous, margins dentate-serrulate. Leaves 3–5 per ultimate branch; sheath margins gray-yellow ciliate; auricles nearly falcate, small; oral setae few, radiating, ca. 1 mm; ligule purple, truncate, ca. 1 mm, margin initially ciliate; blade narrowly lanceolate, 5–9.2 × 0.5–0.8 cm, abaxially densely pilose, secondary veins 3-paired, transverse veins weakly prominent, base cuneate or broadly cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Jul.

• 3200–3300 m. W Yunnan.

19. *Fargesia subflexuosa* T. P. Yi, J. Bamboo Res. 7(2): 36. 1988.

曲秆箭竹 *qu gan jian zhu*

Rhizome neck 5–10 cm, 1.5–2 cm in diam. Culms slightly zigzag, 3–6 m, 1.5–3 cm in diam.; internodes gray-green, terete, 22–25 cm, initially white powdery and white-gray setose, initially densely yellow setose below node, longitudinal ribs prominent; wall 3–5 mm thick; supra-nodal ridges weakly prominent to prominent; sheath scar prominent. Branches 3–7 per node, erect or deflexed. Culm sheaths deciduous, triangularly narrowly rounded or narrowly triangular, longer than internodes, leathery, sparsely yellow adnate-setulose, setae erect and long, longitudinal ribs prominent, margins glabrous or yellow-brown ciliate, apex broadly triangular; auricles and oral setae absent; ligule truncate or convex, 1–2 mm, glabrous; blade readily deciduous, reflexed, triangular or linear-lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath 5–6.6 cm, margins glabrous; auricles absent or obscure; oral setae few, divergent, yellow-brown, 1.5–3 mm; blade lanceolate, 12–16 × 2–3 cm, thin, usually rugose when dry, glabrous, secondary veins 4- or 5-paired, transverse veins slightly distinct, base cuneate or broadly cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Sep.

• 2900–3300 m. W Yunnan.

The culms are used for weaving.

20. *Fargesia mairei* (Hackel ex Handel-Mazzetti) T. P. Yi, J. Bamboo Res. 7(2): 50. 1988.

大姚箭竹 *da yao jian zhu*

Arundinaria mairei Hackel ex Handel-Mazzetti, Symb. Sin. 7: 1273. 1936; *Indocalamus mairei* (Hackel ex Handel-Mazzetti) McClure; *Sinarundinaria mairei* (Hackel ex Handel-Mazzetti) Keng ex P. C. Keng; *Yushania mairei* (Hackel ex Handel-Mazzetti) J. J. N. Campbell.

Rhizome neck 2–10 cm, 1–1.8 cm in diam. Culms 2–4 m, 1–3 cm in diam.; internodes terete, 15–20 cm, initially densely white powdery, distally white or light yellow setulose; wall 1.5–2.5 mm thick; supra-nodal ridge level, initially white powdery; sheath scar prominent, with remains of sheath base. Branches 6–10 per node. Culm sheaths persistent, triangularly narrowly rounded, longer than internodes, leathery, sparsely brown setulose, longitudinal ribs prominent, margins densely brown ciliate apically; auricles and oral setae absent or obscure; ligule truncate or slightly arcuate, 1–2.7 mm; blade reflexed, linear-lanceolate, glabrous. Leaves 2 or 3 per ultimate branch; sheath 1.8–3.5 cm, glabrous; auricles and oral setae absent or obscure; ligule purple, truncate, 1–1.5 mm; blade narrowly lanceolate, 3.5–10.5 × 0.5–0.9(–1.2) cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate or nearly rounded, one margin spinescent-serrulate, other margin obscure. Inflorescence paniculate, exerted from spathe. Spikelets ca. 8, rachilla 3–4 mm. Glumes 1 or 2, purple, scabrous, apex long mucronate; lemma setose on margins, apex acuminate; palea setose. Anthers yellow. Ovary oblong; styles 2. Caryopsis unknown. New shoots Jul.

- 2900–3600 m. N Yunnan.

The inflorescence of this species was described from *R. P. Maire* 7534, whereas vegetative details are from *T. P. Yi* 84014.

The shoots are edible, and the split culms are used for weaving.

21. *Fargesia tenuilignea* T. P. Yi, J. Bamboo Res. 7(2): 39. 1988.

薄壁箭竹 *bao bi jian zhu*

Fargesia aurita Hsueh & C. M. Hui (1998), not T. P. Yi (1985).

Rhizome neck 5.5–10.5 cm, 1.5–3 cm in diam. Culms 4–8(–10) m, 1–3 cm in diam.; internodes terete, 20–25(–40) cm or longer, initially often slightly white powdery, glabrous; wall 2–3 mm thick; supra-nodal ridge level or weakly prominent; sheath scar prominent, narrow, initially brown setose. Branches 8–11 per node. Culm sheaths persistent, narrowly triangularly rounded, equal to or longer than internodes, leathery, densely yellow to yellow-brown setose, longitudinal ribs prominent, margins apically ciliate; auricles absent; oral setae few, erect or slightly curved, yellow-brown, 2–8 mm; ligule truncate, 2–5 mm, margins sometimes ciliate; blade readily deciduous, reflexed, linear-lanceolate, adaxially slightly pilose proximally. Leaves 2–5 per ultimate branch; sheath initially white powdery apically, margins initially ciliate; auricles absent; oral setae few, erect, gray-yellow, 3–11 mm, undulate; ligule light green, truncate, ca. 1 mm, glabrous; blade lanceolate, 13–18(–20) × 1.3–2.3(–2.5) cm, usually rugose when dry, glabrous, secondary veins 4- or 5(or 6)-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscure, apex acuminate. Inflorescence unknown. New shoots Aug.

- 2400–3100 m. SW Yunnan.

The shoots are edible, and the culms are used for papermaking and weaving.

22. *Fargesia spathacea* Franchet, Bull. Linn. Soc. Paris 2: 1067. 1893.

箭竹 *jian zhu*

Arundinaria spathacea (Franchet) D. McClintock; *Thamnocalamus spathaceus* (Franchet) Soderstrom.

Rhizome neck 7–13 cm, 7–20 mm in diam. Culms 1.5–4 m, 0.5–2 cm in diam.; internodes terete, 15–18 cm, initially with or without light white powder, glabrous; wall 1.5–2.5 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, initially white-gray setulose. Branches 9–17 per node, deflexed, slightly white powdery, solid or nearly so. Culm sheaths persistent or gradually deciduous, yellowish, narrowly rounded to triangular, longer, equal to, or shorter than internodes, leathery, brown setulose, longitudinal ribs prominent, margins initially brown ciliate; auricles and oral setae absent; ligule truncate, ca. 1 mm, margin densely gray ciliate; blade reflexed or erect, triangular or linear-lanceolate, adaxially proximally white-gray pilose. Leaves 2 or 3 per ultimate branch; sheath glabrous or margin initially yellow-brown ciliate; auricles obscure, purple; oral setae present; ligule truncate or slightly arcuate, ca. 1 mm, glabrous; blade linear-lanceolate,

6–10 × 0.5–1.3 cm, glabrous, secondary veins 3–5-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence a raceme, subtended by 3 or 4 spathes; spikelets 8–14, 1.3–2.5 cm, rachilla internodes 1.5–3 mm, white-gray pilose, apically swollen; florets 2 or 3. Glumes 1 or 2, leathery; lemma setulose, apex long mucronate. Palea slightly setose, keels serrulate; lodicule ciliate on margins. Anthers yellow. Ovary oblong, glabrous; style 1; stigmas 2. Caryopsis light purple, ovoid, glabrous. New shoots May.

- 1300–2400 m. W Hubei, E Sichuan.

This is the type species of *Fargesia*. It was described from flowers of uncertain origin, and correlation with living plants has been controversial. *Fargesia murielae* was included in this species after the initiation of flowering in *F. murielae* in Europe revealed that it also has tight unilateral inflorescences, which were initially considered (Soderstrom, Garden (New York, 1977+) 3(4): 22–27. 1979) to be a character specific to this species, within a broad *Thamnocalamus*, although they are now considered a characteristic of the genus *Fargesia* instead.

The shoots are edible, and the culms are used for weaving.

23. *Fargesia qinlingensis* T. P. Yi & J. X. Shao, J. Bamboo Res. 6(1): 42. 1987.

秦岭箭竹 *qin ling jian zhu*

Rhizome neck 3–9 cm, 0.4–1.2 cm in diam. Culms 1–3.3 m, 0.4–0.9 cm in diam.; internodes terete, 4–16 cm, initially densely white powdery, glabrous; wall 1–2 mm thick, pith membranous; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 4–10 per node; buds oblong, densely gray-brown pubescent, margins light brown ciliate. Culm sheaths persistent, yellowish, narrowly triangularly rounded, much longer than internodes, thinly leathery, sparsely brown setose, rarely glabrous, longitudinal ribs prominent, margins deciduously ciliate; auricles readily deciduous, falcate; oral setae few, erect or slightly curved, light brown, 4–5 mm; ligule inclined, truncate, ca. 1.5 mm, apex fissured and with erect, light brown cilia 2–4 mm; blade reflexed, initially erect, linear or linear-lanceolate, glabrous or initially pilose proximally. Leaves 4 or 5 per ultimate branch; sheath glabrous; auricles purple or light purple-brown, ovate or elliptic; oral setae white-gray, short; ligule arcuate, ca. 1 mm, margins white-gray ciliate; blade lanceolate or narrowly lanceolate, 2–9 × 0.4–1 cm, both surfaces glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots May–Jun.

- 1000–1200 m. S Shaanxi.

This species is an important source of food for the giant panda.

24. *Fargesia nitida* (Mitford) P. C. Keng ex T. P. Yi, J. Bamboo Res. 4(2): 30. 1985.

华西箭竹 *hua xi jian zhu*

Arundinaria nitida Mitford, Bull. Misc. Inform. Kew 1896: 20. 1896; *Fargesia demissa* T. P. Yi; *Sinarundinaria nitida* (Mitford) Nakai.

Rhizome neck 10–13 cm, 1–2 cm in diam. Culms 2–4 m, 1–2 cm in diam.; internodes terete, 11–20 cm, initially sparsely

white powdery, glabrous; wall 2–3 mm thick; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 15–18 per node, deflexed. Culm sheaths persistent, purple or purple-brown, triangular-elliptic, usually longer than internodes, leathery, glabrous or sparsely white-gray setose, longitudinal ribs prominent, margins glabrous, apex triangular; auricles and oral setae absent; ligule purple, arcuate, ca. 1 mm, margin densely ciliate; blade reflexed or erect, triangular or linear-lanceolate. Leaves 2 or 3 per ultimate branch; sheath purple, margin densely gray-brown ciliate apically; auricles absent; oral setae absent or obscure; ligule truncate or arcuate, ca. 1 mm, margin initially white ciliate; blade linear-lanceolate, $3.8\text{--}7.5 \times 0.6\text{--}1$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence a raceme, subtended by 1–3 spathes; spikelets 1.1–2.5 cm; rachilla 1.5–3 mm; florets 2 or 3. Glumes 1 or 2, leathery, apex acuminate or obtuse; lemma slightly setulose, apex obtuse; palea sparsely setose, keels serrulate, apex bifid; lodicules ciliate. Anthers yellow. Ovary ovoid, glabrous; style 1; stigmas 3. Caryopsis yellow-brown to dark brown, ovoid, glabrous. New shoots late Apr–May.

• 1900–3200 m. E and S Gansu, S Ningxia, E Qinghai, W Sichuan.

As the type species of *Sinarundinaria*, the close similarities between this and *Fargesia spathacea* show that *Sinarundinaria* is a synonym of *Fargesia*. *Fargesia demissa* is a short and beautiful variant, but it has not been given any new status within *F. nitida*.

This species is an important source of food for the giant panda.

25. *Fargesia papyrifera* T. P. Yi, J. Bamboo Res. 7(2): 42. 1988.

云龙箭竹 *yun long jian zhu*

Borinda papyrifera (T. P. Yi) Stapleton.

Rhizome neck 5–12 cm, 3–6 cm in diam. Culms 4–6(–8 m), 2–4(–6) cm in diam.; internodes blue-gray, terete, 22–28 cm, densely white powdery, distally gray-brown to yellow-brown setose, longitudinal ribs prominent, nearly solid; nodes initially white powdery, supra-nodal ridges weakly prominent; sheath scar very prominent, initially brown tomentose. Branches 3–7 per node, strong; buds yellow, ovoid, waxy, basally white powdery, marginally densely yellow-brown ciliate. Culm sheaths deciduous, slightly longer than internode, leathery to thickly so, rigid, triangularly narrowly rounded, sparsely yellow-brown setose, longitudinal ribs prominent, margins densely brown setose; auricles absent; oral setae few, erect or slightly curved, brown, 3–6 mm; ligule dark purple, level or convex, 2–3 mm, margins gray-brown ciliate; blade reflexed, linear-lanceolate, glabrous, margins serrulate, apex long acuminate. Leaves 3–5 per ultimate branch; sheath glabrous, longitudinal ribs prominent; auricles absent; oral setae sparse, yellow-brown, ca. 2 mm; ligule truncate or arcuate, glabrous, setulose; blade lanceolate, $10\text{--}18 \times 1.6\text{--}2.3$ cm, both surfaces glabrous, secondary veins 5- or 6-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Aug–Sep.

• 2700–3600 m. W Yunnan.

The shoots are edible, and the culms are used for weaving and making paper and farm tools.

26. *Fargesia albocerea* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 45. 1988.

片马箭竹 *pian ma jian zhu*

Borinda albocerea (Hsueh & T. P. Yi) Stapleton; *Fargesia pachyclada* Hsueh & C. M. Hui.

Culms 3–4 m, 0.8–2 cm in diam.; internodes terete, 8–14 cm, rigid, densely white powdery, glabrous, nearly solid; nodes waxy, supra-nodal ridges prominent to greatly so; sheath scar prominent to very prominent. Branches 3–5 per node, deflexed; buds yellow-brown, ovoid, area near to margins puberulous. Culm sheaths gradually deciduous, triangularly narrowly rounded, leathery, brown setose, longitudinal ribs prominent, margins glabrous, apex triangular; auricles absent or obscure; oral setae few, erect, yellow-brown, 1.5–4 mm; ligule nearly truncate, 1–1.5 mm, glabrous; blade readily deciduous, reflexed, linear-lanceolate, proximally slightly pilose. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles absent or obscure; oral setae scarce, yellow-brown, short; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, $3.5\text{--}8 \times 0.5\text{--}1.2$ cm, both surfaces glabrous, secondary veins 3–5-paired, transverse veins elongated-tessellate, dense, not very distinct, base nearly rounded or broadly cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown.

• About 2900 m. W Yunnan.

27. *Fargesia solida* T. P. Yi, J. Bamboo Res. 7(2): 47. 1988.

腾冲箭竹 *teng chong jian zhu*

Rhizome neck 2.5–12.5 cm, 0.6–1.8 cm in diam. Culms 3–5 m, 1–2 cm in diam.; internodes light green, terete, 13–16 cm, densely white powdery, glabrous, solid; supra-nodal ridges weakly prominent; sheath scar prominent, woody. Branches 4–9 per node, deflexed; buds oblong, basally white powdery, setulose, margins yellow-brown ciliate. Culm sheaths persistent, narrowly rounded-triangular, longer than internodes, leathery, appressed yellow setose, longitudinal ribs prominent, margins light yellow ciliate; auricles and oral setae absent; ligule arcuate, ca. 1 mm, glabrous; blade persistent, erect, green-purple, triangular or linear-triangular, glabrous. Leaves 3–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate, ca. 0.5 mm; blade narrowly lanceolate, $4\text{--}9.5 \times 0.4\text{--}0.7$ cm, glabrous, secondary veins 2–4-paired, transverse veins slightly distinct, base cuneate, one margin densely serrulate, other margin obscurely so, apex long acuminate. Inflorescence unknown. New shoots Jul.

• 2300–2500 m. W Yunnan.

28. *Fargesia elegans* T. P. Yi, Acta Bot. Yunnan. 14: 136. 1992.

雅容箭竹 *ya rong jian zhu*

Rhizome neck 2–4.5 cm, 0.8–1.5 cm in diam., solid. Culms 2–3.5 m, 0.5–1 cm in diam.; internodes light green, terete, (5–)10–12(–15) cm, initially white powdery, glabrous, solid; supra-nodal ridges level or prominent; sheath scar promi-

ment. Branches 6–11 per node, ascending; bud 1, oblong-ovoid, appressed or adnate. Culm sheaths persistent, purple, narrowly oblong-triangular, longer than internodes, proximally thinly leathery or papery, distally membranous, sparsely yellowish white punctate, longitudinal ribs prominent; auricles and oral setae absent; ligule arcuate-truncate, 0.6–1 mm, glabrous; blade erect, linear-lanceolate. Leaves 3–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate, ca. 0.6 mm; blade linear-lanceolate, 3.2–6 × 0.4–0.6 cm, glabrous, secondary veins 2(or 3)-paired, transverse veins distinct, base cuneate, margin serrulate, apex acuminate. Inflorescence unknown.

- 2700–2800 m. S Sichuan (Mianning).

29. *Fargesia ferax* (Keng) T. P. Yi, J. Bamboo Res. 2(1): 39. 1983.

丰实箭竹 feng shi jian zhu

Arundinaria ferax Keng, Sinensia 7: 408. 1936; *Sinarundinaria ferax* (Keng) P. C. Keng.

Rhizome neck 4–7 cm, 2.2–4 cm in diam. Culms to 5 m, 2–3.6 cm in diam.; internodes terete, 35–41 cm, longitudinal ribs prominent above branches, initially densely white powdery, glabrous or brown setose below nodes; wall 2–5 mm thick, pith initially spongy, becoming granular; supra-nodal ridges level; sheath scar prominent; intranode 4–6 mm. Branches 6–12 per node. Culm sheaths persistent, spotted, triangular to narrowly triangular, longer than internodes, leathery, brown setulose, longitudinal ribs prominent, margins initially densely brown ciliate, apex linear-triangular; auricles absent; oral setae erect, brown, slender; ligule convex, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate, glabrous. Leaves 2–4 per ultimate branch; sheath margins yellow-brown ciliate or not ciliate; auricles absent; oral setae erect, yellow-brown, slender; ligule light green, convex, ca. 1 mm, glabrous; blade narrowly lanceolate, 3.6–10 × 0.3–0.6 cm, proximally white-gray pubescent, secondary veins 2- or 3-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence a racemose panicle; spikelets 3–6, 1.4–2.8 cm; rachilla internodes 2–3 mm; florets 2–7, terminal one sterile. Glumes 1 or 2, unequal, membranous, apex acuminate or obtuse; lemma puberulous, apex long acuminate. Palea keels ciliate, apex bifid; lodicules 3, apex ciliate. Anthers yellow-brown. Ovary red-brown; stigmas 2, plumose. Caryopsis unknown. New shoots Jul.

- 1700–2600 m. W Sichuan.

The culms are used for weaving and making furniture and farm tools.

30. *Fargesia fungosa* T. P. Yi, Bull. Bot. Res., Harbin 5(4): 121. 1985.

棉花竹 mian hua zhu

Rhizome neck 5–11 cm. Culms 4–6 m, 1.5–2.5 cm in diam.; internodes terete, 20–23 cm, longitudinal ribs absent, initially white powdery, glabrous; wall 3–6 mm thick, pith initially spongy; supra-nodal ridges weakly prominent; sheath scar prominent, yellow-brown setose, with persistent remains of

sheath base; intranode 2–4 mm. Branches 9–25 per node. Culm sheaths persistent, yellow-brown, spotted purple-brown, narrowly triangular or narrowly rounded, proximally leathery, distally papery, brown to dark brown setulose, longitudinal ribs prominent, margins sometimes brown to dark brown setose; auricles absent; oral setae deciduous, brown; ligule yellow-brown, truncate, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate, glabrous. Leaves 3 or 4 per ultimate branch; sheath margins initially ciliate; auricles purple, falcate, small; oral setae erect, gray-brown; ligule arcuate, margins initially ciliate; blade lanceolate, (7–)10–16 × 1–1.7 cm, proximally white-gray pubescent, secondary veins 4-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence a racemose panicle, initially terminal to leafy shoot; spikelets 3–7, 2.5–4.3 cm, rachilla internodes 3–4 mm, white-gray setose, apex densely white-gray ciliate; florets 3–7, terminal one sterile. Glumes 1 or 2, papery; lemma densely white-gray setose abaxially, margins ciliate; palea keels setose; lodicules ciliate. Anthers yellow. Ovary ovoid, glabrous; styles 2; stigma white. Caryopsis unknown. New shoots Jul–Aug.

- 1800–2700 m. W Guizhou, SW Sichuan, NE Yunnan.

The shoots are edible, and the split culms are used for weaving.

31. *Fargesia communis* T. P. Yi, J. Bamboo Res. 7(2): 50. 1988.

马亨箭竹 ma heng jian zhu

Rhizome neck 3–10 cm. Culms 4–8 m, 1–3 cm in diam.; internodes terete, 20–25 cm, white powdery, glabrous or initially yellow-brown setose; wall 2–4 mm thick; sheath scars weakly prominent. Branches 4–10 per node, subequal; buds oblong, margins densely gray ciliate. Culm sheaths persistent, red-brown, narrowly triangular, much longer than internodes, proximally leathery, distally papery, sparsely brown setulose, longitudinal ribs prominent, margins initially brown ciliate, apex linear and narrow; auricles absent; oral setae erect, yellow-brown; ligule truncate, ca. 1 mm, glabrous; blade readily deciduous, reflexed, linear-lanceolate, glabrous, margins usually serrulate. Leaves 4 or 5 per ultimate branch; sheath margins gray-yellow ciliate; auricles absent; oral setae erect, light yellow-brown; ligule truncate, glabrous; blade lanceolate, 8.5–12(–16) × 0.5–1(–1.4) cm, abaxially white-gray pubescent proximally, secondary veins 3-paired, transverse veins obscure, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Jul–Aug.

- 2600–3300 m. W Yunnan.

The culms are used for weaving and for making farm tools, furniture, and paper.

32. *Fargesia angustissima* T. P. Yi, J. Bamboo Res. 4(2): 21. 1985.

油竹子 you zhu zi

Rhizome neck 1–3 cm. Culms 4–7 m, 1–2 cm in diam.; internodes terete, 28–35 cm, initially white powdery, glabrous, longitudinal ribs very prominent; wall 1.5–2.5 mm thick; supra-nodal ridges weakly prominent or prominent; sheath scar

prominent. Branches 5–10 per node, slender; buds oblong, margins ciliate. Culm sheaths persistent, much longer than internodes, proximally leathery, distally papery and sparsely brown setulose, longitudinal ribs greatly prominent, margins rolled, initially densely ciliate, apex linear and narrow; auricles absent; oral setae erect or curved, white-gray; ligule truncate or convex, ca. 1 mm, glabrous; blade readily deciduous, reflexed, linear, glabrous, margins usually serrulate. Leaves 3–5 per ultimate branch; sheath glabrous or distally sparsely pilose; auricles absent; oral setae few, erect or curved, yellow-brown, 2–3 mm; ligule convex; external ligule white-gray pubescent; blade narrowly lanceolate, $3.4\text{--}9.5 \times 0.3\text{--}0.7$ cm, abaxially proximally gray pubescent, secondary veins 2- or 3-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Jul–Aug.

● 800–1600 m. W Sichuan.

This species is sometimes considered a synonym of *Fargesia ferax*, but it would appear to be a somewhat smaller bamboo with some slightly different characters.

The culms are used for making furniture and farm tools. The shoots are a source of food for the giant panda.

33. *Fargesia edulis* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 53. 1988.

空心箭竹 kong xin jian zhu

Borinda edulis (Hsueh & T. P. Yi) Stapleton.

Rhizome neck 6–10 cm. Culms 5–8 m, 2–4 cm in diam.; internodes terete, 28–40 cm, densely white powdery, glabrous or setose below node; wall 2–4 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, glabrous or initially erectly brown setose. Branches 4–7 per node. Culm sheaths gradually deciduous, yellow-brown, leathery, densely brown to dark brown setose, longitudinal ribs prominent, margins densely brown setose, apex sharply narrow; auricles absent; oral setae deciduous; ligule truncate, ca. 1 mm, glabrous, fissured; blade erect, lanceolate to linear-lanceolate, glabrous, margins serrulate. Leaves 5–7 per ultimate branch; sheath glabrous; auricles present; oral setae few; ligule truncate, glabrous; blade lanceolate, $10\text{--}15 \times 1\text{--}1.4\text{--}(2.2)$ cm, abaxially pubescent or glabrous, secondary veins 4- or 5-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence a raceme, upper part extended from spathe; spikelets 4–7, 2.5–3.2 cm, rachilla 4–5 mm, glabrous or apically white puberulous; florets 3 or 4. Glumes 2, papery, glabrous; lemma glabrous or pilose, apex acuminate; palea keels ciliate; lodicules ciliate. Anthers 7–9 mm. Ovary yellow-brown, ovoid, glabrous, apex swollen; styles 2; stigma linear. Caryopsis unknown. New shoots May.

● 1900–2800 m. W Yunnan.

The shoots are edible, and the culms are used for weaving and papermaking.

34. *Fargesia jiulongensis* T. P. Yi, J. Bamboo Res. 4(2): 22. 1985.

九龙箭竹 jiu long jian zhu

Rhizome neck 4–6.5 cm. Culms 3–5 m, 1–2 cm in diam.; internodes terete, 20–30 cm, initially white powdery, glabrous, longitudinal ribs absent; wall 2.5–3.5 mm thick, pith spongy, becoming granular; supra-nodal ridges level or weakly prominent; sheath scar prominent to greatly prominent. Branches 5–15 per node; buds subcircular or elliptic, pubescent, margins ciliate. Culm sheaths deciduous, narrowly triangular, longer than internodes, proximally leathery, distally papery, densely yellow-brown setulose, longitudinal ribs prominent, margins brown setose; auricles and oral setae absent; ligule truncate, 1.5–7 mm, sparsely ciliate; blade reflexed, linear-lanceolate, proximally sparsely pilose, articulate with sheath. Leaves 3–5 per ultimate branch; sheath initially gray-yellow pubescent on ventral ridge, margins yellow-brown ciliate; auricles and oral setae absent; ligule purple, truncate, ca. 1 mm, ciliate; blade narrowly lanceolate, $5.5\text{--}13 \times 0.4\text{--}0.9$ cm, abaxially proximally gray or gray-yellow pubescent, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Jul.

● 2800–3400 m. W Sichuan.

The shoots are edible and are a source of food for the giant panda. The split culms are used for weaving.

35. *Fargesia gongshanensis* T. P. Yi, J. Bamboo Res. 7(2): 57. 1988.

贡山箭竹 gong shan jian zhu

Rhizome neck 2.5–9 cm. Culms 3–4 m, 1–2 cm in diam.; internodes terete, 22–32 cm, initially densely white powdery, glabrous, longitudinal ribs obscure; wall 3–5 mm thick; supra-nodal ridges prominent; sheath scar prominent to very prominent. Branches 5–15 per node; buds oblong, pubescent, margins light yellow ciliate. Culm sheaths persistent or gradually deciduous, purple-brown, narrowly triangular, shorter than internodes, proximally leathery, distally papery, glabrous or sparsely brown setulose, longitudinal ribs prominent, margins glabrous; auricles and oral setae absent; ligule truncate, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate, articulate with sheath. Leaves 4–7 per ultimate branch; sheath glabrous; auricles absent; oral setae few, erect, yellow-brown; ligule truncate, ca. 1 mm; blade narrowly lanceolate, $10\text{--}12.5 \times 0.7\text{--}0.9$ cm, abaxially proximally white-gray pubescent, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Aug.

● 1400–1500 m. W Sichuan.

36. *Fargesia contracta* T. P. Yi, J. Bamboo Res. 7(2): 60. 1988.

带鞘箭竹 dai qiao jian zhu

Fargesia contracta f. *evacuata* T. P. Yi; *F. contracta* f. *fugonensis* Hsueh & J. K. Duan.

Rhizome neck 5–6 cm. Culms 3–5 m, 1–2.5 cm in diam.; internodes terete, 18–22 cm, initially densely white powdery, glabrous or initially yellow-brown setose below node, prominently ribbed, usually solid or nearly so, sometimes hollow (f. *evacuata*); supra-nodal ridges level or weakly prominent; sheath scar prominent, initially light yellow setulose. Branches

3–6 per node; buds broadly ovate to oblong, margins gray to gray-brown ciliate. Culm sheaths persistent, purple-brown, equal to or longer than internodes, proximally leathery, distally papery, proximally very sparsely yellow-brown setose, longitudinal ribs prominent, margins initially densely gray to yellow-brown ciliate, apex sharply narrow and linear; auricles absent; oral setae deciduous, erect, pale yellow to yellow-brown; ligule truncate, glabrous, uniformly fissured; blade erect, linear, glabrous. Leaves 5–7 per ultimate branch; sheath margins white-gray ciliate; auricles absent; oral setae few, gray-yellow, curved; ligule obliquely truncate, ca. 1 mm, tomentose, initially gray ciliolate; blade narrowly lanceolate, $9\text{--}13 \times 0.5\text{--}0.9$ cm, abaxially initially sparsely white-gray pubescent, proximally more densely so, secondary veins 3-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Apr–May.

- 2000–3000 m. W Yunnan.

Gatherings from Lushui with hollow culm internodes have been described as *Fargesia contracta* f. *evacuata*.

37. *Fargesia semicoriacea* T. P. Yi, J. Bamboo Res. 7(2): 71. 1988.

白竹 bai zhu

Rhizome neck 4–8 cm. Culms 1–3.5 m, 0.5–1.2 cm in diam.; internodes terete, 20–28 cm, initially white powdery, glabrous; wall 2–3 mm thick; supra-nodal ridges level or weakly prominent; sheath scar weakly prominent. Branches 5–17 per node; buds oblong, margins densely gray ciliolate. Culm sheaths persistent, sometimes purple spotted, triangularly narrowly rounded, proximally leathery, distally papery, glabrous or distally sparsely brown setose, longitudinal ribs prominent, margins initially densely brown ciliate, apex triangular; auricles absent; oral setae absent or few initially; ligule truncate, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate, glabrous, margins usually rolled. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent; oral setae few, erect, gray-yellow or gray-brown, truncate, 2–3 mm; ligule ca. 1 mm, glabrous; external ligule white-gray puberulous, sparsely white powdery; blade narrowly lanceolate, $5.5\text{--}11 \times 0.6\text{--}1$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Aug.

- 2000–3000 m. NE Yunnan.

38. *Fargesia hygrophila* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 74. 1988.

喜湿箭竹 xi shi jian zhu

Rhizome neck 3–11 cm. Culms 3–5 m, 1–2 cm in diam.; internodes terete or grooved above branches, 15–18 cm, initially densely white powdery, glabrous or gray-yellow setose below node; wall 2.5–6 mm thick; supra-nodal ridge level; sheath scar prominent. Branches 5–14 per node, deflexed; buds oblong, margins densely yellow-brown ciliate. Culm sheaths persistent, narrowly triangular, much longer than internodes, leathery, yellow-brown to brown setose, margins glabrous,

longitudinal ribs prominent, apex narrowly triangular; auricles absent; oral setae absent or few; ligule truncate, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate, glabrous, margins smooth, usually rolled. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent; oral setae few, deciduous, erect, yellow-brown, 1–2.5 mm; ligule arcuate, ca. 0.5 mm, glabrous; blade lanceolate, $6\text{--}14 \times 0.6\text{--}1.35$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, apex long acuminate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Aug.

- 1600–3000 m. N Yunnan.

The culms are used for weaving and for making furniture and farm tools.

39. *Fargesia sagittatinea* T. P. Yi, J. Bamboo Res. 7(2): 63. 1988.

独龙箭竹 du long jian zhu

Rhizome neck 5–8 cm. Culms 7–9 m, 3–6 cm in diam.; internodes terete, 20–28 cm, initially white powdery, glabrous; wall 3–7 mm thick; supra-nodal ridge level; sheath scar weakly prominent, glabrous. Branches 7–10 per node; buds elliptic or oblong, margins densely light yellow ciliate. Culm sheaths persistent, narrowly triangular, much longer than internodes, leathery, sparsely brown setose, longitudinal ribs prominent, margins densely brown ciliate, apex triangular; auricles absent; oral setae few, erect, yellow-brown, 5–8 mm; ligule purple, truncate or convex, ca. 1 mm, glabrous; blade erect, linear-lanceolate, usually slightly rugose. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles absent; oral cilia few, erect, light yellow, 1–2 mm; ligule truncate, ca. 1 mm, margins glabrous; external ligule densely pubescent with long, erect, gray hairs; blade narrowly lanceolate, $5\text{--}10.5 \times 0.3\text{--}0.6$ cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence unknown. New shoots Aug.

- 2400–2900 m. NW Yunnan.

The culms are considered the best for making arrows.

40. *Fargesia altior* T. P. Yi, J. Bamboo Res. 7(2): 65. 1988.

船竹 chuan zhu

Rhizome neck 6–8.5 cm. Culms 4–10 m, 1.3–3.5 cm in diam.; internodes terete, 22–45 cm, initially white powdery, glabrous; wall 4.5–8 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 5–15 per node, thin; buds oblong, margins yellow ciliolate. Culm sheaths deciduous, purple-brown, sometimes dark spotted, triangular, longer than internodes, leathery, sparsely appressed yellow-brown setose, longitudinal ribs prominent, margins glabrous, apex narrowly triangular; auricles absent; oral setae few, erect, yellow-brown, 2–5 mm; ligule convex, 1–1.5 mm, glabrous; blade reflexed, linear-lanceolate or linear, glabrous. Leaves 3–6 per ultimate branch; sheath glabrous; auricles absent; oral setae absent or few, erect, yellow-brown, 1–2 mm; ligule purple, truncate, ca. 0.5 mm, glabrous; blade narrowly lanceolate, $6\text{--}14 \times 0.6\text{--}1.1$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins obscure, base cuneate, one margin spinescent-ser-

rule, other margin obscurely so. Inflorescence unknown. New shoots Aug.

- 2300–2500 m. W Yunnan.

The culms are used for weaving and for making furniture and farm tools.

41. *Fargesia concinna* T. P. Yi, Acta Bot. Yunnan. 10: 437. 1988.

美丽箭竹 mei li jian zhu

Rhizome neck 4–6 cm. Culms 6–10 m, 2–5 cm in diam.; internodes gray-green, terete, 28–33 cm, rigid, gray or gray-yellow setose below each node; wall 4–8 mm thick; nodes light yellow-green to purple, supra-nodal ridges weakly prominent; sheath scar weakly prominent, gray. Branches 6–13 per node; buds oblong to elliptic, margins gray-yellow ciliate. Culm sheaths persistent, yellow-brown, narrowly triangular or narrowly rounded, much longer than internodes, leathery, sparsely appressed yellow or yellow-brown setose, longitudinal ribs very prominent, margins initially yellow ciliate, apex triangular; auricles absent; oral setae absent or few, yellow-brown, curved; ligule truncate or convex, 1–6 mm; blade reflexed, curved, narrowly triangular or linear-lanceolate, margins rolled, serrulate. Leaves 3–6 per ultimate branch; sheath glabrous, sometimes distally white powdery; auricles absent; oral setae absent or few; ligule truncate or convex, ca. 1 mm; blade lanceolate, 6–12 × 1.3–2.2 cm, glabrous, secondary veins 4- or 5-paired, transverse veins distinct, base cuneate or broadly cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Aug.

- 2900–3100 m. C Yunnan.

The culms are used for papermaking.

42. *Fargesia praecipua* T. P. Yi, J. Bamboo Res. 7(2): 68. 1988.

弩箭竹 nu jian zhu

Rhizome neck 4–8 cm. Culms 4–8 m, 2–5 cm in diam.; internodes green, terete, 22–30 cm, white powdery in apical ring, glabrous; wall 2–4 mm thick; supra-nodal ridges level or weakly prominent; sheath scar weakly prominent to prominent. Branches 6–12 per node; buds elliptic or broadly elliptic, white powdery, margins light yellow ciliate. Culm sheaths persistent, yellow-brown, narrowly triangular or narrowly rounded, much longer than internodes, leathery, glabrous or apically sparsely brown setose, longitudinal ribs prominent, margins glabrous, apex triangular; auricles and oral setae absent; ligule truncate or convex, ca. 1 mm, glabrous; blade reflexed, linear-lanceolate or linear, articulate with sheath. Leaves 4–10 per ultimate branch; sheath glabrous; auricles absent; oral setae few, gray-yellow, curved; ligule arcuate or truncate, ca. 1 mm; blade lanceolate, 8.5–16.5 × 0.8–1.3 cm, glabrous, secondary veins 3–5-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscurely so, apex long acuminate. Inflorescence unknown. New shoots Aug.

- 1800–2600 m. NW Yunnan.

The culms are used for making arrows.

43. *Fargesia yuanjiangensis* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 76. 1988.

秀叶箭竹 xiu ye jian zhu

Shrubby bamboo. Culms 0.8–1.3 cm in diam.; internodes terete, 8–20 cm, initially lower parts white powdery, powdery-black when old, glabrous; wall 2.5–4 mm thick; supra-nodal ridges level; sheath scar prominent, initially appressed brown setulose. Branches 15–18 per node, deflexed; buds elliptic, setose near ciliate margins. Culm sheaths persistent, narrowly triangular, longer than internodes, proximally leathery, distally papery, brown setose, margins glabrous, longitudinal ribs prominent, apex linear-triangular; auricles absent; oral setae few, erect, white-gray; ligule truncate, ca. 1 mm, glabrous; blade erect, linear-lanceolate, glabrous, margins usually rolled and smooth. Leaves 3–6 per ultimate branch; sheath glabrous; auricles absent; oral setae few, erect or curved; ligule purple, truncate, ca. 1 mm, glabrous; blade narrowly lanceolate, 5.5–10.6 × 0.4–0.9 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown.

- S Yunnan.

44. *Fargesia perlonga* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 79. 1988.

超包箭竹 chao bao jian zhu

Borinda perlonga (Hsueh & T. P. Yi) Stapleton.

Culms to 5 m, to 2.2 cm in diam.; internodes terete, 18–20 cm, light yellow waxy below node, glabrous, nearly solid; nodes smooth, supra-nodal ridges weakly prominent; sheath scar prominent, glabrous. Branches many per node. Culm sheaths persistent, linear to narrowly triangular, much longer than internodes, proximally leathery, distally papery, brown to dark brown setose, longitudinal ribs prominent; auricles absent or small; oral setae erect, yellow, 3–4 mm; ligule truncate, ca. 1 mm, glabrous; blade unknown. Leaves 2–4 per ultimate branch; sheath glabrous; auricles absent; oral setae few, erect, yellow or gray-yellow; ligule purple, truncate, ca. 1 mm, glabrous; blade lanceolate, 10–19.5 × 1.3–1.7 cm, glabrous, secondary veins 5- or 6-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown. New shoots autumn.

- C Yunnan.

45. *Fargesia circinata* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 81. 1988.

卷耳箭竹 juan er jian zhu

Shrubby bamboo. Culms to 1.5 cm in diam.; internodes terete, to 24 cm, glabrous, nearly solid; supra-nodal ridges level; sheath scar prominent, with persistent remains of sheath base. Branches 7–11 per node. Culm sheaths narrowly triangular, longer than internodes, leathery, waxy, purple spotted adaxially, brown setose, proximal setae curved, distal setae straight, longitudinal ribs prominent, margins usually densely brown setose, apex linear-triangular; auricles formed by rolled sheath shoulders; oral setae erect, yellow-brown, 4–15 mm;

ligule truncate, 1–2 mm, margins initially ciliate, external ligule densely brown setose; blade readily deciduous, reflexed, linear-lanceolate, glabrous, usually rolled or rugose. Leaves 2–4 per ultimate branch; sheath margins initially densely ciliate; auricles absent; oral setae few, erect or curved, light yellow, 3–11 mm; ligule truncate, ca. 0.5 mm, glabrous; external ligule densely gray pubescent; blade lanceolate, thin, 5.5–14 × 0.8–1.6 cm, glabrous, secondary veins 3–5-paired, transverse veins distinct, base broadly cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown.

• Yunnan.

46. *Fargesia hsuehiana* T. P. Yi, J. Bamboo Res. 7(2): 104. 1988.

冬竹 dong zhu

Borinda hsuehiana (T. P. Yi) Stapleton.

Rhizome neck 3–6 cm. Culms 3–7 m, 1–3 cm in diam.; internodes terete, 18–25 cm, initially sparsely white-gray setose, longitudinal ribs prominent; wall 3–5 mm thick, pith spongy; supra-nodal ridges weakly prominent; sheath scar prominent, initially densely yellow-brown setose. Branches 6–9 per node. Culm sheaths persistent, triangularly narrowly rounded, shorter than internodes, leathery, proximally brown setose and woolly, margins glabrous, apex triangular; auricles and oral setae absent; ligule truncate, ca. 0.7 mm; blade deciduous, reflexed, linear-lanceolate. Leaves 4–8(–15) per ultimate branch; sheath becoming red-brown, glabrous; auricles absent; oral setae 3–10 mm; ligule arcuate, ca. 1 mm, glabrous; blade narrowly lanceolate, 6–14 × 0.7–1.2 cm, glabrous or abaxially sparsely pilose proximally, secondary veins 3- or 4-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence a raceme, exerted from spathe; spikelets 5–11, 2.5–4.2 cm, rachilla internodes 2.5–6 mm, white-gray setulose; florets 4 or 5, green. Glumes 2, glabrous, apex acuminate; lemma glabrous, apex acuminate; palea keels ciliate; lodicules apically ciliate. Anthers yellow. Ovary ovoid, light yellow, glabrous; style 1; stigmas 2. Caryopsis dark brown, oblong. New shoots Sep.

• About 2000 m. S Yunnan.

47. *Fargesia pleniculmis* (Handel-Mazzetti) T. P. Yi, J. Bamboo Res. 7(2): 113. 1988.

皱壳箭竹 zhou ke jian zhu

Arundinaria pleniculmis Handel-Mazzetti, Symb. Sin. 7: 1276. 1936.

Rhizome neck 4–10 cm. Culms 4–8 m, 1–3 cm in diam.; internodes terete, 24–30 cm, initially densely white powdery, glabrous, longitudinal ribs prominent; wall 4–5 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, initially gray-yellow setose. Branches 7–15 per node, initially white powdery; culm sheaths persistent, triangularly narrowly rounded, proximally papery, distally leathery, glabrous or sparsely yellow-brown setose, longitudinal ribs very prominent, margins densely yellow-brown setose; auricles absent; oral setae deciduous, yellow-brown, 1–2 mm; ligule truncate or arcuate, 1–2 mm, glabrous, initially densely

yellow-brown ciliate; blade reflexed or erect, lanceolate or triangular-lanceolate, glabrous. Leaves 1–3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule purple, truncate, glabrous; blade narrowly lanceolate, 4–8 × 0.5–0.8 cm, thin, both surfaces glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots Aug.

• 2500–3000 m. NW Yunnan.

The shoots are edible.

48. *Fargesia yunnanensis* Hsueh & T. P. Yi, Bull. Bot. Res., Harbin 5(4): 125. 1985.

云南箭竹 yun nan jian zhu

Sinarundinaria yunnanensis (Hsueh & T. P. Yi) Hsueh & D. Z. Li; *Yushania yunnanensis* (Hsueh & T. P. Yi) P. C. Keng & T. H. Wen ex T. H. Wen.

Rhizome neck, 12–35 cm. Culms 4–7 m, 3–6 cm in diam.; internodes terete, 28–36 cm, glabrous or sparsely setose below node, basal internodes solid, upper internodes hollow; supra-nodal ridges level or weakly prominent; sheath scar prominent or very prominent, with persistent remains of sheath base, glabrous. Branches 6–25 per node. Culm sheaths persistent, longitudinally purple striped, triangularly narrowly rounded, slightly shorter than internode, leathery, glabrous or setose in patches, margins glabrous; auricles and oral setae absent; ligule purple, truncate, 1–2 mm, glabrous; blade reflexed, purple-green, linear-lanceolate, glabrous, margins smooth. Leaves 3–7 per ultimate branch; sheath glabrous, sometimes distally white powdery; auricles and oral setae absent; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 13–19 × 1.2–1.8 cm, abaxially proximally pubescent, secondary veins 4- or 5-paired, transverse veins obscure, base cuneate, margins spinescent-serrulate. Inflorescence an open panicle, terminal to leafy branch; spikelets 13–23, 1.6–2.5 cm, rachilla internodes ca. 4 mm, apically densely ciliate; florets 4 or 5, purple or green-purple. Glumes 2, glabrous; lemma glabrous, apex acuminate; palea keels white ciliate; lodicules ciliate. Anthers yellow. Ovary ovoid, light yellow, glabrous; stigmas 2. Caryopsis unknown. New shoots Jul–Sep.

• 1700–2500 m. SW Sichuan, Yunnan.

This species is often placed in *Yushania* because of its open panicles and the relatively long rhizome necks producing well-separated culms.

The shoots are delicious, and the culms are used for making farm tools.

49. *Fargesia acuticontracta* T. P. Yi, J. Bamboo Res. 7(2): 98. 1988.

尖鞘箭竹 jian qiao jian zhu

Rhizome neck 5–20 cm. Culms 3–7 m, 1–5 cm in diam.; internodes initially black-green, terete, 30–50 cm, very rigid, with a brown setose ring below each node, longitudinal ribs prominent, solid, supra-nodal ridge level or prominent; sheath scar prominent, initially brown setose. Branches 3–11 per node. Culm sheaths persistent, narrowly triangular, shorter than internode, leathery, rigid, densely brown to dark brown setose,

longitudinal ribs prominent, margins densely brown setose; auricles absent; oral setae deciduous, erect, yellow, 5–8 mm; ligule purple, truncate or arcuate, ca. 1 mm, initially densely brown ciliate, becoming fissured; blade reflexed, linear-lanceolate, glabrous, usually rolled. Leaves 3–6 per ultimate branch; sheath glabrous; auricles absent; oral setae few, readily deciduous, erect, yellow; ligule truncate, initially sparsely pilose, uniformly fissured; blade lanceolate, 12–21 × 1.1–2.1 cm, initially pubescent, secondary veins 4–6-paired, transverse veins distinct, margins serrulate. Inflorescence unknown. New shoots Jul–Aug.

• 2000–3200 m. NW Yunnan.

50. *Fargesia longiuscula* (Hsueh & Y. Y. Dai) Ohnberger, *Bamboos World Introd.* 3: 14. 1996.

长节箭竹 chang jie jian zhu

Sinarundinaria longiuscula Hsueh & Y. Y. Dai, *J. Bamboo Res.* 6(2): 19. 1987.

Culms 4.5–6 m, 1.6–2.4 cm in diam.; internodes terete, 45–52 cm, longitudinal ribs prominent, initially densely white powdery; wall ca. 3 mm thick; supra-nodal ridges level or slightly prominent; sheath scar prominent, with remains of sheath base, brown ciliate. Branches many per node. Culm sheaths gradually deciduous, triangularly narrowly rounded, shorter than internodes, thick papery to leathery, densely brown or black setose, longitudinal ribs prominent; auricles and oral setae absent or obscure; ligule ca. 3 mm, serrulate; blade revolute. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles absent; ligule purple, ca. 1 mm, fimbriate at top; blade lanceolate, 17–20 × 1.8–2.3 cm, proximally white ciliate, secondary veins 4-paired. Inflorescence unknown. New shoots Jul–Aug.

• 1400–1500 m. NE Yunnan (Yongshan).

The shoots are not edible, and the culms are used for weaving.

51. *Fargesia declivis* T. P. Yi, *J. Bamboo Res.* 7(2): 101. 1988.

斜倚箭竹 xie yi jian zhu

Rhizome neck 6–13 cm. Culms 3–4 m, 5–8 mm in diam., middle and upper part of culm pendulous or scrambling; internodes terete, 20–33 cm, white powdery, initially gray to gray-brown setose, longitudinal ribs greatly prominent, solid or nearly so, supra-nodal ridges prominent; sheath scar prominent to greatly prominent, initially setose. Branches 3–5 per node. Culm sheaths persistent, triangularly narrowly rounded, shorter than internodes, leathery, glabrous or sparsely yellow-brown setose, longitudinal ribs very prominent, margins densely yellow-brown setulose; auricles absent; oral setae present; ligule purple, truncate, 1–2 mm, glabrous, fissured; blade reflexed, linear, glabrous, margins initially serrulate, usually rolled when dry. Leaves 3–5 per ultimate branch; sheath margins initially ciliate; auricles absent; oral setae few, readily deciduous, erect, yellow; ligule truncate, glabrous; blade narrowly lanceolate, 8–12 × 0.7–1.1 cm, abaxially proximally pubescent, secondary veins 3- or 4-paired, transverse veins distinct, base broadly cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots Aug–Sep.

• 2400–2500 m. NW Yunnan.

52. *Fargesia farcta* T. P. Yi, *J. Bamboo Res.* 2(2): 29. 1983.

勒布箭竹 le bu jian zhu

Borinda farcta (T. P. Yi) Stapleton.

Rhizome neck 2.5–6 cm. Culms 2–3.5 m, 0.5–1.5 cm in diam.; internodes terete or slightly flattened, 22–28 cm, initially slightly white powdery, distally white-gray setose, longitudinal ribs greatly prominent, solid; supra-nodal ridges weakly prominent to prominent; sheath scar prominent, with persistent remains of sheath base. Branches (1–)3–10, solid, glabrous. Culm sheaths gradually deciduous, shorter than internodes, leathery, initially setose, longitudinal ribs prominent; auricles small; oral setae 3–5 mm; ligule ca. 1 mm; blade readily deciduous, reflexed. Leaves 2–5 per ultimate branch; sheath slightly white powdery, margins densely gray-brown ciliate; auricles absent; oral setae few, erect, yellow, 1–4 mm; ligule truncate, ca. 1 mm, glabrous; blade narrowly lanceolate, 4–7.5 × 0.5–0.8 cm, abaxially white pubescent, adaxially sparsely white-puberulous, secondary veins 2- or 3-paired, transverse veins distinct, base broadly cuneate, margins serrulate, apex acuminate. Inflorescence unknown.

• About 2300 m. S Xizang.

53. *Fargesia adpressa* T. P. Yi, *J. Bamboo Res.* 4(2): 26. 1985.

贴毛箭竹 tie mao jian zhu

Rhizome neck 5–9 cm. Culms 4–6 m, 2–3 cm in diam.; internodes terete, 35–40 cm, initially white powdery, glabrous or setose below node, gray waxy when old; wall 2–3 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches many per node. Culm sheaths persistent, triangularly narrowly rounded, shorter than internode, leathery, thinly white powdery, densely adnately brown setose, margins initially brown ciliate, apex triangular; auricles absent or present; oral setae present; ligule truncate or arcuate, 1–2 mm, glabrous, irregularly fissured; blade reflexed, linear-lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath thinly white powdery, glabrous; auricles absent; oral setae present; ligule brown-purple, arcuate, margins ciliate; blade linear-lanceolate, 10–15 × 0.9–1.4 cm, abaxially pubescent, secondary veins 3–5-paired, transverse veins obscure, base cuneate, one margin spinescent-serrulate, other margin obscurely so. Inflorescence a raceme, terminal to leafy shoot; spikelets 7–9, 1.7–2.7 cm, rachilla 3–4 mm, pilose; florets 3–7. Glumes 2, slightly pilose, papery; lemma glabrous, apex acuminate; palea keels and apices ciliate; lodicules ciliate. Anthers yellow. Ovary ovoid, glabrous; style 1; stigmas 2. Caryopsis unknown. New shoots May.

• About 2000 m. W Sichuan.

The shoots are edible and are a source of food for the giant panda. The culms are used for weaving and papermaking.

54. *Fargesia pauciflora* (Keng) T. P. Yi, *J. Bamboo Res.* 4(2): 25. 1985.

少花箭竹 shao hua jian zhu

Arundinaria pauciflora Keng, *J. Wash. Acad. Sci.* 26: 397.

1936; *Fargesia pallens* Hsueh & C. M. Hui; *Sinarundinaria pauciflora* (Keng) P. C. Keng.

Rhizome neck 4–8 cm. Culms 2–4 m, 1–3 cm in diam.; internodes terete or slightly flattened, 35–40 cm, initially densely white powdery, glabrous; wall 2–3 mm thick; supra-nodal ridge level or weakly prominent; sheath scar prominent, initially densely yellow-brown setose. Branches 6–10 per node. Culm sheaths persistent or gradually deciduous, triangularly narrowly rounded, shorter than internode, leathery, glabrous or sparsely yellow-brown setose, margins brown ciliate, longitudinal ribs prominent; auricles and oral setae absent; ligule truncate or arcuate, 1–2.5 mm, slightly fissured; blade reflexed, linear-lanceolate, glabrous, margins serrulate. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate or truncate, glabrous; blade narrowly lanceolate, 9–14 × 0.7–1.2 cm, secondary veins 2–4-paired, transverse veins obscure, abaxially pubescent, base cuneate, margin spinescent-serrulate. Inflorescence a raceme, enclosed by spathe; spikelets ca. 3, 2–3 cm, rachilla internodes 2.5–4 mm, pilose; florets 4 or 5, purple. Glumes 2, glabrous or sparsely pilose; lemma acuminate at apex; palea keels ciliate; lodicules ciliate. Anthers ca. 5 mm. Stigmas 2 or 3. Caryopsis unknown. New shoots late May–Jul.

• 2000–3200 m. SW Sichuan, NW Yunnan.

The shoots are edible and are a source of food for the giant panda. The culms are used for weaving and papermaking.

55. *Fargesia grossa* T. P. Yi, J. Bamboo Res. 2(2): 35. 1983.

错那箭竹 cuo na jian zhu

Borinda grossa (T. P. Yi) Stapleton.

Rhizome neck ca. 10 cm. Culms 8–12 m, 2–3.5 cm in diam.; internodes terete, 15–45 cm, glabrous; wall 3–5 mm thick; supra-nodal ridges level; sheath scar prominent, with persistent remains of sheath base. Branches many per node. Culm sheaths narrowly triangular, leathery, initially yellow-brown setose, longitudinal ribs distally prominent, margins yellow-brown setose, apex linear-triangular; auricles present or absent; oral setae yellow-brown, curved, 4–16 mm; ligule truncate or convex, 1–2 mm, margins densely yellow-brown ciliate, cilia 1–5 mm; blade reflexed, linear-lanceolate, slightly rugose, glabrous, margins usually rolled, serrulate. Leaves 3–5 per ultimate branch; sheath margins ciliate; auricles absent; oral setae few, erect, yellow, 3–5 mm; ligule truncate, ca. 1 mm, glabrous; external ligule white-gray pubescent; blade linear-lanceolate, 4.5–8 × 0.5–0.8 cm, thin, abaxially gray pubescent at base, secondary veins 2–4-paired, transverse veins obscure, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Jun.

About 2600 m. S Xizang [Bhutan].

The culms are used for weaving.

56. *Fargesia hainanensis* T. P. Yi, Bull. Bot. Res., Harbin 3(3): 151. 1983.

海南箭竹 hai nan jian zhu

Rhizome neck 5–7 cm. Culms 3–7 m, 2–3.5 cm in diam.;

internodes terete, 24–28 cm, glabrous; wall 2–3.5 mm thick; supra-nodal ridges level or weakly prominent; sheath scar weakly prominent. Branches 3–7 per node. Culm sheaths persistent, orange-red or gray, triangularly narrowly rounded, nearly as long as internodes, leathery, densely setose, margins apically brown ciliate; auricles absent; oral setae deciduous, erect, light yellow; ligule arcuate, 1–1.5 mm, margins initially densely light yellow ciliate; blade reflexed, linear-lanceolate, glabrous, margins serrulate. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent; oral setae present; ligule arcuate or truncate, ca. 1 mm; blade linear-lanceolate, 4–12 × 0.5–0.9 cm, pubescent basally, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence a raceme, terminal to leafy shoot; spikelets 4–7, 2.3–3 cm, rachilla 2.5–5 mm; florets 3–5, light green to dark purple. Glumes 2, papery, glabrous; lemma pilose, apex acuminate; palea keels ciliate; lodicules densely ciliate. Anthers yellow. Ovary light yellow, ovoid, glabrous; style 1; stigmas 2. Caryopsis unknown. New shoots Aug.

• 1500–1800 m. Hainan (Wuzhi Shan).

57. *Fargesia porphyrea* T. P. Yi, J. Bamboo Res. 7(2): 84. 1988.

红壳箭竹 hong ke jian zhu

Rhizome neck 2.5–4 cm. Culms 3–5 m, 1–2.5 cm in diam.; internodes terete, 28–35 cm, initially distally gray setose, glabrescent; wall 2–3 mm thick, pith initially spongy, becoming granular; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 5–11 per node. Culm sheaths persistent, red-brown, narrowly rounded or triangularly narrowly rounded, shorter than internodes, leathery, brown setose, margins glabrous or apically very sparsely gray ciliate, apex triangular; auricles and oral setae absent; ligule purple-brown, truncate or convex, 1–1.5 mm, margins initially densely yellow-brown ciliate, cilia 2–4 mm; blade reflexed, linear-lanceolate, initially gray ciliate, margins rolled, articulate with sheath. Leaves 3–10 per ultimate branch; sheath red-brown when dry, glabrous; auricles absent; oral setae initially present; ligule truncate, ca. 1 mm, glabrous; blade linear-lanceolate, 9–19 × 0.7–1.7 cm, thin, abaxially white-gray pubescent, secondary veins 3- or 4-paired, transverse veins obscure, base cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown. New shoots Aug–Sep.

• 1200–2500 m. S Yunnan.

The shoots are edible.

58. *Fargesia lincangensis* T. P. Yi, J. Bamboo Res. 7(2): 96. 1988.

雪山箭竹 xue shan jian zhu

Rhizome neck 5–9 cm. Culms 4–8 m, 2–5 cm in diam.; internodes terete, 25–45 cm, glabrous; wall 3.5–6 mm thick, pith granular; supra-nodal ridges prominent; sheath scar prominent, with persistent remains of sheath base. Branches 3–18 per node. Culm sheaths gradually deciduous to persistent, narrowly triangular, shorter than internodes, leathery, yellow to yellow-brown setose, setae especially dense and long at base, longitudinal ribs prominent, margins ciliate; auricles present or

absent; oral setae erect or curved, yellow, 4–12 mm; ligule purple, truncate or convex, 1–1.5 mm, setulose, fimbriate, yellow ciliate; blade readily deciduous, reflexed, linear-lanceolate, adaxially puberulous proximally, glabrous. Leaves 2 or 3 per ultimate branch; sheath glabrous or margins initially slightly ciliate; auricles absent or obscure; oral setae yellow, few, 3–6 mm; ligule purple, truncate, glabrous; blade narrowly rounded to lanceolate, $7-10 \times 1.2-1.6$ cm, glabrous, secondary veins 3–5-paired, transverse veins slightly distinct, base broadly cuneate, margins nearly smooth. Inflorescence unknown. New shoots Sep.

• 2900–3200 m. SW Yunnan.

The shoots are edible, and the culms are used for weaving.

59. *Fargesia yulongshanensis* T. P. Yi, J. Bamboo Res. 7(2): 87. 1988.

玉龙山箭竹 *yu long shan jian zhu*

Rhizome neck 6–12 cm. Culms 5–7 m, 1–2.5 cm in diam.; internodes terete, 35–45 cm, initially white powdery, brown setose immediately below node, white-gray setose above; wall 2–4 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, initially yellow-brown setose. Branches many per node. Culm sheaths gradually deciduous to persistent, triangularly narrowly rounded, leathery, longitudinal ribs obscure, densely yellow-brown setose, margins yellow-brown setose; auricles absent; oral setae few, yellow-brown, 1–5 mm, slender; ligule truncate or convex, 1–2 mm, initially ciliate; blade reflexed or erect, linear-lanceolate, glabrous, margins smooth. Leaves 2–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate, 1–1.5 mm; blade narrowly lanceolate, $5-8 \times 0.4-0.9$ cm, glabrous, secondary veins 2–4-paired, transverse veins distinct, base broadly cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Jun–Jul.

• 3000–4200 m. NW Yunnan.

The shoots are edible, and the split culms are used for weaving.

60. *Fargesia strigosa* T. P. Yi, J. Bamboo Res. 7(2): 90. 1988.

粗毛箭竹 *cu mao jian zhu*

Rhizome neck 3–5 cm. Culms 2.5–6 m, 1–2.5 cm in diam.; internodes terete, 22–28 cm, densely and prominently longitudinally ribbed, initially densely white powdery, white-gray setulose below node; wall 3.5–6 mm thick; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 5–10 per node, nearly solid. Culm sheaths persistent, narrowly triangular, shorter than internode, leathery, proximally densely gray setose, margins glabrous, apex triangular; auricles absent; oral setae absent or few, yellow, 2–6 mm; ligule truncate or arcuate, 1–2 mm, glabrous; blade reflexed, linear-lanceolate. Leaves 2–4 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule arcuate or truncate, ca. 0.5 mm, glabrous; blade narrowly lanceolate, $4-8.5 \times 0.6-0.8$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins slightly distinct, base cuneate, margins nearly smooth, or one margin spinescent-serrulate and other margin smooth, apex long acuminate. Inflorescence unknown. New shoots late Aug–early Sep.

• About 2900 m. SW Yunnan.

61. *Fargesia funiushanensis* T. P. Yi, Acta Bot. Yunnan. 13: 375. 1991.

伏牛山箭竹 *fu niu shan jian zhu*

Rhizome neck (2.3–)6–12 cm, (0.5–)0.8–1.4 cm in diam. Culms 1.2–2(–2.5) m, (0.3–)0.5–0.8(–1.2) cm in diam.; internodes terete, 8–12 cm, initially sparsely white powdery, glabrous; wall 1.5–2(–3) mm thick; supra-nodal ridges weakly prominent; sheath scar prominent. Branches 2–5 per node. Culm sheaths persistent, triangular-elliptic, usually shorter than internode, leathery, glabrous, longitudinal ribs prominent, margins glabrous; auricles and oral setae usually absent; ligule arcuate, 5–7 mm; blade erect, linear-triangular or linear. Leaves 2–4(or 5) per ultimate branch; sheath purple, margin densely gray-brown ciliate distally; auricles absent; oral setae absent or obscure; ligule truncate or arcuate, 0.5–1 mm, margin initially white ciliate; blade lanceolate, $(4-5)-8 \times (0.6-0.9)-1.2$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margin serrulate. Inflorescence unknown.

• 1400–2100 m. Henan (Laojun Shan, Luanchuan).

62. *Fargesia dulcicula* T. P. Yi, J. Bamboo Res. 11(2): 9. 1992.

清甜箭竹 *qing tian jian zhu*

Rhizome neck 8–10 cm, 1.8–2.5 cm in diam. Culms erect, 3–4 m, 1–1.8 cm in diam.; internodes terete but grooved above branches, 20–25(–30) cm, initially thinly white powdery below nodes; glabrous; wall 2.5–4.5 mm thick; supra-nodal ridges level or slightly prominent; sheath scar prominent, glabrous or initially stiffly white hairy. Branches 8–10 per node; culm bud 1, narrowly ovoid, appressed, margins white ciliate. Culm sheaths gradually deciduous, purple, triangular-ovate, ca. 1/3 as long as internodes, leathery, white or yellowish setose, longitudinal ribs prominent; auricles absent; oral setae deciduous, erect or curved, yellow; ligule purple, truncate or convex, 1–2 mm; blade reflexed, triangular linear or linear-lanceolate, glabrous. Leaves 4 or 5 per ultimate branch; sheath glabrous; auricles absent; oral setae few, yellow; ligule slightly green, convex, 1–1.5 mm, glabrous; blade lanceolate, $4.5-10.5 \times 0.6-1.1$ cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jul.

• About 3500 m. S Sichuan (Mianning).

The shoots are edible and are one of the favorite foods of the giant panda. The split culms are used for weaving.

63. *Fargesia wuliangshanensis* T. P. Yi, Acta Bot. Yunnan. 10: 438. 1988.

无量山箭竹 *wu liang shan jian zhu*

Rhizome neck 4–8 cm. Culms 3–7 m, 1.5–2.5 cm in diam.; internodes terete, 26–30 cm, initially white powdery; wall 4–8 mm thick or nearly solid; supra-nodal ridges level or weakly prominent; sheath scar prominent, initially pale yellow setose. Branches 4–23 per node. Culm sheaths triangularly narrowly rounded, shorter than internode, leathery, rigid, setose, proximally more densely so, longitudinal ribs prominent, mar-

gins densely ciliate, apex broadly triangular; auricles absent or small; oral setae few, 2–5 mm; ligule convex or concave, 1–3 mm; blade reflexed, narrowly triangular, margins apically rolled. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles absent; oral setae few, 3–6 mm; ligule convex, ca. 0.5 mm; blade linear-lanceolate, 4–9.5 × 0.8–1.2 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate, apex long acuminate. Inflorescence unknown. New shoots Aug.

• 3000–3100 m. C Yunnan.

The culms are used for weaving.

64. *Fargesia glabrifolia* T. P. Yi, J. Bamboo Res. 2(2): 32. 1983.

光叶箭竹 *guang ye jian zhu*

Borinda glabrifolia (T. P. Yi) Stapleton.

Rhizome neck 2.5–4.5 cm. Culms 4–6 m, 0.8–2 cm in diam.; internodes terete, 30–35 cm, initially densely white powdery, glabrous; wall 2–4 mm thick; supra-nodal ridges level; sheath scar weakly prominent. Branches many per node, subequal, initially white powdery. Culm sheaths gradually deciduous, triangularly narrowly rounded, leathery, sparsely gray-white to gray-yellow setose, longitudinal ribs prominent, margins glabrous; auricles absent or small; oral setae few, readily deciduous, erect; ligule truncate, 1–4 mm, initially pubescent, uniformly fissured; blade reflexed, linear-lanceolate to triangular-lanceolate, glabrous, margins serrulate and rolled. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles absent; oral setae yellow-brown; ligule truncate or convex, short, fimbriate, ciliate; blade narrowly lanceolate, 5–8 × 0.4–0.5 cm, glabrous, secondary veins 2-paired, transverse veins obscure, base broadly cuneate, margins obscurely spinescent-serrulate. Inflorescence unknown. New shoots late Jun.

• 3100–3500 m. S Xizang.

65. *Fargesia plurisetosa* T. H. Wen, J. Bamboo Res. 3(2): 27. 1984.

密毛箭竹 *mi mao jian zhu*

Rhizome neck 1–2.5 cm. Culms ca. 2 m, to 1 cm in diam.; internodes terete, 16–18 cm, initially densely gray setose, scabrid after setae fall, longitudinal ribs dense and prominent; wall 1–1.5 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, densely gray setose. Branches 2–8 per node. Culm sheaths persistent, narrowly triangular, much shorter than internode, papery, appressed pale yellow setose, longitudinal ribs greatly prominent, margins light yellow ciliate, apex triangular; auricles absent; oral setae absent or scarce; ligule truncate, 0.8–1 mm, sparsely pilose, margins ciliate, cilia deciduous; blade deciduous, reflexed, linear-lanceolate or triangular-conical, slightly pilose. Leaves 2–10 per ultimate branch; sheath gray pubescent, margins gray ciliate; auricles erect, oblong, ca. 1.5 mm; oral setae few, yellow, 2–6 mm; ligule truncate, slightly pilose; blade lanceolate or linear-lanceolate, 5–10 × 0.7–1.4 cm, abaxially white pubescent with hairs 1–2 mm, secondary veins 3–5-paired, transverse veins obscure, base rounded or broadly cuneate, one margin serrulate, other margin nearly smooth. Inflorescence unknown.

• About 1500 m. S Yunnan.

66. *Fargesia dracocephala* T. P. Yi, Bull. Bot. Res., Harbin 5(4): 127. 1985.

龙头箭竹 *long tou jian zhu*

Rhizome neck 8–20 cm. Culms 3–5 m, 0.3–2 cm in diam.; internodes terete, 15–18 cm, initially white powdery; wall 4–5 mm thick; supra-nodal ridges weakly prominent; sheath scar very prominent, ridged. Branches 7–14 per node. Culm sheaths gradually deciduous, pale red-brown, narrowly rounded-triangular or narrowly rounded, shorter than internode, leathery, gray-yellow setose or nearly glabrous, margins initially yellow-brown setose, longitudinal ribs prominent; auricles small; oral setae absent or sparse, brown; ligule truncate, ca. 1 mm, initially ciliolate; blade erect, triangular or linear-lanceolate, glabrous. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles oblong, with oral setae; ligule purple, truncate, ca. 1 mm, glabrous; blade lanceolate, 5–12 × 0.6–1.3 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, one margin spinescent-serrulate, other margin obscurely serrulate. Inflorescence raceme or simple panicle, partially exserted from spathe; spikelets 1–1.5 cm; rachilla internodes 0.5–3 mm, glabrous; florets 1–3, green. Glumes 2, sparsely pilose, apex acuminate; lemma acuminate and long mucronate at apex; palea keels ciliate; lodicules ciliate. Anthers yellow or purple. Ovary ovoid, glabrous; style 1; stigmas 3, plumose. Caryopsis unknown. New shoots May–Oct.

• 1500–2200 m. S Gansu, W Hubei, S Shaanxi, N Sichuan.

Fargesia dracocephala is one of the main food species for the giant panda.

A bamboo cultivated under this name in the West differs substantially from this description.

67. *Fargesia decurvata* J. L. Lu, J. Henan Agric. Coll. 1981(1): 74. 1981.

毛龙头竹 *mao long tou zhu*

Fargesia aurita T. P. Yi.

Rhizome neck 10–15 cm. Culms 1.5–3.5 m, 0.5–1.5 cm in diam.; internodes terete, 15–20 cm, initially thinly white powdery, glabrous; wall 3–5 mm thick; supra-nodal ridges prominent; sheath scar greatly prominent, ridged. Branches 5–12 per node, deflexed. Culm sheaths deciduous, pale yellow-brown, narrowly triangular or narrowly rounded-triangular, shorter than internode, papery, pale yellow or yellow-brown setose, longitudinal ribs very prominent, margins glabrous, apex triangular; auricles and oral setae absent; ligule purple, arcuate, ca. 1 mm, initially white-gray ciliolate; blade erect, linear-triangular or triangular, glabrous, margins serrulate. Leaves 2–5 per ultimate branch; sheath margins yellow-brown ciliate; auricles purple, nearly circular; oral setae few, gray-yellow, 2–5 mm; ligule arcuate, glabrous; blade lanceolate, 7–14.5 × 0.6–1.6 cm, abaxially proximally white-gray pubescent, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots late Apr–early May.

• 1100–1700 m. W Hubei, NW Hunan, SW Shaanxi, E Sichuan.

This species is an important source of food for the giant panda in Fuping, Shaanxi Province.

68. *Fargesia conferta* T. P. Yi, Bull. Bot. Res., Harbin 5(4): 123. 1985.

笼笼竹 long long zhu

Rhizome neck 3–6 cm. Culms 3–5 m, 1–2 cm in diam.; internodes terete, 25–35 cm, initially distally white-gray setose; wall 2.5–5 mm thick; supra-nodal ridges weakly prominent; sheath scar prominent, with persistent remains of sheath base, glabrous or initially sparsely white-gray setose. Branches many per node, deflexed, subequal. Culm sheaths persistent, gray-red-brown, narrowly triangular, shorter than internode, thickly papery, densely appressed brown to dark brown setose, longitudinal ribs distally prominent, margins brown ciliate, apex triangular; auricles triangular or absent; oral setae several, gray, 2–5 mm; ligule arcuate, 2–6 mm, ciliate; blade erect, linear-lanceolate, glabrous, margins rolled. Leaves 2–6 per ultimate branch; sheath margins glabrous; auricles absent; oral setae few, gray, 3–5 mm; ligule brown, truncate or arcuate, glabrous; blade narrowly lanceolate, 9–13 × 0.5–1 cm, thin, abaxially gray-puberulous proximally, secondary veins 4-paired, transverse veins obscure, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots Jun.

• 1100–1700 m. W Guizhou, S Sichuan.

69. *Fargesia robusta* T. P. Yi, J. Bamboo Res. 4(2): 28. 1985.

拐棍竹 guai gun zhu

Rhizome neck 9–20 cm. Culms 2–7 m, 1–3 cm in diam.; internodes terete, 15–30 cm, initially white powdery; wall 3–5 mm thick; supra-nodal ridges weakly prominent; sheath scar very prominent, ridged. Branches 15–20 per node. Culm sheaths deciduous or gradually deciduous, triangular-elliptic, shorter than internode, leathery, light yellow or yellow-brown setulose, setulae especially dense proximally, longitudinal ribs prominent, margins glabrous; auricles absent or small; oral setae absent, or few and deciduous; ligule truncate, 1–2 mm, initially densely ciliate; blade erect or reflexed, triangular or linear-lanceolate, glabrous. Leaves 2–4 per ultimate branch; sheath to 16 cm, glabrous, margins apically densely ciliate, apex broadly triangular; auricles absent; oral setae present; ligule purple, truncate, ca. 1 mm, glabrous; blade lanceolate, 6–23 × 0.5–2.3 cm, glabrous or abaxially sparsely pilose proximally, secondary veins 4–7-paired, transverse veins distinct, base cuneate, margins spinescent-serrulate. Inflorescence a condensed raceme, partially exserted from spathe; spikelets 5–11, 1–1.5 cm, rachilla internodes 1–2 mm; florets 2–4, green. Glumes 2, sparsely pilose, apex acuminate or long mucronate; lemma long mucronate at apex; palea keels serrulate; lodicules purple, margins ciliate, apex pubescent. Anthers yellow. Ovary ovoid, glabrous; style 1; stigmas 3. Caryopsis unknown. New shoots Jun–Aug.

• 1700–2800 m. W Sichuan.

The shoots are edible and are an important source of food for the giant panda. The culms provide material for weaving.

70. *Fargesia caduca* T. P. Yi, J. Bamboo Res. 7(2): 108. 1988.

景谷箭竹 jing gu jian zhu

Rhizome neck 6–23 cm. Culms 3–5 m, 1–1.5 cm in diam.; internodes terete, 21–30 cm, initially white powdery, glabrous; wall 1.5–2.5 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, narrow, thin. Branches 10–18 per node, deflexed, subequal. Culm sheaths deciduous, narrowly triangular, shorter than internode, proximally leathery, distally papery, sparsely appressed gray-yellow or yellow setose, margins glabrous, apex narrowly triangular; auricles absent; oral setae absent or several, gray, 3–6 mm; ligule purple, triangular or truncate, ca. 0.5 mm, glabrous; blade erect, triangular or linear-lanceolate, glabrous. Leaves 7–9 per ultimate branch; sheath to 28 cm, margins glabrous, apex narrowly triangular; auricles absent; oral setae few, gray, 2–5 mm; ligule truncate, glabrous; blade narrowly lanceolate, 5–13 × 0.5–1.1 cm, abaxially gray puberulous proximally, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin obscurely so, apex acuminate. Inflorescence unknown. New shoots Sep.

• 1800–1900 m. S Yunnan.

71. *Fargesia emaculata* T. P. Yi, J. Bamboo Res. 4(2): 29. 1985.

牛麻箭竹 niu ma jian zhu

Rhizome neck 7–14 cm. Culms 2.5–3.5 m, 0.8–1.2 cm in diam.; internodes terete, 18–25 cm, initially white powdery, yellow-brown setose below each node; wall 2–3 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent. Branches 10–17 per node, purple-red. Culm sheaths persistent, triangularly narrowly rounded, shorter than internode, leathery, brown setose, margins distally densely yellow-brown ciliate, apex triangular; auricles absent; oral setae absent or several, white-gray, 3–4 mm; ligule arcuate, ca. 1 mm, gray-yellow ciliate; blade erect or reflexed, linear-lanceolate, margins white-gray ciliate. Leaves 3 or 4 per ultimate branch; sheath margins glabrous; auricles and oral setae absent; ligule arcuate or truncate, glabrous; blade narrowly lanceolate, 1.5–7 × 0.3–0.75 cm, glabrous, secondary veins 2- or 3-paired, transverse veins obscure, base broadly cuneate, one margin slightly serrulate, other margin smooth, apex acuminate. Inflorescence unknown. New shoots Jul.

• 2800–3800 m. W Sichuan.

This species is a source of food for the giant panda.

72. *Fargesia lushuiensis* Hsueh & T. P. Yi, J. Bamboo Res. 7(2): 111. 1988.

泸水箭竹 lu shui jian zhu

Borinda lushuiensis (Hsueh & T. P. Yi) Stapleton.

Culms 3–5 m, 0.8–1 cm in diam.; internodes terete but grooved above branches, 14–32 cm, initially white powdery, glabrous; wall 1.5–3.2 mm thick; supra-nodal ridges prominent to very prominent; sheath scar prominent. Branches 2–9 per node. Culm sheaths deciduous, narrowly triangular, shorter than internodes, leathery, glabrous or sparsely setose, margins glabrous, apex narrowly triangular; auricles and oral setae absent; ligule purple, truncate, ca. 1 mm, glabrous; blade erect or

reflexed, triangular or linear-triangular, glabrous, adaxially scabrous, margins rolled. Leaves 3–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule purple, truncate, glabrous; blade narrowly lanceolate, 7–11 × 0.6–1 cm, glabrous, secondary veins 3- or 4-paired, transverse veins distinct, base cuneate, margin nearly smooth or slightly scabrous, apex long acuminate. Inflorescence unknown.

- 1700–1800 m. NW Yunnan.

This species is a source of food for the giant panda.

73. *Fargesia mali* T. P. Yi, Acta Bot. Yunnan. 11: 37. 1989.

马利箭竹 *ma li jian zhu*

Rhizome neck 3–8 cm. Culms 3–6 m, 1.2–2.5 cm in diam.; internodes green, terete, 25–38 cm, waxy; wall 3–4 mm thick; supra-nodal ridges level or weakly prominent; sheath scar prominent, initially yellow-brown setulose. Branches 10–15 per node. Culm sheaths gradually deciduous, gray to gray-brown, narrowly triangular, ca. 4/5 as long as internodes, leathery, sparsely yellow clavate-setose, margins initially yellow ciliate, apex broadly triangular; auricles and oral setae absent; ligule purple, arcuate, ca. 1 mm, margins slightly undulate; blade erect, narrowly triangular, margins smooth, rolled. Leaves 2–4 per ultimate branch; sheath margins glabrous; auricles and oral setae absent; ligule purple, truncate; blade linear-lanceolate, 5–7.5 × 0.4–0.7 cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, base cuneate, one margin serrulate, other margin obscure. Inflorescence unknown. New shoots Aug.

- 3000–3200 m. SW Sichuan.

The culms are used for weaving.

74. *Fargesia exposita* T. P. Yi, J. Bamboo Res. 11(2): 12. 1992.

露舌箭竹 *lu she jian zhu*

Rhizome neck (1.5–)2–5.5 cm, (0.8–)1–2 cm in diam. Culms 3–4.5(–5) m, 0.8–1.6(–2.5) cm in diam.; internodes terete, 20–23 cm, initially white powdery, glabrous; wall 3–4 mm thick; supra-nodal ridges level or slightly prominent; sheath scar prominent. Branches 7–15 per node; culm bud 1, narrowly ovoid, appressed, margins white ciliate. Culm sheaths deciduous, oblong-triangular, ca. 3/5 as long as internodes, leathery, shoulders convex on sheaths of upper culm, grayish white or yellow setose, margins slightly yellow or gray ciliate; auricles and oral setae absent; ligule purple, truncate or concave, 0.5–1 mm, wider than base of sheath blade, glabrous; blade erect or reflexed, triangular or linear-triangular, glabrous, margins serrulate. Leaves 3–6 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule purple, truncate or arched, ca. 0.5 mm, glabrous; blade narrowly linear-lanceolate, 4–9.5 × 0.4–0.8 cm, glabrous, secondary veins (2 or)3-paired, transverse veins distinct, base cuneate, margins serrulate. Inflorescence unknown. New shoots Jul.

- 2700–2800 m. S Sichuan (Mianning).

The shoots are edible, and the culms are used for weaving.

75. *Fargesia brevipes* (McClure) T. P. Yi, J. Bamboo Res. 7(2): 113. 1988.

短柄箭竹 *duan bing jian zhu*

Arundinaria brevipes McClure, Sunyatsenia 6(1): 28. 1941; *Sinarundinaria brevipes* (McClure) Keng ex P. C. Keng.

Rhizome, culm, and culm sheath unknown. Leaf sheath purple or purple-brown, initially apically white-gray setose; auricles absent or small; oral setae several, curved, yellow-brown, 1–5 mm; ligule purple, truncate, ca. 1 mm, glabrous; blade narrowly lanceolate, 2.5–6 × 0.3–0.4 cm, glabrous or abaxially initially setulose proximally, secondary veins 2-paired, transverse veins obscure, base cuneate or rounded, one margin serrulate, other margin obscurely so, apex acuminate. Inflorescence a raceme, exerted from spathe; spikelets 3–6, 1.8–3 cm, rachilla 3–4 mm, gray-yellow setose, margins ciliate, apex swollen; florets 3–5, purple. Glumes 2, glabrous, apex long mucronate; lemma narrowly triangular, apex long mucronate; palea keels sparsely setulose; lodicules ciliate. Anthers yellow, glabrous. Ovary ovoid, glabrous; style 1; stigmas 3, white. Caryopsis unknown.

- Yunnan.

The type locality remains unknown.

76. *Fargesia cuspidata* (Keng) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 95. 1981.

尖尾箭竹 *jian wei jian zhu*

Arundinaria cuspidata Keng, Sinensia 7(3): 410. 1936; *Sinarundinaria cuspidata* (Keng) P. C. Keng; *Thamnocalamus cuspidatus* (Keng) P. C. Keng.

Culms ca. 5 m, ca. 2 cm in diam.; internodes terete, 14–19 cm, initially white powdery. Branches many, to 60 cm, glabrous. Culm sheaths unknown. Leaf sheath 3–6 cm, glabrous; auricles absent; oral setae deciduous; ca. 3 mm; ligule truncate, ca. 1 mm, rigid; blade narrowly rectangular, 3.5–12 × 0.5–1 cm, glabrous or slightly pilose basally, secondary veins 3–5-paired, transverse veins present, base broadly cuneate, margins scabrous or nearly smooth, apex long acuminate. Inflorescence a raceme or contracted panicle, exerted from spathe; spikelets many, 2.5–3 cm, rachilla internodes 4–6 mm, slightly pilose apically; florets 3 or 4, light yellow. Glumes 2, sparsely hairy, apex obtuse; lemma hairy, apex obtuse; palea keels ciliate; lodicules ciliate, obtuse at apex. Ovary ca. 2 mm; styles 3; stigma unknown. Caryopsis red-brown.

- About 1600 m. N Guangxi.

77. *Fargesia unguolata* T. H. Wen, J. Bamboo Res. 8(1): 22. 1989.

鸡爪箭竹 *ji zhua jian zhu*

Culms ca. 1.5 m, 0.5–0.8 cm in diam.; internodes dark purple-brown, 7–12 cm, pubescent, nearly solid; supra-nodal ridges weakly prominent; sheath scar woody. Branches 6–8 per node, slender. Culm sheaths unknown. Leaves 3 or 4 per ultimate branch, deciduous; sheath 2.5–2.7 cm, initially densely setose; auricles deflexed, falcate; oral setae short; ligule arcuate, ca. 1 mm; blade narrowly lanceolate, 4–7 × 0.9–1.2 cm, abaxially setose, secondary veins 3- or 4-paired, transverse veins obscure, base broadly cuneate or nearly rounded, margins serru-

late, apex acuminate and obtuse. Inflorescence a raceme; spikelets 2–4; florets 2 or 3. Glumes 2, glabrous; lemma glabrous, apex obtuse; palea glabrous, apex sharply obtuse; lodicules ciliate. Ovary cylindrical, ca. 2 mm; style 1, very short; stigmas 3, penicillate. Caryopsis unknown.

• NW Hunan.

78. *Fargesia vicina* (Keng) T. P. Yi, J. Bamboo Res. 7(2): 113. 1988.

紫序箭竹 *zi xu jian zhu*

Arundinaria vicina Keng, Sinensia 7: 410. 1936; *Pseudosasa vicina* (Keng) T. Q. Nguyen; *Sinarundinaria vicina* (Keng) P. C. Keng.

Rhizome, culm, and culm sheath unknown. Flowering branches 3 per node; ligule truncate or arcuate, ca. 1 mm, abaxially sparsely hairy. Leaves 1–3 per flowering branch; blade 2.5–8 × 0.4–0.7 cm, glabrous, secondary veins 3-paired, transverse veins distinct, one margin scabrous, other margin smooth. Inflorescence a raceme; spikelets 3–5, 2–3 cm, rachilla internodes 4–5 mm, slightly pilose; florets 4–6. Glumes 2, glabrous, apex acuminate; lemma sparsely hairy, apex obtuse or acuminate; palea keels setose; lodicules yellow-brown, margins apically ciliate. Stamens unknown. Stigmas 2. Caryopsis unknown.

• Yunnan.

The type locality remains unknown.

Taxa incertae sedis

Fargesia macrophylla Hsueh & C. M. Hui, Bull. Bot. Res., Harbin 18: 258. 1998.

阔叶箭竹 *kuo ye jian zhu*

Rhizome sympodial. Culms 2–3 m, 0.5–1 cm in diam.; internodes terete, 28–38 cm, initially thinly white powdery, glabrous, hollow; sheath scar prominent, glabrous. Branches very many per node, subequal. Culm sheaths persistent, shorter than internode, leathery, sometimes scattered setose, margins densely ciliate, longitudinal ribs only laterally conspicuous; auricles and oral setae absent; ligule truncate, 2–5 mm; blade reflexed, base narrower than mouth or sheath. Leaves 3–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule rounded or truncate, ca. 1 mm; blade 15–25 × 2–4 cm, proximally pilose, secondary veins 5–7-paired, transverse veins distinct. Inflorescence unknown.

• 1900–2000 m. Yunnan (Fugong).

This taxon appears to key out with *Fargesia pauciflora* (species no. 54); the authors compared it with *F. hsuehiana*, which could be distinguished by, e.g., the initially setose culm internodes and nodes, culm sheath ligules only ca. 0.7 mm, and smaller leaves, 6–14 × 0.7–1.2 cm.

Fargesia nujiangensis Hsueh & C. M. Hui, Bull. Bot. Res., Harbin 18: 261. 1998.

怒江箭竹 *nu jiang jian zhu*

Fargesia nujiangensis f. *lanpingensis* J. R. Hsueh & C. M. Hui; *F. nujiangensis* f. *striata* J. R. Hsueh & C. M. Hui.

Rhizome sympodial. Culms 3–5 m, 1–3 cm in diam.; internodes terete, 23–30 cm, prominently ridged, initially densely white powdery or waxy, filled with pith (hollow in f. *lanpingensis*); nodes glabrous. Branches 5 per node, equal. Culm sheaths soon or gradually deciduous, streaked with yellow in f. *striata*, shorter than internode, leathery, sparsely caducous-setose, margins distally ciliate, longitudinal ribs prominent, transverse veins not evident, apex truncate or sometimes retuse; auricles and oral setae absent; ligule 2–5 mm; blade reflexed (erect in f. *striata*), base narrower than mouth or sheath. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral

setae absent; ligule ca. 1 mm; blade lanceolate, 5–10 × 0.5–0.6 cm, glabrous, secondary veins 2- or 3-paired, transverse veins obscure. Inflorescence unknown.

• 2500–2900 m. Yunnan (Gaoligong Shan).

Fargesia nujiangensis was compared by its authors with *F. hsuehiana*, which differs most obviously by having initially setose culm internodes, 6–9 branches per culm node, and persistent culm sheaths.

Fargesia stricta Hsueh & C. M. Hui, Bull. Bot. Res., Harbin 18: 266. 1998.

马兹箭竹 *ma zi jian zhu*

Culms 5–8 m, 2–3 cm in diam.; internodes terete, 30–37 cm, obscurely ridged, glabrous, hollow or filled with pith toward culm apex; wall about as thick as cavity; supra-nodal ridge prominent, remains of sheath base persistent. Branches 3–5(–8) per node, unequal. Culm sheaths soon deciduous, oblong, leathery, brown setose, setae densest proximally, longitudinal ribs prominent, margins not ciliate; auricles and oral setae absent; ligule 1–3 mm, shortly ciliate; blade reflexed, linear-lanceolate, narrower than mouth of sheath. Leaves 3 or 4(or 5) per ultimate branch; auricles and oral setae absent; ligule ca. 1 mm; blade lanceolate, 5–10 × 0.5–0.8 cm, secondary veins 2- or 3-paired, transverse veins obscure. Inflorescence unknown.

• 2200–2300 m. Yunnan (Lushui).

The authors compared this species with what is now *Himalayacalamus collaris*.

In addition, the following species have been described from China:

Fargesia brevistipedis T. P. Yi (J. Bamboo Res. 19(1): 14. 2000) was described from sterile material from Sichuan (Tianquan). In the protologue it was compared with *F. pauciflora*.

Fargesia incrassata T. P. Yi (J. Bamboo Res. 19(1): 16. 2000) was described from sterile material from Sichuan (Tianquan). In the protologue it was compared with *F. fractiflexa* (*Drepanostachyum fractiflexum* in this account).

Fargesia ostrina T. P. Yi (Acta Bot. Yunnan. 22: 251. 2000) was described from Sichuan (Wanyuan). In the protologue it was compared with *F. murielae*.

15. DREPANOSTACHYUM P. C. Keng, J. Bamboo Res. 2(1): 15. 1983.

镰序竹属 *lian xu zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Shrubby bamboos. Rhizomes short necked, pachymorph. Culms uniaespitose, to 4 m tall, distally pendulous; internodes terete, glabrous, cavity not filled with pith; nodes raised. Mid-culm branch buds very broadly ovoid, bud scale open at front, branch sheathing reduced, very many branch initials visible in 2 ranks. Branches very numerous and congested; branchlets initially 8–16 in 2 or 3 rows, later to 80, verticillate, subequal, slender. Culm sheaths deciduous, narrowly triangular, papery, adaxially scabrous inside apically, apex narrowly acuminate with distally concave edges, blade subulate. Leaves small-sized, narrowly lanceolate to lanceolate, delicate, matte, transverse veins absent. Inflorescence ebracteate, interrupted falcate panicles and dense clusters on leafy or leafless flowering branches. Spikelets delicate, 2–6 flowered, followed by a sterile floret, pedicel curved, short to long. Glumes 2, membranous. Lemma longer than second glume, leathery, many veined, acuminate; palea equal to or shorter than lemma, 2-keeled, obtuse; lodicules 3, transparent. Stamens 3; filaments free, long exserted; anthers yellow. Ovary appendage absent; style 1; stigmas 2, plumose. Caryopsis grainlike, narrow. New shoots summer–early autumn.

About ten species: subtropical Himalayas in Bhutan, China, India, and Nepal; at least four species (all endemic) in China.

- 1a. Culms 1.5–2 m; culm sheaths purple, blades usually erect 1. *D. membranaceum*
- 1b. Culms 2–5.4 m; culm sheaths yellowish brown, blades usually reflexed.
 - 2a. Culm sheaths narrowly triangular; branches 5–17 2. *D. fractiflexum*
 - 2b. Culm sheaths long acuminate; branches 15–80.
 - 3a. Culm sheath blade adaxially glabrous; leaf sheath blade glabrous; leaf sheath auricles and oral setae present, small, deciduous 3. *D. semiorbiculatum*
 - 3b. Culm sheath blade adaxially proximally setose; leaf sheath blade abaxially proximally pubescent; leaf sheath auricles and oral setae absent 4. *D. ampullare*

1. *Drepanostachyum membranaceum* (T. P. Yi) D. Z. Li, Novon 15: 600. 2005.

膜箨镰序竹 *mo tuo lian xu zhu*

Fargesia membranacea T. P. Yi, Acta Bot. Yunnan. 14: 135. 1992.

Rhizome neck 2–5 cm, 1–1.7 cm in diam., solid. Culms 1.5–2 m, 5–10 mm in diam.; internodes cylindrical, (4–)13–15(–18) cm, glabrous; wall 1.8–3 mm thick; supra-nodal ridge prominent; sheath scar prominent. Branches 13–33 per node, ascending, subequal; buds 5–7, suborbicular. Culm sheaths persistent, purple, linear-triangular, longer than nodes, thinly leathery or thickly papery proximally, membranous distally; auricles and oral setae absent; ligule 1–2 mm, initially fimbriate; blade erect, linear, glabrous, involute. Leaves 4 or 5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligules triangular-arcuate, 1–1.5 mm; blade linear-lanceolate, 4–9 × 0.3–0.6 cm, glabrous, secondary veins 2(or 3)-paired, transverse veins slightly distinct, base cuneate, margins serrulate. Inflorescence unknown.

• 2300–2400 m. S Sichuan (Mianning).

2. *Drepanostachyum fractiflexum* (T. P. Yi) D. Z. Li, Fl. Yunnan. 9: 145. 2003 [*“fractiflexa”*].

扫把竹 *sao ba zhu*

Fargesia fractiflexa T. P. Yi, J. Bamboo Res. 4(1): 22. 1985.

Rhizome neck 3–20 cm, 0.7–2 cm in diam.; internodes 1–10 mm. Culms 2–4.5 m, 6–12 mm in diam.; internodes 12–15(–20) cm, initially usually glaucous and white powdery, longitudinal ribs obscure; nodes initially purple; ridge and sheath scar prominent; culm solid or nearly so, cavity with lamellate

pith. Branches 5–17 per node, secondary branches undeveloped. Culm sheaths yellowish brown, narrowly triangular, thinly leathery, longitudinal ribs conspicuous, very sparsely yellow-brown setose; auricles and oral setae absent; ligule arcuate, 1–3 mm, glabrous, uniformly fissured; blade reflexed, linear-lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath margins yellow-brown ciliolate; auricles and oral setae absent; ligule truncate or arcuate, 1–1.5 mm, glabrous; blade lanceolate, 7–13 × 0.5–1.2 cm, secondary veins 3- or 4-paired, transverse veins undeveloped, base cuneate, one margin spinescent-serrulate, other margin obscure. Inflorescence unknown. New shoots Jul–Sep.

• 1300–3200 m. SW Sichuan, N Yunnan.

The culms are used for weaving and making brooms.

3. *Drepanostachyum semiorbiculatum* (T. P. Yi) Stapleton, Novon 15: 600. 2005.

圆芽镰序竹 *yuan ya lian xu zhu*

Fargesia semiorbiculata T. P. Yi, J. Bamboo Res. 2(2): 40. 1983.

Rhizome neck 2–4 cm, 1.2–2.5 cm in diam., internodes 1–4 mm. Culms to 4.2 m, 6–13 mm in diam.; internodes cylindrical, 15–20(–29) cm, rigid, initially glaucous and densely white powdery, longitudinal ribs obscure; wall 2–4 mm thick. Branches many, deflexed, subequal, slender; nodes and sheath scars prominent; shoots purple when fresh, glabrous, sheath margins densely yellow-brown ciliolate. Culm sheaths yellowish brown, narrowly rounded or rarely narrowly triangular, leathery, sharply narrow in upper part, longitudinal ribs prominent, adaxially distally white-gray or gray-yellow setose, especially densely so close to apex, distal margins densely yellow-brown to brown setose; auricles and oral setae absent;

ligule prominent, 1–4 mm, initially densely white-gray to gray-yellow ciliolate, cilioles deciduous; blade usually reflexed, triangular to linear-lanceolate, glabrous. Leaves 2–5 per ultimate branch; sheath light green or purplish, 2–3 cm, glabrous, margins densely white-gray to gray-yellow ciliolate; auricles and oral setae absent; ligule truncate, ca. 1 mm, initially with dense, gray-yellow cilia ca. 1.5 mm; blade narrowly lanceolate, (2–)5–8.5(–10) × 0.4–0.5 cm, glabrous, secondary veins 2- or 3-paired, transverse veins distinct, margins spinescent-serrulate. Inflorescence unknown. New shoots Jun.

- 2400–2500 m. S Xizang (Cona).

4. *Drepanostachyum ampullare* (T. P. Yi) Demoly, *Bambou* 46: 7. 2005.

樟木镰序竹 zhang mu lian xu zhu

Fargesia ampullaris T. P. Yi, *J. Bamboo Res.* 2(2): 18. 1983.

Rhizome neck 3–7 cm, 1.3–2 cm in diam., internodes 1.5–7 mm. Culms erect, 2–5.4 m, 7–15 mm in diam.; internodes cylindrical, 20–25(–30) cm, rigid, initially glaucous and densely white powdery, longitudinal ribs obscure; wall 3–4 mm thick in

mid-culm; nodes initially white powdery, supra-nodal ridge prominent; sheath scar prominent, initially yellow-brown setose. Branches many, subequal, secondary branch undeveloped. Culm sheaths pale yellow-brown, sharply narrow close to apex, leathery, abaxially yellow setose, adaxially apically white-gray or gray-yellow setose, especially densely so close to apex, distal margins densely yellow setulose; auricles and oral setae absent; ligule 1.5–4 mm, densely yellow-brown setose, irregularly fissured; blade reflexed, linear-lanceolate, adaxially proximally yellow-brown setose. Leaves 3–5 per ultimate branch; sheath light green, glabrous; auricles deciduous, small; oral setae gray-brown; ligule truncate, ca. 1 mm, glabrous; blade lanceolate, 7–11 × 0.6–1 cm, abaxially proximally gray hairy, secondary veins 2- or 3-paired, transverse veins undeveloped, base cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots May–Jul.

- About 2200 m. S Xizang (Nyalam).

The combination *Drepanostachyum ampullare* (T. P. Yi) Demoly was published in July 2005; the same combination was made on 12 December 2005 by Stapleton (*Novon* 15: 600. 2005).

The culms are used for weaving.

Taxa incertae sedis

Drepanostachyum exauritum W. T. Lin, *J. Bamboo Res.* 11(1): 30. 1992.

无耳镰序竹 wu er lian xu zhu

Rhizome sympodial. Culms erect, 3–4 m, 10–15 mm in diam.; internodes cylindrical, 7–18.5 cm; nodes flat; sheath scar slightly prominent. Branches many, one dominant, with a few, smaller ones 1–1.5 mm in diam.; buds 3. Culm sheaths yellow-brown setose; auricles and oral setae absent; ligule ca. 5 mm, margin lacinate; blade reflexed, linear, glabrous, involute. Leaves 5 or 6 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule ca. 1 mm, blade linear-lanceolate, 10–17.5 × 1.4–2.5 cm, abaxially white pubescent, adaxially gla-

brous, secondary veins 6- or 7-paired, transverse veins obscure. Inflorescence unknown.

- Guangxi (Guilin).

This species was based on an incomplete type specimen (*Z. M. Wu* 58902, CANT), which has not been seen. From the description and illustration, it seems that it might be a species of *Ampelocalamus*, having a prominent branch and lateral ones, developed culm sheath blades, and growing in a limestone area. However, the erect culms suggest a different genus altogether, possibly *Dendrocalamus*.

In addition, *Drepanostachyum naibunensis* W. T. Lin & Z. M. Wu (*J. S. China Agric. Univ.* 13(2): 84. 1992) was described from Guangdong.

16. HIMALAYACALAMUS P. C. Keng, *J. Bamboo Res.* 2(1): 23. 1983.

喜马拉雅筱竹属 xi ma la ya xiao zhu shu

Li Dezhu (李德铎); Chris Stapleton

Shrubby to subarborescent bamboos. Rhizomes short necked, pachymorph. Culms unicaespitose, nodding to pendulous, to 12 m tall; internodes terete, glabrous, cavity not filled with pith; nodes not raised. Mid-culm branch buds broadly ovoid, bud scale open at front, branch sheathing reduced, several branch initials visible. Branches many and congested, to 25, subequal, with central dominant. Culm sheaths deciduous, papery, usually apically rounded, smooth inside; blade subulate. Leaves lanceolate to broadly lanceolate, usually small, transverse veins absent or inconspicuous. Inflorescence ebracteate, clustered racemes on leafy or leafless flowering branches. Spikelets delicate, 1(or 2)-flowered, followed by a sterile floret, pedicel short. Glumes 2, sometimes membranous; lemma longer than second glume, leathery, many veined, acuminate. Palea equal to or shorter than lemma, 2-keeled, obtuse. Lodicules 3, transparent. Stamens 3; anthers yellow; filaments free, long exserted. Ovary appendage absent; style 1; stigmas 2, plumose. Caryopsis grainlike, broad. New shoots summer–early autumn.

Eight species: Bhutan, China, India, Nepal; two species in China.

- 1a. Culm internodes smooth 1. *H. falconeri*
- 1b. Culm internodes longitudinally striate 2. *H. collaris*

1. *Himalayacalamus falconeri* (Munro) P. C. Keng, J. Bamboo Res. 2(1): 24. 1983.

喜马拉雅箬竹 *xi ma la ya xiao zhu*

Thamnocalamus falconeri Munro, Trans. Linn. Soc. London 26: 34. 1868; *Drepanostachyum falconeri* (Munro) J. J. N. Campbell ex D. C. McClintock; *Fargesia gyirongensis* T. P. Yi; *Himalayacalamus gyirongensis* (T. P. Yi) Ohrnberger.

Rhizome neck 2–3 cm, 8–20 mm in diam., internodes 1.5–3 mm. Culms 3–3.5 m, 1–1.2 cm in diam.; internodes terete, 15–19 cm, initially glaucous and white powdery; culms hollow; wall 1.5–2.5 mm thick, cavity with lamellate pith on inner wall; supra-nodal ridges prominent; sheath scar prominent, initially densely setose. Branches many, deflexed, slender, without secondary branching. Culm sheaths deciduous, narrowly triangular-rounded, leathery, glabrous or setose, longitudinal ribs conspicuous distally, distal margins yellow-brown ciliate, apex asymmetrical; auricles and oral setae absent; ligule truncate or convex, 1–2 mm, glabrous; blade readily deciduous, linear-lanceolate, revolute, adaxially densely yellow-brown setose proximally, articulate. Leaves 4–6 per ultimate branch; sheath margins yellow-brown ciliate; auricles absent; oral setae erect, gray-brown, 1–2 mm, rigid, undulate; ligule truncate, ca. 1 mm; blade lanceolate, 7–11 × 0.6–1.2 cm, abaxial midrib white-gray hairy proximally, secondary veins 3- or 4-paired, transverse veins distinct, base broadly cuneate or rarely rounded, margin spinescent-serrulate. Inflorescence unknown. New shoots May.

Mixed temperate forests; ca. 2400 m. SW Xizang (Gyirong) [Bhutan, India, Nepal].

The description is that of *Fargesia gyirongensis*, which differs somewhat from the type of *Himalayacalamus falconeri*, from near Kathmandu in Nepal, in its erect leaf sheath oral setae (Bamboo Soc. Newslett. 15: 12. 1992).

The culms are used for weaving.

2. *Himalayacalamus collaris* (T. P. Yi) Ohrnberger, Bamboos World Introd. 3: 14. 1996.

颈鞘箬竹 *jing qiao xiao zhu*

Fargesia collaris T. P. Yi, J. Bamboo Res. 2(2): 21. 1983; *Thamnocalamus collaris* (T. P. Yi) T. P. Yi.

Rhizome neck 3–4.5 cm, 1.3–3 cm in diam., internodes 2–6 mm, initially densely white-gray ciliate. Culms 2–6 m, 1–3.5 cm in diam., hollow; internodes terete, 17–28 cm; longitudinal ridges prominent, initially glaucous and densely white powdery, especially in apical ring; wall 2–3 mm thick; nodes prominent; sheath scar prominent, with persistent remains of sheath base. Branches many. Culm sheaths yellow-brown when dry, rectangular, leathery, glabrous, distal margins densely yellow ciliate, apex asymmetrical; auricles and oral setae absent; ligule truncate or inclined, ca. 1 mm, not ciliate; blade reflexed, linear-lanceolate, white-gray setose. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule usually purple, arcuate, ca. 1 mm, glabrous; blade lanceolate, 2–12.5 × 0.3–1.9 cm, abaxially slightly scabrous, secondary veins 3- or 4-paired, transverse veins undeveloped, base rounded or broadly cuneate, margins spinescent-serrulate. Inflorescence unknown. New shoots Apr–May.

Temperate forests; 2200–3000 m. S Xizang (Zhangmu) [Nepal].

This species was collected on the border with Nepal. The ridged and grooved culms distinguish it from *Himalayacalamus falconeri*, while the absence of oral setae distinguishes it from *H. porcatus* Stapleton from further east in Nepal.

The culms are used for weaving.

17. AMPELOCALAMUS S. L. Chen, T. H. Wen & G. Y. Sheng, Acta Phytotax. Sin. 19: 332. 1981.

悬竹属 *xuan zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Patellocalamus W. T. Lin.

Shrubby bamboos. Rhizomes short necked, pachymorph. Culms uniaespitose, pendulous or scrambling; internodes terete, finely ridged; nodal sheath scars usually prominent, often with corky collar. Mid-culm bud broadly ovoid, bud scale thick, initially closed at front, branch sheathing reduced, several branch initials becoming visible. Branches many, geniculate, central often dominant. Culm sheaths deciduous, papery, shorter than internodes; ligule conspicuous; auricles usually developed, often with conspicuous oral setae; blade often foliar, reflexed, lanceolate or narrowly lanceolate. Leaves small to large; ligule conspicuous; auricles usually conspicuous; blade with inconspicuous transverse veins. Inflorescence ebracteate or with few reduced sheaths, semelautant, interrupted clustered pendulous panicles on leafy or leafless flowering branches. Spikelets pendulous on long, wiry inflorescence branches and curved pedicels, 2–7 flowered, followed by a sterile floret; rachilla internodes disarticulating, ca. 1/2 as long as florets. Glumes 2, thin; lemma papery; palea equal to or longer than lemma, 2-keeled, obtuse; lodicules 3, transparent. Stamens 3; filaments free, long exserted; anthers yellow. Ovary appendage absent; style 1; stigmas 2, plumose. Caryopsis ovoid to oblong, glabrous. New shoots late summer.

About 13 species: from C Himalayas to S China; 13 species (12 endemic) in China.

In addition to the species treated below, *Ampelocalamus anhispidis* T. H. Wen (J. Bamboo Res. 4(2): 11. 1985) was described from Hunan. From the original description, its placement in *Ampelocalamus* would appear somewhat speculative. More gatherings are required.

- 1a. Mid- and upper culm sheath margins long fimbriate.
 2a. Central branch dominant; culm sheaths persistent, densely white powdery, purple-brown setose, irregularly spotted; culm to 1.5 cm in diam. 1. *A. mianningensis*
 2b. Branches subequal; culm sheath deciduous, sparsely brown setose; culm 2.5–4(–6) cm in diam. 2. *A. patellaris*
 1b. Mid- and upper culm sheath margins not long fimbriate.
 3a. Culm taller than 10 m.
 4a. Mid-culm internodes to 30 cm; leaf blade 13–20 cm 3. *A. scandens*
 4b. Mid-culm internodes 8–20 cm; leaf blade usually 5–12 cm 4. *A. luodianensis*
 3b. Culm 2–6(–10) m, or shorter.
 5a. Leaf sheath auricles and oral setae absent.
 6a. Leaf blade 9–17 × 1–2.5 cm, abaxially white pubescent 5. *A. yongshanensis*
 6b. Leaf blade 3–9 × 0.4–0.8 cm, glabrous 6. *A. microphyllus*
 5b. Leaf sheath auricles small or conspicuous, with oral setae.
 7a. Culm internode initially hispidulous below node, with persistent remnants visible later.
 8a. Culms 2–3 m, branches climbing to 6(–15) m; leaf blade papery, tomentose 7. *A. actinotrichus*
 8b. Culms to 1.5 m; leaf blade leathery, glabrous 8. *A. calcareus*
 7b. Culm internodes glabrous, smooth.
 9a. Mid-culm internodes 22–53 cm; leaf blade 1–2.2 cm wide.
 10a. Leaf sheaths with prominent oral setae, ligule 2–5 mm 9. *A. saxatilis*
 10b. Leaf sheaths without prominent oral setae, ligule ca. 1 mm 10. *A. melicoideus*
 9b. Mid-culm internodes 12–28 cm; leaf blade 0.5–1.2 cm wide.
 11a. Culm sheath auricles minute 11. *A. naibunensis*
 11b. Culm sheath auricles absent.
 12a. Culm sheath margins brown ciliate; leaf blade (4.5–)11–17 cm 12. *A. hirsutissimus*
 12b. Culm sheath margins glabrous; leaf blade (4–)6–10.5 cm 13. *A. breviligulatus*

1. *Ampelocalamus mianningensis* (Q. Li & X. Jiang) D. Z. Li & Stapleton, Kew Bull. 51: 811. 1996.

冕宁悬竹 mian ning xuan zhu

Dendrocalamus mianningensis Q. Li & X. Jiang, J. Yunnan Forest. Coll. 1984(1): 134. 1984; *Drepanostachyum mianningense* (Q. Li & X. Jiang) T. P. Yi; *Patellocalamus gongshanensis* T. P. Yi; *P. mianningensis* (Q. Li & X. Jiang) T. P. Yi.

Culms 4–8 m, to 1.5 cm in diam., internodes 22.5–27 cm; wall 3–6 mm thick. Branches several, dominant branch obvious. Culm sheaths persistent, irregularly brown spotted, triangular, leathery, white powdery, densely brown hairy, margins long ciliate; auricles absent; ligule ca. 1 cm, fimbriate; blade erect or reflexed. Leaf sheaths 7–8 cm, glabrous; ligule 1–2 mm, apex ciliate; blade 15–21 × 3–3.5 cm. Inflorescence unknown.

• Riverside slopes; 1000–1700 m. W Sichuan, W Yunnan.

2. *Ampelocalamus patellaris* (Gamble) Stapleton, Edinburgh J. Bot. 51: 321. 1994.

碟环竹 die huan zhu

Dendrocalamus patellaris Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 86. 1896; *Chimonobambusa jainiana* C. R. Das & D. C. Pal; *Drepanostachyum jainianum* (C. R. Das & D. C. Pal) R. B. Majumdar; *Patellocalamus patellaris* (Gamble) W. T. Lin.

Culms 6–10 m, 25–40(–60) mm in diam.; internodes 30–45 cm; wall thin. Branches several. Culm sheaths deciduous, leathery, abaxially striate, appressed brown setose; auricles absent; ligule fimbriate or ciliate; blade reflexed, lanceolate. Leaf sheath abaxially striate; ligule long, ciliate; blade variable

in size, 19–24(–40) × 2.5–3.5(–10) cm. Inflorescence semelaucant, paniculate. Spikelets 2–3 cm; florets 4–7, apical one sterile with a reduced rachilla extension. Glumes 2, rounded, short, many veined; lemma broadly rounded, slightly scabrous, 9–11-veined, margins long pubescent, apex mucronate; palea keels scabrous, 2-veined between keels. Anthers yellow, apiculate. Ovary ovoid; style 1, oblong; stigmas 2, plumose. Caryopsis 1–1.2 cm.

Broad-leaved forests; 1000–1800 m. Yunnan [India, Laos, Myanmar, Nepal].

This species was initially described in *Dendrocalamus* after flowers of *D. hamiltonii* were mistakenly included in a gathering from NE India. In China, a new section of *Dendrocalamus* was established to accommodate this species along with several unrelated species of *Dendrocalamus*. The correct flowers were eventually found in Nepal, and also in NE India, where they were described as a new species of *Chimonobambusa*.

3. *Ampelocalamus scandens* Hsueh & W. D. Li, J. Bamboo Res. 4(2): 5. 1985.

爬竹 pa zhu

Drepanostachyum scandens (Hsueh & W. D. Li) P. C. Keng ex T. P. Yi.

Culms subscandent, to 10 m or more, ca. 8 mm in diam., internodes to 30 cm; nodes with persistent, raised sheath base; wall ca. 2.5 mm. Branches many, central branch obviously dominant, often similar to main culm, secondary branches slender. Culm sheaths tardily deciduous or persistent, narrowly triangular, thinly leathery, white setose, margins apically long ciliate; auricles minute; ligule truncate, ca. 5 mm, serrate, fimbriate; blade reflexed, lanceolate, readily deciduous. Leaves 3–5 per ultimate branch; sheath ca. 4.5 cm, margins ciliate;

auricles projecting, hispidulous; oral setae pronounced, initially purple, curving, to 1.5 cm; ligule developed; blade lanceolate, 13–20 × 0.7–2.2 cm, transverse veins not distinct. Inflorescence unknown. New shoots Aug.

- Steep slopes; 200–300 m. Guizhou (Chishui).

4. *Ampelocalamus luodianensis* T. P. Yi & R. S. Wang, J. Bamboo Res. 4(2): 3. 1985.

小篷竹 xiao peng zhu

Drepanostachyum luodianense (T. P. Yi & R. S. Wang) P. C. Keng ex T. P. Yi.

Culms basally erect, apically drooping, ca. 10 m, 4–10 mm in diam., nearly solid, internodes terete, 8–20 cm, initially white powdery, becoming glabrous. Branches several, central dominant, to 5 m. Culm sheaths tardily deciduous, yellow-green, with purple spots, narrowly triangular, abaxially striate, appressed setose; auricles absent; ligule truncate, ciliate; blade erect or reflexed, lanceolate. Leaves 4–11 per ultimate branch. Leaf sheaths ca. 5 cm, ciliate; auricles developed; blade lanceolate, usually 5–12 × 0.7–1.7 cm, white powdery. Spikelet 1.2–1.7 cm; florets 3–5, apical one sterile. Glumes 2, membranous, 3–5-veined; lemma rigid, 8–9 mm, 7-veined; palea slightly longer than lemma, glabrous; lodicules 3, ovate, ca. 1 mm, margins ciliate. Anthers 8–9 mm. Ovary ovoid, glabrous; style 1; stigmas 2, plumose. Caryopsis unknown.

- Steep slopes; 600–1000 m. Guizhou (Chishui).

5. *Ampelocalamus yongshanensis* Hsueh & D. Z. Li, J. Bamboo Res. 6(2): 10. 1987.

永善悬竹 yong shan xuan zhu

Drepanostachyum yongshanense (Hsueh & W. D. Li) P. C. Keng ex T. P. Yi.

Culms erect, apically drooping, to 3 m, 5–10 mm in diam.; internodes terete, 15–19 cm, initially white powdery; node slightly projected, sheath ring obvious with woody rudiment. Branches 5–15, secondary branches slender. Culm sheaths deciduous, narrowly triangular, 9–14 cm, thinly leathery, sparsely brown ciliate; auricles absent; ligule ca. 1 mm, ciliate; blade reflexed, 0.5–3 cm, adaxially pubescent. Leaves 3–5 per ultimate branch; leaf sheath auricles absent; ligule truncate, ca. 1 mm; blade 9–17 × 1–2.5 cm, abaxially white silky. Inflorescence unknown. New shoots Aug–Sep.

- Slopes on hills; 600–700 m. SW Sichuan, Yunnan (Yongshan).

6. *Ampelocalamus microphyllus* (Hsueh & T. P. Yi) Hsueh & T. P. Yi, J. Bamboo Res. 4(2): 7. 1985.

坝竹 ba zhu

Sinocalamus microphyllus Hsueh & T. P. Yi, J. Yunnan Forest. Coll. 1982(1): 71. 1982 [*“microphylla”*]; *Drepanostachyum microphyllum* (Hsueh & T. P. Yi) Hsueh & T. P. Yi; *Neosinocalamus microphyllus* (Hsueh & T. P. Yi) P. C. Keng & T. P. Yi.

Culms 2–6 m, 5–15 mm in diam., internodes terete, 15–35

cm, initially white powdery, becoming glabrous; sheath ring elevated, woody; wall 1.5–2 mm thick; culm sheaths triangular, thickly papery, sparsely gray ciliate; auricles absent; ligule truncate or slightly concave, ca. 1 mm; blade reflexed, subulate or narrowly lanceolate, abaxially glabrous. Leaves 4–10 per ultimate branch; leaf sheath auricles absent; ligule truncate, ca. 1 mm, serrate; blade 3–9 × 0.4–0.8(–1.1) cm, glabrous, transverse veins not distinct. Inflorescence unknown. New shoots Aug.

- Steep slopes; 300–500 m. E and N Sichuan.

7. *Ampelocalamus actinotrichus* (Merrill & Chun) S. L. Chen, T. H. Wen & G. Y. Sheng, Acta Phytotax. Sin. 19: 332. 1981.

射毛悬竹 she mao xuan zhu

Arundinaria actinotricha Merrill & Chun, Sunyatsenia 2: 206. 1935; *Indocalamus actinotrichus* (Merrill & Chun) McClure; *Pleioblastus actinotrichus* (Merrill & Chun) P. C. Keng.

Culms apically drooping, 2–3 m; branches climbing to 6(–15) m, 1–1.5 cm in diam.; internodes initially light purple, becoming gray-green and scarred, to 30 cm, hispidulous. Branches 2 to several. Culm sheaths tardily deciduous, initially green, thickly papery or leathery, margins with red-brown bristles to 2(–3.7) cm; auricles readily deciduous, prominent, ovate; ligule short, fimbriate; blade reflexed, green, lanceolate. Leaf sheaths glabrous; auricles obvious; ligule truncate, rigid, fimbriate; blade elliptic-lanceolate, usually 6–30 × 1–4 cm. Spikelets 1.8–3.5 cm; florets 2–7, apical one sterile; internode of rachilla 6–7 mm. Glumes 2, narrowly lanceolate; 1–5-veined; lemma lanceolate, 7–9-veined, apex mucronate; palea about as long as or longer than lemma, keels ciliate; lodicules 3. Anthers slender. Ovary ovoid; styles 2, basally joined; stigmas plumose. Caryopsis oblong-ovoid. New shoots May, fl. Feb–Jul.

- Slopes of hills; 500–1200 m. Hainan.

8. *Ampelocalamus calcareus* C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 21: 204. 1983.

贵州悬竹 gui zhou xuan zhu

Culms apically drooping, to 1.5 m, 4–5 mm in diam., internodes terete, 8–18 cm, distally pubescent, later subglabrous; supra-nodal ridges prominently raised. Branches often 5–7, subequal, 0.5–1 m, 1–2 mm in diam. Culm sheaths persistent, irregularly spotted, shorter than internode, densely white pubescent, glabrescent, margins densely white ciliate; auricles subcircular, amplexicaul; oral setae many, radiating, ca. 1 cm; ligule short, apex densely white fimbriate; blade reflexed, green, ovate-lanceolate. Leaves 2 or 3 per ultimate branch; sheaths glabrous, glossy, margin ciliate; auricles present; oral setae deciduous, radiating, 5–7 mm; ligule short, apex long, white ciliate; blade 7–20 × 1.2–3 cm, thinly leathery, abaxially slightly glaucous, glabrous, secondary veins indistinct, 4–7 pairs. Inflorescence unknown. New shoots Apr.

- Broad-leaved forests; ca. 500 m. Guizhou.

9. *Ampelocalamus saxatilis* (Hsueh & T. P. Yi) Hsueh & T. P. Yi, *J. Bamboo Res.* 4(2): 7. 1985.

羊竹子 yang zhu zi

Sinocalamus saxatilis Hsueh & T. P. Yi, *Yunnan Linxue-yuan Xuebao* [J. Yunnan. Forest. Coll.] 1982(1): 69. 1982; *Drepanostachyum saxatile* (Hsueh & T. P. Yi) P. C. Keng ex T. P. Yi; *Neosinocalamus saxatilis* (Hsueh & T. P. Yi) P. C. Keng & T. P. Yi.

Culms basally oblique, initially apically drooping, 3–6 m, 5–15 mm in diam.; internodes 5–12 cm at culm base, 22–53 cm at mid-culm, rough, densely striate, hollow; wall 1.5–2 mm thick; supra-nodal ridge level; sheath base persistent, elevated, thickened. Branches (6–)10–15 from 6th to 12th node up, central dominant. Culm sheaths gradually deciduous, oblong-triangular, thickly papery, apex truncate; auricles and oral setae absent; ligule truncate or slightly sunken, ca. 1 mm; blade readily deciduous, reflexed, linear or linear-lanceolate. Leaves 4–10 per ultimate branch; sheaths smooth, margins ciliate; auricles obvious; oral setae present; ligule 2–5 mm, apex serrate; blade 8–18 × 1–2.2 cm, glabrous, secondary veins 4–6 pairs, transverse veins indistinct. Inflorescence unknown. New shoots Aug–Sep.

• Forests; 600–1500 m. S Sichuan, NE Yunnan.

10. *Ampelocalamus melicoideus* (P. C. Keng) D. Z. Li & Stapleton, *Novon* 15: 599. 2005 [*“melicoides”*].

南川竹 nan chuan zhu

Drepanostachyum melicoideum P. C. Keng, *J. Bamboo Res.* 5(2): 35. 1986.

Culms initially apically drooping, 2–3 m, 7–10 mm in diam., internodes (8–)28–35 cm, glabrous; nodes without supra-nodal ridge; sheath ring elevated with persistent sheath base, hollow; wall 1.2–4 mm thick. Branches more than 10, central dominant. Culm sheaths unknown. Leaf sheaths 3.5–5 cm, basally glabrous, distally ciliate, auricles minute, densely ciliate; ligule truncate, ca. 1 mm, abaxially densely ciliate; blade lanceolate, 5.5–15 × 1–2 cm, abaxially sparsely tomentose, adaxially glabrous, secondary veins 2–4-paired, transverse veins not distinct. Spikelets 1.2–1.5 cm; florets 3–5. Glumes 2; lemma lanceolate, 9–11 mm, 7–9-veined, glabrous; palea 1–1.2 cm, apex truncate; lodicules 3. Ovary ovoid, glabrous; stigmas 2, plumose. Caryopsis unknown.

• Chongqing (Nanchuan).

11. *Ampelocalamus naibunensis* (Hayata) T. H. Wen, *J. Bamboo Res.* 6(3): 34. 1987.

内门竹 nei men zhu

Arundinaria naibunensis Hayata, *J. Coll. Sci. Imp. Univ. Tokyo* 30: 408. 1911; *Bambusa naibunensis* (Hayata) Nakai; *Chimonobambusa naibunensis* (Hayata) McClure & W. C. Lin; *Drepanostachyum naibunense* (Hayata) P. C. Keng; *Leleba naibunensis* (Hayata) Nakai; *Pleiblastus naibunensis* (Hayata) Kanehira & Sasaki; *Pseudosasa naibunensis* (Hayata) Makino & Nemoto.

Culms apically drooping, 3–6 m, 5–10 mm in diam.; internodes 12–28 cm, glabrous, hollow; nodes raised; wall 2–3 mm thick. Branches several per node. Culm sheaths thinly papery, sparsely setose; auricles minute, brown setose; blade readily deciduous, linear-subulate. Leaf sheaths 3–6 cm; glabrous; auricles minute; ligule arched, long, ciliate; blade lanceolate, (3–)4–14 × 0.5–1.2 cm, transverse veins not distinct. Spikelets 2–4 cm; florets 3–6. Glumes 2, narrowly rounded; lemma ovate, narrowly rounded, 10–12 × 3–4 mm, 7–11-veined; palea 7–11 × 2–3 mm; lodicules 3, ciliate. Anthers ca. 4 mm. Ovary obovoid; styles 2; stigmas 2, plumose. Caryopsis unknown. Fl. Feb.

• About 1000 m. S Taiwan (Pingdong).

12. *Ampelocalamus hirsutissimus* (W. D. Li & Y. C. Zhong) Stapleton & D. Z. Li, *Novon* 15: 599. 2005.

多毛悬竹 duo mao xuan zhu

Drepanostachyum hirsutissimum W. D. Li & Y. C. Zhong, *J. Bamboo Res.* 16(1): 52. 1997.

Culms caespitose, basally erect, apically drooping, to 3–5 m, 5–10(–15) mm in diam.; internodes 12–18(–23) cm, glabrous, hollow; wall 3–5(–7) mm thick; nodes with 3 bud groups, 2 lateral developing into sub-branches and center 1 developing into main branch. Culm sheaths needle-like, narrowly triangular, asymmetrical, ca. 22 cm, thinly leathery, base ca. 3.5 cm wide, apex ca. 1 mm wide, apex truncate; auricles absent; ligule ca. 1 mm, ciliate; blade readily deciduous, erect, linear, 1.5–2 cm. Leaves 5–11 per ultimate branch; sheaths smooth, margins ciliate; auricles falcate or subcircular; oral setae projecting, purple ciliate; ligule round-arched, margins purple ciliate; blades narrowly lanceolate, (4.5–)11–17 × 0.7–1.5 (–3.1) cm, abaxially tomentose. Inflorescence unknown. New shoots Sep–Oct.

• Guizhou (Guiyang).

13. *Ampelocalamus breviligulatus* (T. P. Yi) Stapleton & D. Z. Li, *Novon* 15: 599. 2005.

钓竹 diao zhu

Drepanostachyum breviligulatum T. P. Yi, *J. Bamboo Res.* 12(4): 42. 1993.

Culms scrambling, apically drooping, 3–6 m, 5–15(–20) mm in diam.; internodes green, terete, 18–20 cm, glabrous, hollow; wall 1.5–2 mm thick. Branches many per node, main branches climbing, to 5 m, 3–5.5 mm in diam. Culm sheaths gradually deciduous, narrowly triangular, (5.5–)12–27 cm, base 2.4–4.8 cm wide, apex 2.5–4 mm wide, leathery, apex acuminate, acumen 2.5–4 mm; auricles and oral setae absent; ligule purple, truncate, 1–2 mm, initially shortly ciliate; blades reflexed, purple-green, triangular, linear, or linear-lanceolate, (0.4–)0.8–9 × (0.1–)0.25–0.7 cm, glabrous, margins serrate. Leaves (2–)4–6(–9) per ultimate branch; sheaths initially gray ciliate; auricles purple, minute; oral setae projecting, purple-brown; ligules purple, rounded, ca. 1 mm, margins initially ciliate; blade abaxially light green, narrowly lanceolate, (4–)6–10.5 × 0.6–1 cm, papery, white-gray pubescent. Inflorescence unknown. New shoots Aug.

• Steep rocks, stony slopes; 400–900 m. Gansu, Guizhou, Sichuan.

18. CHIMONOCALAMUS Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 75. 1979.

香竹属 *xiang zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Sinarundinaria Nakai sect. *Chimonocalamus* (Hsueh & T. P. Yi) C. S. Chao & Renvoize, Kew Bull. 44: 353. 1989.

Shrubby or arborescent bamboos. Rhizomes short necked, pachymorph. Culms unicaespitose, erect; internodes terete, glabrous, cavity not filled with pith; nodes with slightly prominent supra-nodal ridge and a ring of root thorns especially dense at lower nodes. Branch complement 3 at mid-culm nodes, 3–5 at upper culm nodes, promontory absent. Culm sheaths deciduous, usually longer than internodes, sparsely setose; auricles absent or inconspicuous; blade erect or recurved, lanceolate or triangular. Leaves usually small; blade with inconspicuous transverse veins. Inflorescence ebracteate, semelauctant, an open racemose panicle initially terminal to leafy flowering branches. Spikelets robust, 4–12 flowered, followed by a sterile floret, pedicels long. Glumes 2; lemma many veined, mucronate. Palea slightly longer than lemma, 2-keeled, obtuse. Lodicules 3, transparent. Stamens 3; filaments free; anthers yellow. Ovary glabrous, appendage absent; style 1; stigmas 2, plumose. Caryopsis slender, beaked. New shoots Jun–Jul, fl. Mar–May.

Eleven species: E Himalayas, Myanmar, SW China (S Yunnan); nine species (eight endemic) in China.

Most species in this genus produce delicious bamboo shoots and are known as “xiang zhu” (香竹), meaning “fragrant bamboo.” The culms are robust and are widely used in Yunnan for construction and agricultural tools. *Chimonocalamus pallens* and *C. dumosus* are attractive, subtropical ornamentals and have been introduced into gardens.

- 1a. Nodal sheath scar with a ring of tawny hairs; culm sheath blade 0.3–3 cm, twisted when dry; leaf blade lanceolate, broader than 1.2 cm 1. *C. griffithianus*
- 1b. Nodes glabrous; sheath blade usually longer than 3 cm, straight; leaf blade linear-lanceolate, mostly narrower than 1.5 cm.
 - 2a. Apex of culm sheath 2–4 cm wide, convex to projected, base of blade 1–2 cm wide, glabrous.
 - 3a. Culms slightly quadrangular, initially purple, scabrous; sheaths densely tawny hairy; leaf blade gray-green; oral setae developed 2. *C. delicatus*
 - 3b. Culms terete, initially gray-green, glabrous; sheaths hairy; leaf blade green; oral setae absent or scarce 3. *C. pallens*
 - 2b. Apex of culm sheath narrower than 1.5 cm, truncate or concave; sheath blade less than 1 cm at base, slender, usually hairy.
 - 4a. Culm sheath ligule conspicuous, 0.8–1.8 cm.
 - 5a. Culm sheath ligule divided; leaf sheath auricles absent 4. *C. longiligulatus*
 - 5b. Culm sheath ligule fimbriate; leaf sheath auricles present 5. *C. fimbriatus*
 - 4b. Culm sheath ligule short, less than 0.5–0.7(–1.2) cm.
 - 6a. Culm sheaths densely hairy, margins ciliate; root thorns short, robust, dense 6. *C. montanus*
 - 6b. Culm sheaths sparsely hairy, margins glabrous; root thorns longer but sparse.
 - 7a. Apex of culm sheaths 11–13 mm wide; ligule 0.5–0.7 cm; culm sheath scars pubescent 7. *C. makuanensis*
 - 7b. Apex of culm sheath ca. 4 mm wide; ligule less than 0.5 cm; culm sheath scars glabrous.
 - 8a. Arborescent bamboo, 4–6 m tall; young culms pubescent at nodes; internodes to 37 cm ... 8. *C. longiusculus*
 - 8b. Shrubby bamboo, 1.5–3 m tall; young culms white powdery, internodes to 16 cm 9. *C. dumosus*

1. *Chimonocalamus griffithianus* (Munro) Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 83. 1979.

西藏香竹 *xi zang xiang zhu*

Arundinaria griffithiana Munro, Trans. Linn. Soc. London 26: 20. 1868; *Chimonobambusa griffithiana* (Munro) Nakai; *C. tortuosa* Hsueh & T. P. Yi; *Sinarundinaria griffithiana* (Munro) C. S. Chao & Renvoize.

Culms 6–10 m, 1–3.5(–5) cm in diam.; internodes yellow-green, 18–22(–28) cm, distally pilose, hollow; wall 5–6 mm thick; nodes prominent, with a basal ring of tawny hairs. Culm sheaths longer than internode, 12–16 cm wide at base, gradually attenuate upward, papery, striate, base with a thick belt of soft tawny hairs, margins ciliate, apex 3–5 mm wide; auricles tiny; oral setae few; ligule short, sparsely ciliate; blade triangular, 0.3–3 cm, twisted when dry. Leaves 3–7 per ultimate branch; sheaths purple, glabrous; ligule truncate, ca. 1 mm; auricles absent; oral setae scarce; blade lanceolate, 12–20 × 1.2–2.4 cm.

Inflorescence a terminal panicle, subtended by several sheathing bracts. Spikelets in verticillate clusters on thin, wavy, scabrous, hairy pedicels, 2.5–3.8 cm; florets 4–6. Glumes 2; rachilla internodes flattened, 5–7.5 mm; lemma lanceolate, 1.2–1.4 cm, papery, long mucronate; palea slightly shorter than lemma; lodicules obovate, one shorter and narrower. Anthers emarginate. Style short; stigmas 2. Caryopsis unknown. New shoots Jul–Aug.

Evergreen broad-leaved forests; 1700–2200 m. Xizang, Yunnan [NE India].

The inflorescence is unknown in China; its description is taken from NE Indian specimens.

2. *Chimonocalamus delicatus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 77. 1979.

香竹 *xiang zhu*

Culms 6–8 m, 4(–8) cm in diam.; internodes initially

purple-brown, yellow when old, slightly 4-angled, 20–30 cm, initially scabrous, glabrous when old; nodes prominent, glabrous. Culm sheaths distally attenuate and triangular, longer than internode, leathery, with thick, glossy, tawny hairs, apex 2–4 cm wide, centrally strongly convex or projected, slightly projected on 2 sides; auricles tiny; oral setae several, long; ligule 3–4 mm; blade lanceolate, 5–17 × 1.3–2.5 cm. Leaves 4–8 per ultimate branch; sheaths glabrous; auricles absent or tiny; oral setae ca. 8 mm; ligule truncate, ca. 1 mm; blade linear-lanceolate, 10–16 × 0.6–1.3 cm. Inflorescence a panicle, terminal to leafy shoot. Spikelets 2.7–4.5 cm; florets 5–8, plus a terminal, sterile floret. Glumes 2; rachilla internodes flattened, 4–6 mm, densely pubescent; lemma lanceolate, 0.7–1 cm, papery; palea equal to or slightly longer than lemma; lodicules obovate, one shorter and narrower. Anthers ca. 6 mm. Style short; stigmas 2. Caryopsis unknown. New shoots Jun–Jul, fl. Mar–Apr.

• Evergreen broad-leaved forests; 1400–2000 m. S Yunnan (Jinping).

The shoots are eaten, and the culms are used for construction.

3. *Chimonocalamus pallens* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 78. 1979.

灰香竹 hui xiang zhu

Chimonocalamus bicorniculatus S. F. Li & Z. P. Wang, Acta Phytotax. Sin. 33: 614. 1995.

Culms 5–8 m, 2–5 cm in diam.; internodes terete, 12–29 cm, initially white powdery, later gray-green, glabrous; nodes prominent, slightly pubescent. Culm sheaths longer than internode, thinly leathery, striate, sparsely, glossy-tawny hairy, distally attenuate and triangular, apex centrally strongly convex or projected, slightly projected on 2 sides, apex 2–4 cm wide; auricles tiny; oral setae several, long; ligule 3–13 mm; blade lanceolate, 4–16 × 1–1.5 cm. Leaves 5 or 6 per ultimate branch; sheaths glabrous; auricles absent or tiny; oral setae 1 or 2; ligule truncate, ca. 1.5 mm; blade linear-lanceolate, 10–13 × 0.8–1.5 cm. Inflorescence and caryopsis unknown. New shoots Jun–Jul.

• Evergreen broad-leaved forests; 1400–2000 m. S Yunnan (Jinping).

The culms are used for construction.

4. *Chimonocalamus longiligulatus* Hsueh & T. P. Yi, Acta Phytotax. Sin. 23: 236. 1985.

长舌香竹 chang she xiang zhu

Culms 2.5–3.5 m, 1–1.8 cm in diam.; internodes green, terete, (6–)18–22(–32) cm, shallowly grooved above branches, sparsely gray-white setose, hollow; wall 2–4.5 mm thick; nodes prominent, dark brown, slightly pubescent; root thorns spreading or slightly reflexed, 2–4 mm. Branches 3(–10) per node. Culm sheaths deciduous, striate, concave or truncate, longer than internode, leathery, sparsely appressed tawny setose, attenuate, apex 0.8–1 cm wide; auricles absent; oral setae absent to 2; ligule conspicuous, often split, 8–18 mm, apex serrate; blade reflexed, triangular or lanceolate, 7–25(–90) × 2.5–3.5 mm. Leaves 3–6 per ultimate branch; sheaths glabrous; ligule truncate, ca. 1 mm, ciliate; auricles absent or inconspicuous;

oral setae 5–8, 2.5–8 mm; blade linear-lanceolate, 4.5–14 × (0.4–)0.7–1.1 cm, secondary veins (2 or)3- or 4-paired, transverse veins distinct, one margin minutely serrulate-scid. Inflorescence and caryopsis unknown. New shoots Jun–Jul.

• Evergreen broad-leaved forests; 1800–2000 m. S Yunnan (Lüchun).

The culms are used for construction.

5. *Chimonocalamus fimbriatus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 78. 1979.

流苏香竹 liu su xiang zhu

Culms 5–8 m, 2–5 cm in diam.; internodes dark green or purple, 20–36 cm, minutely white setose and pubescent; nodes slightly prominent, slightly pubescent or glabrous; root thorns more than 30, dense, 7–14 mm. Culm sheaths deciduous, striate, gradually attenuate upward, longer than internodes, thickly leathery, sparsely appressed tawny setose, apex 1–1.5 cm wide, concave or truncate; auricles inconspicuous; oral setae few, deciduous; ligule conspicuous, 1–1.3 cm, fimbriate; blade erect or curved upward, lanceolate, 6–16 × 0.4–0.6 cm. Leaves 3–6 per ultimate branch; sheaths glabrous, ciliate; auricles inconspicuous; oral setae 5–11 mm; ligule truncate, ca. 1 mm, scabrous; blade linear-lanceolate, 5–15 × 0.5–1.1 cm, apex finely pointed, tip to 1 cm. Inflorescence unknown. New shoots Sep.

• Evergreen broad-leaved forests; 1500–1800 m. SW Yunnan.

6. *Chimonocalamus montanus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 79. 1979.

山香竹 shan xiang zhu

Culms ca. 5 m, to 1.5 cm in diam.; internodes terete, ca. 33 cm, glabrous; nodes slightly prominent, glabrous; root thorns dense, robust. Culm sheaths deciduous, striate, acuminate, longer than internodes, leathery, initially densely appressed tawny setose (setae ca. 1 mm), margin ciliate, apex truncate, ca. 8 mm wide; auricles absent; oral setae deciduous, to 2 cm; ligule truncate, ca. 2 mm, with fimbriae 2–5 mm; blade recurved, linear-lanceolate, 7–10 × ca. 0.35 cm. Leaves 2–4 per ultimate branch; sheaths ciliate; auricles absent or inconspicuous; oral setae several, ca. 1 cm; ligule truncate, pubescent; blade narrowly lanceolate, ca. 14 × 1 cm, apex finely pointed, tip to 8 mm. Inflorescence unknown. New shoots Jun–Jul.

• Evergreen broad-leaved forests; ca. 1700 m. NW Yunnan (Gaoligong Shan).

7. *Chimonocalamus makuanensis* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 80. 1979.

马关香竹 ma guan xiang zhu

Culms 5–6 m, 1.5–2.5 cm in diam.; internodes pale green, 10–27 cm, initially brown setose, later glabrous; nodes strongly prominent, pubescent; root thorns dense, basally swollen. Culm sheaths deciduous, initially yellow striped, oblong-elliptical, distally broad, longer than internode, leathery, striate, sparsely appressed tawny setose; setae deciduous, ca. 1 mm; apex triangular, 1.1–1.3 cm wide, truncate; auricles absent; ligule trun-

cate or slightly convex, 5–7(–12) mm, apex membranous, fimbriate; blade erect, lanceolate, 5–7 × 0.5–0.7 cm. Leaves 3 or 4 per ultimate branch; sheaths glabrous, margins ciliate; auricles absent or inconspicuous; oral setae several, 4–7 mm; ligule convex, ca. 1.5 mm, pubescent; blade narrowly lanceolate, 9–13 × 0.9–1.3 cm, apex finely pointed, tip to 8 mm. Inflorescence unknown. New shoots Jun–Sep.

• Evergreen broad-leaved forests; 1700–1900 m. SE Yunnan (Maguan).

8. *Chimonocalamus longiusculus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 80. 1979.

长节香竹 *chang jie xiang zhu*

Culms 4–6 m, 1–2 cm in diam.; internodes terete, flattened above branches, to 37 cm, basally nearly solid, hollow further up culm; wall thick; nodes very prominent, minutely white hairy below nodes; root thorns few, short, conical. Culm sheaths gradually deciduous, oblong, thickly papery, proximally glossy-tawny hairy, distally pubescent, attenuate into slightly convex apex ca. 4 mm wide; auricles deciduous, tiny; ligule 1–1.5 mm, ciliate; blade linear, 3–5 × ca. 0.2 cm, both surfaces pubescent. Leaves 3–5 per ultimate branch; sheaths glabrous; auricles absent or tiny; ligule slightly convex, ca. 1 mm; blade linear, 5–14 × 0.5–0.9 cm. Inflorescence a panicle terminal to leafy branch. Spikelets 2.5–4 cm; florets 3–7. Glumes 2; rachilla internodes flattened, 4–5 mm, densely pubescent; lemma lanceolate, 0.9–1 cm, papery, pubescent; palea slightly longer than lemma; lodicules obovate, one shorter and narrower. Anthers unknown. Style short; stigmas 2. Caryopsis unknown. New shoots Apr–May, fl. May.

• Evergreen broad-leaved forests; 1600–1700 m. SE Yunnan (Xichou).

The shoots are eaten, and the culms are used for construction.

9. *Chimonocalamus dumosus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 81. 1979.

小香竹 *xiao xiang zhu*

Culms 1.5–3 m, 0.5–1.5 cm in diam.; internodes terete, 10–16 cm, sometimes nearly solid at culm base, hollow further up; wall thin or thick; nodes very prominent, glabrous; root

thorns sharp and sparse, or blunt and dense. Culm sheaths deciduous, oblong, papery, tawny strigose, attenuate into slightly convex apex ca. 6 mm wide; auricles absent; ligule ca. 1.5 mm, irregularly serrate; blade linear, 4–11 × 0.4–0.5 cm, both surfaces pubescent. Leaves 3–7 per ultimate branch; sheaths glabrous, margins ciliate; ligule slightly convex, ca. 1 mm, puberulent; auricles absent or tiny; oral setae 0.5–1 cm; blade linear-lanceolate, 3–16 × 0.3–1.2 cm. Inflorescence a panicle, terminal to leafy, pubescent branches. Spikelets 0.8–1 cm; florets 2 or 3. Glumes 2; rachilla flattened, 4–5 mm, densely pubescent; lemma lanceolate, 0.8–1 cm, papery, pubescent; palea about as long as or slightly longer than lemma; lodicules ovate, one shorter and narrower. Anthers unknown. Style short; stigmas 2. Caryopsis brown, 3.5–8.5 mm, glabrous, with a persistent style. New shoots Sep–Oct.

• Montane, evergreen, broad-leaved forests. S Yunnan.

The young shoots are harvested, and the culms are used for construction.

- 1a. Culm walls thick, basally nearly solid; root thorns sharp, sparsely arranged; leaves 3–16 cm 9a. var. *dumosus*
- 1b. Culm walls thin, basally hollow; root thorns obtuse, densely arranged on nodes; leaves 5–11 cm 9b. var. *pygmaeus*

9a. *Chimonocalamus dumosus* var. *dumosus*

小香竹(原变种) *xiao xiang zhu* (yuan bian zhong)

Slightly larger in size. Culms subsolid or solid at base; root thorns acute and sparsely arranged; leaves only on basal nodes. Leaves relatively larger, 3–16 × 0.3–1.2 cm.

• Montane evergreen forests. SE Yunnan (Xichou).

9b. *Chimonocalamus dumosus* var. *pygmaeus* Hsueh & T. P. Yi, Acta Bot. Yunnan. 1(2): 82. 1979.

耿马小香竹 *geng ma xiao xiang zhu*

Slightly smaller in size. Culms basally hollow; root thorns obtuse and densely arranged on basal nodes. Leaves relatively smaller, 5–11 × 0.5–0.9 cm.

• Montane evergreen forests. SW Yunnan (Gengma).

19. *GAOLIGONGSHANIA* D. Z. Li, Hsueh & N. H. Xia, Acta Phytotax. Sin. 33: 598. 1995.

贡山竹属 *gong shan zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Shrubby scrambling bamboo, sometimes epiphytic on trees. Rhizomes short necked, pachymorph. Culms uniaespitose, flexuose; internodes terete, glabrous; nodes flat. Branches solitary, reiterating culm. Culm sheaths persistent, leathery, densely setose, shorter than internodes; ligule short; auricles embracing culms, large; blade recurved, lanceolate. Leaves large; blade with several secondary veins and transverse veins. Inflorescence an open, large, ebracteate panicle on leafy or leafless flowering branches. Spikelets 4–9-flowered, followed by a sterile floret, long pedicellate. Glumes 2; lemma many veined, sometimes long mucronate. Palea subequal to lemma, 2-keeled, 2-cleft at apex. Rachilla internodes ca. 1/2 as long as florets, disarticulating. Lodicules 3, transparent. Stamens 3; anthers yellow; filaments free, long exserted. Ovary glabrous; style 1; stigmas 3, plumose. Caryopsis oblong. New shoots late summer–early autumn, fl. Mar–Jul.

• One species: China.

1. Gaoligongshania megalothyrsa (Handel-Mazzetti) D. Z. Li, Hsueh & N. H. Xia, *Acta Phytotax. Sin.* 33: 600. 1995.

贡山竹 gong shan zhu

Arundinaria megalothyrsa Handel-Mazzetti, *Symb. Sin.* 7: 1270. 1936; *Indocalamus megalothyrsus* (Handel-Mazzetti) C. S. Chao & C. D. Chu; *Monocladus megalothyrsus* (Handel-Mazzetti) T. P. Yi; *Yushania megalothyrsa* (Handel-Mazzetti) T. H. Wen.

Culms to 1–3.5(–8) m long, 0.5–1.5 cm in diam.; internodes 30–35 cm, initially white powdery, glabrous; wall 3–4 mm thick; nodes initially flat, prominent after branching. Culm sheaths persistent, yellow or green-brown, ca. 1/2 as long as internodes, leathery, marginally and abaxially with dense,

short, spiny hairs, auricles well developed, purple, falcate; oral setae erect, yellow, 1–1.2 cm, strong; ligule truncate, 1–2 mm; blade reflexed, margins serrulate, base ca. 1/3 as wide as sheath apex. Leaf sheaths white powdery, densely yellow hispid; auricles purple, falcate; oral setae ca. 1.2 cm; ligule ca. 2 mm; blade oblong-lanceolate, 35–40(–50) × 7.5–9(–10) cm, transverse veins conspicuous, base cuneate, apex long acuminate. Panicles 35–45 cm. Spikelets linear, 2–4 cm. Glumes ca. 6 mm, long mucronate; lemma lanceolate, ca. 8 mm, long mucronate; palea ca. 0.8 mm; lodicules ca. 2 mm. Anthers yellow, ca. 5 mm. Ovary oblong. Caryopsis oblong, ca. 1 cm. New shoots Apr–May, fl. Oct.

• Evergreen broad-leaved forests, sometimes on trunks of old trees; 1600–2200 m. NW Yunnan (Gaoligong Shan).

20. ACIDOSASA C. D. Chu & C. S. Chao ex P. C. Keng, *J. Bamboo Res.* 1(2): 31. 1982.

酸竹属 suan zhu shu

Zhu Zhengde (朱政德 Chu Cheng-de), Yang Guangyao (杨光耀); Chris Stapleton

Metasasa W. T. Lin.

Shrubby to arborescent bamboos. Rhizomes leptomorph, with running underground stems. Culms diffuse, erect; internodes terete, weakly grooved basally above branches, cavity with spongy pith; nodes weakly prominent. Branch complement 3 at mid-culm nodes, 3–5 at distal nodes. Culm sheaths deciduous, sparsely setose; auricles small or absent, with or without oral setae; blade lanceolate or triangular. Leaves usually medium-sized; auricles small or absent; blade with many secondary veins, transverse veins distinct. Inflorescence ebracteate, semelautant, a terminal raceme or racemose panicle. Spikelets robust, several to many flowered, long pedicellate. Glumes 2–4; lemma large, many veined, apex acuminate or shortly mucronate. Palea usually shorter than lemma, 2-keeled, veined between keels. Lodicules 3, membranous, usually transparent at margin. Stamens 6; filaments free; anthers yellow. Ovary appendage inconspicuous; style 1; stigmas 3, plumose. New shoots spring–early summer, fl. summer–autumn.

About 11 species: China, Vietnam; ten species (all endemic) in China.

The generic name *Acidosasa* and its type, *A. chinensis*, were previously published by Chu and Chao (*J. Nanjing Technol. Coll. Forest Prod.* 1979(1–2): 142–143. 1979), but not validly so (see Li, *Taxon* 46: 105–107. 1997).

Key based on vegetative features

- 1a. Culm sheath auricles absent.
 - 2a. Young culm internodes hairless.
 - 3a. Culm sheath sparsely spotted, sparsely shortly hispid; sheath blade short, usually 0.5–1 cm 1. *A. breviclavata*
 - 3b. Culm sheath unspotted, initially densely setose, especially at base; sheath blade long, usually 5–10 cm 2. *A. purpurea*
 - 2b. Young culm internodes hispid or pubescent.
 - 4a. Leaf ligule strongly prominent, 5–15 mm tall 3. *A. nanunica*
 - 4b. Leaf ligule truncate, less than 2 mm tall.
 - 5a. Culm internodes initially densely setose, with persistent traces of bristles; apex of culm sheath narrow, about as wide as base of sheath blade; leaf blade broad, usually 2.5–6.5 cm wide, transverse veins prominent 4. *A. chinensis*
 - 5b. Culm internodes apically sparsely setose initially; apex of culm sheath truncate, wider than base of sheath blade; leaf blade narrow, 1.5–2.5 cm wide, transverse veins not very distinct 5. *A. venusta*
- 1b. Culm sheath auricles present.
 - 6a. Young culm internodes setose, shortly hispid.
 - 7a. Culm sheath with thin, white powder; supra-nodal ridge strongly prominent 6. *A. lingchuanensis*
 - 7b. Culm sheath without white powder; supra-nodal ridge weakly prominent 7. *A. guangxiensis*
 - 6b. Young culm internodes without hairs.
 - 8a. Culm sheath purple spotted or purple striate; ligules of culm sheaths and leaf blades prominent, 4–8 mm 8. *A. notata*
 - 8b. Culm sheath without spots or striae; ligules not prominent.
 - 9a. Culm sheath initially green; leaf blade small, 8–18 mm 9. *A. chienouensis*
 - 9b. Culm sheath initially green with purple margins; leaf blade broad, 17–28 mm 10. *A. edulis*

Key to fertile material

- 1a. Lemma glabrous.

- 2a. Lemma not powdery.
 3a. Lemma slightly tessellate, not glossy, veins 21–24; palea 1.4–1.6 cm 1. *A. breviclavata*
 3b. Lemma glossy, veins 17–19; palea ca. 1.2 cm 4. *A. chinensis*
 2b. Lemma powdery.
 4a. Spikelets short, 1.5–7.5 cm; lemma weakly glaucous, 9–13-veined; palea keels hairy 9. *A. chienouensis*
 4b. Spikelets long, ca. 11 cm; lemma farinose, 9–11-veined; palea keels ciliate 6. *A. lingchuanensis*
 1b. Lemma abaxially hairy or with tessellate venation.
 5a. Lemma glabrous, venation tessellate; stigmas flagellate 10. *A. edulis*
 5b. Lemma pubescent; stigmas not flagellate.
 6a. Lemma densely pubescent; palea ciliolate.
 7a. Spikelets 6–8 in a panicle, subtended by a lanceolate bractlet 3. *A. nanunica*
 7b. Spikelets 1–6 in a raceme, not subtended by a bractlet.
 8a. Spikelets 4–9 cm; florets 3–15 2. *A. purpurea*
 8b. Spikelets 6–17 cm; florets 13–33 7. *A. guangxiensis*
 6b. Lemma sparsely pubescent; palea pubescent or sparsely setose.
 9a. Spikelets robust, 4–6 mm wide; lemma 1.4–1.9 cm, pedicel 2–13 mm 8. *A. notata*
 9b. Spikelets slender, 3–4 mm wide; lemma ca. 1.3 cm.
 10a. Pedicel 0.5–1 cm, glabrous, shorter than lemma; palea shorter than lemma; lemma glaucous 9. *A. chienouensis*
 10b. Pedicel 1–3 cm, slightly hairy; longer than lemma; palea about as long as lemma or sometimes slightly longer; lemma not glaucous 5. *A. venusta*

1. *Acidosasa breviclavata* W. T. Lin, Bamboo Res. 5: 27. 1986.

小叶酸竹 xiao ye suan zhu

Acidosasa gracilis W. T. Lin & X. B. Ye.

Culms 1–1.5 m, 5–6 mm in diam.; internodes terete, 13.5–18.5 cm, glabrous; nodes with sheath scars weakly prominent. Culm sheaths deciduous, abaxially shortly setose and spotted; auricles and oral setae absent; ligule short; blade lanceolate, ca. 5 mm. Leaves 4 or 5 per ultimate branch; sheath glabrous; auricles and oral setae usually absent; ligule ca. 1.5 mm, apex recurved; blade 12–18 × 1.8–2.5 cm, glabrous, secondary veins 6-paired, base narrow, margins serrulate, apex caudiform. Inflorescence incompletely known. Spikelets 5.5–6.5 × 0.6–0.7 cm; florets ca. 6; pedicel 1.5–2 cm. Glumes ca. 4, lemma-shaped, 1.1–1.7 cm, glabrous; rachilla 6–7 mm, glabrous; lemma 1.8–2.1 × ca. 0.8 cm, glabrous, 21–24-veined, slightly tessellate, apex acuminate; palea 1.4–1.6 cm, narrow, glabrous; lodicules lanceolate, margins ciliate. Anthers ca. 8 mm. Style short; stigmas plumose.

- About 300 m. Guangdong (Gudou Shan).

The culms are used for papermaking and weaving.

2. *Acidosasa purpurea* (Hsueh & T. P. Yi) P. C. Keng, J. Wuhan Bot. Res. 4: 335. 1985.

毛花酸竹 mao hua suan zhu

Indosasa purpurea Hsueh & T. P. Yi, Acta Phytotax. Sin. 21: 94. 1983; *Acidosasa dayongensis* T. P. Yi.

Culms 3–10 m, 2–8 cm in diam.; internodes 30–45 cm, initially glabrous, glaucous below nodes; wall 4–10 mm thick, cavity with spongy pith; nodes prominent, sheath base initially setose. Culm sheaths unspotted, leathery, setose, transverse veins obscure, base densely setose, apex truncate; auricles and cilia absent; ligule arched or triangular, 2–6 mm, ciliate; blade lanceolate, base narrower than sheath apex. Leaves 4–7 per ultimate branch; sheath glabrous; auricles and cilia absent; ligule

strongly prominent, 1.5–4 mm; blade lanceolate, 12–21 × 1.6–2.6 cm, secondary veins 5–7-paired, transverse veins distinct, serrulate. Raceme terminal or lateral. Spikelets 1–5, purple, 4–9 × 0.3–0.7 cm, compressed; rachilla ca. 5 mm, densely hairy; florets 3–15; pedicel 1–3 cm, apically pubescent. Glumes densely hairy; lemma 1.3–2.1 cm, densely setose. Palea short, 7–15 mm, narrow, ciliate, apex rounded. Lodicules lanceolate, 2–3 mm, glabrous. Anthers yellow, 3–4 mm. Style 3–4 mm; stigmas 3-cleft, plumose. New shoots Apr, fl. May–Sep.

- NW Guangxi, Hunan, Jiangxi, SE Yunnan.

The earlier but not validly published name “*Acidosasa hirtiflora* Z. P. Wang & G. H. Ye” was applied to this species in FRPS (9(1): 565. 1996).

The shoots are edible, although rather bitter, and the culms are used for weaving and fencing.

3. *Acidosasa nanunica* (McClure) C. S. Chao & G. Y. Yang, Acta Phytotax. Sin. 39: 66. 2001.

长舌酸竹 chang she suan zhu

Indocalamus nanunicus McClure, Lingnan Univ. Sci. Bull. 9: 25. 1940; *Acidosasa xiushanensis* T. P. Yi; *Arundinaria bicorniculata* W. T. Lin & Z. J. Feng; *A. nanunica* (McClure) C. D. Chu & C. S. Chao; *A. projecta* W. T. Lin; *Metasasa albofarinosa* W. T. Lin; *M. carinata* W. T. Lin; *Pseudosasa altiligulata* T. H. Wen; *P. nanunica* (McClure) Z. P. Wang & G. H. Ye; *P. nanunica* var. *angustifolia* S. L. Chen & G. Y. Sheng; *P. projecta* (W. T. Lin) P. C. Keng.

Culms to 4 m, ca. 1 cm in diam.; internodes green-yellow, straight, terete, smooth, initially glaucous, black powdery when old; wall thick, pith spongy; nodes prominent, remains of sheath base persistent; intranode ca. 1 cm. Branches 1–3 per node at mid-culm, secondary branchlets undeveloped. Culm sheaths gradually deciduous, light purple-brown, densely white tomentose and brown setose, setae retrorse and adnate, base brown setose, margins ciliate; auricles and oral setae absent;

ligule truncate or arcuate, 7–9 mm; blade linear-lanceolate, scabrous, margins sparsely serrulate. Leaves 2–4 per ultimate branch; sheath striate, densely tomentose to subglabrous; auricles and oral setae absent; ligule acute, 5–15 mm, ciliate; blade elliptic to lanceolate, 10–30 × 2–4.5 cm, abaxially pubescent, adaxially glabrous, secondary veins 9–12-paired, base oblique, both margins distally serrulate, apex shortly acuminate. Panicle 18–25 cm; bract lanceolate, ca. 2 mm. Pedicels 1–2.5 cm, slender, glabrous; spikelets 6–8, 3–7 × 3–5 cm; florets 7–9; rachilla 5–7 mm, densely pubescent, apex densely long ciliate. Glumes 2, abaxially shortly pubescent and keeled, margin proximally glabrous but distally ciliate, 5–9-veined; lemma 1.5–1.7 cm, abaxially shortly pubescent, margin proximally glabrous, 13–18-veined, apex acute; palea narrow, keels ciliate, apex acute or 2-lobed; lodicules lanceolate, prominently striate, margin not ciliate. Ovary shortly setose. Caryopsis oblong, with long beak, glabrous. New shoots late Apr.

• Flat lands, slopes of hills, valleys, streams; below 500 m. Chongqing, Guangdong, S Hunan, Jiangxi, Zhejiang.

Acidosasa xiushanensis was described from Chongqing (Xiushan), which lies to the northwest of what is otherwise the distribution of *A. nanunica*.

4. *Acidosasa chinensis* C. D. Chu & C. S. Chao ex P. C. Keng, *J. Bamboo Res.* 1(2): 31. 1982.

酸竹 suan zhu

Culms to 8 m, 3–5 cm in diam.; internodes initially densely setose, traces of setae persistent, obviously striate; nodes weakly prominent. Culm sheaths red-brown, sparsely spotted, fragile when dry, initially shortly setose, transverse veins distinct, margins ciliate, apex narrow; auricles and oral setae absent; ligule arched, short, ciliate or fimbriate; blade lanceolate, 1.5–4.5 cm, base about as wide as sheath apex. Leaves 2–5 per ultimate branch; sheath glabrous; auricles and oral setae usually absent; blade oblong-lanceolate or lanceolate, (11–)16–22(–30) × (2–)2.5–3.5(–6.5) cm, glabrous, secondary veins 6–11-paired, base cuneate, margins serrulate, apex long acuminate. Flowering branchlets terminal, 10–26 cm; bracts triangular, minute, glabrous, apex long caudate. Spikelets 3–5, forming simple raceme or panicle, robust, (3–)5–6(–10) × 0.3–0.6 cm; pedicel 1.5–4 cm, glabrous; florets (3–)8 or 9(–18); rachilla 6–7 mm, glabrous. Glumes usually 4, apical 2 lemma-shaped; lemma ca. 2 cm, glossy, glabrous, 17–19-veined; palea narrow, glabrous; lodicules elliptic-lanceolate. Anthers yellow, ca. 5 mm. New shoots Apr–May, fl. Oct.

• Scattered in broad-leaved woodlands, open mountain areas; ca. 700 m. Guangdong (Hewei Shan).

The shoots are edible when salted, and the culms are used for papermaking and weaving.

5. *Acidosasa venusta* (McClure) Z. P. Wang & G. H. Ye ex C. S. Chao & C. D. Chu, *Acta Phytotax. Sin.* 29: 524. 1991.

黎竹 li zhu

Semiarundinaria venusta McClure, *Lingnan Univ. Sci. Bull.* 9: 55. 1940.

Culms ca. 1.4 m, 8–9 mm in diam.; internodes initially sparsely hairy, glaucous below nodes; nodes prominent. Culm

sheaths initially proximally hairy, distally glabrous or nearly so, transverse veins obscure, margins ciliate, apex truncate; auricles and oral setae absent; ligule truncate, minutely ciliate; blade deciduous, initially green, slightly purple, strap-shaped, small, scabrous. Leaf sheaths glabrous; auricles absent, oral setae absent or scarce; ligule prominent; blade oblong-lanceolate, 9–20 × 1.7–2.6 cm, glabrous, secondary veins ca. 5-paired. Raceme terminal or lateral. Spikelets 3 or 4, lanceolate or linear, 11–15 × 0.3–0.4 cm; florets 5–10, slightly compressed; pedicel 1–3 cm, slightly hairy. Glumes 2, abaxially minutely setose, apex acute; rachilla 6–7 mm, apex hairy; lemma ca. 1.3 cm, minutely setose, many veined, ciliate, apex acute or acuminate, mucronate; palea about as long as lemma, rarely slightly longer, sparsely setose; keels ciliate, apex obtuse; lodicules 3, nearly equal, transparent, glabrous, margins ciliate. Ovary and style glabrous; stigmas 3-cleft, plumose. Fl. Nov.

• Guangdong (Huaxian).

This species is cultivated in the botanical garden of Zhongshan (Sun Yat Sen) University.

6. *Acidosasa lingchuanensis* (C. D. Chu & C. S. Chao) Q. Z. Xie & X. Y. Chen, *Bull. Bot. Res.*, Harbin 13: 74. 1993.

灵川酸竹 ling chuan suan zhu

Indosasa lingchuanensis C. D. Chu & C. S. Chao, *Acta Phytotax. Sin.* 21: 69. 1983.

Culms ca. 4 m, to 3 cm in diam., internodes initially green, 30–40 cm, sparsely hispid, slightly coarse, hollow; wall unevenly thickened; nodes weakly prominent; sheath scars prominent. Branches 3 per node. Culm sheaths light yellow-green, proximally sparsely brown setose and slightly powdery, margin ciliate; auricles open; oral setae deciduous, radiate, 1–1.5 cm; ligule truncate or slightly arched, subglabrous or shortly fimbriate, proximally sparsely pubescent; blade reflexed, green, broadly linear-lanceolate. Leaves 3–5 per ultimate branch; sheath margin ciliate; auricles small; oral setae erect; blade linear to lanceolate, 6.5–14 × 1–2.3 cm, glabrous, secondary veins 5-paired. Spikelets solitary, forming simple raceme, pale to green, ca. 11 cm, slender; florets 8–12 pairs. Rachilla 4–5 mm; lemma ca. 1 × 0.5 cm, 9–11-veined, abaxially powdery, glabrous; palea slightly shorter than lemma, apex obtuse; keel ciliate; lodicules 3, abaxially light brown, adaxially transparent, base contracted, clawed. Stamens 6; filaments filiform; anthers ca. 5 mm. Ovary ellipsoid; stigma slender. Fruit unknown.

• Guangxi (Lingchuan).

The culms are used for papermaking and weaving.

7. *Acidosasa guangxiensis* Q. H. Dai & C. F. Huang in Ohnberger, *Bamboos World*, 34. 1999.

广西酸竹 guang xi suan zhu

Culms 2–3 m, 1–2 cm in diam.; internodes initially green, 16–18 cm, shortly hispid, finally glabrous. Culm sheaths straw-colored when dry, deciduously densely hispid, margins ciliate; auricles oblong or falcate; oral setae radiate; ligule triangular, ca. 2 mm, margin shortly ciliate; blade erect, linear-lanceolate, scabrous. Leaves 4–8 per ultimate branch; sheath glabrous; auricles small; oral setae radiate; ligule arched; blade 10–16 × 1.5–2.3 cm, abaxially sparsely hairs, especially proximally.

Spikelets 3–6, forming simple raceme, 6–17 cm; florets 13–33; pedicels 1.5–3 cm, glabrous or pubescent. Glumes 2; lemma light green, 1.3–1.5 cm, abaxially densely coarsely pubescent, margins ciliate; palea narrow, keels ciliate; lodicules oblong-lanceolate, abaxially pubescent, margin long ciliate. Stigma purple.

- Guangxi (Nanning).

When Dai and Huang (Bamboo Res. 1986(3): 64. 1986) originally described this species they indicated two types, which rendered the name not validly published.

The culms are used for making broom handles and fences.

8. *Acidosasa notata* (Z. P. Wang & G. H. Ye) S. S. You, J. Bamboo Res. 12(3): 11. 1993.

斑箨酸竹 ban tuo suan zhu

Pseudosasa notata Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 97. 1981; *Acidosasa fujianensis* C. S. Chao & H. Y. Zou; *A. longiligula* (T. H. Wen) C. S. Chao & C. D. Chu; *Arundinaria concava* C. D. Chu & H. Y. Zou; *A. notata* (Z. P. Wang & G. H. Ye) H. Y. Zou ex C. S. Chao & G. Y. Yang; *Indosasa longiligula* T. H. Wen; ?*I. pusilloaurita* W. T. Lin; *I. wuningensis* T. H. Wen & H. Y. Zou; *Pleioblastus acutiligulatus* W. T. Lin.

Culms 3–6 m, 1.5–2 cm in diam.; internodes 20–25 cm, initially glabrous; wall ca. 3 mm thick, cavity with lamellate pith; nodes weakly prominent. Culm sheaths green, purple striate, sparsely purple spotted, initially shortly setose, margins ciliate; auricles oblong, small, ca. 4 mm; oral setae ca. 7 mm; ligule prominent, ca. 6 mm, ciliate, glaucous; blade reflexed, initially green, lanceolate. Leaves 2–5(–8) per ultimate branch; sheath initially pubescent, soon glabrous; auricles and oral setae developed but soon deciduous; ligule prominent, 5–8 mm, pubescent, erose; blade linear-lanceolate, 11–20(–30) × 1–2.3 (–3) cm, secondary veins 5–7-paired, margins obscurely serrulate. Raceme terminal or lateral. Spikelets 3–5, green, tinged purple, slightly compressed, 2.5–7 × 0.4–0.6 cm; florets 3–10; pedicel 2–13 mm, glabrous, terminal one longer. Rachilla ca. 7 mm, pubescent; glumes glabrous; lemma 1.4–1.9 cm, sparsely pubescent; palea 1.3–1.5 cm, pubescent; lodicules 5–6 mm, margin transparent. Anthers yellow. New shoots Apr, fl. Apr–May.

- Forming pure stands or mixed with other bamboos; 500–1000 m. C and S Fujian, Jiangxi.

This species and *Pseudosasa maculifera* are possibly synonymous.

The shoots are sweet, and the culms are commonly used to make containers and tools.

9. *Acidosasa chienouensis* (T. H. Wen) C. S. Chao & T. H. Wen, J. Bamboo Res. 7(1): 31. 1988.

粉酸竹 fen suan zhu

Indosasa chienouensis T. H. Wen, J. Bamboo Res. 2(1): 67. 1983; *Acidosasa glauca* B. M. Yang.

Culms 7–13 m, 4–10 cm in diam.; internodes initially green, 30–48 cm, glabrous, glaucous; wall 3–5 mm thick; nodes prominent, persistent sheath base initially setose. Culm sheaths glaucous-green, shorter than internodes, yellow-brown to brown setose, setae deciduous but leaving hairy traces, proximally denser and more persistent; auricles small, pubescent; oral setae radiating, ca. 5 mm; ligule prominent, arched, 2–3 mm; blade deciduous, erect or reflexed, green, narrowly lanceolate, margin serrulate. Leaves (3 or) 4 per ultimate branch; sheath glabrous; auricles absent, cilia deciduous; ligule ca. 1 mm; blade lanceolate, 9–15 × 0.8–1.8 cm, secondary veins 4–6-paired. Inflorescence racemose, terminal. Spikelets 2–5, ± laterally compressed, 1.5–7.5 × 0.2–0.4 cm; florets 3–12(–15); pedicel 5–10 mm, glabrous. Rachilla ca. 5 mm, pubescent; glumes 2, glabrous; lemma 1.3–1.4 cm, sometimes sparsely pubescent, thinly glaucous, 7–13-veined, apex acuminate; palea shorter than lemma, apex rounded, ciliolate. Anthers ca. 4 mm. New shoots Mar–Apr, fl. Jun.

- 300–600 m. C Fujian, S Hunan.

10. *Acidosasa edulis* (T. H. Wen) T. H. Wen, J. Bamboo Res. 7(1): 31. 1988.

黄甜竹 huang tian zhu

Sinobambusa edulis T. H. Wen, J. Bamboo Res. 3(2): 30. 1984.

Culms to 12 m, to 6 cm in diam.; internodes initially green, flattened above branches, 25–40 cm, initially glabrous, smooth, white powdery or tuberculate below nodes; nodes glabrous, swollen, ca. 8 mm. Culm sheaths initially abaxially green, margin purple or light brown to brown, subtriangular, brown setose, base densely pubescent, margin ciliate, apex narrow; auricles narrowly falcate, expanded, ca. 1.2 cm; ligule short, margin ciliate; blade reflexed, purple, lanceolate to oblong-lanceolate, scabrid. Leaves 4 or 5 per ultimate branch; sheaths green, 5–5.5 cm, glabrous, striolate, margin ciliate; auricles and oral setae absent; ligule ovate, glabrous; blade lanceolate or oblong-lanceolate, 11–18 × 1.7–2.8 cm, proximally pubescent, distally glabrous, lateral veins 6 or 7, tessellate. Spikelets 2–4, 7–11 cm; pedicels 3–12 mm; florets 7–14; rachilla 4–5 mm. Glumes 2, 7–8 mm, 5–7-veined; lemma ca. 1.7 × 0.9 cm, 13-veined, tessellate; palea narrow, 4-veined between keels; lodicules apically ciliate. Stamens (5 or) 6. Ovary oblong; stigmas flagellate.

- Fujian (Fuzhou).

The shoots are edible when salted, and the culms are used for papermaking and weaving.

21. *SASA* Makino & Shibata, Bot. Mag. (Tokyo) 15: 18. 1909.

赤竹属 chi zhu shu

Wang Zhengping (王正平 Wang Cheng-ping); Chris Stapleton

Shrubby bamboos. Rhizomes leptomorph, with long, running underground stems. Culms tillering, pluricaespitose; internodes terete, glabrous, sometimes white powdery or sparsely puberulent below nodes; wall thick; nodes flat in *Sasa* subg. *Sasamorpha* or prominent in *S.* subg. *Sasa*. Branches solitary, often about as large as culm. Culm sheaths persistent, longer than internodes in *S.* subg. *Sasamorpha*, otherwise shorter, papery to nearly leathery; auricles usually developed; blade lanceolate. Leaves usually large relative to culm, in palmate arrangement, transverse veins distinct, margins with substantial necrosis in winter. Inflorescence a loose panicle or raceme, usually subtended by tiny bracts. Spikelets purple or red at maturity, 4–8-flowered; rachilla disarticulating, extended on uppermost floret. Glumes 2, \pm hairy, margins long ciliate; lemma ovate or oblong-lanceolate, nearly leathery, long mucronate; palea 2-keeled; lodicules 3, ovate, thin, transparent, margins ciliate. Stamens 6, long exserted; anthers yellow. Ovary ovoid; style 1, short; stigmas 3, plumose. Caryopsis dark brown at maturity.

Between 50 and 70 recognized species (with very extensive further synonymy): China, Japan, Korea, E Russia; eight species (all endemic) in China.

Chinese species for which the inflorescence is unknown can only tentatively be placed in *Sasa*. They may represent smaller species of genera such as *Pleioblastus*, several of which were also included in *Sasa* in FRPS (9(1), 1996).

Sasa hainanensis C. D. Chu & C. S. Chao (Acta Phytotax. Sin. 18: 31. 1981) and *S. subglabra* McClure (Lingnan Univ. Sci. Bull. 9: 24. 1940), both based on vegetative specimens, are of very uncertain placement and are not treated here. *Sasa guangdongensis* W. T. Lin & X. B. Ye (Acta Phytotax. Sin. 26: 148. 1988) was described from Guangdong; it is a little-known species. *Sasa magninoda* T. H. Wen & Liao (J. Bamboo Res. 10(1): 14. 1991, “*magnonoda*”) was described from Jiangxi; it is a species based on a poor gathering and is possibly not a member of *Sasa* at all.

- 1a. Culms and inflorescence axes thickly white powdery; culm sheath longer than internode, culm nodes not elevated; main branch very erect, at a ca. 10° angle to culm (*S.* subg. *Sasamorpha*).
 - 2a. Culm sheaths densely strigose, apex strongly concave with a triangular projection on both flanks 8. *S. qingyuanensis*
 - 2b. Culm sheaths glabrous or sparsely strigose; apex truncate or weakly concave without triangular projections.
 - 3a. Leaf sheaths usually glabrous; branches hairy below nodes 6. *S. sinica*
 - 3b. Leaf sheaths densely long white strigose; branches glabrous below nodes 7. *S. hubeiensis*
- 1b. Culms and inflorescence axes not white powdery; culm sheath shorter than internode, culm nodes elevated (in Chinese species); main branch spreading at more than a 20° angle to culm (*S.* subg. *Sasa*).
 - 4a. Leaf blade 7–9 cm; culms 2–4 mm in diam. 5. *S. oblongula*
 - 4b. Leaf blade to 26 cm; culms 5–10 mm in diam.
 - 5a. Leaf sheath auricles and oral setae absent.
 - 6a. Leaf sheath ligule to 5 mm; internodes 8–10 cm 2. *S. guangxiensis*
 - 6b. Leaf sheath ligule less than 1 mm; internodes 15–22 cm 4. *S. tomentosa*
 - 5b. Leaf sheath auricles large, falcate, oral setae 5–10 mm, radiate.
 - 7a. Internodes initially hairy below node; leaf sheath auricles and oral setae absent 1. *S. longiligulata*
 - 7b. Internodes glabrous; leaf sheath auricles large, falcate, fimbriate with brown setae ca. 1 cm 3. *S. rubrovaginata*

1. *Sasa* subg. *Sasa*

赤竹亚属 *chi zhu ya shu*

Culms and axis of inflorescence not white powdery; nodal ridge elevated (in Chinese species); culm sheaths shorter than internodes; auricles and oral setae present or absent; branch at 20–30° angle with culm; leaf blade dull.

More than 40 species: China, Japan, Korea, E Russia; five species (all endemic) in China.

1. *Sasa longiligulata* McClure, Lingnan Sci. J. 19: 536. 1940.

赤竹 *chi zhu*

Pseudosasa longiligulata (McClure) Koidzumi.

Culms 1–2 m or more, 5–10 mm in diam.; internodes usually tinged with purple, 8–10 cm, hirtellous and retrorsely brown hirsute below nodes, otherwise glabrous or sometimes initially hirtellous and sparsely hirsute, gradually glabrescent; wall 1–2 mm thick; nodal ridge strongly elevated, more prominent than sheath scar; sheath scar fringed with same hairs as those at apex of culm. Culm sheaths dull green, commonly tinged red-purple when fresh, rusty-straw-colored when dry, shorter than internode, thinly papery, loosely enclosing culm, scabrous with minute brown strigae or bases of fallen hairs, base densely brown hirsute and hirtellous, outer margin brown

ciliate; auricles and oral setae absent; ligule purple-brown, to 5 mm or more, abaxially puberulent, margin sinuous, ciliolate; blade reflexed or erect, purple or purple-green, triangular to lanceolate. Leaves 3–15 per ultimate branch; sheaths glabrous, or hirtellous and sparsely hirsute; auricles and oral setae absent; ligule strongly developed, to 1–1.5 cm, basally rather rigid, hirtellous or subglabrous, brittle, usually lacerate, apically membranous; blade adaxially deep green, lanceolate, 6–25 × 1.5–3.5 cm, glabrous or hirtellous along midrib toward base, abaxially glaucous, scabrous with sparse antrorsely appressed setae, adaxially faintly glossy, base cuneate, apex acuminate. Inflorescence unknown. New shoots Apr–May.

- Moist ravines, brook banks; 1000–1400 m. Guangdong, Hunan.

Sasa sulcata W. T. Lin (J. Bamboo Res. 12(2): 35. 1993) was described from an abnormal gathering and is most probably a synonym of this species.

2. *Sasa guangxiensis* C. D. Chu & C. S. Chao, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 34. 1981.

广西赤竹 *guang xi chi zhu*

Culms ca. 1 m, ca. 5 mm in diam.; internodes green, 8–10 cm, initially shortly pale yellow pubescent especially below nodes, glabrescent; nodes strongly elevated, weakly geniculate. Culm sheaths deciduous, yellow to purple, shorter than or equal to internode, with dense, fine, gray strigae or papillae left by fallen hairs; auricles falcate, large; oral setae radiate, 5–10 mm; ligule to 5 mm, apex lacerate; blade deciduous, lanceolate. Leaves 3–8 per ultimate branch; initially sheath densely pubescent, glabrescent; auricles falcate, large; oral setae radiate, 6–10 mm; ligule to 1.5 cm, membranous; blade adaxially green, elliptic-lanceolate, 13–26 × 2–4.5 cm, abaxially glaucous, both surfaces glabrous, secondary veins 7–9 pairs, transverse veins distinct, base broadly cuneate, apex long acuminate. Inflorescence unknown. New shoots Apr–May.

- Banks of mountain streams; 500–800 m. Guangxi, Jiangxi.

3. *Sasa rubrovaginata* C. H. Hu, Bamboo Res. 1985(2): 59. 1985.

红壳赤竹 *hong ke chi zhu*

Sasa duplicata W. T. Lin & Z. J. Feng.

Culms ca. 1.5 m, 5–6 mm in diam.; internodes 10–17 cm, initially white powdery below nodes, glabrous; wall thin, cavity with lamellate pith; nodal ridge strongly elevated. Culm sheaths straw-colored, ca. 1/3 as long as internodes, rigid and brittle at maturity, lower and middle portions with sparse deciduous strigae or imprints left by appressed hairs, base thickened with an elevated corky ring, margins ciliate, otherwise glabrous; auricles and oral setae not developed; ligule truncate, short; blade deciduous. Leaves 5 or 6 per ultimate branch; sheath initially thinly white powdery, glabrous, margins ciliate; auricles falcate, large, fimbriate with brown setae ca. 1 cm; ligule truncate, ca. 1 cm; blade broadly lanceolate or lanceolate, glabrous, secondary veins 9 or 10 pairs, transverse veins distinct, margins spinescent. Inflorescence unknown.

- Mountain areas; ca. 2000 m. Guangxi.

2. *Sasa* subg. *Sasamorpha* (Nakai) C. H. Hu, Bamboo Res. 1985(2): 60. 1985.

华箬竹亚属 *hua ruo zhu ya shu*

Sasamorpha Nakai, J. Fac. Sci. Hokkaido Univ., Ser. 5, Bot. 26: 180. 1931.

Culms and axis of inflorescence thickly white powdery; nodes flat or weakly elevated; culm sheath longer than internode, auricles and oral setae absent; branch ca. 10° angle with culm; leaf blade glossy.

Between five and twenty-two species: China, Japan, Korea, E Russia; three species (all endemic) in China.

6. *Sasa sinica* Keng, Sinensia 7(6): 748. 1936.

华箬竹 *hua ruo zhu*

Sasamorpha sinica (Keng) Koidzumi.

Culms ca. 1.5 m, ca. 4 mm in diam.; internodes white powdery especially below nodes, rigid, subsolid, with small lumen. Culm sheaths purplish, 6–10 cm, longer than internodes,

Sasa albosericea W. T. Lin & J. Y. Lin (Acta Phytotax. Sin. 26: 232. 1988) is probably a synonym of this species.

4. *Sasa tomentosa* C. D. Chu & C. S. Chao, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 35. 1981.

绒毛赤竹 *rong mao chi zhu*

Culms ca. 2 m, ca. 5 mm in diam.; internodes 15–22 cm, glabrous; nodes weakly elevated. Culm sheaths shorter than internodes, densely strigose, with long, retrorse, swollen-based, yellow hairs; auricles falcate, ca. 5 mm; oral setae radiate, to 8–10 mm; ligule less than 1 mm; blade erect or spreading, lanceolate, 1.5–3.5 × 0.2–0.5 cm. Leaves 2 or 3 per ultimate branch; sheath strigose; auricles developed, falcate; oral setae radiate, 1–1.3 cm; ligule less than 2 mm; pseudopetiole 5–8 mm, both surfaces pilose; blade adaxially green, elliptic-lanceolate, 18–20 × 3–4.2 cm, both surfaces glabrous, abaxially glaucous, secondary veins 8 or 9 pairs, transverse veins distinct, base broadly cuneate, apex acuminate. Inflorescence unknown. New shoots Apr–May.

- Dense forests at mountain summits; ca. 400 m. Guangxi.

5. *Sasa oblongula* C. H. Hu, J. Bamboo Res. 6(4): 18. 1987.

矩叶赤竹 *ju ye chi zhu*

Culms 1–1.5 m, 2–4 mm in diam.; internodes initially yellow-green, later straw-colored, ca. 8 cm, initially ± white powdery below nodes; nodal ridge weakly elevated. Culm sheaths purple-green, about as long as internodes, glabrous or puberulent at base, margins ciliate; auricles ascending, purple-green, falcate, puberulent; oral setae developed, or on lower culm sheaths; auricles and oral setae absent or weakly developed; ligule ca. 1 mm, margins ciliate; blade erect, dark purple, lanceolate. Leaves 3–5 per ultimate branch; sheath glabrous or initially sparsely appressed hirsute on upper sides, margins ciliate; auricles small; oral setae well developed; blade oblong-lanceolate, 7–9 × 1.7–2.6 cm, glabrous, secondary veins ca. 6 pairs, transverse veins distinct, base rounded or broadly cuneate, apex abruptly acute or awnlike. Inflorescence unknown. New shoots Mar–Apr.

- Cultivated. Guangdong (Guangzhou).

pushed off by emerging branch but closely enclosing branch, with fine strigae especially near margins and base, margins long ciliate; auricles and oral setae absent; blade triangular-lanceolate. Leaves 2(or 3) per ultimate branch; sheath white powdery, glabrous or initially setose, margins long ciliate; ligule truncate, 0.5–2 mm; blade oblong-lanceolate, 10–20 × 1.3–3 cm, glabrous or abaxially pilose, secondary veins 6–8 pairs, transverse veins distinct. Inflorescence an open panicle, 5–11 cm, with 4–

8(–10) spikelets or a raceme of 2–4 spikelets; axis and pedicels densely setulose and white powdery, pedicels 3–17 mm, sometimes subtended by a minute, basal bract. Spikelets deep purple at maturity, 0.8–3.5 × 0.4–0.6 cm. Rachilla internodes 2–4 mm, puberulent, apex cup-shaped and ciliolate. Glumes 2, ovate, lower 3–6 mm, puberulent, 7–9-veined, margins ciliate, apex cuspidate; lemma 9–10 mm, puberulent, 11-veined, margins purple ciliate, apex cuspidate; palea slightly longer than lemma, abaxially puberulent, keels red ciliate, apex 2-cleft; lodicules 3, ovate-lanceolate, 2–2.5 mm, membranous, with distinct basal veins, margins fimbriate. Anthers pale yellow, 4–5 mm. Ovary 3–4 mm, narrow; style short; stigmas 3. New shoots May, fl. May–Jul.

• Forests, roadsides; 1000–1500 m. Anhui, Zhejiang.

7. *Sasa hubeiensis* (C. H. Hu) C. H. Hu, *Bamboo Res.* 1985(2): 60. 1985.

湖北华箬竹 hu bei hua ruo zhu

Sasamorph hubeiensis C. H. Hu, *J. Bamboo Res.* 2(1): 51. 1983.

Culms 0.5–1 m, 3–5 mm in diam.; internodes yellow or light yellow when old, very thickly white powdery especially on upper portion; nodes weakly elevated. Culm sheaths persistent on deflexed branch, longer than internode, slightly glossy, thinly leathery, with long strigae; auricles and oral setae absent; ligule truncate, pubescent; blade erect, lanceolate. Leaves 3 or more per ultimate branch; sheath white powdery, initially long

strigose; blade lanceolate, nearly leathery, glabrous, secondary veins 7–9 pairs, transverse veins distinct, base broadly cuneate or rounded. New shoots May–Jun.

• Mountain slopes; ca. 300 m. Hubei, Jiangxi.

8. *Sasa qingyuanensis* (C. H. Hu) C. H. Hu, *Bamboo Res.* 1985(2): 62. 1985.

庆元华箬竹 qing yuan hua ruo zhu

Sasamorph qingyuanensis C. H. Hu, *J. Bamboo Res.* 2(1): 52. 1983.

Culms 1–1.5 m, 4–6 mm in diam.; internodes thickly white powdery, especially so distally; wall thick. Culm sheaths persistent on deflexed branch, straw-colored when dry, longer than internodes, with rather dense, long, tenuous, brown or white strigae, base with a ring of brown setulae and pubescence, margins ciliate or ciliolate, apex strongly concave; auricles and oral setae absent; ligule to 5 mm; blade erect or deflexed, lanceolate. Leaves commonly 3 per ultimate branch; sheath thinly white powdery, base strigose; auricles and oral setae absent; ligule to 5 mm or more, margin ciliate, apex truncate or slightly sinuous; blade adaxially green, abaxially pale green, oblong or narrowly ovate, 18–28 × 4.7–6 cm, glabrous, secondary veins 10–13 pairs, transverse veins distinct, margins entire or one minutely spinescent. New shoots Apr–May.

• Forests; ca. 1400 m. Zhejiang.

22. *ARUNDINARIA* Michaux, Fl. Bor.-Amer. 1: 73. 1803.

青篱竹属 qing li zhu shu

Zhu Zhengde (朱政德 Chu Cheng-de), Li Dezhu (李德铢); Chris Stapleton

Small to arborescent bamboos, spreading or loosely clumped. Rhizomes leptomorph. Culms diffuse to pluricaespitose, suberect to drooping, 1–7(–13) m tall, 0.5–4(–6) cm thick; internodes terete to flattened on one side above branches. Branch buds tall, with or without promontory, within 2-keeled prophyll, always open at front. Branches (1 or) 2–5(–7), subequal. Lateral branch axes always subtended by sheaths, without replication of lateral branches. Culm sheaths deciduous to persistent, blade usually recurved or reflexed, lanceolate, articulate. Leaf sheaths persistent; blade oblong-lanceolate or narrowly lanceolate, small to medium-sized, without marginal necrosis in winter, arrangement random, transverse veins distinct. Inflorescence an open panicle or raceme, flowering branches usually subtended by tiny bracts. Spikelets several to many flowered, slender; rachilla internodes extended, disarticulating. Glumes 1 or 2, mucronate; lemma similar to glumes; palea 2-keeled, apex obtuse; lodicules 3. Stamens 3; filaments free, slender; anthers yellow. Style usually very short; stigmas 2 or 3, plumose. Caryopsis dry, oblong. New shoots May–Jun.

About eight species: SW China, E Himalayas, Vietnam, SE United States; five species (four endemic) in China.

In FRPS (9(1), 1996), *Arundinaria* was considered a unispecific, North American genus with no Asian representatives at all. A much broader treatment of the genus has also been advocated by several authors. In this treatment the morphologically closest Asian species under *Arundinaria*, those from *Bashania* and *Sarocalamus*, are included. *Arundinaria* subg. *Arundinaria* differs in its persistent culm sheaths and larger florets and is restricted to the SE United States.

- 1a. Culms 3–8(–13) m tall; internodes grooved above branches; rough, finely striate, waxy; leaf blade 10–32 cm wide, thick, dark, glossy; inflorescence branches pulvinate, becoming reflexed; pedicels pubescent (*A. subg. Bashania*).
- 2a. Culms 2–4(–6.5) cm in diam.; culm sheath scars brown setose, later glabrous; leaf sheath ligule ciliate 1. *A. fargesii*
- 2b. Culms 0.3–0.7(–1) cm in diam.; culm sheath scars prominent and densely setose; leaf sheath ligule glabrous 2. *A. qingchengshanensis*
- 1b. Culms 1–3 m tall; internodes terete, smooth; leaf blade (2.2–)3–10 cm wide, thin, light, matte; inflorescence branches not pulvinate, remaining erect; pedicels glabrous (*A. subg. Sarocalamus*).
- 3a. Leaf sheath auricles prominent, narrow, erect; leaf blade abaxially sparsely long pilose 3. *A. racemosa*
- 3b. Leaf sheath auricles minute or absent; leaf blade glabrous.

- 4a. Culm sheath completely glabrous; culms 0.3–0.6 cm in diam. 4. *A. faberi*
 4b. Culm sheath sparsely setulose; culms 0.6–1.2 cm in diam. 5. *A. spanostachya*

1. *Arundinaria* subg. *Bashania* (P. C. Keng & T. P. Yi) D. Z. Li, Novon 15: 600. 2005.

巴山木竹亚属 *ba shan mu zhu ya shu*

Bashania P. C. Keng & T. P. Yi, J. Nanjing Univ., Nat. Sci. Ed. 1982(3): 722. 1982.

Subarborescent subtropical to temperate bamboos. Culms 3–8(–13) m tall; internodes grooved above branches, rough, finely striate, waxy; nodes slightly swollen, supra-nodal ridge prominent, wavy. Branch buds on promontory; prophyll keels thickened, prominent, densely pubescent and ciliate. Branches initially 3–6, erect to spreading, terete, basal internodes compressed, lateral branching close to culm. Leaves few, branchlets ramifying extensively. Leaf blade lanceolate, to 32 cm, thick, dark glossy. Inflorescence terminal or lateral. Branches erect to spreading, pubescent, branching subtended by very small remnants of sheaths or rings of hairs, pulvinate. Spikelets several, on promontory; prophyll represented by lower glume; glumes 2, lower glume close to lower lemma, without subtended buds; palea keels glabrous, appressed to rachilla.

• Two species: China.

Molecular evidence would suggest that *Arundinaria* subg. *Bashania* is possibly closer to *Indocalamus* than to *A. subg. Arundinaria*.

1. *Arundinaria fargesii* E. G. Camus, Notul. Syst. (Paris) 2: 244. 1912.

饱竹子 *bao zhu zi*

巴山木竹 *ba shan mu zhu*

Arundinaria dumetosa Rendle; *A. fargesii* var. *grandifolia* E. G. Camus; *Bashania fargesii* (E. G. Camus) P. C. Keng & T. P. Yi; *Indocalamus dumetosus* (Rendle) P. C. Keng; *I. fargesii* (E. G. Camus) Nakai; *I. scariosus* McClure.

Culms pluricaespitose, predominantly tillering in fertile soil, more separated in poor soil. Culms basally erect, apically slightly pendulous, 5–8(–13) m, 2–4(–6.5) cm in diam.; internodes deep green and glaucous initially, light yellow when old, 30–50(–75) cm; wall 4–8 mm thick; pith membranous; nodes weakly prominent, ridged; intranode 6–12 mm; sheath scars brown setose, later glabrous. Culm sheaths initially green and setose, with persistent papillae and imprints of setae; ligule 2–4 mm, dentate; auricles absent; oral setae present; blade lanceolate, tomentose at base, margins ciliate, undulate. Leaves (1–)4–6; sheath setose, pilose, margins ciliate; ligule (1.5–)2–4 mm, slightly hairy, dentate, initially ciliate; blade lanceolate, 10–20(–30) × 2.5–3 cm, abaxially pubescent, adaxially glabrous, secondary veins 5–8(–11)-paired; petiole short, densely pubescent. Inflorescence paniculate, 5–11(–15) × 2–4 cm; spikelets purple-black, cylindrical, 2–3 × ca. 0.4 cm; rachilla internodes compressed, 2–3.5 mm; florets 4–7. Glumes ovate-lanceolate; lemma oblong or lanceolate, pubescent; palea 2-cleft; lodicules sparsely ciliate at margin. Anthers 4–5 mm. Ovary ovoid; stigmas 2 or 3, ca. 2.5 mm plumose. Caryopsis slightly curved, ca. 1 cm, beaked, suture slender. Fl. late Mar–Apr or May, fr. late May.

• Mountain forests, pure bamboo forests; (1100–)1700–2000(–2500) m. Gansu, Hubei, Shaanxi, Sichuan.

The culms are often used for papermaking; also for weaving.

2. *Arundinaria qingchengshanensis* (P. C. Keng & T. P. Yi) D. Z. Li, Novon 15: 600. 2005.

Bashania qingchengshanensis P. C. Keng & T. P. Yi, J. Nanjing Univ., Nat. Sci. Ed. 1982(3): 728. 1982.

Culms 2–4 m, 0.3–0.7(–1) cm in diam.; internodes deep green, 40–45(–56) cm, glabrous, distally waxy-powdery, solid or subsolid; nodes weakly prominent, glabrous; intranode 3–5 mm; sheath scar prominent, densely setose. Culm sheaths dark green or purple-green, setose, margins distally ciliate; ligule purple, truncate or arcuate, less than 1 mm; auricles absent; oral setae 3–5, 3–4 mm; blade persistent, dark green, triangular-lanceolate, basally setose, striate, margins serrulate. Leaves 1–3 per ultimate branch; sheath green, sometimes purple, glabrous; auricles deciduous, green, elliptic, margin ciliate; ligule light green, truncate, ca. 1 mm, glabrous; petiole 3–4 mm, glabrous; blade lanceolate, 22–32 × 2.4–3.8 cm, glabrous, secondary veins 6–8-paired, base cuneate, margin serrulate, apex acuminate. Inflorescence paniculate, 6–10 cm. Spikelets 5–15; pedicel 2–12 mm, densely setose; rachilla internodes 3–5 mm, densely setose; florets 6–14. Glumes setose, long mucronate; lemma ovate, setose, margins ciliate, long mucronate; palea 2-cleft, 2-keeled, with 2 or 3 veins between keels, 2 veins beside keels, margin ciliate; lodicules purple-red, rhombic-ovate, membranous, transparent, margins densely ciliate. Anthers purple, glabrous. Ovary ellipsoid, glabrous; style 1; stigmas 2, white, plumose. Caryopsis slightly curved, brown, ellipsoid, 7–8 × 2–2.5 mm, glabrous, apex acute, suture elongated. New shoots Apr, fl. Apr, fr. May.

• Hardwood forests; 800–1200 m. Sichuan (Guanxian, Qonglai).

Bashania aristata Y. Ren et al. (Novon 13: 473. 2003) and *B. baotingensis* T. P. Yi (J. Bamboo Res. 19(1): 9. 2000) are possibly synonyms of this species.

The culms are used for pen and brush holders, abacus frames, and chopsticks. This species is also cultivated as an ornamental.

2. *Arundinaria* subg. *Sarocalamus* (Stapleton) D. Z. Li, Novon 15: 600. 2005.

冷箭竹亚属 *leng jian zhu ya shu*

Sarocalamus Stapleton, Novon 14: 346. 2004.

Small subalpine bamboos. Culms 1–3 m tall; internodes terete, smooth; nodes not swollen; supra-nodal ridge well developed. Branch buds on promontory; prophyll keels delicate, slightly ciliate. Branches initially 1–3, very erect, appressed, grooved, basal internodes progressively longer, often all long, lateral branching often distant from culm; complement proliferating to become broomlike. Leaf blade pale, linear-lanceolate, thin, matte, less than 12 cm. Inflorescence initially terminal or lateral to leafy branches, later in leafless branch complements; branches very erect, appressed, glabrous, branching subtended by long hairs, not pulvinate; glumes 1 or 2, both small, lower glume usually very small, usually distant from lower lemma, with vestigial remnants of subtended buds; palea keels ciliate.

About three species: Bhutan, China, NE India, Nepal; three species (two endemic) in China.

Molecular evidence would suggest that *Arundinaria* subg. *Sarocalamus* is possibly phylogenetically more closely related to *Phyllostachys*, even though it is morphologically closest to *A.* subg. *Arundinaria* from North America and *A.* subg. *Bashania*.

3. *Arundinaria racemosa* Munro, Trans. Linn. Soc. London 26: 17. 1868.

总花冷箭竹 zong hua leng jian zhu

Fargesia racemosa (Munro) T. P. Yi; *Sarocalamus racemosus* (Munro) Stapleton; *Yushania racemosa* (Munro) R. B. Majumdar.

Culms nodding, to 2 m; internodes smooth, without wax, glabrous; nodes slightly raised. Culm sheaths glabrous; auricles small; oral setae spreading; blade erect. Leaf sheath nearly glabrous, without tessellation; auricles erect, prominent, narrow; oral setae persistent, erect, stout, nearly glabrous; ligule short; blade to 10 cm, abaxially sparsely long pilose, adaxially glabrous, tessellation distinct, margins similarly thickened. Spikelets with up to 10 florets; rachilla sections scabrous, with pubescent edges, distally pubescent; fertile lemma scabrous, margins pubescent; palea scabrous, keels ciliate. Anthers shortly bifid.

Undergrowth of coniferous forests, yak pastures; 2900–3500 m. Xizang [Bhutan, NE India, Nepal].

The identity of this species was clarified by Gamble (Bull. Misc. Inform. Kew 1912: 198. 1912).

The culms are used for brooms, and the foliage is an important winter fodder for yaks and wild animals.

4. *Arundinaria faberi* Rendle, J. Linn. Soc., Bot. 36: 435. 1904.

冷箭竹 leng jian zhu

Arundinaria fangiana A. Camus; *Bashania faberi* (Rendle) T. P. Yi; *B. fangiana* (A. Camus) P. C. Keng & T. H. Wen; *Gelidocalamus fangianus* (A. Camus) P. C. Keng & T. H. Wen; *Sinarundinaria faberi* (Rendle) P. C. Keng; *S. fangiana* (A. Camus) Keng & P. C. Keng.

Culms (0.5–)1–2.5(–3) m, 3–6 mm in diam.; internodes green, yellow-green when old, often purple spotted, 15–20 cm, initially slightly glaucous, glabrous; wall 1.5–3 mm thick, pith initially lamellate, later powdery; sheath scars flattened or slightly prominent; intranode 2–3 mm. Culm sheaths shorter than internodes, glabrous, margins ciliate; auricles minute or absent; oral setae initially scarce, readily deciduous, purple; ligule truncate, ca. 0.5 mm; blade green or purple-red at apex, glabrous, margins revolute. Leaves 2–4 per ultimate branch; sheath glabrous, ribbed, margins initially ciliate; auricles minute

or absent; oral setae scarce, initially purple, later gray-white, 5–7 mm, undulate; ligule truncate, ca. 0.5 mm; pseudopetiole 1–2 mm, glabrous; blade lanceolate, 3–9 × (0.4–)0.8–1.1(–1.4) cm, glabrous, secondary veins 3- or 4(or 5)-paired, base rounded, margin serrulate, scabrous, apex acuminate. Inflorescence racemose to paniculate, 4–6(–13) cm; spikelets 3–12; pedicel 8–22 mm; florets (4 or)5–7, purple-red; rachilla internodes 3–5 mm. Glumes 2; lemma ovate-lanceolate, long mucronate; palea ciliate, bifid, 1-veined between keels; lodicules ovate, anterior 2 larger. Anthers purple-red. Ovary ellipsoid, glabrous; style 1; stigmas 3. Caryopsis slightly curved, purple-brown or brown, oblong, 6–7 × 1.5–2 mm, style base persistent, beaked, suture shallow, pericarp thin and easy to separate. Fl. May–Aug. fr. Jul–Oct.

• Subalpine coniferous forests, especially *Abies*; 2300–3500 m. Guizhou (Fangjing Shan), SW Sichuan, Yunnan (Dongchuan, Wumeng Shan).

The culms are used for arrows, penholders, and roofing of temporary shelters. This species is also an important food resource for the giant panda.

5. *Arundinaria spanostachya* (T. P. Yi) D. Z. Li, Novon 15: 600. 2005.

峨热竹 e re zhu

Bashania spanostachya T. P. Yi, Acta Bot. Yunnan. 11: 35. 1989; *Sarocalamus spanostachyus* (T. P. Yi) Stapleton.

Culms (0.5–)1–3.5 m, 0.6–1.2 cm in diam.; internodes initially green, yellow when old, purple spotted, cylindrical, 13–18(–24) cm, initially slightly glaucous, glabrous; wall 3–4 mm thick, pith initially lamellate, later coarsely powdery; nodes flat; intranode 1.5–3 mm; sheath scar slightly prominent, glabrous. Culm sheaths persistent, yellow, glabrous or adnately setose; auricles absent; oral setae rarely present, 4–6 mm; ligule purple, arcuate, ca. 1 mm, glabrous; blade initially gray-green or purplish, smooth or sometimes rugose, glabrous, margin entire. Leaves 2–4 per ultimate branch; sheath green-purple, glabrous, margins smooth; auricles absent; oral setae 1 or 2, 2–5 mm; ligule purple, truncate, ca. 0.5 mm, glabrous; pseudopetiole purple, 0.8–1.5 mm, glabrous; blade linear-lanceolate, (2.2–)3.3–6.7 × 0.4–0.8 cm, glabrous, secondary veins 2- or 3-paired, base broadly cuneate, one margin serrulate, other margin remotely serrulate or nearly entire, apex acuminate. Inflorescence racemose; rachilla internodes 3.5–5 mm, setose; pedicel

2–6(–11) mm, slender; florets 4–6, purple. Glumes 2, glabrous; lemma ovate-lanceolate, glabrous or setose, long mucronate; palea 2-cleft; lodicules rhombic-lanceolate, margins ciliate. Anthers purple. Ovary light yellow, ellipsoid, glabrous; style 1; stigmas 3. Fruit unknown. New shoots and fl. May.

• Dominating undergrowth of *Abies georgei* and *Rhododendron* forests; 3200–3900 m. SW Sichuan.

The culms are often used as brooms. The plant also provides winter forage for cattle and is important for water and soil conservation in fragile alpine regions.

Taxa incertae sedis

Arundinaria acerba W. T. Lin (J. S. China Agric. Univ. 13(2): 84. 1992) was described from Guangdong.

Arundinaria conghuaensis W. T. Lin (J. Bamboo Res. 19(4): 2. 2000) was described from Guangdong (Conghua). In the protologue it was compared with *A. projecta* (a synonym of *Acidosasa nanunica* in this account).

Arundinaria multinervis W. T. Lin & Z. M. Wu (J. S. China Agric. Univ. 11(3): 48. 1990; *Indocalamus multinervis* (W. T. Lin & Z. M. Wu) W. T. Lin, J. Bamboo Res. 19(4): 17. 2000) was described from sterile material from Guangdong (Shixing).

Arundinaria parvifolia Hackel ex Keng (J. Wash. Acad. Sci. 26: 396. 1936; *Fargesia hackelii* Ohnberger; *Indocalamus parvifolius*

(Hackel ex Keng) P. C. Keng) was described from Yunnan. It may be a species of *Fargesia*, but there is no information on the rhizome.

Arundinaria rectirama W. T. Lin (J. S. China Agric. Univ. 13(2): 85. 1992) was described from Guangdong. The original description is incomplete, and the taxon could belong to any one of several genera of the *Arundinariinae*.

Arundinaria rigidula E. G. Camus (Not. Syst. 2: 243. 1912; *Indocalamus rigidulus* (E. G. Camus) Nakai; *Yushania rigidula* (E. G. Camus) Ohnberger) was described from Sichuan. It may be a species of *Fargesia* or *Yushania*, but there is no information on the rhizome.

Bashania abietina T. P. Yi & L. Yang (J. Bamboo Res. 17(4): 1. 1998) was described from Sichuan. It possibly belongs in *Indocalamus* rather than *Arundinaria* subg. *Bashania*.

23. PSEUDOSASA Makino ex Nakai, J. Arnold Arbor. 6: 150. 1925.

矢竹属 shi zhu shu

Zhu Zhengde (朱政德 Chu Cheng-de), Li Dezhu (李德铎); Chris Stapleton

Plants small, shrublike, or arborescent, spreading and densely clumped; rhizomes leptomorph. Culms pluricaespitose, erect to drooping, 0.5–13 m tall, to 6 cm thick; internodes terete or moderately grooved; nodes not greatly swollen; supra-nodal ridge not evident. Branch buds tall, prophylls 2-keeled, initially closed at front, without promontory. Branches erect, initially 1–3 per node, short or long, central slightly dominant with basal nodes compressed, branches always fully sheathed, without replication of lateral branches, sheaths and prophylls ± glabrous. Culm sheaths deciduous to very persistent, tough; blade erect or reflexed, narrowly triangular to strap-shaped. Leaf sheaths persistent; blades moderately large for size of culm, without marginal necrosis in winter, arrangement random, transverse veins distinct. Inflorescence an open raceme or panicle; branching subtended by large or small bracts. Spikelets 2–20 cm; rachilla sinuous, disarticulation below florets; florets 3–30. Glumes 2, shorter than first lemma; lemma to 1 cm. Palea 2-keeled. Stamens 3. Stigmas 3.

Nineteen species: China, Japan, Korea; 18 species (17 endemic, one introduced) in China.

- 1a. Culm sheaths very persistent; midculm branches 1(–3) (*P.* subg. 1. *Pseudosasa*) 1. *P. japonica*
- 1b. Culm sheaths deciduous; midculm branches usually 3 (*P.* subg. 2. *Sinicae*).
- 2a. Culm sheath blade ovate to broadly ovate, constricted at base.
- 3a. Culm to 1.6 m, less than 4 mm in diam. 13. *P. gracilis*
- 3b. Culm 2–5 m, 5–12 mm in diam.
- 4a. Leaves 3–5(–7) per ultimate branch.
- 5a. Culm sheath sparsely setose and white tomentellate; leaf sheaths densely setose and glaucous; culm internodes 10–15 cm 17. *P. viridula*
- 5b. Culm sheath densely brown setose; leaf sheaths glabrous; culm internodes 20–32 cm 18. *P. magilaminaris*
- 4b. Leaves 4–10 per ultimate branch.
- 6a. Leaf sheath auricles absent; secondary veins of leaf blades 3–5-paired 14. *P. hindsii*
- 6b. Leaf sheath auricles present, secondary veins of leaf blades 5–9-paired.
- 7a. Culm sheath smooth or sparsely setose, light brown, base glabrous, apex truncate or weakly arched 15. *P. cantorii*
- 7b. Culm sheath densely tomentellate, sparsely white setose, base with dense retrorse hairs, apex arched 16. *P. orthotropa*
- 2b. Culm sheath blade linear-lanceolate to narrowly lanceolate, weakly or rarely constricted at base.

- 8a. Culm sheath ± spotted or streaked.
 9a. Culms to 8 m, to 5 cm in diam. 12. *P. longiligula*
 9b. Culms 1.2–4 m, 0.5–1.5 cm in diam.
 10a. Culm sheath obscurely streaked, ligule 7–9 mm or slightly shorter, auricles very small and circular, oral setae present 8. *P. subsolida*
 10b. Culm sheath distinctly spotted, ligule short, less than 4 mm.
 11a. Culm sheath glabrous, occasionally sparsely setose at base; culm internodes powdery-black below nodes 11. *P. wuyiensis*
 11b. Culm sheath setose, hairy at base; culm internodes ± glaucous.
 12a. Culm sheath with adnate, retrorse setae, tomentose at base, slightly yellow, sheath ligule 1.5–4 mm 9. *P. maculifera*
 12b. Culm sheath long hispid; sheath ligule less than 1 mm 10. *P. brevivaginata*
 8b. Culm sheath without spots or streaks.
 13a. Culm sheath auricles absent or elliptic when present, oral setae present, sheath linear-lanceolate.
 14a. Culm sheath auricles present, elliptic; sheath blade lanceolate, erect, base constricted 4. *P. aerea*
 14b. Culm sheath auricles absent; sheath blade.
 15a. Culm sheath densely brown setose, basally densely so 2. *P. amabilis*
 15b. Culm sheath white pubescent and sparsely light brown setose 3. *P. yuelushanensis*
 13b. Culm sheath auricles and oral setae absent.
 16a. Culm sheaths glabrous, auricles present 5. *P. jiangleensis*
 16b. Culm sheaths brown setose, auricles absent.
 17a. Culm sheath blade conical-lanceolate; ligule arched, ca. 1 mm, ciliate 6. *P. acutivagina*
 17b. Culm sheath blade linear-lanceolate; ligule extremely short, nearly absent 7. *P. pubiflora*

1. *Pseudosasa* subg. *Pseudosasa*

矢竹亚属 shi zhu ya shu

Yadakeya Makino, nom. illeg. superfl.

Culm internodes moderately deeply grooved above branches. Branch initially solitary, with basal nodes compressed but without buds, laterals only arising from nodes further from culm. Culm sheaths persistent. Pedicels glabrous.

Two species: native to Japan and Korea; one species (introduced) in China.

1. *Pseudosasa japonica* (Siebold & Zuccarini ex Steudel) Makino ex Nakai, J. Jap. Bot. 2(4): 15. 1920.

矢竹 shi zhu

Arundinaria japonica Siebold & Zuccarini ex Steudel, Syn. Pl. Glumac. 1: 334. 1854; *A. usawae* Hayata; *Pleioblastus usawae* (Hayata) Ohki; *Pseudosasa usawae* (Hayata) Makino & Nemoto; *Yadakeya japonica* (Siebold & Zuccarini ex Steudel) Makino.

Culms erect or nodding, 1–3(–5) m tall, to 1.5 cm thick; internodes long, finely ridged, finely mottled, with light ring of wax below each node; nodes slightly raised; sheath scar large. Branches usually 1 per node, without basal buds or branches on that branch, sometimes rebranching from distal branch nodes. Culm sheaths persistent, to 25 cm, basally glabrous, distally

appressed hispid; auricles and oral setae absent; blade erect, 2–5 cm, abaxially glabrous. Leaf sheaths glabrous, margins membranous, not ciliate, auricles absent or small, erect; oral setae scarce, erect, or lacking; ligule oblique, long, slightly pubescent, eroded; abaxial ligule glabrous to finely ciliate; blade abaxially light green to glaucous, adaxially dark green, 15–37 × 1.5–5 cm, glabrous; pseudopetiole glabrous. Spikelets curving, narrowly terete, 3.5–10 cm; florets 5–20(–25). Lemma 1.2–1.5 cm, glabrous, often with fine mucro ca. 2 mm; palea nearly equal to lemma, glabrous, keels finely ciliate. Inflorescence not known.

Yangtze River to Guangdong, Taiwan [Japan, Korea].

This species is cultivated as an ornamental. It is traditionally used for arrows in Japan.

2. *Pseudosasa* subg. *Sinicae* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 44. 1991.

茶秆竹亚属 cha gan zhu ya shu

Culm internodes terete, rarely grooved. Branches initially 3 per node at mid-culm, very erect. Culm sheaths deciduous. Pedicels pubescent.

• Seventeen species: China.

There is considerable uncertainty about the synonymy of Chinese names within *Pseudosasa* and relationships to certain names within *Pleioblastus* and other genera. Characters at both generic and specific ranks require further investigation.

2. *Pseudosasa amabilis* (McClure) P. C. Keng ex S. L. Chen et al., Fl. Reipubl. Popularis Sin. 9(1): 641. 1996.

茶秆竹 cha gan zhu

Culms 6–13 m, 2–6 cm in diam.; internodes olive-green, terete, 30–40(–50) cm, smooth, initially gray waxy; wall thick; cavity filled with lamellate or spongy pith; nodes weakly prominent. Branches (1–)3 per node, deflexed, secondary branchlets undeveloped. Culm sheaths gradually deciduous, brown, rigid, fragile when dry, densely setose, margins with cilia ca. 1.5 cm, apex truncate or raised on both sides; auricles absent; oral setae few, erect, ca. 1.5 cm, rigid, undulate; ligule arcuate, irregular, ciliate; blade erect, dark brown, narrowly triangular, scabrid, sharply pointed. Leaves 2 or 3 per ultimate branch; sheath glabrous, margins ciliate; auricles minute; oral setae curved, 7–15 mm; ligule 1–2 mm, densely ciliate; pseudopetiole ca. 5 mm; blade narrowly lanceolate, 16–35 × 1.6–3.5 cm, thick, glabrous, secondary veins 7–9-paired, one margin spinescent-serrulate, other margin obscure. Inflorescence paniculate, lateral spikelets 3–15, 2.5–5.5 cm, rachilla internodes ca. 3 mm; florets 5–16. Glumes 2, unequal, densely puberulous or glabrous, margins apically densely ciliate; lemma ovate-lanceolate, densely puberulous or glabrous; palea broadly lanceolate, keels puberulous. Lodicules unequal. Stamens 3. Ovary fusiform, glabrous. Caryopsis 5–6 mm. New shoots Mar to late May.

• Widely cultivated in plantations along streams in mountain areas, open slopes; low elevations. Fujian, Guangdong, Guangxi, Hunan, S Jiangxi.

The culms are of high mechanical quality, and large quantities are exported to other countries of SE Asia and the United States. The species was once highly prized for making fishing rods and ski poles.

- 1a. Culm sheath apically raised on both sides; lemma glabrous 2b. var. *convexa*
- 1b. Culm sheath apically truncate; lemma glabrous to puberulous.
 - 2a. Culm sheaths thick, leathery; glumes and lemma densely puberulous 2a. var. *amabilis*
 - 2b. Culm sheaths thin; glumes and lemma densely glaucous, sparsely puberulous or nearly glabrous 2c. var. *farinosa*

2a. *Pseudosasa amabilis* var. *amabilis*

茶秆竹(原变种) cha gan zhu (yuan bian zhong)

Arundinaria amabilis McClure, Lingnan Sci. J. 10: 6. 1931.

Culm sheaths leathery, apex truncate. Glumes and lemma densely puberulous.

• Often cultivated along streams of mountain areas. Fujian, Guangdong, Guangxi, S Hunan, S Jiangxi.

2b. *Pseudosasa amabilis* var. *convexa* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 98. 1981.

福建茶秆竹 fu jian cha gan zhu

Pseudosasa amabilis var. *tenuis* S. L. Chen & G. Y. Sheng.

Internodes initially densely glaucous; nodes sparsely retrorsely setose. Culm sheaths sparsely setose, apically prominent on both sides; ligule glaucous; auricles elliptic, with a few oral setae.

• Open slopes; low elevations. Fujian, Hunan.

2c. *Pseudosasa amabilis* var. *farinosa* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 45. 1991.

厚粉茶秆竹 hou fen cha gan zhu

Culm sheaths thinner. Leaf blade narrower. Glumes and lemma densely glaucous or nearly glabrous.

• N Guangxi.

3. *Pseudosasa yuelushanensis* B. M. Yang, Nat. Sci. J. Hunan Norm. Univ. 9(3): 90. 1986.

岳麓山茶秆竹 yue lu shan cha gan zhu

Culms 2–3 m, 1.5–2 cm in diam.; internodes striate, glaucous, initially white pubescent above nodes; nodes weakly prominent. Culm sheaths late deciduous, white pubescent and sparsely brown setose, ciliate; auricles weak; oral setae 4–6; ligule truncate or arched; blade narrowly lanceolate, both surfaces pubescent. Leaf sheath sparsely puberulous; auricles absent; oral setae 5–7 mm; ligule arched, 2–2.5 mm; blade lanceolate or oblong-lanceolate, 15–30 × 2–4 cm, abaxially pubescent, secondary veins 5- or 6-paired, margins serrulate. Inflorescence paniculate; spikelets 3–8, pedicel 3–7 mm; florets 3–15. Glumes 2, unequally sized; lemma ovate-lanceolate; palea navicular, keels puberulous. Stamens (1–)3 or 4(–6). Ovary fusiform, glabrous; styles very short; stigmas 3. Caryopsis oblong, 5–7 mm. New shoots May, fl. Apr–Jun.

• Undergrowth of hardwood forests. Hunan (Yuelu Shan).

This species is possibly a synonym of *Pseudosasa subsolida*.

4. *Pseudosasa aeria* T. H. Wen, Bull. Bot. Res., Harbin 3(1): 94. 1983.

空心竹 kong xin zhu

Culms to 6 m, ca. 2 cm in diam.; internodes green, terete, 30–40 cm, not grooved, glabrous; nodes not raised. Branches 1–3 per node. Culm sheaths nearly persistent, green, setose, densely setose at base, margins brown ciliate; auricles brown, elliptic; oral setae slender; ligule truncate, 1–2 mm; blade erect, green, lanceolate, both surfaces glabrous, base constricted, margin serrulate, apex slightly rugose. Leaves 3–5 per ultimate branch; sheath glabrous, margin ciliate; auricles obscure; oral setae erect, to 1.3 cm; ligule truncate, short; blade lanceolate, 11–20 × 1–2.2 cm, both surfaces glabrous, secondary veins 6- or 7-paired, base broadly cuneate, apex long acuminate. Inflorescence terminal to lateral branches; spikelets 1–5, pedicel 5–7 mm, terminal one to 1.4 cm, glabrous; florets ca. 11. Glumes 1 or 2; lemma margins ciliate apically, mucronate; palea slightly shorter than lemma, densely hairy, apex rounded; lodicules ciliate. Ovary columnar. New shoots Jun.

• Zhejiang.

This species is possibly a synonym of *Pleiblastus rugatus*.

5. *Pseudosasa jiangleensis* N. X. Zhao & N. H. Xia in Z. Yu Li, Pl. Longqi Mountain, Fujian, China, 600. 1994.

将乐茶秆竹 *jiang le cha gan zhu*

Culms 7–10(–12) m, 1–3(–5) cm in diam.; internodes terete, ca. 40 cm; wall 6–8 mm thick; nodes not prominent, farinose; intranode ca. 7 mm. Branches 3 per node, erect, base nearly appressed. Culm sheaths deciduous, green, not spotted, slightly longer than internode, thickly papery, glaucous, abaxially sparsely deciduous-setose, margins glabrous, apex truncate or subconcave; auricles subovoid, small, margins ciliate or glabrous; oral setae glabrous; ligule 4–5 mm, membranous, margins glabrous or ciliate; blade reflexed, linear-lanceolate, both surfaces densely pubescent, base slightly contracted. Leaves 4–6(or 7) per ultimate branch, glabrous; sheath glabrous; auricles and oral setae absent; ligule ca. 2 mm, membranous, margins glabrous; blade linear-lanceolate or narrowly lanceolate, 9–20 × 1–2.5 cm, cartilaginous, abaxially proximally pubescent, otherwise glabrous, secondary veins 4–6-paired, transversal veins conspicuous, margins revolute, apex caudate acuminate. Inflorescence unknown. New shoots May.

- Margins of mountains; 400–500 m. W Fujian.

6. *Pseudosasa acutivagina* T. H. Wen & S. C. Chen, J. Bamboo Res. 3(2): 31. 1984.

尖箨茶秆竹 *jian tuo cha gan zhu*

Culms to 4 m, to 2.5 cm in diam.; internodes initially green, to 35 cm, glabrous, glaucous. Culm sheaths narrowly triangular, longer than internodes, brown setose, densely so at base, margins ciliate, auricles and oral setae absent; ligule arched, ca. 1 mm, ciliate; blade erect, conical-lanceolate, 1–3 cm, glabrous. Leaves 2 or 3 per ultimate branch; sheath pale, initially pubescent, margins glabrous; auricles and oral setae absent; ligule ca. 5 mm, fragile; pseudopetiole 7–15 mm; blade elliptic-lanceolate to ovate-lanceolate, 22–32 × 2–4.5 cm, abaxially pubescent, secondary veins 9–11-paired, base cuneate, margins serrulate, apex acuminate or acute. Inflorescence unknown.

- Slopes; below 500 m. S Zhejiang.

This species is possibly a synonym of *Acidosasa nanunica*.

7. *Pseudosasa pubiflora* (Keng) P. C. Keng ex D. Z. Li & L. M. Gao, **comb. nov.**

毛花茶秆竹 *mao hua cha gan zhu*

Basionym: *Arundinaria pubiflora* Keng, Sinensia 7: 416. 1936; *Acidosasa paucifolia* W. T. Lin; *Arundinaria lanshanensis* (T. H. Wen) T. H. Wen; *A. pallidiflora* (McClure) T. H. Wen; *A. tenuivagina* W. T. Lin; *Indocalamus pallidiflorus* McClure; *I. pubiflorus* (Keng) P. C. Keng; *Pseudosasa pallidiflora* (McClure) S. L. Chen & G. Y. Sheng; *P. parilis* T. P. Yi & D. H. Hu; *Yushania lanshanensis* T. H. Wen.

Culms ca. 1 m, 2–3 mm in diam.; internodes terete, woolly or tomentose below nodes; nodes weakly prominent. Branches 1–3 per node, elongated, slender. Culm sheaths persistent; auricles and oral setae absent; ligule extremely short, nearly absent; blade deciduous, small. Leaves 1 or 2 per ultimate

branch; sheath glabrous or apically slightly hairy, margins ciliate; auricles and oral setae weakly developed or absent; ligule extremely short; blade lanceolate or elliptic-lanceolate, ca. 15 × 19 cm, abaxially setulose, adaxially glabrous, one margin roughly hairy. Inflorescence paniculate, lateral; spikelets ca. 10; rachilla glabrous or hairy at base; pedicel densely puberulous; florets 2 or 3, loosely arranged. Glumes 2; lemma ovate, adnately hairy; palea about as long as lemma, keels densely hairy; lodicules 3, subequal. Ovary glabrous; stigmas 2. Caryopsis unknown. New shoots Apr.

- Slopes; low elevations. N Guangdong, S Hunan, S Jiangxi.

The combination *Pseudosasa pubiflora* was not previously validly published by P. C. Keng (Claves Gen. Sp. Gram. Prim. Sin. 154. 1957 and Fl. Ill. Pl. Prim. Sin. Gram. 32. 1959) because a clear and direct reference to the basionym was not given.

The woolly internode apex is unusual in *Pseudosasa* and rather suggestive of *Indocalamus*.

8. *Pseudosasa subsolida* S. L. Chen & G. Y. Sheng, Acta Phytotax. Sin. 21: 405. 1983.

近实心茶秆竹 *jin shi xin cha gan zhu*

Arundinaria subsolida (S. L. Chen & G. Y. Sheng) C. S. Chao & G. Y. Yang.

Culms ca. 2.5 m, 5–12 mm in diam.; internodes terete, 18–30 cm, nearly solid, basally slightly grooved above branches; wall thick, pith spongy; nodes flattened; sheath scars weakly distinct; intranode 6–7 mm. Culm sheaths light yellow-brown, apically purplish, obscurely streaked, striate, glabrous, margins ciliate; auricle circular, small, ciliate; oral setae deciduous, erect, uneven; ligule arcuate, 7–9 mm or slightly shorter, abaxially scabrid, ciliate; blade erect on basal sheaths, revolute on apical ones, small, involute when dry. Leaves 6 or 7 per ultimate branch; basal sheath densely pubescent, sparsely setose; auricles obscure; oral setae few, short; pseudopetiole ca. 2 mm; blade oblong-lanceolate, 15–20(–23) × 1.2–2.3(–2.7) cm, abaxially densely hairy, secondary veins 5- or 6-paired, base rounded, margins minutely serrulate, apex acuminate. Inflorescence unknown. New shoots early Apr.

- Low slopes of hills. Fujian, Hunan, Jiangxi.

Pseudosasa yuelushanensis is possibly a synonym of this species.

9. *Pseudosasa maculifera* J. L. Lu, J. Henan Agric. Coll. 2: 71. 1981.

鸡公山茶秆竹 *ji gong shan cha gan zhu*

Culms 2–4 m, 0.5–1.5 cm in diam.; internodes initially green, yellow-green when old, 21–31 cm, weakly glaucous, distinctly powdery below node, glabrous; supra-nodal ridge more prominent than persistent sheath base; intranode 5–8 mm. Branches (1 or) 3 per node. Culm sheaths light green, sometimes brown spotted, glabrous or sparsely setose, setae light brown and readily deciduous, margins ciliate; auricles absent; oral setae few, readily deciduous; ligule arcuate, truncate, or acute, 1.5–4 mm, glaucous; blade reflexed or erect, triangular-lanceolate or narrowly linear-lanceolate, entire. Leaves 2–4 per ultimate branch; sheath glabrous, margins ciliate; auricles elliptic or falcate; oral setae radiate; blade elliptic-lanceolate, 7–14 ×

1.2–2.2 cm, abaxially proximally slightly hairy, scabrid, secondary veins 5–9-paired, one margin distally serrulate, other margin entire. Inflorescence racemose, terminal. Spikelets 1 or 2, 3–5 cm; florets 5–7, terminal one sterile; rachilla internodes ca. 6 mm, shortly hairy. Glumes 2; lemma ovate; palea navicular, apex obtuse or 2-cleft, keels ciliate; lodicules 3, nearly equal. Stamens 3. Ovary densely hairy; style 1; stigmas 3. Caryopsis oblong, 9–13 × 3–4 mm. New shoots early Jun, fl. May.

- Slopes, roadsides. S Henan, S Zhejiang.

Pleioblastus intermedius, *P. maculosoides*, *Pseudosasa longiligula*, and *P. wuyiensis* are all possibly synonyms of this species.

- 1a. Culm sheaths glabrous, or apex sparsely setose on both sides; ligule arcuate 9a. var. *maculifera*
- 1b. Culm sheaths densely setose; ligule truncate or acute 9b. var. *hirsuta*

9a. *Pseudosasa maculifera* var. *maculifera*

鸡公山茶秆竹(原变种) jī gōng shān chá gān zhū (yuán biàn zhōng)

Culm sheaths brown spotted, densely setose at base; ligule arcuate; blade triangular-lanceolate.

- S Henan.

9b. *Pseudosasa maculifera* var. *hirsuta* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 45. 1991.

毛箨茶秆竹 mǎo tuō chá gān zhū

Culm sheaths densely setose; ligule truncate or acute; blade narrowly linear-lanceolate.

- Slopes, roadsides. S Zhejiang.

10. *Pseudosasa brevivaginata* G. H. Lai, J. Bamboo Res. 19(2): 37. 2001 ["2000"].

短箨茶秆竹 duǎn tuō chá gān zhū

Rhizomes amphipodial. Culms erect, 1.2–1.6 m, 5–7 mm in diam.; internodes initially green, setose, apically glaucous; supra-nodal ridge prominent, persistent sheath base corky, initially densely long, purple-brown hispid. Branches erect, basally adnate to culm. Culm sheath late deciduous to persistent, initially dark green and purple, distinctly spotted, ca. 1/2 as long as internode, brittle, subleathery, densely long, purple-brown hispid, becoming scabrous and verruculose from persistent bristle bases, basally long, dark purple hispid; auricles and oral setae absent; ligule arcuate, less than 1 mm, ciliate; blade reflexed, subulate or linear, 1.6–2.8 cm, glabrous. Leaves (2 or) 3 or 4 per branchlet; sheaths glabrous, margins initially long ciliate; auricles and oral setae deciduous; ligule truncate, less than 1 mm; blade 11–18 × 1.4–2.5 cm, glabrous, secondary veins 6- or 7-paired, transverse veins distinct. Inflorescence unknown.

- Riversides; below 500 m. Anhui (Tiantang, Yuexi).

11. *Pseudosasa wuyiensis* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 46. 1991.

武夷山茶秆竹 wǔ yǐ shān chá gān zhū

Culms 2.5–3.5 m, ca. 8 mm in diam.; internodes basally grooved above branches, with light powdery traces, black powdery below nodes; nodes weakly raised; sheath base persistent; intranode ca. 4 mm. Culm sheaths purple spotted, glabrous, occasionally sparsely setose at base, margins ciliate; auricles and oral setae absent; ligule arcuate, 3–4 mm, nearly glabrous; blade reflexed, narrowly linear-lanceolate, ca. 1/2 as wide as sheath apex, both surfaces puberulous, base slightly constricted, margin serrulate, apex acute. Leaves 3 or 4 per ultimate branch; sheath densely glaucous, hairy at base, margin ciliate; auricles and oral setae absent; ligule acute or arcuate, ca. 3 mm; pseudopetiole ca. 3 mm; blade narrowly lanceolate, 11–17 × 0.6–0.7 cm, abaxially densely puberulous, base broadly cuneate, margins spinescently serrulate, apex tapering, long acuminate. Inflorescence unknown. New shoots Jun.

- Valley slopes. N Fujian (Wuyi Shan).

This species might be better included within *Pseudosasa maculifera*.

12. *Pseudosasa longiligula* T. H. Wen, J. Bamboo Res. 1(1): 27. 1982.

广竹 guāng zhū

Culms ca. 8 m, to 5 cm in diam.; internodes green, 40–50 cm, glaucous below nodes, glabrous; nodes not raised, remains of sheath base persistent. Culm sheaths green, brown spotted or not, base subglabrous, margins brown ciliate, apex broad and concave; auricles elliptic; oral setae present; ligule arched, sometimes truncate or slightly concave; blade erect, striate, narrowly lanceolate to linear-lanceolate, ca. 1/4 as wide as sheath apex, glabrous, base slightly constricted, apex acuminate. Leaves 4–6 per ultimate branch; sheath densely pubescent, soon caducous, margins densely ciliate; auricle circular to elliptic, very small; oral setae soon caducous, straight or curved, rigid; ligule acute, to 8 mm; blade oblong-lanceolate or narrowly lanceolate, 12.5–22 × 3–2.4 cm, abaxially pubescent with denser hairs along midrib, secondary veins 5–7-paired, base cuneate, margins sharply serrulate, apex acute. Inflorescence unknown.

- N Guangxi.

Pseudosasa longiligula is not to be confused with *P. longiligulata* (McClure) Koidzumi, a much smaller species currently placed in *Sasa*. This species might be better included within *P. maculifera*.

The edible shoots are sweet, and the culms are used for making small items of furniture and props.

13. *Pseudosasa gracilis* S. L. Chen & G. Y. Sheng, Acta Phytotax. Sin. 21: 405. 1983.

纤细茶秆竹 xiān xì chá gān zhū

Culms ca. 1.6 m, to 4 mm in diam.; internodes terete, to 24 cm, not powdery, apically adnately and retrorsely setulose; wall thick, cavity with woolly or irregularly lamellate pith; nodes not raised, remains of sheath base persistent. Culm sheaths gradually deciduous, or rather persistent, ca. 4/7 as long as internodes, glabrous or slightly hairy, densely white hairy toward edges, margins ciliate; auricles obscure; oral setae present, straight or slightly curved, ca. 8 mm, rigid; ligule short, unevenly lacinate; blade erect, striate, broadly ovate-lanceolate,

about as long as sheath, both surfaces glabrous, margins ciliate, apex acuminate. Leaves 2 or 3 per ultimate branch; sheath densely pilose, margins ciliate; auricles obscure; oral setae present, to 1.4 cm; ligule short, 0.5–1.5 mm; pseudopetiole 2–3 mm; blade lanceolate or narrowly lanceolate, 14–19 × 1.2–1.7 cm, abaxially glabrous, adaxially hairy, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots late Apr.

• S Hunan.

This species is possibly a synonym of *Pseudosasa pubiflora*.

14. *Pseudosasa hindsii* (Munro) S. L. Chen & G. Y. Sheng ex T. G. Liang, *Fujian Bamboos* 142. 1987.

簕竹 hui zhu

Arundinaria hindsii Munro, *Trans. Linn. Soc. London* 26: 31. 1868; *Acidosasa denigrata* W. T. Lin; *Arundinaria cerata* McClure; *A. flexuosa* Hance; *A. hirtivaginata* W. T. Lin; *A. maudiae* (Dunn) Keng; *A. multifloscula* W. T. Lin; *A. orthotropoides* (W. T. Lin) W. T. Lin; *A. panda* Keng; *A. quadrangula* W. T. Lin & Z. J. Feng; *A. yangshanensis* W. T. Lin; *Oligostachyum orthotropoides* W. T. Lin; *Phyllostachys maudiae* Dunn; *Pleioblastus hindsii* (Munro) Nakai; *P. hispidulus* W. T. Lin; *P. pandus* (Keng) P. C. Keng; *Pseudosasa aureovagina* W. T. Lin; *P. baiyunensis* W. T. Lin; *P. multifloscula* (W. T. Lin) W. T. Lin; *P. nigrinodis* G. A. Fu; *Thamnocalamus hindsii* (Munro) E. G. Camus.

Culms 3–5 m, ca. 1 cm in diam.; internodes dark green, 20–36 cm, basal ones glabrous but apical internodes hairy, initially glaucous. Branches 3–5 per node, erect. Culm sheaths persistent, sparsely white or light brown setose; auricles falcate; oral setae curved; ligule arcuate, ca. 3 mm; blade erect, broadly ovate-lanceolate, nearly as wide as sheath apex, base slightly constricted. Leaves 4–9 per ultimate branch; sheath deciduous, glabrous or sparsely setulose, margins ciliate; auricles absent; oral setae few; ligule truncate, rigid, 1–1.5 mm; pseudopetiole ca. 2 mm; blade linear-lanceolate or narrowly oblong, 7–22 × ca. 1.6 cm, glabrous or abaxially slightly hairy, secondary veins 3–5-paired, base cuneate, one margin spinescently serrulate, other margin entire, apex acuminate. Inflorescence unknown. New shoots May–Jun.

• Coastal hills, mountains. Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Zhejiang.

This taxon was repeatedly published as a “new species” by some authors because of its rather broad distribution. After checking a large number of herbarium specimens, a conclusion was reached that *Pseudosasa magilaminaris*, *P. orthotropa*, and *P. viridula* are possibly synonyms of this species.

15. *Pseudosasa cantorii* (Munro) P. C. Keng ex S. L. Chen et al., *Fl. Reipubl. Popularis Sin.* 9(1): 654. 1996 [“*cantori*”].

托竹 tuo zhu

Bambusa cantorii Munro, *Trans. Linn. Soc. London* 26: 111. 1868 [“*cantori*”]; *Arundarbor cantorii* (Munro) Kuntze; *Arundinaria basiaurita* W. T. Lin; *A. basigibbosa* McClure; *A. cantorii* (Munro) L. C. Chia ex C. S. Chao & G. Y. Yang; *A. funghomii* McClure; *A. publiannula* W. T. Lin & Z. J. Feng; *Oligostachyum pulchellum* (T. H. Wen) G. H. Ye & Z. P.

Wang; *Pseudosasa hainanensis* G. A. Fu; *Sinobambusa pulchella* T. H. Wen.

Culms 2–4 m, 5–10 mm in diam.; internodes terete; nodes obscure. Branches 3 per node. Culm sheaths gradually deciduous, purple-brown to yellow, ca. 1/2 as long as internodes, glabrous or sparsely setose, margins densely ciliate; ligule arcuate or truncate, slightly concave, scabrid, ciliate; blade erect, narrowly ovate-lanceolate, glabrous, basally 1/2–3/5 as wide as sheath apex, margins serrulate, apex acuminate. Leaves 5–10 per ultimate branch; sheath purple, glabrous or slightly hairy, margins ciliate; auricles falcate or suborbicular; oral setae ca. 5 mm; ligule truncate, short, slightly hairy, entire or lacinate; pseudopetiole ca. 4 mm; blade narrowly lanceolate or oblong-lanceolate, 12–20(–32) × 1.2–2.5(–3.7) cm, both surfaces glabrous, secondary veins 5–9-paired, base broadly cuneate, margins serrulate, apex acuminate. Inflorescence paniculate or racemose, terminal; spikelets 3–4 cm, pedicel 5–15 mm; florets 4–9; rachilla internodes 4–6 mm. Glumes 2; lemma glabrous, margins densely ciliate; palea shorter than lemma. Stamens 3. Ovary oblong, glabrous; styles very short; stigmas 3. New shoots Mar.

• S Fujian, Guangdong, Hainan, S Jiangxi.

16. *Pseudosasa orthotropa* S. L. Chen & T. H. Wen, *J. Bamboo Res.* 1(1): 46. 1982.

面秆竹 mian gan zhu

Culms to 3 m, ca. 1 cm in diam.; internodes terete, to 40 cm, basally grooved above branches; wall thick, pith spongy; nodes weakly prominent or not; intranode 7–9 mm; sheath base persistent, initially glaucous and retrorsely hairy. Branches 1–3 per node. Culm sheaths late deciduous, nearly persistent, green, ca. 1/3 as long as internodes, densely pubescent and sparsely setose or subglabrous, apically glaucous; auricles ovate or oblong, densely ciliate; oral setae curved; ligule very short, slightly prominent, margin shortly ciliate; blade ovate-lanceolate, glabrous, margin ciliate, apex acuminate. Leaves 6–10 per ultimate branch; sheath initially pubescent, margin ciliate; auricles initially small and rounded, obscure when old; oral setae 3–15 mm, fringed, or deciduous; ligule truncate, very short, densely hairy and glaucous, entire or unevenly lacinate; blade 9–27(–34) × 0.8–2.5(–3.5) cm, abaxially shortly hairy, secondary veins 5- or 6-paired, base rounded, margin minutely serrulate, apex acuminate. Inflorescence unknown. New shoots early May.

• Valleys, slopes; low elevations. Fujian, Jiangxi, Zhejiang.

This species is possibly a synonym of *Pseudosasa hindsii*.

17. *Pseudosasa viridula* S. L. Chen & G. Y. Sheng, *Bull. Bot. Res.*, Harbin 11(4): 46. 1991.

笔竹 bi zhu

Culms ca. 4 m, ca. 1 cm in diam.; internodes striate, terete, 10–15 cm, basally slightly flattened above branches, glaucous, pith spongy; nodes weakly prominent; intranode ca. 6 mm; sheath base persistent, glaucous at nodes, dark brown when old. Culm sheaths late deciduous, light brown, sparsely spotted, leathery, sparsely setose and pubescent, margins densely ciliate; auricles brown, circular to elliptic, small; oral setae radiate,

curved, 5–10 mm; ligule arcuate, ca. 1.5 mm, scabrid, ciliolate; blade triangular-lanceolate, base slightly constricted, 2/3–3/4 as wide as sheath apex, margin serrulate, apex acuminate. Leaves (2–)4 or 5(–7) per ultimate branch; sheath setose, glaucous, margins ciliolate; auricles absent; oral setae 7–10; ligule very short, slightly scabrous; blade oblong-lanceolate, 8–30 × 2–3.3 cm, abaxially partially densely hairy, secondary veins (5–)7–10-paired, base broadly cuneate, margins serrulate, apex acute. Inflorescence unknown. New shoots May.

- Plains. Zhejiang (Hangzhou).

This species is possibly a synonym of *Pseudosasa hindsii*.

18. *Pseudosasa magilaminaris* B. M. Yang, J. Hunan Sci. Technol. Univ. 1(1): 111. 1985.

江永茶秆竹 *jiang yong cha gan zhu*

Culms 2–5 m, 5–12 mm in diam.; internodes terete, 20–32 cm, pith spongy; nodes weakly prominent, sheath base persistent, corky, glaucous, pilose; intranode ca. 9 mm. Culm sheaths persistent or late deciduous, brown, shorter than internodes, fragile, densely setose; auricles falcate; oral setae ca. 5 mm; ligule arcuate, ca. 2 mm; blade triangularly ovate-lanceolate, abaxially slightly hairy at base. Leaves 3–7 per ultimate branch; blade elliptic-lanceolate 12–18 × 9–2.3 cm, abaxially slightly hairy, secondary veins 6- or 7-paired, base broadly cuneate, margins serrulate, apex acute. Inflorescence unknown.

- Slopes of hills; low elevations. S Hunan.

This species is possibly a synonym of *Pseudosasa hindsii*.

Taxa incertae sedis

Pseudosasa membraniligulata B.M. Yang (Bamboo Res. 1989(2): 3. 1989) was described from Hunan. It is difficult to decide the identity of this species because the type specimen (*B. M. Yang 06537*, HNNU) is abnormal. According to G. Y. Yang's Ph.D. dissertation, it does not belong to *Pseudosasa*.

Pseudosasa pubicatrix W. T. Lin (J. Bamboo Res. 13(2): 22. 1994, "*pubioicatrix*") was described from Hainan. According to G. Y. Yang's Ph.D. dissertation, the holotype specimen (*Huang Quan 0002*, CANT) is a mixture, which probably includes elements of three different genera: the culm sheaths look like *P. hindsii*, whereas the culms look like *Indocalamus*, and the leafy branches are *Bambusa*.

24. PLEIOBLASTUS Nakai, J. Arnold Arbor. 6: 145. 1925.

苦竹属 *ku zhu shu*

Zhu Zhengde (朱政德 *Chu Cheng-de*); Chris Stapleton

Nipponocalamus Nakai; *Polyanthus* C. H. Hu.

Small, shrubby or arborescent bamboos, spreading and loosely clumped. Rhizomes leptomorph. Culms pluricaespitose, suberect to drooping, 0.5–8 m tall, 0.1–4 cm thick; internodes slightly grooved above branches, glabrous, smooth or rough, pruinose below level nodes. Branch buds tall, prophylls 2-keeled, initially closed at front, on small promontory. Branches erect, initially 1–9 per node, long, subequal, basal nodes compressed, laterals arising from basal nodes, some lateral branches lacking subtending sheaths and replicated, sheaths and prophylls very persistent, papery, ± glabrous. Culm sheaths persistent to very persistent, nearly leathery; blade deciduous, often reflexed. Leaf sheaths persistent; blade small to medium-sized, without substantial winter necrosis of margins, arrangement random or ± distichous, transverse veins distinct. Inflorescence open, racemose to paniculate, branching subtended by very small bracts or hairs, often with pulvini; spikelets exerted on long, delicate pedicels. Spikelets 1–4 cm, disarticulating below florets, with 4–8 florets. Glumes 1 or 2(–5), much shorter than first lemma, delicate, basally loose and usually subtending vestigial buds. Lemma to 1 cm. Anthers 3. Stigmas 3. Fruit a caryopsis.

About 40 species: China, Japan, Vietnam; 17 species (15 endemic, two introduced) in China.

In addition to the species treated below, *Pleioblastus albosericeus* W. T. Lin (J. S. China Agric. Univ. 11(3): 47. 1990, "*albo-sericeus*") was described from sterile material from Guangdong (Fogang). In the protologue it was compared with *P. intermedius*. *Pleioblastus angustatus* W. T. Lin, (J. Bamboo Res. 13(2): 18. 1994) was described from cultivated material from Guangdong (Guangzhou). In the protologue it was compared with *P. amarus*. *Pleioblastus patellaris* W. T. Lin & Z. M. Wu (J. S. China Agric. Univ. 14(3): 113. 1993) was also described from Guangdong and is possibly a species of *Indocalamus*.

- 1a. Culms short, 0.1–1 m; leaf blades variegated or closely distichous (natives of Japan, introduced in China for ornamental purposes).
 - 2a. Leaf blade 6–15 × 0.8–1.4 cm, both surfaces white pubescent, especially abaxially, with yellow or white stripes 16. *P. fortunei*
 - 2b. Leaf blade 3–7 × 0.3–0.8 cm, both surfaces glabrous, not striped; culms 20–40 cm 17. *P. distichus*
- 1b. Culms to more than 1 m; leaf blades not variegated, separated, not distichous (endemic to China).
 - 3a. Culm sheaths without conspicuous auricles, oral setae absent or scarce and inconspicuous.
 - 4a. Culm sheaths ± glossy, usually without setae, hairs, marginal cilia, or powder.
 - 5a. Culm sheaths brown-red, with darker spots, oily-glossy 1. *P. maculatus*

- 5b. Culm sheaths green, without spots, \pm glossy but not oily 2. *P. oleosus*
- 4b. Culm sheaths not glossy, \pm pruinose, often with setae or marginal cilia.
 - 6a. Culm sheath ligules usually truncate, 1–2 mm.
 - 7a. Culms initially glabrous but pruinose, culm sheaths glabrous or with sparse setae 3. *P. amarus*
 - 7b. Culms initially pubescent; culm sheaths setose; leaf blades asymmetrical, especially at base.
 - 8a. Culm sheath blades deflexed or revolute; leaves 3 or 4(–8) per ultimate branch 4. *P. intermedius*
 - 8b. Culm sheath blades erect; leaves 1 or 2 per ultimate branch 5. *P. truncatus*
 - 6b. Culm sheath ligules \pm arcuate, 3–8 mm.
 - 9a. Culm sheaths thickly papery or thinly leathery, ligules ca. 3 mm 6. *P. altiligulatus*
 - 9b. Culm sheaths leathery, setose, ligules 5–8 mm.
 - 10a. Culm sheaths without spots, thickly pruinose and with sparse, brown setae, margins distally pink, ligules ca. 5 mm; leaf sheath auricles truncate to vaulted, 1–2.5 mm 7. *P. incarnatus*
 - 10b. Culm sheaths with brown spots and verrucate setae, margins not pink, ligule ca. 8 mm; leaf sheath auricles triangular, 3–4 mm 8. *P. maculosoides*
- 3b. Culm sheaths with well-developed auricles and oral setae.
 - 11a. Culm sheaths mainly glabrous, basally piliferous 9. *P. juxianensis*
 - 11b. Culm sheaths with setae or marginal cilia.
 - 12a. Internodes with small cavity or subsolid.
 - 13a. Internodes subsolid, initially strigose and finely ridged; leaf sheath auricles absent; oral setae absent to 3, erect, to 5 mm 10. *P. solidus*
 - 13b. Internodes with small cavity, initially glabrous, inconspicuously ridged; leaf sheath auricles ovate to elliptical, oral setae radiating, to 13 mm 11. *P. hsienchuensis*
 - 12b. Internodes with large cavity.
 - 14a. Culm sheath blades intensely crinkled; internodes ca. 35 cm 12. *P. rugatus*
 - 14b. Culm sheath blades smooth; internodes to 33 cm.
 - 15a. Internodes to 18.5 cm, culm wall ca. 3 mm thick 13. *P. yixingensis*
 - 15b. Internodes to 33 cm, culm wall 7–8 mm thick.
 - 16a. Culm sheath ligule truncate, ca. 1 mm, auricles subcircular or falcate, small, oral setae 3–5 mm 14. *P. wuyishanensis*
 - 16b. Culm sheath ligule arcuate, ca. 10 mm, auricles oval to elliptical, oral setae ca. 10 mm 15. *P. sanmingensis*

1. *Pleioblastus maculatus* (McClure) C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 18: 31. 1980.

斑苦竹 ban ku zhu

Sinobambusa maculata McClure, Lingnan Univ. Sci. Bull. 9: 64. 1940; *Arundinaria chinensis* C. S. Chao & G. Y. Yang; *A. kwangsiensis* (W. Y. Hsiung & C. S. Chao) C. S. Chao & G. Y. Yang; *A. maculata* (McClure) C. D. Chu & C. S. Chao ex K. M. Lan (1981), not Hackel (1903); *Pleioblastus kwangsiensis* W. Y. Hsiung & C. S. Chao; *P. longispiculatus* B. M. Yang; *P. maculatus* var. *longitubus* Li & Wu.

Culms 3–8 m, 1.5–4 cm in diam., initially green, densely glaucous; internodes subcylindrical; nodes prominent, brown, yellow-green when old, densely hairy, with prominent setose sheath scar. Culm sheaths deciduous, brown-red, oily, glossy, slightly purple, with unevenly scattered brown spots, basally brown setose, margins without cilia; auricles absent or very reduced, brown, dotlike or ovate; oral setae few, erect or curved; ligule often truncate, dark brown-red, entire; blade pendulous, linear-lanceolate, slightly hairy, scabrous, remotely serrulate or nearly entire, revolute. Leaves 3–5 per ultimate branch, soon deciduous; sheath margin sparsely pubescent; auricles and oral setae absent; ligule truncate, 1–2 mm, hairy, margin ciliate; pseudopetiole ca. 4 mm; blade lanceolate, 8.8–18.5 \times 1.3–2.9 cm, base cuneate, apex elongate. Inflorescence paniculate; florets 8–15 per spikelet. Glumes 2; lemma lustrous;

palea keels ciliate; lodicules 3, subequal in size, ciliate at apex. Ovary bottle-shaped, ca. 8 mm; styles ca. 1.5 mm; stigmas 3, plumose. Caryopsis ellipsoid. New shoots early May–early Jun.

• Often growing in dense forests, also planted as an ornamental. Fujian, Guangdong, Guangxi, Guizhou, Jiangsu, Jiangxi, Sichuan, Yunnan; cultivated northward to S Shaanxi.

The shoots are edible, but must be treated first. The culms are used for light duties; they are fragile and not suitable for weaving.

2. *Pleioblastus oleosus* T. H. Wen, J. Bamboo Res. 1(1): 24. 1982.

油苦竹 you ku zhu

Acidosasa lentiginosa W. T. Lin & Z. J. Feng; *Arundinaria oleosa* (T. H. Wen) Demoly; *A. chinensis* C. S. Chao & G. Y. Yang; *Pleioblastus longinternodius* B. M. Yang; *P. longispiculatus* B. M. Yang; *Polyanthus longispiculatus* (B. M. Yang) C. H. Hu.

Culms diffuse, 3–5 m, 1–3 cm in diam.; internodes initially grass-green, yellow when old, cylindrical, 18–20(–26) cm, grooved above branches, glossy, glabrous; wall ca. 3 mm thick; nodes prominent, deciduously brown setose. Culm sheaths light green, slightly lustrous, base light brown setose, otherwise glabrous; ligules truncate or slightly concave, 1–2 mm, margin ciliate; blade erect or reflexed, green, lanceolate.

Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles and oral setae often absent, rarely 2, short; ligules rounded or truncate, ca. 2 mm, slightly hairy, apex not uniform; pseudopetiole 2–5 mm; blade linear-lanceolate, 12–20 × 1.3–2.2 cm, slightly hairy, secondary veins 5–7-paired, base broadly cuneate, margin serrulate, apex caudate. Inflorescence paniculate, lateral; florets 11–13 per spikelet. Glumes 2–4, apex rounded, beaked; lemma subglabrous, apex acute; palea about as long as lemma, keels ciliolate, apex acuminate; lodicules 3, thick, ± rhomboid, margin ciliolate. Ovary cylindrical; stigmas 2 or 3.

- Mountain slopes; ca. 800 m. Fujian, Jiangxi, Yunnan, Zhejiang.

A plant cultivated in the West under the names *Brachystachyum densiflorum* as well as *P. oleosus* is not in fact this species but an *Oligostachyum*. *Pleioblastus oleosus* is possibly a synonym of *P. maculatus*.

The shoots are edible, and the culms are often used for weaving.

3. *Pleioblastus amarus* (Keng) P. C. Keng, Techn. Bull. Natl. Forest. Res. Bur. 8: 14. 1948.

苦竹 *ku zhu*

Culms 3–5 m, 1.5–2 cm in diam.; internodes green or green-purple, spotted, yellow-green when old, cylindrical, 27–29(–38) cm, basally weakly flattened above branches, glabrous or hairy; wall ca. 6 mm thick; nodes prominent; intranode ca. 6 mm. Leafy branchlets sometimes pendulous. Culm sheaths green, densely glaucous, abaxially glabrous or hairy, densely so at base, margins ciliate and apically orange or withered; auricles obscure; ligule truncate, 1–2 mm, densely glaucous, ciliolate; blade narrowly lanceolate, margins serrulate. Leaves 3 or 4 per ultimate branch; sheath straw-colored, glabrous; auricles and oral setae absent; ligule purple-red, ca. 2 mm; pseudopetiole ca. 2 mm; blade elliptic-lanceolate, 4–20 × 2–2.9 cm, secondary veins 4–8-paired, base cuneate, margin serrulate, apex acuminate. Inflorescence racemose or paniculate. Spikelets 3–6, 4–7 cm, glaucous, pedicels hairy; florets 8–13; rachilla internodes 4–5 mm. Glumes 3–5, enlarged upward; lemma ovate-lanceolate; palea longer than lemma, rarely equal in length, ciliate, glaucous and slightly hairy between keels, apex acute. Lodicules 3, ovate or obovate, posterior narrow, apical margins ciliolate. Anthers light yellow. Ovary narrow, glabrous; styles short; stigmas 3. New shoots Apr–Jun, fl. Apr–May.

- Plains to low hills, frequently cultivated. Anhui, Fujian, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang.

1a. Leafy branchlets pendulous 3b. var. *pendulifolius*

1b. Leafy branchlets not obviously pendulous.

2a. Culm sheaths glabrous or with deciduous white hairs at base 3c. var. *tubatus*

2b. Culm sheaths ± hairy, brown setose at base.

3a. Culms green-purple, purple spotted, densely hairy 3d. var. *hangzhouensis*

3b. Culms initially green, yellow-green when old, glaucous, powdery-spotted, glabrous 3a. var. *amarus*

3a. *Pleioblastus amarus* var. *amarus*

苦竹(原变种) *ku zhu* (*yuan bian zhong*)

Arundinaria amara Keng, Sinensia 6(2): 148. 1935; *A. varia* Keng; *Indocalamus varius* (Keng) P. C. Keng; *Pleioblastus brevinodus* W. T. Lin & Z. J. Feng; *P. longqishanensis* N. X. Zhao & Z. Yu Li; *P. amarus* f. *huangshanensis* C. L. Huang; *P. subrectangularis* T. P. Yi & H. Long; *P. varius* (Keng) P. C. Keng; *P. yingdeensis* W. T. Lin & Z. M. Wu.

Culm sheaths ± hairy, brown setose at base. Culms initially greenish, glabrous, glaucous, yellow-green when old, powdery-spotted. Branchlets not obviously pendulous. New shoots Jun, fl. Apr–May.

- Anhui, Fujian, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang.

The shoots are bitter and inedible. The culms are used for woven baskets and containers, umbrella handles, and furniture.

3b. *Pleioblastus amarus* var. *pendulifolius* S. Y. Chen, Acta Phytotax. Sin. 21: 413. 1983.

垂枝苦竹 *chui zhi ku zhu*

Leafy branchlets pendulous. Culm sheaths not glaucous; ligule truncate, slightly concave. New shoots mid–May to early Jun.

- Low hills, slopes. Zhejiang.

This variety is cultivated as an ornamental for its pendulous habit.

3c. *Pleioblastus amarus* var. *tubatus* T. H. Wen, Bull. Bot. Res., Harbin 3(1): 93. 1983.

胖苦竹 *pang ku zhu*

Culm sheaths green, glossy, hard, glabrous or nearly so at base, acute at apex, amplexicaul at middle part; auricles oblong, small, transversely extended at both sides of sheath apex, margin uniformly rough ciliate, cilia erect and short; blade rounded at apex.

- Low hills, plains. Zhejiang.

3d. *Pleioblastus amarus* var. *hangzhouensis* S. L. Chen & S. Y. Chen, Acta Phytotax. Sin. 21: 408. 1983.

杭州苦竹 *hang zhou ku zhu*

Internodes 28–32(–38) cm; culms green-purple, purple spotted, roughly hairy, hairs dense and inverse. Culm sheath purple-green, glossy, not glaucous; auricles absent; blade linear-lanceolate. New shoots late Apr–May.

- Lowlands, small hills. Zhejiang.

The plants are used for fencing and supporting vegetables and are grown as ornamentals. The culms are not suitable for weaving.

4. *Pleioblastus intermedius* S. Y. Chen, Acta Phytotax. Sin. 21: 408. 1983.

华丝竹 *hua si zhu*

Culms 3–4 m, 1–2 cm in diam.; internodes cylindrical but slightly concave at base above branches, 21–22 cm, initially green and densely glaucous, becoming dark green or yellow-green with persistent dark powder, deciduously setose; wall ca. 6 mm thick, pith lamellate; nodes slightly prominent. Culm sheaths gradually deciduous, green, about as long as internodes

or slightly longer, leathery, sparsely setose, margins withered; auricles absent or small and circular; oral setae few, readily deciduous, erect; ligule truncate or arcuate, ca. 2 mm, glaucous, initially ciliate; blade deflexed or reflexed, shortly triangular, base slightly constricted, apex acuminate. Leaves 3 or 4(–8) per ultimate branch; sheath densely deciduously setose; auricles readily deciduous, falcate; oral setae radiate, purple, ca. 3 mm; ligule prominent, ca. 5 mm; blade lanceolate, $10\text{--}23 \times (1\text{--})2.5\text{--}3.3$ cm, secondary veins 7- or 8-paired, abaxially yellow-green and white tomentellate, adaxially light green and glabrous, base asymmetrically cuneate, margins serrulate. Inflorescence unknown. New shoots mid to late May.

• Near streams, roadsides in secondary hardwood forests; 400–800 m. Zhejiang.

The generic placement of this species is rather uncertain as its flowers and branching have not been described. It is similar to *Acidosasa notata* and species of *Pseudosasa* and might be better included within *P. maculifera*.

The shoots are edible, and the culms are used for handicrafts and umbrella handles.

5. *Pleioblastus truncatus* T. H. Wen, J. Bamboo Res. 3(2): 32. 1984.

尖子竹 *jian zi zhu*

Culms to 2 m, to 8 mm in diam.; internodes initially green, to 36 cm, initially densely light yellow ciliate; nodes weakly prominent; sheath scar asymmetrical, ciliate. Branches 3–7. Culm sheaths gradually deciduous, brown or green, $1/3\text{--}1/2$ as long as internode, leathery, white tomentose, sparsely brown setose, margins sometimes withered, apex truncate; auricles absent or falcate; ligule truncate, ciliate; blade erect, lanceolate, base slightly constricted, ca. $1/3$ as wide as ligule, apex acuminate. Leaves 1 or 2 per ultimate branch; sheath 4.5–7 cm, apex truncate; auricles absent or short; blade broadly lanceolate, $10\text{--}22 \times 1.5\text{--}3.2$ cm, glabrous, secondary veins 7- or 8-paired, asymmetrical especially at base. Inflorescence unknown.

• Zhejiang.

The internodes are long, even, and straight and were often used for arrow shafts.

6. *Pleioblastus altiligulatus* S. L. Chen & S. Y. Chen, Acta Phytotax. Sin. 21: 407. 1983.

高舌苦竹 *gao she ku zhu*

Culms 2–5 m, to 1.5 cm in diam.; internodes green, cylindrical, ca. 24 cm, basally slightly concave above branches, smooth, densely glaucous, glabrous, nearly solid, pith lamellate; supra-nodal ridge more elevated than sheath scar. Culm sheaths green, glabrous, margins ciliate; auricles absent; ligules prominent, ca. 3 mm, glaucous; blade pendulous, purple-red at margins and apex, lanceolate, revolute. Leaves 2–4 per ultimate branch; auricles absent; ligule ca. 3.5 mm; blade elliptic-lanceolate, $12\text{--}17 \times 1.4\text{--}2.5$ cm, shortly hairy, abaxially pilose proximally and along midrib, secondary veins 5–7-paired, base broadly cuneate, apex acuminate. Inflorescence unknown. New shoots late Apr.

• Slopes, summits; 700–800 m. Fujian, Hunan, Zhejiang.

This species is sometimes considered a synonym of *Pleioblastus amarus*.

The culms are used for tools and fencing.

7. *Pleioblastus incarnatus* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 42. 1991.

绿苦竹 *lü ku zhu*

Culms ca. 3.5 m, to 1.5 cm in diam.; internodes cylindrical, to 35 cm, glabrous, initially densely pruinose, retrorsely setose; nodes densely pruinose, dark gray powdery when old; supra-nodal ridge as elevated as sheath scar, both slightly prominent. Branches 5–7, slightly spreading. Culm sheaths green, margins distally pink, densely pruinose, pale brown setose, margins densely ciliate; auricles and oral setae absent; ligule green, slightly pink, truncate or vaulted, ca. 5 mm, irregularly crazed, densely pruinose, slightly rough, margin sparsely ciliate or not; blade reflexed, green, slightly purple, base slightly constricted, margins serrate, apex acuminate. Leaves 3 or 4 per ultimate branch; sheath setose, margins densely ciliate; auricles inconspicuous or small, rounded or elliptic; oral setae radiate, slightly rough; ligule truncate or vaulted, to 1.5 mm, thin, glabrous or slightly rough; pseudopetiole ca. 4 mm; blade narrowly ovate to elliptically lanceolate, $9\text{--}17.5 \times 1.4\text{--}2.5$ cm, abaxially pubescent, glabrescent, adaxially glabrous, secondary veins 5–7-paired, base broadly cuneate or obtusely rounded, margins serrulate or one entire, apex acuminate. Inflorescence unknown. New shoots early May.

• Mountain slopes. Fujian.

8. *Pleioblastus maculosoides* T. H. Wen, J. Bamboo Res. 3(2): 33. 1984.

丽水苦竹 *li shui ku zhu*

Culms to 6.5 m, 2–3 cm in diam.; internodes ca. 40 cm, slightly glaucous, apically pilose; nodes slightly prominent; sheath scar initially tomentose. Culm sheaths initially green, brown spotted and setose, bases of setae forming persistent papillae, slightly glaucous, glabrous at base, margins brown ciliate, apex rounded; auricles absent or weak, abaxially brown hairy, scabrous; oral setae absent or occasionally few, erect, short; ligule ca. 8 mm, nearly triangular, thin, glabrous, ciliate; blade reflexed, linear-lanceolate, abaxially brown pubescent at base, margins glabrous. Leaves 3–5 per ultimate branch; sheath smooth, glabrous; auricles and oral setae usually absent, rarely present; ligule triangular, 3–4 mm, thin, glabrous; pseudopetiole ca. 5 mm; blade broadly lanceolate, $12\text{--}19 \times 1.7\text{--}2.3$ cm, abaxially pubescent, adaxially glabrous, secondary veins 7- or 8-paired, base rounded, apex acute. Inflorescence unknown.

• Zhejiang (Lishui).

The culms are used for canopies, sheds, flag poles, and mosquito net poles.

This species might be better included within *Pseudosasa maculifera*.

9. *Pleioblastus juxianensis* T. H. Wen et al., Acta Phytotax. Sin. 21: 409. 1983.

衢县苦竹 *qu xian ku zhu*

Pleioblastus hsienchuensis T. H. Wen var. *juxianensis* (T. H. Wen et al.) S. L. Chen ex T. G. Liang et al.

Culms to 1.75 m tall, to 1.3 cm in diam., internodes initially green, yellow-green when old, cylindrical, concave above branches, 20–28(–33) cm, slightly glaucous, densely so below sheath scars, glabrous, slightly powdery; wall nearly solid; nodes prominent or swollen; sheath scars slightly prominent. Culm sheaths persistent, green, glaucous, smooth, glabrous, margin brown setose at base, withered; auricles suborbicular, scabrous, roughly ciliate; ligules pale green or withered, truncate or slightly concave, glaucous, margin ciliate; blade green, narrowly lanceolate, densely hairy, scabrous, apex acuminate. Leaves 3–5 per ultimate branch; sheath smooth, glabrous; auricles dotlike or elliptic, scabrous, ciliate, oral setae straight or curved; ligule arcuate, ca. 1.5 mm, glaucous, ciliate at apex, leaf blade light green, ovate or elliptic-lanceolate, 12–18 × 2.3–2.6 cm, abaxially scabrous, pilose at base, secondary veins 6- or 7-paired, base rounded, margin serrulate, apex shortly acuminate. Inflorescence unknown. New shoots early May.

• Hills; low elevations. Zhejiang.

This species has also been considered a variety of *Pleioblastus hsienchuensis*, and also as the same taxon as *P. hsienchuensis* var. *subglabratus*.

10. *Pleioblastus solidus* S. Y. Chen, Acta Phytotax. Sin. 21: 411. 1983.

实心苦竹 shi xin ku zhu

Arundinaria solida (S. Y. Chen) C. S. Chao & G. Y. Yang.

Culms 4–5 m, 1.5–2 cm in diam.; internodes initially green-yellow, cylindrical, slightly concave at base above branches, 24–33 cm, densely ribbed, roughly hairy, black powdery when old, nearly solid; wall thick; nodes prominent, densely black powdery; sheath scars corky. Culm sheath pale green, slightly glaucous, deciduously tomentellate at base and margins; auricles falcate, margins sparsely setose and deciduously ciliate; oral setae light brown; ligules yellow-green, truncate; blade pendulous, linear-lanceolate, often revolute. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles absent; oral setae absent or rarely 1–3, erect, ca. 5 mm; ligule arcuate; blade narrowly lanceolate, 11–18 × 1.7–2.4 cm, abaxially pubescent, secondary veins 5–7-paired, base broadly cuneate, one margin serrulate, other margin nearly entire, apex acuminate or caudate. Inflorescence unknown. New shoots Jun.

• Mountain slopes; ca. 700 m. Jiangsu, Zhejiang.

The culms are heavy, nearly solid, and are often used as supporting poles.

11. *Pleioblastus hsienchuensis* T. H. Wen, Bull. Bot. Res., Harbin 3(1): 92. 1983.

仙居苦竹 xian ju ku zhu

Culms to 5 m, 2–3 cm in diam.; internodes ca. 30 cm, initially brown hispid, white powdery below nodes; wall thick, cavity narrow; nodes prominent. Culm sheath initially green, glaucous, glabrous or initially sparsely setose, base densely brown crinite or white hairy, margins densely ciliate, apex

acute; auricles falcate, subamplexicaul; oral setae erect, 1–1.5 cm; ligules truncate or prominent; blade reflexed at culm base, linear, slightly hairy, margins serrulate. Leaves 3 or 4(or 5) per ultimate branch; sheath obviously striate, ca. 4 cm, glaucous, transverse veinlets distinct; auricles ovate or elliptic; oral setae erect, straight, ca. 1.3 cm; ligules arcuate, 1–4 mm, glaucous, ciliate; petiole 2–5 mm; blade elliptic-lanceolate, 7–16 × 1–2.5 cm, glabrous or abaxially hairy proximally, secondary veins 5- or 6-paired, base rounded, ± oblique, apex acute, extended. Inflorescence unknown. New shoots May–Jun.

• Slopes of hills, plains, roadsides. Zhejiang.

1a. Culm sheaths initially hirsute, base densely brown crinite, leaf ligules

ca. 1 mm 11a. var. *hsienchuensis*

1b. Culm sheaths glabrous, base white

hairy; leaf ligules 3–4 mm 11b. var. *subglabratus*

11a. *Pleioblastus hsienchuensis* var. *hsienchuensis*

仙居苦竹(原变种) xian ju ku zhu (yuan bian zhong)

Arundinaria hsienchuensis (T. H. Wen) C. S. Chao & G. Y. Yang.

Culm sheaths initially sparsely hirsute, base densely brown crinite. Leaf ligule ca. 1 mm. New shoots Jun.

• Slopes of hills, plains, roadsides. Zhejiang.

11b. *Pleioblastus hsienchuensis* var. *subglabratus* (S. Y. Chen) C. S. Chao & G. Y. Yang, J. Bamboo Res. 13(1): 17. 1994.

光箨苦竹 guang tuo ku zhu

Pleioblastus amarus (Keng) P. C. Keng var. *subglabratus* S. Y. Chen, Acta Phytotax. Sin. 21: 413. 1983; *Arundinaria hsienchuensis* var. *subglabrata* (S. Y. Chen) C. S. Chao & G. Y. Yang; *Sinobambusa seminuda* T. H. Wen.

Culm sheaths soon deciduous, glabrous, weakly glaucous, base initially white hairy. Leaf ligules 3–4 mm. New shoots May.

• Slopes of hills, roadsides. Zhejiang.

Pleioblastus juxianensis is possibly another synonym of this variety.

12. *Pleioblastus rugatus* T. H. Wen & S. Y. Chen, J. Bamboo Res. 1(1): 26. 1982.

皱苦竹 zhou ku zhu

Arundinaria rugata (T. H. Wen & S. Y. Chen) C. S. Chao & G. Y. Yang.

Culms to 5 m, to 2 cm in diam.; internodes ca. 35 cm, apically glaucous; wall thick; nodes weakly prominent; sheath scar pubescent. Culm sheaths rigid, deciduously setose, base woolly, apex acute; auricles falcate; oral setae ca. 8 mm, scabrous; ligule slightly arched or nearly truncate, margin pubescent; blade erect, narrowly triangular, strongly rugose, abaxially sericeous. Leaves 3 or 4 per ultimate branch; sheath glabrous;

auricles and oral setae absent; ligules prominent, ca. 2 mm, glabrous, glaucous; petiole 2–3 mm, glabrous; blade lanceolate or oblong, 11–18 × 1.4–3 cm, often glabrous, secondary veins 5–7-paired, base rounded, apex acute. Spikelets ca. 3 cm; florets 5–7. Glumes 2 or 3; lemma ca. 9 × 3 mm, apex acute; palea slightly longer than lemma, apically hairy, keels and margin ciliate, 3-veined between keels, 2-veined beside keels; lodicules 3. Ovary glabrous; styles hispidulous; stigmas 3, plumose.

- S Zhejiang.

Pseudosasa aerea and *Sinobambusa urens* T. H. Wen (J. Bamboo Res. 2(1): 59. 1983) are possibly synonyms of this species.

13. *Pleioblastus yixingensis* S. L. Chen & S. Y. Chen, Acta Phytotax. Sin. 21: 411. 1983.

宜兴苦竹 *yi xing ku zhu*

Arundinaria yixingensis (S. L. Chen & S. Y. Chen) C. S. Chao & G. Y. Yang.

Culms 3–5 m, 1.2–2 cm in diam.; internodes cylindrical, concave basally above branches, 17–18 cm, initially yellow-green, slightly purple, densely glaucous, dark green and yellow with black powder when old, glabrous; wall ca. 3 mm thick; nodes weakly prominent. Culm sheaths green or yellow, densely glaucous, purple setose, margins ciliate, apex withered; auricles falcate; oral setae purple-red, 5–10 mm, rigid, scabrous; ligules prominent or truncate, 4–5 mm, densely glaucous; blade purple-green, narrow, shortly linear-lanceolate or lanceolate, revolute, densely pubescent, constricted at base, margins serrulate, apex acute. Leaves 4 or 5 per ultimate branch; sheath glabrous; auricles variable in shape; oral setae radiate, straw-colored or purple-red; ligule prominent, ca. 3 mm, densely glaucous; blade elliptic-lanceolate, 13.5–24 × 2–3 cm, abaxially tomentellate and proximally pilose by midrib, adaxially glabrous, secondary veins 6–8-paired, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots early May.

- Frequent on low hills. Jiangsu.

14. *Pleioblastus wuyishanensis* Q. F. Zheng & K. F. Huang, Wuyi Sci. J. 2: 17. 1982.

武夷山苦竹 *wu yi shan ku zhu*

Culms to 5 m, to 3.5 cm in diam.; internodes cylindrical, to 33 cm, initially densely pruinose, dark powdery when old; wall ca. 7 mm thick; supra-nodal ridge about as high as sheath scar or lower; intranode 5–6 mm. Branches 3–7, erect, subequal, appressed to culm. Culm sheaths yellow-green, about as long as internodes or slightly shorter, leathery, persistently pruinose, nearly glabrous or with weak deciduous purple setae, slightly gray pubescent at base, margins with or without sparse cilia; auricles subcircular or falcate, small; oral setae to ca. 3.5 mm; ligule purple, truncate, ca. 1 mm; blade deflexed or reflexed, lanceolate, 2.5–6 cm, shortly ciliate at base. Leaves 3 or 4 per ultimate branch; sheath glabrous, slightly pruinose; auricles present; oral setae absent; ligule truncate, ca. 1.5 mm; blade lanceolate, 8–14 × 1.5–2.2 cm, secondary veins 5- or 6-paired,

one margin serrate, other margin nearly entire. Inflorescence unknown.

- Mountain slopes; ca. 200 m. Fujian.

15. *Pleioblastus sanmingensis* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 11(4): 42. 1991.

三明苦竹 *san ming ku zhu*

Culms to ca. 5 m, to 3 cm in diam.; internodes terete, 33–40 cm, initially densely pruinose, yellow-brown and unevenly dark gray powdery when old; wall ca. 8 mm thick; supra-nodal ridge more elevated than sheath scar. Branches 3–5. Culm sheaths yellow-brown, densely purple spotted, leathery, base setose, margins yellow-white, shortly ciliate; auricles purple, ovate or elliptic, large, densely ciliate; oral setae radiate, brown, thick; ligule vaulted, purple, ca. 1 cm, glabrous or pubescent, not ciliate, asymmetrical at apex; blade reflexed or pendulous, green, linear-lanceolate, base pubescent and slightly constricted, margins serrulate, apex acuminate. Leaves 3 or 4 per ultimate branch; sheath usually glabrous, thinly glaucous; auricles purple, ovate or elliptical; oral setae radiating, robust, 3–8 mm; ligule vaulted, 2–3.5 mm; blade rhombic-lanceolate, 9–25 × 1.5–3 cm, glabrous, secondary veins 6–8(or 9)-paired, base cuneate, one margin densely serrulate, other margin sparsely serrate, apex acuminate. Inflorescence unknown. New shoots early May.

- Often in dense pure bamboo forests on mountain slopes. Fujian (Sanming).

16. *Pleioblastus fortunei* (Van Houtte) Nakai, J. Jap. Bot. 9(4): 232. 1933.

菲白竹 *fei bai zhu*

Bambusa fortunei Van Houtte, Fl. Serr. Jard. 15: 69. 1863; *Arundinaria fortunei* (Van Houtte) Rivière & C. Rivière; *A. variabilis* Makino ex Vilmorin var. *fortunei* (Van Houtte) J. Houzeau; *Bambusa picta* Siebold & Zuccarini ex Munro; *B. pygmaea* Miquel; *B. variegata* Siebold ex Miquel; *Nipponocalamus pygmaeus* (Miquel) Nakai; *Pleioblastus pygmaeus* (Miquel) Nakai; *P. variegatus* (Siebold ex Miquel) Makino; *Sasa fortunei* (Van Houtte) Fiori; *S. pygmaea* (Miquel.) Rehder; *S. variegata* (Siebold ex Miquel) E. G. Camus.

Culms 10–30(–80) cm, 1–2 mm in diam.; internodes short, glabrous; nodal ridge flat or weakly prominent. Branches absent or 1 per node. Culm sheaths persistent, glabrous. Leaves 4–7 per culm or branch; sheath glabrous; auricles absent; oral setae white, smooth; blade longitudinally white to pale yellow striped, lanceolate, 6–15 × 0.8–1.4 cm, white pubescent, more densely so abaxially, base broadly cuneate, apex acuminate.

Cultivated for ornamental purposes. Jiangsu, Zhejiang; probably in other provinces [native to Japan].

Flowering of this species in Brazil in 1979 confirmed the presence of 3 stamens, hence its placement in *Pleioblastus* rather than *Sasa*, where it has usually been placed in Chinese literature.

17. *Pleioblastus distichus* (Mitford) Nakai, Rika Kyoiku [Sci. Educ. (Tokyo)] 15(6): 69. 1932.

无毛翠竹 *wu mao cui zhu*

Bambusa disticha Mitford, Garden (London) 46: 547. 1894; *Arundinaria pygmaea* var. *disticha* (Mitford) C. S. Chao & S. A. Renvoize; *A. variabilis* Makino ex Vilmorin var. *disticha* (Mitford) J. Houzeau; *Pleioblastus pygmaeus* var. *distichus* (Mitford) Nakai; *Sasa disticha* (Mitford) E. G. Camus; *S. pygmaea* var. *disticha* (Mitford) C. S. Chao & G. G. Tang.

Culms 20–40 cm, 1–2 mm in diam.; internodes glabrous; nodes glabrous or sometimes sheath scar pilose. Culm sheaths glabrous. Leaves 5–8 per branch, closely spaced, distichous;

auricles absent; oral setae white, smooth; blade erect, lanceolate, 3–7 × 0.3–0.8 cm, rather rigid, glabrous.

Cultivated for ornamental purposes. Jiangsu, Zhejiang [native to Japan].

The miniature cultivar grown in China differs from the type in its smaller stature and glabrous culm sheath nodes. Earlier applications of the name *Bambusa pygmaea* to this species were in error. Flowering of plants cultivated in the United Kingdom around 1970 demonstrated the presence of 3 stamens, hence its placement in *Pleioblastus* rather than *Sasa*, where it has usually been placed in Chinese literature.

25. OLIGOSTACHYUM Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1982(1): 95. 1982 [*Oligostacyum*].

少穗竹属 shao sui zhu shu

Wang Zhengping (王正平 Wang Cheng-ping); Chris Stapleton

Clavinodum T. H. Wen.

Shrubby to arborescent bamboos. Rhizomes leptomorph, with running underground stems. Culms diffuse, sometimes clustering; internodes not terete, flattened above branches; nodes ± elevated; intranode (3–)5 mm. Culm sheaths caducous or tardily deciduous, rarely persistent, leathery or papery; auricles and oral setae absent or sometimes weakly developed; blade spreading or reflexed, sometimes erect. Branches 3(–7) at each node in midculm, spreading. Leaf auricles and oral setae absent or weakly developed; blade small, transverse veins distinct. Inflorescence a raceme with 2 or 3(–6) spikelets, rarely a panicle with many spikelets, peduncle, axis, branches, and pedicels slender, glabrous, scabrous or pubescent along longitudinal angles, branches usually subtended by a scaly bract at base. Spikelets ± compressed at maturity, several to many florets; rachilla disarticulating below fertile florets, extended beyond palea of uppermost floret, internodes flattened or concave on side facing floret. Glumes (1–)3(–5), transitional with basal, sterile lemmas; lemma 7- to many veined, abaxially commonly puberulent and with distinct tessellation, adaxially slightly scabrous with minute setulae, apex acuminate with an awnlike point; palea conspicuously smaller than lemma or equaling in length but much narrower in upper florets, abaxially minutely setulate, 2-keeled, 2–4-veined between and beside keels, apex obtuse or emarginate; lodicules 3, membranous with thickened lower portion, 5–7-veined, margins ciliate, anterior pair of lodicules usually asymmetrical. Stamens 3 or 4(or 5). Ovary glabrous; style 1; stigmas (2 or)3, plumose.

- At least 15 species: China.

Oligostachyum is similar to *Acidosasa*, from which it differs in having florets with no more than 5 stamens.

- 1a. Culm internodes obclavate, lower ones gradually thickened downward; midculm branches 3–7 per node, subequal in diam. 1. *O. oedogonatum*
- 1b. Culm internodes of culm cylindrical, not thickened, midculm branches 3 per node, or if more than 3, then conspicuously unequal in diam.
 - 2a. Culm internodes pitted (like pigskin) below nodes; fertile lemma 15- or 16-veined 15. *O. puberulum*
 - 2b. Culm internodes not pitted; fertile lemma where known 7–15-veined.
 - 3a. Culm sheaths dark brown or straw-colored with gray-black upper margins when dry; leaf sheath ligule more than 2 mm.
 - 4a. Culm sheath apically rounded; blade lanceolate or narrowly lanceolate, base tapered 2. *O. lanceolatum*
 - 4b. Culm sheath apically triangular; blade triangular, triangular-lanceolate, or linear-lanceolate, base not or only weakly tapered.
 - 5a. Culm sheath blade deciduous, both surfaces pubescent toward base; culm sheath ligule glabrous or white ciliate 3. *O. hupehense*
 - 5b. Culm sheath blade persistent, both surfaces glabrous or hirtellous; culm sheath ligule long brown ciliate 4. *O. spongiosum*
 - 3b. Culm sheaths uniformly straw-colored when dry; leaf sheath ligule less than 2 mm.
 - 6a. Basal culm sheaths with longitudinal spots or streaks 5. *O. scabriflorum*
 - 6b. Culm sheaths without spots.
 - 7a. Culm sheath blade narrow, narrowly linear or linear-lanceolate; culm sheath auricles absent.
 - 8a. Leaf blade usually more than 1.2 cm wide, length less than 10 × width 11. *O. gracilipes*
 - 8b. Leaf blade less than 1.2 cm wide, or rarely broader, length ca. 14 × width or more.
 - 9a. Leaf sheath ligule to 1.5 mm, prominently exserted; culm sheaths glabrous 14. *O. paniculatum*
 - 9b. Leaf sheath ligule short, not or slightly exserted, culm sheaths strigose.

- 10a. Culm sheath apically 2-lobed; culms ca. 0.8 cm in diam., internodes 8–12 cm 12. *O. bilobum*
 10b. Culm sheath apically truncate; culms 2–3 cm in diam., internodes ca. 25 cm 13. *O. nuspiculum*
 7b. Culm sheath blade broad, lanceolate, triangular-lanceolate, or linear-lanceolate; culm sheath auricles present or absent.
 11a. Leaf blade linear or linear-lanceolate; culm sheaths glabrous 14. *O. paniculatum*
 11b. Leaf blade lanceolate or elliptic-lanceolate, rarely linear-lanceolate; culm sheaths hairy.
 12a. Culm sheaths centrally glabrous.
 13a. Culm sheaths pubescent at base only; culm sheath and leaf sheath auricles usually present, oral setae developed; culm sheath blade glabrous on both surfaces 6. *O. glabrescens*
 13b. Culm sheaths hairy basally, along both sides, and apically; auricles absent, oral setae not developed, culm sheath blade hirtellous on both surfaces 7. *O. scopulum*
 12b. Culm sheaths uniformly setose or strigose.
 14a. Culm sheaths without auricles and oral setae, uniformly thickly white powdery 8. *O. sulcatum*
 14b. Culm sheaths with small auricles and developed oral setae, without powder or powdery only below nodes when young.
 15a. Culm internodes setulose, white powdery below nodes and gray-green with minute, purple speckles when young 9. *O. shiuyingianum*
 15b. Culm internodes glabrous, not white powdery, uniformly green when young 10. *O. lubricum*

1. *Oligostachyum oedogonatum* (Z. P. Wang & G. H. Ye) Q. F. Zheng & K. F. Huang, Wuyi Sci. J. 2: 92. 1982.

肿节少穗竹 zhong jie shao sui zhu

Pleiblastus oedogonatus Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(1): 96. 1981; *Arundinaria oedogonata* (Z. P. Wang & G. H. Ye) G. Y. Yang & C. S. Chao; *Clavinodum oedogonatum* (Z. P. Wang & G. H. Ye) T. H. Wen; *Indosasa curvaurita* B. M. Yang.

Culms ca. 4.5 m, ca. 0.8 cm in diam.; internodes initially dull green becoming gray-green, sometimes with minute dark purple dots, to 33 cm, basally swollen, white powdery, glabrous; supra-nodal ridge strongly elevated, much more prominent than slightly elevated sheath scar. Branches (3–)5(–7) per node, horizontally spreading, subequal in diam. Culm sheaths purple-green, basally, marginally, and apically dark purple, thinly white powdery, lower and middle culm sheaths rather densely strigose; auricles deciduous, deep purple, small; oral setae 3–5, purple; ligule subtruncate, ca. 3 mm, margins subglabrous; blade erect or spreading, deep purple, lanceolate to linear. Leaves 2 or 3 per ultimate branch; sheath glabrous throughout; auricles deciduous, deep purple, narrowly falcate; oral setae several; ligule arcuate, ca. 2 mm, margin subglabrous; blade linear-lanceolate, 13–25 × 0.7–3.9 cm, both surfaces glabrous, secondary veins 5–8-paired. Racemes 4–6 cm, with 2 or 3 spikelets; peduncles slender, enclosed by sheathlike bracts, bracts gradually larger; axis slender, glabrous; pedicels ca. 1.5 cm, slender, glabrous or sometimes sparsely pubescent, angles slightly scabrous. Spikelets 1.5–5 cm; florets several to many. Rachilla readily disarticulating below fertile florets, internodes 2–3.5 mm, angles and apex ciliate. Glumes 1–3, first small, second and third resembling lemma, ca. 1.1 cm, 7–9-veined; lemma 1.3–1.6 cm, 7–11-veined, hirtellous, margins ciliate, apex acuminate with an awnlike point; palea 8–10 mm, keels rigidly ciliate in upper 2/3, apex obtuse or emarginate; lodicules 3. Stamens 3(–5); anthers 4–5 mm. Style 1; stigmas 3. New shoots May, fl. Apr–May.

• Open forests on slopes; below 1500 m. S Zhejiang (N Wuyi Shan)

2. *Oligostachyum lanceolatum* G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 24(1): 163. 1988 [*“lanceolatum”*].

云和少穗竹 yun he shao sui zhu

Culms ca. 4.5 m, 2–3 cm in diam.; internodes purple-green, to 26 cm, weakly grooved above branches, initially with a white powdery ring below nodes, glabrous; nodes elevated, supra-nodal ridge equaling sheath scar or slightly more prominent; intranode ca. 3 mm. Culm sheaths dull green, with yellow-green streaks and purple ciliate margins when fresh, becoming pale brown with gray-black margins in upper part, upper 2/3 with brown or pale brown strigose hairs or striae and with brown papillae left by fallen hairs; auricles and oral setae absent; ligule arcuate, glabrous, margin weakly sinuous; blade erect to reflexed, deep green with purple apex, narrowly lanceolate, both ends gradually narrowed, margins ciliate, otherwise glabrous. Leaves (1 or)2 or 3(or 4) per ultimate branch; sheath entirely glabrous; auricles and oral setae absent; ligule arcuate or truncate, 1.5–2.5 mm; blade to 16 × 1.5 cm, abaxially puberulent, adaxially glabrous. Inflorescence unknown. New shoots Apr.

• Roadsides; ca. 500 m. Zhejiang.

3. *Oligostachyum hupehense* (J. L. Lu) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 24(1): 164. 1988.

凤竹 feng zhu

Pleiblastus hupehensis J. L. Lu, J. Henan Agric. Coll. 1981(2): 73. 1981; *Arundinaria hupehensis* (J. L. Lu) C. S. Chao & G. Y. Yang; *Sinobambusa acutiligulata* W. T. Lin.

Culms ca. 5.5 m, 1–2.5 cm in diam.; internodes green-purple, to 23 cm, initially retrorsely white setulose; wall ca. 3 mm thick; nodes elevated, supra-nodal ridge more prominent than sheath scar; sheath scar with persistent base of sheath and

deciduous ring of hairs. Culm sheaths deciduous, purple-green when fresh, pale brown when dry, papery, strigose, densely retrorsely puberulent at base, margins brown ciliate; auricles and oral setae absent; ligule pale brown, arcuate, abaxially hispidulous, white ciliate; blade deciduous with articulate base, erect, narrowly triangular to linear-lanceolate, both surfaces pubescent especially toward base, margins brown ciliate. Leaves 1–3 per ultimate branch; sheath pubescent especially on upper part; ligule 1–3 mm, puberulent; blade oblong-lanceolate, 6–15 × 0.6–1.6 cm, glabrous or abaxially pilose at base of mid-vein. Racemes with 2 or 3(–5) spikelets; peduncle and sometimes lower branches enclosed by sheathlike bracts; pedicel slender, pubescent, subtended by a subulate bract. Spikelets 1.4–3.5 cm; florets 3–7; rachilla internodes ca. 4 mm, ciliate. Glumes 2 or 3, 1st small, 7–9-veined, 2nd and 3rd resembling lemma; lemma ca. 1.2 cm, scabrid, white pubescent, upper margins ciliate; palea ca. 4 mm, keels sparsely ciliate, apex obtuse or arcuate, sometimes emarginate; lodicules 3, several veined, margin ciliate, posterior one smaller. Stigmas 3. New shoots late Apr, fl. early Apr.

• Hubei.

4. *Oligostachyum spongiosum* (C. D. Chu & C. S. Chao) G. H. Ye & Z. P. Wang, Fl. Reipubl. Popularis Sin. 9(1): 575. 1996.

斗竹 *dou zhu*

Arundinaria spongiosa C. D. Chu & C. S. Chao, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 33. 1981; *Acidosasa bilamina* W. T. Lin & Z. M. Wu; *Pleioblastus altiligulatus* var. *spongiosus* B. M. Yang; *Sinobambusa anaurita* T. H. Wen.

Culms to 10 m, 4–6 cm in diam.; internodes green, becoming yellow-green, 20–40 cm, weakly grooved above branches, white powdery especially below nodes, glabrous, pith spongy; nodes elevated. Culm sheaths red-brown when fresh, gray-brown when dry, apex triangularly attenuated, strewn with brown strigose hairs or later with striae, base densely setose and hirtellous, margins brown setose; auricles absent; oral setae absent or rarely weakly developed; ligule arcuate, ca. 1 mm, ciliate; blade persistent, erect, narrowly triangular or triangular-lanceolate, faintly crinkled, base nearly as broad or slightly narrower than apex of culm sheath. Leaves 3–5 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule 2–2.5 mm; blade lanceolate or linear-lanceolate, 9–17 × 1–2 cm, glabrous. New shoots May.

• Broad-leaved forests, forest margins; below 800 m. Guangxi.

5. *Oligostachyum scabriflorum* (McClure) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1982(1): 98. 1982.

糙花少穗竹 *cao hua shao sui zhu*

Culms to 7 m, ca. 4 cm in diam.; internodes dark green, with purple markings, to 40 cm or more, initially white powdery below nodes, glabrous or pubescent; nodes weakly elevated, supra-nodal ridge as prominent as sheath scar or more prominent in slender culms. Culm sheaths yellow-green or green in smaller shoots, distally laterally straw-colored, with irregular, longitudinal, brown spots and streaks at lower nodes, these diminishing in mid-culm and absent in upper culm;

auricles and oral setae absent; ligule purple, arcuate or convex, to ca. 5 mm, puberulent, ciliate; blade reflexed, usually purple-tinged, lanceolate to linear-lanceolate, contracted at base. Leaves (1 or)2 or 3(–5) per ultimate branch; sheath glabrous; ligule obliquely arcuate or oblique, to ca. 2 mm, glabrous or puberulent, entire or ciliate; blade oblong-lanceolate or linear-lanceolate, to 15 × 1.9 cm, abaxially glaucous or gray-green and puberulent or glabrous, adaxially deep green and glabrous. Racemes 6–12(–16) cm, with (1 or)2 or 3(–6) spikelets; peduncle and lower branches enclosed by sheathlike bracts or slightly exerted; pedicels 5–8 mm, slender, glabrous, subtended by a minute, membranous bract. Spikelets linear or linear-lanceolate, to 8 cm; florets several to many; rachilla internodes 4–5 mm, compressed, apex puberulent. Glumes 3, 1st much smaller, 5–9-veined, 2nd and 3rd resembling lemmas but slightly smaller; lemma 1–2 cm, 11–15-veined, transverse veins abaxially distinct, scabrid, proximally pubescent, apex acuminate with a subulate or short awnlike point; palea abaxially scabrid, usually pubescent, inconspicuously 2–4-veined between keels and on each flank, apex obtuse or emarginate; keels distally distinct, glabrous or distally sparsely ciliate, extending into subapical mucros; lodicules 3, narrowly rhomboid-ovate or lanceolate, ca. 4 mm. Stamens 3; anthers ca. 7 mm. Style slender; stigmas 3. New shoots and fl. May.

• Forests on slopes of hills; below 1100 m. Fujian, Guangdong, Guangxi, S Hunan, S Jiangxi.

- 1a. Culm sheath ligule 2–5 mm; leaf sheath ligule 1–2 mm, glabrous 5a. var. *scabriflorum*
- 1b. Culm sheath ligule less than 1 mm; leaf sheath ligule less than 1 mm, hirtellous 5b. var. *breviligulatum*

5a. *Oligostachyum scabriflorum* var. *scabriflorum*

糙花少穗竹(原变种) *cao hua shao sui zhu* (yuan bian zhong)

Semiarundinaria scabriflora McClure, Lingnan Univ. Sci. Bull. 9: 52. 1940; *Acidosasa heterolodicula* (W. T. Lin & Z. J. Feng) W. T. Lin; *A. macula* W. T. Lin & Z. M. Wu; *Arundinaria heterolodicula* (W. T. Lin & Z. J. Feng) W. T. Lin; *A. maculosa* C. D. Chu & C. S. Chao; *A. scabriflora* (McClure) C. D. Chu & C. S. Chao; *Indosasa angustifolia* W. T. Lin; *I. macula* W. T. Lin & Z. M. Wu; *?I. pusilloaurita* W. T. Lin; *I. suavis* W. T. Lin & Z. J. Feng; *I. truncata* B. M. Yang; *Oligostachyum fujianense* Z. P. Wang & G. H. Ye; *O. heterolodiculum* W. T. Lin & Z. J. Feng; *Pleioblastus ruyuanensis* W. T. Lin & Z. J. Feng; *Pseudosasa flexuosa* T. P. Yi & X. M. Zhou; *Sinobambusa exaurita* W. T. Lin; *S. sulcata* W. T. Lin & Z. M. Wu.

Culm sheath ligule 2–5 mm, glabrous; leaf sheath ligule 1–2 mm.

• Forested slopes; below 1100 m. Fujian, Guangdong, Guangxi, S Hunan, S Jiangxi.

5b. *Oligostachyum scabriflorum* var. *breviligulatum* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 24(1): 164. 1988.

短舌少穗竹 *duan she shao sui zhu*

Arundinaria maculosa var. *breviligulata* (Z. P. Wang & G. H. Ye) C. S. Chao & G. Y. Yang; *Indosasa breviligulata* W. T. Lin & Z. M. Wu.

Both culm sheath and leaf sheath with ligule less than 1 mm; leaf sheath ligule minutely hairy at base.

- Forested slopes; ca. 500 m. Guangdong.

6. *Oligostachyum glabrescens* (T. H. Wen) P. C. Keng & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 26(3): 488. 1990 [*"glabreus"*].

屏南少穗竹 ping nan shao sui zhu

Sinobambusa glabrescens T. H. Wen, J. Bamboo Res. 1(2): 20. 1982.

Culms ca. 2 m or more, ca. 1 cm in diam.; internodes lower 1/2 flattened above branches, green, ca. 30 cm, initially with a white powdery ring below nodes; supra-nodal ridge weakly elevated; sheath scar flat, initially pubescent. Culm sheaths light green, glabrous except at base; auricles absent or small; oral setae 2 or 3, short; ligule ca. 1 mm, initially ciliate; blade usually reflexed, lanceolate or linear-lanceolate. Leaves 3 or 4 per ultimate branch; sheath glabrous, margins densely ciliate; auricles spreading, green, small; oral setae 2 or 3; ligule ca. 1 mm, puberulent; blade lanceolate, 9–11 × 1.1–1.5 cm, abaxially puberulent, adaxially glabrous. Racemes initially terminating leafy branches, peduncle and base of inflorescence enclosed by leaf sheaths; axis and pedicels glabrous or scabrid along angles. Spikelets linear, 4–7 × ca. 0.5 cm; florets 5–11, lower 2 or 3 sometimes sterile. Glumes 2 or 3, thinner than lemma, initially pubescent, 1st small, 5–7-veined, 2nd and 3rd larger, 9–11-veined; lemma 11–14 × ca. 3 mm, scabrid, initially pubescent, transverse veins distinct, apex acuminate or mucronate; lodicules membranous, thickened at base, 5–7-veined. Stamens 3; anthers yellow, ca. 5 mm. Style short; stigmas 3. New shoots May, fl. Jun.

- Roadsides; ca. 900 m. Fujian.

7. *Oligostachyum scopulum* (McClure) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1982(1): 98. 1982.

毛矜少穗竹 mao fu shao sui zhu

Semiarundinaria scopula McClure, Lingnan Univ. Sci. Bull. 9: 53. 1940; *Arundinaria scopula* (McClure) C. D. Chu & C. S. Chao.

Culms to 5 m, ca. 1.5 cm in diam.; internodes initially with a white powdery ring below node, pubescent, becoming glabrous; nodes moderately elevated. Culm sheaths tardily deciduous, base retrorsely hirtellous, apex and both sides strigose or with striae and papillae left by fallen hairs; auricles and oral setae absent; ligule truncate or weakly concave, 1–2 mm, hirtellous, apically ciliate or entire; blade deciduous, erect or reflexed, lanceolate, both surfaces introrsely hirtellous. Leaves 5–9 per ultimate branch; sheath glabrous or subglabrous; auricles and oral setae absent; ligule truncate, less than 1.5 mm, scabrous; blade oblong-lanceolate, 5.5–17 × 0.8–2.1 cm, both surfaces subglabrous. Racemes or panicles initially terminal to leafy branches, later lateral at lower nodes, with 2–5 spikelets; peduncles slender, lower 2/3 enclosed by sheathlike bracts in

lateral inflorescences; pedicels 5–14 mm, slender, glabrous or partly hirsute or hispid along angles. Spikelets 4(–7) × ca. 0.2 cm; florets 6–8; rachilla internodes ca. 1/2 as long as lemma, apex ciliate. Glumes 3 to several, 1st small, others gradually larger; sterile lemmas 1 to several, small, resembling glumes, embracing a small palea; fertile lemmas ca. 7.5(–9) mm, veins inconspicuous, apex acuminate; palea smaller than or about as long as lemma in spikelet center, longer in distal florets, but always narrower than lemma, apex obtuse, keels densely long ciliate; lodicules 2–3 mm. Stamens 3. Stigmas (2 or)3(or 4).

- Open forests in rocky valleys; ca. 1000 m. Hainan.

8. *Oligostachyum sulcatum* Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1982(1): 96. 1982.

少穗竹 shao sui zhu

Sinobambusa parvifolia T. H. Wen & S. Y. Chen, J. Bamboo Res. 6(3): 31. 1987; *Arundinaria sulcata* (Z. P. Wang & G. H. Ye) C. S. Chao & G. Y. Yang.

Culms to 12 m, ca. 6.2 cm in diam.; internodes initially purple-green, to 37.5 cm, initially white powdery, basally or completely grooved above branches; nodes weakly developed, supra-nodal ridge slightly more prominent than sheath scar. Culm sheaths yellow-green, glabrous, white powdery and densely brown strigose, especially densely so at base, margins ciliate in lower culm; auricles and oral setae absent; ligule ca. 3.5 mm, convex at middle, glabrous, ciliate; blade erect or spreading, purple-green, triangular-ovate to linear-lanceolate, proximally contracted. Leaves 2 or 3 per ultimate branch; sheath entirely glabrous; auricles and oral setae absent; ligule arcuate, 1–1.5 mm, ciliate; blade linear-lanceolate, 9–16 × 0.9–1.5 cm. Racemes consisting of 2 or 3(–6) spikelets; peduncle slender, basally enclosed by sheathlike bracts, axis slender, glabrous; pedicels 1–1.5 cm, slender, glabrous. Spikelets lanceolate to linear-lanceolate, 15–37 × 1.5–3 mm; florets 3–7. Rachilla internodes 4–5 mm, flattened on side facing floret, sparsely ciliate along margins. Glumes usually 2, first small with inconspicuous veins, second 7–10 mm, 7-veined; lemma 1.1–1.3 cm, scabrous, 9–15-veined, adaxially transverse veins distinct, apex acuminate; palea 7–10 mm, keels ciliate, apex obtuse; lodicules 3, several veined, ciliate. Stamens 3 or 4. Style 1; stigmas 3, plumose. New shoots May, fl. Apr–May.

- Forests; ca. 800 m. Fujian; cultivated in Zhejiang.

9. *Oligostachyum shiuyingianum* (L. C. Chia & But) G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 26(3): 486. 1990.

秀英竹 xiu ying zhu

Arundinaria shiuyingiana L. C. Chia & But, Kew Bull. 37: 591. 1983.

Culms 4–6 m, 1–2 cm in diam.; internodes gray-green, usually with purple speckles, initially usually white powdery below nodes and sparsely setulose; nodes elevated, supra-nodal ridge more prominent than sheath scar. Culm sheaths yellow-green with purple-green base, brown strigose, margins ciliate; auricles small; oral setae 2 to several; ligule truncate, ca. 1 mm, white ciliate; blade erect, brown-green, ovate-lanceolate or lanceolate, base ca. 1/2 as wide as apex of culm sheath. Leaves 5–

9 per flowering branch; sheath with purple speckles, glabrous; auricles not developed; oral setae 2 or 3; ligule purple, truncate, 0.5–1 mm, weakly exserted, hairy; blade 12–20 × 0.8–1.3 cm, both surfaces glabrous, abaxially transverse veins distinct, rectangular. Racemes or small panicles with 2–4 spikelets, partially exserted from leaf sheaths; axis and branches slender, glabrous or branches sparsely hirtellous along angles. Spikelets lanceolate, 3–8 × ca. 0.5 cm; florets 5–15. Glumes 2, 1st smaller, 8–9 mm; lemma purple speckled, 1.7–2 cm, deciduously pubescent, apex with mucro 2–3 mm; palea 1.2–1.4 cm, pubescent, keels sparsely ciliolate, apex obtuse, thickly hairy; lodicules 3. Stamens 3. Style 1; stigmas 3.

• Partially shaded slopes of hills; below 100 m. Hainan, Hong Kong.

10. *Oligostachyum lubricum* (T. H. Wen) P. C. Keng, J. Nanjing Univ., Nat. Sci. Ed. 22(3): 415. 1986.

四季竹 *si ji zhu*

Semiarundinaria lubrica T. H. Wen, J. Bamboo Res. 2(1): 64. 1983; *Arundinaria lubrica* (T. H. Wen) C. S. Chao & G. Y. Yang.

Culms ca. 5 m, ca. 2 cm in diam.; internodes green, ca. 30 cm, basally flattened above branches, without powder, glabrous. Culm sheaths green, sparsely white or yellow hairy or with imprints and brown papillae from fallen hairs, margins white ciliate; auricles purple or brown, ovate or rarely falcate; oral setae erect, flexuose; ligule purple, truncate, ca. 1.5 mm, margin purple ciliate; blade green, broadly lanceolate, margins ciliate, base contracted, apex acuminate. Leaves 3 or 4 per ultimate branch; sheath pubescent; auricles purple; oral setae usually developed; ligule purple, arcuate or truncate; blade linear-lanceolate, 10–15 × 1.5–2.5 cm, both surfaces glabrous or abaxially scabrous, secondary veins 6-paired, transverse veins distinct. Racemes with 1–4 spikelets; peduncle and branches partially exserted from sheathlike bracts with small blades; axes glabrous. Spikelets to 6 cm, compressed; florets 4–9, lowest one sterile with a lemma enclosing a very small palea. Glumes 1 or 2, 1st 5–8 mm, inconspicuously 5–9-veined, apex and midvein puberulent, 2nd longer, 7–11-veined; lemma purple-red, 1.6–1.8 cm, abaxially initially scabrid and pubescent, adaxially distally puberulent, 11–13-veined; palea keels long ciliate, apex obtuse or emarginate, 5-veined between keels, each flank 4-veined; lodicules 3, upper part membranous, margins ciliate. Stamens 3; anthers yellow, ca. 4 mm. Stigmas 2. New shoots May–Oct, fl. May.

• 400–500 m. Fujian, Jiangxi, Zhejiang.

11. *Oligostachyum gracilipes* (McClure) G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 26(3): 488. 1990.

细柄少穗竹 *xi bing shao sui zhu*

Semiarundinaria gracilipes McClure, Lingnan Univ. Sci. Bull. 9: 47. 1940; *Arundinaria gracilipes* (McClure) C. D. Chu & C. S. Chao; *Clavinodum globinodum* (C. H. Hu) P. C. Keng; *Pleioblastus globinodus* C. H. Hu.

Culms ca. 2 m, ca. 1 cm in diam.; internodes sometimes becoming purplish in age, initially with a white powdery ring

below node, apically retrorsely white pubescent; nodes elevated, supra-nodal ridge more prominent than sheath scar; intranode ca. 5 mm. Culm sheaths tardily deciduous or nearly persistent, purple-green, strigose or with papillae from fallen hairs between veins, base thickened and densely setulose, margins ciliate; auricles and oral setae absent; ligule truncate or arcuate, usually ca. 2 mm, puberulent, ciliate; blade deciduous, erect to reflexed, usually linear-lanceolate to linear. Leaves 3–5 or rarely more per ultimate branch; sheath glabrous or ciliate along distal margins; auricles absent; oral setae absent or several, erect; ligule truncate or arcuate, to 1 mm, hirtellous, ± ciliolate; blade oblong-lanceolate, ca. 20 × 2 cm, both surfaces glabrous, abaxially scabrid. Racemes with 3–5 spikelets; pedicels slender, setulose along angles, subtended by a small, subulate bract. Spikelets 4–6 cm; florets many; rachilla internodes ca. 1/2 as long as lemma, abaxially densely antrorsely pubescent, apex ciliate. Glumes and sterile lemmas 3 or 4 or more, distinctly smaller than fertile lemma, 1st small, others gradually larger; lemma to 1.4 cm, many veined, abaxially scabrid, margins distally ciliate, apex mucronate; palea much smaller than lemma in lower and middle florets or nearly equaling in upper florets, keels densely ciliate, abaxially pubescent, apex obtuse or acute, exceeding keels; lodicules ca. 4 mm. Stamens 3; anthers 5–6 mm. Styles 3. New shoots Apr–May, fl. May.

• Mountain slopes; 600–700 m. Hainan.

12. *Oligostachyum bilobum* W. T. Lin & Z. J. Feng, J. Bamboo Res. 13(2): 23. 1994.

裂舌少穗竹 *lie she shao sui zhu*

Culms 1–1.5 m, to 0.8 cm in diam.; internodes 8–12 cm; nodes elevated, nodal ridge more prominent than sheath scar; intranode 2–3 mm. Branches 3 per node. Culm sheath green, sparsely strigose or with papillae left by fallen hairs, apex 2-lobed; auricles absent; oral setae absent or few, erect; ligule 0.5–1 mm; blade deciduous, narrowly linear. Leaves 3 per ultimate branch; sheath glabrous; auricles present; oral setae absent or few; ligule short, hirtellous; blade linear to linear-lanceolate, to ca. 18 × 0.5–1 cm, sometimes broader, both surfaces glabrous. Racemes with 4 or 5 spikelets; peduncle slender, glabrous; axis and pedicels slender, glabrous; pedicels 1–1.5 mm, sometimes subtended by a small, membranous bract. Spikelets initially purplish, linear-lanceolate, to 7 cm; florets many; rachilla internodes 4.5–6 mm, apex ciliate. Glumes 2–4, gradually larger, uppermost one similar to lemma but slightly smaller; lemma ca. 1.5 cm, 13–15-veined, transverse veins adaxially distinct, apex acuminate, mucronate; palea much smaller than lemma, keels distally ciliate, apex obtuse or acute, exceeding keels; lodicules 3, anterior pair obliquely lanceolate, 5–9-veined, apex ciliolate. Stamens 3; anthers ca. 4 mm. Style shortly 3-fid. New shoots and fr. Apr–May.

• Forested slopes; 500–1500 m. Guangdong.

13. *Oligostachyum nuspiculum* (McClure) Z. P. Wang & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1982(1): 98. 1982.

林仔竹 *lin zi zhu*

Semiarundinaria nuspacula McClure, Lingnan Univ., Sci.

Bull. No. 9: 50. 1940; *Arundinaria lima* (McClure) C. D. Chu & C. S. Chao; *A. nuspacula* (McClure) C. D. Chu & C. S. Chao; *Oligostachyum lima* (McClure) Demoly; *S. lima* McClure.

Culms ca. 4 m, 2–3 cm in diam.; internodes ca. 25 cm; nodes elevated, supra-nodal ridge more prominent than sheath scar; intranode ca. 5 mm. Culm sheaths green, sparsely strigose or with papillae left by fallen hairs; auricles absent; oral setae absent or few, erect; ligule arcuate, ca. 2 mm or very short, hirtellous, margin ciliate; blade deciduous, narrowly linear. Leaves (1 or) 2 or 3 (or 4) per ultimate branch; sheath glabrous; auricles absent; oral setae absent or few; ligule short, hirtellous; blade narrow, linear or linear-lanceolate, to 18×0.5 –1 cm, sometimes broader, both surfaces glabrous. Racemes with 2–4 spikelets; peduncle slender, glabrous; axes and pedicels slender, glabrous; pedicels 1–1.5 mm, sometimes subtended by a small, membranous bract. Spikelets initially purplish, linear-lanceolate, to 7 cm; florets many; rachilla internodes 4.5–6 mm, apex ciliate. Glumes 2–4, gradually larger, uppermost one similar to lemma but slightly smaller; lemma ca. 1.5 cm, 13–15-veined, transverse veins adaxially distinct, apex acuminate, mucronate; palea much smaller than lemma, keels distally ciliate, apex obtuse or acute, exceeding keels; lodicules 3, anterior pair obliquely lanceolate, 5–9-veined, apex ciliolate. Stamens 3; anthers ca. 4 mm. Style shortly 3-fid. New shoots and fr. Apr–May.

• Forested slopes; 500–1500 m. Hainan.

14. *Oligostachyum paniculatum* G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 26(3): 485. 1990.

圆锥少穗竹 *yuan zhui shao sui zhu*

Culms 2–3 m, 0.5–1 cm in diam.; internodes 15–25 cm, initially white powdery, glabrous; supra-nodal ridge more prominent than sheath scar. Culm sheaths tardily deciduous, glabrous; auricles absent; oral setae absent or few, erect; ligule weakly arcuate, less than 1 mm, margin ciliate; blade deciduous, not seen. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule exserted, obliquely arcuate, 1–1.5 mm, proximally densely puberulent, otherwise glabrous; blade linear or linear-lanceolate, ca. 15×1 cm, both

surfaces glabrous, abaxially scabrid, apex acuminate, mucronate. Panicles with several to many spikelets, peduncle and lower branches enclosed by sheathlike bracts. Branches and pedicels slender, angles hirtellous. Spikelets to 11.5 cm; florets many; rachilla internodes ca. 1/2 as long as florets, external side and apex puberulent. Glumes 2 or 3, 1st smaller, 2nd and 3rd longer, resembling lemma; lemma ca. 1.3 cm, scabrid, 7–13-veined, apex acuminate, mucronate; palea much smaller than lemma, keels ciliate, apex exceeding keels; lodicules 3, 2–2.5 mm, ciliate, anterior 2 obliquely lanceolate, posterior narrowly lanceolate. Stamens 3; anthers ca. 4 mm. Style 1; stigmas 3. New shoots and fl. Apr–May.

• Guangxi.

15. *Oligostachyum puberulum* (T. H. Wen) G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 26(3): 486. 1990.

多毛少穗竹 *duo mao shao sui zhu*

Sinobambusa puberula T. H. Wen, J. Bamboo Res. 2(1): 58. 1983.

Culm internodes basally flattened above branches, prominently pitted (like pigskin) below nodes, pale yellow scabrid; node, supra-nodal ridge, and sheath scar elevated; intranode ca. 5 mm. Branches 3–5 per node, initially scabrid. Culm sheaths unknown. Leaves 2 or 3 per ultimate branch; sheath initially scabrid, margins densely ciliate; auricles hook-shaped or absent; oral setae radiating from auricle or erect if auricle absent; ligule subtruncate or arcuate, apex ciliolate; blade lanceolate, 9 – 19×0.1 –1.8 cm, abaxially puberulent. Racemes initially terminating leafy branches. Spikelets ca. 6×2 –3 cm; florets 11–13. Glumes 2 or 3, 9 – 12×4 –5 mm, 7–9-veined, apex acuminate and scabrid; lemma ca. 12×4 mm, adaxially puberulent, 15- or 16-veined, transverse veins distinct abaxially, margins apically ciliate; palea smaller than lemma, ca. 10×2.5 mm, 3-veined between keels, flanks 2-veined with transverse veins, abaxially ciliate; lodicules 3(–5), ca. 2.5×1 mm, 3-veined, apex ciliolate. Stamens 3; anthers ca. 4 mm. Ovary oblong, glabrous or sparsely pubescent; style 1; stigmas 2 or 3. Fl. Mar.

• Guangxi.

Taxa incertae sedis

Oligostachyum exauriculatum N. X. Zhao & Z. Yu Li in Z. Yu Li, Pl. Longqi Mountain, Fujian, China, 599. 1994.

无耳少穗竹 *wu er shao sui zhu*

Culms 3–4 m, (0.7–)1.2 cm in diam.; internodes initially dark green, white powdery, subcylindric, mostly 20–28 cm, shorter toward base, glabrous; nodes distinctly elevated; internodes ca. 5 cm; branches mostly 3 per node, 5 or more at upper nodes. Culm sheaths deciduous, hardly spotted, thickly papery, abaxially sparsely reddish brown setulose; auricles and oral setae absent; blade erect, yellowish brown, triangular, 0.4–1.5 cm, base not narrowed. Leaves 2 or 3 per ultimate branch;

sheath sparsely caducous ciliate; auricles and oral setae absent; ligule arcuate, 2–3 mm, margin subglabrous; blade linear-lanceolate, 10 – 18×1 –1.5 cm, both surfaces subglabrous, base broadly cuneate, apex acuminate; lateral veins transverse, 4- or 5-paired. Inflorescence unknown.

• Montane forest margins; 1900–2000 m. Fujian (Jiangle).

The authors compared this species to *Oligostachyum oedogonium*.

In addition, *Oligostachyum yonganense* Y. M. Lin & Q. F. Zheng (Fl. Fujian. 6: 689. 1995) was described from Fujian (Yongan). In the protologue it was compared with *O. lanceolatum*.

26. *GELIDOCALAMUS* T. H. Wen, J. Bamboo Res. 1(1): 21. 1982.

短枝竹属 *duan zhi zhu shu*

Zhu Zhengde (朱政德 Chu Cheng-de); Chris Stapleton

Shrubby bamboos. Rhizomes leptomorph, with running underground stems. Culms pluricaespitose, erect; internodes terete; nodes weakly prominent. Branches 7–12 per node, rarely more than 20, slender, without secondary branching. Culm sheaths persistent, much shorter than internodes; auricles absent or conspicuous; ligule arched or truncate, short; blade broadly conical or narrowly lanceolate. Leaves usually solitary on each branch; sheaths narrow, closely appressed to branchlets and inconspicuous, usually solitary or rarely 2 or more; blade lanceolate or broadly lanceolate to elliptical, short transverse veins distinct. Inflorescence panicle, large, open, terminal to leafy branches. Spikelets mostly light green, small, 3–5-flowered; pedicel slender. Rachilla compressed. Glumes 2; lemma compressed laterally, ridged abaxially; palea 2-keeled, truncate at apex; lodicules 3. Stamens 3; filaments free. Stigmas 2, or rarely 1, plumose. Caryopsis globose, beaked. New shoots autumn–winter.

- Nine species: China.

In addition to the species treated below, *Gelidocalamus dongdingensis* C. F. Huang & C. D. Dai (Wuyi Sci. J. 8: 173. 1991) was described from Fujian (Wuyi Shan), but no specimens have been seen by the authors and this taxon must be left as a doubtful species. *Gelidocalamus velutinus* W. T. Lin (Acta Phytotax. Sin. 26: 233. 1988) was described from Guangdong (Yunnan). This plant has 14–16 branches per node and distinctive, oblong culm sheath auricles, and looks more like a species of *Pleioblastus* than a *Gelidocalamus*.

- 1a. Culms dwarf, ca. 1 m, 3–6 mm in diam., culm sheath initially pink 9. *G. rutilans*
- 1b. Culms tall, 1–6 m, more than 10 mm in diam.
 - 2a. Young culms glabrous; culm sheath auricles small or weak.
 - 3a. Culm sheath auricles weak, oral setae radiate; leaf blade 1.2–2.2 cm wide, secondary veins 4- or 5-paired 1. *G. stellatus*
 - 3b. Culm sheath auricles small, oral setae not radiate; leaf blade 2–3.5 cm wide, secondary veins 7–9-paired 2. *G. kunishii*
 - 2b. Young culms hairy; culm sheath auricles present or absent.
 - 4a. Young culms setose, especially at basal nodes.
 - 5a. Culms ca. 5 m, to 3 cm in diam., internodes 50–70 cm; leaf blade 28–40 cm 3. *G. longiinternodus*
 - 5b. Culms 1–3 m, 0.7–1.5 cm in diam., internodes 30–40 cm; leaf blade 14–22 cm 4. *G. latifolius*
 - 4b. Young culms pubescent, not setose.
 - 6a. Culms solid; culm sheath auricles elliptic; culm sheath oral setae radiate, ca. 5 mm 8. *G. solidus*
 - 6b. Culms hollow; culm sheath auricles and oral setae absent.
 - 7a. Leaves 2–4 or more per ultimate branch; sheath subglabrous 7. *G. multifolius*
 - 7b. Leaves mostly 1 or 2 per ultimate branch, rarely 4-leaved; sheaths sparsely streaked with diverse colors.
 - 8a. Culm sheaths distally finely purple-brown checkered 5. *G. tessellatus*
 - 8b. Culm sheaths generally darker, with pale elliptical blotches 6. *G. annulatus*

1. *Gelidocalamus stellatus* T. H. Wen, J. Bamboo Res. 1(1): 22. 1982.

井冈短枝竹 jing gang duan zhi zhu

Gelidocalamus monophyllus (T. P. Yi & B. M. Yang) B. M. Yang; *Yushania monophylla* T. P. Yi & B. M. Yang.

Culms to 2 m, to 0.8 cm in diam.; internodes initially green, 25–30 cm, glaucous below nodes, glabrous; nodes prominent, sheath ring with persistent remains of sheath base. Culm sheaths retrorsely setose, margins ciliate; auricles weak or absent, oral setae radiate; ligule prominent, 2–3 mm, glabrous; blade conical, striate, margins ciliate. Leaves 1(or 2) per ultimate branch; blade abaxially light green, adaxially green, lanceolate, 12–17 × 1.2–2.2 cm, abaxially pubescent near midrib, adaxially glabrous, secondary veins 4- or 5-paired, one margin serrulate, other margin entire. Inflorescence panicle, 12–19 × 7–9 cm. Spikelets 5–7 mm; florets 3–5. Glumes 2; lemma ca. 3 mm, 5-veined; palea longer than lemma, not veined; lodicules 3, ovate, not veined. Stamens 3; filaments short; anthers yellow. Ovary 3-angled or ovoid, glabrous; stigmas 2, usually united, compressed, slender. New shoots Oct–Nov.

- Hardwood forests, near streams. Hunan, Jiangxi.

The shoots are edible, and the plants are cultivated for ornament.

2. *Gelidocalamus kunishii* (Hayata) P. C. Keng & T. H. Wen, J. Bamboo Res. 2(1): 20. 1983.

台湾矢竹 tai wan shi zhu

Arundinaria kunishii Hayata, Icon. Pl. Formosan. 6: 136. 1916; *Pleioblastus kunishii* (Hayata) Ohki; *Pseudosasa kunishii* (Hayata) Makino & Nemoto; *P. taiwanensis* Masamune. & Mori; *Sinarundinaria kunishii* (Hayata) Kanehira & Hatusima; *Sinobambusa kunishii* (Hayata) Nakai.

Culms 2–6 m, 1–2.5 cm in diam.; internodes 20–35 cm, smooth, glabrous; nodes weakly prominent. Culm sheaths deciduous, light green, initially purple, gray-brown in age, densely setose, margins not ciliate; auricles brown, small, sparsely ciliate; oral setae not radiate; ligule truncate; blade conical, margins entire, sharply pointed. Leaves 1(–3) per ultimate branch; sheath glabrous; auricles obscure; ligule prominent, arcuate; blade lanceolate-oblong or oblong, 10–25 × 2–3.5 cm, margins nearly entire, secondary veins 7–9-paired. Inflorescence unknown.

- 300–1500 m. C and N Taiwan.

3. *Gelidocalamus longiinternodus* T. H. Wen & Shi C. Chen, J. Bamboo Res. 5(2): 24. 1986.

箭把竹 jian ba zhu

Culms to 5 m, to 3 cm in diam.; internodes green, 50–70 cm, densely dark brown setose below nodes; wall 2–4 mm thick; nodes prominent. Culm sheaths initially green-purple, much shorter than internodes, densely dark brown setose, nearly glabrous at base, margins uniformly brown ciliate; auricles erect, triangular to elliptic, roughly brown hairy; oral setae dense, 5–7 mm (to 1.3 cm on apical sheath); ligule 2–3 mm, roughly hairy, cilia pale yellow and ca. 1.5 cm; blade erect, narrowly lanceolate, glabrous. Leaves 1(–3) per ultimate branch; sheath initially brown setose; auricles extended, falcate, fragile, margins brown ciliate; oral setae erect or spreading, ca. 1.2 cm; ligule strongly arcuate, ca. 2 mm, apex ciliate; blade broadly lanceolate or elliptic, 28–40 × 4.5–5.5 cm, abaxially pubescent near midrib, secondary veins 9–11-paired. Inflorescence unknown. New shoots autumn–winter.

• Lowlands. Hunan.

4. *Gelidocalamus latifolius* Q. H. Dai & T. Chen, J. Bamboo Res. 4(1): 53. 1985 [*“latifolius”*].

掌秆竹 zhang gan zhu

Culms 1–3 m, 0.7–1.5 mm in diam.; internodes initially deep green, 30–40 cm, initially densely brown deciduously setose, pubescent below nodes; supra-nodal ridge weakly swollen, sheath base more prominent, persistent. Culm sheaths initially light green or slightly purple, deciduously brown setose, margins ciliate; auricles and oral setae absent; ligule short, scabrous; blade triangular-lanceolate, weakly rugose, abaxially glabrous, adaxially scabrous. Leaves 1 per ultimate branch; blade green, ovate-lanceolate, 14–22 × 4–6 cm, glabrous except for hairy midrib, base rounded, apex acute. Inflorescence unknown.

• Hardwood forests on low hills; ca. 200 m. NW Guangxi.

The large leaves are used for roofing shelters and also to wrap traditional rice dumplings known as “zong zi” (粽子).

5. *Gelidocalamus tessellatus* T. H. Wen & C. C. Chang, J. Bamboo Res. 1(1): 24. 1982.

抽筒竹 chou tong zhu

Culms 2–3 m, to 1 cm in diam.; internodes initially purple-green, 20–40(–65) cm, initially densely tomentose, sparsely setose in age; nodes slightly prominent. Culm sheaths pale yellow, with purple-brown streaks, sparsely setose, tomentose near base, margins ciliate, apex tomentose; auricles absent; oral setae few, erect; ligule arcuate, short, pubescent, apex ciliate; blade triangular, sharply pointed. Leaves 1 per ultimate branch; blade broadly lanceolate, 19–23 × 2–3.2 cm, abaxially pubescent near midrib, proximally densely so, secondary veins 7-paired, asymmetrical, margins entire or one side serrulate. Inflorescence paniculate, terminal, 13–20 cm, lower branches horizontal. Spikelets green, 6–8 mm; pedicel 5–7 mm, slender; florets 3–5; rachilla pubescent. Glumes 2; lemma ca. 4 mm, 7-veined; palea about as long as lemma, not veined; lodicules ovate, not veined. Styles 2. New shoots Jun–Oct.

• Undergrowth in hardwood forests on low hills. Guangxi, Guizhou.

Gelidocalamus subsolidus W. T. Lin & Z. J. Feng (Guihaia 10: 18. 1990), based on a specimen collected in Guangdong (Xinyi), may be a synonym of this species.

The shoots are delicious, and the culms are split for weaving.

6. *Gelidocalamus annulatus* T. H. Wen, J. Bamboo Res. 7(1): 27. 1988.

亮秆竹 liang gan zhu

Culms 1–2.5 m, 1–1.5 cm in diam.; internodes 20–30 cm, slightly flexuose, initially pubescent, later papillose; nodes prominent, sheath ring glabrous. Culm sheaths white spotted, sparsely setose, margins smooth, glabrous; ligule truncate, ca. 1 mm, scabrid, ciliate; blade erect, narrowly triangular. Leaves 1 or 2 per ultimate branch; sheath sparsely golden setose, margins golden ciliate; auricles absent or weak with a few, erect oral setae; ligule truncate, ca. 1 mm, scabrous; blade broadly lanceolate or oblong, 16–27 × 1.7–3.5 cm, glabrous or abaxially roughly hairy at base of midrib, secondary veins 5- or 6-paired, asymmetrical. Inflorescence unknown.

• N Guizhou.

7. *Gelidocalamus multifolius* B. M. Yang, Nat. Sci. J. Hunan Norm. Univ. 9(3): 4. 1986.

多叶短枝竹 duo ye duan zhi zhu

Culms to 1.5 m, ca. 1 cm in diam.; internodes initially green, 10–26 cm, brown tomentellate below nodes; nodes slightly prominent. Culm sheaths green, nearly glabrous, sparsely tomentellate at base; auricles absent; oral setae 2 or 3, erect; ligule purple, truncate or slightly concave, ca. 1 mm, ciliate; blade reflexed, narrowly lanceolate, glabrous. Leaves 3–5 per ultimate branch; sheath glabrous, ribbed; auricles and oral setae absent; ligule truncate, ca. 1.5 mm; blade lanceolate or broadly lanceolate, 8–14 × 1.5–2.5 cm, abaxially pubescent, adaxially glabrous, secondary veins 4–6-paired. Inflorescence terminal, paniculate, sparsely branched, 10–15 × 5–7 cm. Spikelets 8–14 mm; florets 2–4. Glumes 2, lanceolate; lemma ovate-lanceolate; palea about as long as lemma or longer, glabrous; lodicules obovate, posterior one narrowly so, margins ciliate. Ovary ovoid-ellipsoid; styles 2, connate at base; stigmas 2. Caryopsis gray-green, obovoid, ca. 3 mm in diam.; suture long, narrow. New shoots winter, fl. Nov.

• Hunan (Ningyuan).

8. *Gelidocalamus solidus* C. D. Chu & C. S. Chao, J. Nanjing Inst. Forest. 1984(2): 75. 1984.

实心短枝竹 shi xin duan zhi zhu

Culms to 2 m, ca. 1 cm in diam.; internodes initially green, 30–50 cm, pubescent, brown hirsute below nodes, solid; nodes slightly prominent. Culm sheaths leathery, hirsute, margins ciliate; auricles oblong, 2–3 × ca. 1 mm; oral setae few, radiate; ligule slightly concave, apex ciliate; blade erect, narrowly lanceolate. Leaves 1 or 2 per ultimate branch; sheaths glabrous or initially pubescent; auricles and oral setae present; ligule truncate, ca. 1 mm, with cilia ca. 2 mm; blade broadly lanceolate, 8–25 × 3–4.5 cm, glabrous, secondary veins 5–8-paired. Inflorescence unknown. New shoots Nov.

• Guangxi.

Gelidocalamus albopubescens W. T. Lin & Z. J. Feng (Acta Phytotax. Sin. 30: 561. 1992), described from Guangdong (Guangning), may be a synonym of this species.

9. *Gelidocalamus rutilans* T. H. Wen, J. Bamboo Res. 2(1): 66. 1983.

红壳寒竹 hong ke han zhu

Culms to 1 m, 0.3–0.6 cm in diam.; internodes 10–15 cm,

not waxy, initially densely white pubescent, tomentellate below nodes; nodes slightly prominent. Culm sheaths persistent, pink when fresh, initially hirsute; auricles absent; oral setae minute; ligule slightly concave, ca. 1 mm, ciliate; blade erect, linear-lanceolate or subulate, base ca. 1/3 as wide as sheath apex. Leaves 1 per ultimate branch; pseudopetiole 4–5 mm; blade narrowly lanceolate to oblong, 17–31 × 2–4 cm, abaxially hirsute, secondary veins 6–8-paired. Inflorescence unknown.

• Zhejiang.

27. *FERROCALAMUS* Hsueh & P. C. Keng, J. Bamboo Res. 1(2): 3. 1982.

铁竹属 tie zhu shu

Li Dezhu (李德铸); Chris Stapleton

Shrubby, self-supporting to scrambling bamboos. Rhizomes leptomorph. Culms pluricaespitose, erect; internodes terete, long, thick walled, with a ring of white hairs below nodes; nodes prominent. Branches at mid-culm solitary, erect, parallel to and nearly as thick as culm; at upper nodes 3–5. Culm sheaths persistent, leathery at base, thinner at apex; auricles small or absent; oral setae developed; blade reflexed, leaflike or small. Leaf blade large; auricles absent or present with oral setae; ligule short; transverse veins distinct. Inflorescence a large panicle on leafy flowering branches. Spikelets very many, slender, 3–10-flowered, followed by a sterile floret. Glumes 2, obtuse. Rachilla articulate; florets falling separately; lemma leathery with many veins and obscure transverse venation. Palea longer than lemma, 2-keeled, apex emarginate. Lodicules 3. Stamens 3; filaments free. Ovary glabrous; styles short; stigmas 2, plumose. Fruit berrylike, succulent with thickened, fleshy pericarp but without hardened endocarp, ovoid or subglobose. $2n = 48^*$.

• Two species: China.

In the past, the culms of *Ferrocalamus* were used for making arrows. This rare endemic genus is endangered by habitat destruction, as it is known only from a very limited number of localities.

1a. Culm sheath apically papery, drying but not split on culm, blade broadly lanceolate or oblong-lanceolate, leaflike ... 1. *F. strictus*

1b. Culm sheath apically leathery, drying and splitting on culm, blade tiny, drying when young 2. *F. rimosivaginus*

1. *Ferrocalamus strictus* Hsueh & P. C. Keng, J. Bamboo Res. 1(2): 3. 1982.

铁竹 tie zhu

Culms 5–7(–9) m, 2–3.5(–5) cm in diam.; internodes 60–80(–100) cm, glabrous, nearly solid; nodes prominent; branchlet internodes 1–2 cm at branch base, to 65 cm from 4th or 5th nodes. Culm sheaths drying entire on culms, initially yellow-green, leathery, densely brown or dark brown hairy, apex papery; auricles absent; ligule truncate, 2–3 mm; blade reflexed, initially green, turning brown in age, broadly lanceolate or oblong-lanceolate. Leaf sheath glabrous; auricles absent; oral setae deciduous, 1–2 cm; blade broadly lanceolate, 30–35 × 6–9 cm, base cuneate. Panicles 30–45 cm. Spikelets 1.4–1.8 cm; florets 3–10; rachilla internodes glabrous. Glumes 3–5 mm; lemma ca. 7 mm; lodicules ca. 3 mm. Stamens unknown. Style short; stigmas ca. 1.5 mm. Fruit dark brown, ca. 2 cm, ovoid or subglobose. New shoots Mar–May, fl. Apr.

• Montane broad-leaved forests; 900–1200 m. S Yunnan (Jinping, Luchun).

2. *Ferrocalamus rimosivaginus* T. H. Wen, J. Bamboo Res. 3(2): 26. 1984.

裂箨铁竹 lie tuo tie zhu

Culms 5–7 m, 2–4 cm in diam.; internodes 50–70 cm, glabrous, nearly solid; nodes prominent; branchlet internodes 1–2 cm at branch base, to 65 cm from 4th or 5th node. Culm sheaths brown, leathery, papery and split at apex, densely brown or dark brown hairy; auricles small, oral setae present; ligule truncate, 1–2 mm; blade reflexed, tiny, narrow, drying when young. Leaf sheaths glabrous; auricles absent; oral setae deciduous, ca. 1 cm; blade broadly lanceolate, 25–30 × 5–6 cm, base cuneate. Inflorescence unknown. New shoots Mar–May.

• Montane broad-leaved forests; 900–1000 m. S Yunnan (Jinping).

28. *INDOCALAMUS* Nakai, J. Arnold Arbor. 6: 148. 1925.

箨竹属 ruo zhu shu

Wang Zhengping (王正平 Wang Cheng-ping); Chris Stapleton

Shrubby bamboos. Rhizomes leptomorph, with running underground stems. Culms pluricaespitose, nodding; internodes usually terete, usually with a dense, persistent, apical, yellow-brown tomentose to setaceous ring below nodes, rarely apically glabrous; wall thick; nodes usually flat, sometimes prominent. Branches usually solitary, nearly as thick as culms. Culm sheaths persistent, usually shorter than internodes, papery or nearly leathery; auricles usually developed; blade usually recurved, lanceolate. Leaf sheaths cylindrical, very thick, smooth. Leaves usually large relative to culm size, transverse veins distinct. Inflorescence largely ebracteate,

terminal, a raceme or open panicle; branches usually subtended by tiny bracts. Spikelets several to many flowered, pedicellate. Rachilla articulate. Glumes 2 or 3, ovate or lanceolate; lemma oblong or lanceolate, nearly leathery; palea 2-keeled, shorter than lemma; lodicules 3. Stamens 3, long exserted; anthers yellow. Ovary ovoid; style 1, short; stigmas usually 2 (3 in *I. wilsonii*), plumose. Caryopsis dark brown at maturity. $2n = 48$.

At least 23 species: mainly China, one species in Japan; 22 species (all endemic) in China.

The culms are used for making chopsticks and penholders, and the leaves are used for weaving bamboo hats and wrapping glutinous rice.

- 1a. Blade of mid-culm sheaths large, triangular or ovate-lanceolate, erect, appressed, base \pm amplexicaul, rounded to cordate or if blade narrower and spreading to reflexed, culms with glossy internodes and flat nodes.
 - 2a. Culms without any tomentose rings below nodes; nodes flat.
 - 3a. Culm sheaths sparsely pale strigose; blade usually spreading, deciduous 1. *I. sinicus*
 - 3b. Culm sheaths not strigose; blade erect.
 - 4a. Leaf blade abaxially glabrous 2. *I. herklotsii*
 - 4b. Leaf blade abaxially pubescent, densely so along midrib 3. *I. tongchunensis*
 - 2b. Culms with a white or brown tomentose ring at each node; nodes \pm elevated.
 - 5a. Culm sheaths without auricles; oral setae erect, usually 1.5–3 cm 4. *I. pseudosinicus*
 - 5b. Culm sheaths with well-developed auricles; oral setae usually radiate, less than 1.5(–2) cm.
 - 6a. Culm sheath blade ovate-lanceolate, base cuneate-rounded; sheath auricles 0.6–2 cm 6. *I. longiauritus*
 - 6b. Culm sheath blade broadly triangular to ovate-oblong, base broadly or truncately rounded or cordate; sheath auricles ca. 0.5 cm.
 - 7a. Culm sheaths dark brown strigose, base glabrous 5. *I. guangdongensis*
 - 7b. Culm sheaths glabrous or sparsely brown strigose, base setose 7. *I. decorus*
 - 1b. Blade of mid-culm sheaths small, narrow, ascendant to reflexed, rarely erect, base not amplexicaul, broad or cuneate.
 - 8a. Culm sheath auricles well developed.
 - 9a. Leaf blade tessellations square or transversely rectangular.
 - 10a. Culm sheath ligule 2–2.5 mm; leaf sheath ligule fimbriate 11. *I. quadratus*
 - 10b. Culm sheath ligule ca. 1 mm; leaf sheath ligule entire 12. *I. hunanensis*
 - 9b. Leaf blade tessellations longitudinally rectangular.
 - 11a. Culm sheaths brown, with straw-colored spots of various sizes when dry; leaf blade basally narrowly cuneate 10. *I. emeiensis*
 - 11b. Culm sheaths deep straw-colored without spots when dry; leaf blade basally rounded, rarely cuneate.
 - 12a. Culm sheath auricles with 2 or more rows of oral setae; ligule 0.5–1 mm 8. *I. barbatus*
 - 12b. Culm sheath auricles fringed with 1 row of oral setae; ligule 2–3 mm 9. *I. hirsutissimus*
 - 8b. Culm sheath auricles absent or minute.
 - 13a. Culm sheaths inflated, loosely enclosing culm.
 - 14a. Culm sheaths nearly leathery; leaf blade abaxially densely hairy along midrib 16. *I. tessellatus*
 - 14b. Culm sheaths more papery; leaf blade not abaxially hairy along midrib 17. *I. latifolius*
 - 13b. Culm sheaths not inflated, closely enclosing culm.
 - 15a. Culms less than 0.5 m.
 - 16a. Leaf ligule ca. 0.5 mm; leaf blade not undulate; branch sheath straw-colored when dry 21. *I. pedalis*
 - 16b. Leaf ligule 2.5–9 mm; leaf blade undulate; branch sheath orange-red when dry 22. *I. wilsonii*
 - 15b. Culms more than 1 m.
 - 17a. Culms strigose or with imprints of fallen hairs, especially below nodes.
 - 18a. Culm sheaths with long, retrorse, white hairs 13. *I. chishuiensis*
 - 18b. Culm sheaths with shorter, brown hairs.
 - 19a. Leaf blade abaxially puberulent; leaf ligule 1.5–3 mm 14. *I. hispidus*
 - 19b. Leaf blade abaxially glabrous; leaf ligule (2–)4–8 mm 15. *I. bashanensis*
 - 17b. Culms not strigose and without imprints of fallen hairs, sometimes pubescent.
 - 20a. Culm sheath longer than internode 18. *I. hirtivaginitus*
 - 20b. Culm sheath much shorter than internode.
 - 21a. Internodes 25–33 cm, densely pubescent; leaf blade 3.5–6.5 cm wide 19. *I. inaequilaterus*
 - 21b. Internodes to 26 cm, glabrous; leaf blade 2.5–4 cm wide 20. *I. victorialis*

1. *Indocalamus sinicus* (Hance) Nakai, J. Arnold Arbor. 6: 235. 1862; *A. longiramea* Munro; *A. wightii* Nees ex Benth. 148. 1925.

水银竹 *shui yin zhu*

Arundinaria sinica Hance, Ann. Sci. Nat., Bot., sér. 4, 18:

Culms 1–3.8 m, 0.5–1 cm in diam.; internodes green, straw-colored when dry, glossy, glabrous; wall 3–4 mm thick; nodes flat. Culm sheaths purple-brown, leathery-papery, striate, sparsely white or colorless hairy, margins densely bright gray

ciliate; auricles absent; oral setae several, to 1 cm; ligule red-brown, truncate, 1–1.4 mm, ciliate or not; blade erect to reflexed, narrowly triangular-subulate on mid-culm sheaths, ovate-lanceolate on upper ones, apex long acuminate. Leaves 7–14 per ultimate branch; sheath yellow-brown, leathery, glossy, glabrous; auricles absent; oral setae yellow-brown, to 1.6 cm; ligule red-brown, truncate, short, ciliate or not; blade broadly lanceolate, 14–60 × 2.2–6.8 cm, thinly leathery, both surfaces usually glabrous, secondary veins 8 or 9 pairs, transverse veins sparse, tessellations narrowly rectangular, base cuneate, apex long acuminate. Panicles ample, 23.5–30 cm or more; branches spreading, pulvinate. Spikelets purple-green, pedicel 2–6 cm; florets 3 or 4. Rachilla internodes glabrous. Glumes 2, papery; lower glume oblong-lanceolate, 4.5–5 mm, 3-veined, apex slightly acute, upper glume 5–6.5 mm, 5-veined, apex acuminate; lemma 9–10 mm, papery, adaxially scabrid, 7-veined, apex acuminate; palea nearly as long as lemma, keels and apex ciliate; lodicules unequal in size, anterior pair larger. Stamens unknown. Style short; stigmas 2. New shoots Apr, fl. May.

• Open forests, thickets on hills and in valleys; 600–700 m. Guangdong, Hainan.

2. *Indocalamus herklotsii* McClure, Lingnan Univ. Sci. Bull. 9: 22. 1940.

粽巴箬竹 zong ba ruo zhu

Culms to 2 m, 3–6 mm in diam.; internodes glossy, glabrous, subsolid, with small lumen; nodes flat. Culm sheaths leathery, glossy, fragile, margins usually densely ciliate; auricles absent or minute; oral setae sometimes developed, few, dark brown, rigid, scabrid; ligule truncate or slightly arcuate, very short, hirtellous, ciliate; blade erect, initially rosy red, ovate-lanceolate, thinly papery, glabrous, base broad and amplexicaul, apex long acuminate. Leaves ca. 3 per ultimate branch; sheath obscurely striate on upper part, margins densely brown ciliate; auricles usually absent; oral setae few or absent, dark brown or straw-colored, rigid, scabrid; ligule short, hirtellous, ciliate; pseudopetiole 1–4 mm, hirtellous toward apex; blade lanceolate or oblong-lanceolate, 14–29 × 1–5 cm, glabrous, secondary veins 6–9 pairs, tessellations rectangular, apex caudate. Panicle spreading, purple, 7–8 cm; peduncle to 8.5 cm, glabrous, axis and branches slender, glabrous. Spikelets oblong-lanceolate, to 1.5 cm, slightly compressed; pedicels 3–15 cm, pulvinate; florets ca. 4. Rachilla internodes glabrous on side facing floret, otherwise scabrous. Glumes 2, glabrous; lower glume 5–5.5 mm, apex obtuse; upper glume 6.5–8 mm, apex acute; lemma lanceolate, 6.5(–7) mm, thinly papery, fragile, glabrous, 5-veined, apex obtuse; palea slightly longer or sometimes shorter than lemma, glabrous, keels distally ciliate; lodicules transparent, anterior ca. 1.3 mm, posterior slightly longer. Anthers ca. 5 mm. Ovary fusiform, dorsi-ventrally compressed, subglabrous; stigmas 2.

• Open forests, thickets; ca. 500 m. Hong Kong.

3. *Indocalamus tongchunensis* K. F. Huang & Z. L. Dai, Wuyi Sci. J. 6: 293. 1986.

同春箬竹 tong chun ruo zhu

Culms ca. 1.5 m, ca. 5 mm in diam.; internodes straw-

colored, glossy, thinly white powdery; nodes flat. Culm sheaths glossy, mainly glabrous but distally sparsely white hairy and white powdery, margins long brown ciliate; auricles absent or minute; oral setae absent; ligule truncate or arcuate, rigid, margin minutely ciliate or not; blade erect, narrowly triangular, 1–2 × as long as sheath, thin, glabrous, base cordate, amplexicaul. Leaves 3–7 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule ca. 1.5 mm, rigid, ciliate; blade abaxially pale green, elliptic or elliptic-lanceolate, ca. 40 × 8 cm, densely pubescent especially along both sides of midrib, adaxially glabrous, secondary veins 12–14 pairs, tessellations rectangular to square. Inflorescence unknown. New shoots Mar–Apr.

• Broad-leaved forests; ca. 800 m. Fujian.

4. *Indocalamus pseudosinicus* McClure, Sunyatsenia 6: 37. 1941.

锦帐竹 jin zhang zhu

Culms 1.5–2 m, 3–6 mm in diam.; internodes 20–30 cm, with a white or brown tomentose and setulose ring below each node, otherwise glabrous or initially puberulent and white powdery; wall 1.5–2.5 mm thick; nodes weakly elevated. Culm sheaths yellow-green when fresh, straw-colored when dry, closely encircling culm, ca. 1/2 as long as internodes, brown or colorless strigose, white tomentose and with striae left by fallen hairs; auricles absent; oral setae developed; ligule brown, arcuate, 0.3–1 mm, ciliate or not; blade purple, amplexicaul, contracted at base. Leaves 5–7 per ultimate branch; sheath striate, lower part abaxially glossy, upper part brown strigose, sometimes glabrous near margins, margins densely dark ciliate; auricles absent; oral setae erect or suberect, distally curved, to 2.5–3 cm; ligule short; blade oblong-lanceolate, 19–38 × 2.6–4.6 cm, glabrous or abaxially sparsely appressed hispidulous, secondary veins 9–11 pairs, tessellations rectangular or square, base cuneate, margins minutely denticulate, apex narrowly acuminate. Panicles terminating leafy or leafless branches, erect, ca. 26 cm, axis glabrous, strongly ribbed; branches initially appressed to axis, then ± spreading, slender, glabrous, pulvinate. Spikelets pale green, to 4.5–5 cm, fusiform or slightly compressed; florets 12–13; pedicels 8–12 mm. Rachilla internodes 3–3.2 mm, ciliate on ribs. Glumes 2 or 3; lower glume 3.2–4 mm, 3-veined; upper glume 4.5–5 mm, 5-veined; lemmas 6–7 mm, 5–7-veined, glossy, abaxially glabrous, callus white pubescent, margins ciliate toward apex; palea 5.8–6.2 mm, apex obtuse, 2-toothed. Lodicules, stamens, and pistil unknown. New shoots Apr–May, fl. Jul–Dec.

• Forests on mountain slopes, roadsides; 700–1000 m. Guangdong, Guangxi, Hainan.

- 1a. Leaf blade veins forming rectangular tessellations 4a. var. *pseudosinicus*
- 1b. Leaf blade veins forming square tessellations 4b. var. *densinervillus*

4a. *Indocalamus pseudosinicus* var. *pseudosinicus*

锦帐竹(原变种) jin zhang zhu (yuan bian zhong)

Leaf blade veins forming rectangular tessellation.

• Forests on mountain slopes, roadsides; 700–1000 m. Guangxi, Hainan.

4b. *Indocalamus pseudosinicus* var. *densinervillus* H. R. Zhao & Y. L. Yang, *Acta Phytotax. Sin.* 23: 464. 1985.

密脉箬竹 *mi mai ruo zhu*

Leaf blade veins forming square tessellation.

• Montane forests. Guangdong, Guangxi.

5. *Indocalamus guangdongensis* H. R. Zhao & Y. L. Yang, *Acta Phytotax. Sin.* 23: 462. 1985.

广东箬竹 *guang dong ruo zhu*

Culms 1.5–3.5 m, 0.9–1.5 cm in diam.; internodes initially yellow or purple, white tomentose, hairs denser and forming a brown ring below nodes; wall ca. 0.4 mm thick; nodes weakly elevated. Culm sheaths purple-green, shorter than internode, leathery, white tomentose and dark brown hairy, base corky; auricles ca. 5 mm, brown; oral setae radiate, flexuose, about as long as auricle; ligule truncate to arcuate, 0.5–2 mm, densely puberulent, margin sparsely or not ciliate; blade broad, amplexicaul, base truncately rounded to cordate, about as wide as apex of culm, apex acuminate. Leaves 2–7 per ultimate branch; sheath striate, white tomentose; auricles and oral setae absent; ligule 1–2.5 mm, pubescent, long ciliate; blade broadly lanceolate, 35–56 × 4–10.5 cm, abaxially minutely appressed white pubescent, adaxially glabrous, secondary veins 8–15 pairs, tessellations rectangular or square, base cuneate, apex acuminate. Inflorescence unknown. New shoots Apr–May.

• Forests, mountain slopes, valleys; ca. 900 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan; cultivated in Zhejiang.

- 1a. Leaf blade tessellations abaxially visible, rectangular; midrib not waxy pubescent 5a. var. *guangdongensis*
 1b. Leaf blade tessellations abaxially visible, square; midrib waxy pubescent along one side 5b. var. *mollis*

5a. *Indocalamus guangdongensis* var. *guangdongensis*

广东箬竹(原变种) *guang dong ruo zhu* (*yuan bian zhong*)

Leaf blade not abaxially waxy pubescent along midrib; veins forming rectangular tessellations.

• Forested mountain slopes, valleys. Guangdong, Guizhou; cultivated in Zhejiang.

5b. *Indocalamus guangdongensis* var. *mollis* H. R. Zhao & Y. L. Yang, *Acta Phytotax. Sin.* 23: 462. 1985.

柔毛箬竹 *rou mao ruo zhu*

Leaf blade abaxially pubescent along one side of midrib; veins forming square tessellations.

• Roadsides on mountain slopes; ca. 900 m. Guangxi, Hubei, Hunan.

6. *Indocalamus longiauritus* Handel-Mazzetti, *Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 62: 254. 1925.

箬叶竹 *ruo ye zhu*

Culms 0.8–1 m, 0.35–0.8 cm in diam.; internodes dull green, (8–)10–55 cm, white pubescent, with a pale red-brown tomentose ring below nodes; wall 1.5–2 mm thick; nodes prominent. Culm sheaths purple-green, leathery, dark brown strigose and white tomentose, base with raised corky ring; auricles well developed, purple-green, becoming brown when dry; oral setae radiate, brown, ca. 1 cm; ligule truncate, 0.5–1 mm, ciliate or not; blade purple-green, narrowly triangular to ovate-lanceolate, base abruptly rounded, apex acuminate. Leaf sheath rigid, glabrous or abaxially initially finely strigose, outer margin ciliate; auricles usually developed; oral setae radiate, brown; ligule truncate, 1–1.5 mm, puberulent, fimbriate, margin setose; blade 10–35 × 1.5–6.5 cm, abaxially glabrous or puberulent, secondary veins 5–12 pairs, veins forming rectangular tessellations, base cuneate, apex long acuminate. Panicles 8–15 cm, rather narrow, axis densely white tomentose. Spikelets greenish or straw-colored at maturity, 1.5–3.7 cm; florets 4–6. Rachilla internodes compressed-clavate, 6.8–7.2 mm, angular, densely white tomentose, apex truncate. Glumes 2, acuminate with an awnlike point; first glume 3–5 mm, 3–5-veined, second glume 6–8 mm, 7–9-veined; lemma oblong-lanceolate, apex awnlike, first lemma 1–1.4 cm, 11–13-veined; palea of 1st floret 0.7–1 cm, keels ciliate. Anthers ca. 5 mm. Stigmas 2. Caryopsis oblong. New shoots Apr–May, fl. May–Jul. $2n = 48^*$.

• Mountain slopes, hillsides, roadsides; ca. 500 m. Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangxi, Sichuan; cultivated in Zhejiang.

- 1a. Leaf blade abaxially without hairs along sides of midrib.
 2a. Culm sheaths auricles long, narrowly falcate 6a. var. *longiauritus*
 2b. Culm sheaths auricles shorter, subfalcate 6c. var. *semifalcatus*
 1b. Leaf blade abaxially hairy along one or both sides of midrib.
 3a. Culm sheaths auricles long, falcate; leaf blade abaxially hairy along both sides of midrib 6b. var. *yi yangensis*
 3b. Culm sheaths auricles shorter, subfalcate; leaf blade abaxially hairy along only one side of midrib 6d. var. *hengshanensis*

6a. *Indocalamus longiauritus* var. *longiauritus*

箬叶竹(原变种) *ruo ye zhu* (*yuan bian zhong*)

Arundinaria longiaurita (Handel-Mazzetti) Handel-Mazzetti; *A. vulgata* (W. T. Lin & X. B. Ye) W. T. Lin; *Bashania auctiaurita* T. P. Yi; *Indocalamus dayongensis* W. T. Lin; *I. vulgatus* W. T. Lin & X. B. Ye; *Pseudosasa guanxianensis* T. P. Yi; *P. vittata* B. M. Yang; *P. vulgata* (W. T. Lin & X. B. Ye) W. T. Lin.

Culm sheath auricles narrowly falcate, long. Leaf blade abaxially not hairy along sides of midrib.

• Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangxi, Sichuan.

6b. *Indocalamus longiauritus* var. *yi yangensis* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 23: 464. 1985.

益阳箬竹 *yi yang ruo zhu*

Culm sheath auricles falcate, long. Leaf blade abaxially minutely pubescent along one or both sides of midrib.

• Hillsides. Hunan.

6c. *Indocalamus longiauritus* var. *semifalcatus* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 23: 464. 1985.

半耳箬竹 *ban er ruo zhu*

Culm sheath and leaf sheath auricles subfalcate, short. Leaf blade abaxially not hairy along midrib.

• Guangxi, Sichuan; cultivated in Zhejiang.

6d. *Indocalamus longiauritus* var. *hengshanensis* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 23: 464. 1985.

衡山箬竹 *heng shan ruo zhu*

Culm sheath auricles subfalcate. Leaf blade abaxially hairy along one side of midrib.

• Mountain slopes. Hunan.

7. *Indocalamus decorus* Q. H. Dai, Acta Phytotax. Sin. 20: 494. 1982.

美丽箬竹 *mei li ruo zhu*

Culms 35–80 cm, 0.3–0.5 cm in diam.; internodes initially green, 7–22 cm, white tomentose, with a brown tomentose ring below nodes; nodes elevated. Culm sheaths yellow-green, becoming orange when dry, shorter than internode, initially white tomentose, glabrous or sparsely brown strigose, base edged with dark brown setae, margins brown ciliate; auricles falcate; oral setae 4–5 mm; ligule ca. 1 mm; blade broadly triangular, amplexicaul, abaxially glabrous, adaxially hirtellous between veins, base rounded or cordate, margins minutely brown ciliate. Leaves 2–4 per ultimate branch; sheath tomentose, margins ciliate; auricles present or absent; oral setae ca. 3 mm; ligule truncate, 1–2 mm, scabrid, margin brown or pale ciliate; blade oblong-lanceolate, 15–35 × 3–3.5 cm, glabrous or abaxially pubescent near midrib, secondary veins 6–11 pairs, veins forming rectangular or square tessellations. Inflorescence unknown.

• Forests of *Phyllostachys edulis* and broad-leaved trees, forest margins. Guangxi.

8. *Indocalamus barbatus* McClure, Sunyatsenia 6: 32. 1941.

髯毛箬竹 *ran mao ruo zhu*

Culms ca. 1.5 m, 0.5–1 cm in diam.; internodes 25–35(–45) cm, densely brown strigose, solid; nodes strongly elevated, nodal ridge very prominent; sheath scar relatively flat, fringed with persistent culm sheath base; intranode 9–10 mm. Culm sheaths green, 1/3–1/2 as long as internodes, densely brown strigose; auricles falcate, 1.5–2 cm, oral setae in 2 or more rows, radiate, 2–3 cm; ligule truncate or weakly concave, 0.5–1 mm, densely fimbriate with hairs 2–3 cm; blade green, elliptic-lanceolate. Leaves 5–8 per ultimate branch; sheath rigid, densely long white strigose or later with striae and papillae

from fallen hairs, upper part intermixed with dense white pubescence; auricles rather thick, ca. 15 × 3 mm; oral setae in 2 or more crowded irregular rows, radiate, pale to dark straw-colored, to 3 cm; blade elliptic to elliptic-lanceolate, 15–35(–40) × 5–9(–12) cm, abaxially pubescent, adaxially glabrous, secondary veins 8–12-paired, tessellations rectangular, base broadly cuneate, apex acuminate into subulate point. New shoots spring–summer. $2n = 48^*$.

• Evergreen broad-leaved valley forests; ca. 500 m. Guangxi.

9. *Indocalamus hirsutissimus* Z. P. Wang & P. X. Zhang, J. Bamboo Res. 4(1): 44. 1985.

多毛箬竹 *duo mao ruo zhu*

Culms ca. 3 m, 1–2 cm in diam.; internode initially green or orange under culm sheath, densely brown strigose and white pubescent especially below nodes, glabrescent, with papillae and imprints of fallen hairs except below nodes, pith spongy; nodes strongly elevated, supra-nodal ridge with an elevated keel; sheath scar weakly prominent. Culm sheaths orange, ca. 1/2 as long as internodes, leathery, densely dark brown strigose, base yellow-brown pubescent, outer margin dark brown ciliate, inner margin glabrous; auricles reflexed, suborbicular, large; oral setae in 1 row, radiate, to 2 cm; ligule obliquely arcuate or truncate, 2–3 mm, dark brown pubescent, margin lacerate and fimbriate with setae more than 1 cm; blade deciduous, reflexed, lanceolate, abaxially glabrous, adaxially densely yellow hirtellous toward base. Leaves 2–11 per ultimate branch; sheaths pubescent and minutely setose; auricles and oral setae as for culm sheaths; ligule 2–12 mm; blade 15–28 × 1.5–2.5 cm, abaxially pubescent or glabrous, adaxially glabrous, secondary veins 5–9 pairs, transverse veins remote. Inflorescence unknown. New shoots May–Jun.

• Valley forests, montane forests; 500–600 m. Guizhou.

- 1a. Leaf blade abaxially pubescent 9a. var. *hirsutissimus*
1b. Leaf blade abaxially glabrous or
subglabrous 9b. var. *glabrifolius*

9a. *Indocalamus hirsutissimus* var. *hirsutissimus*

多毛箬竹(原变种) *duo mao ruo zhu* (yuan bian zhong)

Leaf blade abaxially pubescent.

• Open valley forests; 500–600 m. Guizhou.

9b. *Indocalamus hirsutissimus* var. *glabrifolius* Z. P. Wang & N. X. Ma, J. Bamboo Res. 4(1): 45. 1985.

光叶箬竹 *guang ye ruo zhu*

Leaf blade abaxially glabrous or subglabrous.

• Forests on mountain slopes; ca. 500 m. Guizhou.

10. *Indocalamus emeiensis* C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 18: 25. 1980.

峨眉箬竹 *e mei ruo zhu*

Arundinaria emeiensis (C. D. Chu & C. S. Chao) Demoly.

Culms ca. 1.5 m, 0.8–1 cm in diam.; internodes ca. 30 cm,

with appressed, minute, white setae intermixed with retrorse, red-brown hairs and imprints of fallen hairs on upper portion; nodes elevated. Culm sheaths brown, with straw-colored spots of various sizes, less than 1/2 as long as internodes, with dense, retrorse, brown hairs or papillae left by fallen hairs, margins brown ciliate; auricles falcate, 6–7 mm; oral setae radiate, 1–2 cm; ligule ca. 1 mm, ca. 2 × as wide as base of blade, densely ciliate; blade triangular-lanceolate, not amplexicaul. Leaves 4–10 per ultimate branch, sheath white pubescent, with red-brown striae or papillae, margins ciliate; auricles falcate; oral setae radiate, 2–3 cm; ligule very short, fringed with hairs 2.3–3 mm; blade oblong-lanceolate, usually ± asymmetrical, 16–40 × 3.5–6.5 cm, abaxially glaucous, glabrous, secondary veins 7–18 pairs, tessellations square, distinct on both surfaces, base cuneate, apex acuminate. Inflorescence unknown.

- Mountain slopes; ca. 1200 m. Sichuan.

"Indocalamus omeiensis" (C. D. Chu & C. S. Chao, Bamboo Res. 1: 7. 1981) is an orthographic variant of this name.

11. *Indocalamus quadratus* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 20: 216. 1982.

方脉箬竹 fang mai ruo zhu

Culms ca. 3 m, 0.8–1.1 cm in diam.; internodes 22–26 cm, initially apically densely brown strigose and setulose; nodes weakly prominent; intranode 5–8 mm. Culm sheaths green, tinged with purple when fresh, becoming straw-colored, unmarked, shorter than internode on lower culm, densely brown-purple strigose, margins densely brown ciliate; auricles brown, falcate, large, ca. 15 × 1.3–3 mm; oral setae radiate, flexuose, brown, to 2 cm; ligule purple-brown, truncate to slightly arcuate, 2–2.5 mm, ciliate with hairs 1.2–1.6 cm or longer; blade erect or reflexed, green, narrowly triangular. Leaves 6 or 7 per ultimate branch; sheath initially brown strigose, glabrescent, margins long brown ciliate; auricles purple-brown, falcate, ca. 12 × 2 mm; oral setae radiate, brown, ca. 1.4 cm; ligule purple-brown, fimbriate; blade ovate-lanceolate or oblong-lanceolate, 8.5–24.5 × 5.6–7.2 cm, abaxially glaucous, secondary veins 10–13 pairs, tessellations square, base rounded or rarely cuneate, apex acuminate. Inflorescence unknown. New shoots May.

- Valley forests; 600–900 m. Guizhou, Hunan; cultivated in Zhejiang.

12. *Indocalamus hunanensis* B. M. Yang, Acta Phytotax. Sin. 19: 259. 1981.

湖南箬竹 hu nan ruo zhu

Indocalamus auriculatus (H. R. Zhao & Y. L. Yang) Y. L. Yang; *I. hispidus* H. R. Zhao & Y. L. Yang var. *auriculatus* H. R. Zhao & Y. L. Yang; *I. wuxiensis* T. P. Yi.

Culms to 2.5 m, 0.2–0.8 cm in diam.; internodes initially yellow-green, finely striate, 15–26 cm, initially yellow-brown or brown strigose and white pubescent, especially below nodes, rough with tubercles and imprints of fallen hairs at maturity; wall 1.5–3 mm thick; nodes elevated; sheath scar usually edged with a suberous ring left by fallen sheath; intranode 3–7 mm. Culm sheaths initially usually red-brown or dull green, 1/3–1/2 as long as internodes, rigid, brittle, completely minutely white

pubescent except for distal 1/4 part also yellow-brown or brown strigose and with imprints of fallen hairs, margins brown ciliate; auricles purple when fresh, dark purple or brown when dry, falcate; oral setae yellow-brown; ligule truncate or arcuate, 0.5–1 mm, densely puberulent, entire or denticulate and minutely ciliate; blade erect or reflexed, green or yellow, linear-lanceolate, tessellations distinct on both surfaces, base much narrower than sheath apex, margins scabrous. Leaves 2–5 per ultimate branch; sheath glabrous or white pubescent, sometimes sparsely strigose, margins ciliate; auricles purple; oral setae yellow-brown, both weakly developed or absent on upper sheaths; ligule dark purple, truncate or arcuate, 1–1.5 mm, densely puberulent, entire; blade oblong-lanceolate, 10–29 × 3.5–7.5 cm, both surfaces glabrous, abaxially with pale or yellow powdery granules, secondary veins 6–14 pairs, tessellations square, base rounded or cuneate. Panicle 5–11 cm, dense, axis and branches densely white pubescent. Branches ascending, not pulvinate, subtended by minute bracts. Spikelets purple or green, 1–2.5 cm; florets 3–5. Rachilla internodes densely white pubescent. Glumes 2, glabrous, apex acuminate; lower glume 2–2.5 mm, (3–)5(–7)-veined; upper glume 6–8.5 mm, 5(–7)-veined; lemma ovate-lanceolate, 7.5–10 mm, glabrous, 7–11-veined, apex acuminate, mucronate, callus puberulent; palea keels glabrous. Stamens and pistil unknown. New shoots Jun, fl. Aug–Sep.

- Forests, scrub on mountain slopes, valleys; 1400–2400 m. Chongqing, NW Hunan, NE Sichuan.

13. *Indocalamus chishuiensis* Y. L. Yang & Hsueh, Acta Phytotax. Sin. 31: 68. 1993.

赤水箬竹 chi shui ruo zhu

Culms ca. 1 m, 0.3–0.5 cm in diam.; internodes 5–15 cm, initially white pubescent, sometimes also retrorsely white strigose below nodes; wall 1.3–2.3 mm thick; nodes weakly prominent. Culm sheaths straw-colored when dry, closely encircling culm, 5–7 cm, shorter than internode, leathery, gradually thickened toward base, densely white pubescent and retrorsely long white strigose, margins densely ciliate; auricles absent; oral setae absent or few; ligule 0.2–0.5 mm, puberulent; blade erect or reflexed, linear-lanceolate, 2.5–20 mm. Leaves 4–8 per ultimate branch; sheaths with deciduous hairs resembling those of culm sheaths; auricles absent; oral setae absent or rarely few; ligule (1–)1.5–2 mm; blade oblong-lanceolate, 13–18 × 2–3 cm, abaxially glaucous, adaxially glabrous, secondary veins 6 or 7 pairs, tessellations nearly square, base cuneate, apex long acuminate. Inflorescence unknown.

- Mountain slopes, low-lying lands; below 1300 m. Guizhou.

14. *Indocalamus hispidus* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 23: 460. 1985.

硬毛箬竹 ying mao ruo zhu

Culms 1–2(–3.5) m, 0.3–1(–1.2) cm in diam.; internodes initially green, slightly flattened above branches, (10–)15–30 (–35) cm, white powdery, red-brown strigose especially below nodes or with imprints of fallen hairs; wall 2.5–4 mm thick; nodes weakly elevated, supra-nodal ridge absent; sheath scar weakly prominent, corky. Culm sheaths yellow-green, closely

encircling culm, shorter than internode, leathery, densely red-brown strigose; auricles and oral setae absent; ligule truncate, 1–3 mm, glabrous; blade erect or later reflexed, oblong-lanceolate or lanceolate, 0.6–3 cm. Leaves 3–5 per ultimate branch; auricles and oral setae absent; ligule 1.5–3 mm, glabrous; blade abaxially gray-green, broadly oblong-lanceolate, 11–28 × 4–6.5 cm, undulate when dry, abaxially pubescent and minutely pale papillate, adaxially glabrous, secondary veins 8–15 pairs, tessellations square. Panicle 9–10 cm or more, initially terminating leafy branch, axis and branches white pubescent; branches erect. Spikelets gray-green or commonly purple-green, subterete; florets 4 or 5. Rachilla internodes densely pubescent. Glumes 2, apex subulate; lower glume ca. 2/3 as long as upper one, 3–5-veined; upper glume 5–7-veined, transverse veins distinct; lemma ca. 1.5 cm, 7–11-veined, transverse veins distinct, apex subulate; palea shorter than lemma, pubescent. Stamens 3. Styles 2. New shoots Jul–Aug, fl. Aug.

- Montane forests; 1600–1900 m. E Sichuan.

15. *Indocalamus bashanensis* (C. D. Chu & C. S. Chao) H. R. Zhao & Y. L. Yang, *Acta Phytotax. Sin.* 23: 465. 1985.

巴山箬竹 *ba shan ruo zhu*

Sasa bashanensis C. D. Chu & C. S. Chao, *Acta Phytotax. Sin.* 18: 30. 1980.

Culms 2–3 m, 1–1.5 cm in diam.; internodes 38–42 cm at mid-culm, white powdery, densely strigose or with imprints of fallen hairs; wall 2–3 mm thick; nodes elevated, nodal ridge more prominent than sheath scar. Culm sheaths yellow-brown, tinged with red, base with a corky ring, densely strigose or with imprints left by fallen hairs; auricles and oral setae absent; ligule subtruncate, 2–4 mm, glabrous, margin dentate; blade narrowly lanceolate, short. Leaves 6–9 per ultimate branch; sheath conspicuously striate, glabrous; auricles and oral setae absent; ligule well developed, brown, arcuate, (2–)4–8 mm, nearly entire or weakly sinuous, glabrous but dark scurfy powdery; blade elliptic-lanceolate or linear-lanceolate, 25–35 × 4–8 cm, abaxially glabrous but dark scurfy powdery, adaxially glabrous, secondary veins 10–13 pairs, tessellations nearly square, base cuneate or broadly cuneate, one margin scabrid, other margin smooth. Inflorescence unknown.

- Calcareous mountain slopes, valleys. Sichuan.

16. *Indocalamus tessellatus* (Munro) P. C. Keng, *Acta Phytotax. Sin.* 6: 355. 1957.

箬竹 *ruo zhu*

Bambusa tessellata Munro, *Trans. Linn. Soc. London* 26: 110. 1868; *Pseudosasa longivaginata* H. R. Zhao & Y. L. Yang; *Sasa tessellata* (Munro) Makino & Shibata; *Sasamorpha tessellata* (Munro) Koidzumi.

Culms 0.75–2 m, 0.4–0.7 cm in diam.; internodes usually green, ca. 25(–32) cm, with a red-brown tomentose ring below each node; nodes weakly elevated, supra-nodal ridge slightly more prominent than sheath scar. Culm sheaths striate, usually longer than internodes, upper portion loosely encircling culm, lower portion closely encircling it, thinly leathery, white tomentose, purple-brown strigose; auricles and oral setae absent;

ligule truncate, 1–2 mm, membranous, brown hirtellous; blade deciduous, narrowly lanceolate, variable in size. Leaf sheaths leathery, glabrous, margin basally ciliate, distally glabrous; auricles rare, to 1 mm; oral setae very scarce, erect, white, straight, to 2 mm; ligule truncate or eroded, 1–2 mm, puberulent; blade broadly lanceolate or oblong-lanceolate, 20–46 × 4–10.8 cm, abaxially gray-green, glabrous or densely appressed-puberulent and tomentose along both or one side of midrib, secondary veins 8–16 pairs, tessellations square. Panicle 10–15 cm, partially exserted; branches erect, main axis and branches densely brown-puberulent. Spikelets purple-green, nearly terete, 2.3–2.5 cm; florets 5–15; pedicels 1–4 cm. Rachilla internodes 1–4 mm, white puberulent. Glumes 1 or 2, papery; lower glume 5–7 mm, densely puberulent, 5-veined; upper glume 7–12 mm, distally puberulent, 7-veined; first lemma 1.1–1.3 cm, distally puberulent, 11–13-veined, margins sparsely ciliate, apex very long acuminate to mucronate, callus 0.5–1 mm, white barbate; first palea ca. 1/3 as long as lemma, minutely white pubescent between keels, apex very shortly 2-cleft and pubescent; lodicules 3, oblong-lanceolate, ciliate, distally sparsely pilose. Anthers red, 6–7 mm. Ovary green, ovoid; style red, ca. 2 mm; stigmas 2, red, 3–4 mm. Caryopsis ca. 7 × 2.5 mm, style base persistent. New shoots Apr–May, fl. Jun–Jul.

- Open forests on mountain slopes; 300–1400 m. Hunan, Zhejiang.

17. *Indocalamus latifolius* (Keng) McClure, *Sunyatsenia* 6(1): 37. 1941.

阔叶箬竹 *kuo ye ruo zhu*

Arundinaria latifolia Keng, *Sinensia* 6(2): 147. 1935; *Indocalamus lacunosus* T. H. Wen; *I. migoi* (Nakai) P. C. Keng; *Pseudosasa hirta* S. L. Chen & G. Y. Sheng; *P. truncatula* S. L. Chen & G. Y. Sheng; *Sasamorpha latifolia* (Keng) Nakai; *S. migoi* Nakai.

Culms to 2 m, 0.5–1.5 cm in diam.; internodes 5–22 cm, puberulent, with a dense, brown tomentose ring below each node; nodes slightly elevated, supra-nodal ridge slightly more prominent than sheath scar. Culm sheaths distally loosely enclosing culm, papery, initially brown strigose and white tomentose, margins brown ciliate; auricles absent or inconspicuous; oral setae sparse, short, scabrid; ligule truncate, 0.5–2 mm, glabrous or ciliate; blade erect, linear or narrowly lanceolate. Leaf sheath thick, rigid, glabrous except minutely pubescent at apex; auricles absent; ligule truncate, 1–3 mm, glabrous or ciliate; blade oblong-lanceolate, 10–45 × 2–9 cm, abaxially glabrous or pale green and ± puberulent, secondary veins 6–13 pairs, tessellations nearly square, margins hispidulous, apex acuminate. Panicles 6–12 cm, enveloped at base by a leaf sheath, axis and branches densely puberulent; branches ascendant or erect. Spikelets usually pale purple, subterete, 2.5–7 cm; florets 5–9. Rachilla internodes 4–9 mm, densely white pubescent. Glumes usually thin, distally and marginally pubescent, otherwise puberulent or glabrous; lower glume 5–10 mm, inconspicuously 5–9-veined; upper glume 8–13 mm, 7–9-veined; lemma puberulent or subglabrous, 11–13-veined, transverse veins distinct, first lemma 1.3–1.5 cm, callus densely white pubescent; palea 5–10 mm, minutely appressed pubescent between

keels, minutely pubescent near margins; lodicules 2–3 mm. Anthers purple or purple-yellow, 4–6 mm. Stigmas 2. New shoots Apr–May, fl. Jan–Aug. $2n = 48^*$.

• Open forests on mountain slopes and in valleys; below 1000 m. Anhui, Henan, Hubei, Jiangsu, Shaanxi, Shanxi.

18. *Indocalamus hirtivaginitus* H. R. Zhao & Y. L. Yang, Acta Phytotax. Sin. 23: 463. 1985.

毛鞘箬竹 mao qiao ruo zhu

Culms ca. 2 m, 0.8–1 cm in diam.; internodes purple-green, initially white powdery and glabrous or white puberulent, densely brown tomentose below nodes; wall 1.5–2 mm thick; supra-nodal ridge elevated, more prominent than sheath scar. Branches minutely appressed white or brown pubescent and retrorsely strigose. Culm sheaths commonly longer than internode, densely white tomentose and brown strigose or with imprints of fallen hairs; auricles absent or if present, small, sparsely fringed with scabrid oral setae; ligule 0.7–1.8 mm, puberulent, sparsely scabrid ciliate; blade erect, linear-lanceolate, 1.5–6.5 cm. Leaf auricles absent; ligule 1–2 mm, margin pale ciliate; pseudopetiole 0–7 mm; blade oblong-lanceolate, 19–34 × 4.5–7 cm, glabrous, except pubescent abaxially at base, secondary veins 9–12 pairs, tessellations square. New shoots Apr.

• Roadsides. Jiangxi.

19. *Indocalamus inaequilaterus* W. T. Lin & Z. M. Wu, Acta Phytotax. Sin. 26: 147. 1988.

粤西箬竹 yue xi ruo zhu

Culms 1–1.2 m, 0.6–0.9 cm in diam.; internodes terete, 25–33 cm, densely pubescent, densely hispid below nodes; wall 2–3 mm thick; sheath scar slightly raised. Branches often 1 per node. Culm sheaths persistent, 14–16 cm, abaxially sparsely white tuberculate-hispid, transverse veins often distinct distally; auricles absent; oral setae absent or few, erect, hirsute; ligule ca. 1 mm; blade spreading or reflexed, lanceolate, 1.4–2.4 cm, base ca. 1/3 as wide as sheath apex. Leaves 4 or 5 per ultimate branch; sheath sparsely ± hirsute, keeled toward apex; auricles absent; oral setae few or absent; ligule ca. 1 mm; blade oblong-ovate, 14–28 × 3.5–6.5 cm, both surfaces glabrous, secondary veins 9–12 pairs, tessellations conspicuous, apex caudate. Inflorescence unknown.

• Guangdong (Fengkai).

This species is known only from the type. The authors compared it with *Indocalamus hirtivaginitus*, which differs by having the culm sheaths longer than the corresponding nodes and without distinct transverse venation.

20. *Indocalamus victorialis* P. C. Keng, Acta Phytotax. Sin. 1: 121. 1951.

胜利箬竹 sheng li ruo zhu

Bashania victorialis (P. C. Keng) T. P. Yi; *Pseudosasa victorialis* (P. C. Keng) T. P. Yi.

Culms 1–3 m, 0.5–0.8 cm in diam.; internodes striate, to 26 cm, glabrous, lumen 1–2 mm in diam.; supra-nodal ridge

rather elevated; sheath scar flat; intranode 4–5 mm. Culm sheaths closely encircling culm, shorter than internode, leathery to papery, pale brown strigose, densely retrorsely so at base, tubercles of fallen hairs persistent, margins densely ciliate; auricles and oral setae absent; ligule truncate, 0.5–1 mm, puberulent; blade deciduous, narrow, glabrous. Leaves 1–4 per ultimate branch; sheath glabrous except for ciliate distal margins, dorsally keeled; auricles and oral setae absent; ligule truncate, ca. 0.5 mm, puberulent; pseudopetiole short; blade broadly lanceolate, 14–25 × 2.5–4 cm, papery, glabrous, secondary veins 5–9-paired, tessellations rectangular, base broadly cuneate, apex caudate-acuminate. Panicles large, 15–26 cm; branches 3 per node, pulvinate. Spikelets yellow-green, ca. 1 cm; pedicels stiff, 1–5 mm, puberulent; florets ca. 5. Rachilla compressed, puberulent; internodes ca. 2 mm, readily disarticulating. Glumes glabrous except for midrib distally; lower glume purple-green, lanceolate, 3.5–4 mm, 3-veined, apex acuminate; upper glume yellow-green, 5.5–6 mm, inconspicuously 3-veined with prominent midrib, distally scabrous with minute hairs; lemma yellow-green, narrowly lanceolate, 5–6 × ca. 2 mm, papery, glabrous except for one ciliate margin, 7-veined, callus with hairs 0.5–1 mm; palea 4.5–5.5 mm, apically puberulent between keels, otherwise glabrous, margins membranous; lodicules membranous, ca. 1 × 0.3–0.4 mm, posterior oblong, margin sparsely ciliate, apex obtuse; anterior pair oblong-ovate, not ciliate, apex acute. Anthers yellow, ca. 4 mm. New shoots Apr, fl. May.

• Forests with *Bambusa emeiensis*, valleys, mountain slopes. Sichuan.

21. *Indocalamus pedalis* (Keng) P. C. Keng, Techn. Bull. Natl. Forest. Res. Bur. 8: 12. 1948.

矮箬竹 ai ruo zhu

Arundinaria pedalis Keng, J. Wash. Acad. Sci. 36: 84. 1946.

Culms ca. 30 cm, ca. 2 mm in diam.; lower internodes 1–5 cm, initially with a pubescent ring below each node; nodes prominent. Culm sheaths striate, 2–4.5 cm, initially basally pubescent; auricles absent; ligule truncate, ca. 0.3 mm, rigid, margin glabrous. Leaves 2–4 per ultimate branch; sheath brown strigose near upper margins, margins pale brown ciliate; auricles and oral setae absent; ligule truncate, ca. 0.5 mm, brown fimbriate; pseudopetiole 1–4 mm; blade lanceolate, 6.5–15 × 0.9–1.7 cm, glabrous or abaxially initially puberulent, secondary veins 4–6-paired, tessellations rectangular, base broadly cuneate, apex acuminate. Panicle or raceme 8–11 cm; spikelets 4–8; axis and branches brown pubescent. Spikelets brown or dark brown, 2–6 × 0.3–0.5 cm; pedicel erect or ascendant, weakly compressed; florets 4–11. Rachilla internodes 4–5.3 mm, flat on side facing floret, margins brown ciliate. Glumes 3 or 4, distally pubescent; lower glume 4–5 mm, 3–5-veined; second glume 5.5–6 mm, 7-veined; third and fourth glumes 7–8 mm; lemma ovate-lanceolate, 7–11 mm, 11-veined, apex subulate; callus ca. 0.5 mm, densely pale pubescent, hairs ca. 0.8 mm; palea lanceolate, 8–9 mm, or about as long as lemma, keels puberulent, minutely setose at apex; lodicules red-brown, oblong-lanceolate, or lateral ones subovate, ca. 3 mm, basally

veined, upper margin ciliate. Anthers black or purple, 5–6 mm. Stigmas gray-white or milky-white, ca. 3 mm. Inflorescence unknown.

- Fissures of rocky hillsides. Sichuan.

22. *Indocalamus wilsonii* (Rendle) C. S. Chao & C. D. Chu, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 43. 1981.

鄂西箬竹 *e xi ruo zhu*

Arundinaria wilsonii Rendle, J. Linn. Soc., Bot. 36: 437. 1904; *Indocalamus nubigenus* (P. C. Keng) H. R. Zhao & Y. L. Yang; *I. shimenensis* B. M. Yang; *Sasa nubigena* P. C. Keng; *Sinarundinaria wilsonii* (Rendle) P. C. Keng.

Culms 30–90 cm or more, 0.2–0.4 cm in diam.; internodes 4–12 cm, glabrous or white pubescent, sometimes with a densely pubescent ring below each node, lumen 0.5–1 mm in diam.; supra-nodal ridge flat or weakly prominent; sheath scar flat. Culm sheaths pale red-brown or straw-colored, closely embracing culm, ca. 1/2 as long as internode, thickly papery, densely deciduously white pubescent, densely pubescent or glabrescent near outer margin, veins conspicuous, transverse veins

sometimes distinct; auricles and oral setae absent; ligule short, ca. 0.6 mm; blade ovate-lanceolate or narrowly triangular, 2–15 mm, base contracted, apex acute. Branch sheaths orange-red when dry, glabrous; ligule 1.5–4 mm; blade lanceolate or narrowly ovate-lanceolate, 2.5–4 cm. Leaves 3(–5) per ultimate branch; sheath yellow-green, tinged with red, glabrous or pubescent; auricles and oral setae absent; ligule 2.5–9 mm; blade oblong-lanceolate, 6–17 × 1.5–4.7 cm, wavy when dry, abaxially gray-green and pilose, adaxially yellow-green and glabrous, secondary veins 4–8 pairs, tessellations square, base rounded or broadly cuneate, apex acuminate with a weak point. Panicle 5–10 cm, base encircled by leaf sheath; branches ascendant, slender, glabrous, pulvinate. Spikelets usually purple-green, 1.5–2.6 cm; florets 3–7. Rachilla internodes ca. 4 mm, densely yellow-villous. Glumes usually 2, glabrous; lower glume 2–3 mm, 3-veined; upper glume 3–5 mm, 5–7-veined; lemma puberulent, 7–9-veined, apex acuminate with a short mucro, callus densely white villous; palea 6–7.2 mm, puberulent. Anthers yellow. Styles 2(or 3). Fl. May–Aug.

- Forests; 1700–3000 m. Guizhou, Hubei, Sichuan.

Taxa incertae sedis

Indocalamus amplexicaulis W. T. Lin (J. S. China Agric. Univ. 13(2): 86. 1992) was described from Guangdong.

Indocalamus chebalingensis W. T. Lin (J. Bamboo Res. 19(1): 6. 2000) was described from sterile material from Guangdong (Shixing). In the protologue it was compared with *I. longiauritus*.

Indocalamus confertus C. H. Hu (J. Bamboo Res. 15(1): 1. 1996) was described from Sichuan.

Indocalamus cordatus T. H. Wen & Y. Zou (J. Bamboo Res. 10(1): 18. 1991) was described from Jiangxi.

Indocalamus macrophyllus C. F. Huang (Wuyi Sci. J. 8: 171. 1991) was described from Fujian (Wuyi Shan).

Indocalamus pumilus Q. H. Dai & C. F. Huang (Acta Phytotax. Sin. 24: 394. 1986) was described from a cultivated plant in the Guangxi Institute of Forestry Bamboo Garden in Nanning, Guangxi.

Indocalamus suichuanensis T. P. Yi & Y. H. Guo (J. Bamboo Res. 14(1): 14. 1995) was described from Jiangxi.

Indocalamus youxiuensis T. P. Yi (J. Bamboo Res. 11(3): 53. 1992) was described from Sichuan.

29. *INDOSASA* McClure, Lingnan Univ. Sci. Bull. 9: 28. 1940.

大节竹属 *da jie zhu shu*

Zhu Zhengde (朱政德 Chu Cheng-de); Chris Stapleton

Arborescent bamboos, sometimes shrubby. Rhizomes leptomorph, with running underground stems. Culms diffuse, erect to nodding; internodes substantially grooved above branches; wall thick, cavity with granular or spongy pith; nodes prominent. Mid-culm branches 3, subequal or central dominant. Culm sheaths deciduous, leathery or thickly papery, setose; ligule truncate; blade large, triangular or lanceolate, rarely strap-shaped. Leaves usually medium to large-sized, transverse veins distinct. Inflorescence fully bracteate, partially iterant, lateral, racemose, sessile, prophyllate. Spikelets many flowered, gradually enlarged; basal bracts and glumes often with basal axillary buds developed into secondary spikelets; basal 1–4 florets sometimes sterile. Glumes usually 2; lemma larger and broader than glumes, many veined; palea obtuse, 2-keeled; lodicules 3, subequal. Stamens 6; filaments free. Ovary narrowly ellipsoid or fusiform; style short; stigmas 3, plumose. Fruit a caryopsis, ovoid to ellipsoid, beaked. New shoots spring–early summer.

About 15 species: S China, N Vietnam; 15 species (13 endemic) in China.

Indosasa is the only genus of bamboos in China with six stamens, bracteate inflorescences, and leptomorph rhizomes.

In addition to the species treated below, *Indosasa jinpingensis* T. P. Yi (J. Bamboo Res. 20(4): 1. 2001) was described from Yunnan (Jinping). In the protologue it was compared with *I. parvifolia*.

Indosasa hispida (species no. 13) could not be included in the following key because its culm sheaths are unknown.

1a. Culm sheaths without auricles.

2a. Culm internodes initially glabrous.

3a. Culm sheaths asymmetrical, central parts of sheath densely setose; culm wall thick, internodes nearly

solid at culm base 1. *I. crassiflora*

- 3b. Culm sheaths symmetrical, sparsely setose or subglabrous; culm wall thin.
- 4a. Culm branch nodes weakly prominent; ultimate branches usually with 1 leaf, rarely 2-leaved with apical blade inverted 2. *I. shibataeoides*
- 4b. Culm branch nodes very prominent; ultimate branches 2–4-leaved, without apical blade inverted.
- 5a. Culms to 3 m; culm sheaths with oral setae absent or, if present, culms initially white hairy 3. *I. glabrata*
- 5b. Culms to 5 m; culm sheaths with oral setae present, 5–10 mm; culms glabrous 15. *I. triangulata*
- 2b. Culm internodes initially pubescent or scabrous.
- 6a. Culm nodes and branch nodes weakly prominent; leaf blade abaxially pubescent 4. *I. angustata*
- 6b. Culm nodes and branch nodes strongly prominent; leaf blade usually glabrous.
- 7a. Culm internode cavity pith lamellate; internodes initially villous; culm sheath sometimes with sparse oral setae 3. *I. glabrata*
- 7b. Culm internode cavity pith spongy or granular, never lamellate; internodes initially setose; culm sheath without oral setae.
- 8a. Culm internode pith spongy; leaf blade $10-17 \times 2-2.5$ cm 5. *I. spongiosa*
- 8b. Culm internode pith slightly granular; leaf blade $14-27 \times 2.5-4.5$ cm 6. *I. ingens*
- 1b. Culm sheaths with auricles.
- 9a. Ultimate branches with 1 leaf, rarely 2 leaves with apical leaf blade inverted 2. *I. shibataeoides*
- 9b. Ultimate branches with 2–9 leaves, apical leaf blade not inverted.
- 10a. Culm nodes and branch nodes moderately prominent; culm sheaths sparsely setose.
- 11a. Culms initially setose; culm sheaths with brown setae; leaf blade glabrous 11. *I. longispicata*
- 11b. Culms glabrous; culm sheaths with retrorse, purple-brown setae; leaf blade abaxially pubescent 12. *I. gigantea*
- 10b. Culm nodes and branch nodes very prominent (slightly prominent in *I. patens*); culm sheaths with clumped setae.
- 12a. Culm sheaths glaucous 14. *I. singulispicula*
- 12b. Culm sheaths not glaucous.
- 13a. Culm sheaths yellow-green or yellow; blade marginally never undulate.
- 14a. Culm internodes glaucous, culm sheath auricles minute; leaf blade $11-22 \times 1.5-3$ cm 7. *I. sinica*
- 14b. Culm internodes not glaucous; culm sheath auricles large, projecting, rounded; leaf blade $6-14 \times 1-1.5$ cm 8. *I. parvifolia*
- 13b. Culm sheaths red-brown, purple-brown or brown; blade marginally undulate or not.
- 15a. Culm sheath blade marginally not undulate, entire, glabrous; branches horizontal; leaf blade $15-25 \times 2-4$ cm, abaxially sparsely pubescent 9. *I. patens*
- 15b. Culm sheath blade marginally undulate, denticulate, setose; branches deflexed; leaf blade $8-15 \times 1-2.3$ cm, abaxially glabrous 10. *I. lipoensis*

1. Indosasa crassiflora McClure, Lingnan Univ. Sci. Bull. 9: 29. 1940.

大节竹 da jie zhu

Sinobambusa gibbosa McClure, Lingnan Univ. Sci. Bull. 9: 58. 1940; *Indosasa gibbosa* (McClure) McClure.

Culms to 5 m, to 4 cm in diam.; internodes flexuose, initially green, 40–65 cm, glaucous, glabrous; wall thick, cavity pith thin; nodes very prominent. Culm sheath obscurely spotted, shorter than internode, densely setose at base, one or sometimes both sides subglabrous, apex asymmetrical; auricles absent; oral setae sparse; ligule truncate, dentate; blade reflexed, triangular-lanceolate, slightly wrinkled, setose. Leaves 4–6 per ultimate branch; sheath glabrous; auricles weak; oral setae few, deciduous, erect; ligule short; blade linear-lanceolate, $11-22 \times 2-4.5$ cm, glabrous, glaucous, secondary veins 5–8-paired, one margin serrulate, other margin entire. Pseudospikelets robust, $6-12.5 \times 0.7-1$ cm, glabrous; florets 7–13. Palea about as long as lemma, or slightly longer; lodicules oblong. Anthers yellow. Ovary fusiform; style glabrous; stigmas 3. New shoots May, fl. Jun.

Open lowlands. SW Guangxi [N Vietnam].

The asymmetrical culm sheath makes this species very easy to distinguish.

The culms are used in many ways as supporting poles.

2. Indosasa shibataeoides McClure, Lingnan Univ. Sci. Bull. 9: 32. 1940 [*"shibataeoides"*].

摆竹 bai zhu

Indosasa acutiligulata Z. P. Wang & G. H. Ye; *I. levigata* Z. P. Wang & G. H. Ye; *I. tinctilimba* McClure.

Culms to 15 m, to 10 cm in diam.; internodes initially deep green, yellow in age, sometimes spotted and striate, 40–50 cm, glaucous below nodes, glabrous; nodes prominent. Culm sheath light orange, purple or yellow, unspotted or sometimes minutely spotted, striate, setose (glabrous on smaller culms), glaucous; auricles small (absent on small culms), falcate; oral setae radiate; ligule arcuate, ciliolate; blade green, triangular or lanceolate, constricted at base. Leaves usually 1 per ultimate branch, rarely 2 with apical leaf inverted; sheath purple; blade elliptic-lanceolate, $8-22 \times 1.5-3.5$ cm, glabrous, secondary veins 4–6-paired. Flowering branchlets usually leafless. Pseudospikelets solitary or in pairs, robust, slightly compressed, $6-8 \times$ ca. 1 cm, bracts 4–8; florets 6–8. Rachilla internodes ca. 2 mm, glabrous. Glumes usually 4, thin, glabrous; lemma glabrous; palea shorter

and narrower than lemma, glabrous; lodicules glabrous. Anthers yellow. Ovary and style glabrous. New shoots Apr, fl. Jun–Jul.

- Evergreen forests, forming large areas of understory; 300–1200 m. N Guangdong, N Guangxi, S Hunan.

This species is used for the manufacture of bamboo furniture, for which its mottled culms are considered superior.

3. *Indosasa glabrata* C. D. Chu & C. S. Chao, *Acta Phytotax. Sin.* 21: 64. 1983.

算盘竹 *suan pan zhu*

Culms to 3 m, to 2 cm in diam.; internodes initially green, yellow in age, 20–30 cm, glaucous below nodes, glabrous; wall 2–3 mm thick, cavity pith lamellate; nodes very prominent. Culm sheaths readily deciduous, green or yellow when dry, unspotted, shorter than internodes, glabrous or sparsely setose; auricles and oral setae absent; ligule slightly arcuate, short; blade green, triangular lanceolate. Leaves 2–4 per ultimate branch; sheath glabrous; auricles small or obscure; oral setae deciduous, straight; ligule short; blade oblong-lanceolate, 8–16(–23) × 2–2.8(–4.2) cm, secondary veins 5–7-paired. Inflorescence unknown. New shoots early Apr.

- Hills. S Guangxi.

- 1a. Culms glabrous; culm sheaths oral setae absent 3a. var. *glabrata*
 1b. Culms white hairy initially; culm sheath oral setae scarce 3b. var. *albohispidula*

3a. *Indosasa glabrata* var. *glabrata*

算盘竹(原变种) *suan pan zhu* (*yuan bian zhong*)

Culms glabrous. Culm sheath without oral setae.

- Open hills, slopes or summits. S Guangxi.

3b. *Indosasa glabrata* var. *albohispidula* (Q. H. Dai & C. F. Huang) C. S. Chao & C. D. Chu, *Fl. Reipubl. Popularis Sin.* 9: 212. 1996.

毛算盘竹 *mao suan pan zhu*

Indosasa albohispidula Q. H. Dai & C. F. Huang, *J. Bamboo Res.* 3(1): 47. 1984.

Culms initially white hairy. Culm sheath with few, straight oral setae.

- Low hills. S Guangxi.

4. *Indosasa angustata* McClure, *J. Arnold Arbor.* 23: 93. 1942.

甜大节竹 *tian da jie zhu*

Culms to 14 m, to 10 cm in diam.; internodes initially light green, gray-green in age, 30–50 cm, initially sparsely pilose, soon glabrous; cavity pith spongy or lamellate; nodes weakly prominent. Culm sheaths initially green, light brown when dried, unspotted, striate, narrowly elongated, setose, margins ciliate; auricles absent, oral setae 2–4, erect, 7–15 mm; ligule prominent, 2–5 mm high, ciliate; blade pale purple-red, lanceolate, scabrid. Leaves 3–6 per ultimate branch; sheath glabrous, margins sometimes ciliate; auricles usually absent; oral setae scarce, readily deciduous, erect; blade linear-lanceolate to lanceolate, 11–28 × 1.5–5 cm, sparsely setose, secondary veins

3–7-paired, margins scabrid, serrulate. Inflorescence unknown. New shoots Apr.

Under evergreen trees. S Guangxi [N Vietnam].

The shoots are sweet.

5. *Indosasa spongiosa* C. S. Chao & B. M. Yang, *Bamboo Res.* 1982(1): 14. 1982.

江华大节竹 *jiang hua da jie zhu*

Culms 5–8 m, to 6 cm in diam.; internodes 20–35 cm, glaucous near nodes, slightly scabrid; wall ca. 3 mm thick, pith spongy; nodes strongly prominent. Culm sheaths shorter than internodes, sparsely setose, margins ciliate, purple; auricles and oral setae absent; ligule short, shortly hairy; blade lanceolate, scabrid. Leaves 3–5 per ultimate branch; sheath glabrous; auricles absent or weak, oral setae few or absent; blade lanceolate or oblong-lanceolate, 10–17 × 1.2–2.5 cm, glabrous, secondary veins 5- or 6-paired. Inflorescence unknown. New shoots Apr–May.

- About 800 m. S Hunan.

The culms are used as supports, and the plants are cultivated for ornament.

6. *Indosasa ingens* Hsueh & T. P. Yi, *Acta Bot. Yunnan.* 5: 39. 1983.

粗穗大节竹 *cu sui da jie zhu*

Culms to 6 m, 3–5 cm in diam.; internodes initially dark green or purple-green, yellow-brown in age, 30–40(–60) cm, glaucous, setose, scabrid. Culm sheaths yellow-brown, sparsely setose; auricles and oral setae absent; ligule arcuate or weakly prominent, shortly ciliate; blade reflexed or erect, triangular-ovate. Leaves 5–9 per ultimate branch; sheath glabrous; auricles absent; oral setae 2 or 3, deciduous; blade oblong to lanceolate, 14–27 × 2.5–4.5 cm, glabrous, secondary veins 6–8-paired. Pseudospikelets robust, slightly compressed, 4.5–13 × 0.5–0.8 cm; bracts 4–7, distal bracts larger; florets 5–15. Rachilla internodes ca. 1 cm, articulate, glaucous, glabrous. Lemma broadly ovate; palea about as long as lemma or slightly shorter, narrower, keels shortly ciliate; lodicules glabrous. Stigmas 3, purple. Fl. Oct–Dec.

- Streams; 900–1600 m. SE Yunnan.

The shoots are bitter, and the culms are used for fencing and weaving.

7. *Indosasa sinica* C. D. Chu & C. S. Chao, *Acta Phytotax. Sin.* 21: 65. 1983.

中华大节竹 *zhong hua da jie zhu*

Culms 10–15 m, 6–10 cm in diam.; internodes flexuose, initially green, brown or dark green in age, 30–50 cm, densely glaucous, sparsely setose; wall thick; nodes very prominent. Culm sheath yellow-green, striate, with scattered clumps of setae, more densely setose at base; auricles small; oral setae curved, 1–1.5 cm; ligule arched, 2–3 mm, ciliate; blade reflexed, green, triangular-lanceolate, densely setose. Leaves 3–9 per ultimate branch; auricles developed or sometimes obscure; oral setae deciduous, purple, ca. 8 mm; blade lanceolate, 12–22 × 1.5–3 cm, apical blades to 6 cm wide, glabrous, secondary

veins 5- or 6-paired. Pseudospikelets 2 or 3, robust, 4.5–13 cm; florets many. Rachilla articulate, glabrous. Lemma 1.2–1.5 cm, glaucous, glabrous, many veined, apex acute; palea shorter than lemma; lodicules membranous. Stamens with filaments white; anthers purple. Style 1; stigma 3-cleft. Caryopsis brown, ovoid-ellipsoid, ca. 8×2 mm, base rounded; style base persistent. New shoots Apr, fl. May.

- Widespread; low elevations. Guangxi, S Guizhou, S Yunnan.

The culms are used as supports and in small buildings.

8. *Indosasa parvifolia* C. S. Chao & Q. H. Dai, Acta Phytotax. Sin. 21: 67. 1983.

小叶大节竹 xiao ye da jie zhu

Culms to 6 m, to 3.5 cm in diam.; internodes initially deep green, green or gray-green in age, 20–40 cm, glaucous below nodes, densely setose; wall thick; cavity pith slightly granular; nodes strongly prominent. Culm sheaths orange-yellow, glaucous, with scattered clumps of readily deciduous, brown setae; ligule very short, densely ciliate; blade erect, green, triangular or lanceolate, constricted at base, both surfaces setose. Leaves 4–7 per ultimate branch; sheath glabrous; auricles small; oral setae deciduous, erect; blade abaxially light green, linear-lanceolate or lanceolate, 6–14 \times 1–1.5 cm, glabrous, secondary veins 3- or 4-paired. Inflorescence unknown. New shoots Apr.

- Hardwood forests; ca. 800 m. S Guangxi.

9. *Indosasa patens* C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 21: 72. 1983.

横枝竹 heng zhi zhu

Culms to 12 m, 8–12 cm in diam.; internodes initially green, purple striate, 40–60 cm, densely setose; cavity pith spongy or lamellate; nodes weakly prominent. Culm sheaths purple-brown, green-brown on smaller culms and at culm apex, unspotted, shorter than internodes, slightly glaucous, setose in scattered clumps, margins ciliate; auricles small, rugose; oral setae 1–1.5 cm, scabrid; ligule truncate or weakly prominent, 2–3 mm, dark brown ciliate; blade green-brown, triangular or lanceolate, broad, scabrous. Leaves 2–5 per ultimate branch; sheath glabrous; auricles small; oral setae sparse, 5–10 mm; blade broadly linear-lanceolate, 13–25 \times 2–4 cm, pubescent or subglabrous, secondary veins 5–7-paired. Inflorescence unknown. New shoots Apr.

- Evergreen broad-leaved forests on low hills. N Guangxi.

This species is characterized by its open, horizontally spreading branches.

10. *Indosasa lipoensis* C. D. Chu & K. M. Lan, Bamboo Res. 1982(1): 3. 1982.

荔波大节竹 li bo da jie zhu

Culms to 10 m, 3–4 cm in diam.; internodes flexuose, 30–40 cm, not glaucous, initially setose; cavity pith spongy; nodes prominent; sheath ring glabrous. Culm sheath red-brown, densely setose in scattered clumps; auricles developed; oral setae radiate, curved, 7–9 mm; ligule slightly arched, 2–3 mm, shortly ciliate; blade erect or horizontal, green, triangular-lanceolate or narrowly triangular, both surfaces sparsely setose,

basal margins undulate, serrulate. Leaves 2–4 per ultimate branch; sheath glabrous; auricles small; oral setae sparse, deciduous, erect; blade lanceolate or oblong-lanceolate, 8–15 \times 1–2.3 cm, secondary veins 4- or 5-paired, both surfaces glabrous, margins serrulate. Inflorescence unknown. New shoots Apr.

- Usually cultivated; low elevations. S Guizhou.

11. *Indosasa longispicata* W. Y. Hsiung & C. S. Chao, Acta Phytotax. Sin. 21: 71. 1983.

棚竹 peng zhu

Sinobambusa striata T. H. Wen.

Culms 10–15 m, to 6 cm in diam.; internodes initially green, yellow-green in age, 40–50 cm, glaucous, densely setose; cavity pith spongy; nodes weakly prominent. Culm sheaths variable in color, densely glaucous, sparsely setose, nearly glabrous on small culms or at culm apex, margins ciliate; auricles falcate, small; oral setae radiate, 4–6 mm; ligule prominent, short, ciliate; blade green, triangular, lanceolate, or narrowly lanceolate, setulose. Leaves 3–5 per ultimate branch; sheath margins ciliate; auricles developed; oral setae radiate; ligule short, obscure; blade abaxially light green, narrowly lanceolate, 9–12 \times 1.2–2.6 cm, glabrous, secondary veins 4–6-paired, margins serrulate. Pseudospikelets clustered, 4–10(–20) cm; bracts several; florets 10–20. Rachilla internodes 6–8 mm, glabrous. Glumes absent to 2, gradually transformed into lemmas, mucronate, basally and apically usually sterile; lemma papery; palea narrower and shorter than lemma; lodicules subglabrous. Anthers ca. 5 mm. Ovary glabrous; stigmas 3. New shoots May, fl. Apr–May.

- Evergreen broad-leaved forests. N Guangxi.

The culms are used for fencing and the framework of small buildings. The plants are cultivated for ornament.

12. *Indosasa gigantea* (T. H. Wen) T. H. Wen, J. Bamboo Res. 19(1): 22. 1991.

橄榄竹 gan lan zhu

Sinobambusa gigantea T. H. Wen, J. Bamboo Res. 2(1): 57. 1983; *Acidosasa gigantea* (T. H. Wen) Q. Z. Xie & W. Y. Zhang.

Culms 9–12 m, 5–10 cm in diam.; internodes initially green, yellow-green in age, 50–77 cm, glaucous, glabrous, minutely papillate; nodes prominent, glaucous. Culm sheaths golden-yellow or pale red-brown, triangular, 2–4 cm wide, glaucous, purple-brown setose, basally subglabrous, apex narrow; auricles ovate to elliptic, ca. 11 \times 7–8 mm, rugose, abaxially roughly hairy; oral setae erect, 5–10 mm; ligule prominent, 3–5 m, roughly hairy, with cilia 2–3 mm; blade striate, lanceolate to triangular, margins retrorsely setose, both surfaces glabrous. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule ca. 2 mm; blade lanceolate, 8–13 \times 1.4–2 cm, mainly glabrous, abaxially proximally pubescent, secondary veins 5- or 6-paired, serrulate. Flowering branchlets lateral, 8–9 cm. Pseudospikelets 2 or 3, 5–6 cm; florets 7–9. Glumes 1 or 2; lemma glabrous; palea nearly

as long as lemma, keels and apex ciliate; lodicules 3–4 mm. Ovary 0.5–1 mm; styles ca. 2.5 mm; stigmas 3.

- Low hills. N Fujian; cultivated in Zhejiang.

A different interpretation of the inflorescence can place this species in *Acidosasa*.

13. *Indosasa hispida* McClure, Lingnan Univ. Sci. Bull. 9: 31. 1940.

浦竹仔 pu zhu zi

Culms to 2.3 m; internodes glaucous, initially setose, mainly glabrous in age with setae persistent below nodes. Culm sheaths unknown. Leaves 2–5 per ultimate branch; sheath glabrous; auricles absent or small; oral setae absent or few, erect, scabrid; ligule truncate or prominent, 1–2 mm, slightly scabrous, cilia absent; blade narrowly lanceolate, 9–22 × 1.5–2.8 cm, abaxially pubescent, rarely glabrous, secondary veins 5- or 6-paired, margins serrulate. Flowering branchlets leafy or leafless. Pseudospikelets 3 or 4, 3.5–7 cm, yellow hairy, subtended by several, sheathlike bracts 2–4 cm, with shortened blades 5–12 mm; florets 4–7. Rachilla internodes 5–6 mm, slightly compressed, densely pubescent. Glumes 2, yellow, densely hairy, many veined; lemma 1.2–1.6 cm, abaxially densely pubescent, many veined, apex acuminate, long mucronate; palea shorter and narrower than lemma, 1–1.2 cm, keels and apex ciliate; lodicules lanceolate, margin sometimes ciliate. Anthers yellow, ca. 4 mm. Ovary and style glabrous; stigmas 3. Fl. Mar–Apr.

- Marginal lands. C Guangdong.

The culms are used for papermaking.

14. *Indosasa singulispicula* T. H. Wen, J. Bamboo Res. 7(1): 29. 1988.

单穗大节竹 dan sui da jie zhu

Culms 5–7 m, 1–1.5 cm in diam.; internodes green, terete, 10–30 cm, initially white powdery below nodes, pubescent; nodes very prominent; sheath scar slightly prominent; intranode 6–9 mm, black scurfy. Branches 3, central dominant; nodes very prominent. Culm sheaths gradually deciduous, initially pale green, striate, thickly papery, white powdery, initially dark brown setose, densely setose at base, margins pale brown ciliate; auricles obvious, falcate, roughly purple-brown hairy; oral setae brown; ligule ca. 2 mm, ciliate; blade erect, lanceolate, glabrous. Leaves 5–7 per ultimate branch; sheath ciliate; auricles well developed; oral setae many, 1–13 mm; blade lan-

ceolate to oblong-lanceolate, 13–26 × 2.2–3.5 cm, both surfaces glabrous, secondary veins 6–8-paired, transverse veins obvious, base cuneate, apex acuminate. Inflorescence terminal or lateral. Pseudospikelets 10–13 × 0.4–0.6 cm; bracts many; florets 8–13. Glumes 2, leathery, veins reticulate; lemma 1.3–2 cm, leathery, pubescent, veins tessellate, apex acuminate; palea shorter than lemma; lodicules many veined. Ovary ovoid, glabrous; style short; stigmas 3. New shoots Mar–Apr, fl. Sep–Nov.

- Low hills, streams, 600–700 m. S Yunnan.

The shoots are bitter, and the culms are used as supports and in small buildings.

15. *Indosasa triangulata* Hsueh & T. P. Yi, Acta Bot. Yunnan. 5: 41. 1983.

五爪竹 wu zhua zhu

Arundinaria triangulata (Hsueh & T. P. Yi) C. S. Chao & G. Y. Yang.

Culms to 5 m, 1–2.5 cm in diam.; internodes green, longitudinally striate, terete, flattened above branches, 10–30 cm, initially white powdery, glabrous; supra-nodal ridge very prominent and glabrous; sheath scar prominent, retrorsely yellow-brown setose, with remains of sheath base; intranode 3–5 mm, sometimes black scurfy. Branches 3–5 per node, 30–45 cm, irregularly triangular at base. Culm sheath soon deciduous, pale yellow, obviously striate, oblong-triangular, 21–22 × 5–10 cm, abaxially sparsely yellow-brown setose, more densely hairy at base, margins initially densely brown hispid; auricles absent; oral setae 5–10 mm, gray-yellow hairy; ligules arched, ca. 1 mm, glabrous; blades reflexed, linear-lanceolate, 3–10 × 0.2–0.4 cm, glabrous, obviously longitudinally veined, margins involute. Leaves 3–5 per ultimate branch; sheath 5.5–7 cm; auricles absent; ligules purple, arched or truncate, 1–2 mm; blades abaxially gray, lanceolate to narrowly lanceolate, 9–19 × 1.2–2.5 cm, papery, glabrous, secondary veins 5–7-paired, transverse veins distinct, margins sparsely serrulate. Inflorescence unknown.

- Low hills, sloping fields; below 1200 m. Guizhou, SE Yunnan.

Although this species was published in *Indosasa*, its flowers remain unknown, and it may be a species of *Pleioblastus* or, from the triangular branch base and deciduous culm sheaths, possibly *Oligostachyum*.

The shoots are bitter, and the culms are used as supports and in small buildings.

30. *SINOBAMBUSA* Makino ex Nakai, J. Arnold Arbor. 6: 152. 1925.

唐竹属 tang zhu shu

Zhu Zhengde (朱政德 Chu Cheng-de), Yang Guangyao (杨光耀); Chris Stapleton

Arborescent or shrubby bamboos. Rhizomes leptomorph, with running underground stems. Culms diffuse, sometimes also clustering, erect to nodding; internodes substantially grooved above branches, initially usually pubescent; nodes prominent, sheath rings corky. Branches 3, rarely 5–7 at higher nodes, subequal, buds initially closed at front. Culm sheaths deciduous, setose; ligule serrate or entire; blade lanceolate. Leaves 3–9 per ultimate branch; blade lanceolate. Inflorescence fully bracteate, partially iterant, lateral, racemose, prophyllate. Spikelets 1–3, subtended by a prophyll and 2 to more gradually enlarged bracts or glumes, apical 1 or 2 bracts usually with axillary buds, forming secondary pseudospikelets, lateral spikelets sessile, terminal spikelet variably pedicellate. Spikelets with several to many (up to 50) florets. Rachilla disarticulating between florets. Lemma leathery, apex acute;

palea about as long as lemma or slightly shorter, 2-keeled, rounded at apex, ciliate; lodicules 3, membranous, many veined. Stamens 3, sometimes 2 or 4; filaments free. Ovary ellipsoid; style 1, sometimes absent, usually long; stigmas 2 or 3, plumose. Fruit a caryopsis.

About ten species: S and SW China, N Vietnam; introduced to Japan during the Tang Dynasty; ten species (nine endemic) in China.

Sinobambusa is very difficult to distinguish from *Indosasa* without knowledge of stamen number.

In addition to the species treated below, *Sinobambusa glabrata* W. T. Lin & Z. J. Feng (J. S. China Agric. Univ. 14(1): 47. 1993) was described from Guangdong. It is a doubtful species, and the type possibly represents a species of *Bambusa*. *Sinobambusa scabrata* T. H. Wen (J. Bamboo Res. 2(1): 61. 1983) was described from W Guangxi based on a winter-shooting specimen. It would seem that the culm sheaths were taken from newly emerged, abnormal shoots. The flowers are unknown, and the identity of this species is uncertain.

The generic placement of *Sinobambusa dushanensis* (species no. 10) is uncertain. It has not, therefore, been included in the following key.

- 1a. Culm sheath auricles absent, or small and obscure.
 - 2a. Culm sheath auricles present but obscure; culm sheath ligule yellow-green, proximally tomentose; leaf blade abaxially glabrous 9. *S. incana*
 - 2b. Culm sheath auricles absent; leaf blade abaxially pubescent.
 - 3a. Culm sheath ligule convex, purple, proximally densely setose 7. *S. rubroligula*
 - 3b. Culm sheath ligule truncate, proximally tomentose 8. *S. yixingensis*
- 1b. Culm sheath auricles well developed.
 - 4a. Culm internodes glabrous, sometimes papillate below nodes.
 - 5a. Culm internodes and culm sheath densely pruinose initially, gray-green, culm sheath blade rugose 3. *S. farinosa*
 - 5b. Culm internodes green, culm sheath light brown or yellow, light pruinose initially, culm sheath blade not rugose.
 - 6a. Culm internodes dark green; culm sheath blades not purple; culm sheath auricles not developed (except in var. *laeta*) 1. *S. tootsik*
 - 6b. Culm internodes pale green; culm sheath blade purple; culm sheath auricles moderately developed 2. *S. humilis*
 - 4b. Culm internodes pubescent.
 - 7a. Culm sheath initially pruinose, coarsely black glandular hairy 4. *S. henryi*
 - 7b. Culm sheath initially not pruinose, purple-brown to yellow-brown setose.
 - 8a. Culm internodes with fine hairs; culm sheath blade glabrous 5. *S. intermedia*
 - 8b. Culm internodes with coarse hairs; culm sheath blade pubescent 6. *S. nephroaurita*

1. *Sinobambusa tootsik* (Makino) Makino, J. Jap. Bot. 2: 8. 1918.

唐竹 tang zhu

Culms 5–12 m, 2–6 cm in diam.; internodes initially deep green, flattened above branches, 30–40(–80) cm, glaucous, glabrous, apically minutely papillate. Culm sheaths initially red-brown, basally suboblong, leathery, slightly glaucous, setose, densely so at base, margins ciliate, apex broadly rounded; auricles very variable, scabrid, tomentose; oral setae curved, ca. 2 cm; ligule arcuate, ca. 4 mm, uniform; blade reflexed, green, lanceolate. Leaves 3–6(–9) per ultimate branch; sheath glabrous; auricles obscure; oral setae deciduous, radiate, ca. 1.5 cm, undulate; ligule truncate or subrounded; blade 6–22 × 1–3.5 cm, secondary veins 4–8-paired, margins serrulate. Spikelets 1–3(–5), lateral spikelets sessile, terminal spikelet on 2–11 mm pedicel, linear, 8–20 × 0.2–0.3 cm; florets 7–12 mm, glabrous. Lemma ovate, ca. 7 mm wide, margins ciliate, apex acute; palea elliptic; lodicules nearly rhombic, elliptic or ovate, ca. 2.5 mm, ciliate. Anthers light yellow. Ovary glabrous; style 1, extremely short; stigmas 3, 3–4 mm. New shoots Apr–May.

Fujian, Guangdong, Guangxi [N Vietnam; introduced in Japan].

- 1a. Leaf blade abaxially pubescent.
 - 2a. Culm sheath ligule arcuate, 3–4 mm; blade green; lodicule 7–9-veined 1a. var. *tootsik*
 - 2b. Culm sheath ligule truncate, short; blade

purple or purple-green; lodicule few veined 1b. var. *laeta*

- 1b. Leaf blade abaxially glabrous.
 - 3a. Apex of culm sheath ligule entire 1c. var. *maeshimana*
 - 3b. Apex of culm sheath ligule sharply toothed or 2-toothed 1d. var. *dentata*

1a. *Sinobambusa tootsik* var. *tootsik*

唐竹(原变种) tang zhu (yuan bian zhong)

Arundinaria tootsik Makino, Bot. Mag. (Tokyo) 19: 63. 1905; *A. dolichantha* Keng; *Neobambos dolichanthus* (Keng) P. C. Keng; *Pleioblastus dolichanthus* (Keng) P. C. Keng; *Semi-arundinaria okuboi* Makino; *S. tootsik* (Makino) Muroi.

Culm sheath ligule arcuate, 3–4 mm; blade green. Leaf sheath auricles obscure; oral setae radiate, ca. 1.5 cm, undulate; blade abaxially pubescent. Lodicules with 7–9 veins.

Fujian, Guangdong, Guangxi [N Vietnam; introduced in Japan].

This variety is usually planted as an ornamental. The culms, although fragile, are used for pipes and poles.

1b. *Sinobambusa tootsik* var. *laeta* (McClure) T. H. Wen, J. Bamboo Res. 1(2): 13. 1982.

满山爆竹 man shan bao zhu

Sinobambusa laeta McClure, Lingnan Univ. Sci. Bull. 9: 63. 1940; *Semiarundinaria tootsik* var. *laeta* (McClure) T. H. Wen.

Culm sheath ligule truncate, short; blade purple or purple-green. Leaf sheath auricles and oral setae developed; blade abaxially pubescent. Lodicules with a few vertical veins.

• Fujian, Guangdong.

1c. *Sinobambusa tootsik* var. *maeshimana* Muroi ex Sugimoto, New Keys Jap. Trees: 475. 1961.

光叶唐竹 *guang ye tang zhu*

Semiarundinaria tenuifolia Koidzumi, Acta Phytotax. Geobot. 11: 314. 1942; *Sinobambusa tootsik* var. *tenuifolia* (Koidzumi) S. Suzuki.

Culm sheath ligule entire at apex. Leaf blade abaxially glabrous.

• Guangxi [cultivated in Japan].

This variety was described from Japanese cultivated material. Wild plants with the same characteristics are known in Guangxi.

1d. *Sinobambusa tootsik* var. *dentata* T. H. Wen, J. Bamboo Res. 1(2): 13, 1982.

火管竹 *huo guan zhu*

Apex of culm sheath ligule sharply toothed or double-toothed. Leaf blade abaxially glabrous.

• Fujian.

2. *Sinobambusa humilis* McClure, Lingnan Univ. Sci. Bull. 9: 59. 1940 [*"humila"*].

竹仔 *zhu zi*

Culms to 1 m; internodes pale green, grooved above branches, glaucous, glabrous; nodes prominent, densely retrorsely hairy below sheath ring; mid-culm branches 3 per node, base appressed. Culm sheaths \pm persistent, base generally reflexed, pale purple, later green, with pale purple apex, proximally densely hairy, abaxially glabrous; auricles brown, falcate, moderately developed, scabrid; oral setae radiate, slender; ligule very short; blade erect, lanceolate, abaxially glabrous, adaxially hispid. Leaves 3 per ultimate branch; sheath glabrous, margins pale ciliate; auricles generally scabrid or nearly glabrous; oral setae developed, radiate, pale, rigid, glabrous or basally hispid; ligule very short, adaxially hispid; pseudopetiole hispid; blade oblong-lanceolate, 8.7–16.4 \times 1–2.4 cm, glabrous or abaxially slightly hairy, base rounded or cuneate, apex acuminate. Flowering branches lateral. Inflorescence paniculate, simple, erect, 2–3 cm with stalk; basal bract persistent. Spikelets 3–5. Rachilla rigid, glabrous. Glumes 4, apex acute or acuminate, abaxial keel glabrous; lemma ca. 8.5 mm, glabrous, margin ciliate, apex acute; palea shorter than lemma, ciliate, apex obtuse, internal keel nearly appressed, external keel glabrous or subglabrous; lodicules lanceolate, margins ciliate. Ovary very slender, glabrous; styles 2. Mature fruit deciduous.

• Guangdong.

3. *Sinobambusa farinosa* (McClure) T. H. Wen, J. Bamboo Res. 1(2): 19. 1982.

白皮唐竹 *bai pi tang zhu*

Semiarundinaria farinosa McClure, Lingnan Univ. Sci. Bull. 9: 45. 1940.

Culms to 7 m, 2–4 cm in diam.; internodes 40–60 cm, initially densely glaucous, persistent below nodes, glabrous, apically minutely papillate; nodes swollen, sheath ring corky, initially yellow-brown setose. Culm sheaths deciduous, initially gray-green, basally suboblong, leathery, densely glaucous, purple-brown setose, densely so at base, sparsely so near apex, margins dark brown ciliate or glabrous, apex broad; auricles nearly erect, dark brown, elliptic or falcate, moderately sized, coarsely hairy; oral setae yellow-brown, to 1.4 cm, fragile, scabrid; ligule arched, short, coarsely hairy, entire, ciliate; blade lanceolate, green, papery, slightly rugose, glabrous or nearly so, margins serrulate. Leaves 3–6 per ultimate branch; sheath pubescent, soon glabrous; auricles very small; oral setae erect, light yellow, rigid, scabrid at base; ligule short, coarsely hairy; blade lanceolate or oblong-lanceolate, 13–19 \times 1.4–2.2 cm, glabrous or abaxially slightly hairy, secondary veins 4–6-paired, sharply pointed. Inflorescence unknown. New shoots May.

• Fujian, Guangdong, Guangxi, Jiangxi, Zhejiang.

4. *Sinobambusa henryi* (McClure) C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 18: 32. 1980.

扛竹 *kang zhu*

Semiarundinaria henryi McClure, Lingnan Univ. Sci. Bull. 9: 48. 1940; *Sinobambusa nandanensis* T. H. Wen.

Culms 7–13 m, 3–8 cm in diam.; internodes green, 30–60 cm, glaucous below nodes, initially sparsely hairy, papillate; nodes very prominent; sheath ring corky, initially setose. Culm sheaths basally subtriangular, leathery, initially glaucous, setose, coarsely black glandular hairy, margins dark brown ciliate, apex narrow; auricles variable in size, scabrid; oral setae dark brown to yellow-green, rigid; ligule arched, very short, entire, ciliate; blade erect, lanceolate, ca. 1/2 as wide as sheath apex, both surfaces glabrous or scabrid, margins coarsely hairy. Leaves 3–5 per ultimate branch; sheath glabrous or sparsely setose, margins ciliate; auricles fragile, falcate at branchlet base, weak or absent apex; oral setae erect, light yellow; ligule very short, thin, glabrous, sometimes ciliate; blade lanceolate or oblong-lanceolate, 8–15 \times 1.5–2.3 cm, secondary veins 4-paired, margins serrulate, sharply pointed. Inflorescence unknown. New shoots Apr–May.

• Guangdong, Guangxi.

5. *Sinobambusa intermedia* McClure, Lingnan Univ. Sci. Bull. 9: 61. 1940.

晾衫竹 *liang shan zhu*

Arundinaria longifimbriata (S. Y. Chen) T. H. Wen; *A. nanningensis* Q. H. Dai, J. Bamboo Res. 6(3): 35. 1987; *Pleioblastus longifimbriatus* S. Y. Chen.

Culms ca. 5 m, to 2 cm in diam.; internodes green, striate, 50–60 cm, grooved above branches, glaucous below nodes, initially pubescent, scabrid, apically minutely papillate; cavity with granular pith; nodes prominent; sheath ring corky, densely setose. Culm sheaths green when fresh, purple at apex, basally suboblong, sparsely deciduously yellow-brown setose, more densely so proximally, margins ciliate, apex broad; auricles falcate, fragile, scabrid; oral setae erect or radiate, ca. 2 cm, undulate; ligule arched, short, hirsute, sometimes slightly dentate or ciliate; blade erect or deflexed, green with purple apex, narrowly lanceolate, glabrous, apex acuminate. Leaves 3–5 per ultimate branch; sheath glabrous, margins ciliate; auricles obscure or absent, ciliate; ligule truncate or slightly prominent, coarsely hairy; blade broadly lanceolate, 12–22 × 1.3–2.8 cm, base coarsely hairy, margins serrulate. Pseudospikelets to 13 × 0.3 cm; bracts 2–4, pubescent or sometimes glabrous, apex acute. Rachilla glabrous; lemma mucronate at apex; palea shorter than lemma; lodicules 2 or 3, oblong to rhombic, tomentellate, apex ciliate. Anthers yellow. Ovary ovoid, glabrous; style 1, about as long as ovary; stigmas (2 or)3-cleft, sparsely pubescent. New shoots Apr–May.

• Fujian, Guangdong, Guangxi, Sichuan, Yunnan.

6. *Sinobambusa nephroaurita* C. D. Chu & C. S. Chao, Acta Phytotax. Sin. 18: 32. 1980.

肾耳唐竹 shen er tang zhu

Culms 6–8 m, 2–3 cm in diam.; internodes 30–40 cm, thinly glaucous especially below nodes, initially roughly hairy, distally minutely papillate; cavity with slightly granular pith; nodes prominent; sheath ring corky, initially setose. Culm sheaths green or yellow-brown, basally suboblong, leathery, sparsely setose, apex broad; auricles kidney-shaped to elliptic, 7–8(–15) × 4–5(–9) mm, scabrid; oral setae radiate, 1–1.5 cm; blade usually reflexed or horizontal, lanceolate at culm apex, triangular at mid-culm, pubescent, margins serrulate. Leaves 4–6 per ultimate branch, sheath glabrous, margins ciliate, auricles weak or absent; oral setae erect, ca. 1 cm; ligule truncate or arcuate; very short, blade lanceolate, 11–18 × 1.1–1.6 cm, thin, glabrous, secondary veins 4–6-paired, margins serrulate. Inflorescence unknown. New shoots Apr–May.

• Guangdong, Guangxi, Sichuan.

7. *Sinobambusa rubroligula* McClure, Lingnan Univ. Sci. Bull. 9: 65. 1940.

红舌唐竹 hong she tang zhu

Culms 2–4 m, ca. 1 cm in diam.; internodes gray-green, to 27 cm, initially sometimes sparsely hairy, glaucous below nodes, nearly solid; nodes swollen; sheath ring corky, setose. Culm sheaths green, basally suboblong, glabrous but densely setose at base, margins ciliate, apex broad; auricles absent; oral setae absent or scarce, erect; ligule purple, arcuate, 1–2 mm, scabrid or roughly hairy, uniform, ciliate; blade deciduous, usually reflexed, green but with purple margins and apex, lanceolate, ca. 1/3 as wide as sheath apex, tomentose. Leaves 5–7 per ultimate branch; sheath smooth, glabrous or hirsute, margins ciliate; auricles initially present, developed or weak; oral setae dull brown, ca. 1 cm, undulate; ligule convex, 1–2 mm, hirsute,

uniform; blade lanceolate or elliptic-lanceolate, 10–22 × 0.8–2.6 cm, abaxially pubescent, adaxially smooth and glabrous, secondary veins 5- or 6-paired, margins serrulate. Inflorescence unknown. New shoots Apr–May.

• Guangdong, Guangxi, Hainan.

8. *Sinobambusa yixingensis* C. S. Chao & K. S. Xiao, J. Nanjing Inst. Forest. 1985(4): 20. 1985.

宜兴唐竹 yi xing tang zhu

Culms ca. 3 m, ca. 1.7 cm in diam.; internodes 40–70 cm, conspicuously grooved above branches, initially hairy; nodes very prominent, brown hairy below corky ring. Branches 3 per node. Culm sheaths deciduous, green, conspicuously many purple veined, spots absent, not or only thinly glaucous, abaxially deciduously sparsely hispid, basally brown hairy, hairs ca. 3 mm; auricles and oral setae absent; ligule truncate, shortly ciliate; blade deciduous, lanceolate, ca. 2.5 cm. Leaves 3–5 per ultimate branch; sheath glabrous, auricles and oral setae absent; blade oblong-lanceolate, 7–14 × 1.3–2 cm, abaxially white pubescent. Inflorescence unknown. New shoots middle May.

• Jiangsu.

9. *Sinobambusa incana* T. H. Wen, J. Bamboo Res. 1(2): 13. 1982.

毛环唐竹 mao huan tang zhu

Culms internodes flexuose, yellow-green, grooved above branches, glabrous; nodes very prominent, initially pubescent beneath corky ring. Culm sheaths leathery, initially coarsely yellow-brown setose, with striae later, margins pubescent near base, glossy; auricles weak, brown, scabrid, tomentose; ligule arched, basally densely pubescent, ciliate; blade erect, triangular, ca. 1/3 as wide as sheath apex, glabrous, many veined. Leaves 2–4 per ultimate branch; sheath glabrous, margins ciliate, apically pubescent; auricles obscure, ovate, or absent; oral setae few, curved, 7–8 mm; ligule arcuate, ca. 1 mm, coarsely yellow-brown hairy; blade lanceolate, 5–8 × 0.7–1 cm, glabrous, margins serrulate. Flowering branches lateral. Pseudospikelets 1–3, ca. 9 × 0.2–0.3 cm, bracts 2, prophyll nearly leathery, glabrous, 2-keeled; florets to 11. Rachilla slightly flexuose, glabrous. Lemma glabrous, acute; palea sparsely ciliate, apex rounded; lodicules 3, posterior shorter and thicker, rhomboid. Stamens (2 or)3. Anthers yellow. Ovary glabrous, base constricted into a stalk, 1.5–2 mm; style very short, ca. 0.3 mm; stigmas 3, ca. 3 mm.

• Guangdong.

10. *Sinobambusa dushanensis* (C. D. Chu & J. Q. Zhang) T. H. Wen, J. Bamboo Res. 6(3): 33. 1987.

独山唐竹 du shan tang zhu

Arundinaria dushanensis C. D. Chu & J. Q. Zhang, Bamboo Res. 1982(1): 1. 1982.

Culms to 10 m tall, 2–5 cm in diam.; internodes initially green, striate, 25–40 cm, papillate below nodes; wall thick; nodes swollen; sheath ring corky, prominent, initially glabrous or setose. Culm sheath yellow-green or brown-yellow, basally

subtriangular, leathery, densely setose and papillose at base, margins shortly setose, purplish, apex narrowly constricted, ca. 2 cm wide; auricles elliptic or falcate, 5–9 mm, both surfaces coarsely brown hairy; oral setae 8–15 mm; ligule purple, arched or nearly truncate, 2–3 mm, nearly entire, ciliate; blade deciduous, erect or reflexed, purple-green, striate, lanceolate, 8–11 × ca. 1 cm, scabrid. Leaves 2 or 3 per ultimate branch; sheath

glabrous; auricles usually absent, sometimes falcate; oral setae ca. 7 mm, curved; ligule truncate or slightly prominent, 0.5–1 mm, glabrous; blade with 5 pairs of secondary veins, one margin serrulate, other margin entire. Inflorescence unknown. New shoots Apr–May.

• Guizhou.

31. SEMIARUNDINARIA Nakai, J. Arnold Arbor. 6: 150. 1925.

业平竹属 *ye ping zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Brachystachyum Keng.

Shrubby bamboo, sometimes subarborescent. Rhizomes leptomorph, with running underground stems. Culms densely pluricaespitose, erect; internodes flattened or grooved above branches, glabrous (pubescent in *S. densiflora*); nodes prominent. Branches (3–)5–9(–13), subequal, buds initially open at front. Culm sheaths deciduous, leathery or thickly papery; ligule conspicuous; blade recurved or reflexed. Leaves 3–7(–10) per ultimate branch; blade with distinct transverse veins. Inflorescence lateral, racemose to panicle, fully bracteate, partially iterant, prophyllate; pseudospikelets subtended by a spatheform prophyll and 2 or 3 gradually enlarged bracts. Spikelets sessile, 2–7-flowered. Rachilla articulate, internodes extended (short in *S. densiflora*). Glumes absent to 3; lemma papery, acuminate; palea about as long as or longer than lemma, 2-keeled abaxially, apex rounded, ciliate; lodicules 3(or 4). Stamens 3; filaments free; anthers exserted. Ovary ellipsoid, ovoid, or globose; style 1; stigmas 3, plumose. Fruit a caryopsis.

Ten species: E China, Japan; three species (two endemic, one introduced) in China.

In addition to the species treated below, *Semiarundinaria shapoensis* McClure (Lingnan Univ. Sci. Bull. 9: 54. 1940) is an imperfectly known species based on sterile material from Hainan.

- 1a. Culm sheaths partially deciduous, auricles minute 2. *S. fastuosa*
 1b. Culm sheaths completely deciduous; auricles well developed.
 2a. Culms to 2.6 m, to ca. 1 cm in diam.; internodes 7–15 cm; culm sheath blade horizontal or recurved 1. *S. densiflora*
 2b. Culms 3–5 m, 1–1.5 cm in diam.; internodes 15–27 cm; culm sheath blade erect 3. *S. sinica*

1. *Semiarundinaria densiflora* (Rendle) T. H. Wen, J. Bamboo Res. 8(1): 24. 1989.

短穗竹 *duan sui zhu*

Arundinaria densiflora Rendle, J. Linn. Soc., Bot. 36: 434. 1904; *Brachystachyum densiflorum* (Rendle) Keng; *Fargesia densiflora* (Rendle) Nakai.

Culms to 2.6 m, to ca. 1 cm in diam.; internodes green, 7–15 cm, initially sparsely hairy, becoming glabrous, glaucous below nodes; pith chambered. Culm sheaths deciduous, initially green, becoming yellow and striate, papery, sparsely hispid, ciliate; ligule arched, ciliate; auricles well developed, elliptical or falcate, variable in shape and size; oral setae 3–5 mm, undulate; blade horizontal or recurved, lanceolate to narrowly lanceolate, base ca. 1/2 as wide as sheath apex. Leaves 2–5 per ultimate branch; sheath margins ciliate; auricles small; oral setae ca. 3 mm, rough; ligule truncate, 1–1.5 mm; blade lanceolate or oblong-lanceolate, 5–18 × 1–2 cm. Pseudospikelets 2–8 on flowering branches, fascicled, 1.5–3.5 cm; florets 5–7. Glumes 1–3; rachilla internodes 1–3 mm; lemma ovate-lanceolate, 8–10 mm; palea 8–10 mm; lodicules 3.5–4.5 mm. Anthers ca. 7 mm. Style 5–6 mm; stigmas 3, 5.5–7 mm. New shoots May–Jun, fl. Mar–May.

• Sunny slopes and plateaus. Anhui, Guangdong, Hubei, Jiangsu, Jiangxi, Zhejiang.

The culms are split for weaving.

2. *Semiarundinaria fastuosa* (Mitford) Makino, J. Jap. Bot. 2(2): 8. 1918.

业平竹 *ye ping zhu*

Bambusa fastuosa Mitford, Garden (London) 46: 547. 1894; *Arundinaria fastuosa* (Mitford) J. Houzeau; *A. narihira* Makino; *Phyllostachys fastuosa* (Mitford) Pfitzer.

Culms 3–9 m, 1–4 cm in diam.; internodes initially green, later brownish, terete, 10–30 cm, glabrous, hollow. Branches 3 per node. Culm sheaths essentially glabrous but proximally hairy; auricles minute; oral setae few; ligule 1–1.5 mm, apex truncate, ciliate; blade narrowly lanceolate, apex acuminate. Leaves 3–7(–10) per ultimate twig; sheath ca. 4 cm, sparsely pubescent; auricles obscure; ligule truncate, 1–1.5 mm; blades narrowly lanceolate, 8–20 × 1.5–2.5 cm, papery, glabrous or abaxially proximally pubescent, secondary veins 6–8-paired, transverse veins present, base rounded or broadly cuneate, contracted into a short pseudopetiole, margin serrulate, apex acuminate. Inflorescence panicle-like, subtended by ovate or lanceolate, leathery, glabrous, sheathlike spathes 3.5–4 cm. Pseudospikelets 1 or 2 subtended by a spathe; spikelet narrowly terete, 5–10 cm; florets 3–6; rachilla ca. 1 cm. Glumes always absent; lemmas ovate or broadly lanceolate, 1.5–3 cm, leathery, ciliate, ca. 20-veined; palea broadly lanceolate, 1.8–2 cm, 3-veined, apex bifid; lodicules ca. 5 mm. Filaments ca. 2 cm;

anthers yellow, ca. 1.1 cm. Ovary terete, ca. 4 mm, glabrous; styles ca. 4 mm; stigmas 3, plumose. Caryopsis unknown.

Cultivated in many cities of Taiwan and mainland China [native to Japan (SW Honshu)].

3. *Semiarundinaria sinica* T. H. Wen, J. Bamboo Res. 8(1): 13. 1989.

中华业平竹 *zhong hua ye ping zhu*

Culms 3–5 m, 1–1.5 cm in diam.; internodes initially green, flattened above branches, 15–27 cm, glabrous; nodes with prominent supra-nodal ridge; sheath scar prominent; intranode 2–3 mm. Branches 3, subequal. Culm sheaths deciduous, initially green, becoming yellowish brown, hispid, margin and base glabrous; auricles brown, falcate; oral setae ca. 4 mm; ligule arched or truncate, glabrous; blade erect, dark green, narrowly lanceolate, margin recurved. Leaves 3–5 per ultimate

branch; sheaths green, striate, 3.5–4.5 cm, glabrous, margins ciliate; auricles ovate to ellipsoid, oral setae gray, 3–4 mm; ligule ca. 2 mm; blade lanceolate, 9–16 × 1.4–2.2 cm, glabrous, base obtuse, contracted into pseudopetiole 9–12 mm, lateral veins 4 or 5 pairs, transverse veins distinct, margins serrate, apex acuminate. Inflorescence panicle-like, with 6–11 spikelets, spathes ca. 25 × 8 mm; spikelets 55–60 mm; florets 5 or 6. Glumes 1 or 2; lemmas ca. 17 × 6 mm, glabrous, with 9 longitudinal veins, apex mucronate; palea ca. 1.4 cm, 2-keeled, with transverse veins prominent, margins and keel ciliate, apex acuminate, bifid; lodicules 3, narrowly rhomboid, membranous, apex white ciliate. Ovary oblong, glabrous; styles to 8–12 mm; stigmas bifid, plumose. New shoots May.

● Jiangsu, Zhejiang.

This species differs from *Semiarundinaria fastuosa* by its hispid culm sheath. It is known only in cultivation and is likely a cultivar of that species.

32. CHIMONOBAMBUSA Makino, Bot. Mag. (Tokyo) 28: 153. 1914.

方竹属 *fang zhu shu*

Li Dezhu (李德铎); Chris Stapleton

Menstruocalamus T. P. Yi; *Oreocalamus* Keng; *Qiongzhusia* Hsueh & T. P. Yi.

Shrubby bamboos, rarely subarborescent. Rhizomes leptomorph, with running underground stems. Culms usually diffuse, sometimes tillering (pluricaespitose), erect; internodes terete or 4-angled, often basally grooved above branches; nodes prominent to very prominent, basal nodes often with a ring of sparse or dense root thorns; sheath scars usually with a ring of pubescence or persistent base of culm sheath. Branches 3(–7 on upper culm), subequal, buds ovate-triangular, open at front, prophyll reduced. Culm sheaths deciduous and leathery, or sometimes persistent and papery; auricles minute or absent; blade reduced, to 1 cm, narrow. Leaves (1 or) 2–5 per ultimate branch; blade lanceolate, base cuneate. Inflorescence fully bracteate, weakly iterant, 1–3 single pseudospikelet racemes loosely fasciculate, subtended by gradually enlarged bracts. Spikelets several to many flowered, sessile. Rachilla disarticulating. Glumes usually 1–3, frequently one subtending a bud; lemma papery or membranous; palea membranous, 2-keeled, obtuse; lodicules 3, membranous. Stamens 3; filaments free. Ovary ellipsoid; style 1, short; stigmas 2 or 3, plumose. Fruit a nutlike caryopsis with a hardened pericarp. New shoots Apr–Nov.

About 37 species: E Asia; 34 species (31 endemic) in China.

In addition to the species treated below, *Chimonobambusa tianquanensis* T. P. Yi (J. Bamboo Res. 19(1): 11. 2000) was described from sterile material from Sichuan (Tianquan). In the protologue it was compared with *C. quadrangularis*. *Qiongzhusia gracilis* W. T. Lin, (J. Bamboo Res. 19(4): 1. 2000) was described from Guangdong (Yangshan). In the protologue it was compared with *Q. opienensis* (*C. opienensis* in this account). *Qiongzhusia multigemma* T. P. Yi (J. Bamboo Res. 19(1): 18. 2000) was described from Sichuan (Yingjing). In the protologue it was compared with *Q. verruculosa* (*C. verruculosa* in this account).

1a. Culm sheaths persistent.

2a. Culm sheath blade longer than 1 cm.

3a. Culm base intranode without root thorns, initially glabrous 1. *C. sichuanensis*

3b. Culm base intranode with root thorns, initially verrucose-setose and pubescent 2. *C. leishanensis*

2b. Culm sheath blade shorter than 0.6 cm.

4a. Culm sheaths shorter than internodes 3. *C. pubescens*

4b. Culm sheaths longer than internodes.

5a. Culm internodes initially glabrous; culm sheaths glabrous or sparsely setose.

6a. Culm 1–1.5(–3) m, only basal culm nodes with roots or root thorns, culms cylindrical 4. *C. marmorea*

6b. Culm taller than 3 m, basal to mid-culm nodes with root thorns, culms slightly 4-angular 5. *C. purpurea*

5b. Culm internodes initially white pubescent; culm sheaths densely setose.

7a. Leaf sheath ligule ca. 6 mm; leaf blade secondary veins 4- or 5-paired 6. *C. damingshanensis*

7b. Leaf sheath ligule shorter than 1 mm; leaf blade secondary veins 3- or 4-paired 7. *C. brevioda*

1b. Culm sheaths deciduous or gradually deciduous (persistent in *C. luzhiensis*).

8a. Culm nodes prominently swollen; intranode without root thorns; internodes circular in cross section; culm sheaths deciduous.

9a. Culm internodes 10–15 cm, 0.4–1 cm in diam.; culm white powdery when young 8. *C. hsuehiana*

- 9b. Culm internodes 15–33 cm, 1–3 cm in diam.; culm glabrous, not white powdery.
- 10a. Culm internodes (18–)29–33 cm; culm sheaths abaxially glabrous; leaf blades 1.6–5 cm wide, secondary veins 5–8-paired 9. *C. macrophylla*
- 10b. Culm internodes 15–25 cm; culm sheaths abaxially densely brown setose; leaf blades 0.6–1.2 cm wide, secondary veins 2- or 3(or 4)-paired 10. *C. tumidissinoda*
- 8b. Culm nodes slightly swollen, usually with root thorns at lower nodes, internodes partially 4-angular in cross section.
- 11a. Culm nodes with well-developed root thorns.
- 12a. Culm sheaths longer than the corresponding internodes.
- 13a. Culm nodes with a tomentose ring; culm sheaths sparsely minutely adnately brown setose 11. *C. hirtinoda*
- 13b. Culm nodes without a tomentose ring; culm sheaths with erect, swollen-based setae.
- 14a. Culm sheaths with light green or white stripes, yellow-brown, later becoming fulvous, veinlets distinct, purple 12. *C. lactistriata*
- 14b. Culm sheaths without stripes.
- 15a. Culm node sheath scar rings glabrous; culm sheaths leathery, glabrous or sparsely hairy near base 13. *C. paucispinosa*
- 15b. Culm node sheath scar rings brown tomentose; culm sheaths thickly papery, setose.
- 16a. Culm sheaths persistently brown verrucose; leaf blade lateral veins 4- or 5-paired; oral setae well developed 14. *C. armata*
- 16b. Culm sheaths persistently black verrucose; leaf blade lateral veins 6–9-paired; oral setae sparse, deciduous 15. *C. tuberculata*
- 12b. Culm sheaths shorter than corresponding internodes.
- 17a. Leaf blades 1 per ultimate branchlet, with closed sheaths 16. *C. hejiangensis*
- 17b. Leaf blades 2–5 per ultimate branchlet, with open sheaths.
- 18a. Culm sheath blade conspicuous, linear-lanceolate, 11–20 mm 17. *C. convoluta*
- 18b. Culm sheath blade minute, subulate, less than 8 mm.
- 19a. Young culm internodes and culm sheaths glabrous 18. *C. szechuanensis*
- 19b. Young culm internodes tuberculate and hispid, particularly on upper part of culm; culm sheaths glabrous or setose.
- 20a. Culm sheaths pale yellow spotted.
- 21a. Leaf blades narrowly lanceolate to linear, 0.5–1.2 cm wide; culm sheaths with purplish transverse veins 19. *C. angustifolia*
- 21b. Leaf blades lanceolate, 1.1–2.1 cm wide.
- 22a. Culm internodes persistently densely white pubescent; sheath scar persistently hairy; leaf blade abaxially glaucous 20. *C. utilis*
- 22b. Culm internodes initially brown hispid, becoming glabrous; sheath scar brown tomentose, becoming glabrous; leaf blade abaxially dark green 21. *C. pachystachys*
- 20b. Culm sheaths not spotted.
- 23a. Culm nodes with sheath scars prominent, densely retrorsely brown setose, bristles ca. 1 mm, supra-nodal ridge strongly prominent 22. *C. metuoensis*
- 23b. Culm nodes with glabrous sheath scars.
- 24a. Culm sheaths glabrous or sparsely hispid.
- 25a. Culm sheaths with conspicuous purplish transverse veins; basal culm internodes 4-angled 23. *C. quadrangularis*
- 25b. Culm sheaths with obscure transverse veins; basal culm internodes cylindrical 24. *C. microfloscula*
- 24b. Culm sheaths densely bristly.
- 26a. Culms to 14 m; basal culm internodes slightly 4-angled; culm sheath blade not articulate; leaves 20–23 × 1.5–2 cm 25. *C. ningnanica*
- 26b. Culms to 4 m; basal culm internodes cylindrical; culm sheath blade articulate, deciduous; leaves 30–35 × ca. 2.5 cm 26. *C. grandifolia*
- 11b. Culm nodes without root thorns.
- 27a. Leaf sheath oral setae absent.
- 28a. Culm sheaths gradually deciduous; brown verrucose-setose; culm internodes nearly solid 27. *C. verruculosa*
- 28b. Culm sheaths soon deciduous; glabrous or sparsely setose; culm internodes hollow.
- 29a. Culms 1–1.6 m, to 0.5 cm in diam.; nodal sheath scars initially densely yellow-brown setose; intranode initially gray or slightly yellow waxy 28. *C. unifolia*
- 29b. Culms 2–7 m, 1–5.5 cm in diam.; nodal sheath scars nearly glabrous; intranode not waxy.
- 30a. Branches 3 per node; leaves 1–3 per ultimate branch; leaf blade abaxially glabrous, secondary veins 3- or 4-paired; new shoots Sep 29. *C. rigidula*

- 30b. Branches 2 or 3 per node; leaves 1 per ultimate branch; leaf blade abaxially slightly pubescent; secondary veins 4- or 5-paired; new shoots Apr–May 30. *C. opienensis*
- 27b. Leaf sheath oral setae numerous, erect.
- 31a. Culm sheath marginally brown hirsute.
- 32a. Culm internodes glabrous; culm sheaths persistent 31. *C. luzhiensis*
- 32b. Culm internodes puberulous when young, especially below nodes; culm sheaths gradually deciduous 32. *C. puberula*
- 31b. Culm sheath marginally glabrous or gray ciliate.
- 33a. Culms 3–7 m; supra-nodal ridge nearly flat at nodes without branches; culm sheaths glabrous 33. *C. communis*
- 33b. Culms 1.5–2.8 m; supra-nodal ridge distinctly raised on all nodes; culm sheaths yellow-brown setose at base, margins gray ciliate 34. *C. montigena*
- 34a. Culm sheaths persistent; culm internodes glabrous 31. *C. luzhiensis*
- 34b. Culm sheaths deciduous; culm internodes puberulous or glabrous.
- 35a. Culm internodes puberulous when young, especially below node; culm sheaths brown setose 32. *C. puberula*
- 35b. Culm internodes glabrous; culm sheaths glabrous or subglabrous.
- 36a. Culms 3–7 m; 1–3 cm in diam.; supra-nodal ridge only raised on nodes with branches; culm sheaths glabrous 33. *C. communis*
- 36b. Culms 1.5–2.8 m; 0.7–1.4 cm in diam.; supra-nodal ridge distinctly raised on every node; culm sheaths yellow-brown setose at base 34. *C. montigena*

1. *Chimonobambusa sichuanensis* (T. P. Yi) T. H. Wen, J. Bamboo Res. 6(3): 33. 1987.

月月竹 yue yue zhu

Sinobambusa sichuanensis T. P. Yi, Bull. Bot. Res., Harbin 2(4): 105. 1982; *Menstruocalamus sichuanensis* (T. P. Yi) T. P. Yi.

Culms shrubby; internodes terete, to 38 cm, hollow, glabrous; nodes with prominent initially setose sheath scar; supra-nodal ridge slightly swollen. Branches initially 3 per node, later 5–11. Culm sheaths persistent, narrowly triangular-oblong, shorter than internode, leathery; auricles absent; oral setae absent or scarce, erect; blades erect or reflexed on upper culm, subulate or triangularly subulate, 1.2–3.5 × 0.15–2.5 cm. Leaf sheath auricles absent; blade lanceolate, 10–26 × 1.5–3 cm, secondary veins 5–7-paired. Inflorescence with 1–8 pseudospikelets, branching racemose or simply paniculate; pseudospikelets with many florets, reduced at inflorescence base. Glumes 1 or 2; lemma papery, 7–11-veined, apex aristiform-apiculate; palea bifid; lodicules 3. Anthers 5–6 mm. Styles 2. Caryopsis oblong, pericarp thick.

• 400–1200 m. Sichuan.

This species is not to be confused with *Chimonobambusa szechuanensis* (species no. 18).

2. *Chimonobambusa leishanensis* T. P. Yi, Acta Bot. Yunnan. 13: 144. 1991.

雷山方竹 lei shan fang zhu

Culms 1.5–3 m, 0.6–1 cm in diam.; internodes cylindrical, (4–)14–17 cm, grooved above branches, initially tuberculate-hispid and pubescent; wall 3–4 mm; nodes with sheath scars initially with a pubescent ring; intranode 1–2 mm; nodes below mid-culm each with (2–)4–10 root thorns. Culm sheaths persistent, usually longer than internodes, papery, tuberculate-setose, margins ciliate, longitudinal veins distinct; auricles absent; oral setae usually absent; ligule ca. 1 mm, ciliate; blade erect, 2–3 × 6–28 mm. Leaves 1 or 2(or 3) per ultimate branch; sheath glabrous or initially gray pubescent; margins initially ciliate; oral setae initially (3–)6–13, erect; ligule ca. 0.5 mm;

blade lanceolate, (6–)11–20 × (0.9–)1.4–2.5 cm, secondary veins 5- or 6-paired, transverse veins conspicuous, base cuneate, margins serrulate. Inflorescence unknown. New shoots Aug.

• About 1600 m. Guizhou (Leishan).

3. *Chimonobambusa pubescens* T. H. Wen, J. Bamboo Res. 5(2): 20. 1988.

十月寒竹 shi yue han zhu

Chimonobambusa solida B. M. Yang & C. Y. Zhang.

Culms to 2 m, to 8 mm in diam.; internodes green, sometimes spotted purple-brown, 8–14 cm, flattened or grooved above branches, initially white pubescent, solid or nearly so; nodes prominent, lower nodes with some aerial roots; sheath scar with tawny hairs. Culm sheaths persistent, green-yellow or green-purple when young, triangular, shorter than internodes, thickly papery, mainly glabrous but thickly tawny hairy at base, tessellation visible, margins ciliate; auricles and oral setae absent; ligule convex, ca. 2 mm, toothed; blade erect, aristate, small, glabrous. Leaves 3 or 4 per ultimate branch; sheaths 2.5–2.8 cm, glabrous, margins ciliate; auricles absent; oral setae few, erect, white, 4–8 mm; ligule short, scabrid; blade linear-lanceolate, 9–12 × 0.7–0.9 cm, 5-veined, transverse veins conspicuous, base cuneate, apex acuminate. Inflorescence unknown. New shoots Oct–Nov.

• Broad-leaved forests. Hunan (Jingxian).

4. *Chimonobambusa marmorea* (Mitford) Makino, Bot. Mag. (Tokyo) 28: 154. 1914.

寒竹 han zhu

Bambusa marmorea Mitford, Garden 46: 547. 1894; *Arundinaria marmorea* (Mitford) Makino; *A. matsumurae* Hackel; *A. nana* Makino; *Chimonobambusa setiformis* T. H. Wen; *Phyllostachys marmorea* (Mitford) Ascherson & Graebner.

Culms 1–1.5(–3) m, 0.5–1 cm in diam.; internodes initially green, later purple, 10–14 cm, mainly glabrous with a dark brown tomentose ring below nodes; nodes slightly prominent. Culm sheaths persistent, brown, with gray spots, longer than

internodes, papery, initially sparsely hispid, margins ciliate; ligule minute; blade 2–3 mm, articulate. Leaves 2 or 3 per ultimate branch; sheath margins ciliate; oral setae pale, 3–4 mm; ligule truncate; blade linear-lanceolate, 10–14 × 0.7–0.9 cm. Inflorescence paniculate or racemose, terminal branches subtended by several, persistent, gradually enlarged bracts. Pseudospikelets linear, 2–4 cm; florets 4–7. Glumes 1 or 2; rachilla segments 3–4 mm; lemma ovate-lanceolate, 6–7 mm, papery; palea 6–7 mm; lodicules ca. 3 mm. Anthers 3.5–4 mm. Style minute; stigmas 2. Caryopsis nutlike, ca. 5 mm. New shoots Aug–Sep.

• Hills to low mountains; 200–1500 m. Fujian, Hubei, Shaanxi, Sichuan, Zhejiang.

5. *Chimonobambusa purpurea* Hsueh & T. P. Yi, J. Yunnan Forest. Coll. 1982(1): 36. 1982.

刺黑竹 ci hei zhu

Chimonobambusa neopurpurea T. P. Yi.

Culms 4–8 m, 1.5–5 cm in diam.; internodes green, ca. 18(–25) cm, glabrous; supra-nodal ridges slightly prominent; sheath scar raised, initially yellowish brown setose, becoming glabrous. Culm sheaths persistent, brown or gray spotted, longer than internodes, papery, initially sparsely brown or yellow setose, margins ciliate; ligule minute; blade 1–3 mm, articulate. Leaves 2 or 3 per ultimate branch; sheath margins ciliate; oral setae pale, 3–4 mm; ligule truncate; blade narrowly lanceolate, 5–19 × 0.5–2 cm. Inflorescence paniculate or racemose, terminal branches subtended by 4 or 5, persistent, gradually enlarged bracts. Pseudospikelets linear, 1–14.5 cm; florets 4–12. Glumes 1 or 2; rachilla segments 3–12 mm; lemma ovate-lanceolate, 7–12 mm, papery; lodicules ca. 2 mm. Anthers 4–6 mm. Style minute; stigmas 2. Caryopsis nutlike, ca. 4–7 mm. New shoots Aug–Sep.

• Hills to low mountains; 800–1500 m. Hubei, Shanxi, Sichuan.

6. *Chimonobambusa damingshanensis* Hsueh & W. P. Zhang, Bamboo Res. 7(3): 5. 1988.

大明山方竹 da ming shan fang zhu

Culms 1.5–2 m, 0.6–0.8 cm in diam.; internodes green to purple-green, 10–13 cm, initially pilose, with a dark brown tomentose ring below each node; nodes prominent, basal 1 or 2 with aerial roots. Culm sheaths persistent, brown, with gray spots, longer than internodes, papery, densely hirsute, ciliate; ligule minute, ciliate; blade deciduous, 3–4 mm. Leaves 4–6 per ultimate branch; sheaths glabrous; oral setae purple-tinged, ca. 1.1 cm; ligule ca. 6 mm, entire; blade lanceolate, 15–18 × 1.1–1.3 cm. Inflorescence paniculate or racemose; terminal branches subtended by 4 or 5, persistent, gradually enlarged bracts. Pseudospikelets imperfectly known; lemma ovate-lanceolate, ca. 1 cm, papery, apex long mucronate; palea 6–7 mm. Style minute; stigmas 2. Caryopsis unknown. New shoots Aug–Sep.

• Low mountain slopes; ca. 1300 m. Guangxi.

7. *Chimonobambusa brevinoda* Hsueh & W. P. Zhang, J. Bamboo Res. 7(1): 14. 1988.

短节方竹 duan jie fang zhu

Culms 2–3 m, to 1 cm in diam.; internodes dark green, 7–8

cm, initially white pilose, with a brown or dark purple, tomentose ring below each node, nearly solid; nodes prominent, 2-ridged. Culm sheaths persistent, longer than internodes, papery, hispid, margins ciliate; ligule minute, ciliate; blade subulate, ca. 1 mm, articulate. Leaves 3–5 per ultimate branch; sheaths glabrous; oral setae purple-tinged, ca. 1.3 cm; ligule ca. 1 mm, entire; blade lanceolate, 13–16 × ca. 1 cm. Inflorescence unknown. New shoots Oct.

• Broad-leaved forests; 1600–1800 m. SE Yunnan.

8. *Chimonobambusa hsuehiana* D. Z. Li & H. Q. Yang, *nom. nov.*

细秆箬竹 xi gan qiong zhu

Replaced synonym: *Qiongzhuea intermedia* Hsueh & D. Z. Li, Acta Bot. Yunnan. 10: 53. 1988, not *Chimonobambusa intermedia* (Munro) Nakai, J. Arnold Arbor. 6: 151. 1925; *C. macrophylla* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger f. *intermedia* T. H. Wen & Ohrnberger.

Culms 1.5–3.5 m, 0.4–1 cm in diam.; internodes slightly 4-angled or terete, 10–15 cm, initially slightly white powdery, glabrous, basal internodes nearly solid; supra-nodal ridge distinctly raised. Branches 3 or more per node. Culm sheaths deciduous, thickly papery, nearly glabrous or sparsely yellow-brown setose; ligule ca. 1 mm, ciliate; blade 5–8 mm. Leaves (1–)3–5 per ultimate branch; blades lanceolate, 10–20 × 2–3 cm, secondary veins 5–7-paired. Inflorescence unknown. New shoots Apr.

• Broad-leaved forests; 1200–1500 m. Sichuan (Leibo).

9. *Chimonobambusa macrophylla* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 21. 1990.

大叶箬竹 da ye qiong zhu

Culms 2–6 m, 1.5–2.1 cm in diam.; internodes 18–36 cm, flat above branches, initially white powdery or not, glabrous; wall 2.5–3.5 mm; nodes conspicuously raised into ring, readily disarticulating. Culm sheaths deciduous, triangular-ovate, thickly papery, glabrous or sparsely yellow-brown setose, margins ciliate; auricles absent; ligule truncate, 0.5–1 mm, ciliate; blade subulate or triangular-subulate, 3–9 mm, glabrous. Leaves (1 or)2 or 3(or 4) per ultimate branch; sheaths green, 4.5–7.2 cm, glabrous; auricles and oral setae absent; ligule purple-red, arched or truncate, 0.5–1 mm, glabrous; blade ovate-lanceolate, 11–26 × 1.6–5 cm, secondary veins 5–8 pairs, transverse veins distinct. Inflorescence and fruit unknown.

• Broad-leaved forests; 1400–2200 m. Sichuan.

- 1a. Culm internodes 18–29 cm, without white powder; leaf blade 11–18 cm 9a. var. *macrophylla*
- 1b. Culm internodes 31–36 cm, initially with white powder; leaf blade 21–26 cm 9b. var. *leiboensis*

9a. *Chimonobambusa macrophylla* var. *macrophylla*

大叶箬竹(原变种) da ye qiong zhu (yuan bian zhong)

Qiongzhuea macrophylla Hsueh & T. P. Yi, Acta Phytotax. Sin. 23: 398. 1985.

Culm internodes 18–29 cm, not white powdery; leaf blade 11–18 × 1.6–3.2 cm, secondary veins 5- or 6-paired.

- Broad-leaved forests; 1500–2200 m. Sichuan (Leibo, Mabian).

9b. *Chimonobambusa macrophylla* var. *leiboensis* (Hsueh & D. Z. Li) D. Z. Li, **comb. in stat. nov.**

雷波大叶箬竹 *lei bo da ye qiong zhu*

Basionym: *Qiongzhueta macrophylla* f. *leiboensis* Hsueh & D. Z. Li, Acta Bot. Yunnan. 10: 51. 1988; *Chimonobambusa macrophylla* f. *leiboensis* (Hsueh & D. Z. Li) T. H. Wen & Ohrnberger; *Q. macrophylla* var. *leiboensis* (Hsueh & D. Z. Li) Hsueh & D. Z. Li.

Culm internodes 31–36 cm, initially white powdery; leaf blade 21–26 × (3.2–)4–5 cm, secondary veins 7 or 8 pairs.

- Broad-leaved forests; ca. 1400 m. Sichuan (Leibo).

10. *Chimonobambusa tumidissinoda* Hsueh & T. P. Yi ex Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 45. 1990.

箬竹 *qiong zhu*

Qiongzhueta tumidissinoda (Hsueh & T. P. Yi ex Ohrnberger) Hsueh & T. P. Yi.

Culms 2.5–6 m, 1–3 cm in diam.; internodes green, terete, 15–25 cm, grooved above branches, glabrous; wall thick, basal internodes nearly solid; nodes conspicuously enlarged into very prominent, raised discs. Branches (3–)5(–7) per node, subequal. Culm sheaths deciduous, oblong-elliptic, thickly papery, brown setose; auricles absent; oral setae 2–3 mm; ligule arched, 1–1.3 mm, densely gray ciliate; blade readily deciduous, erect, subulate or subulate-lanceolate, 5–17 mm, glabrous. Leaves 2–4 per ultimate branch; sheath terete, 2–2.5 cm; auricles absent; oral setae several; ligule truncate or arched, short; blade narrowly lanceolate, 5–14 × 0.6–1.2 cm, glabrous, secondary veins 2- or 4-paired, transverse veins distinct. Flowering branches leafless or partly with terminal leaves; ultimate flowering branches slender, subtended by 3–5, gradually larger bracts. Pseudospikelet purple-green, 3–4.5 cm, bracts 4 or 5; florets 3–8. Glumes 2(or 3); rachilla internodes 4–6 mm, glabrous; lemma oblong-ovate, 1–1.4 cm, papery, apex acute; palea thinner than lemma, apex obtuse or slightly bifid. Ovary obovoid, ca. 2.5 mm, glabrous; style 1, ca. 1 mm; stigmas 2. Caryopsis nutlike, oblong-ellipsoid or broadly ellipsoid, 1–1.2 cm. New shoots Apr, purplish red, fl. Apr, fr. May.

- Hilltops; 1500–2200 m. SW Sichuan, NE Yunnan.

The name “*Qiongzhueta tumidissinoda*” (Hsueh & T. P. Yi, Acta Bot. Yunnan. 2: 93. 1980) was not validly published because two types were indicated (see Hsueh et al., Taxon 45: 217–221. 1996 and Stapleton and Xia, Taxon 53: 526–528. 2004).

The culms of this famous species have been used for walking sticks since the Han Dynasty; they are also used for umbrella handles, and the shoots are eaten as a vegetable.

11. *Chimonobambusa hirtinoda* C. S. Chao & K. M. Lan, Bamboo Res. 1982(1): 2. 1982.

毛环方竹 *mao huan fang zhu*

Culms ca. 5 m tall, 1.5–2.5 cm in diam.; internodes

slightly 4-angled, 13–14 cm, initially minutely setose, with a fulvous tomentose ring below each node, later verrucose; supra-nodal ridges prominent, basal nodes with rings of root thorns; sheath scar with a fulvous tomentose ring and persistent culm sheath base. Branches 3 per node. Culm sheaths deciduous, longer than internodes, thickly papery, sparsely minutely adnately brown setose, with distinct veins and purple-brown veinlets; ligule minute; blade subulate, 1–2 mm, apex acuminate. Leaves 2 or 3 per ultimate branch, sheaths glabrous; auricles absent; oral setae erect, pale; ligule minute; leaf blade oblong-lanceolate, 8–16 × 1.2–1.5 cm, secondary veins 4- or 5-paired, base broadly cuneate, apex acuminate. Inflorescence unknown.

- About 1100 m. Guizhou.

12. *Chimonobambusa lactistriata* W. D. Li & Q. X. Wu, J. Bamboo Res. 4(1): 46. 1985.

乳纹方竹 *ru wen fang zhu*

Chimonobambusa rivularis T. P. Yi, J. Bamboo Res. 8(3): 18. 1989.

Culms 4–5 m tall, 2–4 cm in diam.; internodes slightly 4-angled, 11–13 cm; supra-nodal ridges strongly elevated, lower nodes each with a ring of 4–19 root thorns; sheath scars purple pubescent, with persistent culm sheath base. Culm sheaths deciduous, initially dark purple, later becoming fulvous with pale green or white stripes, longer than internodes, papery, distally corrugated, veinlets distinct and purple; ligule arched, minute; blade subulate. Leaves 4–6(–9) per ultimate branch; oral setae deciduous, erect, pale, 3–5 mm; ligule arched, ciliate; petiole short, densely pubescent; blade elliptic-lanceolate, 8–17 × 0.8–2 cm, adaxially sparsely pubescent, densely so at base, secondary veins 4–6-paired, veinlets obvious. Inflorescence unknown. New shoots Oct.

- Evergreen broad-leaved forests; ca. 500 m. Guizhou.

13. *Chimonobambusa paucispinosa* T. P. Yi, J. Bamboo Res. 9(3): 24. 1990.

少刺方竹 *shao ci fang zhu*

Culms 3–5 m, 1–2 cm in diam.; internodes cylindrical or several basal internodes 4-angled, (6–)10–14 cm, initially grayish yellow setose, becoming smooth; wall 3.5–6 mm; supra-nodal ridge slightly or distinctly raised at nodes with branches; sheath scar glabrous; intranode 1–2 mm; nodes below branches each with (1 or)2–8(–10) root thorns. Branches 3 per node. Culm sheaths deciduous, narrowly triangular, leathery, abaxially glabrous or sparsely yellowish brown setose at base, longitudinal veins distinct, margins not ciliate; auricles and oral setae absent; ligule truncate, ca. 0.5 mm; blade erect, triangular, 3–6 mm. Leaves 1 or 2(–4) per ultimate branch; ligule arcuate, ca. 0.3 mm; blade lanceolate, (4.5–)9–13 × (0.6–)1–1.5 cm, secondary veins 3 or 4 pairs, transverse veins distinct. Inflorescence unknown. New shoots late Sep.

- About 1500 m. NE Yunnan (Suijiang).

14. *Chimonobambusa armata* (Gamble) Hsueh & T. P. Yi, J. Bamboo Res. 2(1): 38. 1983.

缅甸方竹 *mian dian fang zhu*

Arundinaria armata Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 130. 1896; *Oreocalamus armatus* (Gamble) T. H. Wen.

Culms 3–5(–10) m tall, 1–3 cm in diam.; internodes terete, 12–14 cm, glabrous, sometimes verrucose; nodes with prominent ridge, nodes at and below mid-culm each with a ring of root thorns; sheath scar with a densely fulvous tomentose ring and persistent culm sheath base. Branches 3 per node. Culm sheaths late deciduous, longer than internodes, papery, densely fulvous setose, margins ciliate; oral setae fulvous; ligule 2–3 mm; blade subulate-triangular, 1–3 cm; leaves 3–5 per ultimate branch; sheath ca. 7 cm, glabrous, veins distinct; auricles weak; oral setae developed; blade narrowly lanceolate, ca. 20×1.5 cm, papery to thinly papery, secondary veins 4- or 5-paired. Inflorescence 7–9 cm. Pseudospikelets fasciculate, 5–8 cm, with 3 or 4, gradually larger basal bracts; florets 7–10. Palea subequal to lemma, thinly papery, apex obtuse or slightly bifid. Lodicules transparent, margins white ciliate. Ovary ovoid-ellipsoid; style short, divided close to base; stigmas 2. Fruit unknown.

1300–2000 m. Xizang, Yunnan [India, Myanmar].

15. *Chimonobambusa tuberculata* Hsueh & L. Z. Gao, J. Bamboo Res. 6(2): 11. 1987.

永善方竹 yong shan fang zhu

Chimonobambusa armata (Gamble) Hsueh & T. P. Yi f. *tuberculata* (Hsueh & L. Z. Gao) T. H. Wen ex Ohrnberger.

Culms 3–4 m, ca. 1.2 cm in diam.; internodes cylindrical, 14–18 cm, grooves obscure, initially densely brown setose, developing verrucose spots; wall 2–3 mm; supra-nodal ridge level or raised at nodes with branches; nodes below mid-culm each with 4–12 air roots; sheath scars with a brown tomentose ring; intranode ca. 2 mm. Culm sheaths gradually deciduous, triangular, longer than internodes, papery or thickly so, abaxially initially with irregular brown stains and densely yellowish brown adnate setose, becoming black verrucose; ligule minute; blade 1–2 mm, not articulate. Leaves 3 or 4 per ultimate branch; sheath glabrous, adaxial margins initially ciliate; oral setae sparsely and readily deciduous; ligule ca. 1 mm; blade oblong-lanceolate, $20\text{--}25 \times 2\text{--}3$ cm, secondary veins 6–9-paired, transverse veins distinct. Inflorescence unknown. New shoots Aug–Sep.

• 1300–1400 m. SW Sichuan, NE Yunnan.

16. *Chimonobambusa hejiangensis* C. D. Chu & C. S. Chao, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 36. 1981.

合江方竹 he jiang fang zhu

Culms 5–7 m tall, 2–3 cm in diam.; internodes terete, 16–20 cm, grooved above branches; nodes with weakly prominent ridges, basal nodes each with a ring of root thorns. Culm sheaths deciduous, shorter than internodes, thickly papery or thinly leathery, adnate brown setose, densely so at base, margins with dense cilia 2–2.5 mm; ligule minute, ca. 1 mm; blade subulate-lanceolate or triangular-lanceolate, 7–13 mm. Leaves 1 per ultimate branch; blade oblong-lanceolate, ca. $16 \times 1.5\text{--}2$ cm, papery, secondary veins 4- or 5-paired, transverse

veins distinct, base narrowly cuneate, apex acuminate. Inflorescence paniculate. Pseudospikelets 1(–3) per node, 10–12 cm, prophyll followed by 1 or 2 empty bracts, then 4 or 5, gradually enlarged bracts subtending secondary pseudospikelets or buds; florets 8 or 9. Glumes absent or 1; rachilla internodes 1–1.4 cm, slender; lemma ovate-triangular, papery, 7–9-veined, apex mucronate; palea subequal with lemma, thinly papery, veins indistinct, apex retuse. Ovary ovoid-ellipsoid; style short; stigmas 2. Caryopsis reniform or ellipsoid, $10\text{--}12 \times 3\text{--}5$ mm in diam., with persistent, beaklike style base, pericarp ca. 0.5 mm thick.

• 700–1200 m. Guizhou, Jiangsu, Sichuan.

17. *Chimonobambusa convoluta* Q. H. Dai & X. L. Tao, Acta Phytotax. Sin. 20: 212. 1982.

小方竹 xiao fang zhu

Culms 2–3 m tall, 1–2 cm in diam.; internodes terete or slightly 4-angled, 12–20 cm, initially densely striate, fulvous tomentose, becoming verrucose; nodes with prominent ridge, more level at basal culm nodes without branches, basal nodes each with a ring of 5–7 root thorns; sheath scar with a densely retrorsely fulvous tomentose ring and persistent sheath base. Branches 3 per node. Culm sheaths purple-brown spotted, shorter than internode, papery, sparsely brown setose, more densely setose at sheath base, margins brown ciliate; oral setae absent to 2; ligule arcuate, ca. 1 mm, apex serrulate; blade linear-lanceolate, $1\text{--}2 \times 0.2\text{--}0.3$ cm, glabrous, articulate. Leaves 2–4 per ultimate branch; sheath densely brown tomentose, one margin brown ciliate; oral setae erect, pale, 8–10 mm; ligule ca. 1 mm; blade oblong-lanceolate, $16\text{--}22 \times 1\text{--}1.5$ cm, abaxially densely white pubescent, adaxially glabrous, but rough close to midvein, secondary veins 4- or 5-paired. Inflorescence unknown.

• 800–1400 m. Guangxi.

18. *Chimonobambusa szechuanensis* (Rendle) P. C. Keng, Techn. Bull. Natl. Forest. Res. Bur. 8: 15. 1948.

八月竹 ba yue zhu

Arundinaria szechuanensis Rendle in Sargent, Pl. Wilson. 2: 64. 1914; *Oreocalamus szechuanensis* (Rendle) Keng.

Culms 2.5–4(–6) m tall, 1.5–2 cm in diam.; internodes terete or obscurely 4-angled, 18–22 cm, grooved and ridged above branches, glabrate; basal nodes with rings of root thorns. Branches 3 per node. Culm sheaths deciduous, shorter than internodes, thickly papery, glabrous, main veins purple, transverse veins distally prominent, margins ciliate; ligule 0.5–1 mm; blade subulate-triangular, 3–5 mm, articulate. Leaves 1–3 per ultimate branch; sheaths leathery, glabrous, margins ciliate; oral setae pale, 3–5 mm; ligule 1–1.5 mm; leaf blade oblong-lanceolate, $18\text{--}20 \times 1.2\text{--}1.5$ cm, secondary veins 4–6-paired. Pseudospikelets without bracts or with 1–4 bracts, upper 1 or 2 with buds or secondary spikelets; florets 3 or 4. Glumes 2 or 3; lemma ovate-lanceolate, 7–9-veined, apex gradually acuminate. Palea narrowly ovate, subequal to lemma. Anthers yellow. Ovary ovoid; style short, divided nearly from base. Caryopsis nutlike, ovoid-ellipsoid, ca. 16×6 mm.

- Mountain areas; 1000–2400 m. Sichuan.

This species is not to be confused with *Chimonobambusa sichuanensis* (species no. 1).

19. *Chimonobambusa angustifolia* C. D. Chu & C. S. Chao, J. Nanjing Technol. Coll. Forest Prod. 1981(3): 36. 1981.

狭叶方竹 xia ye fang zhu

Chimonobambusa linearifolia W. D. Li & Q. X. Wu.

Culms 2–5 m tall, 1–2.5 cm in diam.; internodes green, slightly 4-angled or terete, 10–15 cm, initially densely white pubescent and sparsely setose, remaining verrucose; nodes very prominent; sheath scar usually with a ring of hazel cilia or persistent culm sheath base, basal node with a ring of 9–14 root thorns. Culm sheaths fulvous, shorter than internodes, prominently ridged with purple veinlets; ligule truncate or arched, minutely ciliate; blade subulate-triangular, 3–5 mm. Leaves 1–3 (or 4) per ultimate branch; sheaths glabrous or initially ciliate; oral setae 3–5, erect, pale, 3–5 mm; ligules arched, minute; leaf blade linear-lanceolate to linear, 6–15 × 0.5–1.2 cm, papery, glabrous, secondary veins 3- or 4-paired. Inflorescence unknown. New shoots Aug–Sep.

- 700–1400 m. Guangxi, Guizhou, Hubei, Shanxi.

20. *Chimonobambusa utilis* (Keng) P. C. Keng, Techn. Bull. Natl. Forest. Res. Bur. 8: 15. 1948.

金佛山方竹 jin fo shan fang zhu

Oreocalamus utilis Keng, Sunyatsenia 4: 148. 1940.

Culms 5–7(–10) m tall, 2–3.5(–5) cm in diam.; internodes terete or slightly 4-angled, 20–30 cm, initially white pubescent; wall ca. 7 mm; nodes weakly raised, nodal ridges flat or slightly prominent, persistent culm sheath base tomentose. Culm sheaths deciduous, fulvous, with sparse, off-white spots, shorter than internodes, margins ciliate; ligule slightly arched, 0.5–1.2 mm; blade triangular-subulate, 4–7 mm, articulate. Leaves (1 or 2)–(5) per ultimate branch; sheaths 3–6 cm, glabrous; ligule arcuate or truncate, 1–2 mm; pseudopetiole 2–5 mm; leaf blade lanceolate, abaxially gray-green, adaxially deep green, (5–)14–16 × (1–)2–2.5 cm, glabrous, 5–7-veined. Inflorescence branches subtended by 4 or 5, persistent, gradually enlarged bracts. Spikelets 2.5–4.5 cm; florets 4–7. Glumes 1–3, 6–9 mm, 7–9-veined; rachilla internodes 4–6 mm, glabrous; lemma ovate-triangular, 1–1.2 cm, glabrous; palea 8–10 mm, 2–4-veined between keels, 1- or 2-veined on each flank, apex obtuse or retuse; lodicules 2–3 mm, posterior oblong-lanceolate, anterior pair subovate. Anthers 5–6 mm. Ovary ovoid, glabrous; style minute, divided close to base; stigmas 2, ca. 2.5 mm. Caryopsis nutlike, ellipsoidal, 10–15 × 6–8 mm in diam., pericarp 1.5–2.5 mm thick. Fl. Apr.

- 1000–2100 m. Guizhou, Sichuan, Yunnan.

21. *Chimonobambusa pachystachys* Hsueh & T. P. Yi, J. Yunnan Forest. Coll. 1982(1): 33. 1982.

刺竹子 ci zhu zi

Culms 3–7 m tall, 1–3 cm in diam.; internodes terete or

basal ones slightly 4-angled, 15–22 cm, densely gradually deciduous brownish tomentose; nodes below mid-culm with rings of root thorns. Culm sheaths gradually deciduous, papery; ligule truncate, ca. 1 mm; blade subulate, 3–4 mm, articulate. Leaves 1–3 per ultimate branch; sheaths glabrous; oral setae several, deciduous; ligule truncate; blade 6–18 × 1.1–2.1 cm, papery, secondary veins 4–6-paired. Inflorescence lateral to shoots with apical leaves, subtended by 3 or 4, gradually enlarged bracts. Pseudospikelets 1(–3); florets 4–6. Glumes 1 or 2; lemma papery, glabrous or shortly villous, apex acuminate; palea slightly shorter than lemma, thinly papery, glabrous, apex blunt. Anthers purple. Ovary obovoid; style minute, divided close to base; stigmas 2. Caryopsis obovate-elliptic, pericarp thick.

- Evergreen broad-leaved forests; 1000–2000 m. Guizhou, Sichuan.

22. *Chimonobambusa metuoensis* Hsueh & T. P. Yi, J. Bamboo Res. 2(1): 34. 1983.

墨脱方竹 mo tuo fang zhu

Culms 5–7 m, 1–2.5 cm in diam.; internodes green, terete, grooved above branches, initially densely fulvous tomentose; wall 3–4 mm thick, cavity with membranous pith; nodes with strongly prominent ridges; lower branchless nodes usually each with a ring of 12–25 root thorns 2–3 mm; sheath scars prominent, densely retrorsely brown setose, hairs ca. 1 mm; buds triangular-subulate, glabrous. Branches initially 3 per node. Culm sheaths late deciduous, red-purple, narrowly triangular, shorter than internodes, 8–13 cm, 5.5–9 cm wide at base, thinly leathery, minutely off-white setulose, veins distinct, veinlets indistinct, margins densely gray-brown ciliate, apex 3–4 mm; auricles absent; ligule truncate, ca. 1 mm, densely gray-brown ciliate; blade erect, triangular or subulate, 1.5–2 × 1–1.5 mm, glabrous, articulate. Leaves 2 or 3 per ultimate branch; sheath distally dark purple, glabrous, 4–8 cm; ligule slightly prominent, dark purple, truncate, ca. 1 mm, glabrous; blade lanceolate, 12–33 × 1.5–4 cm, papery, glabrous, secondary veins 5–8-paired. Inflorescence unknown. New shoots Jul–Aug.

- Broad-leaved forests; 1900–2200 m. Xizang.

23. *Chimonobambusa quadrangularis* (Franceschi) Makino, Bot. Mag. (Tokyo) 28: 153. 1914.

方竹 fang zhu

Bambusa quadrangularis Franceschi, Bull. Soc. Tosc. Ortic. 5: 401. 1880; *Arundinaria quadrangularis* (Franceschi) Makino; *Phyllostachys quadrangularis* (Franceschi) Rendle.

Culms erect, 3–8 m tall, to 2.5 cm in diam.; internodes obtusely 4-angled, 8–22 cm, sparsely coarsely scabrid, apically more densely so; nodes prominent, supra-nodal ridge raised at branching nodes, level at branchless nodes, lower nodes each with a ring of short, declined root thorns; sheath scar corky, initially with a fulvous, tomentose, minutely setose ring. Culm sheaths deciduous, shorter than internodes, papery, veins prominent, transverse veinlets purple-brown, margins ciliate; auricles, oral setae, and ligule absent; blade deciduous, subulate, 3–5 mm, articulate. Leaves 2–5 per ultimate branch;

sheaths leathery, glabrous, margins apically ciliate; oral setae deciduous, erect, glabrate; ligule truncate, short, ciliate, with minute setae; pseudopetiole ca. 1.8 mm; blade elliptical to lanceolate, $8-29 \times 1-2.7$ cm, papery, abaxially initially pubescent, adaxially glabrous, secondary veins 4-7-paired, tertiary veins 5-7, apex acuminate. Inflorescence racemose or paniculate, terminal ones slender, glabrous, subtended by persistent, gradually enlarged bracts. Spikelets (1 or) 2-4, 2-3 cm, slender; florets 2-5, basal absent to 2 rudimentary. Glumes 1-3, lanceolate, 4-5 mm; lemma green, lanceolate or oblong-lanceolate, subequal to palea, papery, 5-7-veined; lodicules narrowly ovate. Anthers 3.5-4 mm. Stigmas 2.

Anhui, Fujian, Guangxi, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [Japan; cultivated in Europe and North America].

Although *Tetragonocalamus angulatus* and *Chimonobambusa angulata* are widely assumed to be synonyms of *C. quadrangularis*, it has been known for some time that they are actually synonyms of *Bambusa breviflora*, itself now considered to be a synonym of *B. tuldoidea*.

The inclusion of *Chimonobambusa quadrangularis* in the IUCN Red List is surprising, considering its wide distribution and the rather minor differences from several other species described later in China.

24. *Chimonobambusa microfloscula* McClure, Lingnan Univ. Sci. Bull. 9: 17. 1940.

小花方竹 xiao hua fang zhu

Culms 4-6 m tall, 1.5-2 cm in diam.; internodes initially setose distally, persistently verrucose; wall thin; branching nodes with very prominent ridge, basal nodes each with a ring of root thorns; sheath scar level, glabrous, sometimes with slight base of persistent culm sheath. Branches 3 per node. Culm sheaths deciduous, shorter than internodes, thickly papery, veins distinct, veinlets indistinct, margins fulvous ciliate; ligule ca. 1 mm, sparsely ciliate; blade readily deciduous, subulate. Leaves 3-5 per ultimate branch; sheath thinly leathery, glabrous, margin ciliate; oral setae white, ca. 1.2 cm; leaf blade narrowly lanceolate, $9-22 \times 0.7-0.9$ cm, papery, abaxially sparsely white setulose, secondary veins 4- or 5-paired. Inflorescences 8-24 cm with up to 5 brown spikelets; pedicels short or absent. Glumes 2, membranous, apex blunt; lower glume 4-5 mm, abaxially sparsely hirtellous, 5-veined; upper glume 5-6 mm, glabrous, 7-veined; lemma 7-9 mm, membranous, glabrous, secondary veins purplish, apex long acuminate; palea subequal to lemma, 2-veined between keels, apex obtuse, subentire.

Yunnan [N Vietnam].

25. *Chimonobambusa ningnanica* Hsueh & L. Z. Gao, J. Bamboo Res. 6(2): 13. 1987.

宁南方竹 ning nan fang zhu

Chimonobambusa yunnanensis Hsueh & W. P. Zhang.

Culms erect, (6-)10-14 m, 2-3 cm in diam.; internodes terete or 4-angled, ca. 20 cm, initially adnate-setose, becoming verrucose and rough; wall 3-4 mm; supra-nodal ridges level or slightly raised at branching nodes; sheath scar purple-brown pubescent; intranode with reflexed root thorns. Branches 3 per node. Culm sheaths deciduous, shorter than internodes; thickly

papery, yellow-brown setose, longitudinal veins distinct, margins yellow-brown ciliate; ligule arcuate, ca. 0.5 mm, ciliate; blade subulate, $3-6 \times$ ca. 3 mm. Leaves 3 per ultimate branch; sheath smooth; oral setae several, white, 4-5 mm; ligule ca. 1 mm; blade narrowly lanceolate, $20-23 \times 1.5-2$ cm, secondary veins 4- or 5-paired, transverse veins distinct. Inflorescence unknown.

• Broad-leaved forests; 1600-2200 m. SW Sichuan, Yunnan.

26. *Chimonobambusa grandifolia* Hsueh & W. P. Zhang, J. Bamboo Res. 7(1): 17. 1988.

大叶方竹 da ye fang zhu

Culms erect, to 4 m tall, 1-1.5 cm in diam.; internodes terete, 20-25(-30) cm, initially distally adnately brown setose, later verrucose; wall quite thin; supra-nodal ridges prominent, basal nodes with rings of root thorns; sheath scars with a densely brown tomentose ring; buds densely brown hairy. Branches 3 per node. Culm sheaths late deciduous, 1/2-2/3 as long as internode, papery, adnately brown setose, densely so at base, veins distinct, veinlets indistinct, margins fulvous ciliate; ligule ca. 1 mm; blade deciduous, triangular-subulate, 5-7 mm, articulate. Leaves 6-8 per ultimate branch; sheath 5-8 cm, margins white ciliate; oral setae erect, ca. 1.5 cm, stiff; ligule ca. 2 mm; leaf blade oblong-lanceolate, $30-35 \times$ ca. 2.5 cm, secondary veins 7- or 8-paired. Inflorescence unknown. New shoots Jul-Aug.

• Yunnan.

27. *Chimonobambusa verruculosa* (T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 47. 1990.

瘤箨箬竹 liu tuo qiong zhu

Qiongzhuea verruculosa T. P. Yi, Bull. Bot. Res., Harbin 8(4): 65. 1988.

Culms 1.5-3 m, (0.7-)1-1.5 cm in diam.; internodes terete, 10-15(-18) cm, grooved above branches, glabrous or initially with short, stiff, gray-white hairs below nodes, solid or nearly so; nodes with slightly projecting sheath scar. Branches initially 3 per node, later 5-7. Culm sheaths gradually deciduous, narrowly triangular, usually shorter than internodes, papery, gray tubercular-setose, margins densely brown ciliate; auricles absent; oral setae 1 or 2 on each shoulder, gray; ligule truncate, ca. 0.5 mm; blade erect at basal culm nodes, reflexed on upper culm, triangular, 0.5-1(-5) mm, glabrous. Leaves (1 or) 2 or 3 per ultimate branch; auricles and oral setae absent; ligule arcuate; blade lanceolate, $(5-10-18 \times (0.9-1.2-1.6$ cm, glabrous, secondary veins 4-6-paired, transverse veins distinct, base cuneate, margins serrulate, apex acuminate. Inflorescence unknown. New shoots Oct.

• Banks of streams; ca. 1100 m. Sichuan (Gulin).

28. *Chimonobambusa unifolia* (T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 46. 1990.

半边罗汉竹 ban bian luo han zhu

Qiongzhuea unifolia T. P. Yi, J. Bamboo Res. 9(1): 27. 1990.

Culms 1-1.6 m, 0.3-0.5 cm in diam.; internodes terete,

(2-)12-15(-24) cm, grooved above branches, with rings of yellow-brown hairs below nodes; wall 1.5-2 mm; nodes raised into ring; sheath scar prominent, brown, initially densely yellow-brown setose; intranode 1.5-2.5(-3) mm, initially gray or yellow-gray waxy. Branch bud oblong-ovoid, apex spinescent. Culm sheaths deciduous, triangular-oblong, shortly triangular at apex, papery, basally setose, longitudinal veins distinct, margins densely ciliate; auricles and oral setae absent; ligule arcuate, ca. 0.5 mm; blade triangular to linear-lanceolate, 1.5-12 mm, usually involute. Leaves 1 per ultimate branch; auricles and oral setae absent; ligule undeveloped; blade linear-lanceolate, (7-)9-15(-20) × 1.1-1.8(-2.5) cm, glabrous, secondary veins 4-6-paired, transverse veins sparse, base cuneate, apex acuminate. Inflorescence unknown. New shoots Nov-Dec.

- Broad-leaved forests; 1500-2200 m. Sichuan (Changning).

29. *Chimonobambusa rigidula* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger in Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 42. 1990.

实竹子 shi zhu zi

Qiongzhuea rigidula Hsueh & T. P. Yi, Acta Phytotax. Sin. 21: 96. 1983; *Oreocalamus rigidulus* (Hsueh & T. P. Yi) P. C. Keng.

Culms 2-4(-6) m, 1.5-2.5 cm in diam.; internodes slightly 4-angled or terete, (10-)15-18(-24) cm, glabrous; wall 4-10 mm; nodes with slightly projecting sheath scar. Branches 3 per node, subequal. Culm sheaths deciduous, thickly papery or leathery, margins densely yellow ciliate; auricles absent; ligule truncate; blade readily deciduous, triangular, glabrous. Leaves (1 or)2-5 per branchlet; auricles and oral setae absent; ligule truncate; blade lanceolate, 7-13 × 0.8-1.7 cm, with distinct, transverse veins. Flowering branches leafless or with terminal leaves on branchlets; inflorescence paniculate, 1-4 single pseudospikelet racemes grouped in loose fascicles, subtended by 3 or 4, gradually enlarged bracts. Spikelets 3-6-flowered. Glumes 2(or 3); rachilla disarticulating, internodes 2-5 mm, glabrous; lemma 8-14 mm, papery; palea thinner than lemma, 2-keeled, obtuse; lodicules purple, lanceolate, 1.5-3 mm, upper margin ciliate. Ovary ovoid; style 1; stigmas 2, plumose. Caryopsis nutlike. New shoots Sep; shoots purple.

- Hilltops; 1300-1700 m. S Sichuan.

30. *Chimonobambusa opienensis* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 30. 1990.

三月竹 san yue zhu

Oreocalamus opienensis Hsueh & T. P. Yi, J. Nanjing Univ. Nat. Sci. Ed. 22(3): 416. 1986; *Chimonobambusa maculata* (T. H. Wen) T. H. Wen; *Qiongzhuea maculata* T. H. Wen; *Q. opienensis* (Hsueh & T. P. Yi) D. Z. Li & Hsueh.

Culms 2-7 m, 1-5.5 cm in diam.; internodes slightly 4-angled or terete, 18-20(-25) cm, glabrous; wall 5-8 mm; distal nodes 2- or 3-branched, with conspicuously raised ridge. Culm sheaths deciduous, oblong-triangular, thickly papery or leathery, sparsely setose, upper margins densely yellow ciliate, apex arched; auricles absent; ligules rounded, ca. 1 mm, glabrous;

blade triangular, 4-6 mm. Leaves (1 or)2 per ultimate branch; sheaths 2.5-4 cm; auricles absent; oral setae 2-4, 4-7 mm; ligule short when leaf solitary, ca. 0.5 mm when 2-leaved; blade lanceolate, 7.5-17 × 1-1.6 cm, glabrous. Inflorescence unknown. New shoots Apr-May; shoots purplish black.

- Broad-leaved forests; 1600-1900 m. Sichuan (Ebian).

This species was first described as "*Qiongzhuea opienensis*" by Hsueh and Yi (Acta Bot. Yunnan. 2: 98. 1980), but that name was not validly published.

31. *Chimonobambusa luzhiensis* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 20. 1990.

光竹 guang zhu

Qiongzhuea luzhiensis Hsueh & T. P. Yi, Acta Bot. Yunnan. 5: 45. 1983; *Oreocalamus luzhiensis* (Hsueh & T. P. Yi) P. C. Keng.

Culms 2.5-5 m, 1-2 cm in diam.; internodes terete or slightly 4-angled, (10-)14-18(-20) cm, (1 or)2-grooved, white powdery, glabrous; wall 3-5 mm; nodes with conspicuous ridge, glabrous, glossy; sheath scar conspicuous, yellow-brown hispid, with persistent base of culm sheath. Branches 3(-5) per node. Culm sheaths persistent, red-brown or yellow-brown, triangular, leathery, sparsely brown setose, margins densely brown hirsute, apex truncate; auricles absent; ligule truncate, ca. 1 mm, initially yellow-brown ciliate; blade erect, triangular, linear, or lanceolate, 2-9 mm, longitudinal veins distinct. Leaves 2 or 3(or 4) on ultimate branches; ligules truncate, ca. 1 mm, glabrous; blades lanceolate, (7-)15-23(-30) × (1.1-)1.6-2(-2.4) cm, thickly papery, secondary veins 5-7-paired. Inflorescence unknown. New shoots Sep-Oct.

- Broad-leaved forests; 1700-1900 m. Guizhou (Luzhi).

32. *Chimonobambusa puberula* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger, Bamboos World Gen. *Chimonobambusa*, 32. 1990.

柔毛箬竹 rou mao qiong zhu

Qiongzhuea puberula Hsueh & T. P. Yi, Acta Bot. Yunnan. 5: 42. 1983; *Oreocalamus puberulus* (Hsueh & T. P. Yi) P. C. Keng.

Culms erect, 4-5 m, 1.5-2.5 cm in diam.; internodes terete or slightly 4-angled, (8-)15-17(-20) cm, initially puberulous; wall 2-5 mm; nodes with slightly conspicuous ridge, glabrous, glossy; sheath scar conspicuous, brown ciliate. Branches 3(-7) per node. Culm sheaths gradually deciduous, oblong-ovoid or triangular, truncate or arched, leathery, brown hirsute, margins brown hirsute; auricles absent; ligule truncate or arched, ca. 1 mm, glabrous; blade erect, triangular, 2-13 × 1-2 mm. Leaves (2 or)3(or 4) per ultimate branch; sheaths 3-4 cm, margins densely gray ciliate; auricles absent; oral setae 3-5, 3-5 mm; ligule truncate or arched, ca. 1 mm, rounded; blade lanceolate, (4.5-)10-15(-19) × (0.6-)1-1.6 cm, secondary veins (3 or)4- or 5(or 6)-paired. Inflorescence unknown. New shoots Oct.

- Hills; 1200-1500 m. Guizhou (Luzhi).

33. *Chimonobambusa communis* (Hsueh & T. P. Yi) T. H. Wen & Ohrnberger, *Bamboos World Gen. Chimonobambusa*, 16. 1990.

平竹 ping zhu

Oreocalamus communis Hsueh & T. P. Yi, J. Nanjing Univ. Nat. Sci. Ed. 22(3): 416. 1986; *Qiongzhueta communis* (Hsueh & T. P. Yi) D. Z. Li & Hsueh.

Culms 3–7 m, 1–3 cm in diam.; internodes slightly 4-angled or terete at culm base, (8–)15–18(–25) cm, smooth, glabrous; wall 3–5 mm; nodes level or with slightly raised sheath scar at nodes without branches. Culm sheaths deciduous, initially green, becoming yellow-brown, papery or thickly papery; auricles absent; ligule ca. 1 mm; blade triangular or subulate, 5–11 mm, glabrous, articulate, readily deciduous. Leaves (1 or)2(–5) per ultimate branch; sheaths leathery; auricles absent; oral setae several, 3–7 mm; ligule truncate, ca. 1 mm; blade lanceolate, (5–)8–12 × (0.8–)1.3–2 cm, transverse veins distinct. Flowering branches leafless or terminally leafy on branchlet; 2–4 single pseudospikelet racemes grouped in loose fascicles, subtended by several, gradually enlarged bracts. Spikelets 2–3 × 0.4–0.5 cm; florets (3–)5–7. Glumes 1 or 2(or 3), 7–13 mm; rachilla articulate, internodes 3–5 mm, slightly white powdery; lemma 8–13 mm; palea 7–11 mm, apex obtuse or bifid. Anthers yellow, 5–6 mm. Ovary ovoid; style 1; stigmas 2. Fruit a nutlike caryopsis. New shoots May, fl. Mar, fr. May.

- Hills; 1600–2000 m. Guizhou, Hubei, Sichuan.

This species was first described as “*Qiongzhueta communis*” by

Hsueh and Yi (Acta Bot. Yunnan. 2: 96. 1980), but that name was not validly published.

34. *Chimonobambusa montigena* (T. P. Yi) Ohrnberger, *Bambusbrief* 1990(4): 11. 1990.

荆竹 jing zhu

Qiongzhueta montigena T. P. Yi, J. Bamboo Res. 9(3): 28. 1990.

Culms 1.5–2.8 m, 0.7–1.4 cm in diam.; internodes terete, (5–)13–14(–19) cm, grooved above branches, initially sparsely white powdery; wall 3–4 mm; nodes raised into ring; sheath scar initially densely yellow-brown setose. Branches 3–5 per node. Culm sheaths deciduous, triangular-elliptic, shorter than internodes; leathery, yellow setose at base, margins initially gray ciliate, longitudinal veins distinct; auricles absent; ligule truncate, 0.5–0.8 mm; blade erect, triangular or subulate, 2.5–7 mm, margins ciliate. Leaves 2–5 per ultimate branch; auricles small; oral setae initially several; ligule arcuate, ca. 1 mm; blade lanceolate, (4.5–)8–14.5 × (0.8–)1.3–2.6 cm, transverse veins distinct. Inflorescence on leafless branches or terminal to leafy branchlets, 1–4 single pseudospikelet racemes grouped in loose fascicles, subtended by several, gradually enlarged bracts. Spikelets 5–7-flowered, 2–3.2 × 0.3–0.5 cm. Glume 1, 1–2.2 cm; rachilla articulate, internodes 2–4 mm; lemma (7–)9–13 mm; palea 6–9 mm, apex acute. Anthers yellow, 5–6 mm. Ovary ovoid; style 1; stigmas 2 or 3. Fruit a nutlike caryopsis. New shoots late Apr to early May, fl. and fr. Jul–Sep.

- Broad-leaved forests; 2300–2500 m. NE Yunnan.

33. *SHIBATAEA* Makino ex Nakai, J. Jap. Bot. 9(2): 83. 1933.

鹅毛竹属 e mao zhu shu

Wang Zhengping (王正平 Wang Cheng-ping); Chris Stapleton

Shrubby bamboos. Rhizomes leptomorph, with running underground stems. Culms pluricaespitose, less than 1 m, distally flexuose; internodes flattened on branching sides; nodes 2-ridged. Branches 3–5, slender, often without secondary branchlets, usually with persistent membranous prophylls and branch sheaths. Culm sheaths deciduous, papery, transverse veins distinct; auricles absent; ligule well developed; blade lanceolate to subulate, small. Leaves usually solitary on each branchlet; sheaths contiguous with branchlets, thickened, petiole-like, rarely 2 or more with median sheaths exceeding proximal and distal ones; auricles absent; ligule usually long, conical and highly involute in solitary or upper leaves; blade very broadly lanceolate to narrowly lanceolate, transverse veins distinct. Inflorescence bracteate, partially iterant, composed of 1-spikeleted racemes gathered in fascicles with a spatulate prophyll, 0 or 1 empty bract, and 0–3 gemmiferous bracts. Spikelets 2–7-flowered, lower 1 or 2 fertile, upper ones sterile. Glumes usually absent; lemma membranous, broadly lanceolate, apex acuminate; palea 2-keeled; lodicules 3, narrowly obovate, membranous. Stamens 3. Style 1; stigmas 3, plumose. Fruit a caryopsis.

- Seven species: China.

In addition to the species treated below, *Shibataea pygmaea* F. Maekawa (J. Jap. Bot. 19: 150. 1943) was described from Jiangxi. This species was based on abnormal material, and it is difficult to confirm its identity, since no *Shibataea* has been found at the type locality. *Shibataea tumidinoda* T. H. Wen (J. Bamboo Res. 7(1): 23. 1988) was described from Fujian. This species was based on a poor gathering, and its identity is uncertain.

These bamboos are usually cultivated as ornamentals. One species was introduced to Japan at an early date and has been widely planted there.

- 1a. Leaf blade narrowly lanceolate with a long caudate tip, length 6–10 × width.
 - 2a. Culm sheaths glabrous 5. *S. lancifolia*
 - 2b. Culm sheaths initially white pubescent 6. *S. nanpingensis*
- 1b. Leaf blade ovate, ovate-lanceolate, or elliptic, length less than ca. 4 × width.
 - 3a. Culm sheaths glabrous.
 - 4a. Leaf blade abaxially pubescent, margins acutely and rigidly serrulate 4. *S. hispida*
 - 4b. Leaf blade abaxially glabrous, margins minutely serrulate 7. *S. chinensis*

3b. Culm sheaths hairy.

5a. Leaf blade abaxially pubescent 1. *S. kumasaca*

5b. Leaf blade abaxially glabrous.

6a. Culm sheaths sparsely brown strigose 2. *S. strigosa*6b. Culm sheaths densely white pubescent 3. *S. chiangshanensis*

1. *Shibataea kumasaca* (Zollinger ex Steudel) Makino ex Nakai, J. Jap. Bot. 9(2): 78. 1933.

倭竹 wo zhu

Bambusa kumasaca Zollinger ex Steudel, Syn. Pl. Glumac. 1: 331. 1854; *B. ruscifolia* Siebold ex Munro; *Phyllostachys kumasaca* (Zollinger ex Steudel) Munro; *Shibataea ruscifolia* (Siebold ex Munro) Makino.

Culms ca. 1 m, 3–4 mm in diam.; internodes glossy, glabrous; wall thick with small lumen; nodes with ridge strongly raised; intranode to 3–5 mm. Culm sheaths papery, appressed pubescent, outer margin ciliate; auricles absent; oral setae few or absent; ligule truncate or arcuate, to 3–4 mm, pubescent, apex ciliate; blade lanceolate, small. Branches 3–5(or 6) per node, 0.5–1.5 cm, equal in diam., 2–4(–6)-noded, axillary prophyll usually persistent; branch sheaths gradually deciduous or persistent and disintegrating in situ, membranous. Leaves 1(or 2) per ultimate branch; blade adaxially deep green, ovate or narrowly ovate, 2.5–18 × 0.6–3.5 cm, abaxially glaucous and pubescent, adaxially glabrous, secondary veins 6–9-paired, tessellations rectangular, base broadly cuneate to rounded, apex acuminate. Flowering branches at lower nodes of leafy branches or rarely at nodes of culms, usually rebranched, secondary branches comprising a prophyll, few bracts, and (1 or) 2–5 pseudospikelets; pseudospikelets consisting of a prophyll, 0 or 1 empty bract, 2 or 3 gemmiferous bracts, and a terminal spikelet. Spikelets with 3–7 florets, lower 1–3 bisexual, others male or sterile. Lemma thin; palea membranous; lodicules thinly membranous, ovate. Anthers yellow. Ovary narrowly ovoid; style 1; stigmas 2 or 3. Caryopsis narrowly ovoid. New shoots May–Jun. $2n = 48^*$.

• Mountain slopes. Fujian, Zhejiang; cultivated in Anhui, Guangdong, Jiangsu, and Taiwan [widely cultivated in Japan].

The specific epithet has been erroneously spelled “*kumasa*” by some authors.

A cultivar with yellow-striped leaves, *Shibataea kumasaca* ‘Aureostriata’, is grown. The species is introduced in many countries as an ornamental.

2. *Shibataea strigosa* T. H. Wen, Bull. Bot. Res., Harbin 3(1): 96. 1983.

矮雷竹 ai lei zhu

Culms ca. 50 cm, ca. 3 mm in diam.; internodes green, glabrous, flattened throughout on one side; nodal ridge strongly elevated. Culm sheaths pale green, sparsely deciduously brown strigose, base and margins glabrous, apex truncate; ligule weakly arcuate or truncate, margin ciliate; blade erect, subulate, small. Branches 3 per node. Leaves 1 per ultimate branch, petiole 3–4 mm; blade ovate-lanceolate to elliptic, 5–7 × 1.5–2 cm, both surfaces glabrous, base rounded, asymmetric, secondary veins 6- or 7-paired, tessellation distinct, apex abruptly acuminate. Inflorescence unknown.

• Jiangxi, Zhejiang.

3. *Shibataea chiangshanensis* T. H. Wen, Bull. Bot. Res., Harbin 3(1): 95. 1983.

江山鹅毛竹 jiang shan e mao zhu

Culms ca. 50 cm, ca. 2 mm in diam.; internodes initially green, later red-brown, subterete, 7–12 cm, white powdery below nodes, subterete; nodal ridge elevated. Culm sheaths pale red, densely white pubescent, especially at base, margins ciliate; auricles and oral setae absent; ligule truncate, short; blade erect, purple-red, subulate. Branches 3 per node, central one thicker, 2–2.5 cm, lateral two ca. 1/2 as long as central one. Leaves 1 per ultimate branch; pseudopetiole ca. 8 mm; blade ovate to triangular, 6–8 × 1–2.3 cm, broadest near base, both surfaces glabrous, secondary veins 7- or 8-paired, tessellations square, base rounded or subtruncate, apex abruptly acuminate, shortly caudate.

• Zhejiang.

4. *Shibataea hispida* McClure, Lingnan Univ. Sci. Bull. 9: 57. 1940.

芦花竹 lu hua zhu

Culms ca. 1 m, 1.5–4 mm in diam.; internodes pale yellow, triangular, glossy, glabrous, grooved above branches; cavity small; nodal ridge rather elevated; intranode 2–4 mm. Culm sheaths brown, apex acuminate; auricles and oral setae absent; blade subulate, small. Branches 3 or 4 per node, 2–4-noded; internodes 0.5–1 cm, sparsely hispid. Leaves 1 per ultimate branch; sheath 1–2 cm; ligule short; pseudopetiole 4–8 mm, glabrous or scarcely pubescent; blade abaxially gray-green, adaxially green, lanceolate, 7–10 × 2–3(–4) cm, broadest near base, abaxially pilulose, adaxially glabrous, secondary veins 6–8-paired, tessellation distinct, base suborbicular, margins minutely serrulate, apex abruptly acuminate. Inflorescence unknown.

• Forest margins, open forests, slopes; below 300 m. Anhui, Zhejiang.

5. *Shibataea lancifolia* C. H. Hu, J. Nanjing Univ., Nat. Sci. Ed. 1981(2): 257. 1981.

狭叶鹅毛竹 xia ye e mao zhu

Culms 45–100 cm, 2–3 mm in diam.; internodes subterete, 3–4 cm, glabrous, grooved above branches; nodal ridge raised. Culm sheaths deciduous, papery, glabrous; auricles and oral setae absent; blade subulate, 3–6 mm. Branches 3–5 per node, 0.8–1.5 cm, 3–5-noded, with persistent prophyll at base; branch sheaths gradually deciduous, membranous; blade small, mucronate. Leaves 1 or 2 per ultimate branch; sheath ca. 2 cm, lower sheath longer than upper in 2-leaved branches; ligule conical, tightly involute, ca. 5 mm and weakly curved in solitary or upper leaves, shorter in lower ones; blade lanceolate, 8–12 × 0.8–1.5 cm, abaxially pubescent, adaxially glabrous, base cune-

ate, margins minutely serrulate, apex acuminate, caudate. Flowering branches at lower nodes of leafy branches, sometimes with 2–5 secondary branches, each branch subtended by a large spathe-like bract and with an axillary prophyll and 1–4 pseudospikelets; pseudospikelets linear, 1.5–2 cm, comprising a prophyll, 1–3 gemmiferous bracts or lowest bract empty, and a terminal spikelet. Spikelets with 3–5 florets, lower 1 or 2 fertile, others male or sterile. Lemma pale green, lanceolate, ca. 1.2 cm, thin, 11-veined; palea thinner, about as long as lemma; lodicules membranous, transparent. Anthers yellow. Ovary narrowly ellipsoid; style 1; stigmas 3. Caryopsis narrowly ovoid. New shoots May–Jun, fl. Mar–Apr. $2n = 48^*$.

• Montane forests; ca. 500 m. Fujian, Zhejiang.

6. *Shibataea nanpingensis* Q. F. Zheng & K. F. Huang, Wuyi Sci. J. 2: 17. 1982 [*“nanpinensis”*].

南平鹅毛竹 *nan ping e mao zhu*

Culms 1–1.7 m, 4–5 mm in diam.; internodes green, terete, or triangular and grooved above branches, 25–30(–40) cm; nodal ridge conspicuously raised; intranode ca. 5 mm. Culm sheaths pale green, densely deciduously white pubescent especially toward base, scabrous between veins; auricles and oral setae absent; ligule convex, 1.5–4 mm, ciliate; blade linear, 3–6 mm, green. Branches 3 per node, 1.5–1.7 cm, 2- to several-noded. Leaves 1 per ultimate branch; blade elliptic-lanceolate, 17–18 × 2.5–3 cm, both surfaces glabrous or abaxially hairy, secondary veins 7–9-paired, base cuneate, margins minutely serrulate, apex caudate-acuminate. Inflorescence unknown. New shoots Jun–Jul. $2n = 48^*$.

• Fujian.

- 1a. Leaf blade abaxially glabrous 6a. var. *nanpingensis*
1b. Leaf blade abaxially hairy 6b. var. *fujianica*

6a. *Shibataea nanpingensis* var. *nanpingensis*

南平鹅毛竹(原变种) *nan ping e mao zhu (yuan bian zhong)*

Leaf blade glabrous on both surfaces.

• Fujian.

6b. *Shibataea nanpingensis* var. *fujianica* (Z. D. Zhu & H. Y. Zhou) C. H. Hu, Fl. Reipubl. Popularis Sin. 9(1): 321. 1996.

福建鹅毛竹 *fu jian e mao zhu*

Shibataea fujianica Z. D. Zhu & H. Y. Zhao, Acta Phytotax. Sin. 26: 134. 1988.

Leaf blade abaxially hairy.

• Fujian.

7. *Shibataea chinensis* Nakai, J. Jap. Bot. 9: 81. 1933.

鹅毛竹 *e mao zhu*

Culms ca. 1 m, 2–3 mm in diam.; internodes pale green or tinged with purple, triangular, 7–15 cm, glabrous, grooved above branches; nodal ridge rather raised. Culm sheaths deciduous, unmarked, papery, glabrous or basally setulose, margins ciliate; auricles and oral setae absent; ligule to 4 mm, blade small, subulate or acicular in lower sheaths. Branches 3–5 per node, 3–5-noded, with a lateral bud, each branch with a gradually deciduous prophyll and some branch sheaths, prophyll 3–5 cm, membranous, margins ciliate. Leaves 1(or 2) per ultimate branch; sheath glabrous; auricles and oral setae absent; ligule lanceolate or triangular, 4–6 mm or more, conically tightly involute, or loose in lower leaf of 2-leaved branch, membranous, puberulent; blade ovate-lanceolate, 6–10 × 1–2.5 cm, both surfaces glabrous, secondary veins 5–8(or 9)-paired, tessellations distinct, base asymmetric, margins minutely serrulate, apex acuminate. New shoots May–Jun.

• Mountain slopes, forests, forest margins, in cultivation; ca. 1100 m. Anhui, Jiangsu, Jiangxi, Zhejiang.

- 1a. Culm sheaths basally glabrous; blade subulate 7a. var. *chinensis*
1b. Culm sheaths basally setulose; blade minute, awnlike 7b. var. *gracilis*

7a. *Shibataea chinensis* var. *chinensis*

鹅毛竹(原变种) *e mao zhu (yuan bian zhong)*

Culms taller. Culm sheaths basally glabrous. Leaf blade completely green.

• Mountain slopes, forest margins, forests, commonly cultivated as an ornamental; ca. 1100 m. Anhui, Jiangsu, Jiangxi.

7b. *Shibataea chinensis* var. *gracilis* C. H. Hu, J. Nanjing Univ., Nat. Sci. Ed. 1982(3): 733. 1982.

细鹅毛竹 *xi e mao zhu*

Culms smaller. Culm sheaths basally setulose; blade slender, awnlike.

• Jiangsu, Zhejiang.

34. **PHYLLOSTACHYS** Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3: 745. 1843, nom. cons., not Torrey (1836), nom. rej.

刚竹属 *gang zhu shu*

Wang Zhengping (王正平 Wang Cheng-ping); Chris Stapleton

Arborescent or shrubby bamboos. Rhizomes leptomorph, with running underground stems. Culms diffuse; internodes profoundly flattened or grooved on one side above branches; nodes 2-ridged. Branches 2, subequal, rarely with a much smaller, central or lateral 3rd branch. Culm sheaths deciduous, papery to subleathery; ligule usually conspicuous; usually auricled with long bristles; blade usually recurved or reflexed. Leaf blade with distinct transverse veins, usually abaxially pilose proximally. Inflorescence bracteate, partially iterant, composed of 1–7-spikeleted racemes gathered into fascicles or globose mass subtended by a tiny, membranous, 2-keeled prophyll, 0 or 1 gemmiferous bract, 2–6, gradually enlarged scaly bracts, and 2–7 spathe-like bracts.

Spikelets with 2–7 florets, terminal sterile. Glumes absent to 1(–3). Rachilla extending beyond uppermost floret, disarticulating just below fertile florets. Lemma variable in size and texture; palea 2-keeled, apex bifid; lodicules 3, ciliate. Stamens 3. Style long; stigmas (1–)3, plumose. Caryopsis elliptical to linear-lanceolate, dorsally grooved.

At least 51 species: China, India, Japan, Myanmar; introduced to many other countries; 51 species (49 endemic) in China.

Phyllostachys is indigenous in China but is also widely and extensively cultivated. Originally it may have been largely endemic to China, but many species were introduced to neighboring countries, especially Japan, at a very early date. *Phyllostachys* species are now extensively cultivated in neighboring Asian countries, and several have become naturalized there, while some are possibly native. Many species have more recently been introduced to other parts of the world, including Europe and North and South America, but they remain principally ornamental plants outside eastern Asia. *Phyllostachys* species are probably of greater economic importance than any other bamboos in China and are used for building, paper, flooring, furniture, edible shoots, and as ornamentals.

- 1a. Culm sheaths from lower and mid-culm without blotches; blades erect and imbricate at apex of shoots; culm intranode ca. 5 mm; rhizome internodes with ring of air canals; flowering branchlets capitate.
- 2a. Culm sheath auricles large, triangular or falcate.
- 3a. Culm sheath ligule broad, short, width more than $8 \times$ length, shortly ciliate.
- 4a. Culm sheath auricles narrowly falcate, ascendant; leaves 2 per ultimate branch 43. *P. lofushanensis*
- 4b. Culm sheath auricles very broad, contiguous with and extending from swollen cupped base of blade, absent on mid- and lower culm; leaves 1(or 2) per ultimate branch 44. *P. nidularia*
- 3b. Culm sheath ligule narrow, tall, width less than $8 \times$ length (or broader in *P. aurita* and then both culm and branch sheath scar fringed with rust-colored setulae), lacinate with stouter, longer cilia at margin (minutely ciliate in *P. bisetii* and *P. aureosulcata*).
- 5a. Culm sheaths with milky-white or gray-white stripes at least distally or marginally, or in *P. bisetii* not striped and then sheath ligule ciliate.
- 6a. Culm sheaths glabrous with milky-white stripes throughout; culm internodes with green or yellow stripes or entirely green; some culms with a few geniculate nodes near base; sheath auricles conspicuously joined to base of blade 26. *P. aureosulcata*
- 6b. Culm sheaths hairy, with gray-white stripes on upper and lateral parts; culm internodes green, not striped; culms without geniculate nodes near base; sheath auricles sometimes slightly connected with sheath blade.
- 7a. Lower culm with hairy sheaths; sheath ligule ciliate 27. *P. bisetii*
- 7b. Lower and mid-culm sheaths hairy; sheath ligule long ciliate 28. *P. varioauriculata*
- 5b. Culm sheaths without milky-white or gray-white stripes.
- 8a. Culm sheaths red-brown; sheath ligule strongly convex, peaked or arcuate 30. *P. nigra*
- 8b. Culm sheaths green or yellow, tinged with purple; sheath ligule truncate or gently arcuate.
- 9a. Internodes of young culms glabrous; sheath scar of culms and branches densely fringed with rusty hairs in first two years 41. *P. rubromarginata*
- 9b. Internodes of young culms sparsely pubescent; sheath scar of culms and branches without hairs.
- 10a. Leaves 2 per ultimate branch; lower and mid-culm sheath strigose with longer hairs at base; rhizomes without air canals 29. *P. guizhouensis*
- 10b. Leaves 1 or 2 per ultimate branchlet; lower culm sheath pubescent; rhizomes with a ring of air canals 42. *P. veitchiana*
- 2b. Culm sheath auricles small and ovate or absent.
- 11a. Culm sheaths with dark purple or dark brown margins when fresh; sheath ligule dark purple with long cilia.
- 12a. Culm sheath blade distally crinkled; culm sheaths glabrous at base 10. *P. virella*
- 12b. Culm sheath blade not distally crinkled; culm sheaths pubescent at base, at least at lower nodes 11. *P. shuchengensis*
- 11b. Culm sheaths without dark purple or dark brown margins when fresh; sheath ligule green or brown with short or long cilia.
- 13a. Culm sheath ligule narrow, with cilia to 5 mm, oral setae erect 24. *P. robustiramea*
- 13b. Culm sheath ligule broader, with cilia less than 3 mm.
- 14a. Culm sheath blade usually flat, narrower than ligule; internodes of young culms pubescent.
- 15a. Leaf sheath initially pubescent; blade abaxially puberulent; sheath ligule truncate or weakly concave 45. *P. rivalis*
- 15b. Leaf sheath initially glabrous; blade abaxially glabrous; sheath ligule \pm convex 46. *P. carnea*
- 14b. Culm sheath blade usually undulate, broad; triangular to triangular-lanceolate, base equaling width of ligule; internodes of young culm glabrous or sparsely pubescent.
- 16a. Culm sheath light brown or red-purple; sheath ligule arcuate or acutely convex; leaf blade small, to 6 cm 51. *P. parvifolia*
- 16b. Culm sheaths green or dark green, usually tinged with purple; sheath ligule concave to convex; leaf blade ca. 8 cm or more.
- 17a. Culm sheath ligule strongly concave, green when fresh 50. *P. rubicunda*

- 17b. Culm sheath ligule weakly concave to convex, brown or purple when fresh.
 - 18a. Culm sheath dark green with dark purple stripes; ligule inconspicuously ciliate; auricles absent 49. *P. atrovaginata*
 - 18b. Culm sheath green, with or without purple stripes; ligule conspicuously ciliate; auricles usually present but small or absent in slender shoots.
 - 19a. Culm sheath glabrous or subglabrous, not striped but tinted with purple along margins and apex when fresh 47. *P. heteroclada*
 - 19b. Culm sheath strigose, striped with purple when fresh 48. *P. stimulosus*
- 1b. Culm sheaths from lower and mid-culm \pm blotched with brown spots and markings; blade usually horizontal or reflexed, rarely erect; culm intranode ca. 3 mm; rhizome internodes without air canals; flowering branchlets spicate, rarely subcapitate.
 - 20a. Culm sheath auricles and oral setae absent; culm sheaths glabrous, occasionally scabrous or sparsely strigose on upper or marginal portions.
 - 21a. Culm internodes with minute holes or crystalline spots (visible under $10\times$ lens).
 - 22a. Nodal ridge obsolete or less prominent than sheath scar in unbranched nodes; culm sheath ligule fringed with pale green or white cilia 1. *P. sulphurea*
 - 22b. Nodal ridge prominent in unbranched nodes; culm sheath ligule with purple-red cilia 2. *P. makinoi*
 - 21b. Culm internodes without holes or spots, or if with holes, culms initially puberulent.
 - 23a. Sheath scar on young culms and base of culm sheaths densely pubescent or sparsely setose.
 - 24a. Culm internodes strongly shortened and ventricose at culm base, inflated below nodes in mid-culm; culm sheath ligule short, 1–2 mm 4. *P. aurea*
 - 24b. Culm internodes normal; culm sheath ligule long.
 - 25a. Culm sheaths with dark purple margins when fresh; ligule minutely ciliate, also with scabrous dark purple bristles 11. *P. shuchengensis*
 - 25b. Culm sheaths without dark purple margins; ligule white ciliate only.
 - 26a. Culm sheath scar on young culms and base of culm sheaths fringed with pubescence 3. *P. meyeri*
 - 26b. Culm sheath scar on young culms and base of culm sheaths fringed with both pubescence and setae 5. *P. verrucosa*
 - 23b. Culm sheath scar on young culms and base of culm sheaths glabrous.
 - 27a. Culm sheath ligule narrow, tall, width less than $5\times$ length, truncate or convex at base, not decurrent or if decurrent, upper portion of culm sheaths scabrous between veins; blade usually flat, sometimes weakly crinkled.
 - 28a. Culm sheaths distally scabrous between veins; culms tinged with dark purple blotches on lower internodes initially.
 - 29a. Leaf blade abaxially proximally pilose; sheath ligule truncate or convex, not decurrent on both flanks 6. *P. nuda*
 - 29b. Leaf blade abaxially glabrous; sheath ligule strongly convex, decurrent on both flanks 7. *P. arcana*
 - 28b. Culm sheaths glabrous, rarely scabrous near apex, sometimes sparsely setose; culms without initial blotches.
 - 30a. Culm sheath ligule with short white cilia, occasionally intermixed with some longer ones.
 - 31a. Culm sheath blade lanceolate or linear-lanceolate; sheath ligule brown, apex arcuate, convex at middle 9. *P. propinqua*
 - 31b. Culm sheath blade hand-shaped or lanceolate; sheath ligule dark purple-brown or pale brown, apex truncate or weakly convex.
 - 32a. Culm sheath ligule dark purple-brown; culm sheaths purple-brown when fresh; culm internodes initially thickly white powdery throughout 8. *P. glauca*
 - 32b. Culm sheath ligule lighter in color, purple-brown to pale brown; culm sheaths brown-green when fresh; culm internodes initially thinly white powdery on upper half 13. *P. flexuosa*
 - 30b. Culm sheath ligule with long, dark brown or dark purple cilia, or if with white cilia, culm sheaths milky-white.
 - 33a. Culm sheaths with dark purple margins when fresh; blade erect, distally crinkled 10. *P. virella*
 - 33b. Culm sheaths without dark purple margins when fresh; blade horizontal or recurved, not crinkled.
 - 34a. Culm sheaths milky-white to pale yellow; ligule fringed with thin white cilia 12. *P. angusta*
 - 34b. Culm sheaths green-brown; sheath ligule fringed with stout, dark brown cilia 13. *P. flexuosa*
 - 27b. Culm sheath ligule usually broad and short; convex at base, usually \pm decurrent, rarely not so; blade crinkled or occasionally flat.
 - 35a. Culm sheath ligule convex, weakly or not decurrent; culm sheaths tinged purple or purple-red.
 - 36a. Culm sheath ligule marginally finely sinuate, fringed with white cilia 14. *P. glabrata*
 - 36b. Culm sheath ligule marginally not sinuate, ciliate or with long, purple-red hairs.

- 37a. Culm internodes initially white powdery; culm nodes not purple-tinged; sheath ligule ciliate 15. *P. iridescens*
 37b. Culm internodes not white powdery; culm nodes initially purple-tinged; sheath ligule shortly ciliate, long hairy 16. *P. tianmuensis*
 35b. Culm sheath ligule conspicuously convex, strongly decurrent or if not decurrent then fringed with bristles ca. 5 mm; culm sheath green-brown or brown-red. 17. *P. fimbriiligula*
 38a. Culm sheath ligule with fimbriae ca. 5 mm 17. *P. fimbriiligula*
 38b. Culm sheath ligule with cilia less than 5 mm.
 39a. Culm sheath sparsely strigose; blade flat or weakly undulate 18. *P. acuta*
 39b. Culm sheath glabrous; blade strongly crinkled, at least in mid-culm region.
 40a. Mid-culm internodes more than 25 cm, initially slightly white powdery; culm nodes not initially purple 19. *P. vivax*
 40b. Mid-culm internodes less than 25 cm, initially thickly white powdery; culm nodes initially purple 20. *P. violascens*
 20b. Culm sheath oral setae present, or auricles and oral setae present (in *P. mannii* auricles and oral setae sometimes absent, but then culm sheath rigid and fragile when fresh, margins distally purple-red); culm sheaths \pm strigose, rarely glabrous.
 41a. Culm sheath auricles small or nearly absent and oral setae long, or auricles large and falcate with sheath ligule densely fringed with long cilia ca. 8 cm.
 42a. Culm internodes initially densely pubescent; nodal ridge inconspicuously raised in unbranched nodes or less prominent than sheath scar.
 43a. Culm internodes progressively shortened toward culm base and sometimes ventricose, nodes of lower culm dense; leaf blade 4–11 cm 21. *P. edulis*
 43b. Culm internodes not greatly shortened, never ventricose, nodes of lower culm more remote; leaf blade 10–15 cm 22. *P. kwangsiensis*
 42b. Culm internodes initially glabrous or subglabrous; nodal ridge raised in unbranched nodes, equal to or more prominent than leaf scar.
 44a. Culm sheaths without spots or with smaller sparser spots and milky-white or green-brown stripes; oral setae erect 24. *P. robustiramea*
 44b. Culm sheaths with spots but without conspicuous stripes; oral setae radiate or erect.
 45a. Internodes of young culms thickly white powdery; culm sheath ligule with cilia to 1 cm 31. *P. incarnata*
 45b. Internodes of young culms not white powdery or very thinly white powdery; culm sheath ligule shortly ciliate.
 46a. Culm sheaths densely strigose; blade crinkled; sheath scar densely pubescent initially 23. *P. circumpilis*
 46b. Culm sheaths glabrous or scarcely strigose; blade flat or occasionally crinkled at apex; sheath scar glabrous 35. *P. reticulata*
 41b. Culm sheath auricles large, usually falcate, or if absent or minute then culm sheaths rigid and fragile when fresh, with small, sparse spots; sheath ligule shortly ciliate.
 47a. Internodes of young culms hairy, sheath blade flat or wavy to crinkled, erect and usually \pm imbricate at apex of shoots or sometimes diffuse in *P. aureosulcata*.
 48a. Culm sheath ligule short, broad, width ca. 10 \times length, not lacerate; culm sheaths rigid and fragile when fresh, purple along upper margins 25. *P. mannii*
 48b. Culm sheath ligule longer, usually lacerate at apex; culm sheaths neither rigid nor fragile when fresh, without purple margins.
 49a. Culm sheaths red-brown or purple-yellow, without milky-white or gray-white stripes.
 50a. Culm sheaths sparsely strigose; sheath ligule truncate to convex 29. *P. guizhouensis*
 50b. Culm sheaths densely strigose; sheath ligule strongly convex, usually peaked at apex 30. *P. nigra*
 49b. Culm sheaths green with milky-white or gray-white stripes, rarely not striped.
 51a. Culm sheaths glabrous with milky-white stripes throughout; some basal culm nodes geniculate 26. *P. aureosulcata*
 51b. Culm sheaths \pm strigose, with gray-white distal and marginal stripes; culms without geniculate nodes.
 52a. Sheaths of lower culm strigose; sheath ligule ciliate 27. *P. bissetii*
 52b. Sheaths of lower and mid-culm strigose; sheath ligule long ciliate 28. *P. varioauriculata*
 47b. Internodes of young culms glabrous; sheath blade usually strongly crinkled, horizontal or rarely erect, usually not imbricate at apex of shoots.
 53a. Culm sheath ligule ca. 2 mm or more, with cilia equal to or longer than ligule height 31. *P. incarnata*
 53b. Culm sheath ligule less than 2 mm, with shorter cilia.
 54a. Culm sheaths pale yellow when fresh, sometimes tinged with red or green, with small, sparse spots; sheath auricles green when fresh 32. *P. dulcis*

- 54b. Culm sheaths colored with other hues, sheath auricles not green when fresh, or if green, culm sheaths with both long and small spots.
- 55a. Culm sheaths brown-red when fresh, with sparse or rather dense small spots, distal margins dark purple.
- 56a. Culm sheath ligule broad, width ca. $10 \times$ height, apex arcuate or truncate; culm internodes initially white powdery 33. *P. platyglossa*
- 56b. Culm sheath ligule narrower, apex arcuate or centrally prominent; culm internodes glossy or slightly white powdery initially 34. *P. rutila*
- 55b. Culm sheaths not brown-red when fresh, with spots of various sizes, sometimes with only small spots but then sheath ligule narrower and taller, without dark purple margins.
- 57a. Culm sheath blade flat or weakly crinkled, linear; sheath auricles deciduous or sometimes absent 35. *P. reticulata*
- 57b. Culm sheath blade strongly crinkled.
- 58a. Culm sheath ligule narrow, taller, width less than $6 \times$ height, peaked or arcuate at apex; culm sheaths with small spots.
- 59a. Culm sheath ligule strongly convex, \pm peaked, decurrent; culm internodes not ribbed-striate 36. *P. viridiglauescens*
- 59b. Culm sheath ligule arcuate, sometimes weakly decurrent; culm internodes ribbed-striate 37. *P. elegans*
- 58b. Culm sheath ligule broader, truncate or arcuate; culm sheaths with dense small to large spots.
- 60a. Culm nodes strongly elevated, nodal ridge much more prominent than sheath scar 38. *P. prominens*
- 60b. Culm nodes moderately elevated, nodal ridge slightly more prominent than or equaling sheath scar.
- 61a. Culm sheaths glabrous or subglabrous, sheath ligule green when fresh; culm internodes initially white powdery 39. *P. yunhoensis*
- 61b. Culm sheaths strigose; sheath auricles purple-red when fresh; culm internodes initially scarcely white powdery 40. *P. nigella*

1. *Phyllostachys* sect. *Phyllostachys*

刚竹组 gang zhu zu

Rhizome internodes without air canals in transverse section. Culm nodes with intranode ca. 3 mm. Culm sheaths of lower and mid-culm \pm covered with brown or dark brown spots; blade horizontal or reflexed, rarely erect, usually spreading at shoot apex, narrowly lanceolate to linear, base usually narrower than ligule. Flowering branchlets spicate. Spikelets 2.5–3 cm. Lemma 1.6–2.8 cm. Anthers 7–15 mm.

About 40 species: China, India, Japan, Myanmar; introduced to many other countries; 40 species (38 endemic) in China.

1. *Phyllostachys sulphurea* (Carrière) Rivière & C. Rivière,
Bull. Soc. Natl. Acclim. France, sér. 3, 5: 773. 1878.

金竹 jin zhu

Culms 6–15 m, 4–10 cm in diam.; internodes green or sulfur-yellow, usually with yellow or green stripes, 20–45 cm, initially thinly white powdery, glabrous, with small holes or crystalline spots (visible under $10 \times$ lens); wall ca. 5 mm thick; nodal ridge not prominent or nearly so at unbranched nodes in larger culms; sheath scar slightly prominent, thin. Culm sheaths yellow or yellow-brown with green veins and brown rounded or more irregular spots of various sizes, thinly white powdery, glabrous; auricles and oral setae absent; ligule green-yellow, arcuate or truncate, margin pale green or white ciliate; blade reflexed, green with orange margins, narrowly triangular to linear, weakly crinkled. Leaves 2–5 per ultimate branch; sheath subglabrous or distally puberulent; auricles and oral setae usually well developed; blade oblong-lanceolate to lanceolate, 5.6–13 \times 1.1–2.2 cm. Inflorescence not known. New shoots May. $2n = 48^*$.

• Anhui, Fujian, Henan, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Zhejiang [cultivated in Japan, N Africa, Europe, and North America].

The hard but rather brittle culms are used in house construction and for handles of farm tools. The species is commonly planted for ornament.

- 1a. Culms golden yellow at sheath fall 1a. var. *sulphurea*
1b. Culms green-yellow at sheath fall 1b. var. *viridis*

1a. *Phyllostachys sulphurea* var. *sulphurea*

金竹(原变种) jin zhu (yuan bian zhong)

Bambusa sulphurea Carrière, Rev. Hort. 45: 379. 1873 [“*sulfurea*”]; *Phyllostachys reticulata* (Ruprecht) K. Koch var. *sulphurea* (Carrière) Makino; *P. mitis* Poiret var. *sulphurea* (Carrière) Carrière.

Culms golden yellow at sheath fall.

• Anhui, Henan, Jiangsu, Jiangxi, Zhejiang [cultivated in Japan, N Africa, Europe, and North America].

This variety occurs spontaneously in stands of var. *viridis* and is widely cultivated for ornament.

1b. *Phyllostachys sulphurea* var. *viridis* R. A. Young, J. Wash. Acad. Sci. 27: 345. 1937.

刚竹 gang zhu

Phyllostachys chlorina T. H. Wen; *P. faberi* Rendle; *P. villosa* T. H. Wen; *P. viridis* (R. A. Young) McClure.

Culms green-yellow at sheath fall.

• Anhui, Fujian, Henan, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Zhejiang.

2. *Phyllostachys makinoi* Hayata, Icon. Pl. Formosan. 5: 250. 1915.

台湾桂竹 tai wan gui zhu

Culms 10–20 m, 3–8 cm in diam.; internodes to 40 cm, initially thinly white powdery, glabrous, with minute holes or crystalline spots (visible under $10\times$ lens); wall to 1 cm thick; nodal ridge as prominent as sheath scar or slightly more so. Culm sheaths cream-colored, sometimes brown or green-brown, with dense variably sized spots, thinly white powdery or glossy, glabrous; auricles and oral setae not developed; ligule dark purple, truncate or weakly arched, fringed with long purple cilia; blade reflexed, green, with orange or green-yellow margins, narrowly triangular or linear, flat or weakly crinkled. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae usually present; ligule arcuate, commonly eroded, purple-red ciliate; blade $8\text{--}14 \times 1.5\text{--}2$ cm, abaxially initially pubescent especially near petiole. Inflorescence not known. New shoots May–Jun. $2n = 48^*$.

• Open forests; below 1500 m. Fujian, Taiwan [introduced in Japan].

The flowering branchlets of this species are indicated as capitate in Fl. Taiwan (5: 729, pl. 1492–10. 1978), but as spicate in Fl. Ill. Pl. Prim. Sin. Gram. (103, f. 72. 1959). From the combination of characters of culms and culm sheaths it is suspected that the flowering branchlets of this bamboo are most likely to be spicate.

The tough, compact culms are used for building and for making paper, furniture, umbrellas, containers, and agricultural implements.

3. *Phyllostachys meyeri* McClure, J. Wash. Acad. Sci. 35: 286. 1945.

毛环竹 mao huan zhu

Phyllostachys viridis (Young) McClure f. *laqueata* T. H. Wen.

Culms 5–10 m, 3–7 cm in diam.; internodes to 35 cm, initially white powdery below nodes, glabrous; wall ca. 3 mm thick; nodal ridge elevated, as prominent as sheath scar or slightly more so; sheath scar purple-tinted, initially white pubescent. Culm sheaths brown-purple, dark green, or yellow-brown, sometimes striped with purple, distally with dense variably sized dark brown spots, proximally with sparser, smaller ones, white powdery, fringed with white pubescence at base; auricles and oral setae absent; ligule yellow-green to yellow-brown, arcuate with a central hump, moderately long, margin ciliate; blade reflexed, purple-green, with yellow margins, narrowly linear, \pm undulate to weakly crinkled. Leaves 2 or 3 per ultimate branch; sheaths glabrous; auricles and oral setae usually absent; ligule evidently exserted; blade lanceolate to linear-lanceolate $7\text{--}13 \times 1\text{--}2$ cm. Flowering branchlets spicate, 5.5–7 cm, basal bracts 2–4, gradually larger; spathes 5–8, gla-

brous or hairy on one side, without auricles and oral setae; blade ovate-lanceolate to subulate, small. Pseudospikelets 1–3 per spathe. Spikelets lanceolate, 3–3.5 cm; florets 1 or 2; rachilla pubescent, terminally extended beyond uppermost floret. Glumes 1, lanceolate; lemma 2–2.5 cm, glabrous, apex acuminate with a subulate point; palea ca. 2 cm, subglabrous or apically puberulent; lodicules oblong-lanceolate, ca. 2.5 mm. Anthers 1–1.2 cm. Stigmas 3. New shoots Apr. fl. Apr–May.

• Open forests; ca. 600 m. S Hunan; cultivated in Anhui, Guangxi, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Yunnan, and Zhejiang.

The culms are used as supports and for making furniture, umbrellas, and containers.

4. *Phyllostachys aurea* Carrière ex Rivière & C. Rivière, Bull. Soc. Natl. Acclim. France, sér. 3, 5: 716. 1878.

人面竹 ren mian zhu

Phyllostachys bambusoides Siebold & Zuccarini var. *aurea* (Carrière ex Rivière & C. Rivière) Makino; *P. breviligula* W. T. Lin & Z. M. Wu; *P. formosana* Hayata; *P. reticulata* (Ruprecht) K. Koch var. *aurea* (Carrière ex Rivière & C. Rivière) Makino.

Culms 5–12 m, 2–5 cm in diam.; internodes 15–30 cm, usually strongly shortened and commonly ventricose at basal nodes, distally inflated for several mm below node at mid-culm and basal nodes, initially white powdery, glabrous; wall 4–8 mm thick; nodal ridge as prominent as sheath scar or slightly more prominent; sheath scar initially fringed with white pubescence. Culm sheaths yellow-green or pale red-brown, becoming straw-colored, with variably sized brown spots, base edged with white pubescence; auricles and oral setae absent; ligule yellow-green, truncate or weakly convex at apex, very short, 1–2 mm, margin longer pale green ciliate; blade reflexed, green, with yellow margins, linear, flat or crinkled in upper sheaths. Leaves 2 or 3 per ultimate branch; sheath glabrous; auricles and oral setae absent or deciduous; ligule short; blade $6\text{--}12 \times 1\text{--}1.8$ cm, abaxially pilose especially near petiole.

• Forests, widely cultivated as an ornamental. Fujian, Zhejiang [introduced into many other countries as an ornamental].

Culms with irregular basal internodes are used for walking sticks, umbrella handles, and fishing rods.

5. *Phyllostachys verrucosa* G. H. Ye & Z. P. Wang, J. Nanjing Univ., Nat. Sci. Ed. 1983(3): 482. 1983.

长沙刚竹 chang sha gang zhu

Culms ca. 3 m, ca. 1.2 cm in diam.; internodes purple-green with dense minute purple specks especially at both ends, to 16 cm, initially white powdery below nodes; nodal ridge elevated, more prominent than sheath scar; sheath scar initially white setose. Culm sheaths papery, \pm speckled, scabrous between veins, sometimes strigose especially toward apex, base fringed with white setae, auricles and oral setae absent; ligule dark purple, arcuate, narrow, strongly prominent at middle, to 5 mm, apex usually erose, ciliate; blade reflexed, pale purple-yellow, narrowly lanceolate to linear. Branches 2 per node, usually with a 3rd much smaller branch. Leaves 2 or 3 per ultimate branch; auricles and oral setae absent; ligule arcuate, 1–3 mm,

minutely ciliate; blade linear-lanceolate, 7.5–9.5 × 0.8–1 cm, abaxially proximally pubescent along midrib. Inflorescence not known. New shoots Apr.

- Cultivated. Hunan.

6. *Phyllostachys nuda* McClure, J. Wash. Acad. Sci. 35: 288. 1945.

灰竹 hui zhu

Culms 6–9 m, 2–4 cm in diam., sometimes with 1 or 2 geniculate nodes near base; internodes initially dark green, basal nodes blotched dark purple, becoming gray-green or gray-white in age, striate, to 30 cm, distally white powdery, glabrous; wall ca. 1/3 diam. of internodes; nodes initially dark purple, nodal ridge elevated, more prominent than sheath scar. Culm sheaths green-purple or faintly red-brown with purple veins, basal and mid-culm nodes distally blotched dark brown, white powdery, slightly scabrous between veins; auricles and oral setae absent; ligule yellow-green, truncate, ca. 4 mm, narrow, ciliate; blade reflexed, narrowly triangular to linear, initially weakly crinkled, later flat. Leaves 2–4 per ultimate branch; auricles and oral setae absent; blade lanceolate to linear-lanceolate, 8–16 cm. Flowering branches spicate, 5–9 cm; bracts 3–5, gradually larger; spathes 5–7, lowest 1 or 2 sterile and deciduous, margins pubescent, auricles and oral setae absent; blade ovate-lanceolate to subulate, small. Pseudospikelets 2 or 3 per spathe. Spikelets lanceolate, 2.5–3.4 cm; florets 1 or 2. Glumes absent or 1; rachilla internodes densely puberulent; lemma 2.5–3 cm, margins glabrous or sparsely puberulent; palea 2–2.5 cm, usually glabrous; lodicules ca. 4 mm. Anthers ca. 1 cm. Stigmas 2 or 3. Inflorescence not known. New shoots Apr–May, fl. May.

- Cultivated. Anhui, Fujian, Hunan, Jiangsu, Jiangxi, Shaanxi, Taiwan, Zhejiang.

This is a very hardy species with delicious shoots. The tough culms are used for handles of farm implements.

7. *Phyllostachys arcana* McClure, J. Wash. Acad. Sci. 35: 280. 1945.

石绿竹 shi lü zhu

Culms ca. 8 m, ca. 3 cm in diam.; internodes initially green, lower nodes distally blotched purple, becoming yellow-green in age, to 20 cm, white powdery, glabrous; wall 2–3 mm thick; nodes initially purple, nodal ridge elevated, more prominent than sheath scar. Culm sheaths pale green-purple or yellow-green, at lower and or basal nodes with purple blotches and small spots, initially white powdery, scabrous between veins and minutely strigose, at upper nodes unmarked, usually glabrous; auricles and oral setae absent; ligule purple or yellow-green, peaked, fragile, 4–8 mm, usually decurrent on one or both sides, erose or lacerate, ciliate; blade reflexed, green, linear, flat or ± wavy on lower sheaths. Leaves 2 or 3 per ultimate branch; auricles and oral setae absent; ligule arcuate, long, brittle; blade linear-lanceolate, 7–11 × 1.2–1.5 cm, both surfaces glabrous, rarely abaxially pilose proximally. New shoots Apr.

- Cultivated; 700–1800 m. Anhui, Gansu, Jiangsu, Shaanxi, Sichuan, Yunnan, Zhejiang.

The shoots are edible, and the small, hard culms are used as props and for handles of farm implements.

8. *Phyllostachys glauca* McClure, J. Arnold Arbor. 37: 185. 1956.

淡竹 dan zhu

Culms 5–12 m, 2–5 cm in diam.; internodes usually blue-green, to 40 cm, initially white powdery; wall ca. 3 mm thick; nodal ridge nearly equaling or slightly more prominent than sheath scar. Culm sheaths purple-brown or green-brown, usually alternating with pale and darker stripes, with sparse small brown spots or cloudy brown blotches, margins usually dark brown; auricles and oral setae absent; ligule dark purple brown, truncate, 2–3 mm, margin ciliate; blade spreading to reflexed, purple-green with yellow margins, linear-lanceolate to linear, flat or sometimes weakly crinkled. Leaves 2 or 3 per ultimate branch; auricles and oral setae deciduous; ligule purple-brown; blade 7–16 × 1.2–2.5 cm, abaxially proximally pilose. Flowering branchlet spicate, to 11 cm, subtended by 3–5 scaly bracts gradually larger; spathes 5–7, glabrous or pilose on one flank, oral setae sometimes weakly developed; blade narrowly lanceolate to subulate. Pseudospikelets 2–4 per spathe, usually 1 or 2 fertile; bracts subtending lateral pseudospikelets, lanceolate, apex puberulent. Spikelets narrowly lanceolate, ca. 2.5 cm; florets 1 or 2, upper one sterile. Glumes 1 or 2; rachilla densely puberulent, extending awnlike beyond uppermost floret; lemma ca. 2 cm, keels usually puberulent; lodicules ca. 4 mm. Anthers ca. 1.2 cm. Stigmas 2. New shoots Apr–May, fl. Jun. $2n = 48^*$.

- Anhui, Henan, Hunan, Jiangsu, Shaanxi, Shandong, Shanxi, Yunnan, Zhejiang.

The culms are used for weaving and making furniture, containers, handicraft items, tool handles, and shelters.

- 1a. Culms thickly pruinose; culm sheaths sparsely strewn with smaller spots 8a. var. *glauca*
- 1b. Culms glossy or thinly pruinose; culm sheaths with cloudy brown blotches 8b. var. *variabilis*

8a. *Phyllostachys glauca* var. *glauca*

淡竹(原变种) dan zhu (yuan bian zhong)

Young culms thickly white powdery, without spots at maturity. Culm sheaths with sparse small spots.

- Anhui, Henan, Hunan, Jiangsu, Shaanxi, Shandong, Shanxi, Yunnan, Zhejiang.

8b. *Phyllostachys glauca* var. *variabilis* J. L. Lu, J. Henan Agric. Coll. 1981(2): 71. 1981.

变竹 bian zhu

Young culms glossy or thinly white powdery. Culm sheaths with longitudinal, cloudy brown blotches.

- Cultivated. Henan.

9. *Phyllostachys propinqua* McClure, J. Wash. Acad. Sci. 35: 289. 1945.

早园竹 zao yuan zhu

Phyllostachys sapida T. P. Yi.

Culms ca. 6 m, 3–4 cm in diam.; internodes ca. 20 cm, initially white powdery, glabrous; wall ca. 4 mm thick; nodal ridge slightly elevated, as prominent as sheath scar. Culm sheaths faintly red-brown or yellow-brown, usually alternating with pale and deep colored stripes, with denser purple-brown spots especially distally, glabrous, distal margins usually straw-colored; auricles and oral setae absent; ligule brown, arcuate, sometimes slightly convex at middle, ciliate; blade reflexed, abaxially pale purple-brown, adaxially green, lanceolate to linear-lanceolate, flat. Leaves 2 or 3 per ultimate branch; auricles and oral setae commonly absent; ligule strongly exserted, arcuate, ciliate; blade lanceolate to linear-lanceolate, 7–16 × 1–2 cm. New shoots Apr. 2n = 48*.

• Cultivated. Anhui, Fujian, Guangxi, Guizhou, Henan, Hubei, Jiangsu, Jiangxi, Yunnan, Zhejiang.

The culms of this hardy species are used for weaving and for tool handles.

10. *Phyllostachys virella* T. H. Wen, Bull. Bot. Res., Harbin 2(1): 72. 1982.

东阳青皮竹 dong yang qing pi zhu

Culms ca. 9 m, ca. 5 cm in diam.; internodes initially green, not white powdery, puberulent, becoming light green, white powdery on upper portion at maturity, sometimes minutely pitted (visible under 10 × lens); nodal ridge more prominent than sheath scar. Culm sheaths gray-green, larger ones evenly and sparsely strewn with small spots, distal margins tinged with purple, glabrous throughout even on margins; auricles and oral setae absent; ligule dark purple, truncate, 1–2 mm, margin with purple cilia ca. 0.5 mm; blade erect, green, with purple margins, triangular to linear, distally crinkled. Leaves 2 or 3 per ultimate branch; sheath glabrous except for ciliate margins; auricles absent; oral setae 3–5, erect, ca. 8 mm; ligule truncate, ca. 1 mm, margin with cilia 1–2 mm; blade broadly lanceolate to narrowly oblong, 11–16 × 2–2.5 cm, both surfaces glabrous, margins smooth or rarely scabrous. Inflorescence not known. New shoots Apr–May.

• Sandy sites; below 100 m. Zhejiang.

This species was treated as a synonym of *Phyllostachys meyeri* by Chao and Tang (J. Nanjing Forest. Univ. 17(4): 6. 1993) and of *P. rubromarginata* by Lai and Hong (J. Bamboo Res. 14(2): 11. 1995).

11. *Phyllostachys shuchengensis* S. C. Li & S. H. Wu, J. Anhui Agric. Coll. 1981(2): 50. 1981.

舒城刚竹 shu cheng gang zhu

Phyllostachys rubromarginata McClure f. *castigata* T. H. Wen.

Culms to 10 m, ca. 3.5 cm in diam.; internodes to 35 cm or more, thinly white powdery; wall 4.5–5 mm thick; nodal ridges weakly elevated, as prominent as sheath scar; sheath scar initially densely retrorsely yellow pubescent on margin. Culm sheaths green or pale green, unmarked or large sheaths with distal sparse small spots, basal sheaths often with purple or

golden stripes, distal margins red-purple, base densely fringed with yellow pubescence; auricles and oral setae absent; ligule dark purple, truncate or more commonly weakly concave, less than 1 mm, with red-purple bristles much longer than 1 mm, ciliate; blade horizontal or reflexed, green-purple, linear, flat, much narrower than ligule at base. Leaves 1 or 2 per ultimate branch; auricles absent or small in young culms; oral setae erect or radiate in young culms; ligule slightly exserted, purple, ciliate; blade lanceolate, oblong to linear, 6–17 × 1.2–2.2 cm, abaxially scabrid along midrib. Flowering branchlets spicate, ca. 5 cm, subtended by 4 or 5 scaly bracts gradually larger; spathes 5 or 6, auricles and oral setae absent or oral setae weakly developed; blade lanceolate to subulate, small. Pseudo-spikelets (1 or) 2–4 per spathe, if 3 or 4 then 1 or 2 smaller and sterile. Spikelets with 1–4 florets. Rachilla glabrous or pubescent; palea shorter than lemma, pubescent; lodicules narrowly rhomboid, ca. 4 mm. Anthers 0.8–4 cm. Stigmas 3. New shoots early May, fl. May.

• Roadsides, river banks, cultivated, Anhui, Guangdong, Guangxi, Henan, Jiangxi, Yunnan, Zhejiang.

This species was misidentified as *Phyllostachys rubromarginata* by Geng and Wang in FRPS (9(1): 263. 1996).

The culms are used for weaving.

12. *Phyllostachys angusta* McClure, J. Wash. Acad. Sci. 35: 278. 1945.

黄古竹 huang gu zhu

Culms to 8 m, 3–4 cm in diam., straight; internodes gray-green at maturity, to 26 cm, initially thinly white powdery, glabrous; wall ca. 3 mm thick; nodal ridge weakly elevated, as prominent as sheath scar. Culm sheaths milky-white, tinged with yellow-green, unequally striped with purple, with sparse, small, brown spots, not white powdery, glabrous, margins ciliate; auricles and oral setae absent; ligule pale yellow-green, truncate or slightly convex, tall, narrow, notched or lacinate, with pale cilia to 5 mm; blade spreading or reflexed, greenish cream or sometimes purple, linear, flat. Leaves 2 or 3 per ultimate branch; auricles absent; oral setae sometimes present; ligule exserted, yellow-green; blade linear-lanceolate or lanceolate, 5–17 × 1.2–2 cm, abaxially proximally pilose. Inflorescence not known. New shoots late Apr–May. 2n = 48*.

• Cultivated. Anhui, Fujian, Henan, Jiangsu, Zhejiang.

This species is similar to *Phyllostachys flexuosa*, but differs in its inconspicuously pruinose culm internodes, its paler (nearly white), sparsely speckled culm sheaths, and its paler, ciliate, yellow-green ligules.

The culms are used for weaving fine bamboo articles.

13. *Phyllostachys flexuosa* Rivière & C. Rivière, Bull. Soc. Natl. Acclim. France, sér. 3, 5: 758. 1878.

曲竿竹 qu gan zhu

Bambusa flexuosa Carrière, Rev. Hort. 1870: 320. 1870, not Munro (1868).

Culms 5–6(–10) m, 2–4(–7) cm in diam., basally usually ± flexuose; internodes initially green, later gray, to 30 cm or more, initially perceptibly white powdery, especially below

nodes, becoming glabrous at maturity; wall 3–5 mm thick; nodal ridge moderately elevated, as prominent as sheath scar. Culm sheaths green-brown with purple veins, sometimes with pale yellow or yellow-green streaks, usually with sparse to rather dense small brown spots, not white powdery, glabrous; auricles and oral setae absent; ligule arcuate, tall, narrow, margin with long and deciduous or short cilia, apex sometimes notched; blade reflexed, green-purple with pale yellow margins, narrowly lanceolate to linear, flat. Leaves 2 or 3 per ultimate branch; auricles and oral setae usually absent; ligule moderately exerted; blade 8–12 × 1–2 cm, abaxially proximally pilose. Flowering branchlets spicate, 4–6 cm; scaly bracts 3–6, gradually larger; spathes 4–6, both sides puberulent, auricles and oral setae absent, blade small, lanceolate to subulate. Pseudospikelets 2 or 3 per spathe. Spikelets narrowly lanceolate, 2.5–3.5 cm; florets 1–3, uppermost floret usually fertile. Glumes 1; rachilla terminally extended, awnlike; internodes hairy; lemma ca. 2.5 cm, glabrous, apex extending into an awnlike point; palea ca. 2.2 cm, subglabrous or sparsely pubescent at apex; lodicules narrowly ovate-lanceolate, ca. 2 mm. Anthers ca. 1 cm. Stigmas 3. New shoots Apr–May, fl. Apr–May. $2n = 48^*$.

● Cultivated. Anhui, Hebei, Henan, Jiangsu, Shaanxi, Shanxi, Yunnan, Zhejiang.

The shoots are delicious, and the culms are used as tool handles and are split for weaving.

14. *Phyllostachys glabrata* S. Y. Chen & C. Y. Yao, Acta Phytotax. Sin. 18: 174. 1980.

花哺鸡竹 hua bu ji zhu

Culms to 6–7 m, 3–4 cm in diam.; internodes initially deep green, becoming gray-green in age, ca. 19 cm, not white powdery, slightly scabrous; wall ca. 5 mm thick; nodal ridge weakly elevated, as prominent as sheath scar. Culm sheaths pale purple-yellow, with dense, brown spots merging into cloudy blotches at apex; auricles and oral setae absent; ligule pale brown, truncate or weakly convex, short, broad, sinuate, ciliate; blade reflexed, purple-green with purple-red or orange margins, narrowly triangular to linear, crinkled. Leaves 2 or 3 per ultimate branch; auricles green, densely fimbriate; oral setae green or purple-red; ligule ca. 2 mm, blade 8–11 × 1.2–2 cm. Flowering branchlets spicate, 4–7 cm; scaly bracts 2–6; spathes 4–7, glabrous, auricles minute, densely fringed with radiate setae; blade orbicular-ovate to narrowly lanceolate. Pseudospikelets solitary in each spathe. Spikelets narrowly lanceolate, 2–2.8 cm; florets 2. Glumes usually absent; rachilla internodes puberulent; lemma 1.9–2.4 cm, glabrous or slightly scabrous; palea 1.7–2.2 cm, subglabrous; lodicules 2.5–3 mm. Anthers 0.8–1.2 cm. Stigmas 3. New shoots Apr, fl. May. $2n = 48^*$.

● Cultivated. Fujian, Zhejiang.

The shoots are delicious, and the culms are used unsplit.

15. *Phyllostachys iridescens* C. Y. Yao & S. Y. Chen, Acta Phytotax. Sin. 18: 170. 1980 [*“iridescens”*].

红哺鸡竹 hong bu ji zhu

Culms 6–12 m, 4–7 cm in diam.; internodes green, be-

coming gray-green, 17–24 cm, initially white powdery, gradually showing yellow-green stripes in first two years; wall 6–7 mm thick; nodal ridge weakly elevated, as prominent as sheath scar. Culm sheaths purple-red or pale purple-red, with purple-brown margins, densely purple-brown spotted, thinly white powdery, glabrous; auricles and oral setae absent; ligule purple-brown, arcuate, broad, with long, purple-red cilia, blade reflexed, green with red-yellow margins, linear, flat or weakly crinkled. Leaves 3 or 4 per ultimate branch; auricles absent; oral setae deciduous, purple; ligule moderately exerted, purple-red; blade 8–17 × 1.2–2.1 cm. Flowering branchlets spicate, (2.5–)5–6(–8.5) cm, scaly bracts 3–5; spathes 5–7, pubescent; oral setae 1–3, short; blade small. Pseudospikelets 2 or 3(or 4) per spathe. Spikelets lanceolate, purple, 3–3.5 cm; florets 1–3, uppermost usually sterile. Glumes absent or 1, lanceolate; rachilla ending in a short, awnlike point, internodes pubescent; lemma 1.8–2.1 cm, glabrous, apex acuminate with an awnlike point; palea 1.5–1.8 cm, subglabrous or pilosulose at apex; keels conspicuous or inconspicuous; lodicules ovate-lanceolate, 2.5–3 mm. Anthers ca. 1 cm. Stigmas 3. New shoots Apr, fl. Apr–May.

● Cultivated. Anhui, Jiangsu, Zhejiang.

This species is grown for its delicious shoots and strong culms; the latter are used for props and tool handles.

16. *Phyllostachys tianmuensis* Z. P. Wang & N. X. Ma, J. Nanjing Univ., Nat. Sci. Ed. 1983(3): 491. 1983.

天目早竹 tian mu zao zhu

Culms to 7–8 m or more, 3–4 cm in diam.; internodes initially green, with inconspicuous yellow stripes, white powdery, glabrous; nodes initially purple-green, moderately raised, nodal ridge as prominent as sheath scar. Culm sheaths pale red-brown, with dense, small, brown spots basally and apically, thinly white powdery, glabrous throughout even on margins, margins distally red-brown; auricles and oral setae absent; ligule dark purple-brown, arcuate or subtruncate, ciliate, with fragile bristles; blade reflexed, green, with yellow margins, narrowly lanceolate to linear, distally crinkled. Leaves 2 or 3 per ultimate branch; auricles absent; oral setae absent or 2 or 3; ligule usually exerted, arcuate or truncate; blade to 15 × 2 cm, abaxially deciduously pubescent. Inflorescence not known. New shoots late Mar–Apr. $2n = 48^*$.

● Cultivated. Anhui, Zhejiang.

17. *Phyllostachys fimbriatigula* T. H. Wen, J. Bamboo Res. 2(1): 71. 1983.

角竹 jiao zhu

Culms ca. 9 m, ca. 5 cm in diam.; internodes green, 20–25 cm, initially white powdery below nodes, glabrous; nodal ridge as prominent as sheath scar. Culm sheaths green, tinged red-brown, with scattered, dark red-brown spots, sparsely deciduously hairy, attenuate toward apex, margins glabrous; auricles and oral setae absent; ligule to 1 cm, peaked, fimbriate, both sides decurrent; blade erect or reflexed, narrowly linear, sometimes distally undulate. Leaves 3 or 4 per ultimate branch; sheath glabrous; auricles ovate; oral setae to 1.3 cm; ligule to 1

mm, ciliate; blade 8–15 × 1–1.8 cm, abaxially green and glabrous, adaxially gray-green and puberulent. Inflorescence not known. New shoots May–Jun.

- Cultivated. Hunan, Jiangsu, Jiangxi, Zhejiang.

This species is planted primarily for its edible shoots; it is famous for its high rates of shoot production.

18. *Phyllostachys acuta* C. D. Chu & C. S. Chao, *Acta Phytotax. Sin.* 18: 172. 1980.

尖头青竹 jian tou qing zhu

Culms ca. 8 m, 4–6 cm in diam.; internodes deep green, becoming green or yellow-green, to 25 cm, initially thinly white powdery, gently concentrated toward middle; nodes initially purple, conspicuously elevated, nodal ridge more prominent than sheath scar. Culm sheaths green or green-brown, with purple-brown spots, denser centrally, sparsely deciduously hairy or subglabrous; auricles and oral setae absent; ligule convex, ± decurrent on both flanks, ciliate; blade reflexed, green, with yellow margins, linear, flat or wavy. Leaves 3–5 per ultimate branch; sheath initially puberulent; auricles suborbicular; oral setae fimbriate, 5–10 mm; ligule strongly exserted; blade 9–17 × 1–1.2 cm, abaxially pubescent especially along midrib. Flowering branchlets spicate, 8–10 cm; scaly bracts 4 or 5, gradually larger; spathes 5–10, puberulent between veins; auricles small or absent; oral setae few, blade small. Pseudospikelets 1 per spathe. Spikelets lanceolate, 2.5–3(–3.5) cm; florets 1 or 2. Glumes (absent or) 1 or 2(or 3); rachilla pubescent; lemma 2.2–2.4 cm, pubescent; palea shorter than lemma, glabrous or sparsely puberulent, keels ciliate; lodicules linear or elliptic, ca. 5 mm. Anthers ca. 1 cm. Stigmas 3. New shoots Apr, fl. Apr–May. $2n = 48^*$.

- Cultivated. Fujian, Jiangsu, Zhejiang.

The shoots are delicious, and the culms are used for various purposes.

19. *Phyllostachys vivax* McClure, *J. Wash. Acad. Sci.* 35: 292. 1945.

乌哺鸡竹 wu bu ji zhu

Culms 5–15 m, 4–8 cm in diam., with weakly pendulous apex; internodes gray or yellow-green at maturity, conspicuously striate, 25–35 cm, initially thinly white powdery, glabrous; wall ca. 5 mm thick; nodes usually asymmetrical, nodal ridge usually more prominent than sheath scar on one side. Culm sheaths yellow-green tinged with purple, or pale brown-yellow, densely spotted and blotched with brown especially toward center; auricles and oral setae absent; ligule pale brown to brown, arcuate, strongly decurrent on both flanks, ciliate; blade reflexed, abaxially brown-purple, adaxially green, marginally paler or faintly orange-colored, linear-lanceolate, strongly crinkled. Leaves 2 or 3 per ultimate branch, auricles and oral setae developed; ligule to 3 mm; blade slightly pendulous, 9–18 × 1.2–2 cm. Flowering branchlets spicate; scaly bracts 4–6, gradually larger; spathes 5–7, glabrous or sparsely puberulent, auricles small; oral setae radiate; blade ovate-lanceolate to narrowly lanceolate, to 2.5 cm. Pseudospikelets 1 or 2 per spathe; spikelets 3.5–4 cm; florets 2 or 3, sparsely pubescent. Glume 1; lemma 2.7–3.2 cm, sparsely

pubescent; palea 2.2–2.6 cm, subglabrous; lodicules narrowly lanceolate, ca. 5 mm. Anthers ca. 1.2 cm. Ovary glabrous; stigmas 3. New shoots Apr, fl. Apr–May.

- Widely cultivated. Fujian, Henan, Jiangsu, Shandong, Yunnan, Zhejiang.

This species is usually planted for shoot production and for the beautiful culms and elegant, drooping foliage of some cultivars. The culms are used for weaving articles and as handles of farm tools.

20. *Phyllostachys violascens* (Carrière) Rivière & C. Rivière, *Bull. Soc. Acclim. France, sér. 3, 5: 770. 1878* [*"violascens"*].

早竹 zao zhu

Bambusa violascens Carrière, *Rev. Hort.* 1869: 292. 1869; *Phyllostachys praecox* C. D. Chu & C. S. Chao.

Culms 8–10 m, 4–6 cm in diam.; internodes 15–25 cm, initially white powdery, glabrous; nodes initially dark purple, nodal ridge and sheath scar moderately elevated. Culm sheaths brown-green or dark brown, with scattered, variably sized spots and purple stripes, white powdery, glabrous; auricles and oral setae absent; ligule brown-green or purple-brown, arcuate, broader than base of blade, both sides decurrent, ciliate; blade reflexed, green or purple-brown, narrowly linear-lanceolate, strongly crinkled or flat in upper culm. Leaves 2 or 3(–6) per ultimate branch; auricles and oral setae absent; blade 6–18 × 0.8–2.2 cm. Flowering branchlets spicate, 4–5(–7) cm; scaly bracts 4–6, gradually larger; spathes 5–7, glabrous or sparsely puberulent; auricles and oral setae absent; blade lanceolate to subulate, small. Pseudospikelets 2 per spathe, lateral one usually sterile, terminal one with 2 florets, upper floret usually aborted. Glumes 1, puberulent; lemma 2.5–2.8 cm, sparsely puberulent; palea 2–2.5 cm, distally sparsely puberulent; lodicules ca. 3 mm. Anthers 1.2–1.3 cm. Stigmas 2. New shoots Mar–Apr, fl. Apr–May.

- Cultivated. Anhui, Fujian, Hunan, Jiangsu, Jiangxi, Yunnan, Zhejiang.

This species is planted mainly for the production of early spring shoots.

21. *Phyllostachys edulis* (Carrière) J. Houzeau, *Bambou (Mons)* 39. 1906.

毛竹 mao zhu

Bambusa edulis Carrière, *Rev. Hort.* 380. 1866; *B. heterocyclus* Carrière; *Phyllostachys heterocyclus* (Carrière) Mitford; *P. heterocyclus* var. *pubescens* (Mazel ex J. Houzeau) Ohwi.; *P. pubescens* Mazel ex J. Houzeau.

Culms to 20 m or more, to 20 cm in diam.; internodes to 40 cm or more, basal ones gradually shortened and thickened toward base, initially white powdery, densely puberulent; wall ca. 1 cm thick, nodal ridge inconspicuous at nodes without branches, more prominent at branching nodes and in slender culms; sheath scar setose on margin. Culm sheaths yellow-brown or purple-brown with dark brown spots, densely brown hairy; auricles relatively small; oral setae strongly developed; ligule arcuate to acutely so, long ciliate; blade initially erect, becoming reflexed, green, narrowly triangular or lanceolate to

linear. Leaves 2–4 per ultimate branch; auricles inconspicuous; oral setae present; ligule prominent; blade small, thin, 4–11 × 0.5–1.2 cm, abaxially proximally pubescent along midrib, secondary veins 3–6-paired, tertiary veins ca. 9. Flowering branchlets spicate, 5–6 cm; scaly bracts 4–6, gradually larger, sometimes with 1–3 additional bracts resembling foliage leaves at base; spathes more than 10, laterally imbricate, lower ones sterile and deciduous giving naked stalklike axis, upper part puberulent, margins ciliate; auricles absent; oral setae deciduous; blade lanceolate to subulate, small. Pseudospikelets 1–3 per spathe. Spikelets with 1 floret. Glume 1, 1.5–2.8 cm, apex with a small subulate blade, pubescent; rachilla extension short, awnlike, internodes puberulent; lemma 2.2–2.4 cm, distally and marginally pubescent; palea slightly shorter than lemma, distally pubescent; lodicules lanceolate, ca. 5 × 1 mm. Anthers ca. 1.2 cm; filaments ca. 4 cm. Stigmas 3. Caryopsis narrowly elliptic, 5–10 × 1.5–1.8 cm, apex with persistent style base. New shoots Apr, fl. May–Aug. $2n = 48^*$.

• Mountain slopes; below 1600 m or more. Anhui, Fujian Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [introduced in Korea, Japan, Philippines, Vietnam, and North America].

The apparent earlier homonym "*Phyllostachys edulis*" (Rivière & C. Rivière, Bull. Soc. Natl. Acclim. France, sér. 3, 5: 623. 1878) was not validly published because it was merely cited as a synonym of *P. mitis* Poiret.

This is the most economically important bamboo in China, widely cultivated for its versatile culms and delicious shoots. Many cultivars have been named, including *Phyllostachys edulis* 'Heterocycla', the Tortoise-shell Bamboo, which has asymmetrically shortened and swollen culm internodes.

22. *Phyllostachys kwangsiensis* W. Y. Hsiung, Q. H. Dai & J. K. Liu, Acta Phytotax. Sin. 18: 34. 1980.

假毛竹 *jia mao zhu*

Culms 8–16 m, 4–10 cm in diam., straight; internodes initially green, becoming yellow-green or yellow, ca. 35 cm, white powdery above and below nodes, densely puberulent; wall ca. 4 mm thick; nodal ridge less prominent than sheath scar, absent at unbranched nodes. Culm sheaths brown-purple, with small sparse dark brown spots and few stripes, strigose; auricles inconspicuous; oral setae purple, long; ligule red-purple, truncate to arcuate, with dense cilia 1–2 mm; blade reflexed, green-purple, with yellow margins, narrowly lanceolate to linear, crinkled. Leaves 1–4 per ultimate branch; oral setae well developed; ligule strongly exerted, long ciliate; blade 10–15 × 0.8–1.5 cm, both surfaces sparsely puberulent. Flowering branchlets spicate, to 10 cm; scaly bracts 4–6, gradually larger; spathes 4–7, glabrous, usually with 1 or 2 oral setae; blade ovate-lanceolate to subulate. Pseudospikelets 2 or 3 per spathe. Spikelets with 2 or 3 florets. Glumes 1, sparsely puberulent; rachilla internodes pubescent; lemma 2–2.5 cm, setulose; palea shorter than lemma, centrally and distally setulose; lodicules oblong-rhomboid, ca. 4 mm, puberulent. Anthers 7–8 mm. Stigmas 2. New shoots Apr, fl. Apr–May.

• Broad-leaved forests. Guangxi; also cultivated in Guangdong, Guangxi, Hunan, Jiangsu, and Zhejiang.

The tough, compact culms have internodes long and even in length. They are used unsplit for furniture and building materials and split for weaving various articles.

23. *Phyllostachys circumpilis* C. Y. Yao & S. Y. Chen, Acta Phytotax. Sin. 18: 178. 1980.

毛壳花哺鸡竹 *mao ke hua bu ji zhu*

Culms 5–7 m, 3–4.5 cm in diam.; internodes initially deep green, becoming gray-green or pale orange with irregular blotches and stripes at maturity, 17–20 cm, not white powdery; wall ca. 5 mm thick; nodes initially purple, nodal ridge more prominent than or equaling sheath scar; sheath scar brown hairy on margin. Culm sheaths pale yellow-green, with purple veins and variably sized brown spots, not white powdery, densely retrorsely strigose, margins ciliate; auricles absent on lower culm sheaths, small and green on middle and upper culm sheaths; oral setae sometimes weakly developed on lower culm sheaths, long on middle and upper sheaths; ligule truncate to arcuate, short, with green to purple cilia to 5 mm; blade reflexed, green-purple with purple-cream margins, linear-lanceolate, crinkled. Leaves 2 or 3 per ultimate branch; sheath pubescent; auricles suborbicular; oral setae erect, long; ligule convex, white ciliate; petiole densely pubescent; blade 7.8–12 × 1.8–2 cm, abaxially densely pubescent, especially proximally. Inflorescence not known. New shoots Apr.

• Cultivated. Zhejiang.

This species is planted for its delicious shoots. The culms are commonly used for tool handles.

24. *Phyllostachys robustiramea* S. Y. Chen & C. Y. Yao, Acta Phytotax. Sin. 18: 188. 1980.

芽竹 *ya zhu*

Phyllostachys erecta T. H. Wen.

Culms to 10 m, ca. 6 cm in diam.; internodes initially purple-green, becoming gray-green, to 26 cm, white powdery, glabrous; wall 3.5–4 mm thick; nodal ridge elevated, more prominent than sheath scar. Culm sheaths green-purple, unmarked or occasionally with small, sparse spots, sparsely strigose; auricles not developed on lower sheaths, minute on upper ones; oral setae erect, green; ligule pale green, truncate or slightly arcuate, 2–3 mm, densely white-green ciliate; blade erect to reflexed, pale green to dark green or dark brown, with pale yellow margins, lanceolate to linear, crinkled in lower and middle culm sheaths. Leaves 2 or 3 per ultimate branch; auricles small; oral setae pale green-brown to pale yellow, 4–6 mm; blade 6.5–12 × 1.1–2 cm. Inflorescence not known. New shoots Apr.

• Cultivated. Anhui, Zhejiang.

The shoots are delicious, and the culms are used for tool handles and are split for weaving.

25. *Phyllostachys mannii* Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 28. 1896.

美竹 *mei zhu*

Phyllostachys assamica Gamble ex Brandis; *P. bawa* E. G. Camus; *P. decora* McClure; *P. helva* T. H. Wen.

Culms 8–10 m, 4–6 cm in diam.; internodes bright green, not white powdery, becoming yellow-green or green, 30–42 cm in mid-culm, initially sparsely retrorsely white hairy, becoming glabrous; wall 3–7 mm thick; nodal ridge weakly elevated, as prominent as or slightly more prominent than sheath scar. Culm sheaths green or green-purple to purple, with pale yellow or yellow-green stripes, usually with sparse, small, dark spots, distal margins purple, apex broadly truncate or slightly convex; auricles absent to 2, purple, falcate, small to large; oral setae purple; ligule purple, usually slightly arcuate or truncate, relatively short, broad, with longer purple setae, white ciliate; blade erect or sometimes spreading in upper sheaths, yellow-green or purple-green, triangular to linear-triangular, margins proximally purple, nearly flat to weakly crinkled. Leaves 1 or 2 per ultimate branch; auricles small or obsolete; oral setae erect; blade $7.5\text{--}16 \times 1.3\text{--}2.2$ cm. Inflorescence not known. New shoots early May. $2n = 48^*$.

Cultivated. Guizhou, Henan, Jiangsu, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [India, Myanmar].

The inclusion of this species in the IUCN Red List seems difficult to justify given the broad distribution.

The culms are split for weaving mats and various articles.

26. *Phyllostachys aureosulcata* McClure, J. Wash. Acad. Sci. 35: 282. 1945.

黄槽竹 huang cao zhu

Culms to 9 m, to 4 cm in diam., usually geniculate at basal 2 or 3 nodes of slender culms; internodes to 40 cm, initially white powdery, pubescent or scabridulous with tubercles left by fallen hairs; nodal ridge slightly more prominent than sheath scar. Culm sheaths purple-green, usually yellow striped, often with sparse, small, brown spots, thinly white powdery, glabrous; auricles purple-cream or purple-brown, conspicuously connected with base of blade; oral setae developed; ligule purple, arcuate or truncate, broad, ciliate; blade erect, horizontal or reflexed in lower culm, purple or tinged with same colors as those of sheath, triangular or triangular-lanceolate, flat or wavy. Leaves 2 or 3 per ultimate branch; auricles minute or absent; oral setae short; ligule exserted; blade ca. 12×1.4 cm. Flowering branchlets spicate, ca. 8.5 cm, scaly bracts ca. 4, gradually larger; spathes 4 or 5, glabrous or sparsely puberulous; auricles and oral setae absent, blade subulate, small. Pseudospikelets 5–7 per spathe, usually absent from lowest one. Spikelets with 1 or 2 florets. Glumes 1 or 2, keeled; rachilla puberulous; lemma 1.5–1.9 cm, distally pubescent; palea slightly shorter than lemma, distally pubescent; lodicules ca. 3.5 mm. Stigmas 3. New shoots Apr–May.

• Cultivated. Beijing, Henan, Jiangsu, Zhejiang.

This very hardy species is mainly planted as an ornamental.

27. *Phyllostachys bissetii* McClure, J. Arnold Arbor. 37: 180. 1956.

蓉城竹 rong cheng zhu

Culms 5–6 m, ca. 2 cm in diam.; internodes initially purple-green, becoming green or gray-green, to 25 cm, white pow-

dery, glabrous or basal internodes slightly scabrous with minute, erect hairs on distal parts; wall ca. 4 mm thick; nodal ridge slightly more prominent than sheath scar. Culm sheaths deep to pale green, weakly tinged with purple, unmarked or more usually with distal milky-white stripes and extremely minute brown spots, white powdery, those from basal nodes sometimes pubescent; auricles usually present, green or purple-green, small or large and falcate; oral setae sometimes absent; ligule purple, arcuate or truncate, 1–2 mm, ciliate; blade erect, deep green or tinged with purple, narrowly triangular to triangular-lanceolate, flat or wavy. Leaves usually 2 per ultimate branch; auricles and oral setae usually present initially, deciduous; ligule moderately exserted; blade $7\text{--}11 \times 1.2\text{--}1.6$ cm. Inflorescence not known. New shoots Apr.

• Cultivated. Sichuan, Zhejiang.

The culms of this very hardy species are used as tool handles and are split for weaving.

28. *Phyllostachys varioauriculata* S. C. Li & S. H. Wu, J. Anhui Agric. Coll. 1981(2): 49. 1981.

乌竹 wu zhu

Phyllostachys hispida S. C. Li, S. H. Wu & S. Y. Chen.

Culms 3–4 m, 1–3 cm in diam.; internodes initially purple-green, becoming green or gray-green in age, ca. 30 cm, thinly white powdery, pilosulose, scabrous; nodal ridge raised, more prominent than sheath scar; intranode ca. 3 mm. Culm sheaths dark green-purple, with milky-white or purplish stripes, at lower nodes distally scattered with small, brown spots, white powdery, distally densely strigose; auricles purple, falcate or small, often only one developed; oral setae flexuose; ligule dark purple, truncate or arcuate, erose, purple or white ciliate; blade purple-green, narrowly triangular to lanceolate, base slightly narrower than apex of sheath. Leaves usually 2 per ultimate branch; auricles minute; oral setae deciduous; blade adaxially dark green, $5\text{--}11 \times 0.9\text{--}1.5$ cm, abaxially glaucous. Inflorescence not known. New shoots Apr.

• Forests; below 300 m. Anhui, Jiangsu; cultivated in Zhejiang.

29. *Phyllostachys guizhouensis* C. S. Chao & J. Q. Zhang, Bamboo Res. 1982(1): 3. 1982.

贵州刚竹 gui zhou gang zhu

Culms to 10 m, ca. 8 cm in diam.; internodes initially green, becoming gray-green, 30–40 cm, white powdery below nodes at maturity, sparsely setulose and slightly scabrous; nodal ridge rather flat at lower nodes, prominent at upper ones. Culm sheaths purple-green, with purple streaks, unmarked, sparsely brown strigose; auricles purple, small in basal sheaths, falcate and ca. 1 cm in upper ones; oral setae sparse, purple; ligule purple, gently arcuate or truncate, ca. 2 mm, white ciliate; blade erect to horizontal, purple-brown with green streaks, narrowly triangular to linear. Leaves 2 per ultimate branch; sheath glabrous; oral setae deciduous, erect; blade $8\text{--}11 \times 1\text{--}1.6$ cm. Inflorescence not known. New shoots May.

• Cultivated on stream banks; 1400–1500 m. Guizhou.

The culms are used as building materials and in making bamboo articles.

30. *Phyllostachys nigra* (Loddiges ex Lindley) Munro, Trans. Linn. Soc. London 26: 38. 1868.

紫竹 *zi zhu*

Culms 4–8(–10) m, to 5 cm or more in diam.; internodes green or gradually developing purple-brown to black spots or turning uniform purple-brown or black, 25–30 cm, initially white powdery, densely puberulent; wall ca. 3 mm thick; nodal ridge slightly more prominent than or equaling sheath scar; sheath scar initially brown hairy on margin. Culm sheaths red-brown, sometimes tinged with green, unmarked or densely extremely minutely and imperceptibly dark brown spotted, spots aggregating into a distal dark brown patch, thinly white powdery, brown strigose; auricles and oral setae well developed, purple-black; ligule purple, arcuate to acutely so, long ciliate; blade erect or gradually deflexed, green or tinged with purple on both sides, triangular to triangular-lanceolate, navicular, \pm wavy. Leaves 2 or 3 per ultimate branch; auricles weak or absent; oral setae deciduous; ligule slightly exserted; blade thin, 7–10 \times ca. 1.2 cm. Flowering branchlets shortly spicate, 3.5–5 cm, scaly bracts 4–8. Spathes 4–6, glabrous or puberulous; auricles absent; oral setae few or absent; blade usually subulate or ovate-lanceolate, small. Pseudospikelets 1–3 per spathe. Spikelets lanceolate, 1.5–2 cm; florets 2 or 3. Glumes (absent or) 1–3, abaxially \pm distally pubescent; rachilla pubescent; lemma 1.2–1.5 cm, densely pubescent; palea shorter than lemma. Anthers ca. 8 mm. Stigmas 3. New shoots late Apr, fl. May.

• Open forests on slopes and in valleys; 1100–1200 m. S Hunan, widely cultivated elsewhere in China [introduced in many other countries].

This species has a very extensive synonymy, as is often the case with such popular garden plants. At the time of writing, W. D. Clayton lists a total of 79 synonyms in his grass synonymy database.

- 1a. Culms initially green, becoming purple-brown or brown-black in age 30a. var. *nigra*
 1b. Culms remaining consistently green 30b. var. *henonis*

30a. *Phyllostachys nigra* var. *nigra*

紫竹(原变种) *zi zhu* (yuan bian zhong)

Bambusa nigra Loddiges ex Lindley, Penny Cyclop. 3: 357. 1835; *Phyllostachys filifera* McClure; *P. nana* Rendle; *P. nigripes* Hayata; *P. puberula* (Miquel) Munro var. *nigra* (Loddiges ex Lindley) Makino.

Culm internodes initially green, gradually developing purple-brown or brown-black spots and patches, or finally becoming uniformly purple-brown or brown-black. $2n = 48^*$.

• Open forests of valleys; ca. 1100 m. S Hunan, widely cultivated in N and S China [introduced in many other countries as an ornamental for its culms].

This variety and the many named cultivars within it are widely planted throughout the world for their unique culms, which have varying degrees of coloration. *Phyllostachys nigra* 'Boryana' is striking with its persistently mottled, purple-brown culms.

30b. *Phyllostachys nigra* var. *henonis* (Mitford) Stapf ex Rendle, J. Linn. Soc., Bot. 36: 443. 1904.

毛金竹 *mao jin zhu*

Phyllostachys henonis Mitford, Garden (London) 47: 3. 1894; *Bambusa puberula* Miquel; *P. fauriei* Hackel; *P. henryi* Rendle; *P. montana* Rendle; *P. nevinii* Hance; *P. nevinii* var. *hupehensis* Rendle; *P. nigra* f. *henonis* (Mitford) Muroi; *P. nigra* var. *puberula* (Miquel) Fiori; *P. puberula* (Miquel) Munro; *P. stauntonii* Munro.

Culms remaining consistently green.

• Open forests on slopes; ca. 1200 m. S Hunan; cultivated in Anhui, Fujian, Gansu, Guangdong, Guangxi, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [introduced in India, Japan, Korea, Philippines, Vietnam; Europe, North America].

31. *Phyllostachys incarnata* T. H. Wen, Bull. Bot. Res., Harbin 2(1): 65. 1982.

红壳雷竹 *hong ke lei zhu*

Phyllostachys primotina T. H. Wen.

Culms to 8 m, ca. 4.5 cm in diam.; internodes ca. 20 cm, initially thickly white powdery especially below nodes, glabrous; wall ca. 5 mm thick; nodal ridge flat, as prominent as sheath scar, or raised and more prominent than sheath scar in slender culms. Culm sheaths brown-red or distally green on slender culms, sparsely small spotted, denser proximally, sometimes obscurely blotched, sparsely strigose on large culms, glabrous on small culms; auricles purple-brown, falcate; oral setae flexuose, purple; ligule arcuate or subtruncate, relatively tall, margin with long or shorter, dark purple or gray-white cilia; blade erect or reflexed, green to purple-brown, triangular to linear-triangular, wavy. Leaves 3 or 4 per ultimate branch; auricles purple-green, ovate or suborbicular; oral setae radiate; ligule faintly purple, ca. 2 mm or more, narrowed upward, margin with long, slender cilia, apex obtuse; blade to 13 \times 1.5 cm, abaxially puberulent or glabrous except at base, adaxially glabrous. Flowering branchlets spicate; spikelets with 2 or 3 florets. Glumes 1 or 2; lemma ca. 2.2 cm, densely pubescent especially toward apex; palea ca. 1.8 cm, pilose; lodicules ca. 4 mm. Anthers ca. 7 mm. Stigmas 3. New shoots Apr–May, fl. Apr–May. $2n = 48^*$.

• Cultivated. Fujian, Zhejiang.

This species is grown principally for its long season of prolific edible shoot production.

32. *Phyllostachys dulcis* McClure, J. Wash. Acad. Sci. 35: 285. 1945.

白哺鸡竹 *bai bu ji zhu*

Culms to 10 m, 4–6 cm in diam.; internodes to 25 cm, initially thinly white powdery, becoming glaucous, usually obscurely streaked and spotted with yellow or orange in age; wall ca. 5 mm thick; nodal ridge moderately elevated, more prominent than sheath scar. Culm sheaths yellow or milky-white, faintly tinged with green or distally pale purple-red, sometimes with purple veins, sparsely small spotted, margins dark brown, sparsely retrorsely strigose; auricles green or purple-green, ovate to falcate; oral setae well developed; ligule pale purple-brown, arcuate, ciliolate; blade reflexed, purple-green, with yellow-green margins, linear, crinkled. Leaves 2 or 3 per ultimate branch; auricles and oral setae deciduous; ligule obviously

exserted; blade 9–14 × 1.5–2.5 cm, abaxially puberulent especially proximally. New shoots late Apr. $2n = 48^*$.

● Cultivated. Fujian, Jiangsu, Zhejiang.

This species is commonly planted in Zhejiang for its very delicious shoots, which are reputed to be the best of all *Phyllostachys* species. The culms are used for handles of farm tools.

33. *Phyllostachys platyglossa* Z. P. Wang & Z. H. Yu, Acta Phytotax. Sin. 18: 184. 1980.

灰水竹 hui shui zhu

Culms ca. 8 m, ca. 2.5 cm in diam.; internodes dull purple-green, becoming green with lower internodes tinged purple, to 35 cm, initially white powdery; wall ca. 5 mm thick; nodal ridge slightly elevated, as prominent as sheath scar; intranode ca. 5 mm. Culm sheaths pale red-brown, sometimes tinged green, sparsely to densely speckled, dark brown and glabrous along margins, sparsely strigose; auricles and oral setae well developed, purple; ligule purple, truncate to arcuate, short but broad, margin fringed with purple-tinged cilia; blade reflexed, purple to green, crinkled. Leaves usually 2 per ultimate branch; auricles inconspicuous; oral setae few; ligule scarcely exserted, truncate; blade 7–14 × 1.2–2.2 cm. New shoots mid Apr.

● Cultivated. Jiangsu, Zhejiang.

This species is grown mainly for the delicious shoots. The culms are weak but find some uses.

34. *Phyllostachys rutila* T. H. Wen, Bull. Bot. Res., Harbin 2(1): 70. 1982.

衢县红壳竹 qu xian hong ke zhu

Culms to 11 m, 3–5 cm in diam.; internodes to 24 cm, initially thinly white powdery or not, glabrous; nodes initially red-purple, nodal ridge more prominent than or equaling sheath scar. Culm sheaths red-brown, with brown veins and sparse spots, spots sometimes aggregated into large patch toward apex on larger sheaths, sparsely strigose, margins glabrous; auricles dark brown, oblong to ovate; oral setae to 2 cm; ligule arcuate or truncate, convex at middle, ± decurrent on both sides on large sheaths, ciliate; blade reflexed, purple, narrowly lanceolate, crinkled or sometimes nearly flat. Leaves 1 or 2 per ultimate branch; auricles absent; oral setae absent or few; ligule conspicuously exserted, 1–1.5 mm; blade 10–13 × 1.5–2 cm. Inflorescence not known. New shoots May.

● Cultivated. Jiangsu, Zhejiang.

35. *Phyllostachys reticulata* (Ruprecht) K. Koch, Dendrologie 2(2): 356. 1873.

桂竹 gui zhu

Bambusa reticulata Ruprecht, Bambuseae, 58. 1839; *Phyllostachys bambusoides* Siebold & Zuccarini; *P. lithophila* Hayata; *P. megastachya* Steudel; *P. pinyanensis* T. H. Wen; *P. quilioi* Rivière & C. Rivière.

Culms to 20 m, to ca. 15 cm in diam.; internodes to 40 cm, not white powdery or initially faintly so below nodes, glabrous; wall ca. 5 mm thick; nodal ridge slightly more prominent than sheath scar. Culm sheaths yellow-brown, sometimes tinged with green or purple, with dense, variably sized, purple-brown

spots, glabrous or sparsely deciduously erectly brown hairy; auricles deciduous, sometimes absent, purple-brown, small to large and falcate; oral setae radiate; ligule brown or green, arcuate, ciliate; blade reflexed, green in center, purple or brown on both sides, pale yellow along margins, linear, flat or sometimes slightly wavy at apex. Leaves 2–4 per ultimate branch; auricles suborbicular; oral setae well developed, radiate; ligule obviously exserted, arcuate or sometimes truncate; blade 5.5–15 × 1.5–2.5 cm. Flowering branchlets spicate, 5–8(–10) cm, scaly bracts 3–5; spathes 6–8; auricles small or inconspicuous, oral setae usually developed, blade orbicular-ovate to linear-lanceolate, base rounded, apex subulate-acuminate. Pseudospikelets 1 or 2(or 3) per spathe, absent from basal 1–3 deciduous spathes. Spikelets lanceolate, 2.5–3 cm; florets 1 or 2(or 3). Glumes absent or 1; rachilla pubescent, extension glabrous, terminated with a rudimentary floret; lemma 2–2.5 cm, sparsely puberulent, apex aristulate-acuminate; palea slightly shorter than lemma, glabrous except for keels or pubescent at apex; lodicules rhomboid-oblong, 3.5–4 cm. Anthers 1.1–1.4 cm. Stigmas 3. New shoots late May. $2n = 48^*$.

Open or degraded forests from Yangtze to Wuling Mountains, widely planted; below 1800 m. Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan].

This species is planted on a commercial scale for the large culms, which are widely used for building materials, flooring, and furniture and are also split for weaving various bamboo articles. The shoots are bitter.

36. *Phyllostachys viridiglaucescens* (Carrière) Rivière & C. Rivière, Bull. Soc. Natl. Acclim. France, sér. 3, 5: 700. 1878 [“*viridi-glaucescens*”].

粉绿竹 fen lü zhu

Bambusa viridiglaucescens Carrière, Rev. Hort. 146. 1861 [“*viridi-glaucescens*”]; 146. 1861; *Phyllostachys altiligulata* G. G. Tang & Y. L. Xu; *P. nigrivagina* T. H. Wen.

Culms ca. 8 m, 4–5 cm in diam.; internodes 21–25 cm, initially white powdery; wall 4.5–7 mm thick; nodes initially purple; nodes with ridge slightly more prominent than sheath scar. Culm sheaths pale purple-brown, sometimes tinged with yellow-green, speckled brown, strigose, apex usually asymmetrical; auricles purple-brown to pale green, narrowly falcate; oral setae to 2 cm; ligule tall but narrow, ± asymmetrical with one side more decurrent than other, apex strongly convex, margin ciliate; blade reflexed, yellow-green with orange margins, linear, distally crinkled. Leaves 1–3 per ultimate branch; auricles inconspicuous; oral setae deciduous; ligule strongly exserted, margin lacinate; blade 9.5–13.5 × 1.2–1.8 cm. Flowering branchlets spicate, 2.5–8.5 cm, scaly bracts 3–5, gradually larger; spathes 4–7, pubescent; auricles small or absent; oral setae few or absent; blade orbicular-ovate to subulate. Pseudospikelets 1 or 2 per spathe, but absent in lower 3–5 spathes. Spikelets with 1 or 2 florets. Rachilla pubescent, with an awn-like extension. Glumes absent or 1; lemma ca. 2.5 cm, distally pubescent, apex acuminate, awnlike; palea slightly shorter than lemma, distally pubescent; lodicules narrowly elliptical, ca. 4 mm, margins ciliate. Anthers ca. 1.2 cm. Stigmas 3. New shoots late Apr, fl. May. $2n = 48^*$.

- Planted. Fujian, Jiangsu, Jiangxi, Zhejiang.

The shoots are delicious, and the culms are used for tool handles.

37. *Phyllostachys elegans* McClure, J. Arnold Arbor. 37: 183. 1956.

甜笋竹 *tian sun zhu*

Culms 4–8 m, ca. 3 cm in diam.; internodes 12–15 cm, finely ribbed, initially white powdery; wall ca. 4 mm thick; nodal ridge slightly elevated, nearly as prominent as sheath scar. Culm sheaths purple-green, densely speckled, deciduously strigose, margins glabrous; auricles green-purple, narrowly falcate; oral setae long, wavy; ligule pale purple-green, arcuate, narrow, ciliate; blade reflexed, purple-green, linear, crinkled. Leaves 2 or 3 per ultimate branch; auricles small or absent, purple; oral setae present; ligule exserted, purple; blade thin, 4.5–12 × 1–1.7 cm, abaxially pilosulose. New shoots mid Apr.

- Forests on slopes; ca. 600 m. Guangdong, Hainan, Hunan; cultivated in Fujian and Zhejiang.

The shoots are delicious, and the culms are used for tool handles. This species is sometimes considered a synonym of *Phyllostachys viridiglaucescens*.

38. *Phyllostachys prominens* W. Y. Xiong ex C. P. Wang et al., Acta Phytotax. Sin. 18: 182. 1980.

高节竹 *gao jie zhu*

Culms ca. 10 m, ca. 7 cm in diam.; internodes initially dark green, becoming yellow-green to gray, equal in length, to 22 cm, not or initially thinly white powdery; wall 5–6 mm thick; nodal ridge strongly raised, more prominent than sheath scar. Culm sheaths pale yellow-brown or tinged with red or green, with variably sized spots, denser near apex, sparsely strigose, margins brown; auricles purple or green, falcate; oral setae long; ligule purple-brown, densely ciliate, sometimes also with longer cilia; blade reflexed, purple-green or pale green with orange or light yellow margins, linear-lanceolate, strongly crinkled. Leaves 2–4 per ultimate branch; auricles deciduous, green; oral setae well developed, yellow-green; ligule exserted, yellow-green; blade 8.5–18 × 1.3–2.2 cm, abaxially proximally pubescent. Flowering branchlets spicate, 5–6 cm, subtended by 3–5 scaly bracts gradually larger; spathes 4–6, pubescent between veins; auricles small or absent; oral setae several; blade subulate or mucronate. Pseudospikelets 1 or 2 per spathe. Spikelets lanceolate, ca. 2.5 cm; florets usually 2. Glumes absent or 1; rachilla pubescent, terminated by a sterile floret;

lemma 1.6–2 cm, distally puberulent; palea subequal to lemma, puberulent on distal portion and keels; lodicules lanceolate or elliptic, 3.5–4 mm. Anthers ca. 1 cm. Stigmas 3. New shoots May, fl. May. $2n = 48*$.

- Cultivated. Jiangsu, Zhejiang.

The shoots are delicious, and the culms are used as handles.

39. *Phyllostachys yunhoensis* S. Y. Chen & C. Y. Yao, Acta Phytotax. Sin. 18: 183. 1980.

云和哺鸡竹 *yun he bu ji zhu*

Culms 5–6 m, 3–4 cm in diam.; internodes green, 13–14 cm, white powdery; nodal ridge slightly elevated, as prominent as sheath scar; intranode ca. 2 mm. Culm sheaths dark green to yellow-brown, with variably sized, scattered, brown spots, denser toward apex, thinly white powdery, glabrous; auricles deciduous, green, falcate to ovate; oral setae dense, purple, ca. 5 mm; ligule purple, arcuate, long purple ciliate; blade reflexed, purple-green or green, with orange-yellow margins, linear, crinkled. Leaves 2(or 3) per ultimate branch; auricles and oral setae developed; ligule ca. 1.5 mm; blade 9.5–14 × 1.6–1.9 cm. Inflorescence not known. New shoots mid Apr.

- Planted. Zhejiang.

The shoots are delicious, and the culms are used unsplit.

40. *Phyllostachys nigella* T. H. Wen, Bull. Bot. Res., Harbin 2(1): 66. 1982.

富阳乌哺鸡竹 *fu yang wu bu ji zhu*

Culms to 7 m, ca. 4 cm in diam.; internodes 18–22 cm, initially very thinly white powdery, glabrous, becoming yellow-green; nodal ridge equaling or slightly more prominent than sheath scar. Culm sheaths brown to gray-green, with dense, variably sized spots forming a cloud on distal portion, thinly white powdery, brown strigose; auricles and oral setae well developed, dark purple; ligule dark purple, arcuate or truncate, ca. 2 mm, apex long ciliate; blade reflexed, abaxially dark purple, adaxially dark green, margins yellow, crinkled. Leaves 2 or 3(–6) per ultimate branch; auricles falcate; oral setae radiate, ca. 1.2 cm; ligule strongly exserted, ciliate; blade 10–15 × 1.3–2 cm. Inflorescence not known. New shoots May.

- Cultivated. Zhejiang.

The shoots are delicious, and the culms are used for tool handles, weaving baskets, and constructing sheds.

2. *Phyllostachys* sect. *Heterocladae* Z. P. Wang & G. H. Ye, Acta Phytotax. Sin. 18: 185. 1980.

水竹组 *shui zhu zu*

Rhizome internodes with a ring of air canals in transverse section. Culm nodes with intranode ca. 5 mm. Lower and mid-culm sheaths usually without spots; blade erect, appressed, imbricate at shoot apex, sometimes deflexed, rarely lower ones reflexed, triangular to triangular-lanceolate, rarely linear, base usually as wide as ligule or nearly so. Flowering branchlets capitate. Spikelets 1.5–2 cm. Lemma 0.7–1.5 cm. Anthers 4–8 mm. Style 4–5 mm.

- Eleven species: China.

41. *Phyllostachys rubromarginata* McClure, Lingnan Univ. Sci. Bull. 9: 44. 1940.

红边竹 *hong bian zhu*

Phyllostachys aristata W. T. Lin; *P. aurita* J. L. Lu; *Sinobambusa fimbriata* T. H. Wen.

Culms ca. 3.5 m, ca. 2.5 cm in diam.; internodes dark

green, 22–31 cm, initially thinly white powdery, glabrous; wall ca. 2 mm; nodal ridge raised, more prominent than sheath scar; sheath scar flared, margin with a dense ring of tardily deciduous, orange-red hairs. Culm sheaths light green, about as long as or slightly longer than internodes, middle to distal margins densely dark purple ciliate, base edged with orange-red hairs; auricles falcate, \pm connected with sheath blade; ligule brown, truncate or slightly arcuate, long ciliate; blade erect, purple-green, broadly to narrowly triangular, flat or weakly sinuous, sometimes slightly navicular, base about as wide as ligule. Leaves 2 or 3 per ultimate branch; auricles small or inconspicuous; oral setae purple, blade linear-lanceolate, abaxially pilose especially proximally. Flowering branchlets capitate, 1–1.5 cm, with 4 or 5 scaly bracts. Spathes 2–4, 0.6–1 cm, pubescent; auricles and oral setae absent; blade minute, subulate or inconspicuous, rarely narrowly ovate-lanceolate. Pseudospikelets (1 or)2(or 3) per spathe. Spikelets ca. 1.1 cm; florets 1–3, terminal one sterile and reduced. Glumes (absent or)1–3, distally hairy; rachilla pubescent; lemma ca. 1 cm, abaxially centrally and distally densely villous; lodicules oblanceolate or elliptic, ca. 2.5 mm. Anthers ca. 4 mm. Stigmas 3. New shoots mid to late Apr, fl. Sep.

• Scrub, banks of gullies. Guangxi, Guizhou; cultivated in Henan.

42. *Phyllostachys veitchiana* Rendle, J. Linn. Soc., Bot. 36: 443–444. 1904.

硬头青竹 ying tou qing zhu

Phyllostachys rigida X. Jiang & Q. Li.

Culms 3–5 m, 1–2.5 cm in diam.; internodes dark green, commonly 20–22 cm, initially thickly white powdery, sparsely puberulent; wall 3–5 mm thick; nodes elevated, nodal ridge more prominent than sheath scar; intranode ca. 4 mm. Culm sheaths green, with purple or yellow stripes, white powdery, basal ones white or brown pubescent and strigose, others subglabrous or glabrous, margins irregularly ciliate; auricles ascendant, purple, triangular to broadly falcate, connected with base of blade; oral setae flexuose; ligule purple, arcuate, 2–3 mm, erose, densely fringed with stout, purple cilia 2–3 mm; blade erect or deflexed, purple to green-purple, triangular to narrowly triangular, slightly wavy. Leaves 1 or 2 per ultimate branch; auricles absent; oral setae several, erect; ligule with thick cilia; blade 8–14 \times 1.2–1.8 cm. Flowering branchlets capitate or subcapitate; scaly bracts 5 or 6, thinly leathery, margins densely ciliate; basal spathes broadly ovate, distal spathes narrowed; auricles and oral setae absent; ligule conspicuous; blade subulate or triangular. Pseudospikelets 1 or 2 per spathe. Spikelets usually with 4 or 5 florets. Glumes 1 or 2, variably sized, usually narrower than lemma, \pm membranous, pubescent, apex acuminate with an awnlike point; rachilla disarticulating below each fertile floret; lemma narrowly lanceolate, pubescent except at base, inconspicuously many veined, dorsally keeled, apex acuminate, awnlike. Lemmas 1.2–1.4 cm, basal one sterile and subtending a very small palea and depauperate flower; palea shorter than lemma, pubescent, apex 2-cleft; lodicules oblanceolate, apex ciliate. Anthers ca. 6 mm. Ovary 3-ribbed. New shoots May, fl. Apr–May.

• Mountain slopes; below 1300 m. Hubei, Sichuan, introduced in Zhejiang.

This species is similar to *Phyllostachys guizhouensis* at first sight, but differs in having rhizomes with a ring of air canals in transverse section, mid-culm sheaths without strigose hairs, and 1 or 2 leaves per ultimate branch.

The straight, solid culms are used in making furniture or are split for weaving bamboo articles.

43. *Phyllostachys lofushanensis* Z. P. Wang, C. H. Hu & G. H. Ye, J. Nanjing Univ., Nat. Sci. Ed. 1981(2): 258. 1981.

大节刚竹 da jie gang zhu

Culms to 3 m or more, ca. 2 cm in diam.; internodes initially white powdery, becoming gray-yellow or gray-green with thicker powder below nodes at maturity; nodal ridge strongly elevated, much more prominent than sheath scar; sheath scar flared, margin densely shortly brown setose for first 2–3 years. Culm sheaths unmarked, hairy at base, otherwise glabrous, distally slightly contracted with a nearly truncate apex; auricles ascendant, narrowly falcate; oral setae present; ligule truncate or slightly concave, relatively short, broad, ciliate; blade erect, sword-shaped, flat or wavy. Leaves (1 or)2 per ultimate branch; sheath glabrous; auricles not developed; oral setae few, erect; ligule truncate, short, subglabrous; blade 7–10 \times 1–1.6 cm, both surfaces glabrous. Inflorescence not known. New shoots May.

• Montane forests; ca. 800 m. Guangdong.

44. *Phyllostachys nidularia* Munro, Gard. Chron., n.s., 6: 773. 1876.

篾竹 hou zhu

Phyllostachys cantoniensis W. T. Lin; *P. subulata* W. T. Lin & Z. M. Wu.

Culms to 10 m, to 4 cm in diam., straight; internodes to 30 cm, white powdery, glabrous or initially setulose below nodes; wall ca. 3 mm or more thick; nodal ridge conspicuously elevated, equaling or more prominent than sheath scar; sheath scar flared, glabrous or initially with margin brown setose. Culm sheaths green, unmarked, distally milky-white striped, otherwise usually purple striped, white powdery, densely brown strigose toward base or glabrous, margins purple-red or brown ciliate; auricles at culm apex green-purple, very broad, contiguous with and extending from swollen cupped base of blade; auricles absent on mid- and lower culm; oral setae absent or few, radiate, short; ligule purple-brown, slightly arcuate, broad, margin densely white ciliate; blade erect, broadly triangular to triangular, cupped. Leaves usually 1 per ultimate branch, pendulous; auricles and oral setae weakly developed or absent; ligule short, weakly or not exerted; blade 4–13 \times 1–2 cm. Flowering branchlets densely capitate, 1.5–2 cm, scaly bracts 2–4; spathes 1–6, basal ones ovate, distal ones narrower and papery, to 1.6 cm, both sides and apex \pm hairy, margins ciliate, blade inconspicuous to narrowly ovate. Pseudospikelets 2–8 per spathe; bracts narrow, variable in size or sometimes absent, membranous, keeled, 5–7-veined, pubescent on keels and near apex. Spikelets with 2–5 florets, distal 1 or 2 sterile. Glumes 1(–3), resembling uppermost bract, to 1.5 cm; rachilla internodes elevated, compressed and sparsely pubescent on side facing floret, apex truncate; lemma leafy, densely hirsute, many

veined, apex acuminate with an awnlike tip, first lemma 1–1.2(–1.6) cm; palea shorter than lemma, 0.6–1.1 cm, densely hirsute. Anthers 4.5–5.5 mm. Stigmas (1–)3. New shoots Apr–May, fl. Apr–May. $2n = 48^*$.

• Forests, scrub, cultivated; below 1300 m. Guangdong, Guangxi, Henan, Hubei, Jiangxi, Shaanxi, Yunnan, Zhejiang [introduced in Europe and North America].

The shoots are edible, but the culms are brittle and not suitable for weaving. The straight culms, interesting culm sheath auricles, and pendulous foliage make this species suitable as an ornamental.

45. *Phyllostachys rivalis* H. R. Zhao & A. T. Liu, Acta Phytotax. Sin. 18: 189. 1980.

河竹 he zhu

Culms ca. 4 m or more, 1.5–2 cm in diam.; internodes initially purple-brown or yellow-green with inconspicuous purple stripes, becoming yellow-brown, tinged with purple, to 24 cm, white powdery, retrorsely setose especially below nodes, becoming glabrous or scabrous; wall 2.5–3 mm thick; nodal ridge elevated, more prominent than sheath scar; sheath scar initially hairy. Culm sheaths green to purple-brown, or distally milky-white with green veins and inconspicuous purple stripes, papery, glabrous or sparsely deciduous-strigose, sometimes densely pubescent at base, upper margins brown ciliate; auricles absent; oral setae absent or weakly developed; ligule green, truncate or slightly concave, 0.8–1 mm, with pale brown cilia to 2 mm; blade erect, green with purple margins, narrowly triangular to linear-triangular, flat. Leaves (2 or)3–5(–7) per ultimate branch; sheath initially purple, apically pubescent; auricles absent; oral setae erect; ligule purple-red, truncate, ca. 0.5 mm; pseudopetiole ca. 1 mm; blade 4.6–8 × 0.6–1.1 cm, slightly thickened, abaxially initially pubescent. Inflorescence not known. New shoots early May.

• Valleys, stream banks. Fujian, Guangdong, Zhejiang.

This species is sometimes planted along river banks to prevent erosion. The culms are used for fencing.

46. *Phyllostachys carnea* G. H. Ye & Z. P. Wang, Acta Phytotax. Sin. 27: 228. 1989.

湖南刚竹 hu nan gang zhu

Culms ca. 2.5 m, ca. 1.5 cm in diam.; internodes ca. 20 cm, initially thickly white powdery especially below nodes, scabrid; wall ca. 1.5 mm thick; nodes strongly elevated, nodal ridge more prominent than sheath scar. Culm sheaths green and pink, unmarked, white powdery, glabrous; auricles and oral setae absent; ligule pale pink, arcuate, sometimes convex at middle, 1–1.5 mm, margin ciliolate; blade erect, pink, linear-lanceolate, small. Leaves 2 or 3 per ultimate branch; auricles usually absent; oral setae deciduous; ligule arcuate to truncate, ciliolate; blade 6–9 × 0.6–1.2 cm, glabrous. New shoots May.

• Forests on mountain slopes; ca. 800 m. Hunan.

47. *Phyllostachys heteroclada* Oliver, Hooker's Icon. Pl. 23: t. 2288. 1894.

水竹 shui zhu

Phyllostachys congesta Rendle; *P. purpurata* McClure; *P. purpureomaculata* W. T. Lin & Z. J. Feng.

Culms ca. 6 m or more, to 3 cm in diam.; internodes to 30 cm, initially white powdery, sparsely puberulent; wall 3–5 mm thick; nodal ridge flat and as prominent as sheath scar in large culms, or strongly elevated and more prominent than sheath scar in slender culms; intranode ca. 5 mm. Branches deflexed or subhorizontal. Culm sheaths deep green, tinged with purple, white powdery, glabrous or sparsely strigose, margins ciliate; auricles purple, ovate to elliptic, sometimes shortly falcate, small, absent on small shoots; oral setae well developed or few, erect, and fine on small shoots; ligule slightly concave or weakly arcuate, short, white ciliolate; blade erect, green, usually tinged with purple, rarely entirely purple triangular to narrowly triangular, cupped, flat or slightly wavy. Leaves (1 or)2(or 3) per ultimate branch; sheath glabrous, margins ciliate; auricles absent; oral setae deciduous, erect; ligule short; blade 5.5–12.5 × 1–1.7 cm, abaxially proximally pilose. Flowering branchlets densely capitate, (1.6–)1.8–2(–2.2) cm, usually lateral on mature leafy branches; scaly bracts 4–6, gradually larger, or terminating young leafy branches then subtended by 1 or 2 spathes with an ovate or narrow blade; spathes 2–6, broadly ovate or broader, 0.9–1.2 cm, papery or thinly leathery, gradually narrowed and thinned in distal ones, puberulent at apex, margins ciliate, otherwise glabrous or subglabrous, blade absent or very small, mucronate. Pseudospikelets (1–)4–7 per spathe, subtended by bracts, bracts variable in form and size, to 1.2 cm, membranous, keeled, tenuously 5–7-veined, apex pubescent, acuminate. Spikelets to 1.5 cm; florets 3–7, distal ones sterile. Glumes absent to 3, resembling bracts in size, form, and texture, sometimes uppermost one similar to lemma; rachilla internodes 1.5–2 mm, clavate, glabrous, apex subtruncate; lemma lanceolate, 0.8–1.2 cm, distal 1/2–2/3 pubescent, 9–13-veined, distally keeled, apex subulate-acuminate; palea shorter than lemma, puberulent except for base; lodicules rhomboid-ovate, ca. 3 mm, tenuously 7-veined, margins ciliate. Anthers 5–6 mm. Style ca. 5 mm; stigmas (2 or)3. Caryopsis narrowly ovoid, ca. 3.5 × 1.5 mm. New shoots Apr–May, fl. Apr–Aug.

• Forests or scrub on slopes, river banks, valleys. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

Phyllostachys cerata McClure (Lingnan Univ. Sci. Bull. 9: 41. 1940) and *P. dubia* Keng (Sinensia 11: 407. 1940, “*dubius*”) may be further synonyms of this species.

Phyllostachys heteroclada is widely cultivated for its high-quality culms, which are split for weaving articles such as the famous bamboo mats produced in Yiyang, Hunan.

48. *Phyllostachys stimulosa* H. R. Zhao & A. T. Liu, Acta Phytotax. Sin. 18: 186. 1980.

漫竹 man zhu

Culms to 8 m, ca. 3.5 cm in diam.; internodes to 32 cm, initially white powdery, glabrous or slightly scabrid when old; wall ca. 4 mm thick; nodes elevated, nodal ridge equal to or more prominent than sheath scar. Culm sheaths green, purple striped, margins yellow-brown, deciduously strigose; auricles extending from base of blade, purple, broadly ovate, small; oral setae short; ligule purple, arcuate, ca. 1.5 mm, ciliolate; blade erect, purple-green, triangular to narrowly triangular. Leaves 1–3 per ultimate branch; oral setae well developed; blade deep

green, $6-11.5 \times 1-2$ cm, thick, abaxially white powdery. Inflorescence not known. New shoots early May.

- Anhui, Zhejiang.

49. *Phyllostachys atrovaginata* C. S. Chao & H. Y. Zhou, Acta Phytotax. Sin. 18: 191. 1980.

乌芽竹 wu ya zhu

Culms 7–8 m, 3–5 cm in diam.; internodes green, 29–31 cm, initially inconspicuously white powdery, glabrous; wall 3–5 mm thick; nodes with both ridge and sheath scar moderately prominent. Culm sheaths dark green, with purple-black stripes and pale yellow-brown margins, base sometimes purple-red, or deep green with purple veins in shade, unmarked, glabrous or rarely sparsely strigose; auricles absent; oral setae absent or occasionally sparse; ligule green-brown, truncate, short, broad, completely covered by base of blade, subglabrous or minutely ciliolate; blade erect, dark green, with purple-red margins, triangular to triangular-lanceolate, wavy to weakly crinkled. Leaves 2 or 3 per ultimate branch; auricles and oral setae inconspicuous; ligule short, scarcely exerted, densely puberulent, sometimes hirsute at base; blade $5.5-13 \times 0.9-1.6$ cm. Inflorescence not known. New shoots late Apr to early May.

- Cultivated. Jiangsu, Zhejiang.

The shoots are edible, and the culms are used split or unsplit for weaving bamboo articles.

50. *Phyllostachys rubicunda* T. H. Wen, Acta Phytotax. Sin. 16(4): 98. 1978.

红后竹 hong hou zhu

Phyllostachys concava Z. H. Yu & Z. P. Wang; *P. retusa* T. H. Wen.

Culms ca. 6 m, 3–4.5 cm in diam.; internodes initially deep purple-green, 26–30 cm, often thinly white powdery es-

pecially below nodes, glabrous; nodal ridge equal to or slightly more prominent than sheath scar. Culm sheaths pale green, with purple stripes, glabrous or sparsely strigose, margins with alternating white and red-tinged cilia; auricles absent or small on distal sheaths; oral setae absent or several, short on distal sheaths; ligule strongly concave in upper and mid-culm sheaths, green, 1–1.5 mm, margin with intermixed, irregular, white and faintly red cilia; blade pale green, apex pale purple, triangular to lanceolate. Leaves 3 or 4 per ultimate branch; auricles absent; oral setae developed; ligule not exerted; blade $6-12.5 \times 1-2.2$ cm. Inflorescence not known. New shoots mid to late May.

- Valley woods, cultivated. Fujian, Jiangsu, Zhejiang.

51. *Phyllostachys parvifolia* C. D. Chu & H. Y. Chou, Acta Phytotax. Sin. 18: 190. 1980.

安吉金竹 an ji jin zhu

Culms ca. 8 m, ca. 5 cm in diam.; internodes green, with purple streaks, becoming gray-green in age, to 24 cm, initially thickly white powdery; wall ca. 4 mm thick; nodal ridge slightly elevated, equaling or more prominent than sheath scar. Culm sheaths pale brown or pale purple-red, with pale yellow-brown or yellow-white streaks on upper portion, unmarked, thinly white powdery, glabrous, margins white ciliate; auricles absent or small, extending from base of blade in distal sheaths; oral setae absent or few; ligule dark green to purple-red, arcuate or acutely so, 2–2.5 mm, ciliolate; blade erect, triangular to triangular-lanceolate, wavy. Leaves (1 or) 2 per ultimate branch; auricles inconspicuous; oral setae several; ligule exerted; blade $3.5-6.2 \times 0.7-1.2$ cm. Inflorescence not known. New shoots early May.

- Anhui; cultivated in Zhejiang.

This species is grown mainly for shoots. The culms have general uses.

2. Tribe PHAREAE

囊稃竹族 nang fu zhu zu

Liu Liang (刘亮); Sylvia M. Phillips

Perennials. Leaf blades broad, narrowly oblong to oblanceolate, veins slanting obliquely from midrib with transverse connecting veinlets, narrowed into a false petiole, this twisted to bring the abaxial surface uppermost; ligule scarious, margin usually ciliolate. Inflorescence monoecious, an open panicle, ultimate branchlets bearing 1 or 2 female spikelets and a terminal male spikelet. Spikelets unisexual, floret 1, rachilla extension absent. Female spikelet sessile or shortly pedicelled, terete to inflated, disarticulating below floret; glumes scarious, persistent or not, shorter than floret; lemma papery becoming leathery, involute or utriculate, 5- or more-veined, entire, covered in hooked adhesive hairs; palea long, narrow; lodicules absent; stigmas 3. Male spikelet pedicelled, smaller than the female, lanceolate, soon deciduous; lodicules minute or absent; stamens 6. Caryopsis oblong to linear, embryo very small, hilum as long as the caryopsis. Leaf anatomy: non-Kranz; microhairs absent; fusoid cells present. $x = 12$.

Two or three genera and 13 species: tropics of both hemispheres; one species in China.

This is a small tribe of grasses found in the understory of tropical forests. The broad, twisted leaf blades with slanting veins and transverse veinlets provide an easy means of identification.

35. LEPTASPIS R. Brown, Prodr. 211. 1810.

囊稃竹属 nang fu zhu shu

Culms erect or decumbent, solid. Leaf blades strikingly distichous. Panicle branches single or whorled, persistent on axis,

branchlets often subtended by a linear bract. Female spikelet: lemma inflated, shell- or urn-shaped, closed except for a tiny pore through which the 3 stigmas and palea apex protrude, prominently 5–9-ribbed, greatly enlarging after fertilization, coloring white, pink or purple; palea free or adnate to margins of lemma. Male spikelet: lemma conduplicate with free margins, 5–9-veined.

Four to six species: Old World tropics; one species in China.

1. *Leptaspis banksii* R. Brown, Prodr. 211. 1810.

囊稈竹 nang fu zhu

Leptaspis cumingii Steudel; *L. formosana* C. Hsu; *L. sessilis* Ohwi; *L. umbrosa* Balansa.

Perennial, caespitose from short rhizome. Culms erect, 40–60 cm tall. Leaf sheaths clustered at base, longer than internodes, strongly ribbed, laterally compressed, pubescent along keel upward; leaf blades lanceolate or linear-lanceolate, 15–30 × 1.5–3.5 cm, abaxial (upper) surface glabrous, adaxial (lower) surface pubescent, base attenuate into a 1–3 cm pseudopetiole,

apex acute; ligule 0.3–0.5 mm. Panicle very narrow, 15–35 cm, densely hairy with short hooked hairs; branches inserted singly, erect or ascending, lowest 2–7 cm. Female spikelet: glumes subequal, broadly ovate, 1.5–2.3 mm, cuspidate; mature lemma globose, 3.5–5 mm, pink or purplish, asymmetrical, densely pubescent, hairs weakly hooked, 7-ribbed, ribs white or green; palea ca. 1/2 lemma length, base flat, upper part sulcate, apex 2-lobed. Male spikelet: lemma ovate, 2–3 mm, pubescent along veins; anthers 1.8–2.5 mm.

Forests, in shade. S Taiwan [Indonesia, New Guinea, Philippines; NE Australia, New Caledonia, Solomon Islands].

3. Tribe EHRHARTEAE

皱稈草族 zhou fu cao zu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Leaf blades linear; ligule usually membranous. Inflorescence a panicle, often contracted or reduced. Spikelets with 3 florets, 2 lower florets reduced to sterile lemmas, upper floret fertile, laterally compressed, disarticulating above the glumes but not between the florets; glumes shorter than or exceeding florets, membranous, persistent; sterile lemmas subequal, leathery, keeled, often transversely wrinkled, the upper hooked at the base, enclosing fertile floret, sometimes awned; fertile lemma cartilaginous to leathery, keeled, 5–7-veined, entire, awnless; palea hyaline, 2-veined and 2-keeled, or occasionally only 1-veined or 3–5-veined; lodicules 2, elliptic or 2-lobed; stamens 1–4 or 6; stigmas 2. Caryopsis with small embryo and linear hilum. Leaf anatomy: non-Kranz; microhairs slender or apical cell short and inflated; fusoid cells absent. $x = 12$.

One genus and 38 species: warm-temperate regions of the Old World, mainly in Australia and South Africa; one species (introduced) in China.

36. EHRHARTA Thunberg, Kongl. Vetensk. Acad. Handl. 40: 217. 1779, nom. cons.

皱稈草属 zhou fu cao shu

Trochera Richard, nom. rej.

Description and distribution as for tribe.

1. *Ehrharta erecta* Lamarck, Encycl. 2: 347. 1786.

皱稈草 zhou fu cao

Perennials. Culms tufted, slender, straggling, 30–100 cm tall. Leaf sheaths glabrous or shortly hairy; leaf blades flat, rather thin, 6–16 × 0.2–1 cm, margins scabrous-pubescent, apex acute; ligule 3.8–5 mm. Panicle narrow, 5–20 cm; branches ascending or suberect. Spikelets oblong, 3–7 mm, pale green; glumes unequal, 5-veined, subacute; lower glume ovate, shorter than upper; upper glume ovate-oblong, about 1/2 spikelet length; lemmas papery, 7-veined, subacute, awnless; sterile

lemmas narrowly elliptic-oblong, finely pubescent to almost glabrous; lower sterile lemma smooth or rarely transversely wrinkled near apex; upper sterile lemma transversely wrinkled, 2 frill-like appendages on basal hook, sometimes bearded at base; fertile lemma ovate, smooth, glabrous, obtuse; palea 2-veined. Stamens 6, anthers 0.7–1.2 mm.

Shady places along roadsides, introduced. Yunnan [native to Africa].

This native of Africa is adventive in both hemispheres and has recently become naturalized in Yunnan.

4. Tribe ORYZEAE

稻族 dao zu

Liu Liang (刘亮); Sylvia M. Phillips

Annuals or perennials. Leaf blades usually linear, rarely elliptic; ligule membranous. Inflorescence a panicle, occasionally with simple racemelike primary branches; spikelets all alike or the sexes separate. Spikelets with 1 floret, mostly laterally compressed, ra-

branchlets often subtended by a linear bract. Female spikelet: lemma inflated, shell- or urn-shaped, closed except for a tiny pore through which the 3 stigmas and palea apex protrude, prominently 5–9-ribbed, greatly enlarging after fertilization, coloring white, pink or purple; palea free or adnate to margins of lemma. Male spikelet: lemma conduplicate with free margins, 5–9-veined.

Four to six species: Old World tropics; one species in China.

1. *Leptaspis banksii* R. Brown, Prodr. 211. 1810.

囊稈竹 nang fu zhu

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Perennial, caespitose from short rhizome. Culms erect, 40–60 cm tall. Leaf sheaths clustered at base, longer than internodes, strongly ribbed, laterally compressed, pubescent along keel upward; leaf blades lanceolate or linear-lanceolate, 15–30 × 1.5–3.5 cm, abaxial (upper) surface glabrous, adaxial (lower) surface pubescent, base attenuate into a 1–3 cm pseudopetiole,

apex acute; ligule 0.3–0.5 mm. Panicle very narrow, 15–35 cm, densely hairy with short hooked hairs; branches inserted singly, erect or ascending, lowest 2–7 cm. Female spikelet: glumes subequal, broadly ovate, 1.5–2.3 mm, cuspidate; mature lemma globose, 3.5–5 mm, pink or purplish, asymmetrical, densely pubescent, hairs weakly hooked, 7-ribbed, ribs white or green; palea ca. 1/2 lemma length, base flat, upper part sulcate, apex 2-lobed. Male spikelet: lemma ovate, 2–3 mm, pubescent along veins; anthers 1.8–2.5 mm.

Forests, in shade. S Taiwan [Indonesia, New Guinea, Philippines; NE Australia, New Caledonia, Solomon Islands].

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lemmas narrowly elliptic-oblong, finely pubescent to almost glabrous; lower sterile lemma smooth or rarely transversely wrinkled near apex; upper sterile lemma transversely wrinkled, 2 frill-like appendages on basal hook, sometimes bearded at base; fertile lemma ovate, smooth, glabrous, obtuse; palea 2-veined. Stamens 6, anthers 0.7–1.2 mm.

Shady places along roadsides, introduced. Yunnan [native to Africa].

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Forests, in shade. S Taiwan [Indonesia, New Guinea, Philippines; NE Australia, New Caledonia, Solomon Islands].

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lemmas narrowly elliptic-oblong, finely pubescent to almost glabrous; lower sterile lemma smooth or rarely transversely wrinkled near apex; upper sterile lemma transversely wrinkled, 2 frill-like appendages on basal hook, sometimes bearded at base; fertile lemma ovate, smooth, glabrous, obtuse; palea 2-veined. Stamens 6, anthers 0.7–1.2 mm.

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chilla extension absent, falling entire; glumes absent or reduced to small scales at base of floret; lemma membranous to leathery, keeled, 5–10-veined, entire, with or without a straight awn from the apex; palea resembling lemma but narrower, 3–7-veined with central keel. Lodicules 2. Stamens usually 6 (1 in *Chikusichloa*). Caryopsis linear to ovoid. Leaf anatomy: non-Kranz; microhairs slender (apical cell short and inflated in *Hygroryza*); fusoid cells present or absent. $x = 12$ (in *Zizania* 15, 17).

Thirteen genera and ca. 70 species: tropical and warm-temperate regions of the world; five genera and thirteen species (two introduced) in China.

This is a widespread tribe of aquatic and marshland grasses. It can be recognized by its multi-veined keeled palea, and usually by the presence of 6 stamens.

- 1a. Spikelet with 2 narrow scales below the floret 37. *Oryza*
- 1b. Spikelet without scales below the floret (if rarely present, anther 1).
- 2a. Spikelets unisexual 41. *Zizania*
- 2b. Spikelets bisexual.
- 3a. Floret sessile; leaf blades linear 38. *Leersia*
- 3b. Floret stipitate.
- 4a. Leaf blades linear, 20–50 cm; stamen 1 39. *Chikusichloa*
- 4b. Leaf blades elliptic, 3–7 cm; stamens 6 40. *Hygroryza*

37. *ORYZA* Linnaeus, Sp. Pl. 1: 333. 1753.

稻属 dao shu

Annual or perennial, tufted or shortly rhizomatous. Culms erect or ascending. Leaf blades mainly cauline, broadly linear, flat; ligule membranous, sometimes long. Inflorescence a panicle, usually many-spiculate, often nodding, lower branches usually whorled, unbranched or sparsely branched, pedicels short. Spikelets with 3 florets, 2 lower florets reduced, sterile, upper floret fertile, strongly laterally compressed, disarticulating below sterile lemmas, persistent in cultivated species; glumes vestigial, remaining after disarticulation as a shallow lobed frill at pedicel apex; sterile florets reduced to 2 narrow lemmas at base of fertile floret; fertile lemma boat-shaped, keeled, leathery, closely papillose, sometimes spinulose, infrequently smooth, prominently 5-veined, apex awnless to long awned; awn straight; palea resembling lemma but narrower, 3-veined, apex beaked. Stamens 6. Caryopsis variable in shape, embryo 1/4 length of caryopsis, hilum linear, as long as caryopsis. $x = 12$.

Twenty-four species: warm parts of Africa, Asia, Australia, and Central and South America; five species (two introduced) in China.

Oryza includes rice, *O. sativa*, the staple cereal crop throughout most of S China and tropical Asia.

The narrow scales at the base of the fertile floret are sometimes regarded as glumes rather than sterile lemmas, the shallow frill at the pedicel apex being then regarded simply as pedicel tissue. However, aberrant forms of *Oryza sativa* have been reported with one or more of the basal scales well developed and even enclosing a grain, which appears to support their derivation from lemmas.

Oryza latifolia Desvaux is a species from Central and South America which has been reported in Beijing.

- 1a. Spikelets 5–6 mm, disarticulating at maturity; ligule 1–4 mm.
- 2a. Annual; ligule with dense matted hairs on abaxial surface; leaf blades up to 4 cm wide *O. latifolia* (see note above)
- 2b. Perennial; ligule glabrous on abaxial surface; leaf blades 1–2(–3) cm wide.
- 3a. Lemma awned; plant 1.5–3 m tall; leaf blades 30–50 cm 1. *O. officinalis*
- 3b. Lemma awnless; plant 0.3–0.7 m tall; leaf blades 5–20 cm 2. *O. meyeriana*
- 1b. Spikelets 8–10 mm, persistent or disarticulating at maturity; ligule 17–40 mm (if shorter, spikelets persistent).
- 4a. Plant wild; spikelets disarticulating; anthers 4–6 mm 3. *O. rufipogon*
- 4b. Plant cultivated; spikelets persistent; anthers 1–2.5 mm.
- 5a. Ligule of lower leaves up to 40 mm, acuminate; fertile floret papillose and spinulose 4. *O. sativa*
- 5b. Ligule of lower leaves 3–5 mm, rounded; fertile floret glabrous 5. *O. glaberrima*

1. *Oryza officinalis* Wallich ex Watt, Dict. Econ. Prod. India 5: 501. 1891.

药用稻 yao yong dao

Oryza latifolia Desvaux var. *silvatica* Camus; *O. minuta* Presl var. *silvatica* (Camus) Veldkamp.

Perennial. Culms erect or creeping and rooting at lower nodes, 1.5–3 m tall, 7–10 mm in diam. Leaf sheaths more than 3 times internode length, auricles inconspicuous; leaf blades

thick, 30–50 × 2–3 cm, abaxial surface and margins scabrous, adaxial surface scattered villous, midrib stout, lateral veins inconspicuous, base narrowed, puberulous, apex acuminate; ligule 1–4 mm. Panicle loosely contracted, 30–50 cm, base often included in terminal sheath; branches 3–5 at lowest node, axils bearded, longest 10–25 cm, naked in lower half, apices of lowermost branches drooping. Spikelets broadly ovate-oblong, 4–5 mm, length 1.5–2 times width, yellowish green or tinged brownish black, deciduous; sterile lemmas linear-lanceolate, 1.5–2 mm, apex acuminate; fertile lemma papillose, keel and

marginal veins with hard glassy hairs; awn 5–10(–25) mm, slender, scabrid. Anthers 1.5–2.5 mm. Caryopsis reddish brown, ca. 3×2 mm. $2n = 24$.

Low hills, alluvial plains, ditch banks; below 1000 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

The name *Oryza latifolia* Desvaux has sometimes been misapplied to this species in Asian literature.

Oryza officinalis is normally diploid, with the genome CC. It is closely related to the tetraploid *O. minuta* Presl from the Philippines (genome BBCC), and is sometimes placed as *O. minuta* var. *silvatica*. *Oryza minuta* differs only slightly morphologically, the lowermost panicle branches having a shorter naked portion and ascending at the tip. It also has proportionately narrower spikelets with length $2\text{--}2.7 \times$ width.

2. *Oryza meyeriana* (Zollinger & Moritzi) Baillon subsp. ***granulata*** (Nees & Arnott ex Watt) Tateoka, Bot. Mag. (Tokyo) 75: 460. 1962.

疣粒稻 you li dao

Oryza granulata Nees & Arnott ex Watt, Dict. Econ. Prod. India 5: 500. 1891; *O. meyeriana* var. *granulata* (Nees & Arnott ex Watt) Duistermaat; *O. meyeriana* subsp. *tuberculata* W. C. Wei & Y. G. Lu.

Perennial, loosely tufted or sometimes shortly stoloniferous. Culms erect or ascending, 30–70 cm tall, ca. 1.5 mm in diam. Leaf sheaths shorter than internodes, auricles ciliate; leaf blades thin, $5\text{--}20 \times 0.6\text{--}2$ cm, inrolled when dry, abaxial surface smooth, adaxial surface scabrid along veins, margins scabrid, base rounded, narrowed at insertion, apex acuminate; ligule 1–2 mm. Panicle narrow, erect, 3–15 cm; branches 2–5, inserted singly, 2–6 cm, unbranched, ascending, bearing few spikelets. Spikelets elliptic-oblong, 5–6.5 mm, length 2–3 times width, light green or gray; sterile lemmas narrowly lanceolate, slightly unequal, ca. 1 mm; fertile lemma irregularly granular, flanks sulcate, apex obtuse or shortly 3-toothed, awnless. Anthers 3.5–4.5 mm. Caryopsis brown, 3–4 mm. Fl. and fr. Oct–Feb. $2n = 24$.

Hill forests, on well drained soils and damp places by streams; (below 100–)500–1000 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand].

The typical subspecies occurs in Indonesia and the Philippines. It has longer, (6–)7–10 mm spikelets, with length $3\text{--}6 \times$ width. The two subspecies grade into each other. *Oryza meyeriana* is easily distinguished, as it is the only wild rice in China without awns. It is unlike other members of the genus, both in its low stature and shady upland habitat requirements. Phylogenetically this species has been shown to be basal in the genus, with genome GG.

3. *Oryza rufipogon* Griffith, Not. Pl. Asiat. 3: 5. 1851.

野生稻 ye sheng dao

Oryza sativa Linnaeus subsp. *rufipogon* (Griffith) de Wet; *O. sativa* var. *rufipogon* (Griffith) G. Watt.

Perennial, aquatic, tufted or stoloniferous. Culms decum-

bent, rooting and tillering at nodes, sometimes floating, lower part spongy, 0.7–1.5 m or more tall. Leaf sheaths slightly inflated below, upper sheaths tight, glabrous, auricles conspicuous, glabrous or ciliate; leaf blades up to $40 \times 1\text{--}2$ cm, margins and midrib scabrid, apex acuminate; ligule up to 17 mm. Panicle spreading, 12–30 cm, eventually nodding; branches 1–5 at lowest node, longest 2.5–12 cm, axils bearded or glabrous. Spikelets oblong, 8–11 mm, length $2.7\text{--}4.5$ times width, yellowish green with reddish apex, deciduous; sterile lemmas lanceolate, ca. 2.5 mm, apex acuminate; fertile lemma finely reticulate with scattered short glassy hairs, flanks slightly sulcate, keel stiffly ciliate, apex acuminate; awn 5–40 mm or more, stout, scaberulous. Anthers 4–6 mm. Caryopsis reddish brown, 5–7 mm. Fl. and fr. Apr–May and Oct–Nov. $2n = 24$.

Riversides, ponds, streams, lotus ponds, rice fields, ditches, marshes; below 700 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Malaysia, Myanmar, New Guinea, Sri Lanka, Philippines, Thailand, Vietnam; Australia (Queensland)].

This is a member of the AA genome complex, which includes cultivated rice, of which it is a progenitor. Members of this group hybridize quite easily and have contributed to the development of rice cultivars. *Oryza rufipogon* is perennial, but the most important difference from cultivated rice is the possession of readily deciduous spikelets.

4. *Oryza sativa* Linnaeus, Sp. Pl. 1: 333. 1753.

稻 dao

Oryza formosana Masamune & Suzuki; *O. sativa* var. *formosana* (Masamune & Suzuki) Yeh & Henderson.

Annual, aquatic, tufted. Culms erect, rooting at lower submerged nodes, 0.5–1.5 m tall. Leaf sheaths slightly inflated below, upper sheaths tight, glabrous, auricles falcate, ciliate; leaf blades $25\text{--}60 \times 0.5\text{--}2$ cm, glabrous, smooth or scabrid on both sides, margins scabrid, apex acuminate; ligule 10–40 mm. Panicle loosely contracted, up to 30 cm, nodding at maturity; branches 1–3 at lowest node, longest 2–12 cm, axils bearded or glabrous. Spikelets oblong to oblong-lanceolate, 7–10 mm, length $2\text{--}3.5$ times width, persistent; sterile lemmas lanceolate, 1.5–4 mm, apex acuminate; fertile lemma papillose, spinulose, apex acuminate; awn very variable, slender or stout, up to 60 mm or more, scaberulous, sometimes absent. Anthers 1–3 mm. Caryopsis ovate or elliptic to cylindrical, 5–7 mm, whitish yellow to brown or blackish. $2n = 24$.

Cultivated, mainly in flooded fields. Throughout most of China [domesticated in SE Asia].

This is the staple cereal rice, widely cultivated in tropical and warm-temperate parts of the world, and with many different cultivated races. It has the AA genome, and where *Oryza rufipogon* occurs as a weed in rice fields, intermediates may occur.

5. *Oryza glaberrima* Steudel, Syn. Pl. Glumac. 1: 3. 1853.

光稈稻 guang fu dao

Annual. Culms erect, spongy, up to 1 m tall. Leaf sheaths glabrous, leaf blades up to $30 \times 1\text{--}1.5$ cm, glabrous, margins scabrid; ligule 3–5 mm. Panicle loosely contracted, 20–25 cm; branches long, mostly simple. Spikelets obliquely inserted on pedicels, oblong, 7–9 mm, length twice width, yellow or dark brown, persistent; sterile lemmas lanceolate, 1.5–3 mm, mar-

gins sparsely ciliate, apex acuminate; fertile lemma smooth, glabrous or keel ciliate, apex with acute beak, usually awnless. Anthers ca. 1.5 mm. Caryopsis oblong, 5–6 mm. $2n = 24$.

Cultivated, in flooded fields. Hainan, Yunnan [domesticated in W tropical Africa].

This African rice is the other cultivated species in *Oryza*, but its cultivation is much less widespread than that of *O. sativa*. It belongs to the AA genome complex, but can be clearly distinguished from *O. sativa* and others of this complex in China by its much shorter, rounded ligule.

38. LEERSIA Solander ex Swartz, Prodr. 21. 1788, nom. cons.

假稻属 jia dao shu

Homalocenchrus Mieg, nom. rej.

Perennial aquatic or marsh plants, stoloniferous or rhizomatous. Culms slender, lower part creeping or floating, upper part erect or ascending, many-noded, nodes swollen, hairy. Leaf blades mainly cauline, linear-lanceolate; ligule papery. Inflorescence a lax panicle, branches often simple and racemelike, pedicels short. Spikelets with one floret, elliptic to narrowly oblong, straighter on one side, strongly laterally compressed, disarticulating from pedicel; glumes absent; lemma boat-shaped, keeled, firmly papery or leathery, prominently 5-veined, marginal veins interlocking with marginal veins of palea, keel scabrid to pectinate ciliate, apex acute or beaked, awnless; palea resembling lemma but narrower, 3-veined, keel ciliate. Stamens 1, 2, 3, or 6. Caryopsis oblong, embryo 1/3 length of caryopsis, hilum linear. $x = 12$.

About 20 species: tropical and warm-temperate regions of the world; four species in China.

This genus is distinguished from *Oryza* only by the absence of sterile lemmas.

- 1a. Stamens 6; panicle 5–12 cm, branches without branchlets, bearing spikelets to near base.
 - 2a. Spikelets 3–4.5 mm, lateral veins of lemma minutely spinulose; panicle branches slender, terete 1. *L. hexandra*
 - 2b. Spikelets 4.5–6 mm, lateral veins of lemma smooth; panicle branches thick, flattened 2. *L. japonica*
- 1b. Stamens 3; panicle 10–20 cm, branches with branchlets, lower part long naked.
 - 3a. Spikelets elliptic-oblong, 5–6 mm, surface strigillose 3. *L. oryzoides*
 - 3b. Spikelets narrowly oblong, 6–8 mm, surface minutely hispidulous 4. *L. sayanuka*

1. *Leersia hexandra* Swartz, Prodr. 21. 1788.

李氏禾 li shi he

Leersia australis R. Brown; *L. parviflora* Desvaux.

Perennial with well-developed stolons and slender rhizomes. Culms decumbent, rooting at lower nodes, erect shoots up to 50 cm or more tall, nodes retrorsely pubescent. Leaf sheaths shorter than internodes, smooth or scabrid; leaf blades flat or sometimes rolled, 5–12 × 0.3–0.6 cm, abaxial surface scabrid on midrib, base contracted, apex sharply acute; ligule 1–3 mm, truncate. Panicle lanceolate-oblong in outline, 5–10 cm, exserted; branches inserted singly, ascending, 4–5 cm, unbranched, slenderly terete or triquetrous, densely clothed to near base with closely overlapping spikelets. Spikelets narrowly elliptic to elliptic-oblong, 3–4 mm, pale green or purple tinged; lemma conspicuously pectinate-hispid on keel, lateral veins and sometimes surface sparsely spinulose, margins shortly hispid, apex contracted into a short obtuse beak. Stamens 6, anthers 2–2.5 mm. Fl. and fr. May–Dec. $2n = 24$, 48.

Slow-moving shallow water of lake margins, ditches, and depressions, marshlands, sometimes forming floating mats. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, America, Australia].

This is a serious weed of rice fields in tropical regions.

2. *Leersia japonica* (Makino ex Honda) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 7. 1930.

假稻 jia dao

Homalocenchrus japonicus Makino ex Honda, Bot. Mag. (Tokyo) 39: 37. 1925; *Leersia sinensis* K. S. Hao.

Perennial, loosely tufted. Culms decumbent, rooting at lower nodes, upper part geniculately ascending, 60–80 cm tall, nodes densely retrorsely hispid. Leaf sheaths shorter than internodes, scabrid; leaf blades flat, 6–15 × 0.4–0.8 cm, scabrid or abaxial surface smooth, base contracted, apex sharply acute; ligule 2–3 mm, truncate. Panicle elliptic to ovate in outline, 9–12 cm, exserted; branches inserted singly, stiffly ascending or spreading, 4–7 cm, unbranched, thick, slightly flattened, smooth, clothed to near base with approximate or slightly overlapping spikelets. Spikelets lanceolate-oblong, 4.5–6 mm, pale green tinged brownish red; lemma pectinate-hispid on keel only, surface smooth, margins minutely spinulose, apex contracted into a narrowly obtuse beak. Stamens 6, anthers 2.5–3 mm. Fl. and fr. summer and autumn. $2n = 96$.

Ponds, flooded fields, wet streamsides, ditch banks, lake shores. Anhui, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan, S Korea].

3. *Leersia oryzoides* (Linnaeus) Swartz, Prodr. 21. 1788.

蓉草 rong cao

Phalaris oryzoides Linnaeus, Sp. Pl. 1: 55. 1753; *Asprella oryzoides* (Linnaeus) Lamarck; *Homalocenchrus oryzoides* (Linnaeus) Haller; *Oryza oryzoides* (Linnaeus) Brand & W. D. J. Koch.

Perennial, loosely tufted, with slender rhizomes. Culms weak, decumbent, rooting at lower nodes, upper part up to 120 cm tall, branching near base, scabrid below panicle, nodes

retorsely hispid. Leaf sheaths longer to slightly shorter than internodes, the upper retorsely spinulose; leaf blades thin, 7–30 × 0.6–1 cm, scabrid on both surfaces, margins scabrid and spinulose, apex acuminate; ligule 1–2 mm, truncate. Panicle lax, ovate in outline, 10–20 cm; branches 1–3 per node, spreading, up to 10 cm, flexuous, very slender, scabrid, lower part long naked, upper part with branchlets bearing spikelets overlapping along one side of branchlets. Spikelets elliptic-oblong, 5–6 mm, whitish with green veins; lemma conspicuously pectinate-hispid on keel and margins, surface strigillose, sometimes sparsely, apex abruptly contracted, subacute. Stamens 3, anthers 1.5–2 mm. Fl. and fr. Jun–Sep. $2n = 48, 60$.

Wet river banks, marshy places; 400–1100 m. Fujian, Hainan, Heilongjiang, Hunan, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia (Caucasus), Europe, North America; introduced in Australia].

This widespread species has a more temperate distribution than *Leersia hexandra*. The panicles are sometimes produced only within inflated upper leaf sheaths, which remain included and bear cleistogamous spikelets with much smaller, 0.5 mm anthers. These enclosed panicles are produced under cooler conditions.

4. *Leersia sayanuka* Ohwi, Acta Phytotax. Geobot. 7: 36. 1938.

秕壳草 bi ke cao

39. *CHIKUSICHLOA* Koidzumi, Bot. Mag. (Tokyo) 39: 23. 1925.

山涧草属 shan jian cao shu

Perennial. Culms tufted, erect, unbranched. Leaf sheaths longer than internodes; leaf blades linear or broadly linear, with transverse veinlets; ligule membranous. Panicle lax, open. Spikelets with 1 floret, weakly dorsally flattened at anthesis, becoming terete at maturity, floret borne upon a long slender stipe derived from floret callus, disarticulating at base of stipe; glumes usually absent, sometimes 2 minute vestiges at stipe base; lemma membranous, strongly 5–7-veined, apex acute or awned; palea slightly shorter than lemma, (2–)3(–5)-veined. Stamen 1. Caryopsis fusiform, embryo small, hilum linear, slightly shorter than caryopsis.

Three species: Indonesia (Sumatra) to Japan; two species in China.

The species of this genus are apparently rare, but may be overlooked in moist places in the forests where they grow. The third species in the genus, *Chikusichloa brachyathera* Ohwi, is known only from the Ryukyu Islands. This is a shorter species with culms up to 70 cm and a shorter, 1.5–2 mm awn.

- 1a. Spikelets awnless; basal stipe 1–2 mm; leaf blades 1.5–2.5 cm broad 1. *C. mutica*
 1b. Spikelets awned; basal stipe 4–6 mm; leaf blades 0.6–1 cm broad 2. *C. aquatica*

1. *Chikusichloa mutica* Keng, J. Wash. Acad. Sci. 21: 527. 1931.

无芒山涧草 wu mang shan jian cao

Culms 60–100 cm tall, 3–4 mm thick. Leaf sheaths smooth, glabrous; leaf blades broadly lanceolate, flat or conduplicate, 20–50 × 1.5–2.5 cm, glabrous, midrib pronounced on abaxial surface, margins scaberrulous, apex acuminate; ligule 4–5 mm. Panicle lax, open, up to 50 × 15 cm; branches rather distant, usually solitary, ascending to widely spreading, smooth. Spikelets 5–7 mm (including stipe); callus stipe 1–2 mm, scabrous, slightly curved, basal subulate glume vestiges up to 1.5 mm occasionally present; lemma body lanceolate, ca. 4 mm, 5-veined, spinulose along veins, sulcate between veins, apex acuminate, awnless; palea narrowly lanceolate, 3-veined, spinulose along veins. Anther 1.5–2 mm. Caryopsis dark brown, ca. 2 mm. Fl. and fr. Aug–Oct.

Damp streamsides in forests. Guangdong, Guangxi, Hainan [Indonesia (Sumatra)].

Homalocenchrus oryzoides (Linnaeus) Haller var. *japonicus* (Hackel) Honda; *Leersia hackelii* Keng; *L. oryzoides* (Linnaeus) Swartz var. *japonica* Hackel; *L. oryzoides* subsp. *japonica* (Hackel) T. Koyama.

Perennial, tufted, with rhizomes. Culms ascending, 30–70 cm tall, nodes retorsely hispid. Leaf sheaths retorsely spinulose; ligule 1–2 mm, truncate; leaf blades grayish green, 7–10(–20) × 0.5–1 cm, margins scabrid; ligule ca. 0.5 mm, truncate. Panicle lax, ovate in outline, up to 20 cm, base often enclosed in terminal leaf sheath; branches inserted singly, spreading, up to 10 cm, slenderly triquetrous, scabrid, branched or not, lower part long naked. Spikelets narrowly oblong, 6–8 mm, pale green, whitish along keel; lemma hispid on keel, surface sparsely hispidulous, apex abruptly contracted, obtuse. Stamens 3(or 2), anthers 1–2 mm. Fl. and fr. autumn.

Forests, streamsides, lake shores, moist grassy places. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Jiangsu, Shandong, Zhejiang [Japan, Korea].

This species is very close to *Leersia oryzoides* and is not completely distinct from it. It can usually be recognized by its longer, less conspicuously hispid spikelets. *Leersia sayanuka* is not known to produce panicles with cleistogamous spikelets in the leaf axils.

2. *Chikusichloa aquatica* Koidzumi, Bot. Mag. (Tokyo) 39: 23. 1925.

山涧草 shan jian cao

Culms 90–150 cm tall, 3–6 mm thick. Leaf sheaths smooth, glabrous, keeled; leaf blades linear, flat, 30–50 × 0.6–1 cm, scabrous on both surfaces, narrowed toward base, apex long acuminate; ligule 1.5–2.5 mm. Panicle large, loose, 30–50 cm; branches usually solitary, ascending to spreading, smooth. Spikelets 10–17 mm (including stipe and awn), tinged purplish; callus stipe 4–6 mm, spinulose, lacking glume vestiges; lemma body lanceolate to narrowly ovate, ca. 4 mm, 5-veined, spinulose along veins, apex acuminate, awned; awn 4–6 mm, scabrous; palea narrowly lanceolate, 3-veined, spinulose along veins. Anther 1.2–1.5 mm. Caryopsis yellowish brown, 2–2.5 mm. Fl. and fr. Sep–Oct. $2n = 24$.

Wet valleys, streamsides. Jiangsu (Yixing) [Japan].

40. *HYGRORYZA* Nees, Edinburgh New Philos. J. 15: 380. 1833.

水禾属 shui he shu

Perennial, aquatic, stoloniferous, numerous feathery adventitious roots arising from nodes. Culms floating, spongy, much branched. Leaf sheaths inflated, bladderlike, with transverse veinlets; leaf blades ovate-lanceolate; ligule short, membranous. Inflorescence few-spiculate panicle, base enclosed by uppermost leaf sheath. Spikelets with 1 floret, laterally compressed, floret borne upon a long slender stipe derived from floret callus, disarticulating at base of stipe, disarticulation point marked by a brown line; glumes absent; lemma lanceolate, papery, keeled, strongly 5-veined, outermost veins close to margins, apex acuminate, extended into a slender awn; palea as long as lemma body and enclosed within it, papery, 3-veined. Stamens 6. Caryopsis terete, embryo small, hilum linear, almost as long as caryopsis. $x = 12$.

One species: S and SE Asia, including China.

1. *Hygroryza aristata* (Retzius) Nees, Edinburgh New Philos. J. 15: 380. 1833.

水禾 shui he

Pharus aristatus Retzius, Observ. Bot. 5: 23. 1789; *Potamochoa aristata* (Retzius) Griffith ex Steudel; *Zizania aristata* (Retzius) Kunth.

Culms floating, 0.5–1.5 m long. Leaf blades 3–7 × 0.5–2.5 cm, adaxial surface papillate, base rounded to cordate, abruptly constricted to a ca. 1 mm petiole-like base at junction with

sheath, apex obtuse; ligule truncate, 0.5–0.8 mm. Inflorescence triangular in outline; branches short, lowermost subverticillate, reflexing at maturity. Spikelets greenish; stipe 3–6 mm; lemma body 7.5–8 mm, hispidulous on back, spinulose on veins; awn 1–1.4 cm; palea keeled and spinulose along midvein, outer veins smooth, apex acute. Anthers ca. 3.5 mm.

An aquatic grass forming extensive floating mats in ponds and lakes, often in shade of trees. Fujian, Guangdong, Hainan, Taiwan, Yunnan [Bangladesh, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam].

41. *ZIZANIA* Linnaeus, Sp. Pl. 2: 991. 1753.

菰属 gu shu

Monoecious aquatic annuals or perennials, rhizomes and stolons sometimes present. Culms tall, erect, robust. Leaf blades linear to broadly lanceolate; ligule membranous. Inflorescence a large panicle, spikelets unisexual and mostly borne on separate branches; lower branches spreading, bearing pendulous, caducous male spikelets; upper branches erect or ascending at maturity, bearing appressed, tardily deciduous female spikelets; or middle branches with mixed male and female spikelets (*Z. latifolia*). Spikelets with 1 floret, falling entire; glumes absent; lemma as long as spikelet, 5-veined; palea subequal to lemma, narrower, 3-veined. Male spikelet: lemma membranous, weakly flattened, acuminate or awn-pointed; stamens 6. Female spikelet: lemma papery or leathery, cylindrical, tapering into a long slender awn; palea closely clasped by lemma. Caryopsis cylindrical, embryo half as long, hilum almost as long as caryopsis. $x = 15$ or 17.

Four species: E Asia and North America; one species in China.

All species are used as food crops. *Zizania aquatica* Linnaeus and *Z. palustris* Linnaeus are cultivated in botanical gardens in China. They are highly valued cereals in North America (Wild Rice).

1a. Plant perennial; panicle with middle branches bearing both male and female spikelets 1. *Z. latifolia*

1b. Plant annual; panicle with all male spikelets on lower branches and all female spikelets on upper branches.

2a. Plant 2–4 m; ligule to 30 mm, acute or acuminate; lemma of female spikelet papery, with scattered prickles *Z. aquatica* (see note above)

2b. Plant 0.6–2 m; ligule to 16 mm, subrounded; lemma of female spikelet leathery, glabrous or with prickles in lines on back and dense at apex *Z. palustris* (see note above)

1. *Zizania latifolia* (Grisebach) Turczaninow ex Stapf, Bull. Misc. Inform. Kew 1909: 385. 1909.

菰 gu

Hydropyrum latifolium Grisebach in Ledebour, Fl. Ross. 4: 466. 1853; *Zizania aquatica* Linnaeus var. *latifolia* (Grisebach) Komarov; *Z. caduciflora* Handel-Mazzetti, nom. illeg. superfl.; *Z. dahurica* Turczaninow ex Steudel.

Perennial, rhizomatous. Culms erect, 1–2.5 m, ca. 1 cm thick, rooting at lower nodes, nodes glabrous. Leaf sheaths longer than internodes, thickened, lower sheaths tessellate; leaf blades broadly linear, 50–90 × 1.5–3.5 cm, abaxial surface scabrous, adaxial surface glabrous, tapering to base, apex

abruptly narrowed to a long point; ligule triangular, 1–1.5 cm. Panicle 30–50 × 10–15 cm, lower branches with male spikelets, upper branches with female spikelets, middle branches mixed; branches semiverticillate, many at each node, sparsely spinulose; pedicel apex disk-shaped with spinulose margin. Male spikelet 0.8–1.5 cm; lemma elliptic-oblong, margin ciliate; awn 2–8 mm, scabrous; anthers 5–8 mm. Female spikelet 1.5–2.5 cm; lemma linear, scabrous on veins; awn 1.5–3 cm, scabrous. Caryopsis ca. 1 cm. Fl. and fr. Jun–Sep. $2n = 30, 34$.

Shallow water of lake margins and swamps, forming large patches. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shan-

dong, Sichuan, Taiwan, Yunnan, Zhejiang [NE India, Japan, Korea, Myanmar, Russia; cultivated in SE Asia].

This species is cultivated as a vegetable in China. The young

shoots and rhizomes are edible when infected, swollen, and softened by the fungus *Ustilago esculenta*. The presence of the fungus prevents flowering. The grains were used for food by the Emperor in ancient China, and are currently being used by fishermen.

5. Tribe BRACHYELYTREAE

短颖草族 duan ying cao zu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials. Leaf blades narrowly lanceolate, with or without indistinct cross veins, constricted at base; ligule membranous. Inflorescence a scanty panicle. Spikelets all alike, floret 1 with bristle-like rachilla extension, dorsally compressed, disarticulating above glumes; glumes unequal, tiny, lower glume vestigial, upper glume subulate, 1/10–1/4 length of floret; lemma firmly herbaceous, 5-veined, tapering into a straight awn from apex; palea as long as lemma, convolute; stamens 2. Caryopsis linear, the apex with a pallid pubescent beak bearing 2 terminal stigmas; pericarp thick, separable with difficulty. Leaf anatomy: non-Kranz, microhairs and fusoid cells absent. $x = 11$.

One genus and three species: two in E North America and one in E Asia including China.

42. BRACHYELYTRUM P. Beauvois, Ess. Agrostogr. 39. 1812.

短颖草属 duan ying cao shu

Description and distribution as for tribe.

1. *Brachyelytrum japonicum* (Hackel) Matsumura ex Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 210. 1930.

日本短颖草 ri ben duan ying cao

Brachyelytrum erectum var. *japonicum* Hackel, Bull. Herb. Boissier 7: 647. 1899; *Brachyelytrum erectum* subsp. *japonicum* (Hackel) T. Koyama & Kawano.

Perennial from a short knotty rhizome. Culms solitary or loosely tufted, slender, erect, 40–100 cm tall, unbranched, 6–7-noded. Leaf sheaths shorter than internodes, glabrous or puberulent; leaf blades linear-lanceolate, thin, soft, 8–15 × 0.6–0.8 cm, scabridulous or puberulous when young, margins ciliate, apex acuminate; ligule 2–5 mm, obtuse to acuminate, usually

erose. Panicle narrow, 9–15 cm; branches short, suberect, capillary, scabrous, bearing a few subsessile spikelets. Spikelets 8–10 mm, gray-green; lower glume 0.4–1.5 mm; upper glume 1–4 mm, 1-veined or obscurely 3-veined at base, margins scarious; lemma narrowly lanceolate, 8–10 mm, rigid, 5-veined, scabrous on veins; awn 1.2–1.8 cm, slender, scabrous; palea 2-toothed at apex; callus ca. 0.8 mm, shortly pilose. Anthers 3.3–4.5 mm. Rachilla extension 4–7 mm. Fl. Jun–Jul.

Woodland shade. Anhui, Jiangsu, Jiangxi, Yunnan, Zhejiang [Japan, Korea (Cheju Island)].

This species is very similar to the other two species of the genus in North America, but these have wider leaf blades (0.8–2 cm wide) and a shorter lower glume (0.2–0.7 mm).

6. Tribe PHAENOSPERMATEAE

显子草族 xian zi cao zu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennial. Leaf blades broadly linear with transverse veinlets, narrowed into a false petiole, this twisted to bring the abaxial surface uppermost; ligule long, membranous. Inflorescence a large open panicle, branches usually verticillate, scabridulous. Spikelets all alike, floret 1, rachilla extension absent, dorsally compressed, falling entire; glumes unequal, membranous to scarious; lemma as long as spikelet, herbaceous with scarious margins, strongly 3–5-veined, marginal veins obscure; palea resembling lemma but 2-veined, furrowed between keels, splitting at maturity; lodicules 3; stamens 3; stigmas 2. Caryopsis globose with small apical beak from style base, exposed between gaping lemma and palea at maturity, pericarp thick, softening and peeling away when wet, embryo very small, hilum as long as the caryopsis. Leaf anatomy: non-Kranz; microhairs absent; fusoid cells absent. $x = 12$.

One species: E Asia.

43. PHAENOSPERMA Munro ex Bentham, J. Linn. Soc., Bot. 19: 59. 1881.

显子草属 xian zi cao shu

Euthryptochloa Cope.

Description and distribution as for tribe.

1. *Phaenosperma globosa* Munro ex Benth, J. Linn. Soc., Bot. 19: 59. 1881.

显子草 xian zi cao

Euthryptochloa longiligula Cope.

Culms robust, solitary or tufted, stiff, erect or climbing, 1–1.5(–3) m, 4–5-noded, unbranched. Leaf sheaths smooth, usually shorter than internodes; leaf blades 10–50 × 1–3 cm, smooth or scabrous, abaxial (upper) surface dark green, adaxial (lower) surface whitish, apex acuminate; ligule 5–15(–25)

mm, scabrous. Panicle 15–40 cm, branches 5–10 cm, widely spreading at maturity. Spikelets narrowly elliptic-oblong at first, gaping at maturity, 4–4.5 mm, glossy; lower glume ca. 1/2 spikelet length, 1–3-veined; upper glume as long as spikelet, 3–5-veined; lemma narrowly ovate, apex obtuse. Anthers 1.5–2 mm. Caryopsis black-brown, 2.5–3 mm wide, rugose. Fl. and fr. May–Sep.

Mountain slopes, streams, valleys, roadsides in forests; 100–1800 m. Anhui, Gansu, Guangxi, Hubei, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [NE India, Japan, S Korea].

7. Tribe STIPEAE

针茅族 zhen mao zu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, usually forming tussocks. Leaf blades linear to filiform, often convolute or folded; ligule membranous, margin often ciliate. Inflorescence an open or contracted panicle, sometimes spike-like, spikelets all alike. Spikelets with 1 floret (to 3 in *Duthiea*), terete or laterally compressed, disarticulating above glumes; rachilla extension usually absent (present in *Stephanachne*, *Sinochasea*, and *Duthiea*); glumes equaling or longer than floret, persistent, hyaline to membranous, 1–7-veined; floret callus obtuse to pungent; lemma rounded on back, membranous to leathery, firmer than glumes, often indurated at maturity, 3–9-veined, often enclosing palea, apex entire or 2-toothed, awned from apex or between teeth; awn straight or geniculate, glabrous, pubescent or plumose; palea subequal to lemma, hyaline to membranous, usually 2-veined (5–7-veined in *Psammochloa*) but not keeled, apex usually acute. Lodicules 2 or 3. Stamens mostly 3 (1 in *Stephanachne monandra*), anthers sometimes bearded with apical tuft of short hairs. Stigmas 2 or 3. Caryopsis fusiform, tightly enclosed by lemma and palea; hilum linear; embryo short.

Between nine and 17 genera: temperate and warm-temperate regions; ten genera (one endemic) and 67 species (17 endemic) in China.

The number of genera that should be recognized in *Stipeae* is still controversial. Sometimes a broad view is taken of *Stipa*, but in Asia it has usually been broken into segregate taxa. This traditional treatment is followed here, with a few exceptions, to avoid the creation of many new combinations while the taxonomy is still unsettled.

Additionally, the first four small genera are of uncertain tribal placement. These are little known, undercollected grasses from the Himalayas and W China. They are sometimes placed in *Aveneae*, but on balance show more Stipoid characteristics, including multiveined glumes, an unkeeled palea, often 3 lodicules, and a linear hilum.

Lemma measurements refer to the lemma body and the callus together.

- 1a. Lemma apex deeply 2-lobed, lobes slenderly acuminate or bristle-like.
 - 2a. Lemma with a crown of hairs arising from base of apical lobes.
 - 3a. Rachilla extension present 44. *Stephanachne*
 - 3b. Rachilla extension absent 45. *Trikeria*
 - 2b. Lemma without an apical crown of hairs.
 - 4a. Ovary strigose; stigmas raised upon a long slender style 47. *Duthiea*
 - 4b. Ovary glabrous; stigmas sessile.
 - 5a. Stigmas 2 45. *Trikeria*
 - 5b. Stigmas 3 46. *Sinochasea*
- 1b. Lemma apex entire or shortly 2-toothed (if rarely 2-lobed, lobes not bristle-like).
 - 6a. Palea 5–7-veined, resembling lemma 48. *Psammochloa*
 - 6b. Palea 0–2-veined.
 - 7a. Floret dorsally compressed 49. *Piptatherum*
 - 7b. Floret terete or laterally compressed.
 - 8a. Callus usually long (more than 0.6 mm), pungent; lemma usually leathery, margins overlapping and enclosing palea, apex entire or minutely 2-toothed; awn usually deciduous, strongly geniculate with twisted column 50. *Stipa*
 - 8b. Callus usually short (less than 0.6 mm), obtuse to acute; lemma usually papery, margins typically not overlapping with palea midline exposed, infrequently overlapping, apex usually 2-toothed; awn persistent or deciduous, straight or weakly geniculate.
 - 9a. Awn plumose throughout 51. *Ptilagrostis*
 - 9b. Awn scabrid or column pubescent.
 - 10a. Lemma apex usually shortly 2-toothed, without retrorse spines 52. *Achnatherum*
 - 10b. Lemma apex with cylindrical beak armed with stout retrorse spines 53. *Orthoraphium*

44. STEPHANACHNE Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9(2): 134. 1934.

冠毛草属 *guan mao cao shu*

Pappagrostis Roshevitz.

Perennials. Leaf blades linear. Inflorescence a contracted or spikelike panicle. Spikelets with 1 floret, bisexual; rachilla extension present, short; glumes lanceolate, subequal, longer than floret, membranous to herbaceous, 1–5-veined, apex acuminate; callus short, obtuse, shortly bearded; lemma narrowly ovate, herbaceous or thinly leathery, rounded on back, 5-veined, body pubescent or pilose, apex deeply 2-lobed, lobes acuminate or excurrent into a short awn, a circlet of long hairs across base of lobes, awned from sinus; awn geniculate with twisted column, scabrid throughout; palea narrowly lanceolate, equaling or slightly shorter than lemma, hairy between veins; lodicules 2 or 3, narrowly lanceolate. Stamens 1 or 3, anthers glabrous at apex. Stigmas 2.

Three species: W China, Mongolia, Tajikistan; three species (two endemic) in China.

- 1a. Spikelets dark gray or blackish, 12–15 mm; lemma lobes extended into 4–5 mm awnlets; central awn 10–15 mm 1. *S. nigrescens*
 1b. Spikelets yellowish green or tinged purple, 5–9 mm; lemma lobes extended into 0.5–3.5 mm mucros; central awn 6–9 mm.
 2a. Lemma 3–4 mm; stamens 3 2. *S. pappophorea*
 2b. Lemma 6–7 mm; stamen 1 3. *S. monandra*

1. *Stephanachne nigrescens* Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9(2): 135, fig. 14. 1934.

黑穗茅 *hei sui mao*

Perennial, tufted. Culms erect, ca. 90 cm tall, 2–3 mm in diam., 3–4-noded. Leaf sheaths loose, not auriculate; leaf blades flat or involute, 15–20 cm, 5–6 mm wide, upper culm blades much shorter and narrower, abaxial surface scaberulous, adaxial surface glabrous or puberulent, apex finely acuminate; ligule 1–5 mm, lacerate. Panicle narrowly oblong in outline, densely contracted, usually interrupted at base, 4–10 cm; branches scabrid; pedicels 1–4 mm, puberulent. Spikelets 12–15 mm, blackish; glumes narrowly lanceolate, 3–5-veined, midvein scaberulous, apex acuminate-subulate, slightly outcurving; callus hairs ca. 1.5 mm; lemma 9–10 mm (including lobes), body appressed-pubescent, apical lobes extended into 4–5 mm awnlets, circlet of hairs 4–5 mm; awn 1–1.5 cm, geniculate at ca. 1/3 above base, column clearly twisted; palea 7–8 mm, appressed pubescent. Lodicules 3, ca. 3 mm. Stamens 3, anthers 1.2–2 mm. Fl. and fr. Jul–Sep.

• Under bushes, alpine grassy places, mountain slopes; 3800–4600 m. Gansu, Qinghai, Shaanxi, Sichuan.

2. *Stephanachne pappophorea* (Hackel) Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9(2): 136. 1934.

冠毛草 *guan mao cao*

Calamagrostis pappophorea Hackel, Annuaire Conserv. Jard. Bot. Genève 7–8: 325. 1904; *Pappagrostis pappophorea* (Hackel) Roshevitz.

Perennial, forming dense tussocks from a short rhizome, base invested in old leaf sheaths. Culms erect, 10–40 cm tall, 1–1.3 mm in diam., smooth, 2–5-noded. Leaf sheaths tight, auriculate, auricles 2–5 mm; leaf blades flat or involute, 5–25 cm, 1–5 mm wide, both surfaces scabrid, apex finely acuminate; ligule 1.5–3 mm, lacerate. Panicle linear-oblong in outline, spikelike, not interrupted, 4–18 cm, slightly shining;

branches almost smooth; pedicels 0.5–2.5 mm, puberulent. Spikelets 5–7 mm, yellowish green; glumes narrowly lanceolate, 1–3-veined, midvein scabrid, apex slenderly acuminate; lemma 3–4 mm (including lobes), body appressed-pilose, apical lobes extended into ca. 0.5 mm mucros, circlet of hairs 3–4 mm; awn 6–8 mm, weakly geniculate near middle, column slightly twisted; palea slightly shorter than lemma. Lodicules 2 or 3, ca. 1 mm. Stamens 3, anthers 1–1.2 mm. Fl. and fr. Jul–Sep.

Dry stony mountain slopes, steppes, dried floodlands, roadsides; 1800–3200 m. Gansu, Nei Mongol, Qinghai, Xinjiang [Mongolia, Tajikistan].

3. *Stephanachne monandra* (P. C. Kuo & S. L. Lu) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 305. 1987.

单蕊冠毛草 *dan rui guan mao cao*

Stephanachne pappophorea (Hackel) Keng var. *monandra* P. C. Kuo & S. L. Lu, Rep. Invest. Zool. Bot. Ngari Region Tibet [Xizang Ali Diqu Dong Zhi Wu Kao Cha Bao Gao], 106, 127. 1979.

Perennial, tufted. Culms erect, 30–50 cm tall, 1–2 mm in diam., scabrid, 2–3-noded. Leaf sheaths tight; leaf blades involute, 10–25 cm, 1–3 mm wide, both surfaces scabrid, apex acuminate; ligule 2–3 mm, toothed. Panicle linear-oblong in outline, spikelike, not interrupted, 4–6 cm, slightly shining; branches smooth; pedicels 1–5 mm, shortly hairy. Spikelets 7–9 mm, green tipped purple; rachilla extension unknown; glumes lanceolate, 3–5-veined, midvein scaberulous, apex acuminate; lemma 6–7 mm (including lobes), body pilose, apical lobes extended into 1.5–3 mm awnlets, circlet of hairs 2.5–3 mm; awn 7.5–9 mm, weakly geniculate below middle, column slightly twisted; palea 3–4 mm. Lodicules 2, 0.55–1.3 mm. Stamen 1, anther 0.7–1 mm. Fl. Aug.

• Under shrubs on mountain slopes; 4400–4700 m. SW Xizang (Burang, Gê'gyai).

45. TRIKERAIA Bor, Kew Bull. [9] 1954: 555. 1955.

三角草属 san jiao cao shu

Perennial. Leaf blades usually rolled; ligule short, erose, ciliolate. Inflorescence an open or contracted panicle; pedicels short. Spikelets with 1 floret, bisexual, slightly dorsally compressed; rachilla extension absent; glumes subequal or slightly unequal, lanceolate or lanceolate-oblong, herbaceous, scabrid or smooth, 3–5-veined, apex acuminate; callus short, obtuse, bearded; lemma slightly shorter than glumes, lanceolate, covering only flanks of palea, membranous, 3–5-veined, villous, apex 2-lobed, lobes acuminate to setiform, awned from between lobes; awn persistent, scabrid, weakly 1-geniculate, column loosely twisted, sometimes only slightly so; palea hyaline, back exposed, pubescent between veins. Lodicules 2 or 3, lanceolate. Stamens 3, anthers glabrous at apex. Stigmas 2.

Four species: N Pakistan to Bhutan and W China, at high altitudes; three species (one endemic) in China.

1a. Lemma with spreading pappuslike brush of hairs above middle, shortly pubescent below; awn 5–7 mm 1. *T. pappiformis*
1b. Lemma uniformly hairy; awn 8–15 mm.

2a. Glumes 5-veined; awn arising below middle of lemma, lobes acuminate; anthers 1–1.5 mm 2. *T. oreophila*

2b. Glumes 3-veined; awn arising above middle of lemma, lobes setiform; anthers 4.5–5 mm 3. *T. hookeri*

1. *Trikeriaia pappiformis* (Keng) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 317. 1987.

假冠毛草 jia guan mao cao

Stipa pappiformis Keng, Sunyatsenia 6: 71. 1941.

Perennial, rhizomatous. Culms 90–150 cm tall, 3–5-noded. Leaf sheaths glabrous, lower equaling and upper much shorter than internodes; leaf blades rolled or lower blades almost flat, 40–50 cm, 2–4 mm wide, scabrid, apex setiform; ligule ca. 1 mm. Panicle open, up to 30 cm; branches usually 2–3(–4) per node, filiform, up to 15 cm, glabrous, lower part bare, upper part densely spiculate. Spikelets yellowish green, rarely gray brown at apex; glumes subequal or upper slightly longer, narrowly lanceolate, 8–10 mm, 3-veined, apex attenuate; lemma 6–7 mm, 3-veined, spreading pappuslike ca. 5 mm hairs in upper part, sparsely pubescent below with 0.5–1 mm hairs, apical lobes 1–2 mm, slenderly acuminate; awn 0.5–0.7 cm, minutely hispidulous, slightly twisted below. Lodicules usually 3, 1–1.2 mm. Anthers 3–3.5 mm. Fl. and fr. Jul–Oct.

• Forest fringes, grassy mountain slopes, river banks; 3400–4300 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

This species closely resembles species of *Stephanachne*, but lacks a rachilla extension.

The combination “*Achnatherum pappiforme* (Keng) Keng” (Claves Gen. Sp. Gram. Prim. Sin. 106, 213. 1957) was not validly published because a full and direct reference to the basionym was not provided.

2. *Trikeriaia oreophila* Cope, Kew Bull. 42: 350. 1987.

山地三角草 shan di san jiao cao

Trikeriaia tianshanica S. L. Lu & X. F. Lu.

Perennial, densely tufted. Culms 7–45 cm tall, 2–3-noded. Leaf sheaths glabrous, upper shorter than internodes; leaf blades stiff, involute, 3–12 cm, 1.5–5 mm wide, smooth or scaberulous; ligule 0.4–0.5 mm, obtuse. Panicle contracted, narrow, 1-sided, 2.5–8.5 × 1–1.5 cm; branches 1–2 per node, erect, up to 3.5 cm, scabrid. Spikelets green or yellowish tinged purple; glumes subequal, lanceolate, 9–14 mm, 5-veined, scabrid, narrowly acuminate; lemma ca. 10 mm, 5-veined, pilose,

hairs ca. 2 mm, split almost to lower 1/3, lobes 4.2–7 mm, slenderly acuminate, lateral veins continued into lobes, sometimes excurrent as short mucros; awn 0.8–1.2 cm, geniculate near middle, scabrid, twisted below bend. Lodicules 2 or 3, ca. 1 mm. Anthers 1–1.5 mm. Fl. and fr. Jun–Sep.

Grassy hillsides, windy plains; 2800–5200 m. Xinjiang, Xizang [Bhutan, India (Sikkim), Nepal].

3. *Trikeriaia hookeri* (Stapf) Bor, Kew Bull. [9] 1954: 555. 1955.

三角草 san jiao cao

Perennial, tufted with stout scaly rhizomes; old basal sheaths often pale purplish within. Culms 60–80 cm tall, 2–3-noded. Leaf sheaths slightly scabrid, lower longer and upper shorter than internodes; leaf blades 10–40 × 0.4–0.5 cm (when flattened), abaxial surface scaberulous-puberulous; ligule ca. 2 mm. Panicle contracted or open, 10–30 × 2–10 cm; branches 2–12 cm, scabrid, lower part bare, upper part densely spiculate. Spikelets purplish brown or green tinged purple; glumes oblong-lanceolate, subequal or upper slightly longer, 8–11 mm, 3-veined, scabrid, apex acuminate; lemma 5-veined, villous, hairs 2–4 mm, split to shortly above middle, lobes (1–)2–3.2 mm, acuminate into stiff 0.5–1 mm awnlets; awn stout, stiff, 1.2–1.5 cm, stiff, stout, scabrous, recurved to weakly 1-geniculate, loosely or sometimes only obscurely twisted below bend. Lodicules 1.5–2 mm. Anthers 4.5–5 mm. Fl. and fr. Jul–Sep.

Streams, valleys; 3600–4400 m. Qinghai, Xizang [Kashmir, N Pakistan].

1a. Panicle contracted, 10–20 × ca. 2 cm;
branches 2–5 cm 3a. var. *hookeri*

1b. Panicle open, up to 30 × 7–10 cm;
branches up to 15 cm 3b. var. *ramosa*

3a. *Trikeriaia hookeri* var. *hookeri*

三角草(原变种) san jiao cao (yuan bian zhong)

Stipa hookeri Stapf, J. Linn. Soc., Bot. 30: 120. 1894;
Timouria aurita Hitchcock.

Panicle contracted, 10–20 × ca. 2 cm; branches erect or

obliquely ascending, 2–5 cm, lower 1/3 bare. Spikelets ca. 8 mm; lemma hairs ca. 2 mm. Fl. and fr. Jul–Sep.

Near streams in river valleys; 3600–4400 m. Qinghai (Yushu), Xizang [Kashmir, N Pakistan].

The combination “*Achnatherum hookeri* (Stapf) Keng” (Claves Gen. Sp. Gram. Prim. Sin. 106, 213. 1957) was not validly published because a full and direct reference to the basionym was not provided.

3b. *Trikeria hookeri* var. *ramosa* Bor, Kew Bull. [9] 1954: 557. 1955.

展穗三角草 zhan sui san jiao cao

Panicle open, up to 30 × 7–12 cm; branches up to 15 cm, lower half bare. Spikelets 8–11 mm; lemma hairs 1.5–4 mm.

• Streams, valleys; 3600–4400 m. Qinghai, Xizang.

46. *SINOCHASEA* Keng, J. Wash. Acad. Sci. 48: 115. 1958.

三蕊草属 san rui cao shu

Perennial, tufted. Leaf blades narrow, rolled. Inflorescence a contracted panicle. Spikelets with 1 floret, lightly laterally compressed; rachilla extension present, minute, glabrous or rarely with a few hairs; glumes subequal or lower glume slightly longer, as long as spikelet, herbaceous to scarious with hyaline margins, prominently 5–9-veined, apex acuminate; callus obtuse, shortly bearded; lemma narrowly oblong, shorter than glumes, papery, back rounded, 5–9-veined, hairy, apex deeply 2-lobed, awned from sinus; awn geniculate, column twisted; palea slightly shorter than lemma, 2-veined, not keeled. Lodicules 2(or 3), lanceolate. Stamens 3, anthers glabrous at apex. Ovary glabrous, stigmas 3, subsessile.

• One species: W China.

The presence of a rachilla extension is anomalous in *Stipeae*, which normally have strictly 1-flowered spikelets, and on this account the genus is sometimes placed in *Aveneae*. However, the multi-veined glumes, rounded palea lacking keels, and linear hilum are all Stipoid characters.

1. *Sinochasea trigyna* Keng, J. Wash. Acad. Sci. 48: 115. 1958.

三蕊草 san rui cao

Perennial forming small dense tussocks from a short rootstock; basal sheaths persistent. Culms stiffly erect, 7–45 cm tall, 1–2 mm in diam., scabrid under panicle, otherwise smooth, 2–3-noded. Leaf sheaths scaberulous; leaf blades stiff, setaceous, 3–16 cm, 1–2 mm wide, both surfaces and margins scabrid, apex acute; ligule membranous, 0.5–2 mm, truncate or obtuse, ciliolate. Panicle narrowly lanceolate in outline, 3–8.5 cm; branches erect, up to 3 cm; pedicels hispid. Spikelets 8–12 mm, greenish with purple apices; rachilla extension minute; glumes lanceolate, as long as spikelet, 5-veined, almost smooth or scaberulous; lemma (6–)8–9 mm, 5-veined, villous, lobes 3–6 mm; awn 0.9–1.1 cm; palea a little shorter than lemma,

pubescent between veins, apex 2-toothed. Lodicules 1.5–2 mm. Anthers ca. 1 mm. Ovary glabrous. Fl. and fr. Aug–Sep.

• Alpine meadows, mountain slopes; 3800–5100 m. Qinghai, Xizang.

A third small lodicule may be present in this species. *Sinochasea* is sometimes included within the otherwise unispecific genus *Pseudodanthonia* Bor & C. E. Hubbard, because *P. himalaica* (J. D. Hooker) Bor & C. E. Hubbard shares the unusual character of an ovary bearing 3 stigmas. *Sinochasea* is recognized here as distinct, because *Pseudodanthonia* differs by its 2-keeled, winged palea (not seen elsewhere in *Stipeae*) and hairy ovary.

Pseudodanthonia himalaica is known at present only from the NW Himalayas in India. It is a tussocky species about 50 cm tall with a long, acute ligule to 7 mm, larger spikelets with several florets, a geniculate awn to 2 cm, and shorter, obovate lodicules.

47. *DUTHIEA* Hackel, Verh. K.K. Zool.-Bot. Ges. Wien 45: 200. 1895 [“1896”].

毛蕊草属 mao rui cao shu

Thrixgyne Keng; *Triavenopsis* Candargy.

Perennials, tussocky. Leaf blades usually rolled. Inflorescence a simple panicle, compact or elongate, 1-sided, spikelets few. Spikelets with 1–3 florets, laterally compressed or cylindrical, disarticulating above glumes and between florets; rachilla extension present; glumes subequal, equaling or a little shorter than spikelet, herbaceous with hyaline margins, rounded on back, 5–9-veined, often with transverse veinlets; callus hairy; lemmas lanceolate to narrowly ovate, membranous or leathery, hispid or villous, apex 2-toothed to deeply 2-cleft, awned from between lobes; awn geniculate, column twisted; palea keeled, keels usually extended into sharp mucros. Lodicules absent (rarely 2, oblanceolate). Stamens 3, anthers glabrous or shortly hairy at apex. Ovary strigose, stigmas 2 or 3, borne on a long pubescent style. Caryopsis tipped by a subulate beak formed from persistent style.

Three species: Himalayas, from Afghanistan to W China; one species in China.

This genus is often placed in *Aveneae* on account of the several-flowered spikelets of some species; the keeled palea is also atypical in *Stipeae*. It belongs to a small group of genera, including *Pseudodanthonia*, *Sinochasea*, *Stephanachne*, and probably *Trikeria*, which occupy an intermediate and basal position between the two tribes. Multiveined glumes, 3 lodicules, and a linear hilum are all Stipoid characteristics. Three stigmas may also occur in this group. Molecular evidence is scanty but indicates Stipoid affinities.

1. *Duthiea brachypodium* (P. Candargy) Keng & P. C. Keng, Acta Phytotax. Sin. 10(2): 182. 1965.

毛蕊草 mao rui cao

Triavenopsis brachypodium P. Candargy, Arch. Biol. Veg. Pure Appl. 1: 65. 1901; *Duthiea dura* (Keng) Keng & P. C. Keng; *D. nepalensis* Bor; *Thrixgyne dura* Keng.

Perennial forming small dense tussocks, with or without long rhizomes; basal sheaths persistent, brown, papery. Culms stiffly erect, 25–100 cm tall, 1–3-noded. Leaf blades 2.5–13(–35) cm, 2–3.5 mm wide, glabrous, apex acute; ligule 2–3 mm, up to 8 mm on culm leaves. Raceme 7–10 × 0.5–0.7 cm; spikelets 8–18, overlapping. Spikelets narrowly cylindrical, 1.4–2.1 cm, floret 1, gray-green; rachilla extension ca. 2 mm, sometimes tipped with reduced floret; glumes oblong-lanceolate, 1.3–2.1 cm, subacute; callus densely pubescent; lemma

equal to spikelet, leathery, 10–11-veined, body hispid, especially around awn insertion, apex deeply 2-cleft, lobes 7–10 mm, scabrid, acuminate; awn densely scabrid-pubescent, column 0.8–1 cm, bristle 1–1.6 cm; palea keels thick, prominent. Lodicules absent or 2, oblanceolate. Anthers 1.4–1.6 mm, glabrous or with a few short hairs at apex. Style 6–7 mm; stigmas 2 or 3, 7–9 mm. Fl. and fr. Jun–Oct.

Open woodland, between bushes, sunny grassy slopes in high mountains; 3000–5300 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, Nepal].

The specific epithet “*brachypodium*” is here a noun in apposition and should not be altered to “*brachypodia*.”

The other two species in the genus, *Duthiea bromoides* Hackel and *D. oligostachya* (Munro) Stapf from the W Himalayas, both have spikelets with more than one fertile floret and a branching inflorescence. A slender rachilla extension is often present in *D. brachypodium*.

48. **PSAMMOCHLOA** Hitchcock, J. Wash. Acad. Sci. 17: 140. 1927.

沙鞭属 sha bian shu

Perennial, rhizomatous. Leaf blades linear; ligule lanceolate. Inflorescence a long contracted panicle; pedicels short. Spikelets with 1 floret, bisexual; glumes lanceolate-oblong, upper glume slightly longer than lower, membranous, 3–5-veined with transverse veinlets; callus very short, obtuse, glabrous; lemma terete, equaling upper glume, papery with membranous upper margins and apex, 5–7-veined, villous, apex shortly toothed, awned from between teeth; awn caducous, fine, scabrid; palea subequal to and resembling lemma, 5–7-veined, without keels, villous, not enclosed by lemma at maturity. Lodicules 3. Stamens 3, anthers glabrous or tips penicillate.

One species: N China, Mongolia.

1. *Psammochloa villosa* (Trinius) Bor, Kew Bull. [6] 1951: 191. 1951.

沙鞭 sha bian

Arundo villosa Trinius, Sp. Gram. 3: t. 352. 1836; *Amophila villosa* (Trinius) Handel-Mazzetti; *Psammochloa mongolica* Hitchcock; *Timouria mongolica* (Hitchcock) Roshevitz; *T. villosa* (Trinius) Handel-Mazzetti.

Perennial; rhizomes widely spreading; old basal sheaths yellowish brown, finally fibrous. Culms robust, erect, 1–2 m tall, 0.8–1 cm in diam. Leaf sheaths smooth, glabrous, papery, longer than internodes, loosely overlapping and clothing much of culm; leaf blades flat, stiff, up to 50 cm, 5–10 mm wide,

abaxial surface smooth, glabrous, adaxial surface closely ribbed, apex usually convolute; ligule 5–8 mm. Panicle dense, spikelike, narrowly lanceolate in outline, up to 50 × 3–4.5 cm; branches erect, slender, scabrid. Spikelets 1–1.6 cm, pale yellowish; glumes puberulous, apex obtuse-erose; lemma 1–1.2 cm, densely villous with spreading ca. 4 mm hairs, apical teeth membranous, 0.4–0.6 mm, obtuse; awn 0.7–1 cm, bent just above base, slightly flexuous. Anthers ca. 7 mm. Fl. and fr. May–Sep.

Sand dunes; 900–2900 m. Gansu, Nei Mongol, Ningxia, Qinghai, N Shaanxi, Xinjiang [Mongolia].

This is a good sand-binding grass. The awns fall very early, so the spikelets usually appear to be awnless.

49. **PIPTATHERUM** P. Beauvois, Ess. Agrostogr. 17. 1812.

落芒草属 luo mang cao shu

Eriocoma Nuttall; *Fendleria* Steudel; *Urachne* Trinius.

Perennials, tufted. Leaf blades linear to setaceous, flat or rolled. Inflorescence an open or contracted panicle. Spikelets with 1 floret, bisexual, disarticulating above glumes; rachilla extension absent; glumes ovate to lanceolate, subequal, usually longer than floret, herbaceous to membranous, 3–7-veined, veins linked by veinlets or anastomosing near apex, apex obtuse to acuminate; callus very short, rounded, glabrous; lemma lanceolate to ovate or elliptic, dorsally compressed, leathery to bony, brown or black-brown at maturity, glossy, usually with appressed ascending white hairs, infrequently glabrous, covering sides of palea, apex entire or minutely 2-toothed, awned; awn caducous (rarely persistent), fine, straight, scabrid; palea back exposed between lemma margins. Lodicules 3. Stamens 3, anthers usually bearded at apex. Stigmas 2.

About 30 species: Europe through C Asia to the Himalayas and China, also in North America; nine species (two endemic) in China.

Quantitative characters are very variable and reliable qualitative characters are rather few. Plant size varies within wide limits for most species and spikelet size is also very variable. Lemma shape, a stable character, refers to the mature floret when full width has been attained. Other reliable characters for species separation, such as lemma pubescence and awn insertion, require careful observation and a good magnification.

- 1a. Lemma glabrous, slightly longer than glumes at maturity; glumes elliptic-obovate, apex broadly rounded; anthers glabrous at apex 1. *P. kuoi*
- 1b. Lemma usually pubescent, shorter than or equaling glumes; glumes lanceolate, apex obtuse or denticulate to acuminate; anthers usually hairy at apex (glabrous in *P. hilariae*).
- 2a. Awn 2–4(–7) mm; culms 20–60 cm tall, 2–3-noded; panicle often narrow.
 - 3a. Lemma elliptic to ovate, apex shortly beaked, shortly 2-lobed, each lobe bearing hair tuft; anthers glabrous 2. *P. hilariae*
 - 3b. Lemma narrowly lanceolate, apex entire or obscurely 2-lobed, not beaked, without hair tufts; anthers densely bearded.
 - 4a. Lemma back pilose with 0.4–0.5 mm hairs, apex minutely 2-lobed; awn subterminal, bent at insertion 3. *P. gracile*
 - 4b. Lemma back pubescent with 0.2–0.4 mm hairs, apex entire; awn terminal, straight at insertion 4. *P. laterale*
- 2b. Awn 5–9 mm; culms up to 100 cm tall, 3–5-noded; panicle lax, usually open.
 - 5a. Glumes equaling or only slightly longer than lemma; branches of panicle 3–5 per node.
 - 6a. Spikelets lanceolate, 5–9 mm; lemma 4–7.5 mm 5. *P. aequiglume*
 - 6b. Spikelets ovate, 3.5–5 mm; lemma 2.5–4 mm 6. *P. tibeticum*
 - 5b. Glumes distinctly longer than lemma; branches of panicle 2(–3) per node.
 - 7a. Lemma lanceolate, hairy throughout; glumes herbaceous, apex usually purple.
 - 8a. Panicle branches and pedicels scabrid; glumes 4.5–8 mm 7. *P. munroi*
 - 8b. Panicle branches and pedicels smooth; glumes 8–9 mm 8. *P. grandispiculum*
 - 7b. Lemma ovate, hairy in upper part, glabrous below; glumes membranous, green or gray brown 9. *P. songaricum*

1. *Piptatherum kuoi* S. M. Phillips & Z. L. Wu, Novon 15: 474. 2005.

钝颖落芒草 *dun ying luo mang cao*

Oryzopsis obtusa Stapf, Hooker's Icon. Pl. 24: t. 2393. 1895; *Piptatherum obtusum* (Stapf) Roshevitz (1951), not Nees & Meyen (1841).

Perennial, loosely tufted from knotty rootstock. Culms stiffly erect, up to 1 m tall, 2–2.5 mm in diam., scaberulous-puberulous, 2–3-noded. Leaf sheaths glabrous, shorter than internodes; leaf blades stiffly ascending, linear or broadly linear, flat or margins inrolled, 10–25 cm, 5–12 mm wide, abaxial surface smooth, adaxial surface asperulous-puberulous, apex slenderly acuminate; ligule 1–3 mm, obtuse or truncate. Panicle narrow, 15–25 cm; branches 2 per node, suberect, 1–5 cm, densely scabrid. Spikelets yellowish green; glumes elliptic-obovate, 4–5 × 3.5–4 mm, herbaceous, 5–7-veined with transverse veinlets, apex rounded; callus ca. 0.5 mm, knoblike, glabrous; lemma elliptic, 4–5 mm, shortly exserted from glumes, blackish brown at maturity, 5-veined, glabrous, margins overlapping (before caryopsis develops), apex entire; awn persistent, 10–17 mm. Anthers ca. 2.5 mm, glabrous at apex. Fl. and fr. Apr–Jul.

Under shrubs, moist shady places among rocks, roadsides; 600–1900 m. Guangdong, Guizhou, Henan, Hubei, Hunan, Shaanxi, E Sichuan, Taiwan, Yunnan, Zhejiang [Japan (Ryukyu Islands)].

This species is distinctive within the genus in China on account of its very broad glumes and plump, glabrous floret with the tip exserted from the glumes.

2. *Piptatherum hilariae* Pazij, Bot. Mater. Gerb. Inst. Bot. Zool. Akad. Nauk Uzbeksk. SSR 10: 20. 1948.

少穗落芒草 *shao sui luo mang cao*

Oryzopsis hilariae (Pazij) Uniyal; *O. humilis* Bor; *O. wendelboi* Bor; *Piptatherum humile* (Bor) S. Kumar & M. B. Razada.

Perennial, densely tufted. Culms 20–50 cm tall, 2–3-noded. Leaf sheaths glabrous, usually shorter than internodes; leaf blades gray-green or gray purple, usually rolled, rarely flat, up to 10(–30) cm, 2–4 mm wide, abaxial surface smooth or scaberulous, adaxial surface puberulous; ligule lanceolate, 3–6 mm. Panicle open or contracted, 5–12(–30) cm; branches 2 per node, spreading at anthesis, erect at maturity, longest less than 1/2 panicle length. Spikelets purplish red or gray-green; glumes lanceolate-ovate, 5–8 mm, apex sharply acuminate; callus glabrous; lemma elliptic to narrowly ovate, 3.5–4 mm, back pubescent with 0.2–0.3 mm hairs, midline glabrescent at maturity, apex usually shortly beaked, pale, glabrous, shortly 2-lobed above awn insertion, lobes rounded, each with tuft of hairs; awn caducous, 2–4 mm, often slightly bent at insertion. Anthers 1.5–2.5 mm, glabrous at apex or almost so. Fl. and fr. Jun–Sep.

River banks, plateaus; 3100–4500 m. Xizang (Lhohzag, Qusum) [E Afghanistan, NW India, Kashmir, Pakistan, Tajikistan (Pamirs)].

This species is close to *Piptatherum gracile*, but has an abruptly narrowed lemma apex, and the short apical hair tufts are distinctive. It is the only species of *Piptatherum* in China (except for the distinctive *P. kuoi*) with glabrous anthers (1 or 2 short hairs may be present, but never a dense tuft). In neighboring countries it occurs in the upper forest belt and in alpine thickets.

The name *Piptatherum humile* refers to small specimens with linear panicles.

3. *Piptatherum gracile* Mez, Repert. Spec. Nov. Regni Veg. 17: 211. 1921.

小落芒草 xiao luo mang cao

Oryzopsis gracilis (Mez) Pilger.

Perennial, densely tufted. Culms 10–50 cm tall, 2–3-noded. Leaf sheaths glabrous or scaberulous, shorter than internodes; leaf blades gray-green, filiform, usually rolled, 6–20 cm, 1–2 mm wide, abaxial surface smooth or scaberulous, adaxial surface pubescent; ligule lanceolate, 2–7 mm. Panicle laxly contracted to linear, 6–20 cm; branches 2(–4) per node, erect or ascending, longest ca. 1/3 panicle length. Spikelets yellowish green, apex purplish; glumes lanceolate, 5–8 mm, apex sharply acuminate; callus glabrous; lemma narrowly lanceolate, 3–5 mm, densely pilose with 0.4–0.5 mm hairs, apex minutely 2-lobed above awn insertion; awn caducous, delicate, 3–7 mm, slightly bent at insertion. Anthers 1.7–2.5 mm, densely bearded at apex. Fl. and fr. Jun–Aug.

Dry mountain slopes, alpine meadows; 3300–4900 m. Sichuan, Xizang, Yunnan [Afghanistan, NW India, Kashmir, Nepal, N Pakistan].

4. *Piptatherum laterale* (Regel) Munro ex Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 217. 1937.

细弱落芒草 xi ruo luo mang cao

Milium laterale Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 645. 1881; *Oryzopsis lateralis* (Regel) Stapf ex J. D. Hooker.

Perennial, densely tufted. Culms 25–60 cm tall, 2–3-noded. Leaf sheaths glabrous, usually shorter than internodes; leaf blades rolled, setaceous or narrowly linear when flat, 5–15(–25) cm, 1–3 mm wide, abaxial surface scaberulous, adaxial surface pubescent; ligule lanceolate, 2–5 mm. Panicle loosely contracted to linear, 5–20 cm; branches 1–3 per node, erect or ascending, longest not usually more than 3 cm. Spikelets yellowish green, apex usually purplish; glumes lanceolate, 6–8 mm, herbaceous, apex acuminate; callus glabrous; lemma narrowly lanceolate to almost linear, (3.3–)4–6.5 mm, densely pubescent with 0.2–0.4 mm hairs, apex entire, awned from apex; awn sometimes tardily deciduous, delicate, 2–4(–6) mm, straight at insertion. Anthers 2–3.5 mm, bearded at apex. Fl. and fr. Jun–Aug.

Stony mountain slopes, grassy hollows, *Kobresia pygmaea* turf; 1800–4700 m. Sichuan, Xizang [Afghanistan, Kashmir, Kyrgyzstan, Nepal, N Pakistan, Tajikistan, Uzbekistan; SW Asia (Iran, Iraq, E Turkey)].

This is a variable species often confused in the literature with the closely related *Piptatherum gracile*.

5. *Piptatherum aequiglume* (Duthie ex J. D. Hooker) Roshevitz, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 14: 113. 1951.

等颖落芒草 deng ying luo mang cao

Perennial, loosely tufted from a short rhizome. Culms 60–130 cm tall, 3–5-noded. Leaf sheaths glabrous, scabrid; leaf blades linear, flat, up to 30 cm, 5–10 mm wide, abaxial surface

scabrid, adaxial surface scaberulous; ligule rounded, 2–5(–13) mm. Panicle open at maturity, 10–25 cm; branches 3–5 per node, distant, ascending or widely spreading, longest up to 1/2 panicle length, scabrid, lower part bare. Spikelets gray-green; glumes narrowly lanceolate-oblong, (5–)5.5–9 mm, apex acute, occasionally mucronate; callus glabrous; lemma narrowly lanceolate, (4–)5.3–7.5 mm, equaling or slightly shorter than glumes, back pubescent with 0.15–0.3 mm hairs, glabrescent along midline at maturity, apex acute, smoothly extended into awn without constriction; awn tardily deciduous, 6–13 mm. Anthers 3–4 mm, bearded at apex. Fl. and fr. Jun–Sep.

Damp rocky places in montane forests; 1800–2900 m. Sichuan, Xizang, Yunnan [E Afghanistan, Bhutan, NW India, Kashmir, Pakistan].

This species is close to *Piptatherum munroi*, but is rather more lush and grows in more mesophytic habitats. The difference in awn insertion, although a small difference, is reliable for separating the two species.

- 1a. Ligules 2–5 mm; spikelets (5.5–)6.5–9 mm; awn tardily deciduous 5a. var. *aequiglume*
1b. Ligules 8–13 mm; spikelets ca. 5 mm; awn readily deciduous 5b. var. *ligulatum*

5a. *Piptatherum aequiglume* var. *aequiglume*

等颖落芒草(原变种) deng ying luo mang cao (yuan bian zhong)

Oryzopsis aequiglumis Duthie ex J. D. Hooker, Fl. Brit. India 7: 234. 1896 [“1897”]; *O. multiradiata* (Hackel) Handel-Mazzetti; *O. munroi* Stapf f. *multiradiata* Hackel; *Piptatherum sinense* Mez.

Ligule ovate, rounded, 2–5 mm. Spikelets (5.5–)6.5–9 mm; lemma 5.5–7.5 mm, pubescent with 0.15–0.3 mm hairs, passing smoothly into awn; awn tardily deciduous, 6–13 mm. Fl. and fr. Aug–Sep.

Rocky fissures near streams; 1800–2900 m. Sichuan, Xizang, Yunnan [E Afghanistan, Bhutan, NW India, Kashmir, Pakistan].

5b. *Piptatherum aequiglume* var. *ligulatum* (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

长舌落芒草 chang she luo mang cao

Oryzopsis aequiglumis var. *ligulata* P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. 1981.

Ligule long-lanceolate, 8–13 mm. Spikelets 4.9–5.2 mm; lemma ca. 4 mm, pilose with ca. 0.4 mm hairs, constricted at awn junction; awn readily deciduous, 7–8 mm. Fr. Sep.

• Near rocks of rivers, moist ground; 1800–2800 m. Yunnan (Lijiang).

This taxon appears to be a local element from the *Piptatherum aequiglume-munroi* species group. The glumes clearly exceed the lemma, and the delicate, caducous awn with constricted disarticulation point are indicative of *P. munroi*, but glume shape is nearer *P. aequiglume*. The ligule is remarkably long, and lemma pubescence is longer than in either species. It may prove to merit separate specific status when better known.

6. *Piptatherum tibeticum* Roshevitz, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 11: 23. 1949.

藏落芒草 zang luo mang cao

Perennial, tufted from a short rhizome. Culms 30–100 cm, 2–5-noded. Leaf sheaths loose, shorter than internodes; leaf blades linear, flat or slightly rolled, 5–25 cm, 2–4 mm, scabrid; ligule ovate to long-lanceolate, 3–10 mm. Panicle open, ovate in outline, 10–20 cm; branches 3–5 per node, spreading, ca. 3 cm, scabrid, upper half with spikelets. Spikelets yellowish green, apex purplish red; glumes ovate, 3.5–5 mm, glabrous or puberulous, apex acuminate; callus glabrous; lemma ovate, 2.5–4 mm, equaling or slightly shorter than glumes, back pubescent, glabrescent along midline at maturity, infrequently always glabrous; awn caducous, 5–7 mm. Anthers ca. 1 mm, bearded at apex. Fl. and fr. Jun–Aug.

• Field margins, grassy mountain slopes, forest fringes; 1300–3900 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan.

This is a variant from the *Piptatherum aequiglume-munroi* species group with small, broad spikelets.

- 1a. Lemma 2.5–3.5 mm, pubescent when young, glabrescent along midline at maturity 6a. var. *tibeticum*
 1b. Lemma 3–4 mm, always smooth and glabrous 6b. var. *psilolepis*

6a. *Piptatherum tibeticum* var. *tibeticum*

藏落芒草(原变种) zang luo mang cao (yuan bian zhong)

Oryzopsis tibetica (Roshevitz) P. C. Kuo.

Lemma 2.5–3.5 mm, back pubescent when young, glabrescent along midline at maturity. Fl. and fr. Jun–Aug.

• Field margins, grassy mountain slopes, forest fringes; 1300–3900 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan.

6b. *Piptatherum tibeticum* var. *psilolepis* (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

光稃落芒草 guang fu luo mang cao

Oryzopsis tibetica var. *psilolepis* P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. 1981; *O. psilolepis* (P. C. Kuo & Z. L. Wu) L. Liu.

Lemma 3–4 mm, always smooth and glabrous. Fl. Jun.

• Mountain slopes; 2400–3300 m. Sichuan, Xizang.

7. *Piptatherum munroi* (Stapf) Mez, Repert. Spec. Nov. Regni Veg. 17: 212. 1921.

落芒草 luo mang cao

Perennial, loosely tufted from a short rhizome. Culms 30–100 cm tall, 3–5-noded. Leaf sheaths smooth or scabrid; leaf blades linear, flat, 6–30 cm, 2–5 mm wide, abaxial surface glabrous, adaxial surface puberulous; ligule lanceolate, 2–5 mm. Panicle open, often ovate in outline, 10–25 cm; branches (1–)2(–3) per node, distant, ascending or widely spreading, longest up to 1/2 panicle length, scabrid, lower 2/3 bare. Spikelets gray-green or apex and margins purple; glumes lanceolate, 4.5–8 mm, papery, apex narrowly acuminate into sharp beak;

callus glabrous; lemma lanceolate, 2.5–4.5(–5) mm, back pubescent, glabrescent along midline at maturity, apex acute, constricted at awn insertion; awn fine, caducous, 6–9 mm, straight or slightly flexuous. Anthers 1–2.5 mm, apex bearded. Fl. and fr. Jun–Aug.

Alpine scrub, mountain meadows, roadsides, farmlands, alluvial fans; 2200–5000 m. Gansu, Guizhou, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [E Afghanistan, Bhutan, N India, Kashmir, Nepal, N Pakistan].

This is a common species from high parts of W China and the W Himalayas. It is readily recognizable by its relatively robust habit, large, open panicle with sharply purple-beaked spikelets, lanceolate, hairy lemmas, and long, delicate awns constricted at the base and readily falling.

- 1a. Glumes 5–7 mm; lemma 4–5 mm; anthers 2–2.5 mm 7a. var. *munroi*
 1b. Glumes 4.5–5 mm; lemma 2.5–3 mm; anthers 1–1.8 mm 7b. var. *parviflorum*

7a. *Piptatherum munroi* var. *munroi*

落芒草(原变种) luo mang cao (yuan bian zhong)

Oryzopsis munroi Stapf in J. D. Hooker, Fl. Brit. India 7: 234. 1896 [“1897”]; *O. geminiramula* Ohwi.

Glumes 5–7 mm; lemma 4–5 mm; awn 3–7 mm; anthers 2–2.5 mm. Fl. and fr. Jun–Aug.

Alpine scrub, mountain meadows, roadsides, farmlands; 2200–5000 m. Gansu, Guizhou, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [E Afghanistan, Bhutan, N India, Kashmir, Nepal, N Pakistan].

7b. *Piptatherum munroi* var. *parviflorum* (Z. L. Wu) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

小花落芒草 xiao hua luo mang cao

Oryzopsis munroi var. *parviflora* Z. L. Wu, Acta Phytotax. Sin. 30(2): 174. 1992; *O. stewartiana* Bor.

Glumes 4.5–5 mm; lemma 2.5–3 mm; awn 7–9 mm; anthers 1–1.8 mm. Fl. and fr. Jul–Sep.

Alluvial fans; ca. 2700 m. Gansu, Qinghai [NW India].

This taxon differs very little from *Piptatherum tibeticum*, which is reported to have a broader floret and more branches at the panicle nodes.

8. *Piptatherum grandispiculum* (P. C. Kuo & Z. L. Wu) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

大穗落芒草 da sui luo mang cao

Oryzopsis grandispicula P. C. Kuo & Z. L. Wu, Acta Phytotax. Sin. 19: 435. 1981; *O. macrospicula* P. C. Kuo & Z. L. Wu, nom. illeg. superfl.

Perennial, tufted from a short rhizome. Culms ca. 100 cm tall, 3–4-noded. Leaf sheaths shorter than internodes; leaf blades gray-green, flat or rolled, 4–15 cm, 2–3 mm wide, smooth; ligule lanceolate, 4–5 mm. Panicle open, broadly ovate, up to 25 cm; branches 2–6 per node, up to 10 cm, smooth, lower 1/2–2/3 bare. Spikelets gray-green, apex purplish gray; glumes lan-

ceolate, 8–9 mm, glabrous, apex long acuminate into beak; callus glabrous; lemma narrowly lanceolate, 5–6 mm, back pubescent, glabrescent at maturity; awn caducous, 4–7 mm. Anthers ca. 3.5 mm, bearded at apex. Fl. and fr. Aug–Sep.

- Rocky slopes; ca. 3700 m. Xizang (Xigazê).

This is a variant from the *Piptatherum aequiglume-munroi* species group, distinguished by its smooth leaves and panicle branches.

9. *Piptatherum songaricum* (Trinius & Ruprecht) Roshevitz, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 14: 106. 1951.

新疆落芒草 xin jiang lu mang cao

Urachne songarica Trinius & Ruprecht, Sp. Gram. Stipac. 15. 1842; *Oryzopsis songarica* (Trinius & Ruprecht) B. Fedtschenko; *O. tianschanica* Drobow & Vvedensky; *Piptatherum songaricum* subsp. *tianschanicum* (Drobow & Vvedensky) velev.

Perennial, densely tufted from a short rhizome. Culms (25–)30–60(–100) cm tall, 2–4-noded. Leaf sheaths glabrous, shorter than internodes; leaf blades flat or loosely rolled, 5–20 cm, 2–4 mm wide, abaxial surface scaberulous toward apex, adaxial surface glabrous or puberulous; ligule lanceolate, 5–8 mm. Panicle lax, 10–20(–30) cm; branches (1–)2 per node, slender, ascending, sinuous or sometimes nodding, longest 1/2–2/3 panicle length, scabrid at least in upper part, spikelets clustered toward apices. Spikelets green or gray-brown; glumes broadly lanceolate, 6–10 mm, membranous except at base, scabrid, apex acuminate; callus glabrous; lemma ovate, 3–5.2 mm, pubescent above middle, glabrous below except for small tufts at basal margins, glabrescent along midline at maturity, apex acute; awn caducous, 5–8 mm. Anthers 1.5–2 mm, bearded at apex. Fl. and fr. Jun–Aug.

Rocky moist places on mountain slopes; 1000–1900 m. Xinjiang [Kazakhstan, W Mongolia, Russia].

50. STIPA Linnaeus, Sp. Pl. 1: 78. 1753.

针茅属 zhen mao shu

Perennials, forming dense tussocks, old basal sheaths persistent. Leaf blades filiform to setaceous, convolute, abaxial surface smooth or scabrid, adaxial surface prominently ribbed. Inflorescence usually a contracted panicle, enclosed in uppermost leaf sheath or shortly exserted, spikelets few. Spikelets with one floret, bisexual; glumes subequal, hyaline or membranous, much longer than floret, 3–5-veined, long acuminate; callus pungent, shortly bearded; lemma narrowly lanceolate, terete, usually leathery, (3–)5-veined, hairy, margins overlapping, apex entire; awn articulated at lemma apex and deciduous at maturity, scabrid to plumose, 1–2-geniculate, column tightly twisted, bristle straight, flexuous or curling; palea subequaling lemma, hyaline, enclosed within lemma. Lodicules 2 or 3, lanceolate. Stamens 3, anthers glabrous or shortly hairy at apex. Stigmas 2.

About 100 species: temperate and warm-temperate regions of Asia and Europe, in dry, open habitats; 23 species (three endemic) in China.

- 1a. Awn scabrid or minutely hispidulous (hairs to 0.3 mm) throughout.
 - 2a. Cleistogamous spikelets present in basal leaf sheaths; lemma 0.5–0.6 cm 1. *S. bungeana*
 - 2b. Cleistogamous spikelets not present in basal leaf sheaths; lemma 0.8–1.7 cm.
 - 3a. Panicle branches not enclosed by uppermost leaf sheath, usually clearly exserted; awn minutely hispidulous, bristle straight or slightly flexuous.
 - 4a. Glumes 1.2–1.5 cm, apex finely acuminate; awns separate, bristle stiff 2. *S. przewalskyi*
 - 4b. Glumes 1.5–3 cm, apex filamentous; awns twisted together at top of panicle, bristle flexuous 3. *S. capillacea*
 - 3b. Panicle branches enclosed by expanded uppermost leaf sheath; awn scabrid, bristle curling.
 - 5a. Glumes 1.8–2.5 cm; awn column 1.5–2.5 cm to first bend 4. *S. sareptana*
 - 5b. Glumes 2.5–4.5 cm; awn column 3–10 cm to first bend.
 - 6a. Ligule of culm leaves 1.5–2 mm 5. *S. baicalensis*
 - 6b. Ligule of culm leaves 3–10 mm.
 - 7a. Lemma 1–1.2 cm; awn 13–18 cm 6. *S. capillata*
 - 7b. Lemma 1.5–1.7 cm; awn 20–28 cm 7. *S. grandis*
 - 1b. Awn plumose or at least shortly hairy along part or all of its length.
 - 8a. Awn plumose, or at least shortly hairy, throughout its length.
 - 9a. Awn 1-geniculate (sometimes weakly 2-geniculate in *S. consanguinea*).
 - 10a. Awn shortly pubescent, hairs on bristle 0.4–0.7 mm 9. *S. consanguinea*
 - 10b. Awn plumose, hairs on bristle 2–5 mm.
 - 11a. Panicle shortly exserted; lemma evenly hairy 10. *S. mongolorum*
 - 11b. Panicle branches enclosed by uppermost leaf sheath; lemma hairs in lines 11. *S. caucasica*
 - 9b. Awn 2-geniculate.
 - 12a. Lemma hairs in lines; glumes gray-green or pale brownish, narrowly lanceolate, long attenuate-filiform.
 - 13a. Glumes 1.8–3 cm; lemma smooth or scaberulous below apex; awn hairs 1–4 mm.
 - 14a. Culms 15–35 cm; awn 4–6 cm, hairs on bristle 3–4 mm 12. *S. orientalis*
 - 14b. Culms 40–80 cm; awn 9–20 cm, hairs on bristle 1–2.5 mm 13. *S. arabica*

- 13b. Glumes 1.2–2 cm; lemma spinulose below apex; awn hairs 0.8–1.5 mm 14. *S. breviflora*
- 12b. Lemma evenly hairy; glumes green or dark purple, lanceolate, acuminate into awn-point.
- 15a. Panicle branches 3–6 cm, flexuous; glumes dark purple; awn 6.5–9 cm, hairs shorter below, 2–3 mm on bristle 15. *S. purpurea*
- 15b. Panicle branches 2–4 cm, straight; glumes green or purplish; awn 3–6 cm, hairs longer below, 0.3–0.7 mm on bristle 16. *S. roborowskyi*
- 8b. Awn plumose only on column or only on bristle.
- 16a. Awn 1.5–3 cm; column plumose, bristle glabrous or minutely hairy (hairs 0.1–0.2 mm).
- 17a. Panicle 1–2 cm wide; branches 1–3 cm, suberect.
- 18a. Awn obscurely 2-geniculate, hairs on column up to 1 mm; spikelets 1.1–1.4 cm 17. *S. regeliana*
- 18b. Awn distinctly 2-geniculate, hairs on column 2–3 mm; spikelets 0.6–1.1 cm 18. *S. subsessiliflora*
- 17b. Panicle (2–)3–7 cm wide; branches 3–6 cm, spreading or obliquely ascending.
- 19a. Leaf blades scabrid or hairy; panicle branches spreading, with cushion in axils; ligule 3–7 mm; column hairs 3–4 mm 19. *S. penicillata*
- 19b. Leaf blades smooth, glabrous; panicle branches ascending, without cushion in axils; ligule 1–1.5 mm; column hairs 1–2 mm 20. *S. aliena*
- 16b. Awn 6–28 cm; column glabrous, bristle plumose, hairs 2–6 mm.
- 20a. Awn 1-geniculate, 6–13 cm 8. *S. tianschanica*
- 20b. Awn 2-geniculate, 15–28 cm.
- 21a. Glumes 2–3 cm; lemma evenly hairy; awn hairs 2–3 mm 21. *S. lessingiana*
- 21b. Glumes 3–5.5 cm; lemma hairs in lines; awn hairs 3–6 mm.
- 22a. Column of awn 5–6 cm to first bend; ligule up to 4 mm 22. *S. kirghisorum*
- 22b. Column of awn 3.5–4.5 cm to first bend; ligule 4–12 mm 23. *S. macroglossa*

1. *Stipa bungeana* Trinius, Enum. Pl. China Bor. 70. 1833.

长芒草 *chang mang cao*

Perennial, densely tufted. Culms 20–60 cm tall, 2–5-noded. Basal leaf sheaths pubescent, slightly swollen, enclosing cleistogamous spikelets, culm sheaths glabrous or margin ciliate; leaf blades acicular, convolute, basal blades up to 17 cm, culm blades 3–15 cm; ligule of basal leaves rounded, 0.2–0.5 mm, ciliate, of culm leaves lanceolate, 3–5 mm, apex denticulate. Panicle 12–20 cm, base enclosed by uppermost leaf sheath, gradually exerted after maturity. Spikelets gray-green or purple; glumes narrowly lanceolate, 0.9–1.5 cm, apex extended into a slender awn-tipped cusp; callus pungent, 1–1.3 mm; lemma 5–6 mm, pilose in longitudinal lines, awn articulation with a ring of short hairs; awn deciduous, 4–7 cm, scabrid, 2-geniculate, column 1–1.5 cm to first bend, 0.5–1 cm to second bend, bristle 3–5 cm. Cleistogamous spikelets laterally compressed, awnless or shortly awned. Caryopses regularly produced in cleistogamous spikelets. Fl. and fr. May–Oct.

Rocky slopes, loess hills, river banks, roadsides; 500–4000 m. Anhui, Gansu, Hebei, Henan, Jiangsu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Sichuan, Xinjiang, Xizang [Kazakhstan (Tien Shan), Kyrgyzstan (Tien Shan), Mongolia].

This is a good forage grass for summer pasture, becoming green early in the season.

2. *Stipa przewalskyi* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 1(6): 3. 1920.

甘青针茅 *gan qing zhen mao*

Perennial, loosely tufted. Culms 30–100 cm tall, 2–3-noded. Leaf sheaths glabrous, lower slightly longer than internodes; leaf blades filiform, convolute, basal blades up to 30 cm, culm blades 10–15 cm, outer surface scabrid; ligule of basal leaves rounded, 0.5–1 mm, of culm leaves lanceolate, 2–3 mm,

decurrent and adnate to margins of leaf sheath. Panicle slightly spreading, 15–30 cm, exerted from uppermost leaf sheath at maturity. Spikelets gray-green becoming purple; glumes narrowly lanceolate, 1.2–1.5 cm, apex slenderly acuminate; callus pungent, ca. 2 mm; lemma 8–10 mm, densely hairy in a ventral longitudinal line, longitudinally pilose on back, hispidulous below apex, a ring of short hairs at awn articulation; awn deciduous, 4–6 cm, 2-geniculate, column 1.5–2.5 cm to first bend, setulose with ca. 0.3 mm spinules, ca. 1 cm to second bend, bristle scabrid, stiff, straight, 1.5–2.5 cm. Fl. and fr. May–Aug.

• Grassy rocky hillsides, roadsides; 800–3600 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang.

This is a forage grass of summer pasture in steppe and forest steppe regions.

3. *Stipa capillacea* Keng, Sunyatsenia 6(2): 100. 1941.

丝颖针茅 *si ying zhen mao*

Perennial, tufted. Culms 15–50 cm tall, 2–3-noded. Basal leaves 1/3–1/2 length of culms; leaf sheaths glabrous, longer than internodes; leaf blades acicular, convolute, up to 20 cm, outer surface smooth or scaberulous; ligule of basal and culm leaves ca. 0.6 mm, truncate, ciliolate. Panicle narrowly contracted, 14–18 cm, often exerted from uppermost leaf sheath at maturity; branches erect-ascending, awns of spikelets twisted together at panicle top to form a tail. Spikelets greenish or purplish; glumes narrowly lanceolate, body ca. 1.5 cm, apex long attenuate into capillary 1–1.5 cm filament, often breaking into fine threads; callus pungent, 2–2.5 mm; lemma 7–10 mm, pubescent in a ventral longitudinal line, shortly longitudinally pilose on back, hispidulous below apex, a ring of stiff hairs at awn articulation; awn deciduous, 7–10 cm, 2-geniculate, column glabrous or puberulous, sometimes with longer hairs to 0.8

mm, 1–2 cm to first bend, 0.6–1 cm to second bend, bristle setulose, flexuous, 5–7 cm, apex filamentous. Fl. and fr. Jul–Sep.

Alpine scrub, wet meadows, hills, montane plains, river banks; 2900–5000 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

This is an easily recognizable species because of its spirally coiling awns and filamentous glume tips.

- 1a. Glumes 2.5–3 cm; lemma ca. 10 mm ... 3a. var. *capillacea*
 1b. Glumes 1.5–2(–2.2) cm; lemma
 (7–)8–9 mm 3b. var. *parviflora*

3a. *Stipa capillacea* var. *capillacea*

丝颖针茅(原变种) si ying zhen mao (yuan bian zhong)

Stipa koelzii R. R. Stewart.

Glumes 2.5–3 cm. Lemma ca. 10 mm. Anthers ca. 4 mm. Fl. and fr. Jul–Sep.

Alpine scrub, meadows, hills, montane plains, river banks; 2900–5000 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

3b. *Stipa capillacea* var. *parviflora* N. X. Zhao & M. F. Li, Acta Bot. Yunnan. 16: 229. 1994.

小花丝颖针茅 xiao hua si ying zhen mao

Glumes 1.5–2(–2.2) cm. Lemma (7–)8–9 mm. Anthers ca. 2 mm. Fl. Aug.

• Meadows on lake margins, moist places, field margins; 4200–4400 m. Xizang (Langkaze, Tingri).

This variety is used for forage and fiber.

4. *Stipa sareptana* A. K. Becker, Bull. Soc. Imp. Naturalistes Moscou 57: 52. 1882.

新疆针茅 xin jiang zhen mao

Perennial, compactly tufted. Culms 30–80 cm tall, smooth or spinulose, 2–3-noded, nodes dark, exposed. Basal leaves 1/2 length of culms, leaf sheaths smooth or spinulose, shorter than internodes; leaf blades setaceous, convolute, outer surface smooth or scabrid to shortly spinulose; ligule 2–10 mm, of basal leaves rounded, of culm leaves lanceolate. Panicle narrow, 10–20 cm, base enclosed by expanded uppermost leaf sheath. Spikelets yellowish green; glumes narrowly lanceolate, 1.5–2.5 cm, apex filiform; callus pungent, 2.2–3 mm; lemma 9–11 mm, shortly hairy in longitudinal lines, an obscure ring of hairs at awn articulation; awn deciduous, 10–15(–20) cm, scabrid, 2-geniculate, column 1.5–2.5 cm to first bend, 1–1.5 cm to second bend, bristle 9–15 cm, curling. Fl. and fr. Jun–Aug.

Steppes, mountain slopes, floodlands, river banks; 400–4500 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia, Tajikistan].

This species differs from others in the *Stipa capillata* group by its basal leaves, which are much shorter than the culms, exposed culm nodes, and rather small spikelets.

- 1a. Culms and outer surface of leaf blades
 scabrid or shortly spinulose 4a. var. *sareptana*
 1b. Culms and outer surface of leaf blades
 smooth and glabrous 4b. var. *krylovii*

4a. *Stipa sareptana* var. *sareptana*

新疆针茅(原变种) xin jiang zhen mao (yuan bian zhong)

Stipa capillata Linnaeus var. *sareptana* (A. K. Becker) Schmalhausen.

Culms spinulose. Leaf sheaths smooth or spinulose; leaf blades spinulose on outer surface; ligule of culm leaves 5–7(–10) mm. Awn with column ca. 2.5 cm to first bend, 1–1.5 cm to second bend, bristle 10–15 cm. Fl. and fr. Jun–Aug.

Drought steppe, desert steppe, Gobi desert; 400–2700 m. Xinjiang [Kazakhstan, Mongolia, Russia, Tajikistan].

4b. *Stipa sareptana* var. *krylovii* (Roshevitz) P. C. Kuo & Y. H. Sun, Fl. Reipubl. Popularis Sin. 9(3): 275. 1987.

西北针茅 xi bei zhen mao

Stipa krylovii Roshevitz, Izv. Glavn. Bot. Sada SSSR 28: 379. 1929; *S. capillata* var. *coronata* Roshevitz; *S. sareptana* subsp. *krylovii* (Roshevitz) D. F. Cui.

Culms smooth. Leaf sheaths smooth; leaf blades smooth on outer surface; ligule of culm leaves 2–3 mm. Awn with column 1.5–2 cm to first bend, ca. 1 cm to second bend, bristle 7–10 cm. Fl. and fr. Jun–Sep.

Mountain slopes, floodlands, river banks; 400–4500 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia].

This variety is used as a forage grass in steppe regions.

5. *Stipa baicalensis* Roshevitz, Izv. Glavn. Bot. Sada SSSR 28: 380. 1929.

狼针草 lang zhen cao

Perennial, tufted. Culms 50–80 cm tall, 3–4-noded, lower nodes concealed. Leaf sheaths smooth or scabrid, lower usually longer than internodes; leaf blades convolute, basal blades up to 40 cm, outer surface smooth; ligule truncate or 2-toothed, ciliate, of basal leaves 0.5–1 mm, of culm leaves 1.5–2 mm. Panicle narrow, 20–50 cm, base often enclosed by expanded uppermost leaf sheath. Spikelets gray-green or purplish brown; glumes narrowly lanceolate, 2.5–3.5 mm, apex filiform; callus pungent, ca. 4 mm; lemma 12–15 mm, shortly hairy in longitudinal lines, a ring of short hairs at awn articulation; awn deciduous, 14–17 cm, scabrid, 2-geniculate, column 3–5 cm to first bend, 1.5–2 cm to second bend, bristle curling, ca. 10 cm. Fl. and fr. Jun–Oct.

Mountain slopes, dry grassy places; 700–4000 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Xizang [Kazakhstan, Mongolia, Russia].

This species is scarcely distinguishable from the widespread *Stipa capillata*. It has a short ligule and a definite ring of short hairs at the awn articulation. It provides forage in dry steppe and meadow steppe regions.

6. *Stipa capillata* Linnaeus, Sp. Pl., ed. 2, 1: 116. 1762.

针茅 zhen mao

Perennial, densely tufted. Culms 40–80 cm tall, often 4-noded, lower nodes concealed. Leaf sheaths smooth or slightly scabrid, lower longer than internodes; leaf blades convolute, basal blades up to 40 cm, outer surface smooth or scabrid; ligule lanceolate, of basal leaves 1–1.5 mm, of culm leaves 3–10 mm. Panicle narrow, 10–25 cm or more, base enclosed by expanded uppermost leaf sheath. Spikelets yellowish green or gray-white; glumes narrowly lanceolate, 2.5–3.5 cm, apex filiform; callus pungent, 2–3 mm; lemma 9–12 mm, shortly hairy in longitudinal lines, smooth and glabrous toward apex; awn deciduous, 11–19 cm, scabrid, 2-geniculate, column 3.5–5 cm to first bend, ca. 1.5 cm to second bend, bristle curling, ca. 10 cm. Fl. and fr. Jun–Aug.

Mountain valleys, plains, rocky slopes; 500–2300 m. N Gansu, Hebei, Shanxi, N Xinjiang [Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

This is a widespread species yielding good forage in the steppe zone when young. After the fruiting heads appear the sharp calluses can cause damage to cattle.

7. *Stipa grandis* P. A. Smirnov, Repert. Spec. Nov. Regni Veg. 26: 267. 1929.

大针茅 da zhen mao

Perennial, densely tufted. Culms 50–100 cm tall, 3–4-noded, lower nodes concealed. Basal leaves often reaching to panicle, leaf sheaths smooth or scabrid, lower longer than internodes; leaf blades filiform, convolute, up to 50 cm, outer surface smooth; ligule of basal leaves rounded, 0.5–1 mm, ciliate, of culm leaves lanceolate, 2.5–10 mm. Panicle narrow, 20–50 cm, base enclosed by expanded uppermost leaf sheath. Spikelets greenish purple; glumes narrowly lanceolate, 3–4.5 cm, apex filiform; callus pungent, 4–4.5 mm; lemma 15–17 mm, shortly hairy in longitudinal lines, a ring of short hairs at awn articulation; awn deciduous, 20–28 cm, scabrid, 2-geniculate, column 7–10 cm to first bend, 2–2.5 cm to second bend, bristle curling, 11–18 cm. Fl. and fr. May–Aug.

Flat open steppes; 100–3400 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi [Mongolia, Russia].

This species is very close to *Stipa capillata*, but with larger spikelets and longer awns. It provides good forage for grazing and cutting in the steppe zone.

8. *Stipa tianschanica* Roshevitz in B. Fedtschenko, Fl. Aziatsk. Ross. 1(12): 149. 1916.

天山针茅 tian shan zhen mao

Culms 10–25 cm tall, 2–3-noded, glabrous or pubescent below nodes. Basal leaves equaling or overtopping culms; leaf sheaths glabrous, shorter than internodes; leaf blades convolute, acicular, outer surface smooth or scabrid; ligule ca. 1 mm, obtuse, densely pilose. Panicle contracted, 4–10 cm, branches usually enclosed by inflated uppermost leaf sheath. Spikelets pale

greenish; glumes narrowly lanceolate, equal or lower glume slightly longer, 2–3.5 cm, apex hyaline, long attenuate-filiform; callus pungent, 1.5–2 mm; lemma 7–10 mm, pilose in longitudinal lines, apex with a ring of short hairs or glabrous; awn deciduous, 6–13 cm, 1-geniculate, column 1–2.5 cm, glabrous, bristle 4–14 cm, plumose, hairs 3–6 mm. Fl. and fr. Jun–Jul.

Dry mountain slopes, dry steppes, deserts; 300–4500 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Uzbekistan].

This is the only species in China with a clearly 1-geniculate awn with glabrous column and feathery bristle. The twisted column is almost smooth, and the hairs of the feather begin just below the bend, splaying out around it. It is a good forage grass.

- 1a. Lemma apex scabrid, with a ring of short hairs 8a. var. *tianschanica*
- 1b. Lemma apex smooth, glabrous.
 - 2a. Glumes 2–2.5 cm; awn bristle 4–7 cm 8b. var. *gobica*
 - 2b. Glumes 3–3.5 cm; awn bristle 10–15 cm 8c. var. *klemenzi*

8a. *Stipa tianschanica* var. *tianschanica*

天山针茅(原变种) tian shan zhen mao (yuan bian zhong)

Stipa potaninii Roshevitz.

Culms 17–23 cm tall. Panicle ca. 5 cm. Glumes 2.7–3.3 cm; lemma 7–8 mm, apex scabrid, with a ring of short hairs; awn 7–9.5 cm, column 1.2–1.5 cm, bristle 6–7 cm, hairs to 6 mm. Fl. and fr. Jun–Jul.

Dry mountain slopes; 2100–2600 m. Gansu, Qinghai, Xinjiang, Xizang [Kazakhstan (Tien Shan), Kyrgyzstan, Uzbekistan].

This variety has the most westerly distribution within the species, being more or less confined to the Tien Shan range.

8b. *Stipa tianschanica* var. *gobica* (Roshevitz) P. C. Kuo & Y. H. Sun, Fl. Reipubl. Popularis Sin. 9(3): 277. 1987.

戈壁针茅 ge bi zhen mao

Stipa gobica Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 5: 13. 1924; *S. gobica* var. *wulateica* Y. Z. Zhao; *S. sinomongolica* Ohwi; *S. tianschanica* subsp. *gobica* (Roshevitz) D. F. Cui; *S. wulateica* (Y. Z. Zhao) Y. Z. Zhao.

Culms 10–12 cm tall. Panicle 4–7 cm. Glumes 2–2.5 cm; lemma 7.5–8.5 mm, apex smooth, without a ring of short hairs; awn 6–8 cm, column 1–1.5 cm, bristle 4–6 cm, hairs 3–5 mm. Fl. and fr. Jun–Jul.

Gravelly slopes, stony plains, dry steppes, deserts; 300–4500 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang [Mongolia].

8c. *Stipa tianschanica* var. *klemenzi* (Roshevitz) Norlindh, Fl. Mongol. Steppe 1: 66. 1949.

石生针茅 shi sheng zhen mao

Stipa klemenzi Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 5: 12. 1924.

Culms 20–40 cm tall. Panicle 6–10 cm. Glumes 3–3.5 cm; lemma 9–11 mm, apex smooth, without a ring of short hairs; awn 9.5–13 cm, column 1.5–2.5 cm, bristle 10–15 cm, hairs up to 6.5 mm. Fl. and fr. Jun–Jul.

Gravelly slopes; ca. 1400 m. Nei Mongol [Mongolia, Russia (near Mongolian border)].

9. *Stipa consanguinea* Trinius & Ruprecht, Sp. Gram. Stipac. 78. 1842.

宜红针茅 yi hong zhen mao

Perennial, tufted. Culms erect or geniculate at base, 15–50 cm tall, 2-noded. Leaf sheaths shorter than internodes; leaf blades grayish green, setaceous, abaxial surface smooth, glabrous; ligule of basal leaves 0.1–0.4 mm, of culm leaves 1–1.5 mm. Panicle contracted, 6–8 cm, base enclosed in uppermost leaf sheath. Spikelets tinged purplish; glumes subequal, 2.2–2.6 cm, hyaline, apex long acuminate; callus short; lemma 8–10 mm, hairy in longitudinal lines, hairs denser in lower part, a ring of short hairs at awn articulation; awn deciduous, 8–11 cm, pubescent, 1(or 2)-geniculate, hairs on column 0.2–0.4 mm, bristle slightly flexuous, hairs 0.4–0.7 cm. Fl. and fr. May–Jul.

Open stony slopes; 1500–2500 m. Xinjiang [Mongolia (Altai), Russia (Altai)].

This species has sometimes been considered conspecific with *Stipa koelzii* (a synonym of *S. capillacea* in this treatment), but it has much larger glumes lacking filamentous tips and more clearly pubescent, non-spiralling awns. It also grows in drier habitats.

10. *Stipa mongolorum* Tzvelev, Rast. Tsent. Azii 4: 57. 1968.

蒙古针茅 meng gu zhen mao

Perennial, densely tufted. Culms 15–40 cm tall, 1–2-noded, pubescent below nodes. Basal leaves 1/2 length of culms; leaf sheaths glabrous or hairy on margin, shorter than internodes; leaf blades acicular, convolute, outer surface smooth or almost so; ligule 0.3–0.5 mm, densely hairy. Panicle open, lax, 8–20 cm, shortly exserted from uppermost leaf sheath. Spikelets pale greenish; glumes subequal or lower slightly longer, narrowly lanceolate, 1.4–1.9 cm, membranous, apex acuminate-filiform; callus pungent, 1.5–2 mm; lemma 6–7.5 mm, uniformly densely pilose; awn deciduous, 4.5–6.4 cm, plumose throughout, 1-geniculate, column 0.4–0.7 cm, hairs ca. 2 mm, bristle 4–6 cm, hairs 2–3.5 mm. Fl. and fr. Jun–Aug.

Rocky or stony slopes, dry steppes; ca. 1500 m. Nei Mongol, Ningxia (Helan Shan) [Mongolia].

The awn has a shorter column in proportion to the bristle than in *Stipa caucasica*.

11. *Stipa caucasica* Schmalhausen, Ber. Deutsch. Bot. Ges. 10: 293. 1892.

镰芒针茅 lian mang zhen mao

Densely tufted perennial, roots thick, tomentose, clothed in sand grains; old basal sheaths forming large clumps. Culms 15–30 cm tall, 2–3-noded, lower internodes pubescent. Basal leaves 2/3 length of culms; leaf sheaths shorter than internodes; leaf blades acicular, convolute, outer surface smooth or scabrid,

ligule of basal leaves truncate, ca. 0.5 mm, of culm leaves rounded, 1–1.5 mm, ciliate. Panicle narrow, 5–10 cm, branches enclosed in inflated uppermost leaf sheath. Spikelets pale green-brown sometimes faintly purple-tinged; glumes equal or lower glume slightly longer, narrowly lanceolate, 1.5–4 cm, apex long attenuate-filiform; callus pungent, 1–2 mm; lemma 7–10 mm, pilose in longitudinal lines, a ring of soft hairs at apex; awn deciduous, 5–12 cm, hairy throughout, 1-geniculate, column 1.5–2.3 cm, hairs 1–2 mm, bristle 5–8 cm, falcately curved, plumose, hairs 3–5 mm. Fl. and fr. Apr–Jun.

Stony mountain slopes, sand dunes, gravel plains; 1400–5100 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang, Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan, Turkmenistan; SW Asia (Caucasus, N Iran)].

This is a widespread and highly polymorphic species. Variation in China is best accommodated within the following two subspecies. *Stipa caucasica* subsp. *glareosa* has a rather more easterly distribution, but smaller, scabrid-leaved forms occur sporadically throughout the range of the species in part related to increased altitude. The species is close to *S. orientalis*, the most obvious difference being the 1-geniculate awn. Hybrids between *S. caucasica* and *S. orientalis* have been reported.

- 1a. Leaf blades usually smooth on outer surface; glumes 3.5–4 cm; awn 7–12 cm 11a. subsp. *caucasica*
- 1b. Leaf blades usually scabrid on outer surface; glumes 1.5–3.5 cm; awn 4.5–7 cm ... 11b. subsp. *glareosa*

11a. *Stipa caucasica* subsp. *caucasica*

镰芒针茅(原亚种) lian mang zhen mao (yuan ya zhong)

Stipa orientalis Trinius var. *grandiflora* Ruprecht.

Plant coarse, at least 20 cm tall; leaf blades 0.5–1 mm in diam., outer surface usually smooth; glumes 3.5–4 cm; awn 7–14 cm.

Stony slopes, landslips; 1400–4500 m. Xinjiang, Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan; SW Asia (Caucasus, N Iran)].

This subspecies provides fodder in early spring in desert steppe.

11b. *Stipa caucasica* subsp. *glareosa* (P. A. Smirnov) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 20. 1974.

沙生针茅 sha sheng zhen mao

Stipa glareosa P. A. Smirnov, Bull. Soc. Imp. Naturalistes Moscou 38: 12. 1929; *S. caucasica* f. *desertorum* Roshevitz; *S. caucasica* subsp. *desertorum* (Roshevitz) Tzvelev; *S. caucasica* var. *desertorum* (Roshevitz) Tzvelev; *S. glareosa* var. *langshanica* Y. Z. Zhao; *S. langshanica* (Y. Z. Zhao) Y. Z. Zhao.

Plant delicate, up to 20 cm tall; leaf blades 0.25–0.5 mm in diam., outer surface usually scabrid; glumes 2–3.5 cm; awn 4.5–7 cm.

Stony mountain slopes, sand dunes, gravel plains; 600–5100 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang, Xizang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan].

Stipa langshanica appears to represent a small, local variant from a mountain range in Nei Mongol. The type has not been seen.

12. *Stipa orientalis* Trinius in Ledebour, Fl. Altaic. 1: 83. 1829.

东方针茅 dong fang zhen mao

Perennial, densely tufted; old basal sheaths forming large clumps, yellowish, slightly glossy, margins ciliate. Culms 15–35 cm tall, 2–3-noded, nodes purple, internodes puberulous. Basal leaves 1/2–2/3 length of culms; leaf sheaths shorter than internodes; leaf blades filiform, convolute, 4–15 cm, abaxial surface scaberulous-puberulous; ligule lanceolate, 2–4 mm, ciliate. Panicle contracted, 4–8 cm, branches frequently enclosed by inflated uppermost leaf sheath. Spikelets green, or occasionally faintly purple-tinged, with silvery tips; glumes narrowly lanceolate, lower usually slightly longer, 1.8–2.2 cm, apex scarious, finely long-acuminate; callus pungent, ca. 2 mm; lemma 7–8 mm, pilose in ventral line and along midvein, intermediate veins pilose at least below middle, a ring of short soft hairs at awn articulation; awn deciduous, 4–6 cm, hairy throughout, 2-geniculate, column 0.7–1.2 cm to first bend, 0.5–0.8 cm to second bend, shortly hairy, hairs 0.5–1 mm, bristle 3–4 cm, plumose, hairs 3–4 mm at base reducing toward apex. Fl. and fr. May–Jul.

Rocky slopes, mountain valleys, desert steppes; 400–5100 m. Qinghai, Xinjiang, Xizang [Kashmir, Kyrgyzstan, W Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; Europe (Ural)].

This is a good forage grass in desert steppe regions.

13. *Stipa arabica* Trinius & Ruprecht, Sp. Gram. Stipac. 77. 1842.

图尔盖针茅 tu er gai zhen mao

Stipa arabica subsp. *caspia* (K. Koch) Tzvelev; *S. arabica* var. *szovitsiana* Trinius; *S. arabica* var. *turgaica* (Roshevitz) Tzvelev; *S. caspia* K. Koch; *S. szovitsiana* (Trinius) Grisebach; *S. turgaica* Roshevitz.

Perennial, tufted. Culms 40–80 cm tall, gray pubescent, 2–3-noded, nodes often dark-brown. Basal leaves 1/2 length of culms; leaf sheaths shorter than internodes, pubescent or lower part subglabrous; leaf blades filiform, convolute, outer surface glabrous to densely pilose; ligule lanceolate, 5–10 mm. Panicle contracted, 15–35 cm, base enclosed by slightly inflated uppermost leaf sheath. Spikelets pale green or greenish yellow; glumes narrowly lanceolate, 2–3 cm, membranous, apex long-acuminate; callus pungent, ca. 1 mm; lemma 9–12 mm, shortly hairy in longitudinal lines not reaching apex, a ring of hairs at awn articulation; awn 9–20 cm, deciduous, hairy throughout, 2-geniculate, column 1.5–1.8 cm to first bend, hairs ca. 1 mm, ca. 1.5 cm to second bend, bristle 6–7 cm, plumose on second column and bristle, hairs 1–2.5 mm. Fl. and fr. May–Jul.

Rocky slopes, Gobi desert; 500–3100 m. Xinjiang, Xizang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

This is a widespread and variable species, reaching the eastern limit of its range in W China. It is sometimes subdivided into more narrowly defined species or infraspecific taxa based on variations in leaf indumentum and spikelet size. Chinese material is referable to subsp. *caspia*, or *Stipa caspia* at specific rank. *Stipa arabica* subsp. *arabica* from SW Asia has lemmas 7–9 mm and awns not exceeding 9 cm. *Stipa*

turgaica is based on a form with densely pilose leaf blades. *Stipa arabica* is a good forage grass in desert steppe regions.

14. *Stipa breviflora* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 82. 1868.

短花针茅 duan hua zhen mao

Perennial, forming spreading tuft; old basal sheaths pubescent. Culms sometimes geniculate, 20–60 cm tall, 1–3-noded. Basal leaves 1/4–1/3 length of culms; leaf sheaths shorter than internodes; leaf blades acicular, convolute, 7–15 cm, outer surface glabrous; ligule of basal leaves 0.5–1.5 mm, rounded, ciliate, of culm leaves up to 2 mm. Panicle loosely contracted, 10–25 cm, base enclosed by uppermost leaf sheath. Spikelets pale gray-green or light brown with silvery tips; glumes narrowly lanceolate, lower often slightly longer, 1.2–2 cm, apex scarious, acuminate into fragile filiform extension; callus pungent, 1.2–1.5 mm; lemma 0.6–0.8 cm, pilose along veins in lower half, minutely asperulous above, scabrid-spinulose below apex, a ring of short stiff hairs at awn articulation; awn 5.5–8 cm, deciduous, hairy throughout, 2-geniculate, column 1–1.6 cm to first bend, 0.7–1 cm to second bend, hairs 0.8–1 mm, bristle 3–6 cm, hairs 1–1.5 mm. Fl. May–Jul.

Gravel and rocky slopes; 700–4700 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [Kashmir, Kazakhstan (Tien Shan), Kyrgyzstan, Mongolia, Nepal, Tajikistan, Uzbekistan].

This species is easily recognized by its shortly plumose awn, spinulose lemma apex, and hairy basal sheaths. The long filiform glume tips are readily broken off, so that the spikelets appear to be much shorter. This is a spring forage grass in desert steppe regions.

15. *Stipa purpurea* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 82. 1868.

紫花针茅 zi hua zhen mao

Lasiagrostis tremula Ruprecht; *Ptilagrostis purpurea* (Grisebach) Roshevitz; *Stipa purpurea* subsp. *arenosa* (Tzvelev) D. F. Cui; *S. purpurea* var. *arenosa* Tzvelev; *S. pilgeriana* K. S. Hao.

Perennial, densely tufted. Culms 20–45 cm tall, 1–2-noded. Basal leaves 1/2 length of culms; leaf sheaths smooth, longer than internodes; leaf blades acicular, convolute, outer surface smooth or scabrid; ligule of basal leaves ca. 1 mm, obtuse, ciliate, of culm leaves lanceolate, 3–6 mm, decurrent and adnate to margins of leaf sheath. Panicle open, up to 15 cm, base enclosed in elongate purple uppermost leaf sheath, spikelets few; branches 3–6 cm, capillary, flexuous. Spikelets purple; glumes lanceolate, 1.3–2.5 cm, apex acuminate into 2–3 mm awn point; callus pungent, 1.5–2.2 mm; lemma 8–12 mm, back softly pubescent, apex without ring of hairs; awn deciduous, 6–9 cm, plumose throughout, hairs 2–3 mm, 2-geniculate, column 1.5–1.8 cm to first bend, 0.7–1 cm to second bend, bristle 4.5–7 cm. Fl. and fr. Jun–Oct.

Stony slopes, valley silt, sand or gravel flats; 1900–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Kashmir, Kyrgyzstan (Pamirs), Tajikistan (Tien Shan)].

This species provides forage in mountain areas. At high altitudes it often occurs in *Kobresia pygmaea* turf.

16. *Stipa roborowskyi* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 1(6): 1. 1920.

昆仑针茅 kun lun zhen mao

Perennial, forming dense tussocks. Culms 30–75 cm tall, 2–3-noded. Basal leaves 1/2–2/3 length of culms; leaf sheaths longer than internodes; leaf blades acicular, convolute, 8–10 cm, outer surface sparsely pubescent; ligule of basal leaves lanceolate, 2–5 mm, of culm leaves 3–7(–12) mm. Panicle 15–30 cm, base included in uppermost leaf sheath; branches obliquely ascending, straight, 2–4 cm. Spikelets green or tinged pale purple; glumes narrowly lanceolate, 1.4–1.6 cm, apex finely acuminate; callus pungent, 1–3 mm; lemma 7–8 mm, back pubescent, a ring of hairs at awn articulation; awn deciduous, 4–6 cm, hairy throughout, 2-geniculate, column plumose with ca. 2 mm hairs, 0.6–0.7 cm to first bend, ca. 1 cm to second bend, bristle 3–4 cm, hairs 0.3–0.7 mm. Fl. and fr. Jul–Sep.

Grassy mountainsides, silt fans and gravelly places by lakes; 3500–5100 m. Qinghai, Xinjiang (Kunlun Shan, Pamirs), Xizang [India (Sikkim), Kashmir].

This is a good forage grass in steppe and meadow steppe regions.

17. *Stipa regeliana* Hackel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1: 130. 1884.

狭穗针茅 xia sui zhen mao

Stipa purpurascens Hitchcock.

Perennial, densely tufted. Culms 20–50 cm tall. Basal leaves 1/3–1/2 length of culms; leaf sheaths glabrous; leaf blades setaceous, convolute, outer surface smooth or slightly scaberrulous, apex often with a tuft of ca. 0.2 mm spinules; ligule lanceolate, 4–6 mm, puberulent. Panicle narrow, 3–10 cm, exerted from uppermost leaf sheath; branches suberect, spikelets few. Spikelets purple with pale tips; glumes subequal or lower glume slightly longer, narrowly oblong, 1.1–1.4 cm, membranous, apex acute to finely acuminate; callus pungent, 1–1.5 mm; lemma 7–8 mm, pubescent, hairs slightly longer below awn; awn stout, stiff, 1.5–2 cm, 1–2-geniculate, column weakly twisted, shortly plumose, 0.3–0.5 cm to first bend, ca. 0.5 cm to second bend, this sometimes obscure, hairs 0.7–1 mm decreasing toward bristle, bristle ca. 1 cm, setulose, hairs appressed, 0.1–0.2 mm. Fl. and fr. Jul–Sep.

Montane grasslands, alluvial flats in mountain valleys, floodplains; 1600–4600 m. Gansu, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Kashmir, E Kazakhstan, Kyrgyzstan (Tien Shan), Tajikistan (E Pamirs)].

The combination “*Achnatherum purpurascens* (Hitchcock) Keng” (Claves Gen. Sp. Gram. Prim. Sin. 106, 213. 1957) was not validly published because Keng did not cite the place and date of valid publication of the basionym.

This is a forage grass in montane regions.

18. *Stipa subsessiliflora* (Ruprecht) Roshevitz in B. Fedtschenko, Izv. Imp. Bot. Sada Petra Velikago 14 (Suppl. 2): 50. 1915.

座花针茅 zuo hua zhen mao

Lasiagrostis subsessiliflora Ruprecht in Osten-Sacken &

Ruprecht, Sert. Tianschan. 35. 1869; *Ptilagrostis subsessiliflora* (Ruprecht) Roshevitz; *Stipa basiplumosa* Munro ex J. D. Hooker; *S. subsessiliflora* subsp. *basiplumosa* (Munro ex J. D. Hooker) D. F. Cui; *S. subsessiliflora* var. *basiplumosa* (Munro ex J. D. Hooker) P. C. Kuo & Y. H. Sun.

Perennial, densely tufted. Culms 10–45 cm tall, 2–3-noded. Basal leaves 1/3 length of culms; leaf sheaths glabrous, lower shorter than internodes, upper longer than internodes; leaf blades setaceous, convolute, basal blades up to 15 cm, outer surface scabrid; ligule lanceolate, 2–4 mm or slightly shorter at base. Panicle narrow, 7–14 × 1–2 cm, base enclosed by uppermost leaf sheath when young; branches suberect, 1–3 cm. Spikelets purple; glumes equal or lower longer, lanceolate-oblong, 0.6–1.1 cm, papery, apex scarious, acute to attenuate-mucronate; callus pungent, ca. 1 mm; lemma 4–6 mm, pubescent; awn deciduous, 1.5–2.7 cm, 2-geniculate, column plumose, hairs to first bend 2–3 mm, hairs to second bend 1–1.5 mm, bristle scabrid. Fl. and fr. Jul–Sep.

Stony slopes, alluvial plains, sandy river banks; 1900–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Kashmir, E Kazakhstan, Kyrgyzstan, Russia (Altai), Tajikistan, Uzbekistan].

This is a high mountain species, yielding good forage.

19. *Stipa penicillata* Handel-Mazzetti, Oesterr. Bot. Z. 85: 226. 1936.

疏花针茅 shu hua zhen mao

Perennial, tufted. Culms 25–70 cm tall, 1–2-noded. Basal leaves reaching to panicle; leaf sheaths scabrid to white-hirsute; leaf blades setaceous, convolute, basal blades up to 30 cm, outer surface densely scabrid with some longer spinules or hirsute; ligule lanceolate, 3–7 mm, acute. Panicle open, 15–25 cm, exerted from uppermost leaf sheath; branches with axillary cushions, capillary, flexuous, with 2–4 spikelets. Spikelets green or flushed purplish; glumes subequal or lower slightly longer, lanceolate-oblong, 0.8–1 cm, apex acuminate into a fine point; callus pungent, ca. 1 mm; lemma 5–8 mm, pilose; awn ca. 2 cm, deciduous, 1–2-geniculate, column plumose, hairs 3–4 mm, 0.3–0.7 cm to first bend, 0.4–0.5 cm to second bend, this sometimes obscure, bristle 0.7–1.8 cm, scabrid. Fl. and fr. Jun–Sep.

• Mountain slopes, sand and gravel of river and lake valleys; 1400–5200 m. Gansu, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang.

- 1a. Leaf sheaths and blades scabrid; ligule glabrous on back 19a. var. *penicillata*
- 1b. Leaf sheaths and blades densely hirsute; ligule hairy on back, ciliolate along margin 19b. var. *hirsuta*

19a. *Stipa penicillata* var. *penicillata*

疏花针茅(原变种) shu hua zhen mao (yuan bian zhong)

Stipa laxiflora Keng.

Leaf sheaths and blades scabrid; ligule glabrous on back. Fl. and fr. Jun–Sep.

• Mountain slopes, sand and gravel of river and lake valleys; 1400–5200 m. Gansu, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang.

This is a good forage grass when young.

19b. *Stipa penicillata* var. *hirsuta* P. C. Kuo & Y. H. Sun, Bull. Bot. Res., Harbin 4(4): 89. 1984.

毛疏花针茅 mao shu hua zhen mao

Leaf sheaths and blades densely hirsute with gray-white hairs; ligule hairy on back, ciliate along margin. Awn distinctly 2-geniculate. Fl. and fr. Jul–Sep.

• Dry mountain slopes, ravine sides; 3400–4500 m. Qinghai.

20. *Stipa aliena* Keng, Sunyatsenia 6(1): 74. 1941.

异针茅 yi zhen mao

Perennial, tufted. Culms 20–40 cm tall, 1–2-noded. Basal leaves 1/2–2/3 length of culms; leaf sheaths smooth, glabrous, longer than internodes; leaf blades setaceous, convolute, basal blades up to 24 cm, outer surface smooth; ligule rounded, 1–1.5 mm, shorter in basal leaves, hairy on back. Panicle open, 10–15 cm; branches without axillary cushions, loosely ascending. Spikelets gray-purple; glumes subequal, lanceolate, 1–1.3 cm, apex slenderly acuminate; callus pungent, ca. 1 mm; lemma 6.5–8 mm, pilose; awn persistent, 1.8–2.5 cm, 2-geniculate, column 0.4–0.5 cm to first bend, plumose, hairs 1–2 mm at base reducing toward first bend, 0.4–0.5 cm to second bend, puberulous, bristle 1–1.5 cm, appressed-puberulous. Fl. and fr. Jul–Sep.

• Damp grassy mountain slopes, silt fans, river banks; 2900–4600 m. Gansu, Qinghai, Sichuan, Xizang.

This is a good forage grass in steppe regions.

21. *Stipa lessingiana* Trinius & Ruprecht, Sp. Gram. Stipac. 79. 1842.

细叶针茅 xi ye zhen mao

Perennial, tufted. Culms 30–60 cm tall, 2–3-noded. Basal leaves 1/2–2/3 length of culms; leaf sheaths smooth or margins ciliate, longer than internodes; leaf blades setaceous, up to 35 cm, 0.3–0.5 mm in diam., outer surface scabrid at least in apical part; ligule of basal leaves 0.2–0.5 mm, rounded, ciliate, of culm leaves 1–2 mm. Panicle narrow, 10–20 cm, base enclosed by uppermost leaf sheath. Spikelets yellowish green; glumes subequal, linear-lanceolate, 2–3 cm, apex attenuate into hyaline filament; callus pungent, 1.5–2 mm; lemma 8–10 mm, pubescent, densely in lower part and sparsely in upper part, a ring of short hairs at apex; awn deciduous, 15–20 cm, 2-geniculate, column 2–3 cm to first bend, smooth, glossy, 1–1.5 cm to second bend, bristle 8–15 cm, plumose, hairs 2–3 mm. Fl. and fr. May–Jul. $2n = 44$.

Rocky hill slopes, piedmont regions; 800–1300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, S Russia, Tajikistan, Turkmenistan; SW Asia (Caucasus, Iran), E Europe].

Stipa hohenackeriana Trinius & Ruprecht has been reported from Xinjiang. It differs from *S. lessingiana* by the smooth outer surface of the leaf blades, longer ligules (1.5–5 mm), and scabrid awn column.

Stipa lessingiana is a good forage grass in steppe regions.

22. *Stipa kirghisorum* P. A. Smirnov, Repert. Spec. Nov. Regni Veg. 21: 232. 1925.

大羽针茅 da yu zhen mao

Stipa pennata Linnaeus subsp. *kirghisorum* (P. A. Smirnov) Freitag.

Perennial, tufted. Culms 35–60 cm tall, 4-noded. Basal leaves 2/3 to equaling length of culms; leaf sheaths longer than internodes, scabrid, lowermost with ciliate margins; leaf blades setaceous, convolute, 0.5–0.7 mm in diam., outer surface scabrid; ligule of basal leaves 1–1.5 mm, rounded, margin ciliate, of culm leaves up to 4 mm, acuminate. Panicle narrow, 10–15 cm, branches often enclosed by uppermost leaf sheath. Spikelets yellowish green; glumes subequal, lanceolate, 3.5–5 cm, apex acuminate into long fragile filiform tip; callus pungent, 2.5–4 mm; lemma 14–18 mm, hairs in longitudinal lines, marginal line terminating 1–2 mm below apex, dorsal lines separate to base, apex glabrous; awn deciduous, 16–26 cm, 2-geniculate, column smooth, glossy, 5–6 cm to first bend, 1–2 cm to second bend, bristle 12–18 cm, plumose, hairs 4–5 mm. Fl. and fr. May–Sep.

Rocky mountain slopes, alluvial fans, dry steppes; 300–2400 m. Xinjiang [Afghanistan (Hindu Kush), Kashmir, Kazakhstan, Kyrgyzstan, W Mongolia, N Pakistan, Tajikistan, Uzbekistan].

This is part of the widespread *Stipa pennata* complex, extending from W Europe to Siberia and the Himalayas, and including a number of subsidiary taxa. *Stipa kirghisorum* is one of the more distinctive segregates, differing from *S. pennata* s.s. by the longer marginal lines of hairs on the lemma and dorsal lines separate to the base. It is a common forage grass in steppe regions.

23. *Stipa macroglossa* P. A. Smirnov, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 5: 47. 1924.

长舌针茅 chang she zhen mao

Perennial. Culms 30–50 cm tall, 2–3-noded, pubescent below nodes. Basal leaves nearly equal to culms; leaf sheaths shorter than internodes, scabrid; leaf blades setaceous, convolute, ca. 0.5 mm in diam., outer surface strongly scabrid; ligule linear-lanceolate, 4–7(–12) mm, laterally decurrent and adnate to margins of leaf sheath. Panicle contracted, 10–15 cm, base enclosed by expanded uppermost leaf sheath. Spikelets yellowish green; glumes 4–5.5 cm, apex long acuminate-filiform; callus pungent, ca. 3 mm; lemma 12–16 mm, hairs in longitudinal lines, marginal line terminating 2.5–3.5 mm below apex, other lines shorter, apex glabrous; awn deciduous, 15–28 cm, 2-geniculate, column smooth, glossy, 3–4.5 cm to first bend, ca. 2 cm to second bend, bristle 15–20 cm, plumose, hairs 3–6 mm. Fl. and fr. Jun–Sep.

Dry steppes, rocky slopes; 800–1800 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan].

This is a member of the *Stipa pennata* complex, distinguished by an exceptionally long ligule. It provides good forage when young in steppe regions.

51. PTILAGROSTIS Grisebach in Ledebour, Fl. Ross. 4: 447. 1852.

细柄茅属 xi bing mao shu

Stipa sect. *Ptilagrostis* (Grisebach) Hackel.

Perennials, densely tufted. Culms slender, erect. Leaf blades setaceous. Inflorescence an open or loosely contracted panicle. Spikelets with 1 floret, bisexual, disarticulating above glumes; rachilla extension absent; glumes lanceolate to elliptic-oblong, subequal, a little longer than floret, herbaceous to scarious, 1–3-veined, apex obtuse to acuminate; callus short, obtuse, shortly bearded; lemma lanceolate, terete, papery, 3–5-veined, pubescent or pilose, margins not overlapping, apex minutely or distinctly 2-toothed, awned from between teeth; awn persistent, plumose throughout, 1(or 2)-geniculate, column twisted; palea midline exposed between lemma margins. Lodicules 3. Stamens 3, anthers glabrous or apex with hair tufts. Stigmas 2.

Eleven species: E Tajikistan (Pamirs) to Russia (NE Siberia), also W United States, on mountains; seven species (two endemic) in China.

Ptilagrostis pelliottii is a distinct and readily separable species, but most of the remainder of the genus comprises a complex of intergrading forms and local variants. The genus is weakly separated from *Stipa*, *S. subsessiliflora* being intermediate.

- 1a. Ligule truncate, ciliate; leaf blades fairly stiff; glumes lanceolate, sharply acuminate; gravelly and rocky places on desert plains 1. *P. pelliottii*
- 1b. Ligule oblong or lanceolate, rounded, glabrous; leaf blades softer; glumes elliptic or oblong-lanceolate, obtuse to acute; alpine meadows and high hilly steppe.
 - 2a. Panicle open, 3–5 cm wide; branches up to 6 cm, spreading.
 - 3a. Glumes 2.6–3.5 mm; awn 0.6–1 cm 2. *P. luquensis*
 - 3b. Glumes 4.5–7 mm; awn 1–3 cm.
 - 4a. Anthers 1–2 mm, with hair-tufts at apex; glumes gray-brown or purplish, whitish at apex; awn 1–2 cm 3. *P. dichotoma*
 - 4b. Anthers 1.8–3 mm, glabrous; glumes dark-purple at base, otherwise whitish; awn 1.5–3 cm 4. *P. mongholica*
 - 2b. Panicle contracted, 0.7–2 cm wide; branches 0.3–2.8 cm, suberect or narrowly ascending.
 - 5a. Spikelets 8–12 mm; glumes unequal 5. *P. yadongensis*
 - 5b. Spikelets 4–7 mm; glumes subequal.
 - 6a. Panicle with sheathing membranous bract at base of lowest branches; spikelets purple; lemma 3.5–5 mm; awn 1–1.5 cm 6. *P. concinna*
 - 6b. Panicle without membranous bract at base of lowest branches; spikelets brownish mauve; lemma 4.5–6 mm; awn 1.5–2 cm 7. *P. junatovii*

1. *Ptilagrostis pelliottii* (Danguy) Grubov, Consp. Fl. Mongol. 62. 1955.

中亚细柄茅 zhong ya xi bing mao

Stipa pelliottii Danguy in Lecomte, Notul. Syst. (Paris) 2: 167. 1912.

Perennial, densely tufted from a short rhizome, old basal sheaths persistent. Culms 20–50 cm tall, 1–2 mm in diam., 2–3-noded. Leaf blades gray-green, fairly rigid, setaceous, (3–)6–10 cm, abaxial surface scabrid; ligule truncate, ca. 1 mm, margin ciliate. Panicle lax, up to 10 × 3–4 cm; branches usually paired, capillary, 2.5–4 cm, lower part bare. Spikelets yellowish; glumes lanceolate, 5–6 mm, 3-veined with lateral veins short, membranous, smooth, apex sharply acuminate; lemma 3–4 mm, 3-veined, veins convergent at apex, evenly pubescent throughout, apex minutely 2-toothed; awn 2–3 cm, strongly curved near base, column short, twisted, plumose; palea subequal to lemma, 1-veined. Anthers ca. 2.5 mm, apex glabrous. Fl. and fr. Aug–Oct.

Desert plains, rocky slopes, on rocks and gravel; 1100–3500 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Mongolia (Gobi Desert)].

2. *Ptilagrostis luquensis* P. M. Peterson et al., Sida 21: 1356. 2005.

短花细柄茅 duan hua xi bing mao

Perennial, densely tufted. Culms 5–23 cm tall, 0.5–0.8 mm in diam., 1-noded. Leaf blades filiform, 2–6 cm, abaxial surface smooth or scaberulous; ligule oblong, 0.4–1.2 mm. Panicle open, ovate in outline, 2–5.2 × 1–3 cm; branches single or paired, loosely ascending or spreading, prominent axillary cushions present, capillary, bare in lower part; pedicels 3–12 mm. Spikelets whitish with purplish base; glumes oblanceolate to elliptic-oblong, 2.6–3.5 mm, lower glume 1–3-veined, upper glume 3–5-veined, apex scaberulous, obtuse; lemma 2.2–2.7 mm, pilose below middle, densely scaberulous above; awn 0.6–1 cm, column twisted, plumose, hairs 1.2–2 mm; palea subequal to lemma, 2-veined. Anthers 1–1.4 mm, bearded at apex. Fl. and fr. Jul–Sep.

• Grassy plains; 3300–4800 m. Gansu, Qinghai, Sichuan, Xizang.

3. *Ptilagrostis dichotoma* Keng ex Tzvelev, Rast. Tsent. Azii 4: 43. 1968.

双叉细柄茅 shuang cha xi bing mao

Perennial, densely tufted. Culms 15–50 cm tall, 0.7–1 mm in diam., 1–2-noded. Leaf blades setaceous, up to 20 cm, abaxial surface smooth or scabrid; ligule triangular or lanceolate, 1–3 mm. Panicle open, ovate in outline, 6–10(–14) × 2–6 cm; branches usually single, rarely paired, dichotomously branched, sometimes with prominent axillary cushions, filiform, bare in lower part; pedicels slender, 5–15 mm. Spikelets purplish or gray-brown, whitish at apex; glumes elliptic, 4.5–

6.5 mm, 3-veined, apex usually smooth, obtuse to acute; lemma 3.6–5.2 mm, pilose below middle, scabrid or minutely pubescent above; awn 1–2 cm, column twisted, plumose, hairs 1.2–3 mm below bend, shorter above; palea equal to lemma, 2-veined. Anthers 1–2 mm, bearded at apex. Fl. and fr. Jul–Sep.

Alpine meadows, grassy mountain slopes, forests, under shrubs; 3000–4800 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, N India, Nepal].

Specimens from the southern slope of the Himalayas usually have smooth leaf blades, but those from further north generally have scabrid blades. An exceptionally tall specimen with small spikelets (3.2–4 mm) and very scabrid panicle branches, collected at 2800 m in Qinghai (Nanshan), has been separated as *Ptilagrostis dichotoma* var. *roshevitsiana* Tzvelev (Rast. Tsent. Azii 4: 43. 1968). It seems likely that this will prove to be a different species when more material is available.

Ptilagrostis dichotoma is very indistinctly separable from *P. mongholica*, and specimens from the Himalayas have been identified as the latter. However, the presence of shorter, bearded anthers does seem to be correlated with a slightly different smaller habit and shorter awns. *Ptilagrostis dichotoma* is also very close to *P. concinna*, but it lacks the sheathing, membranous bract at the base of the panicle characteristic of that species.

4. *Ptilagrostis mongholica* (Turczaninow ex Trinius) Grisebach in Ledebour, Fl. Ross. 4: 447. 1852 [“1853”].

细柄茅 xi bing mao

Stipa mongholica Turczaninow ex Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4, 2(1): 42. 1836; *Ptilagrostis tibetica* (Mez) Tzvelev; *Stipa tibetica* Mez.

Perennial, densely tufted. Culms 30–60 cm tall, 1–1.5 mm in diam., usually 2-noded. Leaf blades setaceous, up to 20 cm, abaxial surface scabrid; ligule obtuse, 1–3 mm. Panicle open, ovate in outline, 12–17 × 6–9 cm; branches single or paired, with prominent axillary cushions, widely spreading, capillary, lower part bare, pedicels long, capillary. Spikelets dark-purple or grayish at base, whitish scarious above; glumes elliptic-oblong, 4.5–6(–7) mm, 3–5-veined, apex scabrid, obtuse to acute; lemma 4–6 mm, pilose below middle, scabrid above; awn 1.5–3 cm, weakly geniculate, column slightly flexuous, plumose, hairs 1.2–1.5 mm; palea equal to lemma, 2-veined. Anthers 1.8–3 mm, glabrous at apex. Fl. and fr. Jul–Aug.

Alpine steppes; 2000–4600 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Yunnan [Bhutan, Kashmir, Mongolia, Nepal, Russia].

5. *Ptilagrostis yadongensis* P. C. Keng & J. S. Tang, J. S. W. Agric. Coll. 1985(4): 44. 1985.

大穗细柄茅 da sui xi bing mao

Ptilagrostis macrospicula L. B. Cai.

Perennial, forming small dense tussocks. Culms 8–18 cm tall, ca. 0.8 mm in diam., 1–2-noded. Leaf blades setaceous, 2–10 cm, abaxial surface glabrous; ligule lanceolate, 2.5–6 mm, denticulate. Panicle contracted, 4–8 × 0.7–1 cm, lowermost branches subtended by 2 ca. 5 mm membranous bracts; lower

branches paired, 0.3–2.8 cm, suberect, spikelets few. Spikelets brownish or purplish; glumes lanceolate, unequal, lower glume 8.5–12.5 mm, 3-veined, upper glume 8–9.5 mm, 1-veined, apex acute; lemma 5.5–8 mm, glabrous in middle part, gradually pubescent toward base and apex, apex 2-toothed; awn 14–16 mm, 1-geniculate, plumose below bend with ca. 1.5 mm hairs, pubescent above with ca. 0.4 mm hairs; palea shorter than lemma by 0.5–1.5 mm, 2-veined. Anthers 1.9–2.5 mm, glabrous at apex. Fr. Sep.

• Meadows on mountainsides; ca. 4000 m. Xizang.

6. *Ptilagrostis concinna* (J. D. Hooker) Roshevitz in Komarov, Fl. URSS 2: 75. 1934.

太毛细柄茅 tai bai xi bing mao

Stipa concinna J. D. Hooker, Fl. Brit. India 7: 230. 1896 [“1897”].

Perennial, densely tufted, old basal sheaths forming tight clusters. Culms 10–30 cm tall, 0.6–1 mm in diam., 2-noded. Leaf blades setaceous, 5–15 cm, abaxial surface smooth; ligule obtuse, 0.5–2 mm. Panicle contracted, 2–5 × 1–2 cm, lowest branches enclosed by a sheathing lanceolate membranous bract, smaller bracts present at base of some upper branches; branches usually paired, 1–2 cm, suberect, spikelets few. Spikelets dark purple or purplish red with white scarious apices; glumes elliptic, 4–6.3 mm, lower glume 1-veined, upper glume 3-veined, apex smooth, acute; lemma 3.5–5 mm, pilose below middle, scabrid above, apex 2-toothed, teeth 0.3–0.5 mm; awn 1–1.5 cm, plumose, hairs 1–1.5 mm, shorter toward apex, column loosely twisted; palea subequal to lemma, 2-veined. Anthers 1.5–2.2 mm, bearded at apex. Fl. and fr. Jul–Sep.

Alpine meadows, moist grassy places, under shrubs, swampy places, *Kobresia* moors; 3700–5400 m. Gansu, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [India (Sikkim), Kashmir, Kyrgyzstan (Tien Shan), Tajikistan (Pamirs)].

7. *Ptilagrostis junatovii* Grubov, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 3. 1955.

窄穗细柄茅 zhai sui xi bing mao

Perennial, tufted. Culms erect, 15–30 cm tall, ca. 1 mm in diam., 2-noded. Leaf blades setaceous, involute, 5–15 cm, abaxial surface smooth, prominently veined; ligule obtuse, 0.5–2 mm. Panicle contracted, 4–8(–10) × 1–1.5 cm, lowest branches without sheathing membranous bract; branches usually paired. Spikelets brownish mauve, usually purplish at base; glumes elliptic, (5–)6–7 mm, 3-veined, apex scabrid; lemma 4.5–6 mm, pilose below middle, shortly pubescent above, apex 2-toothed; awn (1–)1.5–1.7 cm, geniculate in a right angle, hairs longer on column, fewer toward apex; palea slightly shorter than lemma, 2-veined. Anthers ca. 1.2 mm, bearded at apex. Fl. and fr. Jul–Sep.

Alpine meadows, grassy mountain slopes, floodlands, forests, under shrubs; 3200–4500 m. Xinjiang, Xizang [Kazakhstan, Mongolia, Russia].

This species is very close to *Ptilagrostis concinna*, but lacks a sheathing bract at the base of the panicle.

52. ACHNATHERUM P. Beauvois, Ess. Agrostogr. 19, 146. 1812.

芨芨草属 jì jì cǎo shù

Lasiagrostis Link; *Stipa* sect. *Lasiagrostis* (Link) Hackel; *Timouria* Roshevitz.

Perennials, usually tussocky. Leaf blades linear to setaceous, flat or rolled. Inflorescence an open or contracted panicle, sometimes almost spikelike. Spikelets with 1 floret, bisexual, disarticulating above glumes; rachilla extension absent; glumes lanceolate to elliptic-oblong, subequal or slightly unequal, a little longer than floret, membranous, 1–3(–5)-veined, apex obtuse to acuminate; callus short, obtuse or acute, not pungent, shortly bearded; lemma lanceolate, terete, usually papery, sometimes becoming somewhat indurate at maturity, 3–5-veined, pilose, margins typically approximate, sometimes overlapping, apex shortly 2-toothed, awned from between teeth; awn persistent or deciduous, straight or 1(or 2)-geniculate with twisted column, scabrid throughout or column minutely hairy; palea midline often exposed between lemma margins. Lodicules 3, lanceolate. Stamens 3, anthers often with hair tufts at apex. Stigmas 2.

About 50 species: N Africa, Europe eastward to Japan, North America; 18 species (six endemic) in China.

Achnatherum is sometimes included within a more broadly defined *Stipa*, mainly because of the difficulty in placing the group of species around *A. sibiricum*, which are intermediate in their characteristics. Some species, including *A. inebrians*, are poisonous to livestock.

- 1a. Awn straight or slightly curved, without obvious column, very indistinctly twisted below, usually falling early.
 - 2a. Leaf blades 1–2 cm wide; glumes 7–9-veined 1. *A. coreanum*
 - 2b. Leaf blades 0.1–1 cm wide; glumes 1–3-veined.
 - 3a. Culms usually more than 1 m; ligule of culm leaves 5–17 mm.
 - 4a. Lemma pilose throughout; awn 0.5–1.2 cm 2. *A. splendens*
 - 4b. Lemma pilose along lateral veins; awn 0.2–0.4 cm 3. *A. brevistaristatum*
 - 3b. Culms less than 1 m; ligule of culm leaves 0.2–1 mm.
 - 5a. Panicle spikelike, 4–7 cm; glumes keeled; awn ca. 0.4 cm 4. *A. saposhnikovii*
 - 5b. Panicle open or contracted, 7–30 cm; glumes rounded on back; awn 0.4–2 cm.
 - 6a. Lemma pubescent below, a conspicuous tuft of longer hairs below apex; awn 1.5–2 cm 5. *A. inaequiglume*
 - 6b. Lemma evenly pubescent; awn 0.4–1.2 cm.
 - 7a. Ligule 0.5–1 mm 6. *A. caragana*
 - 7b. Ligule 0.1–0.2 mm or absent.
 - 8a. Densely tufted, without rhizome; leaf blades 1–2 mm wide; branches of panicle 2 per node; awn 0.4–0.8 cm 7. *A. chinense*
 - 8b. Loosely tufted, shortly rhizomatous; leaf blades 3–10 mm wide; branches of panicle 3–4 per node; awn 0.8–2 cm 8. *A. henryi*
 - 1b. Awn clearly geniculate with twisted column, persistent (caducous in *A. psilanthrum*).
 - 9a. Culms slender, less than 1 m tall, 1–1.5 mm in diam.; leaf blades usually rolled, 0.5–2(–4) mm wide.
 - 10a. Spikelets 7.5–14 mm; lemma pilose below middle; awn with pubescent column.
 - 11a. Anthers 2–2.5 mm, often glabrous 9. *A. chingii*
 - 11b. Anthers 2.8–4.5 mm, bearded 10. *A. duthiei*
 - 10b. Spikelets 5–7 mm; lemma pilose throughout; awn scabrid throughout.
 - 12a. Panicle contracted, branches suberect, spiculate to base.
 - 13a. Awn 2–3 cm, persistent; anthers 2.8–3.5 mm 11. *A. jacquemontii*
 - 13b. Awn 1.5–1.8 cm, caducous; anthers 2–2.5 mm 12. *A. psilanthrum*
 - 12b. Panicle lax, branches spreading, bare in lower part; awn 1–1.5 cm 13. *A. nakaii*
 - 9b. Culms fairly robust, up to 1.5 m tall, 1.5–4 mm in diam.; leaf blades often flat, 2–10 mm wide.
 - 14a. Lemma 4–4.2 mm; panicle densely contracted, spikelike 14. *A. inebrians*
 - 14b. Lemma 4.5 mm or more; panicle open or contracted.
 - 15a. Leaf sheaths scabrid; culms scabrid below panicle; leaf blades pubescent; glumes puberulous 15. *A. pubicalyx*
 - 15b. Leaf sheaths smooth; culms smooth; leaf blades smooth or scabrid; glumes glabrous, smooth or asperulous.
 - 16a. Panicle densely contracted, branches with spikelets to base; leaf blades often convolute, 0.3–0.7 mm wide; callus acute, 0.5–1 mm 16. *A. sibiricum*
 - 16b. Panicle open or loosely contracted, branches often bare below middle; leaf blades flat, up to 1 cm wide; callus obtuse, 0.3–0.5 mm.
 - 17a. Awn 20–25 mm 17. *A. pekinense*
 - 17b. Awn 10–18 mm 18. *A. brandisii*

1. *Achnatherum coreanum* (Honda) Ohwi, J. Jap. Bot. 17: 404. 1941.

大叶直芒草 *da ye zhi mang cao*

Stipa coreana Honda, Koryo Shikerin No Ippan: 80. 1932; *Orthoraphium coreanum* (Honda) Ohwi; *Orthoraphium grandifolium* (Keng) Keng ex P. C. Kuo; *Patis coreana* (Honda) Ohwi; *Stipa grandifolia* Keng.

Perennial from a short knotty rhizome. Culms solitary or few, stiffly erect, up to 1 m tall, 2–3 mm in diam., 7–8-noded. Leaves all cauline; leaf sheaths usually longer than internodes, scabrid or puberulous, pilose at collar; leaf blades linear-lanceolate, flat, 10–35 × 1–2 cm, scaberulous or puberulous especially on abaxial surface, base attenuate, apex finely acuminate; ligule 0.5–2 mm, truncate, erose. Panicle linear, 20–35 cm; branches single or paired, simple, puberulous. Spikelets gray-green or dark-green; glumes lanceolate, subequal, 13–15 mm, herbaceous, 7–9-veined with transverse veinlets, apex acuminate; callus obtuse, ca. 1 mm; lemma 1–1.2 cm, indurate at maturity, evenly pubescent, margins overlapping, apex shortly 2-toothed, teeth minutely hairy; awn persistent, 2.5–3.5 cm, scabrid, slightly twisted with lateral grooves below, upper part flexuous. Lodicules 2, lanceolate, ca. 1.8 mm. Anthers 5–7 mm. Ovary villous below styles. Fl. and fr. Aug–Oct.

Hillsides, forests in mountain valleys, grassy places in gullies, near roads; 400–1500 m. Anhui, Hebei, Hubei, Jiangsu, Jiangxi, Shaanxi, Zhejiang [Japan, Korea].

This species has firmer glumes with more veins than usual, only 2 lodicules, and a distinctive hairy ovary. It has been placed in the genus *Orthoraphium*, but appears to have very little affinity with the single Himalayan member of that genus. It is also rather anomalous in *Achnatherum*, but is placed here until generic limits in *Stipeae* are better understood.

2. *Achnatherum splendens* (Trinius) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937.

芨芨草 *ji ji cao*

Stipa splendens Trinius, Neue Entdeck. Pflanzenk. 2: 54. 1821; *S. altaica* Trinius; *S. schlagintweitii* Mez; *Lasiagrostis splendens* (Trinius) Kunth; *Stipa kokonorica* K. S. Hao.

Perennial, forming large dense tussocks; roots thick, tough, coated with sand; old basal sheaths fibrous. Culms stiff, erect, 0.5–2.5 m tall, 3–5 mm in diam., 2–3-noded. Leaf sheaths glabrous; leaf blades convolute, tough, 30–60 cm, 5–6 mm wide, abaxial surface smooth; ligule triangular, 5–10(–17) mm, acute. Panicle pyramidal, (15–)30–60 cm; branches 2–6 per node, ascending or spreading, 8–17 cm, lower part bare. Spikelets 4.5–7 mm, gray-green with purple-brown base; glumes unequal, elliptic, lower glume 4–5 mm, 1-veined, upper glume 6–7 mm, 3-veined, scabrid, apex acute or denticulate; callus obtuse, 0.3–0.6 mm; lemma 4.8–5.7 mm, scaberulous-puberulous, also evenly pilose with longer hairs, apex 2-toothed; awn 0.5–1.2 cm, caducous, straight or slightly curving and indistinctly twisted below, scabrid. Anthers 2.5–3.5 mm, bearded at apex. Fl. and fr. Jun–Sep.

Dry mountain slopes, grassy places on slightly alkaline, sandy

soil; 900–4500 m. Gansu, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, N India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

This species tolerates high levels of salinity and is used for improving saline and alkaline land. It is also a good forage grass and a source of fiber.

3. *Achnatherum brevistaratum* Keng & P. C. Kuo, Fl. Tsinling. 1(1): 442. 1976.

短芒芨芨草 *duan mang ji ji cao*

Perennial, shortly rhizomatous; rhizomes clothed in smooth yellowish green scales. Culms erect, ca. 1.5 m tall, 2–3-noded. Leaf sheaths smooth or scaberulous, longer than internodes; leaf blades convolute, up to 50 cm, abaxial surface smooth, margins setosely scabrid; ligule oblong-lanceolate, up to 14 mm. Panicle contracted, ca. 30 cm; branches several per node, suberect, short, with spikelets to base; pedicels 2–10 mm, setulose. Spikelets 6–6.5 mm, yellowish green becoming purplish at base; glumes subequal, lanceolate-elliptic, lower glume ca. 6 mm, 5–7-veined at base, upper glume ca. 6.5 mm, often 5-veined at base, glabrous, apex acute; callus obtuse; lemma ca. 5 mm, pilose along lateral veins with long white hairs, apex shortly 2-toothed; awn 0.2–0.4 cm, straight. Anthers 3.5–4 mm, bearded at apex. Fl. Jun.

• Grassy places on mountain slopes, dry river valleys; ca. 2100 m. Gansu (Minxian).

4. *Achnatherum saposhnikovii* (Roshevitz) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 224. 1937.

钝基草 *dun ji cao*

Timouria saposhnikovii Roshevitz in B. Fedtschenko, Fl. Aziatsk. Ross. 12: 174. 1916; *Stipa saposhnikovii* (Roshevitz) Kitagawa.

Perennial, forming small tufts. Culms erect, 25–50 cm tall, 1–1.5 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, tightly overlapping, smooth; leaf blades convolute, setaceous, 5–15 cm, 1–2.5 mm wide, abaxial surface smooth; ligule 0.2–0.7 mm. Panicle linear, spike-like, dense, 3–7 × 0.6–0.8 cm; branches appressed to axis, 0.5–2 cm, scabrid, with spikelets to base. Spikelets 5–6 mm, yellowish green; glumes keeled, lanceolate, slightly unequal, lower glume 5–6 mm, upper glume 4.5–5 mm, prominently 3-veined, keel scabrid, apex finely acuminate; callus obtuse, ca. 0.3 mm, lemma elliptic, 2.5–3.5 mm, back pilose, apex 2-toothed, teeth ca. 0.2 mm; awn ca. 0.4 cm, caducous, straight or slightly twisted at base, scabrid. Anthers 1.6–2 mm, glabrous at apex. Fl. and fr. Jul–Sep.

Dry stony slopes, steppe regions; 1500–3500 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Uzbekistan].

This grass is distinctive in the genus on account of its keeled, prominently 3-veined glumes. It is sometimes placed in the separate genus *Timouria*, but resembles *Achnatherum* in its elliptic floret and 2-toothed lemma.

5. *Achnatherum inaequiglume* Keng, Fl. Tsinling. 1(1): 443. 1976.

异颖茭草 yì yǐng ji ji cǎo

Perennial, densely tufted. Culms erect or geniculately ascending, 30–65 cm tall, 0.8–1 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, glabrous or upper part often puberulous; leaf blades filiform, up to 20 cm, abaxial surface smooth; ligule 0.5–1 mm, truncate or toothed. Panicle contracted, oblong in outline, moderately dense, 7–13 cm; branches ascending, 0.5–3 cm, with spikelets to base; pedicels scaberulous-puberulous. Spikelets greenish or grayish; glumes lanceolate, unequal, lower glume 7–8 mm, upper glume 5–6 mm, membranous, 3-veined, scabrid especially along midvein, lower margins sometimes sparsely pilose, apex acuminate; callus obtuse, ca. 0.3 mm; lemma 3–4 mm, densely pubescent, a conspicuous brush of longer 3–4 mm hairs below apex, apex shortly 2-toothed; awn 1.5–2 cm, lower 1/4–1/3 curved and obscurely twisted, scabrid. Anthers 2–2.5 mm, glabrous at apex. Fl. and fr. Jul–Sep.

• Dry mountain slopes; 900–2200 m. Gansu, Sichuan.

6. *Achnatherum caragana* (Trinius) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 337. 1937.

小茭草 xiǎo ji ji cǎo

Stipa caragana Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 74. 1831; *Lasiagrostis caragana* (Trinius) Trinius & Ruprecht; *Oryzopsis asiatica* Mez.

Perennial, densely tufted; roots sometimes coated in sand. Culms erect, 50–90 cm tall, 1.5–3 mm in diam., 3–5-noded. Leaf sheaths shorter than internodes, smooth or scabrid; leaf blades gray-green, flat or convolute and setaceous, 15–30 cm, 1–2.5 mm wide, abaxial surface smooth except toward apex; ligule truncate, 0.5–1 mm. Panicle open, lax, 15–30 cm; branches 2–5 per node, ascending to divaricate, 5–13 cm, bare in lower part, spikelets crowded above. Spikelets 4.2–5.5 mm, pale green; glumes subequal, elliptic, membranous becoming hyaline upward, lower 1–3-veined, upper 3-veined, apex acute; callus obtuse, 0.2–0.3 mm; lemma narrowly elliptic, 3–4 mm, densely appressed-pilose, apex minutely 2-toothed; awn caducous, 0.7–1.2 cm, flexuous or almost straight, indistinctly twisted below, scabrid. Anthers 1.5–2 mm, apex bearded or glabrous. Fl. and fr. Jun–Aug.

Dry rocky or stony slopes; 900–1200 m. Xinjiang [Afghanistan, Kazakhstan, Pakistan, Russia, Tajikistan; SW Asia (Caucasus, Iran, E Turkey)].

7. *Achnatherum chinense* (Hitchcock) Tzvelev, Rast. Tsentr. Azii 4: 40. 1968.

中华茭草 zhōng huá ji ji cǎo

Oryzopsis chinensis Hitchcock, Proc. Biol. Soc. Washington 43: 92. 1930; *Piptatherum parviflorum* Roshevitz.

Perennial, usually densely tufted. Culms erect, 30–80 cm tall, ca. 1 mm in diam., 2–4-noded. Leaf sheaths glabrous or ciliolate along mouth and margins, shorter than internodes; leaf

blades mainly basal, usually rolled, filiform, 10–30 cm, 1–2 mm, abaxial surface smooth or scabrid along veins, adaxial surface and margins scabrid; ligule 0.1–0.2 mm. Panicle open, ovate in outline, sometimes nodding, 12–15 cm; branches usually 2 per node, distant, slender, 5–7 cm, spikelets clustered toward apices. Spikelets 3.3–4.5 mm, green; glumes subequal, lanceolate, hyaline, 3–5-veined, lateral veins not extending to apex, apex acute or denticulate; callus obtuse, ca. 0.15 mm; lemma elliptic, 2–3 mm, leathery, dark brown at maturity, densely pubescent, margins overlapping at least toward apex, apex shortly 2-toothed; awn caducous, 0.4–0.8 cm, very weakly geniculate column slightly twisted. Anthers ca. 1.8 mm, minutely bearded at apex.

• Dry mountain slopes, grassy roadsides, forest fringes; 500–2400 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi.

8. *Achnatherum henryi* (Rendle) S. M. Phillips & Z. L. Wu, Novon 15: 475. 2005.

湖北茭草 hu bei ji ji cǎo

Perennial, loosely tufted from a short knotty rhizome. Culms erect or slightly geniculate, 40–95 cm tall, 3–4-noded. Leaf sheaths ciliolate at abaxial junction with blade, shorter or lower longer than internodes; leaf blades linear, usually flat, 6–30 cm, 3–10 mm wide, abaxial surface smooth, adaxial surface and margins scaberulous, base narrowed, apex slenderly acuminate; ligule ca. 0.2 mm or absent. Panicle open to loosely contracted, 15–20 cm; branches 3–4 per node, capillary, 5–8 cm. Spikelets yellowish with green veins; glumes ovate-oblong, 3–4.5(–6) mm, hyaline, scabrid, 3-veined, veins prominent, distinct to apex, indistinct transverse veinlets present, apex apiculate or denticulate; callus thinly pilose; lemma elliptic-oblong, 2.5–3.5(–4) mm, subleathery, pallid, 3–5-veined, appressed pubescent, apex entire or emarginate; awn persistent, stout, flexuous, 0.8–1.2(–2) cm, very slightly twisted toward base. Anthers 1.5–2 mm, minutely bearded or glabrous at apex. Fl. Apr–Jun.

• Mountain slopes, forests, shady roadsides, moist places; 100–2500 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Yunnan.

The 3 prominent, green veins of the glumes are an obvious feature of the spikelet. They are linked above the middle by inconspicuous, transverse veinlets. The species has 3 lodicules (not 2, as given in the protologue), which sometimes have hairy tips.

- 1a. Glumes apiculate or denticulate, 3–4.5 mm; awn 0.8–1.2 cm 8a. var. *henryi*
- 1b. Glumes acuminate, 5–6 mm; awn 1.5–2 cm 8b. var. *acutum*

8a. *Achnatherum henryi* var. *henryi*

湖北茭草(原变种) hu bei ji ji cǎo (yuan bian zhong)

Stipa henryi Rendle, J. Linn. Soc., Bot. 36: 382. 1904; *Oryzopsis henryi* (Rendle) Keng ex P. C. Kuo.

Glumes 3–4.5 mm, apex apiculate or denticulate; lemma 2.5–3.5 mm, apex emarginate or entire; awn 0.8–1.2 cm. Anther apex bearded or glabrous. Fl. Apr–Jun.

• Forests on mountain slopes, shady roadsides, among rocks; 100–2300 m. Gansu, Hubei, Shaanxi, Sichuan.

8b. *Achnatherum henryi* var. *acutum* (L. Liu ex Z. L. Wu) S. M. Phillips & Z. L. Wu, *Novon* 15: 475. 2005.

尖颖芨芨草 *jian ying ji ji cao*

Oryzopsis henryi var. *acuta* L. Liu ex Z. L. Wu, *Acta Phytotax. Sin.* 19(4): 435. 1981; *Oryzopsis acuta* (L. Liu ex Z. L. Wu) L. Liu.

Glumes 5–6 mm, apex acuminate; lemma ca. 4 mm, apex entire; awn 1.5–2 cm. Anther apex slightly bearded. Fl. May.

• Moist places; ca. 2500 m. Yunnan.

9. *Achnatherum chingii* (Hitchcock) Keng, *Fl. Tsinling*. 1(1): 152. 1976.

细叶芨芨草 *xi ye ji ji cao*

Stipa chingii Hitchcock, *Proc. Biol. Soc. Washington* 43: 94. 1930.

Perennial, densely tufted. Culms erect, 40–70 cm tall, ca. 1.5 mm in diam., 2–3-noded. Leaf sheaths shorter than internodes, smooth; leaf blades filiform, convolute, soft, up to 25 cm, 0.5–1 mm wide, scabrid; ligule lanceolate, 2–4 mm, often 2-lobed or obtuse. Panicle open or loosely contracted, 10–20 cm; branches often paired, laxly ascending or lower spreading, lower part bare, upper part with few spikelets. Spikelets 7–12 mm, yellowish green or purple at base; glumes subequal, lanceolate-oblong, membranous, lower 7–8 mm, 1–3-veined, upper 8–10 mm, 3-veined, apex obtuse; callus obtuse or acute, 0.5–1 mm; lemma 6–8 mm, lower back pubescent, apex 2-toothed; awn persistent, 1–1.8 cm, 1(–2)-geniculate, column twisted, pubescent, bristle glabrous; palea slightly shorter than lemma. Anthers ca. 2 mm, glabrous or with a few hairs at apex. Fl. and fr. Jul–Sep.

• 2200–4000 m. Gansu, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

This taxon appears to differ from *Achnatherum duthiei* only in its shorter anthers. An examination of a sufficient quantity of specimens may show them to be the same species.

10. *Achnatherum duthiei* (J. D. Hooker) P. C. Kuo & S. L. Lu, *Fl. Reipubl. Popularis Sin.* 9(3): 322. 1987.

藏芨芨草 *zang ji ji cao*

Stipa duthiei J. D. Hooker, *Fl. Brit. India* 7: 232. 1896 [“1897”]; *Achnatherum chingii* var. *laxum* S. L. Lu.

Perennial, densely tufted. Culms erect, 50–80 cm tall, 1–2 mm in diam., 3–4-noded. Leaf sheaths smooth or scaberulous; leaf blades narrowly linear to setaceous, thin, flat or convolute when dry, 10–30 × 0.1–0.25 cm, abaxial surface smooth; ligule of culm leaves oblong, 2–2.5 mm. Panicle open or loosely contracted, 10–25 cm; branches paired, 3–10 cm, pairs distant, laxly ascending or lower spreading, few spiculate, bare in lower part. Spikelets 9–14 mm, pale yellowish, base brownish purple; glumes subequal, lanceolate, membranous, lower 3–5-veined, upper 5-veined, apex hyaline, acuminate; callus acute, 0.5–0.8 mm; lemma 7(–9) mm, back loosely pilose below middle, gla-

brous or sparsely pubescent above, apex 2-toothed, teeth 0.5–1 mm; awn 1.4–1.8 cm, persistent, delicate, weakly 1-geniculate, column loosely twisted, pubescent, bristle scabrid; palea as long as lemma. Anthers 3–4.5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Mountain shrubland and in coniferous forest; 2500–4500 m. Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [N India, Kashmir, Nepal].

11. *Achnatherum jacquemontii* (Jaubert & Spach) P. C. Kuo & S. L. Lu, *Fl. Reipubl. Popularis Sin.* 9(3): 323. 1987.

干生芨芨草 *gan sheng ji ji cao*

Stipa jacquemontii Jaubert & Spach, *Ill. Pl. Orient.* 4: 60. 1851; *Lasiagrostis jacquemontii* (Jaubert & Spach) Munro ex Boissier; *Stipa sibirica* Linnaeus var. *pallida* J. D. Hooker.

Perennial, densely tufted from tough rootstock. Culms wiry, 30–70 cm tall, 1–1.5 mm in diam., 2–4-noded. Leaf sheaths glabrous, lower longer than internodes; leaf blades setaceous, convolute, 10–25 cm, ca. 0.8 mm wide, abaxial surface smooth, adaxial surface pubescent; ligule truncate, ca. 0.3 mm. Panicle contracted, narrow, 10–20 cm; branches 2 to several per node, laxly suberect, delicate, 2–7 cm, with spikelets to base. Spikelets 5–7 mm, greenish or purplish; glumes subequal, elliptic-lanceolate, 3-veined, membranous, smooth, apex acute; callus obtuse, 0.3–0.4 mm; lemma 4–5 mm, membranous, pilose throughout, apex 2-toothed, teeth 0.3–0.4 mm; awn persistent, 2–3 cm, very fine, weakly 2-geniculate, column twisted, scabrid throughout; palea 2/3 length of lemma. Anthers 2.8–3.5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Dry mountain slopes, especially in rock crevices; ca. 3300 m. Xizang [E Afghanistan, NW India, Kashmir, N Pakistan].

This is a well-defined species from rocky places in the W Himalayas. *Achnatherum duthiei* has a similar but wider distribution. Besides the key characters, *A. jacquemontii* can also be distinguished from *A. duthiei* by its short ligule, whorls of panicle branches bearing more spikelets, and shorter palea.

12. *Achnatherum psilanthrum* Keng ex Tzvelev, *Rast. Tsentr. Azii* 4: 41. 1968.

光药芨芨草 *guang yao ji ji cao*

Perennial, densely tufted. Culms erect, 40–100 cm tall, 1–1.5 mm in diam., 2–3-noded. Leaf sheaths smooth, shorter than internodes; leaf blades filiform, to 12 cm, to 0.5 mm wide, surfaces smooth or scaberulous; ligule truncate, 0.1–0.5 mm, often toothed. Panicle loosely contracted, narrowly oblong in outline, 5–15 cm; branches 2 to several per node, suberect or slightly spreading, delicate, up to 2.5 cm. Spikelets 6–7 mm, purple with pale hyaline apices; glumes subequal or lower glume slightly shorter, lanceolate, 3-veined, apex acuminate to a fine point; callus subacute, ca. 0.3 mm; lemma 3.8–4.5 mm, densely pubescent, apex subentire; awn caducous, 1.5–1.8 cm, 1-geniculate, scabrid, column weakly twisted; palea as long as lemma. Anthers 2–2.5 mm, glabrous at apex. Fl. and fr. Jun–Sep.

• Grassy and rocky mountainsides, river banks, floodlands; 2000–4100 m. Gansu, Qinghai, Sichuan.

13. *Achnatherum nakaii* (Honda) Tateoka ex Imzab in Ma et al., Fl. Intramontol. 7: 196. 1983.

朝阳芨芨草 chao yang ji ji cao

Stipa nakaii Honda, Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 104. 1936; *S. roerichii* Keng.

Perennial, densely tufted; roots sometimes coated with sand. Culms erect, 40–60 cm tall, 1–1.2 mm in diam., 2–3-noded. Leaf sheaths smooth or sparsely pubescent, lower longer than internodes; leaf blades setaceous, 10–30 cm, 1–4 mm wide, smooth or scabrid along margins; ligule truncate, 0.5–1 mm, lacerate. Panicle fairly loose, 12–25 cm; branches 2–3 per node, ascending or widely spreading at maturity, scabrid, lower part bare. Spikelets 5–6.5 mm, yellowish green or brownish purple; glumes oblong-lanceolate, subequal or lower glume slightly shorter, 3-veined, puberulous, acute; callus obtuse, ca. 0.5 mm; lemma firm, 4.5–5 mm, densely pubescent; awn persistent, 1–1.5 cm, weakly 1(or 2)-geniculate, scabrid throughout. Anthers 3–4 mm, glabrous or with a few hairs at apex. Fl. and fr. Jul–Sep.

Grassy places on mountain slopes, floodlands; 1200–1700 m. Hebei, Liaoning, Nei Mongol, Shanxi [Mongolia].

This species appears to be a small-spicate member of the *Achnatherum sibiricum-pekinese* complex. The type has not been seen.

The combination *Achnatherum nakaii* has usually been attributed to Tateoka (J. Jap. Bot. 30: 208. 1955), but it was not validly published there because Tateoka made no reference to Honda's basionym.

14. *Achnatherum inebrians* (Hance) Keng ex Tzvelev, Rast. Tsent. Azii 4: 40. 1968.

醉马草 zui ma cao

Stipa inebrians Hance, J. Bot. 14: 212. 1876.

Perennial, tussocky. Culms erect, (40–)60–100 cm tall, 2.5–4 mm in diam., 3–4-noded, nodes dark, puberulous below. Leaf sheaths smooth; leaf blades linear, flat or convolute at margins, 8–15(–30) cm, 2–5(–10) mm wide, abaxial surface granular-scaberulous, apex finely acuminate; ligule truncate, 0.5–1.2 mm. Panicle densely contracted, almost spike-like, narrowly oblong in outline, interrupted below, 10–25 cm; branches up to 5 per node, erect, densely clothed with spikelets. Spikelets 5–6 mm, gray-green or purplish, tinged bronze at maturity; glumes subequal, lanceolate, 3-veined, asperulous, midrib scabrid, apex acute or obtuse and denticulate; callus acute, ca. 0.5 mm; lemma 4–4.2 mm, firm, dark brown at maturity, pilose, hairs slightly longer upward, increasing to 1.1–1.3 mm around awn base, apex shortly 2-toothed; awn tardily deciduous, stiff, 1–1.3 cm, 1-geniculate, column minutely pubescent, bristle scabrid. Anthers ca. 2 mm, bearded at apex. Fl. and fr. Jul–Sep.

Upland steppes, grassy mountainsides, roadside bordering fields, floodlands; 1700–4200 m. Gansu, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang [Mongolia].

This grass is reported to cause intoxication in cattle.

15. *Achnatherum publicalyx* (Ohwi) Keng, Fl. Tsinling. 1(1): 153. 1976.

毛颖芨芨草 mao ying ji ji cao

Stipa publicalyx Ohwi, J. Jap. Bot. 17: 401. 1941; *Achnatherum pekinese* subsp. *publicalyx* (Ohwi) T. Koyama.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–100 cm tall, scabrid under panicle, 3–4-noded. Leaf sheaths scabrid, lower longer than internodes; leaf blades flat, often involute at margins, up to 40 cm, 3–5 mm wide, adaxial surface densely pubescent, abaxial surface scabrid, apex finely acuminate; ligule truncate, ca. 1 mm. Panicle slightly contracted, 15–25 cm; branches 2–4 per node, ascending, with spikelets to base. Spikelets 8–9 mm, purple or brownish; glumes subequal or upper glume slightly longer, elliptic-oblong, 3-veined, appressed-puberulous, apex acute or obtuse; callus subacute, ca. 0.8 mm; lemma narrowly lanceolate, 6–7 mm, leathery, pilose, margins overlapping and enclosing palea, apex very slightly lobed; awn persistent, 2–2.5 cm, 1-geniculate, column twisted, minutely hispidulous, bristle scabrid. Anthers 4–5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Grassy mountain slopes, forests; 600–2700 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Xinjiang [Korea].

This taxon is a pubescent variant of the *Achnatherum sibiricum-pekinese* complex and is sometimes included within *A. pekinese*.

16. *Achnatherum sibiricum* (Linnaeus) Keng ex Tzvelev, Probl. Ekol. Geobot. Bot. Geogr. Florist. 140. 1977.

羽茅 yu mao

Avena sibirica Linnaeus, Sp. Pl. 1: 79. 1753; *Achnatherum avenoides* (Honda) Y. L. Chang; *A. confusum* (Litvinov) Tzvelev; *A. sibiricum* var. *qinghaiense* Y. J. Wang; *Stipa avenoides* Honda; *S. confusa* Litvinov; *S. sibirica* (Linnaeus) Lamarck.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–150 cm tall, 1.7–3 mm in diam., smooth, 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades usually convolute, occasionally flat, 20–60 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scaberulous, sometimes also pilose, apex finely acuminate; ligule truncate, 0.5–2 mm. Panicle contracted, often dense, 10–30(–60); branches 3 to several per node, suberect or narrowly ascending, with spikelets to base. Spikelets 7–10 mm, yellowish green or purple; glumes subequal, elliptic-oblong, 3-veined, smooth or scaberulous, often scabrid-spinulose on midvein, apex acute or denticulate; callus acute, 0.5–1 mm; lemma narrowly lanceolate, leathery, 5–8 mm, densely pilose, hairs slightly longer upward, 1–2 mm at awn base, margins overlapping and enclosing palea, apex entire; awn persistent, 1.5–2.5 cm, 1(or 2)-geniculate, column twisted, minutely hispidulous, bristle scabrid. Anthers ca. 4 mm, bearded at apex. Fl. and fr. Jul–Sep.

Grassy mountain slopes, forest fringes, roadsides; 600–3400 m. Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Uzbekistan; SW Asia (Caucasus)].

Achnatherum sibiricum, *A. brandisii*, *A. pekinese*, *A. publicalyx*, and probably *A. nakaii* form a complex of rather ill-defined, intergrading species. The complex lies on the boundary between *Stipa* and

Achnatherum. The leathery, convolute lemma enclosing the palea and almost entire lemma apex are typical of *Stipa*, whereas the short glumes scarcely exceeding the floret, non-pungent callus, and persistent awn are characters of *Achnatherum*. The poisonous properties reported for some members of this complex are due to the presence of cyanogenic glycosides.

Besides the key characters, typical *Achnatherum sibiricum* is distinguished from *A. pekinense* by the entire lemma apex and the slightly longer lemma hairs around the base of the awn. *Achnatherum sibiricum* var. *qinghaiense* is said to be distinguished by obtuse glumes and an obtuse callus. The type has not been seen.

17. *Achnatherum pekinense* (Hance) Ohwi, Bull. Natl. Sci. Mus. 33: 66. 1953.

京芒草 jing mang cao

Stipa pekinensis Hance, J. Bot. 15: 268. 1877; *Achnatherum effusum* (Maximowicz) Y. L. Chang; *A. extremiorientale* (H. Hara) Keng; *A. pekinense* subsp. *effusum* (Maximowicz) T. Koyama; *S. extremiorientalis* H. Hara; *S. japonica* (Hackel) Hackel; *S. sibirica* (Linnaeus) Lamarck var. *effusa* Maximowicz; *S. sibirica* var. *japonica* Hackel.

Perennial, loosely tufted, scaly buds at base. Culms erect, 60–150 cm tall, 1.8–3 mm in diam., 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades linear or broadly linear, flat or margins inrolled, 20–50 cm, 4–10 mm wide, abaxial surface smooth, adaxial surface and margins scabrid, apex finely acuminate; ligule truncate, 1–1.5 mm. Panicle open, sometimes effuse, 12–40 cm; branches 2–4 per node, bare below middle. Spikelets 8–13 mm, yellowish green or purplish; glumes subequal or lower glume slightly longer, elliptic-oblong, 3-veined, smooth, glabrous, apex of lower glume acuminate, of upper glume acute or denticulate; callus obtuse, 0.3–0.5 mm; lemma narrowly lanceolate, 5–7 mm, leathery, pilose, hairs slightly longer upward, 0.6–1.2 mm at awn base, margins overlapping and enclosing palea, apex very shortly toothed; awn persistent, stiff, 2–3 cm, 1-geniculate,

column twisted, minutely hispidulous, bristle scabrid. Anthers 4–6 mm, bearded at apex. Fl. and fr. Jul–Oct.

Open forest, among shrubs, roadsides; 300–3600 m. Anhui, Gansu, Hebei, Heilongjiang Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Yunnan [Japan, Korea, E Russia].

This species is often confused with *Achnatherum sibiricum*, and intermediates appear to be common.

18. *Achnatherum brandisii* (Mez) Z. L. Wu, Acta Phytotax. Sin. 34: 154. 1996.

展序芨芨草 zhan xu ji ji cao

Stipa brandisii Mez, Repert. Spec. Nov. Regni Veg. 17: 207. 1921; *Stipa subeffusa* Ohwi.

Perennial, loosely tufted. Culms erect, 70–150 cm tall, 3–4-noded. Leaf sheaths smooth, lower longer than internodes; leaf blades usually flat, up to 40 cm, 4–10 mm wide, abaxial surface smooth, adaxial surface smooth or scabrid, apex finely acuminate; ligule truncate, up to 1 mm. Panicle open, 10–30 cm; branches usually 2 per node, laxly ascending to widely spreading at maturity, lower part bare or with spikelets to base. Spikelets 7–10 mm, pallid or green; glumes subequal, elliptic-oblong, 3-veined, midvein scabrid, apex acute or denticulate; callus obtuse, 0.3–0.5 mm; lemma narrowly lanceolate, 5.5–7.5 mm, leathery, pilose, hairs slightly longer below awn, margins overlapping and enclosing palea, apex rounded, not lobed; awn persistent, 1–1.8 cm, 1(or 2)-geniculate, column twisted, scabrid throughout. Anthers 4–5 mm, bearded at apex. Fl. and fr. Jul–Sep.

Forest fringes, grassy mountain slopes, riverine floodplains; 1500–3800 m. W Gansu, Qinghai, Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, NW India, Nepal, Pakistan].

This species differs from *Achnatherum pekinense* in little more than its shorter awn and more westerly distribution. Further work may show that subspecific rank under *A. pekinense* is more appropriate. It is reputed to be poisonous to livestock.

53. ORTHORAPHIUM Nees, Proc. Linn. Soc. London 1: 94. 1841.

直芒草属 zhi mang cao shu

Stipa sect. *Orthoraphium* (Nees) Hackel.

Perennial. Leaf blades narrowly linear. Inflorescence a narrow panicle; branches erect. Spikelets with 1 floret, bisexual, disarticulating above glumes; rachilla extension absent; glumes lanceolate-oblong, unequal with upper longer, thinly papery, 3–5-veined, apex acute or obtuse; callus obtuse, shortly bearded; lemma narrowly lanceolate, slightly dorsally flattened, firmly papery, pilose, margins overlapping only toward apex, apex narrowed to cylindrical beak slightly exceeding upper glume and bearing 2 to several stout retrorse spines; awn persistent, almost straight, hispid at base, otherwise scabrid; palea exposed between lemma margins. Lodicules 3. Stamens 3, anthers glabrous. Stigmas 2.

One species: outer ranges of the Himalayas, including China.

1. *Orthoraphium roylei* Nees, Proc. Linn. Soc. London 1: 94. 1841.

直芒草 zhi mang cao

Stipa roylei (Nees) Duthie.

Loosely tufted, shortly rhizomatous. Culms 40–60 cm tall,

3–5-noded. Leaf sheaths glabrous, mostly longer than internodes; leaf blades flat (inrolled when dry), 15–30 cm, 2–3 mm wide, abaxial surface smooth, scabrid toward apex, adaxial surface pubescent; ligule oblong-lanceolate, up to 5 mm. Panicle linear, 10–20 cm; branches single or lower paired, up to 7 cm, smooth. Spikelets green or tinged purplish; lower glume 5–8 mm, upper glume 7–11 mm, smooth; callus 0.5–0.7 mm; lem-

ma 9–10 mm, loosely pubescent in lower 1/4–1/2; awn 1.3–1.7 cm, stiffly hispid at base, hairs 0.5–0.8 mm, scabrid above. Anthers 2–3 mm. Fl. and fr. Aug–Oct.

Open grassy mountainsides, forest clearings; 2700 m and above.

Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, N Myanmar, Nepal].

The long, retrorse spines at the lemma apex are an unmistakable distinguishing feature of this species.

8. Tribe BRYLKINIEAE

扁穗草族 *bian sui cao zu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennial. Leaf sheaths with connate margins; leaf blades linear, transverse veinlets present; ligule very short, membranous. Inflorescence a lax raceme. Spikelets with 1 fertile floret, 2 sterile empty lemmas below and a rachilla extension above, strongly laterally compressed, falling entire together with the pedicel; glumes unequal, narrowly lanceolate, shorter than lemmas, herbaceous, 3–5-veined, apex acuminate to caudate; lemmas lanceolate, thinly leathery, strongly keeled, 5–7-veined, sterile lemmas acuminate to short-awned, fertile lemma with a straight awn from apex; palea keels closely adjacent. Lodicules 2, free, fairly large, rectangular, hyaline. Stamens 3. Caryopsis narrowly ellipsoid, apex with glossy rounded caplike appendage with central knob from style base, embryo small, hilum linear, slightly shorter than caryopsis. Leaf anatomy: non-Kranz; microhairs absent. $x = 10$.

One species: China, Japan, E Russia.

This is a unispecific tribe of uncertain affinity, found in cool, temperate forests.

54. BRYLKINIA F. Schmidt, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 12: 199. 1868.

扁穗草属 *bian sui cao shu*

Description and distribution as for tribe.

1. *Brylkinia caudata* (Munro) F. Schmidt, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 12: 199. 1868.

扁穗草 *bian sui cao*

Ehrharta caudata Munro in A. Gray, Mem. Amer. Acad. Arts, n.s., 6: 420. 1859.

Perennial with slender rhizomes, basal sheaths becoming fibrous. Culms loosely tufted, erect, 50–70 cm tall, 3–5-noded. Leaf sheaths pubescent with retrorse hairs, upper sheaths shorter than internodes; leaf blades flat or margins involute, thin, 20–30 × 0.3–1 cm, abaxial surface glabrous, adaxial surface pubes-

cent or glabrous, slightly narrowed to base, tapering to acuminate apex; ligule 0.2–0.6 mm, thick. Raceme 6–22 cm; spikelets 13–20, distant, divaricate becoming pendulous; axis 4-angled; pedicels 2–7 mm, bent at base, spinulose. Spikelets 1–1.4 cm, greenish; lower glume 5–6 mm, 3-veined, upper glume 6–7.5 mm, 5-veined; sterile lemmas 1–1.4 cm; fertile lemma 1–1.2 cm, narrowly winged along upper keel; awn 0.9–1.5 cm; palea shorter than lemma, membranous, ciliolate along keels. Anthers ca. 4 mm. Fl. and fr. summer. $2n = 40$.

Forest glades; below 3000 m. Jilin (Changbai Shan), Sichuan [Japan, Russia (Far East)].

9. Tribe MELICEAE

臭草族 *chou cao zu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennial. Culms usually unbranched. Leaf sheaths tubular, margins fused for most or all of their length; leaf blades linear, transverse veinlets sometimes present; ligule membranous, sometimes tubular and lobed on side opposite blade. Inflorescence an open or contracted panicle, sometimes scanty or racemelike. Spikelets all alike, laterally compressed, of 1 to many fertile florets, upper florets sterile and often gathered into a clump of rudimentary lemmas, usually disarticulating below each floret; glumes persistent, usually shorter than spikelet, often shorter than adjacent lemma, often papery with hyaline margins, 1–5-veined; lemmas herbaceous or becoming leathery, rounded on back, prominently 5–9(–13)-veined, awnless or with straight or curved awn from apex or back; lodicules 2, fused, short, fleshy, truncate. Stamens (2 or)3. Caryopsis ellipsoid; hilum linear. Leaf anatomy: non-Kranz; microhairs absent. $x = 9, 10$.

Eight genera and ca. 130 species: temperate regions throughout the world; three genera and 34 species (nine endemic) in China.

This small tribe is allied to *Poeae*, but differs in the closed, tubular leaf sheaths, small, fleshy lodicules, and chromosome number.

- 1a. Floret callus hairy; lemma awned 57. *Schizachne*
 1b. Floret callus glabrous; lemma awnless.

- 2a. Spikelets with several to many fertile florets; upper glume 1-veined; aquatic and marsh plants 55. *Glyceria*
 2b. Spikelets with 1–4 fertile florets and terminal sterile lemmas; upper glume 3–5-veined; forest and grassland
 plants 56. *Melica*

55. GLYCERIA R. Brown, Prodr. 179. 1810, nom. cons.

甜茅属 tian mao shu

Hemibromus Steudel.

Perennial, usually rhizomatous. Culms erect, ascending or prostrate. Leaf sheaths with margins completely or partially fused; leaf blades linear; ligule membranous. Panicle open or contracted, sometimes racemelike when spikelets few. Spikelets with several to many florets, laterally compressed or terete; rachilla smooth or scabrid, disarticulating below each floret; glumes small to almost as long as adjacent lemma, membranous, 1-veined, apex acute or obtuse; floret callus small, glabrous, obtuse; lemmas overlapping, ovate to lanceolate or oblong, thinly herbaceous or thinly leathery, back rounded, smooth, granular or scaberulous, 5–11-veined, veins conspicuous, parallel, apex usually membranous, acute to broadly obtuse or denticulate; palea as long as, longer, or slightly shorter than lemma, keels sometimes narrowly winged. Stamens 2 or 3. $x = 10$.

About 40 species: temperate regions of the world, in wet habitats; ten species (one endemic) in China.

- 1a. Spikelets linear to narrowly oblong, terete, 1–4.2 cm; palea keels narrowly winged in upper half.
 2a. Spikelets 2.5–4.2 cm; palea distinctly longer than lemma 1. *G. acutiflora*
 2b. Spikelets 1–2.5 cm; palea as long as or only slightly longer than lemma.
 3a. Leaf blades 2–3 mm wide; lower panicle branches 2 per node, bearing 1(–3) spikelets 2. *G. chinensis*
 3b. Leaf blades 4–10 mm wide; lower panicle branches 3–5 per node, bearing up to 15 spikelets 3. *G. notata*
 1b. Spikelets usually ovate to narrowly oblong, laterally compressed, up to 1(–1.4) cm; palea keels wingless.
 4a. Culms 20–50 cm tall, tufted or with slender rhizomes; leaf blades 1.5–3.5 mm wide.
 5a. Plant loosely tufted; lowest panicle branches bearing up to 14 spikelets; spikelets elliptic-oblong,
 0.6–0.9 cm 4. *G. tonglensis*
 5b. Plant with filiform rhizomes; lowest panicle branches bearing 1–4 spikelets; spikelets linear,
 0.8–1.4 cm 5. *G. leptorhiza*
 4b. Culms robust, 50–150 cm tall, with thick spreading rhizomes; leaf blades 3–16 mm wide.
 6a. Stamens 2, anthers 0.5–0.8 mm; plants mainly of swampy forest.
 7a. Culms hard, 5–8 mm in diam.; leaf blades firm; ligule 0.3–1 mm; spikelets pale green maturing
 yellowish brown 6. *G. leptolepis*
 7b. Culms soft, 3–5 mm in diam.; leaf blades soft, thin; ligule 2–3 mm; spikelets bright green or purple
 tinged 7. *G. lithuanica*
 6b. Stamens 3, anthers 1–2 mm; plants usually of wet meadows and other open wet habitats.
 8a. Leaf blades 3–5 mm wide; upper glume 3.5–4.5 mm, 3/4 as long as adjoining lemma or more,
 acuminate 8. *G. spiculosa*
 8b. Leaf blades 5–16 mm wide; upper glume 2–4 mm, 3/4 as long as adjoining lemma or less, obtuse
 or subacute.
 9a. Adaxial surface of leaf blades grayish green, minutely papillose; panicle open, branches
 spreading; upper glume 2–3 mm 9. *G. triflora*
 9b. Adaxial surface of leaf blades green, smooth; panicle somewhat contracted, branches obliquely
 ascending; upper glume 3–4 mm 10. *G. maxima*

1. *Glyceria acutiflora* Torrey subsp. **japonica** (Steudel) T. Koyama & Kawano, Canad. J. Bot. 42: 869. 1964.

甜茅 tian mao

Hemibromus japonicus Steudel, Syn. Pl. Glumac. 1: 317. 1854; *Glyceria japonica* (Steudel) Miquel.

Perennial. Culms ascending from long prostrate base, rooting at lower nodes, 40–70 cm tall, 1.5–3 mm in diam. Leaf sheaths keeled, smooth, longer than internodes; leaf blades flat, flaccid, 5–15 cm × 4–5 mm, slightly scaberulous, apex acute; ligule 4–7 mm. Panicle narrow, 15–30 cm, base often included in uppermost leaf sheath; branches 2 at lower nodes, unequal with one very short, erect, unbranched, bearing only one spike-

let, panicle racemelike toward apex. Spikelets linear, cylindrical, 2.5–4.2 cm, florets 7–14, pale green; glumes oblong to lanceolate, membranous, 1-veined, lower glume 2.5–4 mm, upper glume 4–6 mm, apex subacute; lemmas lanceolate, 7–9 mm, herbaceous, 7-veined, scaberulous, apex membranous, acute or slightly tridentate; palea longer than lemma by 0.7–1.4 mm, keels thick, narrowly winged, hyaline between keels down midline, exposed apex 2-toothed. Stamens 3, anthers 0.8–1.3 mm. Fl. Mar–Jun. $2n = 20$.

Rice fields, streams, ditches, forming colonies; 400–1000 m. Anhui, Fujian, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan, Korea; North America].

Glyceria acutiflora subsp. *acutiflora* occurs in E North America. It is tetraploid ($2n = 40$) and can be distinguished morphologically by its

longer anthers (1.5–1.8 mm), narrower, membranous lemma apex, and frequently longer palea (extended up to 2 mm beyond lemma apex).

2. *Glyceria chinensis* Keng ex Z. L. Wu, Acta Phytotax. Sin. 30: 174. 1992.

中华甜茅 zhong hua tian mao

Perennial. Culms soft, decumbent at base, rooting at lower nodes, 30–60 cm tall, 1.5–2 mm in diam. Leaf sheaths smooth, longer or lower shorter than internodes; leaf blades flat or folded, flaccid, 5–12 cm × 2–3 mm, smooth or adaxial surface scabrid, apex acute; ligule 5–6 mm. Panicle narrow, 15–19 cm, base included in uppermost leaf sheath or shortly exserted; branches 2 at lower nodes, suberect, bearing 1–3 spikelets, panicle racemelike toward apex. Spikelets linear-oblong, 1–1.6 cm, florets 5–9, green; glumes oblong-ovate, membranous, 1-veined, lower glume 1.7–2 mm, apex acute, upper glume 2.7–3 mm, apex obtuse; lemmas lanceolate-oblong, 4–4.5 mm, herbaceous, smooth or scaberulous, 7-veined, veins scaberulous, apex membranous, obtuse; palea as long as or slightly longer than lemma, keels narrowly winged, apex emarginate. Stamens 3, anthers 0.7–1 mm.

• Damp places. SW Guizhou (Xingyi), E Yunnan.

3. *Glyceria notata* Chevallier, Fl. Env. Paris 174. 1827.

蔗甜茅 zhe tian mao

Glyceria fluitans (Linnaeus) R. Brown var. *plicata* Fries; *G. plicata* (Fries) Fries; *G. turcomanica* Komarov.

Perennial, forming loose patches. Culms spongy, ascending from prostrate base, rooting at lower nodes, 30–100 cm tall, 3–6 mm in diam. Leaf sheaths keeled, scabrid in upper part, longer than internodes; leaf blades flat or folded, flaccid, green or gray-green, 6–30 cm × 4–10 mm, abaxial surface smooth or scabrid, adaxial surface scabrid, apex acute; ligule 3–6 mm. Panicle lanceolate at first, ovate at maturity, up to 30 cm; branches 3–5 at lower nodes, finally widely spreading, longer branches bearing up to 15 spikelets. Spikelets linear-oblong, cylindrical or slightly laterally compressed, 1–2.5 cm, florets 5–16, grayish green or purplish; glumes ovate, membranous, 1-veined, lower glume 1.4–2.3 mm, upper glume 2.5–4 mm, apex rounded; lemmas broadly elliptic or obovate-oblong, 3.5–4.5 mm, firmly herbaceous, scabrid, 7-veined, apex membranous, broadly obtuse; palea as long as lemma, keels narrowly winged, apex 2-denticulate. Stamens 3, anthers 0.8–1.4 mm. Fl. Jun–Aug. $2n = 40$.

Moist grassy places, ditches, shallow water; 700–1900 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan (Karachi), Russia, Tajikistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in North America and Australia].

4. *Glyceria tonglensis* C. B. Clarke, J. Linn. Soc., Bot. 15: 119. 1876.

卵花甜茅 luan hua tian mao

Glyceria kashmiriensis Kelso; *G. ovatiflora* Keng ex P. C. Keng; *G. tonglensis* var. *ovatiflora* (Keng ex P. C. Keng) P. C. Keng.

Perennial, tufted or shortly creeping. Culms ascending, 10–50(–75) cm tall, 1–2 mm in diam. Leaf sheaths slightly keeled, smooth or scaberulous, upper shorter than internodes; leaf blades flat or folded, 6–15 cm × 2–3(–5) mm, smooth or scaberulous, abruptly acute; ligule 0.7–1(–3) mm. Panicle narrow and contracted when young, later open, 10–27 cm; branches 2–4 at lower nodes, erect at first, later spreading or deflexed, smooth, longest bearing up to 14 spikelets. Spikelets narrowly elliptic-oblong, 6–9 mm, florets 4–8, gray-green or tinged purplish brown; glumes ovate to ovate-oblong, membranous, 1-veined, lower glume 1–2 mm, upper glume 1.8–2.8 mm, apex acute; lemmas ovate-oblong, 2.8–3.6 mm, firmly papery, minutely granular, 7-veined, veins scaberulous, apex membranous, obtuse, often slightly crenulate; palea as long as lemma, keels thick, wingless, scabrid. Stamens 3, anthers 0.85–1 mm. Fl. and fr. Jul–Sep.

Marshy ground in forests, wet grassy places under shrubs, streams, ditches; 1500–3600 m. Anhui, Guizhou, Jiangxi, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal].

The name *Glyceria tonglensis* has been misapplied to *G. ischyro-neura* Steudel, which occurs from Japan and S Korea northward to the S Kuril Islands. This is a very similar species, distinguished by its shorter (2–2.8 mm), ovate lemmas, shorter anthers (0.5–0.7 mm), more strongly convex palea keels, and strongly sinuous rachilla. It has been reported in the literature from NE China, but its presence there has not been confirmed.

5. *Glyceria leptorhiza* (Maximowicz) Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 20: 307. 1901.

细根茎甜茅 xi gen jing tian mao

Glyceria fluitans (Linnaeus) R. Brown var. *leptorhiza* Maximowicz, Prim. Fl. Amur. 320. 1859.

Perennial, rhizomatous; rhizomes filiform. Culms ascending, 20–50 cm tall, 1–2 mm in diam. Leaf sheaths smooth, upper shorter than internodes; leaf blades flat, thin, 7–10 cm × 1.5–3.5 mm, smooth; ligule 1–3 mm. Panicle narrow, contracted, 6–25 cm, base included in uppermost leaf sheath; branches 1–3 per node, erect, appressed to main axis, smooth, bearing 1–4 spikelets. Spikelets linear, 8–14 mm, florets 5–9, pale green or pinkish; glumes ovate-oblong, 1-veined, lower glume 2–3 mm, upper glume 3–4 mm, apex obtuse; lemmas oblong, 3–4 mm, smooth, 7-veined, upper margins and apex narrowly membranous, apex obtuse; palea slightly longer than lemma, keels wingless, apex emarginate. Stamens 3, anthers 1–1.7 mm. Fl. and fr. Jul–Aug. $2n = 20$.

River banks, shallow water, swampy grasslands. N Heilongjiang [Russia (Far East, E Siberia)].

Reports of this species in Japan refer to *Glyceria depauperata* Ohwi (*G. leptorhiza* subsp. *depauperata* (Ohwi) T. Koyama), which differs from *G. leptorhiza* in having spikelets to 25 mm, florets 7–15, and anthers 0.5–0.7 mm.

6. *Glyceria leptolepis* Ohwi, Bot. Mag. (Tokyo) 45: 381. 1931.

假鼠妇草 jia shu fu cao

Glyceria ussuriensis Komarov.

Perennial, rhizomatous; rhizomes long, thick. Culms robust, hard, 80–110 cm tall, 5–8 mm in diam. Leaf sheaths not prominently keeled, lower sheaths scabrid, with transverse veinlets; leaf blades flat or margins inrolled, firm, up to 40 cm × 5–12 mm, abaxial surface smooth, adaxial surface scabrid, transverse veinlets present, apex abruptly acute; ligule 0.3–1 mm. Panicle ovate in outline, 15–25 cm, exserted, spikelets many; branches 2 or 3 per node, ascending, scabrid. Spikelets elliptic to ovate-oblong, 6–8 mm, florets 4–7, pale green, yellowish brown at maturity; glumes ovate-oblong, membranous, 1-veined, lower glume 1.5–2 mm, upper glume 1.8–2.5 mm, apex obtuse; lemmas lanceolate-oblong, thinly herbaceous, 3–3.5 mm, minutely granular, 7-veined, veins finely scabrid, margins and apex membranous, apex subacute; palea as long as or slightly longer than lemma, keels wingless, scaberulous, apex emarginate. Stamens 2, anthers 0.6–0.8 mm. Fl. and fr. Jul–Sep. $2n = 20$.

Swampy forests, watersides of streams, lakes, ditches. Anhui, Gansu, Heilongjiang, Henan, Hubei, Jiangxi, Nei Mongol, Shaanxi, Shandong, Taiwan, Zhejiang [Japan, Korea, Russia (Ussuri)].

Species nos. 6–10 belong to *Glyceria* sect. *Hydropoa* Dumortier, characterized by a strongly rhizomatous habit, rounded leaf sheaths, large panicle with many spikelets, short, laterally compressed spikelets, and wingless palea keels.

Glyceria formosensis Ohwi (Acta Phytotax. Geobot. 2: 164. 1933) was placed in synonymy under *G. leptolepis* in Taiwanese literature, but it is excluded from that species by its soft habit, scabrid panicle branches, and especially by the presence of 3 stamens. While clearly a member of *G.* sect. *Hydropoa*, it has not been possible to assign it to another species. It is apparently known only from the type gathering.

7. *Glyceria lithuanica* (Gorski) Gorski, Icon. Bot. Char. Cyper. Gram. Lith. t. 20. 1849.

两蕊甜茅 liang rui tian mao

Poa lithuanica Gorski in Eichwald, Naturhist. Skizze 117. 1830; *Glyceria aquatica* (Linnaeus) J. Presl & C. Presl subsp. *debiliior* (Trinius ex Fr. Schmidt) T. Koyama; *G. aquatica* var. *debiliior* Trinius ex Fr. Schmidt; *G. debiliior* (Trinius ex Fr. Schmidt) Kudo; *G. orientalis* Komarov.

Perennial, rhizomatous. Culms soft, 60–150 cm tall, 3–5 mm in diam. Leaf sheaths not prominently keeled, lower sheaths scabrid; leaf blades flat, soft, thin, up to 30 cm × 4–9 mm, scabrid, apex acute; ligule 2–3 mm. Panicle ovate in outline, 15–30 cm, exserted, spikelets many; branches 2–4 per node, spreading, often flexuous, sometimes nodding, filiform, scabrid. Spikelets elliptic to ovate-oblong, 5–8 mm, florets 3–6, bright green or purple tinged; rachilla densely scabrid; glumes ovate, membranous, 1-veined, lower glume 1.2–1.8 mm, upper glume 1.7–2.5 mm, apex subobtuse; lemmas lanceolate-oblong, 2.5–4 mm, thinly herbaceous, often minutely granular or scaberulous, 7-veined, veins scabrid, apex membranous, obtuse; palea as long as or slightly longer than lemma, keels wingless, scaberulous, apex emarginate. Stamens 2, anthers 0.5–0.8 mm. Fl. Jun–Aug. $2n = 20$.

Swampy forests, forest margins, streamsides; 600–1800 m. Jilin, Liaoning [Japan, Korea, Mongolia, Russia; SW Asia (Caucasus), C and N Europe].

This is a generally more slender species than *Glyceria leptolepis*, the other species in China with only 2 anthers. The basal culm internodes are not hard and canelike as in *G. leptolepis*, but flatten on pressing.

8. *Glyceria spiculosa* (F. Schmidt) Roshevitz in B. Fedtschenko, Fl. Zabaik. 1: 85. 1929.

狭叶甜茅 xia ye tian mao

Scolochloa spiculosa F. Schmidt, Reis. Amur-Land., Bot. 201. 1868; *Glyceria longiglumis* Handel-Mazzetti; *G. paludificans* Komarov.

Perennial, rhizomatous. Culms erect, rooting and sometimes branching from lower nodes, 50–120 cm tall, 2–7 mm in diam. Leaf sheaths smooth or slightly scabrid; leaf blades flat or margins rolled, stiff, 20–30 cm × 3–5 mm, abaxial surface green, smooth, adaxial surface grayish green, scabrid, apex acuminate; ligule 0.8–3 mm. Panicle somewhat contracted before flowering, becoming laxer, 10–25 cm, exserted; branches 2–4 per node, obliquely ascending, slender, smooth or sparsely scabrid. Spikelets elliptic to ovate, 4–8(–10) mm, florets 5–8, yellowish green, whitish gray or purplish; glumes lanceolate, membranous, 1-veined, lower glume 2.7–4 mm, upper glume 3.5–4.5 mm, ca. 3/4 as long as adjacent lemma or more, acuminate; lemmas narrowly oblong-lanceolate, 3.5–4.8 mm, thinly herbaceous, often minutely granular, 7-veined, veins scabrid, apex membranous, acute; palea as long as or slightly shorter than lemma, keels wingless, scabrid. Stamens 3, anthers 1–2 mm. Fl. Jun–Jul. $2n = 40$.

Wet meadows, lake shores, swamps. Heilongjiang, Liaoning, Nei Mongol [N Korea, Russia (Far East, E Siberia)].

9. *Glyceria triflora* (Korshinsky) Komarov, Fl. URSS 2: 459. 1934.

东北甜茅 dong bei tian mao

Glyceria aquatica (Linnaeus) Wahlberg var. *triflora* Korshinsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 418. 1892; *G. arundinacea* Kunth subsp. *triflora* (Korshinsky) Tzvelev; *G. effusa* Kitagawa; *G. kamtschatica* Komarov; *G. maxima* (Hornberg) Hartman subsp. *triflora* (Korshinsky) Hultén; *G. triflora* var. *effusa* (Kitagawa) Z. L. Wu.

Perennial, rhizomatous; rhizomes long, thick. Culms stout, 50–150 cm tall, 4–8 mm in diam. Leaf sheaths smooth, lower sheaths with transverse veinlets; leaf blades flat, 15–25 cm × 5–10 mm, abaxial surface green, smooth or scaberulous, adaxial surface grayish green, finely papillose, apex acuminate; ligule 2–4 mm, margin cuspidate in middle. Panicle open, obovate in outline, 20–30 cm, shortly exserted, spikelets many; branches 3–4 per node, ascending or spreading, smooth or slightly scabrid. Spikelets elliptic or oblong, 5–8 mm, florets 3–8, green or purplish at maturity; glumes ovate, membranous, 1-veined, lower glume 1.5–2 mm, upper glume 2–3 mm, obtuse or subacute; lemmas elliptic-oblong, 2–3.5 mm, thinly herbaceous, 7-veined, veins finely scabrid, apex hardly membranous, obtuse; palea as long as or slightly shorter than lemma, keels wingless, scabrid, apex truncate. Stamens 3, anthers 0.9–1.5 mm. Fl. and fr. Jun–Sep. $2n = 20$.

Swamps, marshy ground near streams and lakes; 200–3300 m. Hebei, Heilongjiang, Nei Mongol, Shaanxi, ?Sichuan, ?Yunnan [Kazakhstan, Korea, Mongolia, Russia (Far East, Siberia); Europe (Ural Mountains)].

This species is an Asian element of the *Glyceria arundinacea* complex and is sometimes included as a subspecies of the latter. *Glyceria arundinacea* Kunth s.s. occurs in C Europe and the Caucasus and is distinguished by its densely scabrid adaxial leaf surface and panicle branches, and shorter glumes. The North American species *G. grandis* S. Watson, with slightly smaller glumes and anthers, also belongs to this complex.

The records from Sichuan and Yunnan have not been confirmed.

10. *Glyceria maxima* (Hartman) Holmberg, Bot. Not. 1919: 97. 1919.

水甜茅 shui tian mao

Molinia maxima Hartman, Handb. Skand. Fl. 56. 1820; *Glyceria aquatica* (Linnaeus) Wahlberg (1820), not (Linnaeus) J. Presl & C. Presl (1819); *G. spectabilis* Mertens & Koch; *Poa aquatica* Linnaeus.

Perennial, rhizomatous; rhizomes long, thick. Culms stout, erect, 80–200 cm tall, up to 10 mm in diam. Leaf sheaths smooth or scabrid toward blade; leaf blades flat, light green, 25–50 cm × 8–16 mm, with transverse veinlets, abaxial surface scabrid, adaxial surface smooth or sparsely scabrid, apex acute; ligule 2–4 mm. Panicle ovate to oblong in outline, usually laxly contracted, 20–40 cm, exserted, spikelets many; branches 4–10 per node, obliquely ascending, relatively thick, scabrid. Spikelets narrowly oblong, 5–12 mm, florets 5–10, yellowish green or purple tinged; rachilla internodes smooth; glumes narrowly ovate, 1-veined, lower glume 2–3 mm, upper glume 3–4 mm, subacute; lemmas oblong, 3–4 mm, thinly herbaceous, 7-veined, veins scabrid, apex membranous, broadly obtuse; palea as long as lemma, keels wingless, scabrid. Stamens 3, anthers 1.2–1.8 mm. Fl. May–Jul. $2n = 28, 56, 60$.

Marshy floodlands, stream and lake banks. Xinjiang [Kazakhstan, Russia (W Siberia westward)]; Europe; introduced in North America and Australia].

Glyceria aquatica (Linnaeus) J. Presl & C. Presl is a synonym of *Catabrosa aquatica*.

56. *MELICA* Linnaeus, Sp. Pl. 1: 66. 1753.

臭草属 chou cao shu

Perennial, tufted or rhizomatous. Culms erect or ascending. Leaf sheaths with fused margins; leaf blades linear; ligule membranous, often cylindrical and then sometimes with lobe on side opposite blade. Panicle spreading or more often contracted, sometimes scanty or racemelike; pedicels drooping, pubescent below spikelet. Spikelets weakly laterally compressed, composed of 1–3 lower fertile florets and a few upper reduced florets, these often compressed into a terminal cluster of rudimentary scales, disarticulating below lowest floret, tardily between florets, or spikelet falling entire; glumes well developed, broadly lanceolate or ovate, often not keeled, membranous or papery, equal or lower glume shorter, 1–5-veined, apex obtuse or acute; floret callus small, glabrous, obtuse; lemmas broadly lanceolate or ovate, usually herbaceous, sometimes largely membranous, back rounded, smooth, scabrid or hairy; 5–9(–13)-veined, apex membranous, obtuse, acute, or shallowly 2-lobed; palea usually shorter than lemma, or as long as lemma in upper florets, keels scabrid or ciliate. Stamens 3. $x = 9$.

About 90 species: temperate and subtropical regions of the world, except Australia; 23 species (eight endemic) in China.

- 1a. Lowest lemma conspicuously long-hairy from base to apex, on marginal or all veins, hairs 2–5 mm.
 - 2a. Lemmas long-pilose on all veins 1. *M. persica*
 - 2b. Lemmas long-ciliate on marginal veins only.
 - 3a. Panicle rather lax, often 1-sided, central axis usually visible; all leaf sheaths antrorsely scaberulous; leaf blades rolled; lower glume 2/3–4/5 length of upper 2. *M. ciliata*
 - 3b. Panicle dense, cylindrical, central axis not visible; lowermost leaf sheaths retrorsely scabrid or pubescent; leaf blades flat; lower glume 1/2–2/3 length of upper 3. *M. transsilvanica*
- 1b. Lowest lemma glabrous or with short scattered hairs.
 - 4a. Spikelets terminating in 1 sterile lemma, resembling the fertile lemmas but smaller; panicle branches up to 15 cm, often spreading, branchlets present.
 - 5a. Lowest lemma 6–9 mm; leaf sheaths harshly scabrid 4. *M. scaberrima*
 - 5b. Lowest lemma 4–6.5 mm; leaf sheaths smooth, scabrid or pubescent.
 - 6a. Plants with slender rhizomes; panicle narrow, branches erect or ascending.
 - 7a. Ligule 3–5 mm; leaf blades 2–2.5 mm wide; anthers ca. 2 mm 7. *M. longiligulata*
 - 7b. Ligule 0.3 mm or shorter; leaf blades 2–6 mm wide; anthers 0.5–1 mm 8. *M. przewalskyi*
 - 6b. Plants lacking slender rhizomes; panicle broad at maturity, branches spreading.
 - 8a. Culms up to 150 cm tall; leaf blades 6–14 mm wide; ligule 0.2–0.5 mm 5. *M. onoei*
 - 8b. Culms up to 80 cm tall (if taller, ligule 1–4 mm); leaf blades 2–6 mm wide.
 - 9a. Panicle with many branches and spikelets; spikelets with purple glumes and green florets; fertile florets 2 or 3 6. *M. schuetzeana*
 - 9b. Panicle with distant divaricate branches and widely spaced spikelets; spikelets green or gray-green; fertile florets 1 or 2.
 - 10a. Glumes hyaline, shining, upper glume 6–8 mm; pedicels up to 20 mm; anthers 1.8–2 mm 9. *M. yajiangensis*

- 10b. Glumes not conspicuously hyaline and shining, upper glume 5–6 mm; pedicels 3–5 mm; anthers 1–1.25 mm 10. *M. taylorii*
- 4b. Spikelets terminating in a globular cluster of rudimentary lemmas; panicle branches usually less than 5 cm, erect, unbranched or almost so, panicle sometimes racemelike (rarely branches longer or branchlets present).
- 11a. Panicle racemelike, unbranched; spikelets few (3–15), borne directly on main axis.
- 12a. Spikelets 5–8 mm; glumes purplish red; panicle eventually nodding 11. *M. nutans*
- 12b. Spikelets 7–10 mm; glumes usually green; panicle erect.
- 13a. Glumes subequal, ovate, obtuse 12. *M. grandiflora*
- 13b. Glumes unequal, lanceolate, acute 13. *M. pappiana*
- 11b. Panicle branched; spikelets more than 15, borne on panicle branches.
- 14a. Culms up to 1.5 m tall; spikelets 8–14 mm; glumes obviously 5–7-veined.
- 15a. Panicle open, ovate, branches spreading; lemmas hispid below middle 14. *M. turczaninowiana*
- 15b. Panicle dense, linear-oblong, branches erect; lemmas glabrous 15. *M. altissima*
- 14b. Culms less than 1 m tall; spikelets 3.5–8(–11) mm; glumes with short inconspicuous lateral veins.
- 16a. Glumes unequal, much shorter than florets; lower glume ca. 1/2 length of adjacent lemma ... 16. *M. virgata*
- 16b. Glumes subequal, large; lower glume slightly shorter to longer than adjacent lemma.
- 17a. Lemma apex obtuse or acute.
- 18a. Panicle with many crowded spikelets, 20–50 on lower branches (including branchlets); leaf blades flat, 2–7 mm wide 17. *M. scabrosa*
- 18b. Panicle with few spikelets, 1–6 on lower branches (branchlets absent); leaf blades usually rolled, 1–3 mm wide.
- 19a. Plant tufted; ligules ca. 0.5 mm; lemmas coarsely tubercular-scabrid 18. *M. radula*
- 19b. Plant rhizomatous; ligule 2–5 mm; lemmas scaberulous 19. *M. secunda*
- 17b. Lemma apex very broad, denticulate-erose, usually 2-lobed or emarginate.
- 20a. Panicle lax; ligules with ca. 3 mm lobe on side opposite blade; anthers 1.2–2.2 mm 20. *M. kozlovii*
- 20b. Panicle very dense; ligules without lobe on side opposite blade; anthers 0.6–1 mm.
- 21a. Spikelets silvery green; lemmas narrowly membranous at apex; ligule abaxially glabrous 21. *M. tangutorum*
- 21b. Spikelets purple or yellow; lemmas membranous and slightly enlarged in upper 1/3; ligule abaxially pubescent.
- 22a. Panicle purple; spikelets 5–8 mm; ligules 0.8–1.5 mm 22. *M. tibetica*
- 22b. Panicle yellow; spikelets 8–11 mm; ligules 2–4 mm 23. *M. subflava*

1. *Melica persica* Kunth, Révis. Gramin. 1: 351. 1829.

伊朗臭草 *yi lang chou cao*

Perennial, forming dense tussocks, with wiry rhizomes. Culms 15–50 cm tall, ca. 1 mm in diam. Leaf sheaths glabrous, scabrid or retrorsely pubescent; leaf blades flat or rolled, 5–15 cm × 1–3 mm, glabrous to densely pubescent on one or both surfaces; ligule 0.5–5 mm. Panicle spike-like, 5–12 cm, lax and 1-sided to densely cylindrical. Spikelets gaping, 5–11 mm, pallid or purplish, fertile florets 1 or 2, terminal sterile lemmas gathered into globular cluster; lower glume broadly lanceolate, 1/3–3/4 length of upper, 3-veined, upper glume lanceolate, as long as spikelet, 5-veined, both acute; lemmas elliptic, lowest 4–7.5 mm, granular-scaberulous, 7–9-veined, densely hairy with 3–5 mm hairs along all veins, apex acute or 2-toothed, second lemma (when present) shorter, glabrous; palea keels shortly ciliate. Anthers 1–1.8 mm. Fl. and fr. May–Aug. $2n = 18$.

Grassy hillsides. Gansu, Jilin, Sichuan, W Xizang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; NE Africa (Egypt), SW Asia].

Melica persica s.l. comprises a perplexing complex of forms, extending from the E Mediterranean through C Asia. Variable characters include hairiness of the leaf sheaths and blades, angle of the leaf blades,

panicle density, spikelet length and color, and the relative length of the glumes. A particularly hairy variant, present in Xizang, is recognized at subspecific rank here. The other Chinese records are based on plants described as having sparsely pubescent lemmas with ca. 1 mm hairs. This is atypical for *M. persica* s.s. and is also a big extension eastward from its known range. It has not been possible to confirm their identity.

- 1a. Leaf sheaths and blades glabrous to pubescent; spikelets 5–11 mm 1a. subsp. *persica*
- 1b. Leaf sheaths and blades densely pubescent; spikelets 6–8 mm, crowded 1b. subsp. *canescens*

1a. *Melica persica* subsp. *persica* s.l.

伊朗臭草(原亚种) *yi lang chou cao* (yuan ya zhong)

Melica inaequiglumis Boissier; *M. Jacquemontii* Decaisne; *M. vestita* Boissier.

Leaf sheaths and blades glabrous to pubescent; spikelets 5–11 mm.

Grassland on stony hillsides. Gansu (Wudu), Jilin (Changbai Shan), Sichuan (Baishui) [Afghanistan, NW India, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; NE Africa (Egypt), SW Asia].

The presence of *Melica persica* in China, apart from subsp. *canescens*, has not been confirmed (see the comment under the species).

1b. *Melica persica* subsp. *canescens* (Regel) P. H. Davis, Fl. Turkey 9: 534. 1985.

毛鞘臭草 mao qiao chou cao

Melica cupani Gussoni var. *canescens* Regel, Descr. Pl. Nov. Rar. 8: 88. 1880; *M. canescens* (Regel) Lavrenko ex Nevski; *M. jacquemontii* Decaisne subsp. *canescens* (Regel) Bor.

Leaf sheaths and blades densely pubescent with retrorse hairs; spikelets 6–8 mm, crowded.

Gravel banks; ca. 3500 m. Xizang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan; SW Asia (Iran, E Turkey)].

2. *Melica ciliata* Linnaeus, Sp. Pl. 1: 66. 1753.

小穗臭草 xiao sui chou cao

Melica ciliata subsp. *taurica* (K. Koch) Tzvelev; *M. ciliata* var. *taurica* (K. Koch) Grisebach; *M. taurica* K. Koch.

Perennial, densely tufted, shortly rhizomatous. Culms 20–80 cm tall, 1–2 mm in diam. Leaf sheaths scabrid with upwardly directed teeth; leaf blades usually rolled, 6–10 cm × 1–4 mm, abaxial (outer) surface smooth or scabrid; ligule 1–4 mm. Panicle spike-like, 2.5–8 cm, dense or rather lax, strongly to indistinctly 1-sided, sometimes lobed below, main axis usually visible. Spikelets 4–8 mm, green or purplish, fertile floret 1, terminal sterile lemmas gathered into globular cluster; glumes ovate, papery, 5-veined, lower glume 3/4–4/5 length of upper, upper glume as long as spikelet, both acute; lemma lanceolate, 2.5–3.2 mm, granular-scaberulous, 7–9-veined, densely ciliate along marginal veins with 2–3 mm hairs, apex acute; palea keels ciliolate. Anthers 0.8–1.5 mm. Fl. May–Jul. $2n = 18$.

Grassy places in rock gullies; ca. 1500 m. Xinjiang [Kazakhstan, Russia, Turkmenistan; SW Asia (Caucasus, N Iran), Europe].

This is an extremely variable species, variants differing in the number of culm nodes, degree and position of roughness on the leaves, panicle shape and density, and spikelet color and length. This variation is often partitioned among several ill-defined subspecies. *Melica ciliata* subsp. *taurica* has been reported from Xinjiang (as *M. taurica*). This variant is distinguished by scabrid leaf sheaths, scabrid abaxial surface of leaf blades, and a rather dense, almost cylindrical panicle of many pale green, 4–6 mm spikelets.

3. *Melica transsilvanica* Schur, Enum. Pl. Transsilv. 764. 1866, nom. cons.

德兰臭草 de lan chou cao

Melica altissima Linnaeus var. *transsilvanica* (Schur) Schur; *M. caricina* Dumont d'Urville; *M. ciliata* Linnaeus subsp. *transsilvanica* (Schur) Čelakovský; *M. ciliata* var. *transsilvanica* (Schur) Hackel.

Perennial, loosely tufted. Culms 30–100 cm tall, 2–3 mm in diam., scabrid below panicle. Leaf sheaths at base retrorsely scabrid or pubescent; leaf blades usually flat, 10–20 cm × 3–6 mm, abaxial surface scabrid, adaxial surface pubescent, midrib prominent; ligule 2–5 mm. Panicle spike-like, 5–11 cm, dense, cylindrical, sometimes lobed below, main axis hidden. Spikelets 4.5–9 mm, pallid, fertile florets 1 or 2, terminal sterile lemmas gathered into globular cluster; glumes papery, 5-veined, scabrid, lower glume ovate, 1/2–2/3 length of upper, sharply acute, upper glume lanceolate-oblong, as long as spikelet,

abruptly acuminate; lemma lanceolate, 5–5.5 mm, granular-scaberulous, 7-veined, densely ciliate along marginal veins with ca. 3 mm hairs, apex subacute, second lemma (when present) shorter, glabrous. Anthers 0.6–1.2 mm; palea shorter than lemma. Fl. May–Aug. $2n = 18$.

Deciduous broad-leaved forests, hills in steppe, dry places; 800–2000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (N Iran), Europe].

4. *Melica scaberrima* (Nees ex Steudel) J. D. Hooker, Fl. Brit. India 7: 330. 1896 [“1897”].

糙臭草 cao chou cao

Glyceria scaberrima Nees ex Steudel, Syn. Pl. Glumac. 1: 287. 1854.

Perennial. Culms 90–200 cm tall, 2–3 mm in diam., many-noded. Leaves all cauline, leaf sheaths as long as or longer than internodes, harshly retrorsely scabrid on veins, teeth sometimes elongated into short bristles; leaf blades thin, 15–25 cm × 3–7 mm, abaxial surface scabrid, adaxial surface smooth, glabrous or sparsely hispid; ligule 1–2.3 mm. Panicle open, 15–30 cm; branches 2 or 3 per node, distant, eventually divaricate, usually branched, up to 15 cm, spikelets often clustered on the branchlets. Spikelets narrowly elliptic, 10–14 mm, green, fertile florets 2 or 3, 1 or 2 similar but smaller sterile florets raised on elongate internodes; glumes unequal, clearly shorter than adjacent florets, lower glume narrowly ovate, 2.6–5.2 mm, upper glume lanceolate, 3.8–6.5 mm, both acute; lemmas narrowly lanceolate, lowest 6–9 mm, granular-scaberulous, 5–7-veined, upper margins and apex membranous, apex subacute; palea keels scabrid-ciliolate. Anthers ca. 2 mm. Fl. Jul–Aug.

Forest fringes, grassy places on mountain slopes; 2800–4000 m. Xizang, NW Yunnan (Dêqên, Zhongdian) [NW India, Kashmir, W Nepal, N Pakistan].

This is a tall species with a large panicle, only likely to be confused with *Melica onoei*, from which it can be distinguished by its narrower, thinner leaf blades, longer ligules, and spikelets with more florets, in addition to the key characters. It is a species of the W Himalayas. Specimens reported from China have not been seen.

5. *Melica onoei* Franchet & Savatier, Enum. Pl. Jap. 2: 603. 1879.

广序臭草 guang xu chou cao

Melica matsumurae Hackel; *M. kumana* Honda; *M. scaberrima* (Nees ex Steudel) J. D. Hooker var. *micrantha* J. D. Hooker.

Perennial, tufted. Culms few, 75–150 cm tall, 2–2.5 mm in diam., many-noded. Leaves all cauline; leaf sheaths much longer than internodes, scaberulous or puberulous, lower sheaths with reduced blades, often retrorsely setose; leaf blades broadly linear, 10–25 cm × 6–14 mm, abaxial surface smooth, adaxial surface hispid or pilose, often sparsely; ligule 0.2–0.5 mm. Panicle lax, 15–35 cm; branches 2 or 3 per node, ascending or spreading, branched, up to 15 cm, spikelets diffuse. Spikelets linear-lanceolate, 5–9.5 mm, green, fertile florets 1 or 2, 1 smaller sterile floret raised on ca. 2 mm internode; glumes unequal, clearly shorter than adjacent florets, lower glume nar-

rowly ovate, 2.5–3.5 mm, upper glume lanceolate-oblong, 4–5 mm, both obtuse to acute; lemmas lanceolate-oblong, lowest 4.8–5.5 mm, herbaceous, granular-scaberulous, 7-veined, additional weaker veins sometimes present, upper margins and apex broadly membranous, apex obtuse; palea keels scaberulous near apex, otherwise smooth. Anthers 0.8–1.5 mm. Fl. and fr. May–Oct. $2n = 18$.

Woodlands, damp shady places on hillsides, gullies, roadsides; 400–2500 m. Anhui, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Kashmir, Korea, N Pakistan].

This species is mainly distributed from Japan to Yunnan, but a few gatherings are known from the W Himalayas. The combination of broad leaf blades, short ligule, narrow, green spikelets and smooth palea keels distinguishes it from other Chinese *Melica* species with a large, open panicle.

Melica onoei var. *pilosula* Papp (Acad. Romana, Mem. Sect. Sti., ser. 3, 12: 242. 1937) was described as having a simple, contracted panicle, smooth leaf sheaths, a long pilose adaxial leaf surface, and a pointed, ca. 5 mm ligule. The panicle and ligule definitely exclude it from *M. onoei*. It is based on a specimen from Beijing that has not been seen.

6. *Melica schuetzeana* W. Hempel, Feddes Repert. 83:4. 1972.

藏东臭草 zang dong chou cao

Perennial. Culms 80–110 cm tall, 2–3 mm in diam., many-noded. Leaves all cauline; leaf sheaths usually longer than internodes, retrorsely scabrid on veins, basal sheaths purplish; leaf blades stiff, 15–30 cm × 3–6 mm, abaxial surface scabrid, adaxial surface scaberulous; ligule cylindrical, 1–4 mm, soon splitting. Panicle open, up to 35 cm; branches whorled, distant, ascending or spreading, branched, up to 12 cm, spikelets diffuse. Spikelets elliptic, 6–8 mm, glumes purple, florets pale green, fertile florets 2 or 3, 1 smaller sterile floret raised on ca. 2 mm internode; glumes unequal, clearly shorter than adjacent florets, lower glume narrowly ovate, 2.8–4 mm, upper glume lanceolate-oblong, 4.5–6.5 mm, both acute; lemmas elliptic-oblong, lowest 5–6.5 mm, herbaceous, granular-scaberulous, 5–7-veined, midvein extending to apex, apex membranous, emarginate; palea keels scabrid, ciliolate near apex. Anthers 1.1–1.8 mm. Fl. Jul–Aug.

Forest margins; 3200–3500 m. Qinghai, Sichuan, SE Xizang, Yunnan [Bhutan].

This species is similar to *Melica onoei*, but can be distinguished by its longer ligules, narrower leaf blades, broader spikelets with purple glumes, and ciliolate palea keels.

7. *Melica longiligulata* Z. L. Wu, Acta Phytotax. Sin. 30: 171. 1992.

长舌臭草 chang she chou cao

Perennial, loosely tufted, with slender rhizomes. Culms wiry, up to 60 cm tall, 0.7–1 mm in diam., 3–5-noded. Leaves all cauline, leaf sheaths purple, longer than internodes, asperulous-puberulous between veins, veins smooth; leaf blades narrowly linear, loosely rolled when dry, 8–20 cm × 2–2.5 mm, abaxial surface scaberulous, adaxial surface closely ribbed, ribs scabrid; ligule cylindrical, 3–5 mm, soon splitting into lanceolate lobes. Panicle narrow, 10–18 cm; branches 2–4 per node,

suberect, branched, longest ca. 6 cm. Spikelets ovate, 5–7 mm, glumes purplish and florets pale green, fertile florets 2 or 3, 1 or 2 smaller sterile florets raised on ca. 2 mm internode; glumes unequal, shorter than adjacent florets, lower glume ovate-oblong, 3–3.7 mm, upper glume elliptic, 4–5.5 mm, both acute; lemmas narrowly lanceolate, lowest 4.3–5 mm, herbaceous, granular-scaberulous, 7-veined, upper margins and apex broadly membranous, apex obtuse; palea keels ciliolate above middle. Anthers ca. 2 mm. Fl. Jul.

• Dry mountain slopes, among shrubs; 3300–3400 m. Sichuan.

This is a delicate species, with very slender culms and narrow leaf blades. The long ligule resembles that of the more robust *Melica schuetzeana*, which has similar spikelets with purple glumes and green florets, but slightly longer spikelet parts. Both these species are known from very few gatherings.

8. *Melica przewalskyi* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 25. 1921.

甘肃臭草 gan su chou cao

Melica polyantha Keng.

Perennial, loosely tufted, with slender rhizomes. Culms 40–90 cm tall, 1.5–2 mm in diam., scabrid below panicle, several-noded. Leaves all cauline; leaf sheaths densely pubescent at base, scaberulous upward; leaf blades flat or loosely involute when dry, 8–22 cm × 2–6 mm, abaxial surface scabrid, adaxial surface puberulous, sometimes sparsely pilose; ligule ca. 0.3 mm or almost absent. Panicle narrow, 12–30 cm; branches 2–4 per node, erect or ascending, longest 6–15 cm. Spikelets linear-lanceolate, 5–9(–11) mm, usually purple tinged, fertile florets 2–3(–4), 1 very small sterile floret raised on 2–3 mm internode; glumes membranous, lower glume 2–3.5 mm, upper glume 3–5 mm, both acute; lemmas lanceolate, lowest 4–6 mm, minutely scaberulous upward, apex membranous, obtuse; palea keels scabrid to ciliolate. Anthers 0.5–1 mm. Fl. Jun–Aug.

• Rocky slopes, moist ground, roadsides; 2300–4200 m. Gansu, Guizhou, Hubei, Ningxia, Qinghai, Shaanxi, Sichuan, Xizang.

9. *Melica yajiangensis* Z. L. Wu, Acta Phytotax. Sin. 30: 172. 1992.

雅江臭草 ya jiang chou cao

Perennial, loosely tufted. Culms 55–75 cm tall, 1–2 mm in diam., 4–5-noded. Lower leaf sheaths pilose, longer than internodes, upper sheaths glabrous, shorter than internodes; leaf blades narrowly linear, up to 27 cm × 2–3 mm, abaxial surface smooth, adaxial surface ribbed, ribs scaberulous; ligule 0.3–0.5 mm. Panicle open, 15–25 cm; branches 2 per node, horizontally spreading, very fine, unbranched, up to 12 cm, bearing relatively few distant spikelets; pedicels setaceous, up to 20 mm. Spikelets 5–8 mm, gray-green, fertile floret 1, 1 smaller sterile floret raised on 2–3 mm densely scabrid internode; glumes subequal, narrowly lanceolate, as long as or longer than florets, hyaline, lower glume 5–7 mm, upper glume 6–8 mm, both acuminate; lemmas lanceolate-oblong, lowest 4–5 mm, herbaceous, granular-scaberulous, 7-veined, upper margins and apex narrowly membranous, apex acute; palea as long as or slightly shorter than lemma, keels scabrid, ciliolate near apex. Anthers 1.8–2 mm. Fl. Aug–Sep.

- Mountain slopes; ca. 2700 m. Sichuan.

This species is apparently known only from the type. The panicle with paired, divaricate branches resembles that of *Melica taylorii*, but the glistening, long-glumed spikelets on long, very fine pedicels are distinctive.

10. *Melica taylorii* W. Hempel, Feddes Repert. 83: 2. 1972 [“*taylori*”].

高山臭草 gao shan chou cao

Perennial, tufted; roots woolly. Culms 55–80 cm tall, 0.5–2 mm in diam., 4–5-noded. Leaf sheaths longer than internodes, basal sheaths membranous, short, bladeless, retrorsely scabrid-pubescent on veins, upper sheaths smooth, glabrous, pilose at collar; leaf blades thin, 10–18 cm × 3–6 mm, abaxial surface scaberulous, adaxial surface slightly scaberulous; ligule 1–1.5 mm. Panicle open, ca. 14 cm; branches 2 per node, finally horizontally spreading, slender, not or scarcely branched, bearing relatively few distant spikelets; pedicels 3–5 mm. Spikelets 5–7.5 mm, greenish brown, fertile florets 1 or 2, 1 smaller sterile floret raised on 2–2.5 mm, scabrid internode; glumes unequal, shorter than adjacent floret, narrowly lanceolate, lower glume 3.8–5.8 mm, upper glume 5–6 mm, both acute; lemmas narrowly lanceolate-oblong, purple tinged, lowest 5–6 mm, herbaceous, granular-scaberulous, 5–7-veined, upper margins and apex narrowly membranous, apex subacute; palea keels ciliate. Anthers 1–1.25 mm. Fl. Jul–Sep.

- Mountain slopes, in Picea or Quercus forests; 4000–4500 m. Xizang.

11. *Melica nutans* Linnaeus, Sp. Pl. 1: 66. 1753.

俯垂臭草 fu chui chou cao

Perennial, with slender creeping rhizomes. Culms scattered, 25–970 cm tall, 1–2 mm in diam. Leaf sheaths keeled, very narrowly winged, wing margin and sometimes veins scabrid, glabrous or sparsely pubescent at junction with blade, lower sheaths purplish; leaf blades flat, thin, 10–26 cm × 2–5 mm, abaxial surface smooth, adaxial surface puberulent, sometimes sparsely pilose, transverse veinlets present; ligule ca. 0.3 mm or almost absent. Panicle lax, 4–15 cm, racemelike, 1-sided, eventually nodding; spikelets 5–15, mostly borne in pairs or singly directly on main axis, lowest branch sometimes bearing 2 or 3 spikelets. Spikelets obovate, 5–8 mm, glumes purple, florets green, fertile florets 2(or 3), terminal sterile lemmas gathered into globular cluster; glumes broadly ovate, subequal, 4–6 mm, margins broadly membranous, 3–7-veined, both obtuse; lemmas broadly elliptic, lowest 5–7 mm, leathery, 7–9-veined, additional intermediate veins in lower part, scaberulous or puberulous, apex obtuse; palea keels ciliate. Anthers 1–1.5 mm. Fl. May–Jul. $2n = 18$.

Hill slopes, shady places; 1500–2300 m. Heilongjiang, Xinjiang [Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Russia, Tajikistan, Uzbekistan; SW Asia (Caucasus), Europe].

12. *Melica grandiflora* Koidzumi, Bot. Mag. (Tokyo) 39: 17. 1925.

大花臭草 da hua chou cao

Melica komarovii Luchnik; *M. nutans* subsp. *grandiflora* (Koidzumi) T. Koyama; *M. nutans* var. *argyrolepis* Komarov.

Perennial, with slender creeping rhizomes. Culms 20–60 cm, 1–2 mm in diam. Leaf sheaths keeled, keel broadly winged, wing margin scabrid, otherwise smooth, glabrous or pubescent at junction with blade, lower sheaths purplish; leaf blades flat, thin, 6–15 cm × 2–5 mm, abaxial surface smooth, adaxial surface puberulent or scaberulous, transverse veinlets present; ligule 0.2–0.7 mm. Panicle lax, 3–10 cm, racemelike, 1-sided, erect (not nodding); spikelets 3–12, mostly borne in pairs or singly directly on main axis, lowest branch sometimes bearing 2 or 3 spikelets. Spikelets ovate, 7–10 mm, pale green or infrequently glumes pale purplish, fertile florets 2(or 3), terminal sterile lemmas gathered into globular cluster; glumes subequal, ovate, margins broadly membranous, lower glume 4–6 mm, 3–7-veined, upper glume 5–7 mm, 5–7-veined, both obtuse; lemmas lanceolate-oblong, lowest 6–10 mm, leathery, prominently 7–9-veined, additional intermediate veins in lower half, scaberulous or puberulous, apex obtuse; palea keels ciliate. Anthers 1.2–1.7 mm. Fl. and fr. Apr–Jul.

Mountain slopes, forests, among shrubs, grassy roadsides, damp places; 500–3200 m. Anhui, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, Shanxi, Zhejiang [Japan, Korea].

The name *Melica komarovii* has been applied to a form with a more than usually densely pubescent leaf sheath/blade junction.

13. *Melica pappiana* Hempel, Analele Ști. Univ. “Al. I. Cuza” Iași, Ser. Nouă, 2.a. 17(2): 380. 1971.

北臭草 bei chou cao

Melica uniflora Retzius f. *glabra* Papp, Acad. Romana, Mem. Sect. Ști., ser. 3, 12: 251. 1937.

Plants tufted. Culms slender, basal internodes swollen, 40–60 cm tall. Leaf sheaths glabrous; leaf blades flat, 4–15 cm × 1–3 mm, glabrous or adaxial surface pubescent, transverse veinlets present; ligule 0.5–1.5 mm. Panicle racemelike, 5–6 cm, erect; spikelets 3–4; pedicels 0.4–1.5 cm, scabrid. Spikelets ca. 7 mm, glumes purplish red, florets green, fertile florets 2, terminal sterile lemmas gathered into clavate cluster; glumes unequal, lanceolate, lower glume 4.5–5.5 mm, upper glume 6.5–7.5 mm, 5-veined, acute; lemmas ovate-lanceolate, lowest ca. 6.5 mm, 7-veined; palea keels ciliate. Fr. Jul.

- Open *Larix* forests, grassy mountain slopes; 500–2000 m. Jilin (Changbai Shan), Shanxi (Ningwu).

This little-known species is based on an over-mature specimen in which the florets have been shed. It appears close to *Melica grandiflora*, but is excluded from that species by the unequal, acute glumes. The type has not been seen, but is reported to have swollen basal internodes, which are not otherwise found in E Asian *Melica* species. A second gathering cited in the protologue is a specimen of *M. turczaninowiana*.

14. *Melica turczaninowiana* Ohwi, Acta Phytotax. Geobot. 1: 142. 1932.

大臭草 da chou cao

Melica gmelinii Turczaninow ex Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 368. 1831, not Roth (1789).

Perennial, tufted. Culms 40–130 cm tall, ca. 1.5 mm in diam. Leaf sheaths glabrous, lower sheaths tinged purplish brown; leaf blades flat, 6–18 cm × 3–7 mm, abaxial surface strongly scabrid on veins, adaxial surface shortly pilose; ligule 2–4 mm. Panicle open, ovate in outline, 10–20 cm; branches 2–3 per node, flexuously ascending or spreading, up to 9 cm, unbranched, spikelets spaced on 3–7 mm pedicels. Spikelets broadly elliptic, 8–13 mm, fertile florets 2 or 3, terminal sterile lemmas gathered into elongate cluster; glumes brownish purple or blackish, elliptic-oblong, subequal, 8–11 mm, papery, 5–7-veined with connecting veinlets, both obtuse; lemmas lanceolate-oblong, lowest 9–11 mm, 7-veined, additional intermediate veins in lower half, scaberulous-puberulous, hispid on veins below middle with stiff, ca. 1 mm, yellowish hairs, apex obtuse, sometimes shortly split; palea 1/2–2/3 lemma length, keels ciliolate. Anthers 1.5–3.5 mm. Fl. and fr. Jun–Aug. $2n = 18$.

Fringes of conifer and *Betula japonica* forests in mountainous regions, meadows on N slopes; 700–2200 m. Hebei, Heilongjiang, Henan, Nei Mongol, Shanxi [N Korea, Mongolia, Russia (Far East, E Siberia)].

15. *Melica altissima* Linnaeus, Sp. Pl. 1: 66. 1753.

高臭草 gao chou cao

Melica altissima var. *atropurpurea* Papp; *M. altissima* var. *interrupta* Reichenbach; *M. sibirica* Lamarck.

Perennial, loosely tufted, with long creeping rhizomes. Culms 50–150 cm tall, 2–3 mm in diam. Leaf sheaths scabrid on veins; leaf blades flat, thin, 10–20 cm × 4–12 mm, abaxial surface strongly scabrid on veins, adaxial surface smooth; ligule 2–5 mm. Panicle linear-oblong in outline, very dense with many crowded spikelets, interrupted below, 10–20 cm, 1-sided; branches erect, appressed to main axis, up to 5 cm. Spikelets broadly elliptic to obovate, 10–14 mm, fertile florets 2(or 3), terminal sterile lemmas gathered into globular cluster; glumes dark purple or white at maturity, oblanceolate-oblong to ovate, subequal, 7–11 mm, papery, 5–7-veined with connecting veinlets, both acute or obtuse; lemmas oblanceolate-oblong, lowest 8–11 mm, 7-veined, additional intermediate veins in lower half, scaberulous, apex obtuse, acute or minutely mucronate; palea 2/3 lemma length, keels ciliolate. Anthers 1.8–2.5 mm. Fl. and fr. Jun–Aug. $2n = 18$.

Woodland fringes, among shrubs; 800–1400 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan; SW Asia (Caucasus, N Iran), C and E Europe].

This is a tall, robust species with a showy, dense panicle of large, papery spikelets. It is closely related to the E Asian *Melica turczaninowiana* by its spikelet structure and by the strongly scabrid abaxial surface of the leaf blade. However, the two species are completely different in panicle structure.

16. *Melica virgata* Turczaninow ex Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 369. 1831.

抱草 bao cao

Perennial, tufted, old basal sheaths becoming fibrous. Culms wiry, 30–80 cm tall, 0.6–1.4 mm in diam. Leaf sheaths smooth; leaf blades usually rolled, 7–15 cm × 2–4(–6) mm, smooth, abaxial surface green, adaxial surface grayish green;

ligule 0.7–1 mm, ca. 1.5 mm lobe on side opposite blade. Panicle linear, 10–25 cm; branches clustered at nodes, erect, flexuous, 1–2 cm, distant or slightly overlapping, bearing 1–5 spikelets. Spikelets ovate-oblong, 3.5–6.5 mm, purple or straw-colored, fertile florets 2 or 3, terminal sterile lemmas gathered into globular cluster; glumes unequal, much shorter than florets, lower glume ovate, 1.5–3.5 mm, 3–5-veined, upper glume broadly lanceolate, 2.5–4.2 mm, 5-veined, both acute; lemmas elliptic-oblong, lowest 3–5 mm, herbaceous, 7-veined, granular-scabrid, usually sparsely hirsute at middle back with stiff, 0.3–0.6 mm hairs along veins, rarely glabrous, apex obtuse or acute; palea as long as lemma, keels scaberulous. Anthers 1–1.8 mm. Fl. and fr. May–Jul.

Stony and grassy mountain slopes, rocky gullies; 1000–3900 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Sichuan, Xizang [Mongolia, Russia (SE Siberia)].

This species has unusually short glumes, much shorter than the florets, and is also distinguished by its hirsute lemmas and short, clustered panicle branches. A specimen found in Jiangsu (Nanjing) was presumably a chance introduction.

17. *Melica scabrosa* Trinius in Bunge, Enum. Pl. China Bor. 72. 1833.

臭草 chou cao

Melica scabrosa var. *limprichtii* Papp; *M. scabrosa* var. *puberula* Papp.

Perennial, tufted. Culms 20–90 cm tall, 1–3 mm in diam. Leaf sheaths usually glabrous, lower occasionally sparsely to densely pilose; leaf blades usually flat, 6–15 cm × 2–7 mm, abaxial surface smooth, keeled, adaxial surface scaberulous or sparsely pilose; ligule 1–3 mm, often extended into 2–4 mm acuminate lobe on side opposite blade. Panicle linear or linear-oblong in outline, lax to moderately dense, 8–22 cm; branches erect or obliquely ascending, branched in vigorous specimens, up to 5 cm, 1-sided, bearing 20–50 crowded spikelets. Spikelets ovate, 5–8 mm, pale greenish brown or milky white, fertile florets 2–4(–6), terminal sterile lemmas gathered into globular cluster; glumes keeled, lanceolate in side view, subequal, 4–8 mm, slightly shorter to slightly longer than florets, 3–5-veined, keel usually ciliolate, both acuminate; lemmas ovate-oblong, lowest 4–8 mm, herbaceous with membranous upper margins and apex, 7-veined, coarsely tubercular-scabrid, apex acute to obtuse; palea keels ciliolate. Anthers 0.8–1.3 mm. Fl. and fr. May–Aug.

Rocky slopes, river gravel banks; 200–3300 m. Anhui, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Shandong, Sichuan, Xizang [Korea, Mongolia].

18. *Melica radula* Franchet, Pl. David. 1: 336. 1884.

细叶臭草 xi ye chou cao

Melica scabrosa Trinius var. *radula* (Franchet) Papp; *M. sinica* Ohwi.

Perennial, tufted. Culms 30–45 cm tall, 1–2 mm in diam. Leaf sheaths smooth or scabrid; leaf blades usually rolled, 5–12 cm × 0.8–2 mm (flattened), abaxial surface scabrid at least

toward apex, adaxial surface shortly but densely pubescent; ligule ca. 0.5 mm. Panicle linear in outline, 6–15 cm; branches few, single, mostly erect, unbranched, laxly bearing 3–6 spikelets. Spikelets ovate, 5–8 mm, whitish green, fertile florets (1–)2(–3), terminal sterile lemmas gathered into globular cluster; glumes keeled, narrowly oblong-lanceolate in side view, subequal, 4–7 mm, slightly shorter than florets, lower glume 1–3-veined, upper glume 3–5-veined, keel scaberulous, both subacute; lemmas lanceolate-oblong, lowest 4.5–7 mm, herbaceous with narrowly membranous upper margins and apex, 7-veined with additional intermediate veins in lower half, coarsely tubercular-scabrid, apex obtuse; palea 2/3 lemma length, keels ciliate. Anthers 1–2 mm. Fl. and fr. May–Aug.

• Mountain slopes, stream banks, field margins; 300–2100 m. Gansu, Hebei, Henan, Hubei, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, W Sichuan, NW Yunnan (Dêqên).

The spikelets are much like those of *Melica scabrosa*, but the habit is more slender, with narrower leaf blades, pubescent on the adaxial surface, and a scanty panicle with markedly fewer spikelets.

19. *Melica secunda* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 629. 1881.

偏穗臭草 pian sui chou cao

Melica gracilis Aitchison & Hemsley.

Perennial, tufted, with creeping rhizomes. Culms 40–80 cm tall, 1–2 mm in diam. Leaf sheaths smooth, glabrous; leaf blades flat or rolled, 12–18 cm × 1.5–3 mm, abaxial surface smooth except near apex, adaxial surface scaberulous; ligule 2–5 mm, extended into acuminate lobe on side opposite blade. Panicle linear in outline, lax, usually 1-sided, 10–18 cm; branches erect or almost so, unbranched, up to 2 cm, bearing 1–6 spikelets. Spikelets ovate, 5–8.5 mm, silvery green, sometimes purple tinged, fertile florets (1–)2(–4), usually 3rd floret smaller and enclosing terminal sterile globular cluster; glumes subequal, 5.5–7 mm, mainly hyaline, herbaceous around veins in lower part, lower glume lanceolate, 1–3-veined, upper glume elliptic, 3–5-veined, both acute; lemmas elliptic-oblong, lowest 5–6.5 mm, 7–9-veined, scaberulous, apex hyaline, obtuse-erose; palea ca. 3/4 lemma length, keels ciliate. Anthers 1.1–1.5 mm. Fl. and fr. May–Aug.

Grassy mountainsides, stony and gravel slopes; 2400–3300 m. Gansu, Sichuan, Xinjiang, Xizang [E Afghanistan, NW India, Kashmir, Kazakhstan (Tien Shan), Kyrgyzstan, Tajikistan, Uzbekistan].

The name "*Melica secunda* var. *interrupta* Hackel" (Trudy Imp. S.-Peterburgsk. Bot. Sada 26: 58. 1906) was not validly published because it was merely cited as a synonym.

20. *Melica kozlovii* Tzvelev, Rast. Tsentr. Azii 4: 125. 1968.

柴达木臭草 chai da mu chou cao

Perennial, loosely tufted, with short rhizomes, basal sheaths finally fibrous. Culms 20–60 cm tall, ca. 1 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths scabrid or pubescent; leaf blades flat or slightly rolled, 5–10 cm × 1–2.7 mm, abaxial surface scabrid, adaxial surface scabrid to pubescent; ligule 0.5–1.5 mm, lobe on side opposite blade ca. 3 mm, this soon splitting. Panicle lax, narrow, 6–16 cm; branches

suberect or spreading, 1–2 cm, 1-sided, bearing 1–5 spaced spikelets. Spikelets ovate, 6.8–8.3 mm, flushed grayish purple, fertile florets 2 or 3, terminal sterile lemmas gathered into globular cluster; glumes membranous, lower glume elliptic to broadly ovate, 5–7 mm, 3–5-veined, upper glume oblong, 6–8.2 mm, 5–9-veined, obtuse or acute; lemmas broadly oblong, lowest 5–8 mm, herbaceous, 7–9-veined, tuberculate-scabrid, a very few ca. 0.5 mm hairs sometimes present at middle back, apex broadly membranous, obtuse or weakly emarginate; palea keels ciliate. Anthers 1.2–2.2 mm. Fl. and fr. May–Aug.

Rocky slopes, mountain valleys; 2000–3900 m. Gansu, Qinghai, Shanxi [Mongolia].

21. *Melica tangutorum* Tzvelev, Rast. Tsentr. Azii 4: 126. 1968.

青甘臭草 qing gan chou cao

Perennial, loosely tufted. Culms 30–80 cm tall, 1–2 mm in diam., scabrid below panicle, 3–4-noded. Leaf sheaths scabrid; leaf blades flat or slightly rolled, 10–15 cm × 1–4 mm, scabrid on both surfaces; ligule 2–6.5 mm. Panicle narrow, fairly dense, 10–20 cm, slightly 1-sided, spikelets many; branches short, erect. Spikelets 4–7 mm, silvery green, fertile florets 2 or 3, terminal sterile lemmas gathered into globular cluster; glumes elliptic, papery, scabrid, lower glume 4–5 mm, 3–5-veined, upper glume 4–7 mm, 5–7-veined, both obtuse; lemmas obovate-oblong, lowest 3–4.5 mm, firmly herbaceous, 7–9-veined, granular scabrid, apex narrowly membranous, emarginate or shortly 2-lobed; palea keels ciliate. Anthers 0.7–1 mm. Fl. and fr. May–Sep.

Rocky mountain slopes, river gravel banks, or under shrubs; 1500–3200 m. Gansu, Qinghai, Sichuan [Mongolia].

22. *Melica tibetica* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 27. 1921.

藏臭草 zang chou cao

Perennial, tufted. Culms erect or inclined at base, 15–60 cm tall, ca. 2 mm in diam., 3–6-noded, scabrid below panicle. Leaf sheaths keeled, harshly scabrid on veins; leaf blades flat or folded, 10–20 cm × 3–6 mm, abaxial surface scabrid, adaxial surface puberulous; ligule 0.8–1.5 mm, truncate, backside (blade side) pubescent. Panicle broadly linear in outline, 6–18 cm, dense, spikelets many; branches erect, appressed to main axis. Spikelets broadly ovate, 5–8 mm, purplish, fertile florets (1–)2(–3), terminal sterile lemmas gathered into globular cluster; glumes as long as spikelet, papery, slightly unequal, lower glume broadly elliptic, (4–)5–7 mm, 1–3-veined, upper glume broadly oblanceolate, 5–8 mm, 3–5-veined, both acute or obtuse; lemmas oblong, lowest 3.5–6 mm, lower part herbaceous, pallid, 5–7-veined, minutely hispidulous or granular-scabrid, upper 1/3 slightly enlarged, membranous, purple, apex shallowly 2-lobed, erose; palea as long as herbaceous part of lemma, keels ciliate. Anthers 0.6–1 mm. Fl. and fr. Jul–Sep.

• Alpine meadows, usually under shrubs; 3500–4300 m. Nei Mongol (Alxa Youqi), Qinghai, Sichuan, Xizang.

23. *Melica subflava* Z. L. Wu, Fl. Reipubl. Popularis Sin. 9(2): 314. 2002.

黄穗臭草 huang sui chou cao

Melica flava Z. L. Wu, Acta Phytotax. Sin. 30: 171. 1992, not Steudel (1855); *M. qinghaiensis* W. Hempel, nom. illeg. superfl.

Perennial, loosely tufted. Culms erect or inclined at base, 50–80 cm tall, 2–4 mm in diam., 3–5-noded, scabrid below panicle. Leaf sheaths keeled, scabrid on veins; leaf blades flat or folded, 10–22 cm × 3–6 mm, both surfaces scaberulous; ligule 2–4 mm, truncate, back pubescent. Panicle broadly linear in outline, 6–12 cm, dense, interrupted below, weakly 1-sided, spikelets many; branches laxly erect. Spikelets broadly ovate,

8–11 mm, yellow, fertile florets 2–4, terminal sterile lemmas gathered into globular cluster; glumes as long as spikelet, papery, slightly unequal, obovate-oblong or oblong-lanceolate, lower glume 6–8 mm, 1–3-veined, upper glume 7–11 mm, 3-veined, both acute; lemmas oblong, lowest 5.5–7 mm, lower part herbaceous, 5–7-veined, upper 1/3 slightly enlarged, membranous, apex 2-lobed, lobes rounded; palea as long as herbaceous part of lemma, keels ciliate. Anthers ca. 1 mm. Fl. Jul–Aug.

• Grassy mountain slopes; ca. 3600 m. Qinghai.

57. *SCHIZACHNE* Hackel, Repert. Spec. Nov. Regni Veg. 7: 322. 1909.

裂稈茅属 lie fu mao shu

Perennial. Culms slender, erect. Leaf sheaths with margins fused in lower part; leaf blades linear. Panicle little branched, often racemelike, spikelets few. Spikelets elliptic, florets several, upper 1 or 2 sterile; rachilla scabrid, disarticulating below each floret; glumes broadly lanceolate, shorter than first floret, unequal with lower glume shorter, membranous, lower glume 1–3-veined, upper glume 5-veined, apex subacute; floret callus oblong, bearded, obtuse; lemmas lanceolate, thickly herbaceous, back rounded, 7-veined, apex shallowly 2-toothed, awned from just below teeth; awn straight or slightly recurved, usually longer than lemma body; palea 2/3–3/4 lemma length, keels ciliate above middle. Stamens 3. Caryopsis oblong, free from lemma and palea. Chromosomes small. $x = 10$.

One species: E Europe to E Asia, North America.

1. *Schizachne purpurascens* (Torrey) Swallen subsp. ***callosa*** (Turczaninow ex Grisebach) T. Koyama & Kawano, Canad. J. Bot. 42: 862. 1964.

裂稈茅 lie fu mao

Avena callosa Turczaninow ex Grisebach in Ledebour, Fl. Ross. 4: 416. 1852; *Melica callosa* (Turczaninow ex Grisebach) Ohwi; *Schizachne callosa* (Turczaninow ex Grisebach) Ohwi; *S. fauriei* Hackel.

Perennial, shortly rhizomatous. Culms loosely tufted, 20–50 cm tall, 0.7–1.5 mm in diam., scabrid below panicle. Leaf sheaths longer than internodes, lower sheaths scaberulous; leaf blades narrowly linear, flat or margins inrolled, 5–20 cm × 1–1.5 mm, abaxial surface glabrous, adaxial surface scaberulous and sparsely pilose; ligule 1–2 mm. Panicle lanceolate in outline, 6–8 cm, laxly bearing 4–6(–10) spikelets; branches slender, scabrid, up to 1.5 cm, unbranched and tipped by a single

spikelet. Spikelets 10–14 mm, florets 3–4(–5), pale green tinged brownish purple; lower glume 4–5 mm, upper glume 5–7 mm; callus hairs 1–1.5 mm; lemmas 7–9 mm, veins scaberulous, margins broad, scarious, apical teeth acute, ca. 1.5 mm; awn 1–1.5 cm, straight or almost so. Anthers 1.5–2 mm. Fl. and fr. Jun–Jul. $2n = 20$.

Forest undergrowth, moist grassy places; 800–2000(–3500) m. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Shanxi, Yunnan (Hengduan Shan) [E Kazakhstan, Korea, Japan, Mongolia, Russia; Europe (Ural Mountains)].

This is a forage grass of forest pastures. It has been reported to occur at 2800–3500 m in Yunnan, based on “*Schizachne hengduanensis* L. Liou,” which name was not validly published.

Schizachne purpurascens subsp. *purpurascens* occurs in North America and NE Russia (Kamchatka). It has broader leaf blades 2–5 mm wide, larger panicles with up to 20 spikelets, the lower branches longer and subdivided, and spikelets with more definitely recurved awns.

10. Tribe DIARRHENEAE

龙常草族 long chang cao zu

Liu Liang (刘亮); Sylvia M. Phillips

Perennials with short scaly rhizomes. Culms slender, arching, unbranched. Leaf blades narrowly lanceolate, transverse veinlets present (visible on abaxial surface), narrowed to base; ligule thickly membranous. Inflorescence an open or contracted panicle, sparingly branched. Spikelets all alike, florets 2–5(–7) with uppermost floret reduced, laterally compressed, disarticulating below each floret; glumes lanceolate or ovate, unequal, much shorter than lemmas, membranous, 1–3-veined; lemmas ovate or ovate-elliptic, herbaceous to thinly leathery, rounded on back, 3(–5)-veined, apex obtuse to cuspidate; palea subequal to lemma, keels smooth or ciliate; lodicules 2, large, membranous; stamens 2 or 3. Caryopsis obliquely ellipsoid; pericarp thick, enlarged at apex into a conspicuous pallid knob or beak bearing 2 terminal stigmas, softening and peeling away when wet. Leaf anatomy: non-Kranz; microhairs obscure; fusoid cells absent. $x = 10$.

One genus and four species: three species in E Asia and one in the United States; three species in China.

This is a small tribe found in warm-temperate forests.

58. DIARRHENA P. Beauvois, Ess. Agrostogr. 142. 1812, nom. cons.

龙常草属 long chang cao shu

Neomolinia Honda.

Description and distribution as for tribe.

- 1a. Keels of palea smooth; anthers 0.7–1.2 mm; panicle open, branches spreading 1. *D. japonica*
 1b. Keels of palea ciliate; anthers 1.5–2 mm; panicle \pm contracted, branches erect to ascending.
 2a. Panicle contracted at first, becoming somewhat lax at maturity, primary branches often further divided;
 lemmas smooth on veins; lowest lemma 3.5–4 mm 2. *D. fauriei*
 2b. Panicle always contracted, primary branches erect, simple; lemmas scabrid on veins near apex; lowest
 lemma 4.5–5 mm 3. *D. mandshurica*

1. *Diarrhena japonica* Franchet & Savatier, Enum. Pl. Jap. 2: 603. 1879.

日本龙常草 ri ben long chang cao

Neomolinia japonica (Franchet & Savatier) Probatova.

Culms tufted, erect, 50–80 cm tall, 1–1.5 mm in diam., 4–5-noded, glabrous below nodes. Leaf sheaths mostly shorter than internodes, glabrous; leaf blades flat, 20–30 \times 0.8–1.5 cm, glabrous or adaxial surface sparsely pilose, apex gradually acuminate; ligule 0.5–1 mm. Panicle open, ovate in outline, 10–20 \times 8–20 cm; primary branches 1 or 2 per node, widely spreading, filiform, scabrid, sparingly branched, bearing up to 6 spikelets. Spikelets obovate at maturity, 3–5 mm, florets 1–3; glumes membranous, 1-veined, lower glume lanceolate, 0.8–1 mm, upper glume broadly lanceolate, ca. 1.5 mm, acute; lemmas lanceolate-ovate, lowest 2.7–3 mm, 3-veined, veins smooth, apex obtuse; palea keels smooth. Anthers 0.7–1.2 mm. Caryopsis 2.5–3 mm. Fl. and fr. Aug–Sep. $2n = 38$.

Mountain slopes in forests. NE China [Korea (Cheju Island), Japan, Russia (Kunashir Island in S Kuril Islands)].

2. *Diarrhena fauriei* (Hackel) Ohwi, Acta Phytotax. Geobot. 10: 135. 1941.

法利龙常草 fa li long chang cao

Molinia fauriei Hackel, Bull. Herb. Boissier, ser. 2, 3: 504. 1903; *Diarrhena koryoensis* Honda; *D. nekkamontana* Honda; *D. yabeana* Kitagawa; *Neomolinia fauriei* (Hackel) Honda; *N. koryoensis* (Honda) Nakai.

Culms solitary or in small tufts, erect, 80–100 cm tall, 2–3 mm in diam., 5–7-noded, puberulous below nodes. Leaf sheaths shorter than internodes, glabrous, rarely upper puberulous; leaf blades flat, thin, 20–30 \times 1–2 cm, adaxial surface glabrous or

puberulous, abaxial surface scabrid or nearly smooth, apex gradually long-acuminate; ligule ca. 0.5 mm. Panicle laxly contracted, narrowly lanceolate at first, later slightly more spreading, 12–15 \times 2–3 cm; primary branches in clusters of 2–5, erect to ascending, scabrid, each branch with branchlets, loosely bearing 4–13 spikelets. Spikelets obovate at maturity, 4–7 mm, florets 2; glumes lanceolate, usually 1-veined, acute, lower glume 1–1.5 mm, upper glume ca. 2 mm; lemmas 3.5–4 mm, 3-veined, veins smooth, apex subacute; palea keels ciliate. Anthers 1.5–2 mm. Caryopsis ca. 2.5 mm. Fl. and fr. Jul–Sep. $2n = 38$.

Montane forests. Shandong, NE China [Japan, Korea, Russia (Far East)].

3. *Diarrhena mandshurica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 628. 1888.

龙常草 long chang cao

Neomolinia mandshurica (Maximowicz) Honda.

Culms solitary or in small tufts, erect, 70–120 cm tall, 2–3 mm in diam., 5–6-noded, scabrid or puberulous below nodes. Leaf sheaths shorter than internodes, pubescent; leaf blades flat, thin, 15–30 \times 0.6–2 cm, adaxial surface pubescent, abaxial surface scabrid, apex gradually long-acuminate; ligule ca. 1 mm. Panicle densely contracted, 12–20 \times ca. 1 cm; primary branches solitary or paired at base, erect, each branch simple, bearing 2–7 spikelets. Spikelets obovoid at maturity, 4.5–7 mm, florets 2–3; glumes lanceolate, acute, lower glume 1.5–2 mm, 1-veined, upper glume 2–3 mm, 1–3-veined, the lateral veins obscure; lemmas 4.5–5 mm, 3–5-veined, veins scabrid near apex, apex subacute; palea keels ciliate. Caryopsis ca. 4 mm. Fl. and fr. Jun–Sep. $2n = 38$.

Forests, grassy hillsides. NE China [Korea, Russia (Far East)].

11. Tribe POEAE

早熟禾族 zao shu he zu

Wu Zhenlan (吴珍兰), Lu Shenglian (卢生莲), Liu Liang (刘亮),
 Zhu Guanghua (朱光华), Chen Shouliang (陈守良), Chen Xiang (陈翔);
 Sylvia M. Phillips, Robert J. Soreng, Susan G. Aiken, Nikolai N. Tzvelev, Marina V. Olonova

Annual or perennial. Leaf blades linear to filiform; ligule membranous. Inflorescence usually an open or contracted panicle, rarely spike-like or a single raceme with tough rachis (fragile in *Parapholis*). Spikelets all alike or rarely dimorphic with mixed fertile and sterile spikelets, florets (1 or) 2 to many with uppermost reduced, usually laterally compressed, disarticulating below each floret;

glumes persistent, usually shorter than lemmas, membranous or rarely leathery; floret callus glabrous or with woolly hairs; lemmas membranous to leathery, (3–)5–7(–13)-veined, glabrous or infrequently hairy, apex entire or denticulate, awnless or with a straight or curved awn from apex; palea subequalling lemma. Lodicules 2, hyaline. Stamens (1–)3. Ovary sometimes hairy. Caryopsis mostly ellipsoid; hilum linear or round. Leaf anatomy: non-Kranz; microhairs absent. Chromosomes large. $x = 7$.

About 50 genera and 1200 species: temperate and cold regions of the world, also on tropical mountains; 16 genera and 212 species (54 endemic, at least nine introduced) in China.

This is a large tribe of predominantly temperate grasses, usually with a paniculate inflorescence, simple, several-flowered spikelets with the florets exerted from the glumes, and 5- or more veined lemmas.

- 1a. Inflorescence a single terminal spikelike raceme; spikelets sessile.
 - 2a. Spikelets with several florets; rachis tough 61. *Lolium*
 - 2b. Spikelets with one floret; rachis fracturing below each spikelet 74. *Parapholis*
- 1b. Inflorescence an open, contracted or dense panicle, occasionally sparse and subracemose; spikelets pedicellate.
 - 3a. Fertile spikelets accompanied by pectinate sterile spikelets 63. *Cynosurus*
 - 3b. Fertile spikelets not accompanied by sterile spikelets.
 - 4a. Plants annual.
 - 5a. Lemmas awned 60. *Vulpia*
 - 5b. Lemmas awnless.
 - 6a. Pedicels stout; panicle 1-sided, with short branches or reduced to a compact raceme; lowest rachilla internode enlarged.
 - 7a. Panicle with very short, simple branches; glumes 3–9-veined; lemmas keeled throughout 72. *Sclerochloa*
 - 7b. Panicle with short, often branched branches; glumes 1–3-veined; lemmas keeled in upper half 73. *Pseudosclerochloa*
 - 6b. Pedicels slender; panicle not as above; lowest rachilla internode not enlarged.
 - 8a. Spikelets plumply ovate to rotund; pedicels filiform; lemmas orbicular to oblate 65. *Briza*
 - 8b. Spikelets elliptic to ovate; pedicels slender; lemmas lanceolate to ovate 66. *Poa*
 - 4b. Plants perennial.
 - 9a. Lemmas rounded on back, at least toward base.
 - 10a. Spikelets with 1 floret; floret indurated and glossy at maturity 69. *Milium*
 - 10b. Spikelets with more than 1 floret; florets herbaceous or leathery.
 - 11a. Plant a robust aquatic with long spongy rhizomes; floret callus stiffly bearded 62. *Scolochloa*
 - 11b. Plant not as above; floret callus glabrous (lemma base sometimes pubescent).
 - 12a. Lemma apex firm, acute or awned; hilum linear 59. *Festuca*
 - 12b. Lemma apex thinly scarious to hyaline, \pm obtuse, awnless; hilum round to oval 64. *Puccinellia*
 - 9b. Lemmas keeled throughout.
 - 13a. Lemmas orbicular to oblate, margins broad, membranous, appressed to lemma above 65. *Briza*
 - 13b. Lemmas narrower, margins less distinct, often inrolled.
 - 14a. Palea keels smooth.
 - 15a. Lemmas indistinctly 3–5-veined below, almost veinless in upper half, apex obtuse to acute 70. *Colpodium*
 - 15b. Lemmas prominently 3-veined, apex broadly obtuse to truncate, erose 71. *Catabrosa*
 - 14b. Palea keels scabrid to ciliolate.
 - 16a. Lemmas herbaceous or membranous with hyaline margins, apex awnless 66. *Poa*
 - 16b. Lemmas thinly leathery, apex acute to briefly awned.
 - 17a. Spikelets in dense 1-sided fascicles at the ends of the panicle branches; florets 2–5 67. *Dactylis*
 - 17b. Spikelets evenly dispersed; floret 1 68. *Aniselytron*

59. FESTUCA Linnaeus, Sp. Pl. 1: 73. 1753.

羊茅属 yang mao shu

Lu Shenglian (卢生莲), Chen Xiang (陈翔); Susan G. Aiken

Perennials, tufted, shoots extra- or intra-vaginal. Leaf sheath margins usually free, rarely connate, sometimes with auricles; leaf blades folded to conduplicate and filiform, sometimes flat; ligule membranous. Inflorescence an open, contracted or spikelike panicle. Spikelets with 2 to several florets, uppermost floret usually reduced; rachilla usually scabrid, rarely smooth or pubescent; disarticulating above glumes and between florets; glumes usually unequal, herbaceous to scarious, rarely subleathery, lower glume often small, 1-veined, upper glume usually shorter than lowest lemma, 3(–5)-veined; lemmas usually similar in texture to glumes, often

subleathery at least with age, usually \pm laterally compressed but not keeled, rounded on back at least toward base, usually 5-veined, veins sometimes prominent, apex acuminate, entire or notched, awned or awnless; palea subequal to lemma, keels scabrid, rarely smooth. Stamens 3. Ovary glabrous or hairy on top. Caryopsis oblong or linear, usually ventrally sulcate, usually free from lemma and palea, hilum long-linear. $x = 7$.

About 450 species: temperate regions throughout the world, extending into the tropics on mountain tops; 55 species (25 endemic) in China.

Many of the species are superficially very similar, particularly among the fine-leaved species. In these, the position of sclerenchyma tissue, as seen in a cross section of the leaf blade, is an important aid to identification. The type of branching of the basal vegetative shoots (tillers) is also important. If the shoot breaks through the base of the subtending leaf sheath a loose tuft results (extravaginal branching), but if it grows up inside the leaf sheath a denser tuft results (intravaginal branching).

The fine-leaved species include a number of species aggregates. The aggregate name has been used in the main key, as this will be sufficient for most users. Within the aggregates individual taxa are recognized either at specific or infraspecific rank, but the differences between the taxa are slight and often overlapping.

This large genus is divided into subgenera, which are indicated in the key. Recent molecular work is indicating that the larger broad-leaved species are not closely related to the fine-leaved species.

Most of the species provide good grazing, and some are important constituents of fine lawns.

- 1a. Leaf blades flat or loosely involute; panicle usually loose, open, more than 10 cm (infrequently contracted or shorter).
- 2a. Lemmas awnless or mucronate, mucro less than 2 mm (except *F. altaica* with membranous glumes) (species nos. 1–8: *F.* subg. *Drymanthele* V. I. Kreczetowicz & Bobrov; species nos. 9–13: *F.* subg. *Leucopoa* (Grisebach) Hackel).
- 3a. Ligule 1.5–5 mm; lemmas awnless.
 - 4a. Panicle 7–9 cm; spikelets 17–18 mm; florets 9–10 1. *F. sinomutica*
 - 4b. Panicle more than 15 cm; spikelets less than 15 mm; florets 3–5.
 - 5a. Spikelets 6–7 mm; first lemma ca. 5 mm; anthers 1.5–2 mm 4. *F. changduensis*
 - 5b. Spikelets 7–15 mm; first lemma 7–11 mm; anthers 2.5–4 mm.
 - 6a. Leaf sheaths smooth, glabrous or scabrid; anthers 3–4 mm; ovary apex glabrous 5. *F. dolichantha*
 - 6b. Leaf sheaths with retrorse hairs at base; anthers 2.5–3.2(–3.5) mm, ovary apex hairy.
 - 7a. Lemma punctiform or scabrid, veins 5; ovary usually densely hairy 2. *F. modesta*
 - 7b. Lemma smooth, veins 3; ovary sparsely hairy 3. *F. handelii*
 - 3b. Ligule 0.1–1(–1.5) mm; lemmas awnless or mucronate.
 - 8a. Spikelets 4–5.5 mm; glumes ovate; first lemma 3.5–4 mm 6. *F. japonica*
 - 8b. Spikelets more than 6 mm; glumes lanceolate; first lemma more than 6 mm.
 - 9a. Leaf sheaths not conspicuous at base; anthers less than 2 mm.
 - 10a. Lower glume 5–6 mm, upper glume 7–8 mm; anthers 1.2–1.8 mm 7. *F. sinensis*
 - 10b. Lower glume 2–3.5(–4.5) mm, upper glume 3.5–4.5(–6) mm; anthers 1–1.2 mm 8. *F. undata*
 - 9b. Leaf sheaths conspicuous at base, persistent; anthers more than 2 mm (*F.* subg. *Leucopoa* (Grisebach) Hackel).
 - 11a. Plants usually dioecious; ovary apex densely hairy.
 - 12a. Basal sheaths glossy straw-colored, not becoming fibrous; shoots intravaginal 9. *F. olgae*
 - 12b. Basal sheaths light gray or brownish, becoming fibrous; some shoots extravaginal 10. *F. sibirica*
 - 11b. Plants bisexual; ovary apex thinly hairy.
 - 13a. Adaxial to abaxial sclerenchyma strands absent in leaf blade cross section 11. *F. tristis*
 - 13b. Adaxial to abaxial sclerenchyma strands present in leaf blade cross section.
 - 14a. First lemma 7–9 mm; lemmas scabrid, veins prominent; leaf blades pubescent on adaxial surface 12. *F. altaica*
 - 14b. First lemma 6–6.5 mm; lemmas smooth or only upper part scabrid, veins weak; leaf blades scaberulous on adaxial surface 13. *F. alata*
 - 2b. Lemmas awned, awn more than 2 mm (if awnless, falcate auricles present).
 - 15a. Auricles usually absent, if present small (*F.* subg. *Subulatae* (Tzvelev) E. B. Alexeev).
 - 16a. Ovary apex glabrous or rarely sparsely hairy; leaf blades sometimes involute.
 - 17a. Awns ca. 5 mm or less; anthers more than 2.5 mm.
 - 18a. Lower glume 5–6 mm, upper glume 6–7 mm; anthers 3.5–4 mm; ovary apex glabrous 14. *F. pubiglumis*
 - 18b. Lower glume 3.8–4.2 mm, upper glume 5.3–5.7 mm; anthers 2.5–3.5 mm; ovary apex sparsely hairy 15. *F. yunnanensis*
 - 17b. Awns usually more than 5 mm; anthers less than 2.2 mm.
 - 19a. Panicle branches usually paired; anthers 1.2–2 mm; adaxial to abaxial sclerenchyma strands absent in leaf blade cross section 16. *F. fascinata*

- 19b. Panicle branches usually single; anthers 1.8–2.2 mm; adaxial to abaxial sclerenchyma strands present in leaf blade cross section.
 - 20a. Lower glume 6–6.5 mm, upper glume 8.5–9 mm 17. *F. longiglumis*
 - 20b. Lower glume 3–4.5 mm, upper glume 5–6 mm 18. *F. vierhapperi*
- 16b. Ovary apex densely hairy; leaf blades always flat.
 - 21a. Lower glume ovate, 1–1.8 mm; upper glume ovate, 2.2–3 mm 19. *F. parvigluma*
 - 21b. Lower glume lanceolate, 1.5–4.5 mm; upper glume broadly lanceolate, 2.5–6 mm.
 - 22a. Lemma apex entire or slightly notched; awn 4–8 mm 20. *F. extremiorientalis*
 - 22b. Lemma apex distinctly notched; awn usually more than 8 mm.
 - 23a. Florets 2–3; anthers 1–1.2(–1.6) mm 21. *F. leptopogon*
 - 23b. Florets 4–6; anthers 1.7–2 mm 22. *F. elata*
- 15b. Auricles present, lanceolate, falcately curved or erect (*F. subg. Schedonorus* (P. Beauvois) Petermann).
 - 24a. Auricles erect; anthers 1.5–2.2 mm.
 - 25a. Panicle 15–25 cm; lemma apex 2-lobed; awn 6–8 mm; ovary apex hairy 23. *F. scabriflora*
 - 25b. Panicle 5–7 cm; lemma apex entire; awn 2–3 mm; ovary apex glabrous 24. *F. chayuenensis*
 - 24b. Auricles falcately curved; anthers 2.5–4 mm.
 - 26a. Lemma awnless or awn 0.7–3(–5) mm.
 - 27a. Ligule 1.8–2 mm 25. *F. formosana*
 - 27b. Ligule 0.3–1 mm.
 - 28a. Auricle margins ciliate 26. *F. arundinacea*
 - 28b. Auricle margins glabrous 27. *F. pratensis*
 - 26b. Lemma awned, awn more than 5 mm.
 - 29a. Panicle loose, open; branches flexuous.
 - 30a. Leaf blades 4–18 mm wide; rachilla scabrid; anthers 2–3 mm 28. *F. gigantea*
 - 30b. Leaf blades 2.5–4 mm wide; rachilla smooth; anthers 3.6–4 mm 29. *F. liangshanica*
 - 29b. Panicle narrow, spikelike; branches stiff.
 - 31a. Culms with 2 nodes 30. *F. durata*
 - 31b. Culms with 3–4 nodes 31. *F. mazzettiana*
- 1b. Leaf blades folded or tightly involute; panicle usually contracted, narrow or spikelike (*F. subg. Festuca*).
 - 32a. Plants usually loosely tufted with extravaginal shoots; leaf blade cross section with five or more well-defined ribs; sclerenchyma strands five or more; panicle rather loose.
 - 33a. Lemma awnless 32. *F. jacutica*
 - 33b. Lemma awned.
 - 34a. Awn 5–8 mm 33. *F. stapfii*
 - 34b. Awn 0.5–5(–6) mm.
 - 35a. Rachilla internodes ca. 2 mm; ovary apex densely hairy 34. *F. kashmiriana*
 - 35b. Rachilla internodes ca. 1 mm; ovary apex sparsely hairy or glabrous.
 - 36a. Ovary apex sparsely hairy; awns 0.5–2 mm.
 - 37a. Anthers 2.7–3.7 mm 35. *F. georgii*
 - 37b. Anthers less than 2.5 mm.
 - 38a. Anthers 0.5–1 mm 36. *F. nitidula*
 - 38b. Anthers 1.8–2.4 mm 37. *F. amblyodes*
 - 36b. Ovary apex glabrous; awns 1–5 mm (if less, lemmas densely pubescent).
 - 39a. Panicle compact, narrow; culms 18–30 cm tall.
 - 40a. Spikelets 8–10 mm; lemmas smooth 38. *F. yulungshanica*
 - 40b. Spikelets 5–8 mm; lemmas scabrid.
 - 41a. Plants with intravaginal shoots; leaf sheaths 0.4–0.6 mm; spikelets 7–8 mm 39. *F. kansuensis*
 - 41b. Plants with extravaginal shoots; leaf sheaths 0.1–0.3 mm; spikelets 5–6 mm 40. *F. subalpina*
 - 39b. Panicle open, ± loose; culms 30–100 cm tall.
 - 42a. Basal vegetative shoots short and dense; leaf blades always folded; awn 3–7 mm 41. *F. forrestii*
 - 42b. Basal vegetative shoots long and loose; leaf blades somewhat flat or folded; awn 1–3 mm 42. *F. rubra*
- 32b. Plants usually densely tufted with intravaginal shoots; leaf blade cross section with only midrib or also two lateral ribs well defined; sclerenchyma strands three (if 5–7, lateral strands small) or a continuous subepidermal layer; panicle contracted or spikelike.
 - 43a. Lemmas awnless.

- 44a. Glumes pubescent; anthers ca. 1.5 mm 43. *F. chelungkiangnica*
 44b. Glumes glabrous; anthers 2–3 mm 44. *F. dahurica*
 43b. Lemmas awned.
 45a. Sclerenchyma in leaf blade cross section in a continuous layer.
 46a. Anthers 2–3.4 mm; leaf blade cross section with 3–5 well-defined ribs 45. *F. trachyphylla*
 46b. Anthers 1.5–2.2 mm; leaf blade cross section with only midrib well defined.
 47a. Spikelets 8–9 mm; lemmas 5.5–5.7 mm 46. *F. hondae*
 47b. Spikelets 4–6 mm; lemmas 3–4(–5) mm 47. *F. ovina*
 45b. Sclerenchyma in leaf blade cross section in discrete strands.
 48a. Leaf blades with 5–7 sclerenchyma strands, including 2–4 small lateral strands.
 49a. Plant densely tufted; glume margins glabrous; anthers 0.7–1.1 mm 48. *F. brachyphylla*
 49b. Plant loosely tufted; glume margins ciliate; anthers 1.1–1.5 mm 49. *F. chumbiensis*
 48b. Leaf blades with three sclerenchyma strands (one at midrib, two at ends of leaf).
 50a. Leaf sheaths of vegetative shoots usually closed for more than half their length 50. *F. cumminsii*
 50b. Leaf sheaths of vegetative shoots usually open for more than half their length.
 51a. Leaf cross section with 3 well-developed sclerenchyma strands 51. *F. kryloviana*
 51b. Leaf cross section with 3 small sclerenchyma strands.
 52a. Anthers more than 1.5 mm.
 53a. Spikelets 4.5–6 mm; glume margins ciliate or glabrous; palea 2.5–4 mm 52. *F. valesiaca*
 53b. Spikelets 6–8 mm; glume margins ciliate; palea 4.5–5.5 mm 53. *F. litvinovii*
 52b. Anthers less than 1.5 mm.
 54a. Old basal leaf sheaths present; leaf sheaths glabrous; leaf blades smooth on abaxial surface 54. *F. tibetica*
 54b. Old basal leaf sheaths absent; leaf sheaths pubescent; leaf blades scabrid on abaxial surface 55. *F. wallichiana*

1. *Festuca sinomutica* X. Chen & S. M. Phillips, Novon 15: 69. 2005.

贫芒羊茅 pin mang yang mao

Festuca mutica S. L. Lu, Acta Phytotax. Sin. 30: 534. 1992, not Chevallier (1827).

Plant loosely tufted. Culms 68–75 cm tall. Leaf sheaths glabrous; auricles absent; leaf blades flat or involute, (7–)13–20(–32) cm × 1–3 mm, veins 7, pubescent along veins, adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 1.5–2 mm (ca. 0.5 mm in tillers). Panicle loose, open, 7–9 cm; branches 2.5–5 cm, 1–2 at lowest node, upper few-spiculate, lower 1/2 naked. Spikelets 17–18 mm; florets 8–10; glumes smooth, margins narrowly membranous; lower glume linear or lanceolate, 2.5–3 mm, apex acute; upper glume lanceolate or broadly lanceolate, 3.5–4 mm, apex acute; rachilla internodes 0.9–1.1 mm long, smooth; lemmas 6.5–7 mm; awns absent; palea keels smooth. Anthers 2.8–3.2 mm. Ovary apex hairy. Fl. and fr. Jul.

● Meadows; ca. 2900 m. Yunnan (Eryuan).

2. *Festuca modesta* Nees ex Steudel, Syn. Pl. Glumac. 1: 316. 1854.

素羊茅 su yang mao

Plant loosely tufted or single-stemmed; shoots extravaginal. Culms 80–100 cm tall, nodes 2–3. Leaf sheaths scabrid, basal sheaths with retrorse hairs; auricles absent; leaf blades flat, (10–)15–30(–60) cm × 5–12(–15) mm, margins scabrid, veins 14–36; adaxial to abaxial sclerenchyma strands present; ligule 1.5–3(–5) mm, margin ciliate. Panicle loose, open, erect

or nodding, 18–22 cm; branches 4–11 cm, (1–)2(–3) at lowest node, lower 1/2–2/3 naked. Spikelets (7–)9–11 mm; florets (1–)3–4; glumes glabrous or hairy; lower glume narrowly lanceolate, 2.5–3(–4) mm, apex acuminate; upper glume broadly lanceolate, 3.5–4(–5) mm, apex acute to obtuse; rachilla internodes 1.2–1.8 mm; lemmas 6.5–8.5 mm, punctiform or scabrid, 5-veined; awns absent; palea keels scaberulous. Anthers 2.5–3.5 mm. Ovary apex moderately to densely hairy. Fl. and fr. Apr–Sep.

Forests, grassy mountain slopes, valleys; 1000–3600 m. Gansu, Qinghai, Shaanxi, Sichuan, Yunnan [NW India, Nepal].

3. *Festuca handelii* (St.-Yves) E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 82(3): 95. 1977.

哈达羊茅 ha da yang mao

Festuca modesta Steudel subsp. *handelii* St.-Yves in Handel-Mazzetti, Symb. Sin. 7: 1289. 1936.

Plant loosely tufted or single-stemmed; shoots extravaginal. Culms 60–85 cm tall, nodes 2–3. Leaf sheaths with trichomes; auricles absent; leaf blades flat or loosely convolute, 3–4(–6) mm wide; adaxial to abaxial sclerenchyma strands present; ligule 2.5–3.5 mm. Panicle loose, open, 15–20 cm. Spikelets 9–10 mm, florets 3–4; glumes with trichomes; lower glume narrowly lanceolate, 2.5–3 mm; upper glume broadly lanceolate, 4–4.5 mm; rachilla internodes 1–1.5 mm; lemmas 6.4–8 mm, smooth, veins 3; awns absent; palea keels scabrid. Anthers 2.8–3.2 mm. Ovary apex sparsely to moderately hairy. Fl. and fr. Jul.

● 3600–3700 m. Sichuan, Yunnan.

4. *Festuca changduensis* L. Liu, Fl. Xizang. 5: 85. 1987.

昌都羊茅 *chang du yang mao*

Culms 60–100 cm tall, nodes 3–4. Leaf sheaths glabrous; auricles absent; leaf blades flat, 10–20 cm × 3–5 mm, both surfaces scabrid; ligule 3–5 mm. Panicle very loose, open, 18–22 cm; branches horizontal, 9–11 cm, 3–4 per node. Spikelets 6–7 mm; florets 3–5; glumes with trichomes; lower glume narrowly lanceolate, 2.8–3.2 mm, scabrid along keel; upper glume narrowly oblong, 3.8–4.2 mm, scabrid; rachilla internodes 0.9–1.1 mm, scabrid; lemmas 4.8–5.2 mm, puncti-scabrid or pubescent, apex acute; awns absent; palea keels scabrid toward apex. Anthers 1.5–2 mm. Ovary apex glabrous.

- Grassy mountain slopes; 3200–3800 m. Sichuan, Xizang.

This species has a unique combination of flat leaf blades, awnless lemmas, and a glabrous ovary.

5. *Festuca dolichantha* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 274. 1982.

长花羊茅 *chang hua yang mao*

Plant solitary or loosely tufted; shoots extravaginal. Culms 50–110 cm tall, nodes 2–3. Leaf sheaths glabrescent; auricles absent; leaf blades flat or involute, (10–)25–40 cm × 1–4(–6) mm, margins scaberulous or scabrid; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 1.1–2.5(–5) mm, margin ciliate. Panicle loose, open but narrow, 15–20(–25) cm; branches 5–10(–14) cm, 2 at lowest node, lower 1/3–1/2 naked. Spikelets 11–15 mm; florets (2–)3–5; glumes smooth or veins spinescent, margins membranous; lower glume narrowly lanceolate, (3.5–)4–5 mm; upper glume lanceolate or broadly lanceolate, 5.5–7 mm; rachilla internodes (1–)1.5–2 mm; lemmas (7–)8–9(–11) mm, scabrid, apex mucronate to awned; awns 0.1–2 mm; palea keels smooth. Anthers 3–4 mm. Ovary apex glabrous. Fl. and fr. Jul–Sep.

- Forests, grasslands; 3800–4000 m. Sichuan, Yunnan.

The subgeneric placement of this species is uncertain. It differs from species of *Festuca* subg. *Drymanthele* by its glabrous ovary and may be nearer to species of *F.* subg. *Subulatae*.

6. *Festuca japonica* Makino, Bot. Mag. (Tokyo) 20: 83. 1906.

日本羊茅 *ri ben yang mao*

Festuca fauriei Hackel.

Plant loosely tufted or turf-forming, shortly rhizomatous; shoots extravaginal. Culms 30–75 cm tall, nodes 1–2(–3). Leaf sheaths smooth, loose; auricles absent; leaf blades flat or involute, 5–20 cm × 1–2.5 mm, veins 5, adaxial surface scabrid, abaxial surface smooth; adaxial to abaxial sclerenchyma strands absent; abaxial sclerenchyma in narrow discrete strands; ligule 0.2–0.5(–1) mm, margin ciliate or not. Panicle loose, open, pyramidal, (7–)10–20 cm; branches horizontal or pendulous, (2–)4.5–9 cm, (1–)2 at lowest node, lower 2/3–3/4 naked. Spikelets 4–6 mm; florets 2–3(–4); glumes glabrous, margins membranous; lower glume lanceolate, 1–1.5 mm; upper glume

ovate, 1.5–2 mm; rachilla internodes 0.4–0.8 mm; lemmas 3.5–4 mm, smooth; awns absent; palea keels scaberulous to ciliate toward apex. Anthers 1.2–1.6(–2) mm. Ovary apex moderately hairy. Fl. and fr. May–Aug.

Forests, grasslands, roadsides, streamsides; 1300–3100 m. Anhui, Gansu, Guizhou, Hubei, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

The relationships of this species are uncertain, although it has been placed in *Festuca* subg. *Drymanthele*.

7. *Festuca sinensis* Keng ex E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 93(1): 112. 1988.

中华羊茅 *zhong hua yang mao*

Plants loosely tufted; shoots extravaginal. Culms 60–75 cm tall, nodes 3–4, dark purple. Leaf sheaths glabrous, uppermost 16–22 cm, much longer than its blade; auricles present as erect swellings or absent; leaf blades flat or involute, erect, rigid, 6–16 cm × 1.5–3.5 mm, uppermost much shorter, veins 7–13; adaxial to abaxial sclerenchyma strands present; ligule 0.3–1.5 mm, margin ciliate. Panicle loose, open, 11–18 cm; branches ascending, 6–11 cm, 2 at lowest node, lower 1/2 naked. Spikelets 8–9 mm; florets 3–4; lower glume glabrous, 5–6 mm, apex acuminate; upper glume, 7–8 mm, scabrid on upper keel, apex acuminate; rachilla internodes 0.9–1.1 mm, hispidulous; lemmas 6.5–7.5 mm, pubescent; awns (absent to) 0.8–2 mm; palea keels ciliate. Anthers 1.2–1.8 mm. Ovary apex glabrous or sparsely hairy. Fl. and fr. Jul–Sep.

- Alpine meadows, grassy mountain slopes, forests; 2600–4800 m. Gansu, Qinghai, Sichuan.

The relationships of this species are uncertain, although it has been placed in *Festuca* subg. *Drymanthele*.

8. *Festuca undata* Stapf in J. D. Hooker, Fl. Brit. India 7: 350. 1896 [“1897”].

曲枝羊茅 *qu zhi yang mao*

Plants loosely tufted; shoots extravaginal. Culms (25–)30–65 cm tall, nodes 2–3. Leaf sheaths smooth; auricles present as erect swellings; leaf blades flat or involute, 3–10(–15) cm × 1.5–2.9 mm, veins (7–)12–14; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.4(–0.5) mm, truncate, margin sometimes ciliate. Panicle loose, nodding, 5–12(–16) cm; branches erect or slightly curved, 4–9 cm, 1(–2) at lowest node. Spikelets 6–8.5 mm; florets (2–)3–4(–5); glumes glabrous or punctate, margins broadly membranous, apex acuminate; lower glume narrowly lanceolate or lanceolate, (2.1–)2.8–4.5 mm; upper glume broadly lanceolate or oblong, 3.8–6 mm; rachilla internodes 0.7–1 mm; lemmas 5.5–7 mm, scabrid; awns 0.5–2 mm; palea keels scabrid. Anthers 1–1.2 mm. Ovary apex moderately hairy. Fl. and fr. Jun.

Grassy mountain slopes, forest margins; 4100–4800 m. Sichuan, Xizang, Yunnan [India (Sikkim), Nepal].

This taxon has been placed in *Festuca* subg. *Drymanthele*, but is probably closer to taxa in *F.* subg. *Subulatae*.

9. *Festuca olgae* (Regel) Krivotulenko, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 56. 1960.

西山羊茅 xi shan yang mao

Molinia olgae Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 625. 1881; *Festuca deasyi* Rendle; *F. olgae* var. *deasyi* (Rendle) Tzelev; *F. sibirica* subsp. *deasyi* (Rendle) Tzvelev; *Leucopoa olgae* (Regel) V. I. Kreczetowicz & Bobrov.

Plant dioecious, densely tufted; shoots intravaginal, basal sheaths straw-colored, glossy, not splitting into fibers. Culms 25–85 cm tall, nodes 1–3. Leaf sheaths glabrous; leaf blades usually flat, occasionally involute, 8–25(–40) cm × 2–3(–4.5) mm; ligule 0.1–0.3 mm. Panicle loose, lanceolate to ovate in outline, 6–14 cm; branches 3–7 cm, smooth, usually solitary, naked below middle. Spikelets 7–11 mm, purplish; florets 2–6; glumes entirely membranous except for narrow thicker band along vein; lower glume 3–4.5 mm; upper glume 4–6 mm; lemmas 6–8 mm, back asperulous, margins broadly membranous, apex obtuse to lacerate; awns absent or with 0.1–2 mm mucro. Anthers 2.7–4 mm in male florets. Ovary apex densely hairy in female florets. $2n = 28$.

Grassy and stony mountain slopes, screes; 3500–4000 m. Xinjiang, Xizang, Yunnan [Afghanistan, India, Kashmir, Kyrgyzstan, Pakistan, Tajikistan; SW Asia (NE Iran)].

10. *Festuca sibirica* Hackel ex Boissier, Fl. Orient. 5: 626. 1884.

西伯利亚羊茅 xi bo li ya yang mao

Festuca albida (Turczaninow ex Trinius) Malyshev (1965), not Lowe (1831); *Poa albida* Turczaninow ex Trinius; *Leucopoa albida* (Turczaninow ex Trinius) V. I. Kreczetowicz & Bobrov; *L. sibirica* Grisebach, nom. illeg. superfl.

Plant dioecious, densely tufted; shoots extravaginal and intravaginal; basal sheaths light gray or brownish, becoming fibrous. Culms 22–40 cm tall, nodes 1(–2). Leaf sheaths glabrous; leaf blades flat or involute, 8–30 cm × 1.5–3 mm, margins smooth or scaberulous; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.4–0.7 mm, margin ciliate. Panicle weakly spreading, 5–7 cm; branches 1–1.5 cm, scabrid, 2 at lowest node (the short branch with only one spikelet). Spikelets 6–8 mm, greenish or yellowish; florets 2–3; glumes membranous; lower glume lanceolate or broadly lanceolate, 3.5–4.8 mm; upper glume broadly lanceolate or ovate, 4–5.3 mm; rachilla internodes 0.5–0.7 mm; lemmas 5.8–6.5 mm, back asperulous; awns absent; palea keels scabrid. Anthers 3–3.5 mm long in male florets. Ovary apex densely hairy in female florets. $2n = 28$. Fl. and fr. Jun.

Stony slopes, screes, among rocks, sometimes in sand. Nei Mongol, NE China [Mongolia, Russia].

11. *Festuca tristis* Krylov & Ivanitzkaja, Sist. Zametki Mater. Gerb. Tomsk. Univ. 1928(1): 1. 1928.

黑穗羊茅 hei sui yang mao

Plant densely tufted; shoots intravaginal. Culms 30–50 cm tall. Leaf sheaths glabrous or lower sparsely pubescent; leaf blades usually involute, occasionally flat, stiff, 4–25 cm ×

0.5–0.8 mm, veins 5–7, outer surface scabrid; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.1–0.3 mm, margin ciliate. Panicle loose, open, 7–13 cm; branches 2–5 cm, upper single, lower paired, naked below middle. Spikelets 8–12 mm, purplish or brown, shiny; florets 3–4; glumes smooth, margins membranous, rarely ciliate; lower glume narrowly lanceolate, 4.5–5.5 mm; upper glume broadly lanceolate, 5.7–6.7 mm; rachilla internodes 1.2–1.5 mm; lemmas 6–7 mm, punctiform or scabrid except toward base, conspicuously veined, margins broad, hyaline, apex entire; awns (0.3–)1–2 mm; palea keels scaberulous. Anthers 3–3.6 mm. Ovary apex moderately hairy. Fl. and fr. Jul–Sep.

Alpine grasslands, rocky slopes; 2800–4600 m. Xinjiang [E Kazakhstan (Tarbagatai Mountains), Mongolia, Russia (W Siberia)].

12. *Festuca altaica* Trinius in Ledebour, Fl. Altaic. 1: 109. 1829.

阿尔泰羊茅 a er tai yang mao

Festuca scabrella Torrey; *F. altaica* subsp. *scabrella* (Torrey) Hultén; *F. altaica* var. *scabrella* (Torrey) Breitung.

Plant densely tufted, base with brown scabrid old sheaths, shortly rhizomatous between tufts; shoots usually intravaginal. Culms (25–)30–90(–120) cm tall. Leaf sheaths glabrous; leaf blades involute or culm blades occasionally flat, (4–)10–30(–45) cm × 0.5–1.4 mm (to 4 mm when flat), adaxial surface densely pubescent, margins scaberulous, veins 5–17; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.1–0.6 mm, margin ciliate. Panicle loose, open, (5–)7–16 cm; branches 3–10(–13) cm, scabrid, 1–2(–3) at lowest node. Spikelets 8–14 mm, purplish or brown; florets 3–6; glumes broadly lanceolate, margins broadly membranous; lower glume 4–6.8(–8.3) mm; upper glume 5–7.5(–10) mm; rachilla internodes 1.2–1.8 mm; lemmas (6–)7–9(–12) mm, scabrid, veins prominent; awns 0.2–0.7 mm; palea keels scaberulous. Anthers 2.5–4.5(–5.5) mm. Ovary apex moderately hairy. $2n = 28$. Fl. and fr. Jun–Sep.

Stony mountain slopes, meadows; 2400–3800 m. Xinjiang [E Kazakhstan (Tarbagatai Mountains), Mongolia, Russia; North America].

13. *Festuca alata* (Hackel ex St.-Yves) Roshevitz in Komarov, Fl. URSS 2: 528. 1934.

阿拉套羊茅 a la tao yang mao

Festuca rubra Linnaeus subsp. *alata* Hackel ex St.-Yves, Candollea 3: 393. 1928; *F. tianschanica* Roshevitz.

Plant densely tufted, shortly rhizomatous. Culms 30–80 cm tall. Leaf sheaths smooth or scabrid; leaf blades flat or involute, stem blades 2–4 cm, basal blades up to 20 cm, adaxial surface scaberulous; ligule 0.1–0.3 mm, ciliate. Panicle broadly ovate in outline, very loose, 7–16 cm; branches 3–6 cm, widely spreading, scabrid, few-spiculate, 2 at lowest node. Spikelets 10–12 mm; florets 4–6; glumes smooth, almost entirely hyaline, thickened around veins; lower glume narrowly lanceolate, 4–4.5 mm; upper glume broadly lanceolate, 5–5.5 mm; lemmas narrowly oblong, (5–)6–6.5 mm, smooth or scabrid upward, apex acuminate or with awn-point; awns 1–1.5

mm; palea keels scabrid. Anthers 2.5–4 mm. Ovary apex sparsely hairy. Fl. and fr. Aug–Sep.

Stony slopes, wet places; 2600–4000 m. Xinjiang [Kashmir, E Kazakhstan, Kyrgyzstan, N Pakistan, Tajikistan].

14. *Festuca pubiglumis* S. L. Lu, Acta Phytotax. Sin. 30: 531. 1992.

毛颖羊茅 mao ying yang mao

Plant loosely tufted, shortly rhizomatous, old basal sheaths stramineous; shoots extravaginal. Culms 40–50 cm tall; nodes 1–2. Leaf sheaths glabrous; auricles present as erect swellings or absent; leaf blades flat or involute, gray-green 10–25 cm × 3–4 mm, margins smooth or scabrid, veins 13–15; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.4–0.7 mm, margin ciliate. Panicle loose, open, 11–15 cm, base included in uppermost leaf sheath, uppermost blade exceeding panicle; branches (2–)4–8 cm, 2 at lowest node, lower 1/2 naked. Spikelets 10–13 mm; florets 4–6(–8), closely overlapping; glumes pubescent, apex acuminate; lower glume narrowly lanceolate, 5–6 mm; upper glume lanceolate, 6–7 mm; rachilla internodes 1.2–1.5 mm, scabrid; lemmas 7–8 mm, densely pubescent; awns (2–)4–7 mm; palea keels scabrid. Anthers 3.5–4 mm. Ovary apex glabrous. Fl. and fr. Jun–Jul.

• Alpine meadows; 3600–3800 m. Yunnan (Eryuan).

This species was placed in *Festuca* subg. *Subulatae* by S. L. Lu, but it is not closely related to other species in this subgenus.

15. *Festuca yunnanensis* St.-Yves, Rev. Bretonne Bot. Pure Appl. 2: 72. 1927.

滇羊茅 dian yang mao

Plant loosely tufted; shoots extravaginal. Culms rigid, 65–90 cm tall, glabrous or villous. Leaf sheaths glabrous or pubescent on innovation shoots; auricles present as erect swellings or absent; leaf blades usually folded, occasionally flat, 25–35 cm × 3–5 mm. Panicle loose, erect, 12–15(–19) cm; branches 3–10 cm, 2 at lower nodes, lower 1/3 naked. Spikelets 9–10 mm; florets 4–5; glumes glabrous or pubescent; lower glume lanceolate, 3.8–4.2 mm; upper glume lanceolate, 5.3–5.7 mm; rachilla internodes scabrid or pubescent; lemmas 6.8–7.2 mm, scabrid or villous; awns (0.5–)1–2(–5) mm; palea keels ciliate to long-ciliate. Anthers 2.5–3.5 mm. Ovary apex glabrous or sparsely hairy. Fl. and fr. Jun–Aug.

• Subalpine meadows, *Pinus* forests; 2900–4800 m. Sichuan, Yunnan.

- 1a. Glumes smooth, glabrous; lemmas scabrid on upper back, margins glabrous; palea keels ciliate along upper 1/3 15a. var. *yunnanensis*
 1b. Glumes pubescent; lemmas long villous on back, margins ciliate; palea keels long ciliate 15b. var. *villosa*

15a. *Festuca yunnanensis* var. *yunnanensis*

滇羊茅(原变种) dian yang mao (yuan bian zhong)

Culms glabrous. Leaf sheaths smooth. Rachilla scabrid; glumes glabrous; lemmas scabrid on upper back; palea keels ciliate along upper 1/3.

• Subalpine meadows, *Pinus* forests; 2900–3800 m. Sichuan, Yunnan.

15b. *Festuca yunnanensis* var. *villosa* St.-Yves in Handel-Mazzetti, Symb. Sin. 7: 1287. 1936.

毛羊茅 mao yang mao

Culms long villous. Leaf sheaths of innovations smooth or pubescent. Rachilla densely pubescent; glumes pubescent, midrib long villous; lemmas long villous on back; palea keels long-ciliate.

• Subalpine meadows; 3700–4800 m. Sichuan (Muli), Yunnan (Lijiang).

16. *Festuca fascinata* Keng ex S. L. Lu, Acta Phytotax. Sin. 30: 533. 1992.

蛊羊茅 gu yang mao

Plant loosely or densely tufted; shoots extravaginal. Culms 60–90 cm tall, nodes 2–3. Leaf sheaths glabrous; auricles absent; leaf blades flat (at culm) or involute (at base), (7–)14–25(–27) cm × 1.5–2.6 mm, margins scaberrulous, veins 5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.6(–0.8) mm, margin sometimes ciliate. Panicle loose, nodding, 10–20 cm, base enclosed by uppermost leaf sheath; branches erect or ascending, (3–)9–12 cm, (1–)2 at lower nodes. Spikelets 7–10 (–12) mm; florets 3–5(–7); glumes glabrous or sparsely hairy; lower glume narrowly lanceolate, 2.1–3(–5) mm; upper glume lanceolate, occasionally broadly lanceolate, 3.8–6 mm; rachilla internodes 1–1.5(–2) mm, scabrid; lemmas 4.8–7 mm, scabrid upward; awns (4–)5–9 mm; palea 5–6 mm, keels scabrid. Anthers 1.2–2 mm. Ovary apex glabrous, or rarely sparsely hairy. Fl. and fr. Jun–Sep.

• Forests, mountain slopes, meadows; 2500–4100 m. Gansu, Hubei, Shaanxi, Sichuan, Xizang, Yunnan.

17. *Festuca longiglumis* S. L. Lu, Acta Phytotax. Sin. 30: 531. 1992.

长颖羊茅 chang ying yang mao

Plant loosely tufted or turf-forming; shoots extravaginal. Culms 40–65 cm tall, nodes 3–4. Leaf sheaths glabrous; auricles absent; leaf blades flat or involute, soft, (16–)20–35 cm × 2.5–3.5(–4) mm, smooth, veins 7–12; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.2–0.4 mm, margin ciliate. Panicle loose, open, 10–22 cm, base enclosed by uppermost leaf sheath; branches ascending or spreading, 3–8(–10) cm, smooth, inserted singly, naked below middle. Spikelets 10–12 mm; florets 5–6; glumes glabrous, long acuminate; lower glume narrowly lanceolate, 5–6.5 mm; upper glume lanceolate, 8–9 mm; rachilla internodes 1.3–1.5 mm; lemmas 7–8.5(–10) mm, smooth; awns 7–10 mm; palea keels scabrid. Anthers 1.8–2 mm. Ovary apex glabrous. Fl. and fr. Aug.

- Mountain slopes, near forests; ca. 2900 m. Yunnan (Binchuan).

18. *Festuca vierhapperi* Handel-Mazzetti, Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 176. 1920.

藏滇羊茅 zang dian yang mao

Plants loosely to densely tufted; shoots extravaginal. Culms 60–90(–120) cm tall, nodes 2–3(–4). Leaf sheaths glabrous or basal sheaths hairy, uppermost 15–25 cm, longer than blade; auricles usually absent; leaf blades flat or involute, rigid, (3–)10–26(–30) cm × 3–5.5 mm, margins scabrid, veins 7–13; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.4–0.6 mm, margin ciliolate. Panicle loose, erect or nodding, 8–20(–30) cm; branches 8–12 cm, 1–2 at lowest node. Spikelets 7–15 mm; florets 3–5(–7); glumes long acuminate; lower glume narrowly lanceolate, 2–3.5(–4.5) mm; upper glume narrowly lanceolate, 5–6 mm; rachilla internodes 1.2–1.4 mm, scabrid; lemmas (6–) 6.5–8 mm, smooth or scabrid upward; awns 4–8(–10) mm; palea keels scabrid. Anthers 1.8–2.2 mm. Ovary apex glabrous. Fl. and fr. Jun–Sep.

- Grassy mountain slopes, forests, along forest margins; 2900–4100 m. Sichuan, Xizang, Yunnan.

19. *Festuca parvigluma* Steudel, Syn. Pl. Glumac. 1: 305. 1854.

小颖羊茅 xiao ying yang mao

Plant loosely tufted or turf-forming; shoots extravaginal. Culms (30–)40–80 cm tall, nodes 2–3. Leaf sheaths glabrous or basal leaf sheath hairy; auricles absent; leaf blades flat, 7–20(–36) cm × 2.5–3.8(–5) mm, veins 13–17; adaxial to abaxial sclerenchyma strands present; ligule 0.2–0.5 mm, margin ciliolate. Panicle loose, nodding, (10–)15–20 cm; branches 4–13 cm, 1(or 2) at lowest node. Spikelets 7–9 mm; florets 3 or 4(or 5); glumes smooth, apex obtuse to acute; lower glume ovate, 1–1.8 mm; upper glume ovate, 2.2–3(–4) mm; rachilla internodes 0.9–1.1 mm; lemmas 4.8–7 mm, smooth, apex subobtuse, rarely slightly notched; awns 5–10(–12) mm; palea keels smooth. Anthers 0.7–1.1(–1.5) mm. Ovary apex densely hairy. Fl. and fr. Apr–Jul.

Grassy slopes, forests, roadsides, river banks; (200–)1000–3700 m. Guizhou, Hunan, Jiangxi, Shaanxi, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Korea].

Records of this species from NE India and Nepal are based on misidentifications.

20. *Festuca extremiorientalis* Ohwi, Bot. Mag. (Tokyo) 45: 194. 1931.

远东羊茅 yuan dong yang mao

Festuca subulata Trinius var. *japonica* Hackel; *F. subulata* subsp. *japonica* (Hackel) Koyama & Kawano.

Plant loosely tufted; shoots extravaginal. Culms 60–100 cm tall, nodes (2–)3(–4). Leaf sheaths glabrous; auricles absent; leaf blades flat, soft, 10–30 cm × 4–10(–13) mm, glabrous, margins smooth or scaberulous; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 1.1–2.5(–3.5) mm. Panicle loose, nodding,

(8–)12–30 cm; branches (3–)7–15 cm, scabrid, (1–)2 per node. Spikelets 5–8(–9.5) mm; florets 3–4(–5); glumes smooth or scaberulous on midvein; lower glume narrowly lanceolate to lanceolate, 2.5–3.5(–4.5) mm; upper glume lanceolate to broadly lanceolate, 3.5–6 mm; rachilla internodes 0.8–1.1 mm, pubescent; lemmas 5–6(–7) mm, strongly 5-veined, scabrid, apex entire or slightly notched; awns 4–8 mm; palea 5–6(–7) mm, keels smooth. Anthers 1–1.5(–2) mm. Ovary apex moderately or densely hairy. $2n = 28$. Fl. and fr. Jun–Aug.

Forests, valleys, grasslands, riversides; 900–2800 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan [Japan, Korea, E Russia].

This taxon is sometimes treated as an Asian subspecies of the North American *Festuca subulata*. However, *F. subulata* is considered here to be a different species, separable by its shorter ligule 0.2–1 mm, weakly 3-veined lemmas, longer awns 5–17 mm, and scabrid palea keels.

21. *Festuca leptopogon* Stapf in J. D. Hooker, Fl. Brit. India 7: 354. 1896 [“1897”].

弱序羊茅 ruo xu yang mao

Festuca subulata Trinius var. *leptopogon* (Stapf) St.-Yves; *F. takasagoensis* Ohwi.

Plant loosely tufted, shortly rhizomatous; shoots extravaginal. Culms (30–)60–120 cm tall, nodes 3–5. Leaf sheaths glabrous, old basal sheaths reddish brown, becoming fibrous; auricles absent; leaf blades flat, soft, 8–15(–30) cm × 3–8 mm, glabrous, margins smooth or scabrid, veins 12–22; adaxial to abaxial sclerenchyma strands present; ligule (0.5–)1–2 mm, truncate. Panicle loose, nodding, (10–)15–30 cm; branches flexuously ascending, 6–15 cm, 1(–2) at lower nodes. Spikelets 7–8 mm; florets 2–3; glumes smooth; lower glume lanceolate, 1.5–3.2 mm; upper glume broadly lanceolate, 2.5–4(–5.5) mm; rachilla internodes 1–1.5 mm, scabrid; lemmas 6.5–7.5(–8) mm, smooth, apex distinctly notched; awns 6–10(–15) mm; palea keels smooth or occasionally scaberulous. Anthers 1–1.2(–1.6) mm. Ovary apex moderately or densely hairy. Fl. and fr. May–Jul.

Forests on mountain slopes, grasslands, streamsides; 2300–3900 m. Guizhou, Qinghai, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, NE India, Malaysia, Nepal].

22. *Festuca elata* Keng ex E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 82(3): 97. 1977.

高羊茅 gao yang mao

Plant loosely tufted or shortly rhizomatous; shoots extravaginal. Culms 70–100 cm tall; nodes 3–4. Leaf sheaths glabrous; auricles absent; leaf blades flat, 10–20 cm × 4–9 mm wide, glabrous, margins scabrid; ligule 1.5–3.5 mm. Panicle loose, open, 20–26 cm; branches ca. 15 cm, inserted singly, scabrid, with branchlets and spikelets to base. Spikelets 8–9 mm; florets 4–6; lower glume lanceolate, 2.5–3.2 mm; upper glume broadly lanceolate, 4–5 mm; lemmas lanceolate-elliptic, 7.5–8.2 mm, smooth, apex distinctly notched, awns 8–13 mm; palea keels scaberulous. Anthers 1.7–2 mm. Ovary apex densely hairy.

• Mountain slopes, forests, roadsides. Guangxi, Guizhou, Sichuan.

23. *Festuca scabriflora* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 387. 2002.

糙花羊茅 cao hua yang mao

Plant loosely tufted. Culms 60–80 cm tall, nodes 3–4. Leaf sheaths glabrous; auricles lanceolate, straight; leaf blades flat, 10–15 cm × 4–6 mm, margins scabrid; ligule 0.4–0.6 mm. Panicle loose, 15–25 cm; branches 5–8(–15) cm, paired, lower 1/3 naked. Spikelets 16–18 mm; florets 4–5; lower glume narrowly lanceolate, 1.5–2.5 mm, apex acute; upper glume narrowly lanceolate, 3–3.5 mm, apex acuminate; lemmas 6–7 mm, densely scabrid, apex notched; awns 6–8 mm; palea keels ciliate. Anthers 1.3–1.7 mm. Ovary apex hairy. Fl. and fr. Jul–Aug.

• Alpine *Quercus* forests, streamsides, grassy mountainsides; 2700–3600 m. Sichuan, Xizang, Yunnan.

This species is apparently close to *Festuca gigantea*, but specimens have not been seen.

24. *Festuca chayensis* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 387. 2002.

察隅羊茅 cha yu yang mao

Plant densely tufted. Culms 15–20 cm tall, node 1. Leaf sheaths smooth; auricles lanceolate, straight; leaf blades flat to involute, 5–8 cm × ca. 1 mm, margins scabrid; ligule 0.4–0.6 mm, truncate, margin ciliate. Panicle loose, open, 5–7 cm; branches 2–3 cm, inserted singly. Spikelets 8–10 mm, dark purple; florets 4–5; glumes smooth; lower glume narrowly lanceolate, 2–3 mm; upper glume narrowly lanceolate, 3–4 mm; lemmas 5–6 mm, scabrid or pubescent, apex entire; awns 2–3 mm; palea keels scabrid. Anthers 2–2.2 mm. Ovary apex glabrous.

• Grassy mountainsides; ca. 3900 m. Xizang.

25. *Festuca formosana* Honda, Bot. Mag. (Tokyo) 42: 134. 1928.

台湾羊茅 tai wan yang mao

Culms robust, (40–)150–200 cm tall. Leaf sheaths glabrous; auricles falcate; leaf blades flat, stiff, (15–)30–60 cm × 5–20 mm, margins scabrid, finely acuminate; ligule 1.8–2.2 mm, truncate. Panicle large, effuse, 30–40 cm; branches ascending, paired, scabrid. Spikelets 8–10 mm; florets 1–2(–3), 3rd floret reduced; glumes glabrous; lower glume narrowly lanceolate, 2.2–2.8(–3.2) mm; upper glume broadly lanceolate, 3.5–4.5 mm; lemmas 8–9 mm, puberulent, awnless; palea keels ciliate. Anthers 2.6–3 mm.

• Limestone areas. Taiwan.

This species appears to be close to *Festuca arundinacea*. Specimens have not been seen.

26. *Festuca arundinacea* Schreber, Spic. Fl. Lips. 57. 1771.

苇状羊茅 wei zhuang yang mao

Plant tussock forming; shoots intravaginal. Culms robust, 30–100 cm tall, nodes 1–2(–5). Leaf sheaths usually smooth, occasionally scabrid at base; auricles falcate, ciliate; leaf

blades flat, tough, 4–35 cm × 1.5–7 mm, margins scabrid, veins 18, tapering to a fine point; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.5–1 mm, truncate. Panicle loose or contracted, 5–25 cm, many-spiculate; branches 2–10 cm, 1–2 at lower nodes. Spikelets 8–15 mm; florets (2–)3–7; glumes glabrous; lower glume narrowly lanceolate, 3–6 mm; upper glume lanceolate, 4.5–7 mm; rachilla internodes 1.2–1.5 mm; lemmas 6–9 mm, firm except for narrow scarious scabrid margins, apex notched; awns 0.3–0.8(–5) mm; palea keels scabridulous. Anthers 2.7–3.7 mm. Ovary apex glabrous. Fl. and fr. Jun–Sep.

Valleys, under shrubs, along forest margins; 700–1200 m. Xinjiang; cultivated and adventive in Gansu, Hubei, Jiangxi, Nei Mongol, Qinghai, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang, NE China [Russia; Europe, North America].

This species is a native of C and N Asia and Europe, widely introduced as a pasture grass and naturalized in other temperate countries. The ciliate auricles are characteristic, but the hairs become worn off with age.

The earlier name *Festuca elatior* Linnaeus (1753) has been formally rejected.

- 1a. Lemmas awnless or mucronate, mucro ca. 0.5 mm; leaf sheaths scabrid at base 26a. subsp. *arundinacea*
- 1b. Lemmas awned, awn 0.7–2.5(–5) mm; leaf sheaths smooth throughout 26b. subsp. *orientalis*

26a. *Festuca arundinacea* subsp. *arundinacea*

苇状羊茅(原亚种) wei zhuang yang mao (yuan ya zhong)

Bromus arundinaceus (Schreber) Roth; *Festuca elatior* Linnaeus, nom. utique rej.; *F. elatior* subsp. *arundinacea* (Schreber) Celak; *F. elatior* var. *arundinacea* (Schreber) Wimmer; *Lolium arundinaceum* (Schreber) Darbyshire; *Schedonorus elatior* (Linnaeus) P. Beauvois, nom. rej.

Leaf sheaths usually scabrid at base. Lemmas awnless or mucronate; mucro up to 0.5 mm.

Valleys, under shrubs, along forest margins; 700–1200 m. Xinjiang, cultivated in Gansu, Hebei, Hubei, Jiangxi, Nei Mongol, Qinghai, Shaanxi, Sichuan, Yunnan, Zhejiang, NE China [Russia; Europe].

26b. *Festuca arundinacea* subsp. *orientalis* (Hackel) Tzvelev, Fl. URSS 18: 17. 1970.

东方羊茅 dong fang yang mao

Festuca elatior Linnaeus subvar. *orientalis* Hackel, Monogr. Fest. Eur. 154. 1882; *F. arundinacea* var. *aristata* Regel; *F. orientalis* (Hackel) V. I. Kreczetowicz & Bobrov; *F. regelia* Pavlov.

Leaf sheaths usually smooth throughout. Lemmas awned; awn 0.7–2.5(–5) mm.

Forest margins, wetlands. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

27. *Festuca pratensis* Hudson, Fl. Angl. 37. 1762.

草甸羊茅 cao dian yang mao

Festuca elatior Linnaeus subsp. *pratensis* (Hudson) Hackel; *F. elatior* var. *pratensis* (Hudson) A. Gray; *F. fluitans* Linnaeus var. *pratensis* (Hudson) Hudson; *Lolium pratense* (Hudson) Darbyshire; *Schedonorus pratensis* (Hudson) P. Beauvois.

Plant loosely tufted; shoots extravaginal. Culms 30–130 cm tall, nodes 2–4. Leaf sheaths glabrous; auricles falcate, glabrous; leaf blades flat or loosely rolled, 10–25 cm × 2–7 mm, glabrous, veins 18–25; adaxial to abaxial sclerenchyma strands present; ligule 0.2–0.5 mm, margin ciliate. Panicle compact except at anthesis, (6–)10–25 cm; branches usually paired, (3.5–)4–6.5 cm, unequal, longer branch with 4–6 spikelets, shorter branch with 1–3 spikelets. Spikelets 8.5–17 mm; florets (2–)4–12; glumes glabrous or scabrid; lower glume (2–)2.6–4(–4.5) mm; upper glume (3–)3.5–5 mm; rachilla internodes scabrid; lemmas (5–)6–8 mm, smooth or scabrid, apex hyaline, acute, rarely awn-tipped; awns 0–2 mm; palea keels scabrid. Anthers (0.5–)2–4.6 mm. Ovary apex glabrous. $2n = 14, 28, 42, 70$.

Cultivated. Guizhou, Jiangsu, Jilin, Qinghai, Sichuan, Xinjiang, Yunnan [SW Asia, Europe; cultivated North America].

This grass (Meadow Fescue) was widely cultivated as a pasture grass in the late 1800s and early 1900s and is now found in most temperate parts of the world. It may have been introduced to China at that time.

28. *Festuca gigantea* (Linnaeus) Villars, Hist. Pl. Dauphiné 2: 110. 1787.

大羊茅 da yang mao

Bromus giganteus Linnaeus, Sp. Pl. 1: 77. 1753; *Lolium giganteum* (Linnaeus) Darbyshire.

Plant loosely tufted, usually with old brownish sheaths at base; shoots extravaginal. Culms 45–150 cm tall, nodes (1–)2–3. Leaf sheaths glabrous or scabrid; auricles falcate; leaf blades dark green, flat, (10–)15–35(–50) cm × 6–18 mm, midrib conspicuous, margins scabrid, veins 26–36; adaxial to abaxial sclerenchyma strands present; ligule (0.5–)1–1.5(–2.5) mm, margin glabrous. Panicle loose, open, 15–25(–50) cm; branches flexuous, 5–10(–15) cm, paired, unequal, shorter with 3–6 spikelets, longer with 6–9 spikelets, lower 1/3 naked. Spikelets 8–13(–20) mm; florets 3–10; glumes smooth or scabrid; lower glume lanceolate, (3.5–)4–7 mm; upper glume broadly lanceolate, 5–8 mm; rachilla internodes 1.3–1.8 mm, scabrid; lemmas 6–7.5(–9) mm, scabrid, apex entire or slightly notched; awns (6–)10–15(–18) mm; palea keels scaberulous. Anthers 2.5–3 mm. Ovary apex glabrous. Fl. and fr. Jul–Aug. $2n = 42$.

Damp shady places along forest margins, grasslands, under shrubs; 1000–3800 m. Sichuan, Xinjiang (Tian Shan), Yunnan [Bhutan, NW India, Kazakhstan, Pakistan, Russia, Tajikistan; SW Asia, Europe; cultivated North America].

29. *Festuca liangshanica* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 387. 2002.

凉山羊茅 liang shan yang mao

Plant loosely tufted with short slender rhizomes. Culms 60–80 cm tall, nodes 1–2. Leaf sheaths glabrous; auricles falcate; leaf blades flat, 6–13 cm × 2.5–4 mm, margins smooth,

veins 15–17; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.5 mm, margin glabrous. Panicle loose, open, 8–20 cm; branches flexuous, 3–9 cm, 2 at lowest node, one long and the other short, smooth. Spikelets 10–20 mm; florets 3–8; glumes smooth, apex obtuse; lower glume narrowly lanceolate, 4–6 mm; upper glume lanceolate, 6–7 mm; rachilla internodes 1.8–2.2 mm, smooth; lemmas 7.5–9 mm, punctiform or scaberulous, apex entire or slightly notched; awns 4.5–13 mm; palea keels scaberulous. Anthers 3.6–4 mm. Ovary apex glabrous. Fl. and fr. Jul.

• Grassy mountain slopes; ca. 1200 m. Sichuan (Liang Shan, Xichang).

This species resembles *Festuca gigantea* in its falcate auricles, long awns, and glabrous ovary apex.

30. *Festuca durata* B. S. Sun & H. Peng, Guihaia 13: 223. 1993.

硬序羊茅 ying xu yang mao

Plant loosely tufted or single-stemmed; shoots intravaginal. Culms (30–)50–80(–110) cm tall, nodes 2. Leaf sheaths glabrous; auricles falcate; leaf blades flat, usually erect, 5–15(–25) cm × 2–6 mm, veins 10–14, glabrous; adaxial to abaxial sclerenchyma strands present, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.5 mm. Panicle narrow, spikelike, 10–25 cm; branches stiff, erect, 1.2–3(–9) cm, 1(–2) at lowest node, bearing 2–4 spikelets from base. Spikelets 10–17 mm; florets (3–)4–6; glumes glabrous, apex acuminate; lower glume narrowly lanceolate, 5–7 mm; upper glume narrowly lanceolate, 6–8 mm; rachilla internodes 1.6–2.5(–3) mm; lemmas 6.5–9.5 mm, apex slightly notched; awns 6–13 mm; palea keels scabrid. Anthers 2.5–3.5 mm. Ovary apex glabrous. Fl. and fr. Jun–Oct.

• Roadsides, ditches; 1400–2600 m. Guizhou, Yunnan.

This species resembles *Festuca gigantea* in its falcate auricles, long awns, and glabrous ovary apex.

31. *Festuca mazzettiana* E. B. Alexeev, Byull. Moskovsk. Obsch. Isp. Prir., Otd. Biol. 82(3): 99. 1977.

昆明羊茅 kun ming yang mao

Festuca mairei Hackel ex Handel-Mazzetti, Symb. Sin. 7: 1288. 1936, not St.-Yves (1922); *F. kunmingensis* B. S. Sun; *Lolium mazzettianum* (E. B. Alexeev) Darbyshire.

Plant solitary or loosely tufted; shoots intravaginal. Culms (40–)60–80 cm tall; nodes (3 or)4. Leaf sheaths glabrous; auricles falcate; leaf blades flat or involute, (2.5–)6–10(–30) cm × 1.5–2.5(–4) mm, veins 10–14; ligule 0.3–0.6(–1) mm, margins ciliate or without cilia. Panicle spikelike, 13–17(–26) cm; branches 2–5 cm, 2 or 1 at lowest node. Spikelets 12–16 mm, purplish or brown (tinged greenish); florets 3–4; glumes glabrous; lower glume narrowly lanceolate, 4–5(–7) mm; upper glume lanceolate, 5.2–6.7 mm; rachilla internodes 1.8–2.2 mm; lemmas 7.5–9(–10) mm, scabrid, apex slightly notched; awns 7–15 mm; palea 7.5–8.5 mm, keels scaberulous. Anthers 2.5–3 mm. Ovary apex glabrous (immature). Fl. and fr. Jul.

- Grassy places, forest margins; 2600–2800 m. Sichuan, Yunnan.

32. *Festuca jacutica* Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 14: 163. 1915.

雅库羊茅 ya ku yang mao

Plant tufted, turf-forming, base clothed in old sheaths. Culms 50–80 cm tall, nodes 2–3. Leaf sheaths glabrous; auricles present as erect swellings or absent; leaf blades conduplicate, filiform, stem blades 4–8 cm × ca. 0.3 mm, basal blades up to 30 cm, veins 5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in broad bands or continuous; ligule 0.1–0.3 mm, margin ciliate. Panicle loosely contracted, 5–10 cm; branches 2–3 cm. Spikelets 5–7.5 mm, usually purplish, occasionally greenish, tawny at maturity; florets 4–7; glumes smooth, margins and apex broadly membranous; lower glume narrowly lanceolate, 1.8–2.2 mm; upper glume broadly lanceolate, 2.8–3.2 mm; lemmas 3–4 mm, punctiform, apex acute or obtuse; awns absent; palea keels scabrid or ciliate. Anthers 1.5–2 mm. Ovary apex glabrous. Fl. and fr. Jun–Aug.

Hill slopes, meadows, open forests. 700–1800 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [E Russia].

33. *Festuca stapfii* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(4): 115. 1978.

细芒羊茅 xi mang yang mao

Festuca undata Stapf var. *aristata* Stapf.

Plant tufted; shoots extravaginal. Culms 20–70 cm tall, nodes 2, dark brown. Leaf sheaths smooth or basal sheaths pubescent; auricles present as erect swellings; leaf blades conduplicate, flaccid, 3–10 cm × 0.8–1 mm, veins 7–9; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.5 mm, margin ciliate. Panicle loose, open, 6–23 cm; branches 3–6 cm, filiform, scabrid, 1(–2) at lowest node. Spikelets 6–8.5(–9.5) mm, greenish or purplish; florets 3–4(–7); glumes smooth, margins broadly membranous; lower glume narrowly lanceolate, 2–2.5(–3.8) mm; upper glume lanceolate, 3–4.5(–6.5) mm; rachilla internodes 1–1.5 mm; lemmas 5–6.5 mm, smooth, acuminate; awns (3–)5–8 mm; palea keels scabrid. Anthers 1–1.8 mm. Ovary apex glabrous when young, later sparsely hairy. Fl. and fr. Jul–Sep.

Grassy mountainsides, chalky meadows, forest margins; 3000–3200 m. Sichuan, Xizang, Yunnan (E Lijiang mountains) [Bhutan, India (Darjeeling, Sikkim), Nepal].

Festuca undata Stapf, from India (Sikkim), differs by its extravaginal shoots, shorter awns 0.7–1.4 mm, and smaller anthers 0.5–0.7 mm.

34. *Festuca kashmiriana* Stapf in J. D. Hooker, Fl. Brit. India 7: 351. 1896 [“1897”].

克什米尔羊茅 ke shi mi er yang mao

Festuca rubra Linnaeus subsp. *kashmiriana* (Stapf) St.-Yves.

Plant densely tufted; shoots intravaginal or extravaginal. Culms 15–60 cm tall, nodes 1–2. Leaf sheaths smooth, glabrous, margins membranous; auricles present as erect swellings

or absent; leaf blades conduplicate, 10–20 cm × ca. 0.5 mm, both surfaces scabrid. Panicle loose, open at flowering, 6–10 cm; branches 2–5 cm, inserted singly. Spikelets 8.5–11 mm, greenish or purplish brown; florets 3–6; glumes smooth or scabrid, margins thinly membranous or ciliate, apex acute; lower glume lanceolate, 2–2.5 mm; upper glume lanceolate-ovate, 3–4.5 mm; rachilla internodes 1.8–2.2 mm, pubescent; lemmas 5.1–6.5 mm, scabrid on upper back, rarely pubescent laterally at base; awns 2–3.5 mm; palea keels scabrid, pubescent between keels. Anthers 1.5–2.5 mm. Ovary apex densely hairy. Fl. and fr. Jul.

Grassy places on sunny slopes; ca. 4600 m. Xizang [NW India, Kashmir].

35. *Festuca georgii* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(5): 94. 1978.

滇西北羊茅 dian xi bei yang mao

Plant loosely tufted; shoots extravaginal. Culms 60–80 cm tall, nodes 2–3. Leaf sheaths glabrous; auricles absent; leaf blades conduplicate, 7–22 cm × 0.8–1.5 mm, veins 7–9(–13); adaxial to abaxial sclerenchyma strands absent, adaxial sclerenchyma present on tops of ribs, abaxial sclerenchyma in broad bands, some reaching vascular bundles, or continuous beneath epidermis; ligule 0.2–0.4 mm, margin ciliate. Panicle loose, open, 15–20 cm; branches 4–8 cm, 2 at lowest node. Spikelets 8–10 mm, greenish or purplish; florets 3(–4); glumes glabrous; lower glume narrowly lanceolate, 3.5–4 mm; upper glume broadly lanceolate, 4.5–5 mm; rachilla internodes 1.3–1.5 mm; lemmas 6–7 mm, scabrid; awns (0.5–)0.8–1.5 mm; palea keels scabrid. Anthers 3–3.3 mm. Ovary apex sparsely hairy. Fl. and fr. Aug.

• Moist shady situations at *Pinus* forest margins; 3000–3400 m. Yunnan (E Lijiang mountains).

36. *Festuca nitidula* Stapf in J. D. Hooker, Fl. Brit. India 7: 350. 1896 [“1897”].

微药羊茅 wei yao yang mao

Plant loosely tufted or turf-forming; shoots intravaginal or extravaginal. Culms (10–)18–60 cm tall; nodes usually 1(–2). Leaf sheaths glabrous; auricles usually absent; leaf blades setaceous, conduplicate or sometimes flat, 2–15 cm × 1–2 mm, veins 7–12; adaxial to abaxial sclerenchyma strands present or absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.2–0.5(–1) mm, margin ciliate. Panicle loose, open, usually drooping, 4–10 cm; branches 3–5(–7) cm, flexuous, 1 at lowest node. Spikelets 5–6(–7) mm, purplish or sometimes brown; florets 2–5; glumes smooth, margins membranous, apex sub-obtuse; lower glume lanceolate, 1.5–3 mm; upper glume broadly lanceolate to oblong, 3–4 mm; rachilla internodes 0.8–1 mm; lemmas 4–5 mm, scabrid; awns (0.5–)1–2(–4) mm; palea keels scabrid. Anthers 0.5–1 mm. Ovary apex sparsely hairy. Fl. and fr. Jun–Sep.

Wet places in alpine meadows, grassy mountain slopes, floodlands, swamp meadows; 2500–5300 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [NW India, Kashmir, Nepal].

This species has unusually small anthers.

37. *Festuca amblyodes* V. I. Kreczetowicz & Bobrov in Komarov, Fl. URSS 2: 771. 1934.

葱岭羊茅 *cong ling yang mao*

Festuca amblyodes subsp. *erectiflora* (Pavlov) Tzvelev; *F. erectiflora* Pavlov.

Plant loosely tufted or turf-forming. Culms 15–30 cm tall, nodes 1–2. Leaf sheaths smooth; auricles present as erect swellings; leaf blades conduplicate, 5–15 cm × 0.3–0.5 mm, 1/3–1/2 length of culms, veins 5; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule (0.2–)0.4–0.6 mm, margin ciliolate. Panicle loose, open, 3–5 cm; branches 1–2(–4) cm, inserted singly. Spikelets 6–11 mm, greenish, purplish or brown; florets 3–5; glumes smooth, margins narrowly membranous; lower glume narrowly lanceolate, 2–2.8 mm; upper glume lanceolate, 3.4–4.1 mm; rachilla internodes 1.2–1.6 mm, scabrid or pubescent; lemmas 4.5–6.2 mm, punctiform toward apex, smooth below; awns 1–1.5 mm; palea keels scabrid. Anthers 1.8–2.4 mm. Ovary apex sparsely hairy. Fl. and fr. Jun–Aug.

Meadow steppes, alpine meadows, mountain valleys; 2200–3700 m. Qinghai, Xinjiang, Yunnan [E Kazakhstan, Kyrgyzstan, Tajikistan].

38. *Festuca yulungschanica* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(4): 116. 1978.

丽江羊茅 *li jiang yang mao*

Plant densely tufted; shoots intravaginal. Culms 18–26 cm tall. Leaf sheaths smooth, closed below middle when young; auricles present as erect swellings or absent; leaf blades conduplicate, 0.4–0.6 mm wide, veins 5; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands. Panicle contracted, narrow, 4.5–6 cm. Spikelets ovate, 8–10 mm, greenish; lemmas 5–5.5 mm, smooth; awns (1.5–) 2.5–5.5 mm; palea keels scabrid. Anthers 2.3–2.8 mm. Ovary apex glabrous.

• Subalpine grassy places, mountain slopes; 3300–3700 m. Yunnan.

39. *Festuca kansuensis* Markgraf-Dannenberg, Acta Bot. Acad. Sci. Hung. 19: 207. 1973.

甘肃羊茅 *gan su yang mao*

Plant densely tufted; shoots intravaginal. Culms 20–30(–50) cm tall, nodes 2. Leaf sheaths smooth, glabrous or rarely pubescent; auricles present as erect swellings; leaf blades conduplicate, filiform, 10–15(–25) cm × (0.25–)0.3–0.5 mm, veins 5, abaxial surface scabrid; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in broad bands; ligule 0.4–0.6 mm, margin ciliate. Panicle loose, narrow; branches 1–3 cm, scabrid, 1 or 2 at lowest node. Spikelets 7–8 mm, yellowish green or purplish; florets 3–4; lower glume glabrous, linear or narrowly lanceolate, 3–3.5 mm; upper glume narrowly lanceolate, 4.2–4.8 mm, margins minutely ciliate, scaberulous near apex; lemmas 5.3–5.7 mm, scabrid; awns 1.5–2.7 mm; palea keels and back scabrid. Anthers (2.1–)2.5–3 mm. Ovary apex glabrous or sparsely hairy. Fl. and fr. Jun–Aug.

• Mountain slopes, meadow steppe; 3200–3700 m. Gansu, Qinghai.

40. *Festuca subalpina* Y. L. Chang & Skvortsov, Acta Soc. Harbin. Investig. Nat. Ethnogr., Bot. 12: 29. 1954.

长白山羊茅 *chang bai shan yang mao*

Plant densely tufted; shoots extravaginal. Culms 15–25 cm tall, nodes 1. Leaf sheaths smooth, glabrous or basal leaf sheaths pubescent; auricles present as erect swellings; leaf blades conduplicate, flaccid, 7–13 cm × 0.3–0.8 mm, veins (5–)7–9; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 3 strands at midrib and margins; ligule 0.1–0.3 mm, margin ciliate. Panicle contracted, narrow, 3–6 cm; branches 0.5–2 cm, 1 at lowest node. Spikelets 5–6 mm, purplish or greenish brown; florets 3–5; glumes glabrous or pubescent; lower glume lanceolate, 2–2.5 mm; upper glume oblong or broadly lanceolate, 2.8–3.2 mm; rachilla internodes 1–1.2 mm; lemmas 3.5–4 mm, smooth in lower part, scabrid or pubescent toward apex; awns 1–2.5(–3) mm; palea keels scabrid. Anthers 1.5–2.1(–2.5) mm. Ovary apex glabrous. Fl. and fr. Jul–Sep.

• Mountain slopes; 2500–2600 m. Jilin (Changbai Shan).

41. *Festuca forrestii* St.-Yves, Rev. Bretonne Bot. Pure Appl. 2: 72. 1927.

玉龙羊茅 *yu long yang mao*

Festuca forrestii var. *kozlovii* Tzvelev.

Plant loosely tufted or turf-forming; shoots intravaginal or extravaginal. Culms stiff, (18–)30–60 cm tall, 1-noded. Leaf sheaths smooth; auricles present as erect swellings; leaf blades conduplicate, 6–20 cm × 0.3–0.5 mm, both surfaces smooth or abaxial surface scabrid, margins scaberulous, veins 5; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule ca. 0.1 mm. Panicle loose, open, 4–7 cm; branches 1.5–4 cm, inserted singly. Spikelets 8–10 mm, purplish or rarely greenish; florets 3–5(–7); glumes smooth or upper scabrid, margin ciliate; lower glume narrowly lanceolate, 2.5–3.5 mm; upper glume lanceolate, 4–5 mm; rachilla internodes 1.1–1.4 mm, scabrid; lemmas 5–6 mm, punctiform or scabrid; awns 2–6 mm; palea keels and back scabrid. Anthers 1.8–2.5(–3) mm. Ovary apex glabrous or sparsely hairy. Fl. and fr. Jul–Sep.

• Wet alpine meadows; 2500–4400 m. Qinghai, Sichuan, Xizang, Yunnan.

42. *Festuca rubra* Linnaeus, Sp. Pl. 1: 74. 1753.

紫羊茅 *zi yang mao*

Plants loosely tufted, shortly rhizomatous; shoots extravaginal; basal sheaths reddish brown. Culms 15–60(–100) cm tall, nodes 1–3. Leaf sheaths glabrous or with retrose hairs, occasionally reddish; auricles present as erect swellings or absent; leaf blades setaceous, conduplicate or culm blades flat, 6–30 cm × 0.4–1 mm (to 4 mm when flat), veins 5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.1–0.5 mm, margin without cilia. Panicle fairly loose, 5–14(–20) cm; branches 1.5–8 cm, scabrid

or hairy, 1–4 at lowest node. Spikelets 6–13 mm, green or purple; florets 2–6(–10); glumes smooth or slightly scabrid; lower glume narrowly lanceolate, 2–3.5(–4.5) mm; upper glume broadly lanceolate, 3.5–5.5(–6) mm; rachilla internodes ca. 0.8 mm, pubescent; lemmas smooth, scabrid or pubescent, (4–)5–7(–8) mm; awns (0.3–)1–3.5(–5) mm, rarely awnless; palea keels scabrid toward apex. Anthers (1–)2–3.7 mm. Ovary apex glabrous. $2n = 14, 21, 28, 42, 49, 53, 56, 64, 70$.

Grassy slopes, roadsides, alpine meadows, other grassy places, in sun or shade; 600–4500 m. Widespread and common in China [temperate regions of N hemisphere].

Festuca rubra is a very polymorphic species, widespread in temperate and cold regions of the N hemisphere, and useful for pastures and lawns. Members of the complex (nos. 35–42) may be identified by the presence of young tiller leaf sheaths that are fused in a tube almost to the top. Look for this character if the leaf sheaths are reddish brown with retrorse hairs and the older leaf sheaths are fibrous. Leaf cross sections of the *F. rubra* complex are characteristic, with small patches of sclerenchyma under the lower epidermis, but no strands running across the leaf.

There are numerous variants, and many infraspecific taxa have been described. The following subspecies can be recognized in China.

- 1a. Lemmas densely pubescent; awn 0–1.5 mm 42c. subsp. *arctica*
- 1b. Lemmas smooth or scabrid; awn 1–5 mm.
 - 2a. Lemmas 4–6 mm; awn 1–3.5 mm; anthers 2–3.5 mm 42a. subsp. *rubra*
 - 2b. Lemmas 6–8 mm; awn 3–5.5 mm; anthers 1–2 mm 42b. subsp. *clarkei*

42a. *Festuca rubra* subsp. *rubra*

紫羊茅(原亚种) *zi yang mao* (yuan ya zhong)

Festuca rubra var. *nankataizanensis* Ohwi; *F. rubra* var. *niitakensis* Ohwi.

Panicle branches scabrid. Spikelets with 3–6 florets; lemmas smooth or scabrid, 4–6 mm. Anthers 2–3.5 mm.

Grassy slopes, roadsides, alpine meadows, other grassy places, in sun or shade. Common in China except in the S [Japan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America].

This is a very widely distributed grass, adventive or introduced for pasture and lawns in many cool-temperate countries.

Festuca rubra var. *nankataizanensis*, described from Taiwan, differs from this subspecies in its densely hirsute lemmas and small anthers 1–1.5 mm.

42b. *Festuca rubra* subsp. *clarkei* (Stapf) St.-Yves, Rev. Bretonne Bot. Pure Appl. 2: 62. 1927.

克西羊茅 *ke xi yang mao*

Festuca rubra var. *clarkei* Stapf in J. D. Hooker, Fl. Brit. India 7: 353. 1896 [“1897”]; *F. clarkei* (Stapf) B. S. Sun.

Panicle branches scabrid. Spikelets with 3–5 florets; lemmas glabrous or with very short hairs, 6–8 mm; awn 3–5.5 mm. Anthers 1–2 mm.

Mountain slopes; 2000–3600 m. Yunnan [Bhutan, N India, Kashmir, Pakistan].

42c. *Festuca rubra* subsp. *arctica* (Hackel) Govoruchin, Fl. Urala 127. 1937.

毛稈羊茅 *mao fu yang mao*

Festuca rubra Linnaeus f. *arctica* Hackel, Monogr. Festuc. Eur. 140. 1882; *F. kirelowii* Steudel; *F. cryophila* V. I. Kreczetowicz & Bobrov; *F. rubra* subsp. *kirelowii* (Steudel) Tzvelev; *F. rubra* subsp. *pluriflora* (D. M. Chang) N. R. Cui.

Panicle branches hairy. Spikelets with 2–7(–10) florets; lemmas densely pubescent, 5–6.5 mm; awn up to 1.5 mm or awnless. Anthers 2.7–3.7 mm. $2n = 42$.

Among shrubs, grassy mountain slopes, valleys, floodlands; 2100–4300 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang [Kashmir, Kazakhstan (Tarbagatai Mountains), Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan; N Europe, North America].

Festuca rubra subsp. *pluriflora* is based on a variant from Xinjiang (S Tian Shan) with 8 or more florets in the spikelet and glabrous leaf sheaths.

43. *Festuca chelungkiangnica* Y. L. Chang & Skvortsov ex S. L. Lu, Acta Phytotax. Sin. 30: 539. 1992 [“*chelungkingnica*”].

草原羊茅 *cao yuan yang mao*

Plant densely tufted. Culms 15–30 cm tall. Leaf sheaths glabrous; auricles present as erect swellings or absent; leaf blades filiform, conduplicate, 7–15 cm × 0.4–0.6 mm, cauline leaves 1.5–3 cm, veins 5; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 3 broad bands at midrib and margins; ligule 0.9–1.1 mm, margin ciliolate. Panicle narrow, 3.5–4.5 cm × 0.3–0.5 cm; branches 0.5–1 cm, inserted singly, rarely paired at lowest node, upper part of panicle racemose. Spikelets 5–6 mm, yellowish green; florets 4; glumes pubescent, margins ciliolate; lower glume narrowly lanceolate, ca. 3 mm; upper glume broadly lanceolate, ca. 4 mm; lemmas 4–5 mm, pubescent, awnless or mucronate. Anthers ca. 1.5 mm. Ovary apex glabrous. Fl. and fr. Sep–Nov.

• Grassland steppes. Heilongjiang.

44. *Festuca dahurica* (St.-Yves) V. I. Kreczetowicz & Bobrov in Komarov, Fl. URSS 2: 517. 1934.

达乌里羊茅 *da wu li yang mao*

Plants densely tufted, base clothed in old sheaths; shoots intravaginal. Culms (20–)30–60 cm tall; nodes 1–2. Leaf sheaths glabrous; auricles present as erect swellings; leaf blades conduplicate, 4–15 cm × 0.5–1 mm, veins 5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 3 broad bands; ligule 0.2–0.3 mm, margin ciliolate. Panicle narrow, contracted, (3–)6–8 cm; branches 1–3 cm, pubescent, 1–2 at lowest node. Spikelets 6–8.5 mm, greenish or purplish, brownish at maturity; florets 4–6; glumes glabrous, apex acute; lower glume lanceolate, 3–4 mm; upper glume lanceolate or elliptic, 3.5–5 mm; rachilla internodes 1–1.5 mm; lemmas 4.5–6.5 mm, scabrid or pubescent, awnless; palea keels glabrous. Anthers (2–)2.5–3 mm. Ovary apex glabrous. Fl. and fr. Jun.

Hill slopes; 600–3200 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai [Mongolia, E Russia].

- 1a. Panicle 6–8 cm; leaf blades 0.8–1 mm wide; anthers 2.5–3 mm 44a. subsp. *dahurica*
 1b. Panicle 3–5 cm; leaf blades ca. 0.6 mm wide; anthers ca. 2 mm 44b. subsp. *mongolica*

44a. *Festuca dahurica* subsp. *dahurica*

达乌里羊茅(原亚种) da wu li yang mao (yuan ya zhong)

Festuca ovina Linnaeus var. *dahurica* St.-Yves, Bull. Soc. Bot. France 71: 40. 1924.

Culms 30–60 cm tall. Leaf blades 0.8–1 mm wide. Panicle 6–8 cm. Lemmas 4.5–5.5 mm. Anthers 2.5–3 mm.

Hill slopes; 600–1400 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol [Russia].

44b. *Festuca dahurica* subsp. *mongolica* S. R. Liou & Ma in Ma et al., Fl. Intramongol. 7: 261. 1983.

蒙古羊茅 meng gu yang mao

Plants dwarf. Leaf blades narrow, less than 0.6 mm wide. Panicle 3–5 cm. Lemmas 4–5 mm. Anthers ca. 2 mm.

• Grassy mountainsides; 1200–3200 m. Gansu, Hebei, Heilongjiang (Sunwu), Nei Mongol, Qinghai.

45. *Festuca trachyphylla* (Hackel) Krajina, Acta Bot. Bohem. 9: 190. 1930.

草稭羊茅 cao fu yang mao

Festuca ovina Linnaeus subvar. *trachyphylla* Hackel, Monogr. Festuc. Eur. 91. 1882.

Plant densely tufted; shoots intravaginal. Culms 20–75 cm tall, nodes 1–2. Leaf sheaths glabrous or hairy; auricles present as erect swellings; leaf blades involute, 8–30 cm × 0.4–0.6 mm, veins (5–)7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma usually forming an interrupted or almost continuous, unevenly thickened ring, occasionally in 3 strands; ligule 0.1–0.3 mm, margin ciliate. Panicle 3–13 cm, branches 1.2–3.5 cm, 1 at lowest node. Spikelets 5.5–10 mm; florets 4–8; glumes pubescent; lower glume 2–4 mm; upper glume 3–5.5 mm; lemmas 3.8–5.5 mm, scabrid or pubescent; awns 0.5–2.5 mm; palea keels scabrid. Anthers 2–3.4 mm. Ovary apex glabrous. $2n = 42$.

Perhaps introduced in China [Russia (European part); Europe; introduced in North America].

This commercially available species (Hard Fescue or Sheep Fescue) is widely used in North America and Europe for land stabilization on pipelines, mine tailings, and roadside plantings. It may have been introduced to China for similar purposes, but this has not been confirmed.

46. *Festuca hondae* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 86(1): 70. 1981.

光稭羊茅 guang fu yang mao

Festuca formosana E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(5): 98. 1978, not Honda (1928); *F. taiwanensis* S. L. Lu, nom. illeg. superfl.

Plant densely tufted; shoots intravaginal. Culms 15–30 cm

tall. Leaf blades conduplicate, 5–12 cm × 0.6–0.8 mm, veins 5 or 7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in a continuous ring. Panicle contracted, 2.5–4.5 cm; branches scabrid. Spikelets ovate, 8–9 mm, greenish; florets 4–6; lemmas 5.5–5.7 mm, smooth; awns 2–2.5 mm; palea keels smooth or scaberulous. Anthers 1.8–2 mm. Ovary apex glabrous.

• Among rocks, open mountain ridges; ca. 4300 m. Taiwan.

This species is known only from the type and is perhaps no more than an extreme variant of *Festuca ovina*.

47. *Festuca ovina* Linnaeus, Sp. Pl. 1: 73. 1753.

羊茅 yang mao

Plant densely tufted; shoots intravaginal. Culms 10–60 cm tall; node 1. Leaf sheaths glabrous or basal leaf sheaths occasionally with trichomes; auricles present as erect swellings or absent; leaf blades filiform, conduplicate, (3–)8–25 cm × 0.3–0.6 mm, margins usually scabrid, veins 5(–)7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in a continuous ring; ligule (0.1–)0.2–0.5 mm, margin ciliate. Panicle contracted, narrow, 2–8 cm; branches (0.5–)1–2 cm, 1 at lowest node. Spikelets 4–6 mm, greenish, purplish or brown; florets 3–6; glumes glabrous or scabrid below apex; lower glume narrowly lanceolate to lanceolate, 1.8–2.8 mm; upper glume lanceolate or broadly lanceolate, 2.8–3.5 mm; rachilla internodes 0.8–1 mm; lemmas 3–4(–)5 mm, punctiform or scabrid; awns 0.5–2 mm; palea keels scabrid. Anthers 1.5–2.2 mm. Ovary apex glabrous. Fl. and fr. Jun–Sep.

Alpine meadows, steppe, grassy places in forests; 1600–4400 m. Anhui, Gansu, Guizhou, Jiangsu (cultivated), Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia; SW Asia (Caucasus), Europe, North America].

This is an extremely polymorphic species with a natural distribution throughout temperate and cold parts of the N hemisphere. It provides good forage on poor upland soils. Numerous variants have been recognized at infraspecific rank, often from different habitats and based on small differences in pubescence, size, proportion of vegetative and floral parts, and other characters. The name *Festuca airoides* Lamarck, a European segregate, has been applied to plants from the *F. ovina* complex in China.

Festuca ovina and related species (nos. 43–47) can be distinguished from members of the *F. rubra* complex as follows: plants densely tufted, without rhizomes; young leaf sheaths with free, overlapping margins; shoots intravaginal; leaf blades with only midrib or also two lateral ribs well defined; leaf sclerenchyma a continuous or broken subepidermal band, or 3 broad strands at midrib and margins.

48. *Festuca brachyphylla* Schultes & J. H. Schultes, Mant. 3(Add. 1): 646. 1827.

短叶羊茅 duan ye yang mao

Festuca brevifolia R. Brown, Chloris Melvillianiana 31. 1823, not Muhlenberg (1817); *F. jouldosensis* D. M. Chang; *F. ovina* subsp. *brachyphylla* (Schultes & J. H. Schultes) Piper; *F. ovina* var. *brachyphylla* (Schultes & J. H. Schultes) Hitchcock.

Plant usually densely tufted; shoots intravaginal. Culms (5–)8–30(–55) cm tall; node 1. Leaf sheaths glabrous; auricles

present as erect swellings; leaf blades conduplicate, (1.5–)2–10(–20) cm × 0.5–0.8 mm, veins (3–)5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 5–7 narrow discrete strands; ligule ca. 0.2 mm, margin ciliate. Panicle contracted, spikelike, 1.5–4(–5.5) cm; branches 0.2–1.5 cm, scabrid, 1–2 at lowest node. Spikelets 4–8 mm, usually brown or brownish purple, occasionally greenish; florets 2–6; glumes smooth, margins glabrous, apex acute or sub-obtuse; lower glume narrowly lanceolate, (1.2–)1.5–2.5(–3.3) mm; upper glume oblong, (2.4–)3–4.5 mm; rachilla internodes 0.8–1 mm; lemmas 3–4.5(–5.2) mm, scabrid; awns 0.8–1.5 mm; palea keels smooth or minutely scaberulous. Anthers (0.5–)0.7–1.1(–1.3) mm. Ovary apex glabrous. Fl. and fr. Jul–Sep. $2n = 42$.

Alpine meadows, mountain slopes, forests, among shrubs, gravelly places; 3500–4800 m. Gansu, Qinghai, Xinjiang, Xizang (Amdo) [E Kazakhstan (Tarbagatai Mountains.), Kyrgyzstan, Mongolia, Russia, Tajikistan; N Europe, North America].

This is a panarctic tundra species, extending southward into C Asia on high mountains.

49. *Festuca chumbiensis* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(4): 118. 1978.

春丕谷羊茅 chun pi gu yang mao

Plant turf-forming; shoots intravaginal. Culms 20–50 cm tall, nodes 1–2. Leaf sheaths glabrous; auricles present as erect swellings; leaf blades conduplicate, 4–7 cm × 0.7–0.8 mm, veins 7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 5–7 narrow discrete strands; ligule 0.3–0.4 mm, margin ciliate. Panicle contracted, 3–5(–7) cm; branches 0.5–1.5 cm, scabrid, 1–2 at lowest node. Spikelets ovate, 5–5.5 mm, greenish or brown; florets 4–5; glumes with ciliate margins; lower glume lanceolate, 1.6–2 mm; upper glume ovate, 3–3.5 mm; rachilla internodes 0.6–1 mm; lemmas broadly lanceolate, 3–3.5 mm, scabrid; awns 0.8–1.8 mm; palea keels scabrid. Anthers 1.1–1.5 mm. Ovary apex glabrous. Fl. and fr. Jun.

• Wet places; 3300–5000 m. Xizang.

50. *Festuca cumminsii* Stapf in J. D. Hooker, Fl. Brit. India 7: 349. 1896 [“1897”], aggregate.

纤毛羊茅 xian mao yang mao

Plant loosely or densely tufted; shoots intravaginal. Culms 4–45 cm tall, nodes 1–3. Leaf sheaths glabrous or pubescent; auricles acute erect swellings or absent; leaf blades conduplicate, (1.5–)5–10(–14) × 0.2–0.4 mm, 0.5–0.8 mm deep, veins 5–7(–9); adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 3 narrow discrete strands; ligule 0.1–0.4 mm, margin ciliate. Panicle contracted to spikelike, 2–10 cm; branches stiffly ascending to erect, 1 at lowest node. Spikelets 5–10 mm, greenish, brownish or purplish; florets 2–6; glumes often ciliate on margins; lower glume narrowly lanceolate; upper glume lanceolate to broadly lanceolate; lemmas 3.2–6 mm, scabrid; awns 0.8–3 mm; palea keels scaberulous or scabrid. Anthers (0.8–)1–3 mm. Ovary apex glabrous. Fl. and fr. May–Sep.

Forest margins, under shrubs, grassy or stony mountain slopes, alpine meadows, among pebbles in mountains, floodlands; 2500–5300 m. Gansu, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India (Sikkim), Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, N Pakistan, Russia (Altai), Tajikistan; SW Asia (N Iran)].

The name *Festuca cumminsii* is used here in a broad sense to include a number of segregate taxa that can be grouped together as the *F. cumminsii* aggregate. The aggregate is characterized by intravaginal branching, leaf sheaths closed for more than half their length, and leaf sclerenchyma in 3 small strands. *Festuca cumminsii* s.s. is known only from Bhutan and India (Sikkim). Taxa in the aggregate that occur in or very near China are as follows.

- 1a. Anthers 1.7–3 mm.
 - 2a. Spikelets brownish green.
 - 3a. Leaf blades with 7 vascular bundles, abaxial surface smooth 50a. *F. borissii*
 - 3b. Leaf blades with 5 vascular bundles, abaxial surface somewhat scabrid 50b. *F. kurtshumica*
 - 2b. Spikelets often with a violet tinge; leaf blades with 5–7 vascular bundles 50c. *F. alaica*
- 1b. Anthers 1–1.6 mm.
 - 4a. Lemmas pale green, usually violet-tinged, dull; sheaths on tillers closed for 1/2 their length or less.
 - 5a. Leaf blades with 5 vascular bundles 50d. *F. coelestis*
 - 5b. Leaf blades almost always with 7(–9) vascular bundles 50e. *F. tschatkalica*
 - 4b. Lemmas brownish green, slightly glossy; sheaths on tillers closed for 1/2 their length or more.
 - 6a. Lemmas 4.5–6 mm, broadly lanceolate 50f. *F. pamirica*
 - 6b. Lemmas 3.2–4.3 mm, lanceolate-ovate 50g. *F. goloskokovii*

50a. *Festuca borissii* Reverdatto, Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. Kuybysheva 83: 8. 1965.

博日羊茅 bo ri yang mao

Leaf blades with 7 vascular bundles, abaxial surface smooth. Spikelets brownish green.

Stony mountain slopes. Not yet recorded from China [Kazakhstan (Tarbagatai Mountains), Kyrgyzstan, Russia (Altai)].

50b. *Festuca kurtshumica* E. B. Alexeev, Novosti Sist. Vyssh. Rast. 13: 24. 1976.

三界羊茅 san jie yang mao

Culms ca. 35 cm tall, nodes 1–2. Leaf sheaths smooth or pubescent between veins; leaf blades 5–12 cm, adaxial surface scabrid or pubescent. Panicle 2–3(–5) cm. Spikelets 5.5–6.5(–7) mm, brownish; florets 3–5; lower glume narrowly lanceolate; upper glume broadly lanceolate, ciliate along margins; lemmas 3.5–4.5 mm, scabrid on upper back; awns (0.2–)0.8–1.5 mm. Anthers 1.5–2 mm. Fl. Jul.

Alpine meadows; ca. 2700 m. Xinjiang (Altay Shan) [E Kazakhstan, Mongolia].

50c. *Festuca alaica* Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 134. 1916.

翼羊茅 yi yang mao

Leaf blades with 5–7 vascular bundles. Spikelets tinged violet.

Stony slopes, among pebbles in mountains. Not yet recorded from China [Kyrgyzstan, Tajikistan; SW Asia (N Iran)].

50d. *Festuca coelestis* (St.-Yves) V. I. Kreczetowicz & Bobrov in Komarov, Fl. URSS 2: 514. 1934.

矮羊茅 ai yang mao

Festuca ovina Linnaeus subsp. *coelestis* St.-Yves, Candollea 3: 376. 1928.

Culms 4–10(–12) cm tall. Leaf sheaths smooth; leaf blades rigid, 1.5–6(–10) cm, smooth, glabrous; vascular bundles 5. Panicle 1–5 cm. Spikelets 5–6 mm, green tinged purple or brownish purple; florets 3–6; glumes with margins usually ciliate or lower glume only ciliate on abaxial margin; lower glume narrowly lanceolate; upper glume broadly lanceolate or obovate; lemmas 3.2–4 mm, usually scabrid on upper back; awns 1–2 mm. Anthers 1–1.4 mm. Fl. and fr. May–Sep.

Forest margins, under shrubs, grassy mountain slopes, alpine meadows, floodlands; 2500–5300 m. Gansu, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Kashmir, E Kazakhstan (Tarbagatai Mountains), Kyrgyzstan, N Pakistan, Tajikistan].

50e. *Festuca tschatkalica* E. B. Alexeev, Novosti Sist. Vyssh. Rast. 13: 27. 1976.

沙卡羊茅 sha ka yang mao

Leaf blades almost always with 7(–9) vascular bundles. Spikelets pale green tinged violet.

Stony slopes in high mountains. Not yet recorded from China [Kyrgyzstan (Tien Shan)].

50f. *Festuca pamirica* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 422. 1960.

帕米尔羊茅 pa mi er yang mao

Festuca alaica Drobow subsp. *pamirica* (Tzvelev) Tzvelev.

Plant densely tufted, base with brown old sheaths. Culms 10–20(–34) cm. Leaf sheaths smooth; leaf blades 6–14 × ca. 0.1 cm, scabrid. Panicle 3–5 cm; branches 0.5–1 cm, scabrid. Spikelets (6.5–)8.7–10 mm, brown; florets 3–5(–7); glumes smooth, usually ciliate along margins, apex mucronate; lower glume lanceolate; upper glume lanceolate-ovate; lemmas 4–5 mm, scabrid on upper back; awns 0.6–1 mm. Anthers 1.8–2 mm. Fl. and fr. Jun–Sep.

Alpine grassy slopes; ca. 3200 m. Xinjiang, NW Yunnan [Tajikistan (Pamirs)].

50g. *Festuca goloskokovii* E. B. Alexeev, Novosti Sist. Vyssh. Rast. 13: 25. 1976.

宫喀什羊茅 gong ka shi yang mao

Spikelets brownish green; lemmas lanceolate-ovate, 3.2–4.3 mm.

High mountain slopes. Not yet recorded from China [E Kazakhstan (Alatau Mountains)].

51. *Festuca kryloviana* Reverdatto, Sist. Zametki Mater. Gerb. Tomsk. Univ. 1927(2): 3. 1927.

寒生羊茅 han sheng yang mao

Plant turf-forming or densely tufted; shoots intravaginal. Culms (15–)20–55 cm tall, node 1. Leaf sheaths glabrous or with trichomes; auricles present as erect swellings; leaf blades conduplicate, 8–18 cm × 0.3–0.4 mm, veins (5–)7, margins scaberrulous; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma usually in 3 broad bands; ligule 0.2–0.6 mm, margin ciliate. Panicle usually contracted, occasionally loose, open, (1.5–)3–7 cm; branches 1–2.5 cm, with spikelets from base, inserted singly. Spikelets 6–8 mm, greenish or rarely brown; florets 4–6; glumes glabrous or upper ciliate along margins; lower glume narrowly lanceolate or lanceolate, 2.5–4 mm; upper glume lanceolate or broadly lanceolate, 3.7–5 mm; rachilla internodes 0.8–1 mm; lemmas 4.5–5.5(–6) mm, scabrid above middle; awns (1.5–)2–3(–4) mm; palea keels scabrid. Anthers 1.6–2.6 mm. Ovary apex glabrous. Fl. and fr. Jun–Aug.

Alpine meadows, semi-desert steppe, grassy mountain slopes; 1300–2600 m. Hebei, Xinjiang [E Kazakhstan (Tarbagatai Mountains), Kyrgyzstan (Tien Shan), Mongolia (Altai), Russia (Altai)].

52. *Festuca valesiaca* Schleicher ex Gaudin, Agrost. Helv. 1: 242. 1811.

瑞士羊茅 rui shi yang mao

Plant densely tufted; shoots intravaginal. Culms 20–35(–50) cm tall, nodes 1(–2). Leaf sheaths glabrous or basal leaf sheaths occasionally with trichomes; auricles present as erect swellings; leaf blades filiform, green or bluish, conduplicate, (2–)6–15(–20) cm × 0.3–1.1 mm, veins (3–)5(–7); adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in 3(–5) discrete strands; ligule 0.1–0.3 mm, margin ciliate. Panicle spikelike, 3–7 cm; branches 1–2.5 cm, scabrid, 1 at lowest node. Spikelets 4.5–6 mm, greenish brown or purplish; florets (2–)3–5; glumes sometimes with ciliate margins; lower glume lanceolate, 2–2.6(–3.5) mm; upper glume broadly lanceolate, 3–4.2 mm; rachilla internodes 0.4–0.8(–1.2) mm; lemmas 3.8–5 mm, scabrid; awns 0.7–2.2 mm; palea keels scabrid. Anthers (1–)1.6–2.4 mm. Ovary apex glabrous. Fl. and fr. May–Aug.

Grassy mountain slopes, subalpine meadows, grasslands, roadsides; 1000–3700 m. Guizhou, Jilin, Qinghai, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

The name *Festuca valesiaca* is used here in a broad sense, distinguished from the *F. rubra* complex by its intravaginal shoots and weakly defined ribs; from the *F. ovina* complex by its discrete sclerenchyma strands; and from the *F. cumminsii* complex by its leaf sheaths open for more than half their length. Subspecies that have been recognized within this complex occurring in or near China are distinguished as follows.

- 1a. Leaf blades bluish green.
 2a. Spikelets 4–6(–7.5) mm; lemmas 2.8–4.2(–4.7) mm 52a. subsp. *valesiaca*
 2b. Spikelets (5.4–)6–9 mm; lemmas (4.3–)4.5–5.2 mm 52b. subsp. *pseudodalmatica*
 1b. Leaf blades green.
 3a. Spikelets green, often tinged violet; leaf sheaths on tillers closed up to 1/6 their length.
 4a. Spikelets 4–6 mm; lemmas 2.5–4 mm; leaf blades 0.3–0.6(–0.7) mm wide 52c. subsp. *pseudovina*
 4b. Spikelets (5.5–)6.5–10 mm; lemmas (4.5–)4.8–6 mm; leaf blades (0.4–)0.5–1.1 mm wide ... 52d. subsp. *sulcata*
 3b. Spikelets brownish green; leaf sheaths on tillers closed 1/6–1/3 their length.
 5a. Spikelets 4–6(–7) mm; lemmas 3.2–4.2(–4.6) mm; leaf blades 0.3–0.6(–0.7) mm wide 52e. subsp. *hypsochila*
 5b. Spikelets (7–)8–14 mm; lemmas 4.8–6.5 mm; leaf blades (0.5–)0.6–0.9 mm wide 52f. subsp. *kirghisorum*

52a. *Festuca valesiaca* subsp. *valesiaca*

瑞士羊茅(原亚种) rui shi yang mao (yuan ya zhong)

Leaf blades bluish green. Spikelets 4–6(–7.5) mm; lemmas 2.8–4.2(–4.7) mm.

Grassy mountain slopes, subalpine meadows, grasslands, roadsides; 1000–3700 m. N Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

52b. *Festuca valesiaca* subsp. *pseudodalmatica* (Krajina ex Domin) Soó, Acta Biol. (Szeged 1955+) 17(1–2): 117. 1972 [“1971”].

假达羊茅 jia da yang mao

Festuca pseudodalmatica Krajina ex Domin, Acta Bot. Bohem. 8: 61. 1929.

Leaf blades bluish green. Spikelets (5.4–)6–9 mm long; lemmas (4.3–)4.5–5.2 mm long.

Steppe, stony slopes, among rocks. ?China [Kazakhstan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

52c. *Festuca valesiaca* subsp. *pseudovina* (Hackel ex Wiesbaur) Hegi, Ill. Fl. Mitt.-Eur. 1: 334. 1908.

假羊茅 jia yang mao

Festuca pseudovina Hackel ex Wiesbaur, Oesterr. Bot. Z. 30: 126. 1880; *F. valesiaca* var. *pseudovina* (Hackel ex Wiesbaur) Schinz & R. Keller.

Leaf blades green. Spikelets greenish purple or purplish red, 4–6 mm; lemmas 2.5–4 mm, smooth or upper back pubescent; awn 1–1.5 mm. Fl. and fr. Jun–Sep.

Open grassy hill tops, alluvial fans; 1200–1700 m. NW Sichuan, Xinjiang, Xizang; NE China [Kazakhstan, Russia, Turkmenistan; SW Asia (Caucasus), Europe].

52d. *Festuca valesiaca* subsp. *sulcata* (Hackel) Schinz & R. Keller, Fl. Schweiz, ed. 2, 26. 1905.

沟叶羊茅 gou ye yang mao

Festuca ovina Linnaeus var. *sulcata* Hackel, Bot. Centralbl. 8: 405. 1881; *F. ovina* subsp. *sulcata* (Hackel) Hackel; *F. sulcata* (Hackel) Beck; *F. rupicola* Heuffel.

Leaf blades green. Spikelets greenish purple or rarely tawny, 5.5–10 mm; lemmas 4.5–6 mm, smooth or upper back slightly scabrid; awn 2–3 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows, rock fissures, alpine steppe; 1800–4500 m. Jilin, Nei Mongol, Shaanxi, Shanxi, NW Sichuan, Xinjiang, Yunnan [Kazakhstan, Russia, Turkmenistan; Europe].

52e. *Festuca valesiaca* subsp. *hypsochila* (St.-Yves) Tzvelev, Bot. Zhurn. (Kiev) 56: 1255. 1971.

松菲羊茅 song fei yang mao

Festuca ovina Linnaeus var. *hypsochila* St.-Yves, Candollea 5: 111. 1932.

Leaf sheaths on tillers closed 1/6–1/3 their length; leaf blades 0.3–0.6(–0.7) mm wide. Spikelets 4–6(–7) mm, brownish green; lemmas 3.2–4.2(–4.6) mm.

Stony slopes, among rocks, hill steppe. ?China [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; SW Asia].

52f. *Festuca valesiaca* subsp. *kirghisorum* (Kashina ex Tzvelev) Tzvelev, Zlaki SSSR, 410. 1976.

克松羊茅 ke song yang mao

Festuca rupicola Heuffel subsp. *kirghisorum* Kashina ex Tzvelev, Bot. Zhurn. 56: 1255. 1971.

Leaf sheaths on tillers closed 1/6–1/3 their length; leaf blades (0.5–)0.6–0.9 mm wide. Spikelets (7–)8–14 mm, brownish green; lemmas 4.8–6.5 mm.

Stony hillsides, *Juniperus* forests. ?China [Kyrgyzstan (Tien Shan)].

53. *Festuca litvinovii* (Tzvelev) E. B. Alexeev, Novosti Sist. Vyssh. Rast. 13: 31. 1976.

东亚羊茅 dong ya yang mao

Festuca pseudosulcata Drobow var. *litvinovii* Tzvelev, Rast. Tsent. Azii 4: 170. 1968.

Plant loosely or densely tufted or turf-forming; shoots intravaginal. Culms 20–50 cm tall, nodes 1–2. Leaf sheaths glabrous; auricles absent; leaf blades conduplicate, rigid, 5–20 cm × 0.5–0.8 mm, smooth, veins 5–7; adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands or rarely in broad bands; ligule 0.2–0.4 mm, margin ciliolate. Panicle spike-like, 3–6 cm; branches 1–2 cm, pubescent, 1(–2) at lowest node. Spikelets 6–8 mm, yellowish green or brown; florets 3–5; glumes with ciliate margins; lower

glume lanceolate, glabrous, 2.8–3.5(–4.2) mm; upper glume lanceolate or oblong, (3–)4–5 mm, pubescent; rachilla internodes 0.8–1.2(–1.9) mm; lemmas 4–5.5 mm, pubescent; awns 0.8–3 mm; palea keels scabrid, pubescent between keels. Anthers 2–2.8 mm. Ovary apex glabrous. Fl. and fr. Jun–Aug.

Grassy mountain slopes, meadow steppe, roadsides; 2100–4200 m. Hebei, Heilongjiang, Liaoning, Nei Mongol, Qinghai, Shanxi, Xinjiang [Mongolia, Russia].

54. *Festuca tibetica* (Stapf) E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(4): 118. 1978.

西藏羊茅 xi zang yang mao

Festuca valesiaca var. *tibetica* Stapf in J. D. Hooker, Fl. Brit. India 7: 349. 1896 [“1897”].

Plants densely tufted, old basal sheaths present; shoots intravaginal. Culms 4–17 cm tall, node 1. Leaf sheaths glabrous; auricles present as erect swellings or absent; leaf blades conduplicate, 1.5–10.5 cm × 0.6–0.8 mm, abaxial surface smooth, veins 7; adaxial to abaxial sclerenchyma strands absent; abaxial sclerenchyma in narrow discrete strands; ligule 0.1–0.4 mm, margin ciliate. Panicle contracted, 1.5–3 cm; branches 0.5–1 cm, 1–2 at lowest node. Spikelets 4–6 mm, greenish; florets 3–4; glumes glabrous; lower glume lanceolate, 2.3–2.8 mm; upper glume lanceolate, 3.8–4.2 mm; rachilla internodes 0.6–0.8 mm; lemmas 3.3–3.7 mm, scabrid or pubescent; awns 1–1.8 mm; palea keels scabrid. Anthers 0.8–

1.2(–1.4) mm. Ovary apex glabrous. Fl. and fr. Jul–Sep.

Grassy mountain slopes; 2700–4000 m. Xizang, Yunnan [Bhutan, India (Sikkim)].

This taxon is composed of short plants from high altitudes in Xizang. It is sometimes considered conspecific with *Festuca coelestis* in the *F. cumminsii* complex.

55. *Festuca wallichiana* E. B. Alexeev, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 83(4): 120. 1978.

藏羊茅 zang yang mao

Plant densely tufted; shoots intravaginal. Culms (7–)15–35 cm tall, nodes 1–2. Leaf sheaths pubescent; auricles present as erect swellings; leaf blades conduplicate, 2.5–11 cm × 0.35–0.45 mm, abaxial surface scabrid, veins 5(–7); adaxial to abaxial sclerenchyma strands absent, abaxial sclerenchyma in narrow discrete strands; ligule 0.3–0.5 mm, margin ciliate. Panicle contracted, (1.5–)2.5–6 cm; branches 1.5–2.5 cm, 1 at lowest node. Spikelets 5–5.5 mm, greenish or purplish; florets 4–5; glumes glabrous; lower glume narrowly lanceolate, 2–2.5 mm; upper glume narrowly lanceolate, 3.8–4.2 mm; rachilla internodes 0.7–0.9 mm; lemmas 3.2–3.8 mm, scabrid; awns (0.6–)0.8–1.8 mm; palea keels scabrid. Anthers 1.1–1.5 mm. Ovary apex glabrous.

Steppe, dry slopes; 3300 m. Xizang [Bhutan, India, Nepal].

60. *VULPIA* C. C. Gmelin, Fl. Bad. 1: 8. 1805 [“1806”].

鼠茅属 shu mao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annuals. Culms tufted, slender. Leaf blades linear, usually involute; ligule membranous. Inflorescence a contracted, narrow, somewhat 1-sided panicle. Spikelets laterally compressed, florets several to many with the uppermost reduced, widely spaced; rachilla scabrid or pubescent, disarticulating below each floret; glumes narrow, very unequal, persistent; lower glume small, sometimes minute, 0–1-veined; upper glume much longer, 1–3-veined; lemmas narrowly lanceolate, membranous becoming firm at maturity, rounded or occasionally keeled, faintly 3–5-veined, back smooth, scabrid or pubescent, margins inrolled over palea, apex narrowed into an awn; awn straight or curved, usually longer than lemma; callus short, glabrous or bearded; palea slightly shorter than lemma, keels ciliate. Stamens 1–3. Ovary glabrous. Caryopsis narrow, tightly enclosed by lemma and palea; hilum linear.

Twenty-six species: mainly temperate regions of the N hemisphere, extending into tropical uplands, also a few species in South America; a few species widely adventive; one species in China.

Vulpia is closely related to *Festuca* and is distinguished mainly by the annual habit.

1. *Vulpia myuros* (Linnaeus) C. C. Gmelin, Fl. Bad. 1: 8. 1805 [“1806”].

鼠茅 shu mao

Festuca myuros Linnaeus, Sp. Pl. 1: 74. 1753.

Culms erect or geniculately ascending, 20–70 cm tall, 3–4-noded, smooth. Leaf sheaths loosely overlapping, shorter or lower longer than internodes, smooth, glabrous; leaf blades involute, 7–11 cm × 1–2 mm, adaxial surface pubescent, abaxial surface smooth; ligule 0.2–0.5 mm, truncate. Panicle linear, 10–20 × 0.5–1 cm, loose to somewhat dense, mostly curved or nodding, base enclosed by uppermost leaf sheath or just exerted from it. Spikelets oblong or wedge-shaped, 8–10 mm

(excluding awns), florets 4–7; lower glume minute, 1–3 mm, upper glume linear-lanceolate, 3–8 mm, apex acute; lemmas 5–7 mm, back scabrid, 5-veined, margins scabrid or ciliate, apex acuminate; awn 1.3–1.8 cm. Stamen 1; anther 0.4–1 mm. Caryopsis reddish brown, ca. 4 mm. Fl. and fr. Apr–Jul. $2n = 42$.

Mountain slopes, roadsides, especially in sandy places. Anhui, Fujian, Jiangsu, Jiangxi, Taiwan, Xizang, Zhejiang [Afghanistan, Bhutan, Kyrgyzstan, Pakistan, S Russia, Tajikistan, Turkmenistan, Uzbekistan; Africa (N and on mountains), SW Asia, Europe].

This species is adventive in most temperate parts of the world. *Vulpia alpina* L. Liu (Fl. Reipubl. Popularis Sin. 9(2): 405. 2002), based on a single specimen from Xizang (Lhasa), may be simply a depauperate form of this species. The type has not been seen.

61. LOLIUM Linnaeus, Sp. Pl. 1: 83. 1753.黑麦草属 *hei mai cao shu*

Liu Liang (刘亮); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat or rolled, often auriculate; ligule membranous. Inflorescence a single, stiff, 2-sided raceme, spikelets arranged edgewise on, alternate in 2 opposite rows, their inner edges sunk in hollows of the tough rachis. Spikelets laterally compressed, florets several to many, uppermost florets reduced, disarticulating below each floret; glumes leathery; lower glume suppressed except in terminal spikelet and there similar to upper; upper glume abaxial, narrow, persistent, shorter than lemmas as long as spikelet; lemmas membranous to leathery, rounded on back, 5–9-veined, with or without a subterminal awn; palea usually equal to lemma. Caryopsis tightly enclosed by hardened lemma and palea; hilum linear.

About eight species: temperate N Africa, Asia, and Europe, especially the Mediterranean region; now widely introduced or adventive elsewhere; six species (at least four introduced) in China.

Most species are good forage grasses. *Lolium* is a difficult genus taxonomically as all the species are more or less interfertile and consequently intergrade. The individual species are also very variable. Most will hybridize with *Festuca arundinacea* and its allies, and the resulting hybrids have the nothogenetic name *×Festulolium* Ascherson & Graebner.

- 1a. Lemmas elliptic to ovate, turgid at maturity; mature caryopsis not more than 3 times as long as wide.
 - 2a. Lemmas of lower florets 5.2–8.5 mm, usually awned; caryopsis 4–7 mm 1. *L. temulentum*
 - 2b. Lemmas of lower florets 3.5–5.4 mm, usually awnless; caryopsis 3.2–4.5 mm 2. *L. remotum*
- 1b. Lemmas oblong, not turgid at maturity; mature caryopsis more than 3 times as long as wide.
 - 3a. Perennial with non-flowering shoots at anthesis; young leaf blades folded; lemmas awnless 3. *L. perenne*
 - 3b. Annual (or short-lived perennial); young leaf blades rolled; lemmas awned or awnless.
 - 4a. Spikelets with 8–22 florets; glume less than half spikelet length 4. *L. multiflorum*
 - 4b. Spikelets with 3–10 florets; glume half spikelet length or more.
 - 5a. Rachis 2–3 mm thick; spikelets partly sunken in rachis; lemmas 5–8 mm; awns absent or up to 3(–8) mm, present on upper florets only 5. *L. rigidum*
 - 5b. Rachis 0.4–1.5 mm thick; spikelets not sunken in rachis; lemmas 9–15 mm; awns 5–20 mm, present on all florets 6. *L. persicum*

1. *Lolium temulentum* Linnaeus, Sp. Pl. 1: 83. 1753.毒麦 *du mai*

Annual. Culms tufted, erect or decumbent, slender to moderately robust, 20–120 cm tall, 3–5-noded. Leaf blades flat, thin, 10–25 cm × 4–10 mm, smooth or scabridulous on abaxial surface, margins scabrid, young blades rolled; auricles present or absent; ligule 0.5–2.5 mm, obtuse to truncate. Raceme stiff, straight, 10–30 cm; rachis thick, smooth or scabridulous, spikelets about their own length apart. Spikelets turgid, 0.8–2.5 cm, florets 4–10, rachilla internodes 1–1.5 mm, smooth, glabrous; glume linear-oblong, rigid, as long as spikelet, often exceeding florets, 5–9-veined, margins narrowly membranous, apex obtuse; lemmas elliptic to ovate, turgid at maturity, 5.2–8.5 mm, apex obtuse; awn usually present, stiff, scabrid; palea ciliate along keels. Caryopsis very plump, length 2–3 times width, 4–7 mm. Fl. and fr. May–Aug. $2n = 14$.

Fields of cereals, introduced. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hunan, Qinghai, Shaanxi, Shanghai, Xinjiang, Zhejiang [N Africa, SW Asia, S Europe].

This is a noxious arable weed, widespread and naturalized in warm-temperate parts of the world (Darnel). The grains are often infected by a fungus (ergot) which produces the alkaloid temulin, causing poisoning when grazed by cattle or when present as a contaminant of flour.

Awnless or weakly awned variants can be distinguished at varietal rank.

- 1a. Lemmas strongly awned; awn

10–20 mm 1a. var. *temulentum*

- 1b. Lemmas awnless or weakly awned; awn 0–3 mm 1b. var. *arvense*

1a. *Lolium temulentum* var. *temulentum*毒麦(原变种) *du mai (yuan bian zhong)*

Lemmas strongly awned; awn 10–20 mm. Fl. and fr. Jun–Jul.

Fields of cereals, introduced. Anhui, Gansu, Hebei, Heilongjiang, Henan, Qinghai, Shaanxi, Xinjiang, Zhejiang [Europe].

1b. *Lolium temulentum* var. *arvense* (Withering) Liljeblad, Svensk. Fl. 80. 1816.田野黑麦草 *tian ye hei mai cao*

Lolium arvense Withering, Arr. Brit. Pl., ed. 3, 2: 168. 1796; *L. temulentum* subsp. *arvense* (Withering) Tzvelev.

Lemmas awnless or weakly awned; awn 0–3 mm.

Fields of cereals, introduced. Hunan (Xiangtan), Shanghai, Zhejiang (Dai Shan) [Russia; Europe].

2. *Lolium remotum* Schrank, Baier. Fl. 1: 382. 1789.疏花黑麦草 *shu hua hei mai cao*

Annual. Culms erect, slender, 30–100 cm tall, 3–4-noded, smooth or scabridulous below inflorescence. Leaf blades linear, up to 25 cm × 1–6 mm, adaxial surface smooth or scabrid, abaxial surface smooth, margins scabridulous near apex, young blades rolled; auricles to 2 mm or absent; ligule to 2.5 mm,

truncate. Raceme straight, 6–20 cm, slender; rachis smooth, spikelets their own length or more apart. Spikelets 0.8–1.6 cm, florets 5–10; glume linear-lanceolate, 1/2–2/3 as long as spikelet, 3–7-veined, apex obtuse or acute; lemmas elliptic, plump, 3.5–5.4 mm, apex rounded, erose, usually awnless; palea spinulose along upper keels. Caryopsis length 2–3 times width. Fl. and fr. Jul–Aug. $2n = 14$.

Fields, roadsides, introduced. Heilongjiang, Xinjiang [Afghanistan, W Russia; Europe].

This species is a weed of *Linum* fields.

3. *Lolium perenne* Linnaeus, Sp. Pl. 1: 83. 1753.

黑麦草 hei mai cao

Perennial, turf-forming. Culms tufted, erect or spreading, sometimes prostrate and rooting from lower nodes, 30–90 cm tall, 3–4-noded. Leaf blades soft, 5–20 cm × 3–6 mm, glabrous, young blades folded; auricles to 3 mm; ligule 2–2.5 mm. Raceme stiffly erect, or rarely slightly curved, 10–30 cm; rachis glabrous, smooth, spikelets usually less than their own length apart. Spikelets 0.8–2 cm, florets 5–10, rachilla internodes ca. 1 mm, smooth, glabrous; glume lanceolate, 1/3 as long to subequaling spikelet, 3–9-veined, margins narrowly membranous, apex acute or obtuse; lemmas oblong, herbaceous, 5–9 mm, 5-veined, smooth, apex obtuse to subacute, awnless; palea ciliate along keels. Caryopsis length more than 3 times width. Fl. and fr. May–Jul. $2n = 14$, 28.

Meadows, grassy places, moist roadsides. Commonly cultivated in China [Russia; N Africa, Europe].

This species is extensively cultivated in temperate regions of the world as an excellent forage and lawn grass. It is a variable species, with many cultivars (Perennial Rye Grass).

4. *Lolium multiflorum* Lamarck, Fl. Franç. 3: 621. 1779 [“1778”].

多花黑麦草 duo hua hei mai cao

Annual, biennial, or short-lived perennial. Culms tufted, erect or decumbent at base, 0.5–1.3 m tall, 4–5-noded. Leaf blades flat, 10–20 cm × 3–8 mm, glabrous, adaxial surface scabrid, young blades rolled; auricles usually present, 1–4 mm; ligule up to 4 mm. Raceme erect or nodding, 10–30 cm; rachis scabridulous, spikelets overlapping or up to their own length apart. Spikelets 0.8–3 cm, florets 8–22; glume lanceolate, much shorter than spikelet, scarcely exceeding lowest floret, 5–7-veined, margin narrowly membranous, apex obtuse, acute or slightly erose; lemmas oblong-lanceolate, 5–8 mm, 5-veined, apex acute, obtuse or erose; awn up to 5(–15) mm, fine, straight, or upper lemmas awnless; palea equal to lemma, ciliate along keels. Caryopsis length 3 times width. Fl. and fr. Jul–Aug. $2n = 14$.

Grasslands, introduced. Anhui, Fujian, Guizhou, Hebei, Henan, Hunan, Jiangxi, Nei Mongol, Shaanxi, Sichuan, Taiwan, Xinjiang, Yunnan [N Africa, SW Asia, C and S Europe].

This species is widely grown in temperate regions of the world for pasture and forage (Italian Rye Grass).

Lolium multiflorum hybridizes with *Festuca pratensis* to form the hybrid ×*Festulolium braunii* (K. Richter) A. Camus. *Lolium grandispermum* Y. J. Fei (Guihaia 19: 205. 1999), described from Hubei (Jingzhou) is probably based on a specimen of this hybrid. The type (*Y. J. Fei* 98088, HBAC) has not been seen.

5. *Lolium rigidum* Gaudin, Agrost. Helv. 1: 334. 1811.

硬直黑麦草 ying zhi hei mai cao

Annual. Culms tufted, erect or geniculate at base, 20–80 cm tall, 2–4-noded, smooth or scabrid below inflorescence. Leaf blades 5–20 cm × 3–6 mm, adaxial surface and margins smooth or scabrid, abaxial surface smooth; auricles up to 3 mm or absent; ligule 0.5–2.5 mm, rounded or truncate. Raceme stiff, straight or curved, 5–20 cm; rachis slender to fairly stout, smooth or scabrid, 1–3 mm thick, spikelets appressed to partly sunken, overlapping by half their length or up to their own length apart. Spikelets 1–2 cm, florets 5–10; glume lanceolate to oblong, as long as spikelet, 5–7(–9)-veined; lemmas oblong or oblong-lanceolate, 5–8 mm, 3–5-veined, scabrid, apex obtuse or erose; awn absent or 3(–8) mm on upper fertile florets only. Caryopsis length 3 times width or more.

Fields; 200–1800 m. Gansu (Tianshui), Henan [Afghanistan, Pakistan, Turkmenistan; N Africa, SW Asia, Europe].

This taxon comprises a polymorphic species complex. It is a good fodder grass, introduced in temperate parts of the world.

6. *Lolium persicum* Boissier & Hohenacker in Boissier, Diagn. Pl. Orient., ser. 1, 13: 66. 1854 [“1853”].

欧黑麦草 ou hei mai cao

Annual. Culms tufted, erect or decumbent, 20–70 cm tall, 3–4-noded, scabrid below inflorescence. Leaf blades flat, 6–15 cm × 2–8 mm, adaxial surface scabrid; auricles up to 2 mm or absent; ligule 0.5–2 mm. Raceme straight, 10–20 cm; rachis scabrid, 0.4–1.5 mm thick, spikelets about their own length apart. Spikelets 1–2 cm, florets 5–9; rachilla internodes ca. 0.5 mm, slightly spinescent; glume narrowly lanceolate, 2/3 as long to subequaling spikelet, 5-veined, apex obtuse or acute; lemmas lanceolate, 6.5–11 mm, 5-veined, apex attenuate into awn; awn 5–20 mm, slightly curved; palea equal to or slightly shorter than lemma, ciliate along keels. Caryopsis length 3.5–5 times width. Fl. and fr. Jun–Jul. $2n = 14$.

Streamsides, roadsides, mountain slopes; 1400–2300 m. Gansu, Hebei, Qinghai, Shaanxi, Xinjiang [Afghanistan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

62. *SCOLOCHLOA* Link, Hort. Berol. 1: 136. 1827, nom. cons., not Mertens & W. D. J. Koch (1823).

水茅属 shui mao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Fluminia Fries.

Perennial, rhizomatous. Leaf blades linear, flat. Inflorescence an open panicle. Spikelets laterally compressed, lanceolate-

oblong, florets several, contiguous; rachilla scaberulous, disarticulating above glumes and between florets; glumes slightly unequal, upper nearly as long as spikelet, firmly membranous, keel scaberulous, apex abruptly acuminate, lower glume 1–3-veined, upper glume 3–5-veined; lemmas broadly lanceolate, thinly leathery, rounded on back, 5–7-veined, veins smooth, not raised, scabrid above middle, apex scarious, usually 3-denticulate, sometimes mucronate; floret callus subacute, bearded laterally with stiff hairs; palea subequal to lemma, narrow, flat, apex sharply 2-denticulate. Ovary densely hairy at apex; hilum linear.

Two species: N temperate regions, one species widespread, including China.

1. *Scolochloa festucacea* (Willdenow) Link, Enum. Pl. 1: 137. 1827.

水茅 shui mao

Arundo festucacea Willdenow, Enum. Pl. 1: 126. 1809; *Donax borealis* Trinius; *Festuca borealis* (Trinius) Mertens & Koch ex Röhling; *Fluminia arundinacea* (Roemer & Schultes) Fries; *F. festucacea* (Willdenow) Hitchcock; *Grapphorum arundinaceum* (Roemer & Schultes) Ascherson; *Schedonorus arundinaceus* Roemer & Schultes (1817), not (Schreber) Du-mortier (1824), nom. cons.

Plant with spreading spongy rhizomes. Culms robust, erect from a decumbent base, rooting at lower nodes, 0.7–2 m tall.

Leaf sheaths smooth, glabrous; leaf blades 15–40 cm × 4–10 mm, smooth, margins sharply scabrid, apex finely acuminate; ligule 3–8 mm, truncate. Panicle loose, elliptic to ovate in outline, 15–30 cm; branches 2–4 at each node, erect at first, spreading after anthesis, naked in lower half, scabrid. Spikelets 7–10 mm, florets (2–)3–4(–5); glumes broadly lanceolate, lower glume 6.5–8 mm, upper glume 7.3–10 mm; lemmas 6–8 mm; palea lanceolate, ca. 6 mm. Anthers 2.5–3.4 mm. Fl. Jun–Aug. $2n = 28$.

Shallow, slow-flowing water, swamps; below 1000 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Kazakhstan, Mongolia, Russia; SW Asia (Caucasus), NE Europe, North America].

This is a forage grass, providing hay from swampy areas.

63. **CYNOSURUS** Linnaeus, Sp. Pl. 1: 72. 1753.

洋狗尾草属 yang gou wei cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Leaf blades linear, flat; ligule membranous. Inflorescence condensed, a narrowly spikelike or capitate panicle, ± 1-sided, bearing paired dimorphic spikelets, the outer of each pair sterile and covering a fertile spikelet. Fertile spikelet with (1–)2–5 florets, laterally compressed, disarticulating above glumes and between florets; glumes subequal, narrow, thin, acute; lemmas leathery, rounded on back, 5-veined, scabrid upward, apex acute, narrowly obtuse or bidenticulate, mucronate or awned. Sterile spikelet flattened, reduced to distichously pectinate glumes and sterile empty lemmas, persistent on panicle. Caryopsis elliptic or oblong, adherent to palea. $x = 7$.

Eight species: N Africa, SW Asia, Europe; introduced elsewhere; one species (introduced) in China.

1. *Cynosurus cristatus* Linnaeus, Sp. Pl. 1: 72. 1753.

洋狗尾草 yang gou wei cao

Perennial, compactly tufted. Culms wiry, erect or decumbent at base, 20–70 cm tall, 1–2 mm in diam., unbranched, 3–4-noded. Leaf sheaths smooth, glabrous; leaf blades up to 15 cm × 1–4 mm, soft, smooth, glabrous, apex finely acute; ligule 0.5–1.5 mm, rounded. Panicle linear-oblong, spikelike, 5–10 × 0.5–0.7 cm, erect or slightly curved; branches very short. Fertile spikelet oblong or wedge-shaped, 3–6 mm, florets 2–5; glumes lanceolate, shorter than florets, 3–4.5 mm, margins membran-

ous, back keeled, keel scabrid, apex acuminate or mucronate; lemmas narrowly ovate-oblong, lowest ca. 4 mm, spinescent, apex mucronate; palea slightly shorter than lemma, keels scabrid. Anthers ca. 2 mm. Caryopsis oblong, ca. 2 mm, apex glabrous. Sterile spikelet ovate, composed of up to 18 stiff, narrowly linear, shortly awned empty lemmas with green ciliate keel. Fl. and fr. Jun–Aug. $2n = 14$.

Roadsides, forest margins, fields, adventive. Jiangxi (Lu Shan) [N Africa, SW Asia, Europe; introduced in North America and Australia].

This species is introduced in some temperate countries as a pasture and lawn grass and is adventive elsewhere.

64. **PUCCINELLIA** Parlatores, Fl. Ital. 1: 366. 1848, nom. cons.

碱茅属 jian mao shu

Liu Liang (刘亮), Zhu Guanghua (朱光华); Nikolai N. Tzvelev

Atropis (Trinius) Ruprecht ex Grisebach, nom. rej.; *Poa* sect. *Atropis* Trinius.

Perennial herbs, tufted. Culms erect. Leaf sheaths spread along culms or clustered at base, glabrous; leaf blades linear, often convolute or conduplicate, scabrid or smooth; ligule membranous. Inflorescence a spreading or contracted panicle. Spikelets slightly compressed or cylindrical, disarticulating above glumes and between florets; florets 2–8, imbricate; glumes lanceolate to broadly ovate, unequal, shorter than first floret, papery, apex often scarious, obtuse or acuminate; lower glume small, 1(–3)-veined, upper glume 3-veined; lemmas oblong, lanceolate or ovate, papery, 5-veined, back rounded or slightly keeled, glabrous or pubescent on

lower veins, intervein spaces, and base, apex obtuse or slightly acuminate, membranous, ciliate or irregularly finely toothed; palea as long as or slightly shorter than lemma; lodicules 2, often 2-lobed; stamens 3, small. Caryopsis small, narrowly ellipsoid, not sulcate, free from palea and lemma. $x = 7$.

About 200 species: temperate and arctic regions of both hemispheres, usually along shores of saline lakes, also on mountains in the tropics; 50 species (14 endemic) in China.

- 1a. Base of plant with a few very short budlike extravaginal shoots, covered with scales.
 - 2a. Anthers 1.5–2.4 mm; lemmas 2.7–3.5 mm.
 - 3a. Lemma glabrous, rarely base minute pubescent; panicle narrow, branches appressed, sometimes slightly spreading 21. *P. przewalskii*
 - 3b. Lemma base pubescent; panicle more lax; branches spreading after anthesis 22. *P. roshevitsiana*
 - 2b. Anthers 0.7–1.5 mm; lemmas 1.5–3.2 mm.
 - 4a. Lemmas 1.5–2 mm, base minutely hairy; anthers 1–1.2 mm; branches of panicle scabrid 24. *P. koeieana*
 - 4b. Lemmas 2.2–3.2 mm.
 - 5a. Palea keels smooth or with a few spinules on upper part; spikelets usually tinged with purple; panicle spreading after anthesis 23. *P. altaica*
 - 5b. Palea keels scabrid; spikelets usually pale green; panicle very narrow, contracted.
 - 6a. Lemma base shortly hairy; panicle branches scabrid 19. *P. schischkinii*
 - 6b. Lemma base glabrous or subglabrous; panicle branches smooth at least on lower parts 20. *P. kuenlunica*
- 1b. Base of plant without extravaginal shoots.
 - 7a. Lemmas 1.3–2.4(–2.8) mm.
 - 8a. Anthers 0.3–0.5 mm.
 - 9a. Branches of panicle smooth 48. *P. micrandra*
 - 9b. Branches of panicle scabrid.
 - 10a. Lemma base pubescent 46. *P. hauptiana*
 - 10b. Lemma base glabrous 47. *P. iliensis*
 - 8b. Anthers 0.5–1.7 mm.
 - 11a. Lemma glabrous, rarely with a few hair on callus.
 - 12a. Anthers 0.5–0.8 mm.
 - 13a. Branches of panicle scabrid or smooth only near base.
 - 14a. Ligule 2–3 mm, acuminate; panicle 8–12 cm 44. *P. florida*
 - 14b. Ligule 1–2 mm, obtuse; panicle 5–9 cm 45. *P. leioplepis*
 - 13b. Branches of panicle smooth or only in upper part slightly scabrid.
 - 15a. Lemmas 2.2–2.4 mm; panicle contracted, 1.5–2.5 × ca. 0.5 cm; culms 5–10 mm tall 49. *P. minuta*
 - 15b. Lemmas 1.5–2.1 mm; panicle at first contracted but open at maturity, 3–9 × 1–4 cm; culms 5–20 cm tall 50. *P. himalaica*
 - 12b. Anthers 0.8–1.7 mm.
 - 16a. Panicle 3–5 cm, contracted.
 - 17a. Culms 10–25 cm tall, not rooting from lower nodes; panicle branches 2–4 per node; anthers 1.2–1.5 mm; apex of palea mucronulate 15. *P. degeensis*
 - 17b. Culms 5–10 cm tall, rooting from lower nodes; panicle branches single; anthers 0.8–1.2 mm; apex of palea not mucronulate 16. *P. strictura*
 - 16b. Panicle 4–15 cm, open.
 - 18a. Plants densely tufted, 20–40 cm tall; basal leaves very numerous, conduplicate, 0.3–0.7 mm wide; plants of sandy habitats 13. *P. filifolia*
 - 18b. Plants more laxly tufted, 4–15 cm tall; basal leaves less numerous, conduplicate or flat, 1–4 mm wide; plants of non-sandy habitats.
 - 19a. Panicle broadly diffuse, 6–15 cm; branches 2–5 per node, scabrid at least in upper part 12. *P. tenuiflora*
 - 19b. Panicle less diffuse, 4–10 cm; branches (1 or)2(or 3) per node, smooth.
 - 20a. Lemmas 1.5–2.2 mm, usually violaceous 14. *P. tianschanica*
 - 20b. Lemmas 2.2–2.5 mm, usually pale pink 29. *P. vachanica*
 - 11b. Lemmas somewhat pubescent at base.
 - 21a. Lowermost internodes of culms thickened, tuberlike; panicle broad and open 4. *P. diffusa*
 - 21b. Lowermost internodes of culms not tuberlike.
 - 22a. Anthers 0.5–0.9 mm; branches of panicle scabrid, usually reflexed after anthesis.
 - 23a. Spikelets in panicle branches very numerous, usually pale green; mostly ruderal plants, rarely found at up to middle montane zone 42. *P. distans*

- 23b. Spikelets in panicle branches less numerous, usually grayish or pinkish violet tinge; montane plants 43. *P. glauca*
- 22b. Anthers 0.8–2 mm; branches of panicle scabrid or smooth.
 - 24a. Plants with numerous thin, erect flowering culms, shorter vegetative shoots absent; ligule of upper cauline leaf 2–3.5 mm, gradually narrowed upward 3. *P. tenuissima*
 - 24b. Flowering culms less numerous, thicker, often geniculate; vegetative shoots usually present; ligule of upper cauline leaf 0.7–2 mm, usually rounded.
 - 25a. Panicle branches scabrid throughout; spikelets usually grayish violet tinge; culms usually geniculate 2. *P. gigantea*
 - 25b. Panicle branches smooth at least near their base; spikelets pale green or purple-tinged.
 - 26a. Lemmas 2–2.5 mm; anthers 1.2–1.6 mm; spikelets usually pale green; panicle usually hardly exerted from upper sheath 9. *P. coreensis*
 - 26b. Lemmas 1.5–2.2 mm; anthers 0.9–1.3 mm; spikelets usually purple-tinged; panicle usually broadly open and far exerted from upper sheath.
 - 27a. Plant of high mountains, 10–30 cm tall; panicle branches 1–2 per node; spikelets intense purple 11. *P. qinghaica*
 - 27b. Plant of lower altitudes, 20–50(–60) cm tall; panicle branches 2–5 per node; spikelets usually less intensely purple.
 - 28a. Lemma densely pubescent near base; palea keels ciliate on lower part, scabrid on upper part; anthers 1.2–1.5 mm 8. *P. chinampoensis*
 - 28b. Lemma glabrous or slightly pubescent near base; palea keels smooth throughout or scaberulous on upper part; anthers 0.8–1.2 mm.
 - 29a. Lemmas pubescent near base; palea keels scabrid on upper part 10. *P. manchuriensis*
 - 29b. Lemmas glabrous or subglabrous near base; palea keels usually smooth, rarely with 1–3 small teeth 12. *P. tenuiflora*
- 7b. Lemmas 2.5–4 mm.
 - 30a. Lemmas glabrous, rarely with a few hairs on the callus.
 - 31a. Branches of panicle scabrid or smooth only near base.
 - 32a. Anthers 0.3–0.5 mm 39. *P. micranthera*
 - 32b. Anthers 1.2–3 mm.
 - 33a. Spikelets with 6–9 florets; culms 30–50 cm tall; anthers 1.2–1.7 mm 25. *P. multiflora*
 - 33b. Spikelets with 2–5 florets; culms stout, 20–40 cm tall; anthers 1.5–3 mm.
 - 34a. Panicle open, 10–20 cm; anthers 2.3–3 mm; lemmas 3.4–4 mm 26. *P. thomsonii*
 - 34b. Panicle narrow, 5–10 cm; anthers 1.5–2.2 mm; lemmas 3–3.5 mm 27. *P. stapfiana*
 - 31b. Branches of panicle smooth or slightly scabrid only on upper part.
 - 35a. Anthers 0.5–1.3 mm.
 - 36a. Panicle spreading.
 - 37a. Culms erect, 20–40 cm tall, very thin; panicle 8–13 cm; branches very thin; lemmas 2.2–2.8 mm 29. *P. vachanica*
 - 37b. Culms usually geniculately ascending, 10–25 cm tall, rather thick; panicle 5–10 cm; lemmas 2.7–3.5 mm 34. *P. pauciramea*
 - 36b. Panicle contracted and dense.
 - 38a. Lemmas 3.2–3.5 mm, palea keels smooth; culms scabrid below inflorescence 32. *P. kashmiriana*
 - 38b. Lemmas 2.5–3.2 mm; palea keels with a few teeth; culms smooth throughout 33. *P. nudiflora*
 - 35b. Anthers 1.3–2.5 mm.
 - 39a. Panicle spreading; branches (1 or) 2 per node; leaf blades soft, 1–2 mm wide 35. *P. ladyginii*
 - 39b. Panicle contracted and dense.
 - 40a. Palea keels ciliate or scabrid; leaf blade soft, smooth, 1.5–2.5 mm wide 36. *P. subspicata*
 - 40b. Palea keels glabrous and smooth, rarely with a few teeth; leaf blade 0.2–1.5 mm wide.
 - 41a. Culms 5–8 cm tall, 1-noded; panicle 1–2 cm, branches 1 per node ... 28. *P. shuanghuensis*
 - 41b. Culms 8–40 cm tall, 2–3-noded; panicle 5–10 cm, branches 1–3 per node.

- 42a. Culms usually erect, 15–30(–40) cm tall; leaf blade 0.5–1.5 mm broad; spikelets 4–5 mm 30. *P. pamirica*
- 42b. Culms geniculate ascending, 8–20 cm tall; leaf blade 0.2–0.5 mm broad; spikelets 5–6 mm 31. *P. ladakhensis*
- 30b. Lemmas somewhat pubescent at base.
- 43a. Panicle branches smooth or in upper part some scabrid.
- 44a. Panicle 1.5–5 cm, contracted and dense; culms 4–15 cm 41. *P. humilis*
- 44b. Panicle 5–10 cm, contracted or open; culms 15–40 cm.
- 45a. Plants of coastal shoals and rocks, marshy meadows; lemma sparsely pubescent along lower part of veins; anthers 0.7–1.2 mm 38. *P. kurilensis*
- 45b. Plants of high mountains (3000 m or higher); lemma densely pubescent near base or anthers 1–1.3 mm.
- 46a. Lemma 2.8–3.5 mm, slightly pubescent near base; anthers 1–1.3 mm 17. *P. roborovskyi*
- 46b. Lemma 3.5–4 mm, densely pubescent near base; anthers 0.8–1.2 mm 18. *P. arjinshanensis*
- 43b. Panicle branches scabrid, rarely almost smooth along lower 1/3.
- 47a. Anthers 0.5–0.9(–1) mm.
- 48a. Culms straight, 30–80(–100) cm tall; panicle 10–20(–30) cm, branches directed obliquely upward; plants of lowlying, usually seaside, habitats, saltmarshes 37. *P. nipponica*
- 48b. Culms usually geniculate, 15–40 cm tall; panicle 5–12(–15) cm, branches usually spreading; plants of montane habitats 40. *P. hackeliana*
- 47b. Anthers 1–1.5(–1.8) mm.
- 49a. Ligule of upper cauline leaf 0.7–1.5(–2) mm, apex rounded; culms 30–50 cm tall, rather thick; leaf blades 1.5–3(–4) mm wide.
- 50a. Lemmas 3–3.5 mm, acuminate 6. *P. jeholensis*
- 50b. Lemmas 2.4–3 mm, obtuse 7. *P. macranthera*
- 49b. Ligule of the upper cauline leaf 1.7–3.5(–4) mm, gradually narrowed upward.
- 51a. Leaf blade 0.5–1.2 mm wide, convolute; plants usually without short vegetative shoots; culms thin and straight 5. *P. dolicholepis*
- 51b. Leaf blade 1.5–4 mm wide, laxly convolute or flat; plants usually with a few short vegetative shoots; culms thick and geniculate 1. *P. poecilantha*

1. *Puccinellia poecilantha* (K. Koch) V. I. Kreczetowicz in Komarov, Fl. URSS 2: 472. 1934.

斑稈碱茅 *ban fu jian mao*

Festuca poecilantha K. Koch, Linnaea 21: 411. 1848;
Atropis poecilantha (K. Koch) V. I. Kreczetowicz; *A. chilochloa* V. I. Kreczetowicz.

Perennial, tufted, grayish green. Culms 30–50 cm tall, usually geniculate, thick. Ligule 2–3.5 mm; leaf blades subinrolled or conduplicate, 3–6 cm, 1.5–4 mm wide, adaxial surface and margins scabrid. Panicle contracted, but later spreading, 6–12 cm; branches 2–7 cm, scabrid. Spikelets 5–8 mm, florets 5–9; lower glume ca. 1.5 mm, 1-veined, upper glume 1.5–2 mm, inconspicuously 3-veined, apex obtuse and margins ciliate; lemmas 2.5–3.5(–4) mm, usually tinged with purple, veins pubescent on lower part, apex acuminate or obtuse; palea keels scabrid; anthers 1.2–2 mm. Fl. May–Jul. $2n = 28$.

Dry grasslands, saline places, saline lake shores; 100–2000 m. Qinghai, Xinjiang [Afghanistan, Kazakhstan, Russia, Turkmenistan, Uzbekistan; SW Asia (Iran)].

Material of this species has been incorrectly named as *Puccinellia festuciformis* (Host) Parlature.

2. *Puccinellia gigantea* (Grossheim) Grossheim, Fl. Kavkaza 1: 114. 1928.

大碱茅 *da jian mao*

Atropis gigantea Grossheim, Vestn. Tiflissk. Bot. Sada 46:

35. 1919; *A. anisoclada* V. I. Kreczetowicz; *A. sclerodes* V. I. Kreczetowicz; *Puccinellia anisoclada* (V. I. Kreczetowicz) Parsa; *P. sclerodes* (V. I. Kreczetowicz) V. I. Kreczetowicz ex Drobow.

Perennial, loosely tufted, grayish green. Culms erect or geniculately ascending, 50–80(–100) cm tall. Ligule 1–3.5 mm, abaxial surface scabrid; leaf blades flat or inrolled, 5–15 cm, 1.5–4 mm wide, adaxial surface scabrous. Panicle 6–20 cm, contracted, but later spreading; branches 2–6 per node, basal primary branch 4–10 cm, scabrous. Spikelets 4–6 mm, usually purple, florets 3–7; glumes obtuse, lower glume 1.5–2 mm, 1-veined, upper glume 2–2.5 mm, 1–3-veined; lemmas 1.7–2.3(–2.5) mm, veins \pm pubescent below, apex triangular-rounded; palea keels scabrid on upper part; anthers 1–1.4 mm. Fl. Jun–Jul. $2n = 14$.

Saline moist meadows, lake banks; 100–2000 m. Qinghai, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, E Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Caucasus, Iran), SE Europe].

3. *Puccinellia tenuissima* (Litvinov ex V. I. Kreczetowicz) Litvinov ex Pavlov, Fl. Kazakhst. 1: 242. 1956.

纤细碱茅 *xian xi jian mao*

Atropis tenuissima Litvinov ex V. I. Kreczetowicz in Komarov, Fl. URSS 2: 765. 1934.

Perennial, densely tufted. Culms slender, 20–50 cm tall, ca. 0.5 mm in diam. Ligule 1.5–3 mm; leaf blades 4–10 cm,

0.3–1.5 mm wide, narrowly linear, usually convolute, adaxial surface slightly scabrid. Panicle straight or slightly spreading, loose, 5–1.2 cm; branches slender, smooth or slightly scabrid. Spikelets 3–4 mm, florets 3–5; glumes obtuse, lower glume ca. 0.7 mm, upper glume ca. 1.5 mm; lemmas 1.7–2.3 mm, usually purple, pubescent near base, apex obtuse; palea keels ciliate on lower part, scabrid in upper part; anthers 1–1.5 mm. Fl. May–Jul. $2n = 14$.

Low wet places, saline meadows; 100–1500 m. Qinghai, Xinjiang [Kazakhstan, Russia].

4. *Puccinellia diffusa* (V. I. Kreczetowicz) V. I. Kreczetowicz ex Drobow, Fl. Uzbekistan. 1: 253. 1941.

展穗碱茅 zhan sui jian mao

Atropis diffusa V. I. Kreczetowicz in Komarov, Fl. URSS 2: 760. 1934.

Perennial, tufted. Culms 30–50 cm tall, base thickened and tuberlike. Ligule ca. 1.5 mm; leaf blades flat or subinrolled, 4–10 cm, 0.6–1.3 mm wide, adaxial surface scabrous. Panicle effuse, 8–12 cm, branches 2–4 per node, 2–4 cm, slender, lower part smooth and naked, scabrous near spikelets. Spikelets 5–6 mm, florets 3–6; glumes obtuse, lower glume ca. 1.2 mm, upper glume ca. 2 mm; lemmas 2–2.7 mm, purple with yellow margins, base pubescent, apex obtuse; palea keels pubescent near base, scabrid on upper part; anthers 1.2–1.6 mm. Fl. May–Jul.

Dry river banks, sandy gravel, saline grassy places; 100–2000 m. Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Uzbekistan].

5. *Puccinellia dolicholepis* (V. I. Kreczetowicz) Pavlov, Fl. Kazakhst. 1: 242. 1956.

毛稈碱茅 mao fu jian mao

Atropis dolicholepis V. I. Kreczetowicz in Komarov, Fl. URSS 2: 764. 1934.

Perennial, densely tufted. Culms erect, 20–40(–50) cm tall, slender, 1–1.5 mm in diam. Ligule 1.7–3.5 mm; leaf blades usually inrolled, 3–5 cm, 0.3–1.2 mm wide. Panicle loose, 5–12 cm; branches 1–2 cm, ascending and then spreading, scabrid. Spikelets 4–7 mm, usually tinged with purple, florets 2–6; lower glume 1.3–1.6 mm, upper glume 2–2.8 mm, apex subacute; lemmas 2.5–3.5(–4) mm, shortly hairy on lower part of veins, apex acute to acuminate; palea keels pubescent on lower part, scabrid on upper part; anthers 1.4–2.3 mm. Fl. Jun–Jul.

Dry grasslands, sandy saline lake shores and meadows, sandstone slopes; 100–1500 m. Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Russia (SW Siberia); SW Asia (Caucasus), SE Europe].

6. *Puccinellia jeholensis* Kitagawa, Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 102. 1936.

热河碱茅 re he jian mao

Puccinellia palustris (Seenus) Grossheim subsp. *jeholensis* (Kitagawa) Norlindh.

Perennial, tufted, grayish green. Culms erect or geniculate, ascending, 30–60 cm tall, 1–2 mm in diam. Leaf sheaths smooth; ligule 0.5–1.3 mm; leaf blades flat, 6–10 cm, 2–3 mm

wide, abaxial surface glabrous, adaxial surface and margins scabrous. Panicle usually spreading, 8–20 × 5–10 cm; branches 2–4 per node, basal primary branch 4–8 cm, upper part scabrid. Spikelets 5–6 mm, florets 4 or 5; rachilla internodes scabrid; lower glume ca. 1.2 mm, 1-veined, apex acuminate, upper glume ca. 1.8 mm, 3-veined, apex obtuse; lemmas 3–3.5 mm, purple, lower 1/4 pubescent, margins membranous, yellow, apex obtuse; palea as long as lemma, keels hairy in lower part, scabrid in upper part; anthers 1.2–2 mm. Fl. Jun–Jul.

Lake shores, shallow sandy slopes, low saline meadows. Hebei, Heilongjiang, Jiangsu, Nei Mongol [Mongolia].

7. *Puccinellia macranthera* (V. I. Kreczetowicz) Norlindh, Fl. Mongol. Steppe 1: 102. 1949.

大药碱茅 da yao jian mao

Atropis macranthera V. I. Kreczetowicz in Komarov, Fl. URSS 2: 759. 1934; *Puccinellia poaeoides* Keng.

Perennial, tufted, grayish green. Culms 30–50 cm tall, 1–2.5 mm in diam. Leaf sheaths smooth or scabrid; ligule 0.5–1.2 mm, truncate or obtuse; leaf blade flat or inrolled, 3–8 cm, 2–4 mm wide, margins and adaxial surface scabrous. Panicle laxly spreading, 8–20 × 6–12 cm; branches 2–4 per node, basal primary branch 4–8 cm, horizontally spreading or reflexed after anthesis, axis and branches scaberulous, lower part naked. Spikelets 5–6 mm, florets 4–6; rachilla internodes smooth; glumes obtuse, lower glume 1–1.5 mm, upper glume ca. 2 mm; lemmas 2.4–3 mm, base pubescent, margins yellow, apex truncate-triangular; palea keels ciliate; anthers 1.5–2 mm. Fl. Jun–Jul.

Moist saline places; 100–2000 m. Gansu, Jilin, Liaoning, Nei Mongol, NE Xinjiang [Mongolia, Russia (Siberia)].

8. *Puccinellia chinampoensis* Ohwi, Acta Phytotax. Geobot. 4: 31. 1935.

朝鲜碱茅 chao xian jian mao

Perennial, tufted, grayish green. Culms erect, 30–80 cm tall, ca. 1.5 mm in diam. Leaf sheaths smooth; ligule 1–1.7 mm; leaf blade flat or inrolled, 4–9 cm, 1.5–3 mm wide, adaxial surface scabrid. Panicle loose, 7–15 × 4–8 cm; branches 3–5 per node, 6–8 cm, ascending, spreading or slightly nodding after anthesis, scabrid, lower 1/2 naked. Spikelets 4–6 mm, florets 4–7; lower glume 0.7–1.3 mm, 1-veined, upper glume 1–1.7 mm, 3-veined; lemmas 1.8–2.2 mm, later tinged with purple, hairy near base, apex truncate; palea as long as or slightly longer than lemma, keels sparsely pubescent on lower part, scabrid on upper part; anthers 1.2–1.5 mm. Fl. Jun–Jul.

Saline meadows, sandy seashores. Hebei, Liaoning [Korea].

9. *Puccinellia coreensis* Hackel ex Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 57. 1930.

高丽碱茅 gao li jian mao

?*Puccinellia coreensis* var. *asperifolia* Kitagawa.

Perennial, loosely tufted. Culms 20–60 cm tall, 1.3–2 mm in diam., nodes geniculate. Leaf sheaths loose, uppermost sheath ca. 10 cm, reaching base of inflorescence; ligule 1–2

mm; leaf blades flat or conduplicate, 8–20 cm, 1–3 mm wide, margins and adaxial surface scabrous. Panicle 8–20 × 3–5 cm; branches 2–5 per node, 3–8 cm, smooth, lower part naked, upper part densely spiculate. Spikelets 5–7 mm, florets 5–7; lower glume 1–1.2 mm, upper glume 1.5–2 mm; lemmas 2–2.5 mm, base slightly pubescent, apex obtuse, dentate-ciliate; palea keels scabrous on upper part; anthers 1.1–1.3 mm. Fl. Jun–Aug.

Hills, slopes, wet places along field margins. Jilin, Liaoning [Korea].

This taxon was first described as “*Agrostis distans* var. *coreensis* Hackel ex T. Mori” (Enum. Pl. Corea, 36. 1922), which is a *nomen nudum* and, therefore, was not validly published.

10. *Puccinellia manchuriensis* Ohwi, Acta Phytotax. Geobot. 4: 31. 1935.

柔枝碱茅 rou zhi jian mao

Perennial, tufted. Culms 30–60 cm tall. Leaf sheaths smooth; ligule 1–2 mm; leaf blade inrolled or flat, 10–15 cm, 1.5–3 mm wide, adaxial surface densely scabrous along veins. Panicle 7–15 cm; branches 3–5 per node, 2–4 cm, smooth or scabrous, spikelets many. Spikelets 3–4 mm, florets 3–5; lower glume ca. 0.8 mm, upper glume ca. 1.2 mm; lemmas 1.6–2.2 mm, base pubescent, apex obtuse; palea keels scabrid on upper part; anthers 0.8–1.3 mm. Fl. May–Jul. $2n = 28$.

Riversides, saline meadows, sandy seashores. Beijing, Gansu, Heilongjiang, N Jiangsu, Nei Mongol, Shanxi, Tianjin [Japan, Mongolia, Russia (Far East)].

11. *Puccinellia qinghaica* Tzvelev, Bot. Zhurn. (St. Petersburg) 89: 842. 2004.

青海碱茅 qing hai jian mao

Perennial, tufted. Culms erect, 10–30 cm tall. Ligule 0.5–1.5 mm; leaf blades 2–6 cm, 0.5–1.5 mm wide. Panicle usually spreading, 3–8 cm; branches (1 or)2(or 3) per node, 2–5 cm, thin, smooth, lower part naked. Spikelets 3–4 mm, tinged with purple, florets 2–4; glumes obtuse, lower glume 0.5–1 mm, upper glume 1–1.5 mm; lemmas 1.6–2.2 mm, pubescent at base; palea keels scabrid on upper part; anthers 0.8–1.3 mm. Fl. Jun–Jul.

• Alpine riversides, meadows; 2000–3500 m. Qinghai.

12. *Puccinellia tenuiflora* (Grisebach) Scribner & Merrill, Contr. U. S. Natl. Herb. 13: 78. 1910.

星星草 xing xing cao

Atropis tenuiflora Grisebach in Ledebour, Fl. Ross. 4: 389. 1852; *Puccinellia mongolica* (Norlindh) Bubnova; *P. tenuiflora* var. *mongolica* Norlindh.

Perennial, tufted. Culms erect, often geniculate, 30–70 cm tall, 1–2 mm in diam., terminal node in lower 1/3. Leaf sheaths glabrous; ligule 0.7–1.5 mm, obtuse; leaf blade conduplicate or slightly inrolled, 2–8 cm, 1–3 mm wide, adaxial surface scabrid. Panicle loose, 6–15 cm; branches 2–5 per node, slender, horizontally spreading, scabrid or smooth, lower part naked. Spikelets 2.5–3.5 mm, usually tinged purple, florets 2–4; lower glume ca. 0.6 mm, 1-veined, upper glume ca. 1.2 mm, 3-veined, apex subobtusely; lemmas 1.5–2.2 mm, glabrous or subglabrous,

apex obtuse; palea keels smooth or with a few small teeth; anthers 0.8–1.4 mm. Fl. Jun–Jul. $2n = 14$, 56.

Saline wet grasslands, stable sandy beaches, saline meadows; 500–4000 m. Anhui, Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shanxi, Xinjiang [Japan, Kazakhstan, Mongolia, Russia (Siberia); SW Asia (Iran)].

13. *Puccinellia filifolia* (Trinius) Tzvelev, Novosti Sist. Vyssh. Rast. 1964: 18.1964.

线叶碱茅 xian ye jian mao

Colpodium filifolium Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4, 2(1): 70. 1836.

Perennial, densely tufted, tillers very numerous. Culms erect, 20–30 cm tall, 0.7–1.5 mm in diam. Ligule 0.6–2 mm; leaf blades conduplicate, setaceous, 2–5 cm, 0.3–1 mm wide. Panicle spreading, 3–8 cm; branches 2 or 3 per node, 2–6 cm, thin, smooth. Spikelets 2.5–4 mm, usually tinged with purple; florets 2–4; glumes obtuse, lower glume 0.5–1 mm, upper glume 1–1.5 mm; lemmas 1.6–2 mm, glabrous or subglabrous; palea keels smooth; anthers 0.9–1.1 mm. Fl. May–Jun.

Sandy saline places; near sea level to 500 m. Nei Mongol (near Chailar) [Mongolia].

14. *Puccinellia tianschanica* (Tzvelev) Ikonnikov, Opred. Viss. Rast. Baskirsk. ASSR 80. 1979.

天山碱茅 tian shan jian mao

Puccinellia tenuiflora (Grisebach) Scribner & Merrill subsp. *tianschanica* Tzvelev, Novosti Syst. Vyssh. Rast. 8: 79. 1971; *P. gyirongensis* L. Liu.

Perennial, tufted. Culms erect, 10–30 cm tall, 1–1.6 mm in diam., nodes slightly geniculate. Ligule 0.7–1.5 mm; leaf blade 2–6 cm, 0.5–2 mm wide. Panicle 3–10 × 1.5–3 cm; branches mostly 1–3 per node, 3–5 cm, thin, smooth, lower part naked, upper part with a few spikelets. Spikelets 2.5–4 mm, usually tinged with purple, rarely yellowish brown, florets 2–4; lower glume 0.5–1 mm, upper glume 1.3–1.8 mm; lemmas 1.5–2.3 mm, glabrous, apex obtuse-truncate; palea keels smooth; anthers 0.8–1.2 mm. Fl. Jun–Aug.

Dry grasslands, dampish grassy places; 1500–3500 m. Qinghai, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

15. *Puccinellia degeensis* L. Liu, Vasc. Pl. Hengduan Mts. 2: 2199. 1994.

德格碱茅 de ge jian mao

Perennial, densely tufted. Culms obliquely ascending, 15–20 cm tall, 1–1.5 mm in diam. Leaf sheaths glabrous, uppermost enclosing base of panicle; ligule ca. 1 mm, truncate; leaf blades flat or conduplicate, 3–5 cm, (1–)2–3 mm wide, margins scabrid. Panicle narrow, 3–4 × ca. 3 cm; branches 2–4 per node, 1–2 cm, smooth. Spikelets 3–4 mm, florets 2 or 3; lower glume 0.6–1 mm, veinless or sometimes 1-veined, upper glume 1–1.5 mm, 1–3-veined; lemmas 2–2.5 mm, glabrous, margins ca. 0.3 mm wide, yellow, membranous, apex obtuse; palea keels smooth, apex 2-toothed and mucronate, mucros ca. 0.2 mm; anthers 1.2–1.5 mm. Fl. Jun–Jul.

• Alpine riversides, marshes, meadows; ca. 3600 m. NW Sichuan.

16. *Puccinellia strictura* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 405. 2002.

竖碱茅 shu jian mao

Perennial, tufted. Culms many, rooting from lower nodes, 5–10 cm tall. Leaf sheaths smooth, uppermost reaching lower part of panicle; ligule 1–1.5 mm; leaf blade convolute, 2–3 cm, 1–2 mm wide. Panicle dense, spike-like, 3–5 × ca. 0.5 cm, green; branches single, ca. 1 cm, smooth, spikelets 4 or 5. Spikelets 4–4.5 mm, florets 4; lower glume 1.2–1.5 mm, apex acuminate, upper glume ca. 2 mm, apex acuminate; lemmas 2–2.2 mm, glabrous, apex acuminate; palea keels smooth; anthers 0.8–1.2 mm. Fl. Jul–Aug.

- Moist places in alpine ravines; ca. 3900 m. Xizang.

17. *Puccinellia roborovskyi* Tzvelev, Rast. Tsentr. Azii 4: 157. 1968.

疏穗碱茅 shu sui jian mao

Perennial, tufted. Culms 20–40 cm tall. Leaf sheaths smooth; ligule 1–2.5 mm; leaf blade inrolled, 3–8 cm, 1–2 mm wide. Panicle 5–10 cm; branches paired, 3–5 cm, with axillary pad, spreading after anthesis, smooth or slightly scabrid, lower part naked, upper part with 1–3 spikelets. Spikelets 6–7 mm, tinged with purple, florets 3–5; glumes acuminate, lower glume ca. 1.5 mm, upper glume ca. 2 mm; lemmas lanceolate, 2.8–3.5 mm, base pubescent along veins, margins membranous, yellow, apex acuminate; palea keels scabrid; anthers 0.7–1.3 mm. Fl. Jul–Aug.

- Sandy lake shores, river valleys, moist saline grassy places; 3000–4600 m. Qinghai, Xizang.

18. *Puccinellia arjinshanensis* D. F. Cui, Fl. Xinjiang. 6: 119. 1996.

阿尔金山碱茅 a er jin shan jian mao

Perennial, tufted. Culms erect, 20–30 cm tall, ca. 1 mm in diam. Leaf sheaths smooth; ligule ca. 2 mm, semi-rounded; leaf blade conduplicate or inrolled, hard, 3–7 cm, 1–1.5 mm wide, margins scabrous, adaxial surface scabrous along veins. Panicle 5–10 × ca. 4 cm; branches 1 or 2 per node, smooth, apex sparsely scabrous. Spikelets 4–7 mm, florets 3–5; lower glume 2–2.5 mm, 1-veined, upper glume ca. 3 mm; lemmas 3.5–4 mm, veins inconspicuous, base and between veins densely pubescent, margins broadly membranous; palea keels ciliate on lower half, scabrous on upper half; anthers 0.8–1.2 mm. Fl. Jul–Aug.

- Gully banks on slopes; 3000–3500 m. Xinjiang.

19. *Puccinellia schischkinii* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 57. 1955.

斯碱茅 si jian mao

Perennial, tufted, intravaginal and a few short extravaginal shoots present. Culms erect or ascending, 20–40 cm tall, 1–2 mm in diam., soft. Ligule 1–2 mm, rounded or acuminate; leaf blades inrolled or flat, hard, 4–5 cm, 1–2 mm in diam., abaxial surface glabrous, grayish green, adaxial surface scabrid. Panicle very narrow, 10–20 cm, pale green; branches 1–3 cm, straight,

scabrid, spiculate to base. Spikelets 5–7 mm, florets 5–7; glumes lanceolate, slightly keeled, upper keel scabrous, apex acuminate, lower glume 1.5–1.8 mm, 1-veined, upper glume 2–2.5 mm, 3-veined; lemmas 2.2–3.2 mm, base sparsely shortly hairy, midvein scabrid toward apex, apex acute; palea keels ciliate on lower part, scabrous on upper part; anthers 0.7–1.2 mm. Fl. Jun–Jul.

Mountain saline meadows, marshes, lowland gravel beaches, grassy places along saline lake shores; (600–)3000–4300 m. Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan].

Some authors have incorrectly named material of this species as *Puccinellia roshevitsiana*.

20. *Puccinellia kuenlunica* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 62. 1955.

昆仑碱茅 kun lun jian mao

Perennial, densely tufted, intravaginal and extravaginal tilering shoots present. Culms erect, 20–30 cm tall. Uppermost leaf sheath very long; ligule ca. 2 mm; leaf blade 3–8 cm, 1–2.5 mm wide, margins and adaxial surface scabrid. Panicle very narrow, 8–18 cm; branches short, appressed or slightly spreading after anthesis, smooth or sparsely scabrous along upper part. Spikelets ca. 4–6 mm, florets 3–5; glumes ovate-lanceolate, lower glume 1–1.5 mm, 1-veined, upper glume 1.5–2 mm, 3-veined; lemmas ovate-lanceolate, 2.5–3.2 mm, base glabrous or subglabrous, apex acuminate; palea keels smooth on lower part, scabrous on upper part; anthers 0.7–1.2 mm. Fl. Jun–Jul.

- Deserts, dry grasslands; 2000–3000 m. Gansu, Qinghai, SE Xinjiang, Xizang.

21. *Puccinellia przewalskii* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 63. 1955.

勃氏碱茅 bo shi jian mao

Perennial, loosely tufted, intravaginal and a few short extravaginal shoots present. Culms erect or ascending from a geniculate base, 25–40 cm tall. Leaf sheaths smooth; ligule 2–3 mm; leaf blade flat or inrolled, hard, grayish green, 5–10 cm, 2–3 mm wide, adaxial surface scabrid. Panicle narrow, 8–15 cm; branches ca. 5 cm, appressed or sometimes spreading, scabrid or smooth in lower part. Spikelets 5–7 mm, slightly tinged with purple, florets 5–7; glumes obtuse or subacuminate, lower glume ca. 1.5 mm, upper glume 2–2.5 mm; lemmas 3.2–3.5 mm, lower part glabrous, rarely base minutely pubescent, apex acuminate or narrowly rounded; palea keels smooth in lower part, shortly ciliate in upper part; anthers 1.5–2.4 mm. Fl. Jun–Jul.

- Moist saline places on sandstone, river banks. Gansu, Qinghai.

22. *Puccinellia roshevitsiana* (Schischkin) V. I. Kreczetowicz ex Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 60. 1955.

西域碱茅 xi yu jian mao

Atropis roshevitsiana Schischkin, Sist. Zametki Mater. Gerb. Tomsk. Univ. 1929(3): 1. 1929.

Perennial, tufted, grayish green. Culms erect, 30–60 cm

tall, hard, grayish green. Ligule ca. 1.5 mm; leaf blades recurved, straight, 5–10 cm, 2–4 mm wide, margins scabrid. Panicle 8–15 cm; branches 3–5 per node, 2–6 cm, scabrid, spreading after anthesis. Spikelets linear-lanceolate, 5–8 mm, florets 5–6; glumes obtuse, lower glume ca. 1.5 mm, upper glume ca. 2.5 mm; lemmas 2.7–3.5 mm, marginal veins pubescent at base, apex scarious; palea keels scabrid in upper half; anthers 1.5–2 mm. Fl. Jun–Jul.

Low saline deserts, gravel flats in river valleys; ca. 500 m. Xinjiang [Kazakhstan].

23. *Puccinellia altaica* Tzvelev, Rast. Tsent. Azii 4: 152. 1968.

阿尔泰碱茅 a er tai jian mao

Puccinellia dolicholepis var. *paradoxa* Sergievskaja.

Perennial, loosely or densely tufted, intravaginal and a few extravaginal shoots present. Culms erect, 20–30 cm tall. Ligule ca. 1 mm; leaf blades 3–8 cm, ca. 1 mm wide. Panicle contracted or slightly loose, 5–14 × 2–4 cm; branches paired, lower part naked, smooth. Spikelets 3.5–4.5 mm, florets 3–5; lower glume 1–1.2 mm, apex acuminate, upper glume 1.5–2 mm, apex acuminate; lemmas 2.3–2.8(–3) mm, violet, glabrous or slightly hairy near base, apex acuminate; palea keels smooth or with a few spinules in upper 1/3; anthers 1.2–1.5 mm. Fl. Jul–Aug. $2n = 14$.

Flat sandy river banks, saline meadows, grassland on slopes; 1000–2500 m. NE Xinjiang [Mongolia, Russia (Siberia)].

24. *Puccinellia koeieana* Melderis, Biol. Skr. 14(4): 72. 1965.

科氏碱茅 ke shi jian mao

Perennial, loosely or densely tufted; intravaginal and extravaginal shoots present. Culms erect or geniculately ascending, 15–30 cm tall. Leaf blades flat or ± inrolled, 2–5 cm, ca. 2 mm wide, grayish green, adaxial surface scabrid along veins. Panicle contracted, later spreading, 7–8 × ca. 5 cm; branches paired at lower nodes, 2–3 cm, slender, scabrid, reflexed after anthesis. Spikelets 4.5–5 mm, often tinged with purple, florets 4–7; glumes broadly lanceolate or ovate, lower glume ca. 1 mm, 1-veined, upper glume ca. 1.5 mm, 1–3-veined, apex acute or subobtuse; lemmas 1.5–2 mm, purple, glabrous or base minutely hairy, apex obtuse, mucronate; anthers 1–1.2 mm. Fl. May–Jul.

Alpine moist saline places; 2000–3000 m. Xizang [Afghanistan; SW Asia (Iran)].

25. *Puccinellia multiflora* L. Liu, Fl. Xizang. 5: 123. 1987.

多花碱茅 duo hua jian mao

Perennial, loosely tufted. Culms geniculate at base, 30–50 cm tall, soft. Terminal sheath enclosing lower part of inflorescence; ligule 1–2.5 mm; leaf blade soft, 5–10 × 0.2–0.3 cm, margins and adaxial surface scabrid. Panicle spreading, ca. 15 × 4 cm; branches 2 or 3 per node, basal primary branch 5–8 cm, scabrid, lower 1/2 naked, upper 1/2 with 2–4 spikelets. Spikelets 8–11 mm, tinged purplish brown, florets 6–9; glumes obtuse; lower glume ca. 1.5 mm, upper glume 2–2.5 mm; lemmas

2.8–3.5 mm; palea scabrid on upper part of keels; anthers 1.2–1.5 mm. Fl. Jun–Jul.

• Sandy saline lake shores, alluvial fans; 2900–4200 m. Qinghai, W Xizang.

26. *Puccinellia thomsonii* (Stapf) R. R. Stewart, Brittonia 5: 418. 1945.

长穗碱茅 chang sui jian mao

Glyceria thomsonii Stapf in J. D. Hooker, Fl. Brit. India 7: 347. 1896 [“1897”]; *Atropis thomsonii* (Stapf) Pampanini.

Perennial, densely tufted. Culms stout, 20–40 cm tall, 1.5–3 mm in diam., 3–5-noded, nodes often geniculate. Leaf sheaths loose, terminal sheath ca. 10 cm, often enclosing base of inflorescence; ligule ca. 3 mm, broadly ovate; leaf blade flat or conduplicate or inrolled, 6–18 cm, 1–3 mm wide, margins and adaxial surface scabrid. Panicle spreading, 12–20 × 2–3 cm; branches paired, 3–5 cm, obliquely ascending, scabrid, lower part naked. Spikelets 5–9 mm, florets 3–5; glumes oblong, apex acuminate, lower glume 1.8–2.5(–3) mm, upper glume 2.2–3.2 mm; lemma 3.5–4(–4.5) mm, glabrous, keeled toward apex, apex acuminate; palea keels smooth on lower part, scabrid upward; anthers 2–2.6 mm. Fl. Jun–Jul.

Open basins; 4000–5200 m. Xizang [Pakistan].

27. *Puccinellia stapfiana* R. R. Stewart, Brittonia 5: 418. 1945.

藏北碱茅 zang bei jian mao

Glyceria poaeoides Stapf in J. D. Hooker, Fl. Brit. India 7: 348. 1896 [“1897”], not *Puccinellia poaeoides* Keng (1938).

Perennial, tufted. Culms erect or obliquely ascending, 20–40 cm tall. Leaf sheaths dense at culm base, terminal sheath reaching panicle; ligule ca. 1 mm; leaf blades conduplicate, 3–10 cm, 1–2.5 mm wide, margins and adaxial surface scabrid. Panicle narrow, 5–10 × ca. 1.5 cm; branches 2 or 3 per node, obliquely ascending, scabrid, 2–3 cm, lower part naked, upper part with 2–4 spikelets. Spikelets 5–6 mm, tinged with purple at maturity, florets 2–4; glume apex obtuse or acuminate, lower glume 2–2.2 mm, upper glume 2.5–2.8 mm; lemmas 3–3.5(–4) mm, glabrous, margins ciliate, finely toothed, apex obtuse; palea keels smooth or upper part scabrid, anthers 1.5–2.2 mm. Fl. Jun–Jul.

Alpine grassy places, saline sandy lake shores, marshy meadows; 4000–4800 m. NW Xizang [India, Pakistan].

28. *Puccinellia shuanghuensis* L. Liu, Fl. Xizang. 5: 125. 1987.

双湖碱茅 shuang hu jian mao

Perennial, densely tufted. Culms slender, 5–8 cm tall, 1-noded at base. Leaf sheaths clustered at culm base; ligule ca. 1 mm, triangular; leaf blades soft, 2–3 cm, ca. 1 mm wide, adaxial surface scabrid. Panicle 1–2 × ca. 1 cm, with ca. 10 spikelets; branches 1 per node, 0.7–1 cm, spreading, smooth, spikelets 1–3; pedicels thickened at apex. Spikelets ca. 4 mm, florets 2 or 3; glumes narrowly acuminate, lower glume 1.2–1.5 mm, upper glume ca. 2 mm; lemmas 2.8–3 mm, glabrous, apex acuminate; palea shorter than lemma, keels smooth; anthers ca. 1.5 mm. Fl. Jun–Jul.

- Saline grassland on mountain slopes; 4500–5100 m. Xizang.

29. *Puccinellia vachanica* Ovczinnikov & Czukavina, Fl. Tadziksk. SSR 1: 505. 1957.

文昌碱茅 *wen chang jian mao*

Puccinellia pamirica (Roshevitz) V. I. Kreczetowicz ex Ovczinnikov & Czukavina subsp. *vachanica* (Ovczinnikov & Czukavina) Tzvelev.

Perennial, tufted. Culms erect, 20–40 cm tall, slender. Ligule 1–2 mm; leaf blade conduplicate or inrolled 3–5 cm, 0.5–1.5 mm wide. Panicle usually spreading, 5–10 cm; branches 1–3 per node, slender, smooth or upper parts sparsely scabrid. Spikelets 3–5 mm, usually slightly purple tinged, florets 3 or 4; lower glume 1–1.5 mm, upper glume 2–2.5 mm; lemmas 2.2–2.8 mm, glabrous; palea keels smooth or sparsely scabrid on upper part; anthers 0.9–1.1 mm. Fl. Jun–Aug. $2n = 28$.

Lake shores, saline meadows; 2500–3500 m. Qinghai, S Xinjiang, W Xizang [Tajikistan].

30. *Puccinellia pamirica* (Roshevitz) V. I. Kreczetowicz ex Ovczinnikov & Czukavina, Fl. Tadziksk. SSR 1: 224. 1957.

帕米尔碱茅 *pa mi er jian mao*

Atropis distans (Jacquin) Grisebach f. *pamirica* Roshevitz, Trudy Glavn. Bot. Sada 38: 121. 1924; *A. pamirica* V. I. Kreczetowicz.

Perennial, tufted. Culms usually erect, rarely geniculately ascending, 15–40 cm tall. Leaf sheaths mostly clustered at plant base; ligule ca. 1 mm; leaf blades conduplicate or inrolled, 3–4 cm, 0.5–1.5 mm wide, margins and adaxial surface scabrid. Panicle mostly contracted, or spreading after anthesis, 5–10 cm; branches 2–4 cm, ascending, smooth. Spikelets 4–5 mm, purple tinged, florets 3 or 4; lower glume 1.5–1.8 mm, apex shortly acuminate, upper glume 2–2.5 mm, inconspicuously 3-veined, apex shortly acuminate; lemmas 2.5–3.5 mm, glabrous, with a raised keel, margins membranous, apex acute or acuminate, finely toothed; palea keels smooth or sparsely scabrid; anthers 1.3–1.8 mm. Fl. and fr. Jul. $2n = 14, 28$.

Lake shores, stony depressions; 3200–4800 m. Qinghai, Xinjiang, NW Xizang [Afghanistan, Kyrgyzstan, Tajikistan, Uzbekistan].

31. *Puccinellia ladakhensis* (H. Hartmann) Dickoré, Stapfia 39: 182. 1995.

拉达克碱茅 *la da ke jian mao*

Poa ladakhensis H. Hartmann, Candollea 39: 510. 1984.

Perennial, loosely tufted, old basal sheaths lacerate to fibrous. Culms geniculately ascending, 8–20 cm tall, 3- or 4-noded. Ligule ca. 1 mm; leaf blades 2–5 cm, 0.2–0.5 mm wide. Panicle contracted, 5–10 × 1–2 cm; branches 2–3(–5) cm, lower 1/2 naked, smooth. Spikelets 5–6 mm, purple tinged, florets 3 or 4; lower glume 1.5–1.8 mm, upper glume ca. 2.5 mm; lemmas 3.2–3.5 mm, glabrous, keeled toward apex, apex acuminate; palea keels glabrous, apex mucronate; anthers 1.2–1.6 mm. Fl. May–Jul.

Saline shores of rivers and lakes. Xizang [Kashmir, Nepal].

32. *Puccinellia kashmiriana* Bor, Kew Bull. [8] 1953: 270. 1953.

克什米尔碱茅 *ke shi mi er jian mao*

Perennial, densely tufted. Culms 10–15 cm tall, scabrid below inflorescence. Leaf sheaths clustered at plant base; ligule ca. 1.5 mm; leaf blades short, linear, basal blades flat, soft, ca. 5 cm, upper blades conduplicate, ca. 2 cm, 1–1.5 mm wide, adaxial surface and margins scabrid. Panicle very narrow, 3–4 × ca. 0.5 cm; branches 2 per node, ca. 1.5 cm, ascending, smooth, lower part naked, upper part with 1 or 2 spikelets. Spikelets ca. 5 mm, tinged with purple, florets 3–5; lower glume 1.2–1.5 mm, 1-veined, upper glume 2–2.5 mm, 3-veined; lemmas 3–3.5 mm, glabrous, apex acute or mucronate; palea keels smooth; anthers 0.6–0.8 mm. Fl. Jul–Aug.

Gravelly places in open alpine valleys; 4000–5100 m. Xinjiang, Xizang [Afghanistan, NW India, Kashmir, Pakistan].

33. *Puccinellia nudiflora* (Hackel) Tzvelev, Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. SSR 17: 75. 1962.

裸花碱茅 *luo hua jian mao*

Poa nudiflora Hackel, Oesterr. Bot. Z. 52: 453. 1902.

Perennial, tufted. Culms geniculate at base, 7–20 cm tall. Leaf sheaths smooth, uppermost often reaching inflorescence base; ligule ca. 1 mm; leaf blade conduplicate or inrolled, 1–4 cm, 1–2 mm wide, adaxial surface scabrid. Panicle dense, 4–6 cm; branches 2–4 cm, smooth, upper part with 2–4 spikelets. Spikelets 4–5.5 mm, florets 3 or 4; lower glume 1–1.2 mm, upper glume ca. 1.5 mm; lemmas 2.5–3 mm, glabrous, upper part keeled, apex obtuse; palea keels with a few teeth; anthers 0.6–0.8 mm. Fl. Jun–Jul.

Meadows on gravelly lake shores, saline beaches, alpine marshes, along ravine edges, valleys; 2400–4900 m. Qinghai, Xinjiang, Xizang [Kyrgyzstan, Tajikistan].

34. *Puccinellia pauciramea* (Hackel) V. I. Kreczetowicz ex Ovczinnikov & Czukavina, Fl. Tadziksk. SSR 1: 227. 1957.

少枝碱茅 *shao zhi jian mao*

Atropis distans (Jacquin) Grisebach f. *pauciramea* Hackel, Trudy Imp. S.-Peterburgsk. Bot. Sada 21: 442. 1903; *A. pauciramea* (Hackel) V. I. Kreczetowicz.

Perennial, tufted. Culms geniculately ascending, 15–30 cm tall, with many tillering shoots, 5–10 cm tall. Ligule 1–3 mm; leaf blades conduplicate or inrolled, 4–10 cm, 1–2 mm wide, margins and adaxial surface scabrid. Panicle broadly open, 4–7 cm; branches 2 per node, smooth, spikelets 1–3 at branch tips. Spikelets 5–6 mm, florets 2–4; glumes with apex obtuse or acuminate, lower glume 1.2–1.5 mm, upper glume 1.8–2 mm; lemmas 2.5–3.5 mm, purple with golden yellow membranous margins, glabrous, keeled, apex obtusely triangular; palea keels smooth or with 1–2 teeth; anthers 0.6–1.3 mm. Fl. Jun–Jul. $2n = 28$.

Lake banks, sand dunes, gravel of river valleys, alluvial fans, saline soils in mountainous areas; 3000–5000 m. Qinghai, Xinjiang, Xizang [Afghanistan, Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan].

35. *Puccinellia ladiyginii* Ivanova ex Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 65. 1955.

布达尔碱茅 bu da er jian mao

Perennial, loosely tufted. Culms erect, 20–30 cm tall, 2- or 3-noded. Leaf sheaths smooth; ligule 1–2 mm; leaf blade flat, 5–8 cm, 1.5–2.2 mm wide, smooth or adaxial surface scabrid. Panicle open, 5–8 × 3–5 cm; branches 2 per node, 3–4 cm, lower part naked, branchlets and spikelets in upper half, smooth or rarely slightly scabrid. Spikelets ca. 6 mm, tinged purplish red, florets 4–6; glumes ovate-lanceolate, lower glume 1.5–2 mm, 1-veined, upper glume 2–2.5 mm, 3-veined, apex obtuse or slightly acuminate; lemmas 2.5–3.4 mm, glabrous, apex obtuse; palea keels smooth or sparsely scabrid in upper part; anthers 1.3–2 mm. Fl. Jun–Aug.

• Alpine sandy river beaches; 3500–4500(–5000) m. Qinghai.

36. *Puccinellia subspicata* V. I. Kreczetowicz ex Ovczinnikov & Czukavina, Fl. Tadzhiksk. SSR 1: 226. 1957.

穗序碱茅 sui xu jian mao

Atropis subspicata V. I. Kreczetowicz in Komarov, Fl. URSS 2: 760. 1934; *Poa gorbunovii* Ovczinnikov.

Perennial, loosely tufted. Culms 5–25(–30) cm tall, soft. Leaf blades flat or conduplicate, soft, 3–10 cm, 1.5–2.5 mm wide, smooth. Panicle cylindrical, contracted or spreading, 2–5 cm; branches 1–2 cm, smooth, lower part naked, spikelets 1–3 at branch tips. Spikelets 5–8 mm, usually purplish tinged, florets 3–7; glumes ovate, apex subobtusely, lower glume 1–1.5 mm, upper glume 2–2.5 mm; lemmas elliptic, 2.7–4.5 mm, usually purple tinged, glabrous, keeled, apex acute; palea keels scabrid; anthers 1.5–2.5 mm. Fl. Jun–Jul. $2n = 14$.

Wet alpine meadows. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

37. *Puccinellia nipponica* Ohwi, Bot. Mag. (Tokyo) 45: 379. 1931.

日本碱茅 ri ben jian mao

Perennial, tufted. Culms erect, 30–100 cm tall. Uppermost leaf sheath long, usually enclosing base of inflorescence; ligule 2–3 mm; leaf blades soft, 10–20 cm, 1–3 mm wide. Panicle 10–20(–30) cm; branches 3–5 per node, erect and appressed to axis, spiculate to base, scabrid. Spikelets 4–6 mm, pale green, florets 3 or 4; glumes lanceolate, lower glume 2–2.5 mm, 1-veined, upper glume ca. 3 mm, 3-veined; lemmas 2.5–3.5 mm, base pubescent, apex acuminate; anthers 0.7–0.8 mm. Fl. Jun–Jul. $2n = 28$.

Sandstone seashores, saline grassy places. Liaoning, Nei Mongol [Japan, Korea, Russia (Far East)].

38. *Puccinellia kurilensis* (Takeda) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 59. 1930.

千岛碱茅 qian dao jian mao

Atropis kurilensis Takeda, J. Linn. Soc., Bot. 42: 497. 1914; *Puccinellia kamtschatica* Holmberg var. *sublaevis* Holmberg; ?*P. pumila* (Vasey) Hitchcock; ?*P. adpressa* Ohwi.

Perennial, loosely tufted. Culms erect, 10–40 cm tall, uppermost node at about middle of culm. Ligule 1.5–3 mm; leaf blade flat, thin, 6–10 cm, 2–3 mm wide, adaxial surface scabrid. Panicle contracted, 5–15 cm, lower part often enclosed in uppermost leaf sheath; branches 2–6 cm, spreading at maturity, smooth or upper part slightly scabrid. Spikelets 6–8 mm, florets 4–7(–9); lower glume 1.5–3 mm, upper glume 2–3.5 mm; lemmas 2.7–3.5(–4) mm, green, margins later golden, veins conspicuously raised, sparsely pubescent along lower part of veins, apex acuminate; palea keels scabrid upward; anthers 0.7–1.2 mm. $2n = 42, 56$.

Seashores, gravel meadows. Heilongjiang, Liaoning [Japan, Korea, Russia (Far East); North America].

39. *Puccinellia micranthera* D. F. Cui, Fl. Xinjiang. 6: 600. 1996 [“*microanthera*”].

小药碱茅 xiao yao jian mao

Perennial, tufted. Culms erect, 25–40 cm tall, 2–3-noded, terminal node at lower 1/3. Leaf sheaths smooth; ligule 1.5–2 mm, obtuse; leaf blades flat, 3–8 cm, 1.5–3 mm wide, scabrid. Panicle large, effuse, 12–20 × 5–7 cm; branches many per node, 5–10 cm, scabrid; pedicels 5–8 mm, scabrid. Spikelets 4–7 mm, florets 3–6; glumes with broadly membranous margins, lower glume 1–1.5 mm, 1-veined, upper glume ca. 2 mm; lemmas 3–4 mm, glabrous, apex acuminate; palea keels scabrid on upper part; anthers 0.3–0.5 mm. Fl. Jun–Jul.

• Gully slopes, marshy meadows; 1300–2000 m. Xinjiang, Xizang.

40. *Puccinellia hackeliana* (V. I. Kreczetowicz) V. I. Kreczetowicz ex Drobow, Fl. Uzbekistan. 1: 250. 1941.

高山碱茅 gao shan jian mao

Atropis hackeliana V. I. Kreczetowicz in Komarov, Fl. URSS 2: 762. 1934.

Perennial, densely tufted, grayish green. Culms 15–45 cm tall, nodes geniculate. Ligule 1–2.5 mm; leaf blades conduplicate or flat, 1–3 cm, 1–1.5 mm wide, adaxial surface and margin scabrid. Panicle 5–15 cm; branches 2–5 per node, scabrid. Spikelets 4–6(–8) mm, florets 3–6, purple; glumes ovate, apex obtuse, lower glume 1.5–2 mm, upper glume 2–2.5 mm; lemmas 2.5–3 mm, base pubescent, apex triangular-rounded; palea keels pubescent in lower part, scabrid in upper part; anthers 0.7–1 mm. Fl. 7–8. $2n = 28, 42$.

Alpine desert grasslands, saline meadows, gravel slopes, field borders, lake banks; 1600–4000 m. Qinghai, Xinjiang, Xizang, [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan].

41. *Puccinellia humilis* (Litvinov ex V. I. Kreczetowicz) Bor, Nytt Mag. Bot. 1: 19. 1952.

矮碱茅 ai jian mao

Atropis humilis Litvinov ex V. I. Kreczetowicz in Komarov, Fl. URSS 2: 759. 1932; *Puccinellia hackeliana* subsp. *humilis* (Litvinov ex V. I. Kreczetowicz) Tzvelev.

Perennial, densely tufted, grayish green. Culms erect, 4–15 cm tall. Leaf blades conduplicate or inrolled, 1–3 cm, ca. 1 mm

wide, smooth. Panicle dense, spikelike, $2-5 \times 0.5-1$ cm; branches smooth, spikelets 1-3. Spikelets 6-7 mm, florets 3-6; lower glume ca. 2.2 mm, upper glume 2.5-3 mm; lemmas 2.5-3.5 mm, violet, base shortly hairy, apex subobtusely; palea keels scabrid on upper part; anthers 0.7-1.2 mm. Fl. Jun-Jul.

Alpine grassy slopes; 3000-4200 m. Xinjiang, Xizang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

42. *Puccinellia distans* (Jacquin) Parlatores, Fl. Ital. 1: 367. 1848.

碱茅 jian mao

Poa distans Jacquin, Observ. Bot 1: 42. 1764; *Atropis distans* (Jacquin) Grisebach; *Puccinellia filiformis* Keng.

Perennial, tufted, pale green. Culms erect or geniculate, 20-40(-60) cm tall, ca. 1-2 mm in diam. Ligule 1-2 mm, truncate or toothed; leaf blade flat or conduplicate, 2-10 cm, 1-2 mm wide, abaxial surface scabrid. Panicle open, 5-15 \times 5-6 cm; branches 2-6 per node, horizontally spreading or reflexed, lower part naked, scabrid. Spikelets 4-6 mm, florets 3-7; glumes obtuse, lower glume 1-1.5 mm, 1-veined, upper glume 1.5-2 mm, 3-veined; lemmas 1.8-2.2 mm, base pubescent, apex truncate or rounded; palea keels scabrid; anthers 0.5-0.8 mm. Fl. May-Jul. $2n = 28, 42$.

Saline moist grassy places, field banks, river valleys, lowland saline abandoned meadows; 100-2000 m. Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Xinjiang [Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; NW Africa, SW Asia, Europe, North America].

43. *Puccinellia glauca* (Regel) V. I. Kreczetowicz in Komarov, Fl. URSS 2: 484. 1934.

灰绿碱茅 hui lü jian mao

Atropis distans (Jacquin) Grisebach var. *glauca* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 623. 1881; *A. glauca* (Regel) V. I. Kreczetowicz.

Perennial, tufted, grayish green. Culms 20-50 cm tall. Leaf blades flat or conduplicate, 5-15 cm, 1.5-2.5 mm wide. Panicle open, 6-15 cm; branches 2 or 3 per node, 3-8 cm, scabrid, tips with a few spikelets, nodding at maturity. Spikelets 5-6 mm, florets 3-5; lower glume ca. 1.5 mm, upper glume 1.8-2 mm, apex obtuse; lemmas obovate, 1.8-2.4 mm, base pubescent, veins inconspicuous, apex rounded; palea keels scabrid-ciliate; anthers 0.5-0.8 mm. Fl. Jun-Aug. $2n = 42$.

Mountainous areas, river valleys, sandy places, fields. Qinghai, Sichuan, Xinjiang [Afghanistan, India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

44. *Puccinellia florida* D. F. Cui, Fl. Xinjiang. 6: 600. 1996.

玫花碱茅 jiu hua jian mao

Perennials, tufted. Culms erect, 15-40 cm tall. Leaf sheaths smooth, uppermost sheath reaching lower part of panicle; ligule 2-3 mm, acuminate; leaf blades flat or conduplicate, 3-6 cm, 1.2-3 mm wide, margins and adaxial surface scabrid. Panicle contracted, 8-12 \times 2-3 cm, branches 2-5 per node, axis and branches scaberulous. Spikelets 6-7 mm, green or slightly

tinged with purple, florets 6-9; lower glume 1-1.5 mm, 1-veined, upper glume 1.5-2 mm, 3-veined; lemma 2-2.2 mm, glabrous or subglabrous, upper keel spinulose, margins broadly membranous, apex obtuse or almost truncate; palea keels conspicuously spinulose on upper half; anthers 0.5-0.7 mm. Fl. May-Jul.

• River beaches; ca. 1100 m. Xinjiang.

45. *Puccinellia leirolepis* L. Liu, Fl. Xizang. 5: 126. 1987.

光稃碱茅 guang fu jian mao

Perennial. Culms erect or base creeping, 15-20 cm tall, much branched. Leaf sheaths broad, loose, uppermost sheath enclosing panicle base; ligule 1-1.5 mm, obtuse; leaf blades flat or conduplicate, 2-5 cm, 1-2 mm wide. Panicle 5-8 \times ca. 1 cm; branches 2-4 per node, scabrid, base naked. Spikelets 4-6 mm, florets 5-7; lower glume ca. 1 mm, 1-veined, apex obtuse, upper glume ca. 1.5 mm, 3-veined; lemmas 2-2.3 mm, glabrous, apex obtuse; palea keels scabrid, anthers 0.6-0.8 mm. Fl. Jun-Jul.

• Wet ravines, saline places, alpine meadows; 3000-4500 m. Xizang, Qinghai, Sichuan.

46. *Puccinellia hauptiana* (Trinius ex V. I. Kreczetowicz) Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 1: 255. 1937.

鹤甫碱茅 he fu jian mao

Atropis hauptiana Trinius ex V. I. Kreczetowicz in Komarov, Fl. URSS 2: 763. 1934; *Puccinellia kobayashii* Ohwi.

Perennial, loosely tufted, grayish green. Culms 15-60 cm tall, 1-2 mm in diam. Ligule 1-1.5 mm; leaf blades flat or conduplicate, 2-6 cm, 1-2 mm wide, margins and adaxial surface scabrid. Panicle open, 6-20 cm; branches 3-8 cm, horizontally spreading or reflexed, scabrid. Spikelets 4-5 mm, florets 5-8; glumes ovate, lower glume 0.7-1 mm, upper glume 1.2-1.5 mm; lemmas 1.6-1.8 mm, green, rarely purplish tinged, base pubescent, apex broadly obtuse; palea keels ciliate-scabrid; anthers 0.3-0.5 mm, Fl. Jun-Jul. $2n = 28$.

River banks, marshy lake shores, ditch banks in fields, low wet saline flats and sandy places in river valleys; 100-3000 m. Anhui, Gansu, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; E Europe, North America].

47. *Puccinellia iliensis* (V. I. Kreczetowicz) Sergievskaja in Krylov, Fl. Zapadnoi Sibiri 12: 3116. 1961.

伊犁碱茅 yi li jian mao

Atropis iliensis V. I. Kreczetowicz in Komarov, Fl. URSS 2: 763. 1934.

Perennial, densely tufted, grayish green. Culms (5-)10-25(-30) cm tall. Ligule ca. 1 mm; leaf blades thin, 1-6 cm, 0.5-2 mm wide. Panicle open or contracted, 5-8 cm; branches 2-4 per node, slender, scabrid, spikelets 3-5 on upper part. Spikelets 2.5-3 mm, green, later tinged purplish red, florets 2-4(-5); glumes obtuse, lower glume ca. 0.5 mm, upper glume ca. 1 mm; lemmas 1.4-1.6 mm, glabrous, apex rounded; palea keels thinly scabrid on upper part; anthers 0.3-0.5 mm. Fl. Jun-Jul.

Sandy beaches in river valleys, damp grassy places; 600–2000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Uzbekistan].

Tzvelev initially treated this species as a synonym of *Puccinellia hauptiana*, but he now believes that it is best treated as a distinct species.

48. *Puccinellia micrandra* (Keng) Keng & S. L. Chen, Bull. Bot. Res., Harbin 14(2): 140. 1994.

微药碱茅 wei yao jian mao

Puccinellia distans (L.) Parl. var. *micrandra* Keng, Sunyatsenia 6: 58. 1941.

Perennial, loosely tufted, grayish green. Culms geniculate-ly ascending, 10–20 cm tall, ca. 1 mm in diam. Ligule ca. 1 mm, truncate or triangular; leaf blades short, 2–4 cm, 1–2 mm wide, margins and adaxial surface scabrid. Panicle open, 5–8 × up to 5 cm wide; branches 2 per node, 2–4 cm, lower part naked, smooth; pedicels ca. 0.5 mm, scabrid. Spikelets ca. 2.5 mm, pale yellow, later tinged with purple, florets 2 or 3; lower glume 0.6–1 mm, upper glume ca. 1.2 mm, 3-veined; lemmas ca. 1.5 mm, callus shortly hairy, apex truncate; palea keels smooth; anthers 0.3–0.5 mm. Fl. Jun–Jul.

• Watersides, meadows; 1000–3100 m. Gansu, Hebei, Heilongjiang, N Jiangsu, Nei Mongol, Shanxi.

Tzvelev initially treated this species as a synonym of *Puccinellia hauptiana*, but he now believes that it is best treated as a distinct species.

49. *Puccinellia minuta* Bor, Nytt Mag. Bot. 1: 19. 1952.

侏碱茅 zhu jian mao

?*Puccinellia platyglumis* L. Liu.

Perennial, small, densely tufted. Culms 3–8 cm tall, glabrous. Leaf sheaths clustered at base; ligule ca. 1 mm; leaf blades conduplicate or inrolled, 1–2 cm, 0.6–1.2 mm wide, margins scabrid. Panicle contracted to spikelike, erect, ca. 2 × 0.5 cm; branches 2 or 3 per node, ca. 0.5 cm, ascending, smooth; spikelets ca. 3.5 mm, purple tinged, florets 2 or 3; glumes keeled, shortly acuminate, lower glume ca. 0.8 mm, upper glume ca. 1.2 mm, 1-veined; lemmas lanceolate, 2.2–2.3(–2.4) mm, glabrous, apex slightly acuminate; anthers 0.6–0.8 mm. Fl. Jun–Jul.

Alpine sandy lake shores, saline meadows; 4000–5100 m. Qinghai, Xizang [Pakistan].

50. *Puccinellia himalaica* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 66. 1955.

喜马拉雅碱茅 xi ma la ya jian mao

Perennial, tufted. Culms 5–20 cm tall. Leaf sheaths smooth; ligule 0.7–1.8 mm; leaf blade conduplicate or inrolled, 3–4 cm, 0.7–2 mm wide, glabrous or adaxial surface scabrid. Panicle contracted at first, open at maturity, 3–9 × 1–4 cm; branches 2–5 per node, 1–6 cm, slender, ascending, smooth. Spikelets 2.4–3.5 mm, pale green, becoming purple, florets 2–4; glumes with conspicuous midrib, apex acuminate, lower glume 0.9–1.5 mm, 1-veined, upper glume 1.2–1.9 mm, 3-veined; lemmas 1.5–2.1 mm, glabrous, apex obtusely acuminate, sometimes midrib extended into mucro; palea keels smooth or scabrid toward apex; anthers 0.5–0.7 mm. Fl. Jun–Jul.

Open grassy places, marshy sandy places on lake and river shores, meadows, along ditches, moist lake ravines; 3000–5000 m. Xinjiang, W Xizang [Afghanistan, India, Pakistan; SW Asia (Iran)].

65. *BRIZA* Linnaeus, Sp. Pl. 1: 70. 1753.

凌风草属 ling feng cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial, slender. Leaf blades linear or broadly linear, flat. Inflorescence an open panicle; pedicels filiform. Spikelets ovate to rotund, laterally compressed or globose, florets several to many, glumes and florets horizontally spreading, disarticulating above glumes and between florets; glumes subequal, shorter than florets, narrowly ovate to orbicular, 3–5-veined, margins broad, scarious, apex hooded; lemmas tightly overlapping, orbicular to oblate, deeply concave, papery to leathery, 5–11-veined, back gibbous, usually slightly keeled, margins broad, membranous, appressed to floret above, base cordate, apex obtuse, cuspidate or 2-lobed; palea slightly or much shorter than lemma, lanceolate to orbicular, keels narrowly winged. Stamens 1–3. Caryopsis plumply elliptic; hilum round to elliptic, or linear.

Twenty-one species: temperate Asia, Europe, and South America; three species (two introduced) in China.

The delicate panicles of plump spikelets on fine trembling pedicels are very ornamental and are used in dried flower arrangements (Quaking Grass).

1a. Panicle drooping, with few spikelets; spikelets ca. 12 × 10 mm; florets 10–12 3. *B. maxima*
1b. Panicle erect, with numerous spikelets; spikelets 3–6 × 4–7 mm; florets 3–8.

2a. Perennial; ligule 0.5–1.5 mm; spikelets 4–6 mm; anthers 1.5–2 mm 1. *B. media*

2b. Annual; ligule 3–6 mm; spikelets 3–5 mm; anthers ca. 0.4 mm 2. *B. minor*

1. *Briza media* Linnaeus, Sp. Pl. 1: 70. 1753.

凌风草 ling feng cao

Perennial, shortly rhizomatous. Culms loosely tufted, erect, 40–60 cm tall. Leaf sheaths smooth; leaf blades 4–15 cm × 4–5 mm, margins scabrid, otherwise smooth, apex subacute;

ligule 0.5–1.5 mm, truncate. Panicle open, erect, ovate or pyramidal in outline, 4–18 cm, with many pendant spikelets; branches paired, obliquely ascending, sparingly branched; pedicels hairlike, longer than spikelets, flexuous. Spikelets broadly ovate, 4–6 × 5–7 mm, shining, purplish, florets 4–8; lower glume 2.5–3 mm, 1-veined, upper glume 3–3.5 mm, 3–5-

veined; lemmas orbicular, lowest 3–4 mm, 7–9-veined; palea obovate, slightly shorter than lemma, keels glabrous. Anthers 1.5–2 mm. Fl. and fr. Jul–Sep. $2n = 14, 28$.

Meadow slopes, grassy clearings in forests; 3600–3800 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal; SW Asia, Europe].

2. *Briza minor* Linnaeus, Sp. Pl. 1: 70. 1753.

银鳞茅 yin lin mao

Annual. Culms usually solitary, erect, slender, 20–60 cm tall. Leaf sheaths thin, soft, smooth, loosely overlapping; leaf blades thin, 4–12 cm × 4–10 mm, adaxial surface and margins scabridulous, apex acute; ligule 3–6 mm, subacute. Panicle open, erect, broadly ovate in outline, 5–10 cm, with many pendant spikelets; branches mostly paired, very slender, obliquely spreading, scabrid; pedicels hairlike, mostly longer than spikelets, flexuous. Spikelets broadly ovate, 3–5 × ca. 4 mm, pale green, florets 3–8; glumes broad, 2–2.5 mm, 3–5-veined, apex rounded; lemmas very broadly ovate, wider than long, lowest 1.5–2 mm, 7–9-veined, back smooth and glossy or pubescent, membranous margins very broad; palea ovate, slightly shorter than lemma, back appressed pubescent or marginal hairs spreading and fringing keels, keels almost wingless, glabrous. Anthers ca. 0.4 mm. $2n = 10$.

Gardens, cultivated. Fujian, Guizhou, Jiangsu, Taiwan, Zhejiang (Hangzhou Shi) [N Africa, SW Asia, S Europe].

This is a ornamental grass with a delicate panicle of many small, rounded spikelets.

3. *Briza maxima* Linnaeus, Sp. Pl. 1: 70. 1753.

大凌风草 da ling feng cao

Annual. Culms solitary or loosely tufted, erect or geniculate at base, 20–60 cm tall. Leaf sheaths smooth, glabrous; leaf blades thin, 4–20 cm × 3–8 mm, margins scabrid, otherwise smooth, apex acute; ligule 2–5 mm, obtuse. Panicle loose, nodding, 7–10 cm, sparingly branched with few pendant spikelets; branches inserted singly, scaberulous, sometimes with only 1 spikelet; pedicels hairlike, shorter or longer than spikelet, drooping. Spikelets ovate, ca. 1.2 × 1 cm, tinged reddish brown, florets 7–20; lower glume 5–6 mm, 5-veined, upper glume 6–7 mm, 7–9-veined, margins purple or tawny, apex broadly rounded; lemmas very broadly ovate, wider than long, lowest 7–8 mm, 7–9-veined, glabrous or appressed-pubescent; palea obovate, 1/2–2/3 length of lemma, back glabrous, keels pubescent. Anthers ca. 2 mm. $2n = 14$.

Gardens. Frequently cultivated in China [N Africa, S Europe].

This is a very attractive ornamental grass with a panicle of relatively few large spikelets. It is widely cultivated and an established introduction in many warm-temperate countries.

66. *POA* Linnaeus, Sp. Pl. 1: 67. 1753.

早熟禾属 zao shu he shu

Zhu Guanghua (朱光华), Liu Liang (刘亮); Robert J. Soreng, Marina V. Olonova

Annuals or perennials. Culm bases infrequently swollen, or with bulbous sheath bases; new shoots intravaginal or extravaginal, rarely (in China) pseudointravaginal, intravaginal but with reduced or rudimentary lower leaf blades and weakly differentiated prophyll. Uppermost culm leaf sheath closed from 1/20th to entire length; ligule hyaline, membranous or infrequently papery; blade flat, folded, or involute, abaxially keeled, adaxially with 1 groove on either side of the midvein, apex prow-tipped. Inflorescence a terminal panicle; branches 1–9 per node; flowers all bisexual, or mixed bisexual and female (rarely male), with distal female flowers within spikelets, or with partially to wholly female spikelets or inflorescences. Spikelets laterally compressed, florets (1–)2–8(–10), rachilla disarticulating above glumes and between florets, uppermost floret vestigial; vivipary sometimes present; glumes mostly strongly keeled, unequal, or subequal, lower glume 1- or 3-veined, upper glume 3(or 5)-veined; lemmas laterally compressed, usually distinctly keeled, 5(–7)-veined, distal margins and apex membranous, apex awnless, rarely minutely mucronate; floret callus short, truncate, blunt, glabrous or webbed (with a dorsal tuft of woolly hairs), rarely with a line of hairs around base of lemma; palea subequal or infrequently to 2/3 as long as lemma, not gaping, keels green, distinctly separated, usually scabrid, smooth in *Poa* sect. *Micrantherae*, sometimes pilulose to villous, margins usually smooth, glabrous. Lodicules 2. Stamens 3, anthers sometimes vestigial. Ovary glabrous. Caryopsis oblong to fusiform, triangular to oval in cross section, sometimes grooved, free or adhering to the palea. $2n = 14–266$. $x = 7$.

More than 500 species: throughout Arctic and N and S temperate regions and extending to most subtropical and tropical mountains, in habitats such as temperate forests, mountain slopes, grasslands, wetlands, steppes, alpine areas and tundra, deserts, and around human habitation, on acidic to sub-basic or subsaline, dry to wet soils, from sea level to the upper limits of vegetation; 81 species (14 endemic, at least one introduced) in China.

Poa includes many species useful and important for forage, soil stabilization, and lawns, and several widespread weeds. Five of six recognized subgenera are present in China. (1) *Poa* subg. *Arctopoa*: stout plants with thick rhizomes, scabrid to ciliate lemma margins, and glabrous calluses, found in subsaline to subalkaline wetlands. (2) *Poa* subg. *Ochlopoa*: plants with bulbous sheathed culm bases (spikelets then often viviparous), or if not bulbous then commonly quite smooth throughout, with shortly villous palea keels and no callus hairs, sometimes annuals. (3) *Poa* subg. *Pseudopoa*: slender annuals with scabrid-angled panicle branches, shortish glumes, uppermost culm sheaths closed for 1/15–1/10 their length, glabrous calluses, and scabrid rachillas. (4) *Poa* subg. *Poa*: the largest and most diverse subgenus, including annuals and perennials, with or without rhizomes, but generally with the uppermost culm sheaths closed for over 1/4 their length. (5) *Poa* subg. *Stenopoa*: commonly tufted perennials generally with the uppermost culm sheaths closed for only 1/15–1/5(–1/4) their length, with mainly extravaginal shoots, mostly without rhizomes, mostly with panicle branches that are scabrid angled from the base, and with 3-veined first glumes.

Some species have races with florets that develop into bulbils that can readily send down roots as soon as they drop from the inflorescence (i.e., they are viviparous). Viviparous spikelets often have fairly normal-looking proximal florets. Pubescence on the lemmas and calluses of such florets is often poorly developed relative to that in normal spikelets, or absent. Identification is easiest with plants having normal spikelets.

Hybridization and facultative apomixis are common in some subgenera, especially *Poa* subg. *Poa* and *P.* subg. *Stenopoa*, and the vast majority of species studied are polyploid.

- 1a. Lemma margins scabrid to long ciliate, or at least between lower margin and marginal vein; glumes often ciliolate on lower margins; plants robust with long thick rhizomes; butts of some old basal sheaths retrorsely strigose, hairs 0.1–0.2 mm 1. *P.* subg. *Arctopoa* (species nos. 1–3)
- 1b. Lemma margins smooth or sparsely scabrid; glumes never ciliolate on margins; rhizomes present or absent; butts of old basal sheaths glabrous, infrequently finely strigose in *P.* subg. *Stenopoa*, hairs to 0.05 mm.
 - 2a. Culms with bulbous bases due to basally swollen sheaths; spikelets frequently viviparous 2. *P.* subg. *Ochlopoa* (*P.* sect. *Arenariae*: species nos. 5–7)
 - 2b. Culms without basally swollen sheaths (rarely culm base swollen); spikelets infrequently viviparous.
 - 3a. Palea keels smooth, pubescent; panicle branches smooth 2. *P.* subg. *Ochlopoa* (*P.* sect. *Micrantherae*: species nos. 8–11)
 - 3b. Palea keels usually scabrid, glabrous or pubescent, if smooth then panicle branches scabrid; if pubescent then with 1 or more hooks near apex.
 - 4a. Panicle branches in distinct whorls; annuals; lower glume 1-veined, much shorter than adjacent lemma 3. *P.* subg. *Pseudopoa* (species no. 12)
 - 4b. Panicle branches not clearly whorled; perennials or infrequently annual; lower glume 1- or 3-veined, subequal to or longer than adjacent lemma.
 - 5a. Uppermost culm sheath closed for less than 1/4 of length; shoots extravaginal; rhizomes usually absent; panicle branches scabrid; lower glume 3-veined 5. *P.* subg. *Stenopoa* (species nos. 64, 66–81)
 - 5b. Uppermost culm sheath closed for ca. 1/4 of length to near top; shoots intravaginal and/or extravaginal; rhizomes sometimes present; panicle branches smooth or scabrid; lower glume 1- or 3-veined.
 - 6a. Leaf blades 1–4 mm wide, mostly shorter than 10 cm; lemmas densely villous on keel and marginal veins, appressed short villous between veins; palea keels shortly villous; plant less than 40 cm, forming dense tufts; callus web absent in Chinese species 2. *P.* subg. *Ochlopoa* (*P.* sect. *Alpinae*: species no. 4)
 - 6b. Leaf blades 1–10 mm wide, some often over 10 cm; lemmas glabrous or pubescent; palea keels glabrous or pubescent; plant up to 120 cm, forming loose or dense tufts; callus web present or absent.
 - 7a. Palea keels with minute, smooth to apiculate bumps, without distinctly hooked prickles; hairs, glabrous; lemmas pubescent on keel, otherwise glabrous; callus long webbed; ligule acuminate; lower glume 1-veined, often sickle-shaped 5. *P.* subg. *Stenopoa* (*P.* sect. *Pandemos*: species no. 65)
 - 7b. Palea keels with hooked prickles, glabrous or pubescent between keels; lemmas glabrous or variously pubescent; callus webbed or not; ligule truncate to acuminate; lower glume 1- or 3-veined, usually not sickle-shaped 4. *P.* subg. *Poa* (species nos. 13–63)

1. *Poa* subg. *Arctopoa* (Grisebach) Probatova, Novosti Sist. Vyssh. Rast. 8: 34. 1971.

类早熟禾亚属 *lei zao shu he ya shu*

Zhu Guanghua (朱光华), Liu Liang (刘亮); Robert J. Soreng

Glyceria sect. *Arctopoa* Grisebach in Ledebour, Fl. Ross. 4: 392. 1852; *Arctopoa* (Grisebach) Probatova.

Perennials, stoutly rhizomatous; shoots mostly extravaginal. Culms stout, mostly 2–4 mm in diam., smooth. Lowermost leaf sheath retrorsely strigose at base, uppermost sheaths closed 1/6–1/3 of length; blade grayish green, flat, folded, or involute, papery, 2–8 mm wide, abaxially smooth, adaxially nearly smooth to densely scabrid along prominent veins, apex slender prow-tipped; ligule white or off white to brownish or yellowish, membranous-papery. Panicle contracted or open; branches stout; vivipary absent; rachilla smooth or scabrid. Glume veins prominent, margins smooth or scabrid to ciliate or villous, elsewhere smooth, lower glume 1- or 3-veined; lemmas 5–7-veined, veins faint, abaxial surface smooth or scabrid, glabrous or keel and marginal veins villous, outer margins scabrid to ciliate in part; callus obliquely angled, obtuse or pointed, glabrous or nearly so, or with sinuous hairs around the base of the lemma (*P. eminens*); palea scabrid, keels medially hairy, distally scabrid. Anthers 1.6–3.1 mm.

Four or five species: C to E Asia and North America, in high alpine areas to steppes and taiga, and on subarctic sea coasts, generally on sub-saline, subalkaline, or saline moist to wet ground; three species in China.

The Chinese species all belong to *Poa* sect. *Aphydris* (Grisebach) Tzvelev. *Poa eminens* C. Presl, the only member of *P.* sect. *Arctopoa* (Grisebach) Tzvelev, was reported for Heilongjiang and Nei Mongol in FRPS 9(2): 93. 2002). We have seen no vouchers from China, and the distribution seems improbable given its otherwise strictly coastal and generally more northern distribution. However, it might yet be found in the upper Tumen River delta.

The lower and middle margins of the lemma are distinctly scabrid to long ciliate, unlike other *Poa* species. DNA data suggest the subgenus arose from hybridization between an ancient lineage of *Poa* and an ancient lineage outside the genus that today includes *Arctophila* (Ruprecht) Andersson and *Dupontia* R. Brown, and it could alternatively be recognized as a separate genus, *Arctopoa*.

- 1a. Callus usually with a crown of sinuous hairs to 2 mm long, slightly pointed; lemmas membranous-papery, glumes subequal to lowest lemma, lateral veins prominent; plants of coastal habitats (*P.* sect. *Arctopoa*) *P. eminens* (see note above)
- 1b. Callus glabrous, blunt; lemmas ± papery; glumes generally distinctly shorter than lowest lemma, lateral veins indistinct at least on lower glumes; plants of inland habitats (*P.* sect. *Aphydris*).
 - 2a. Panicle branches smooth; panicle contracted, branches erect 2. *P. tibetica*
 - 2b. Panicle branches scabrid angled; panicle open or only slightly contracted.
 - 3a. Lemma keels glabrous or sparsely pilulose near base; panicle open 1. *P. subfastigiata*
 - 3b. Lemma keels villous; panicle slightly contracted or open 3. *P. ×schischkinii*

1. *Poa subfastigiata* Trinius in Ledebour, Fl. Altaic. 1: 96. 1829.

散穗早熟禾 *san sui zao shu he*

Arctopoa subfastigiata (Trinius) Probatova; *Glyceria subfastigiata* (Trinius) Grisebach.

Perennials, rhizome stout, 2–3 mm in diam.; shoots mainly extravaginal. Culms erect, (30–)50–115 cm tall, 2–4 mm in diam., smooth, nodes 2 or 3, none or 1 exserted, base enclosed by withered fibrous sheaths. Leaf sheaths loose, smooth, 6–20 cm, several × as long as blade, uppermost closed for 1/6–1/4 of length; blade grayish green, flat or folded, papery, 4–20(–50) cm, 2–8 mm wide, abaxially smooth, adaxially scabrid along the prominent veins, apex slender prow-tipped; ligule white or off-white, 1.5–4 mm, abaxially scabrid, apex truncate, ciliate, collar margins ciliate or glabrous. Panicle open, well exserted, (6.5–)10–35 × 10–32 cm; branches widely spreading, strict, 2–5 per node, stout, scabrid angled, longest (5–)10–20 cm, divaricately branching in distal 1/2, with spikelets in distal 1/4. Spikelets ovate to lanceolate, purple or tawny, (5–)6–10 mm, florets 3–5; glumes narrowly to broadly lanceolate, keel scabrid, lower glume 3–4 mm, 1- or 3-veined, upper glume 4–5 mm, 3-veined, margins smooth or proximally sparsely scabrid to ciliate; lemmas broadly lanceolate, 4–5.5(–6) mm, glabrous throughout or base minutely hairy, intermediate veins indistinct, margins sometimes sparsely scabrid or ciliate; callus glabrous; palea proximally scabrid to pilulose between keels, keels distally scabrid, medially ciliate, pilulose or villous. Anthers 1.6–2.6(–3) mm. Fl. and fr. Jun–Jul. $2n = 28, 42, 91, 97$.

Desert lake-basins, steppe wetlands, moist grassy places on river shores, saline sandy places, meadows. Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai [Mongolia, Russia (Far East, Siberia)].

This species has spikelets up to 1 cm long, effuse panicles up to 32 cm wide, glabrous lemmas, a glabrous callus, and a thick and well-developed rhizome. It is a forage species used for soil stabilization in arid regions.

2. *Poa tibetica* Munro ex Stapf in J. D. Hooker, Fl. Brit. India 7: 339. 1896 [“1897”].

西藏早熟禾 *xi zang zao shu he*

Poa chushualana Rajeshwari et al.; *P. spiciformis* D. F. Cui (2001), not (Steudel) Hauman & Parodi (1929).

Perennials, stoutly rhizomatous or stoloniferous; shoots mainly extravaginal. Culms erect or obliquely ascending (or geniculate), (15–)20–60(–90) cm tall, 2–3 mm in diam., smooth, glabrous, nodes 1 or 2 in lower part, sometimes 1 exserted, base enclosed in withered fibrous sheaths. Leaf sheaths of culm smooth, uppermost closed for 1/4–1/3 of length, of tillers smooth and glabrous or infrequently densely retrorsely scabrid to hispidulous; blade grayish green, flat, folded, or involute, papery, 3.5–12.5 cm, (1–)2–5 mm wide, abaxial surface smooth, adaxial surface with scabrid margins and veins, apex slender prow-tipped, somewhat pungent, blades of tillers 12–18(–35) cm, surfaces glabrous (or pubescent); ligule white or off-white, brownish to yellowish, firmly membranous, 1–2(–5.5) mm, abaxially scabrid, apex rounded, ciliate, sometimes irregularly dentate. Panicle contracted to spikelike, often interrupted, 5–13 × 1–2(–3) cm; branches erect or steeply ascending, strict, (1–)2–4(–5) per node, rounded, smooth, longest 1–5 cm with spikelets from base or in distal 1/2–3/4. Spikelets pale green, sometimes purple, (4–)5–8(–9) mm, florets 3–6(–8); vivipary absent; rachilla internodes 0.5–1.5 mm, smooth or scabrid; glumes smooth except for a few hooks on the upper part of keel, margins smooth or faintly to prominently scabrid, proximally ciliate or villous, lower glume 2.5–4.6 mm, narrow, 1- or 3-veined, upper glume 3.5–6 mm, 3-veined; lemmas broadly lanceolate, 3.8–5.7 mm, apex and margins ± membranous, sometimes minutely mucronate, lower half of keel and marginal veins villous, upper part nearly smooth to closely scabrid, intermediate veins indistinct; callus glabrous or with 1 to several hairs, these straight, to 1.5 mm; palea smooth or scabrid between keels, keels ciliate, medially pilulose or villous, distally scabrid. Anthers 2–3.1 mm. Fl. and fr. Jul–Sep.

Marshy meadows, riversides, lake banks, grassy places, ditch banks, saline meadows, saline moist places; 3000–4500 m. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [N India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia), Tajikistan; SW Asia (Iran)].

This is a stout species with well-developed, thick rhizomes, contracted to spikelike panicles, sparsely long villous lemma keel and margins, and usually a glabrous callus. The types of *Poa chushualana*, *P. stenostachya*, and *P. spiciformis* have not been seen, but their descriptions fit within the variation of this species, though they cannot all be placed to variety reliably. *Poa chushualana*, from Kashmir, just W of the Xizang border, is said to differ by its stoloniferous form, geniculate culm bases, and leaf blades 1–3 mm wide with pubescent surfaces. *Poa tibetica* s.l. needs detailed study. Some gatherings from China might be *P. tianschanica*. The exact identity of *P. tianschanica* is problematic and the Chinese material could prove to be a robust form of *P. pratensis* or the product of past hybridization with that species.

- 1a. Spikelets narrowly elliptical, 6.6–8.2 mm;
lemmas 5.3–5.7 mm 2a. var. *aristulata*
1b. Spikelets ovate to elliptical, 5–5.5 mm;
lemmas 4–4.5 mm 2b. var. *tibetica*

2a. *Poa tibetica* var. *aristulata* Stapf in J. D. Hooker, Fl. Brit. India 7: 339. 1896 [“1897”].

芒柱早熟禾 mang zhu zao shu he

Poa pseudotibetica Noltie.

Culms stout, to 45 cm tall, smooth, leafy in lower 1/2–2/3. Blade 4–16 cm; ligule 1.5–5.5 mm, apex subacute, irregularly dentate. Panicle contracted, up to 9 cm. Spikelets narrowly elliptical, 6.6–8.2 mm, florets 3 or 4; vivipary absent; lower glume 4–4.6 × 1.5–1.7 mm, upper glume 4.8–6 × 2–2.4 mm; lemmas 5.3–5.7 mm, firmer, long acute. Anthers 2.2–3.1 mm.

Marshy meadows at high elevations. Xinjiang, Xizang [India (Sikkim)].

Plants of the S Xizang-Qinghai Plateau have been treated as a separate species, *Poa pseudotibetica*, but no clean break was noticed between this and more northern material.

2b. *Poa tibetica* var. *tibetica*

西藏早熟禾(原变种) xi zang zao shu he (yuan bian zhong)

Poa ciliatiflora Roshevitz; *P. stenostachya* S. L. Lu & X. F. Lu (2001), not R. Brown (1810); *P. stenostachya* var. *koko-norica* S. L. Lu & X. F. Lu.

Culms erect or obliquely ascending, 20–60 cm tall. Leaf blade 4–7 cm, of tillers 12–18 cm; ligule membranous, 1–2 (–3.5) mm, apex rounded. Panicle contracted to spikelike, 5–10 cm. Spikelets ovate to elliptical, 5–5.5 mm, florets 3–5; lower glume 2.5–3.5 mm, narrow, upper glume 3.5–5 mm; lemmas 4–

4.5 mm, a little thinner and subacute. Anthers ca. 2 mm. Fl. and fr. Jul–Sep. $2n = 42$.

Marshy meadows, riversides, lake banks, grassy places, ditch banks, saline meadows, saline moist places; 3000–4500 m. Gansu, Nei Mongol, Qinghai, Xinjiang, W Xizang [NW India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia), Tajikistan; SW Asia (Iran)].

Poa stenostachya seems to differ from *P. tibetica* var. *tibetica* only in its longer ligules, 3–3.5 mm.

3. *Poa* × *schischkinii* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 32. 1974, pro sp.

希斯肯早熟禾 xi si ken zao shu he

Arctopoa × *schischkinii* (Tzvelev) Probatova.

Perennials, stoutly rhizomatous; shoots extravaginal. Culms stout, erect, simple, 25–40 (–60) cm tall, 2–3 mm in diam., smooth, nodes 2 or 3, sometimes 1 exerted, base enclosed by withered fibrous sheaths. Leaf sheaths loose, smooth, 6–20 cm, several × longer than its blade, basal ones strigose near the nodes only, uppermost closed for 1/6–1/4 length; blade grayish green, flat or folded, papery, 4–20 (–50) cm, 2–8 mm wide, abaxially smooth, adaxially scabrid along the prominent veins, apex slender prow-tipped; ligule white or off-white, 1.5–3 mm, abaxially scabrid, apex truncate, ciliate, collar margins ciliate or glabrous. Panicle open, diffuse, 10–20 × 10–15 cm; branches spreading widely, strict, 2–5 per node, stout, angular, scabrid, longest (5–)10–20 cm, branching divaricately in distal 1/2, with spikelets in distal 1/4. Spikelets oblong to lanceolate, 5–7 mm; vivipary absent; glumes narrowly to broadly lanceolate, 3–4 mm, keel scabrid, surface smooth, lower glume slightly shorter, 1 (or 3)-veined, proximally ciliate or villous, distally smooth or margins scabrid; lemmas ca. 5 mm, keel and marginal veins proximally densely villous; callus glabrous; palea proximally scabrid to pilulose between keels, keels medially ciliate, pilulose or villous. Anthers ca. 2.2 mm. Fl. and fr. Jul–Aug.

Sporadic in steppe grasslands on middle to high mountains, saline wet meadows. Nei Mongol, Qinghai, Xinjiang (Altay) [Mongolia, Russia (Siberia)].

Tzvelev (Zlaki SSSR, 1976) suggested that *Poa* × *schischkinii* is a hybrid between *P. tibetica* and *P. subfastigiata*. The sporadic occurrence of intermediate forms suggests that these may represent remnants of a series of hybrids or introgressed plants between parents that are no longer or only sporadically in contact.

2. *Poa* subg. *Ochlopoa* (Ascherson & Graebner) Hylander, Bot. Not. 1953: 354. 1953.

黄褐早熟禾亚属 huang he zao shu he ya shu

Zhu Guanghua (朱光华), Liu Liang (刘亮); Robert J. Soreng

Poa sect. *Ochlopoa* Ascherson & Graebner, Syn. Mitteleur. Fl. 2: 387. 1900; *Ochlopoa* (Ascherson & Graebner) H. Scholz.

Annuals or perennials, tufted, not rhizomatous, sometimes stoloniferous in *Poa* sect. *Micrantherae*; shoots with or without bulbous bases. Culm bases bulbous or not. Uppermost leaf sheaths smooth, closed for ca. 1/4 length; blade flat or folded, papery to thickly papery; ligule membranous. Panicle open or somewhat contracted; branches smooth or scabrid; spikelets compact; vivipary present (frequent in *P.* sect. *Arenariae*) or absent; glumes usually 3-veined. Anthers 0.2–2 mm.

Thirty species: worldwide, mostly in N Africa, C and SW Asia, and Europe, in habitats such as temperate forests, steppes, alpine areas, and disturbed places, on moist to dry ground; eight species in China.

The Chinese species belong to three sections: *Poa* sect. *Alpinae* (Hegetschweiler ex Nyman) Stapf (species no. 4); *P.* sect. *Arenariae* (Hegetschweiler ex Nyman) Stapf (species nos. 5–7); and *P.* sect. *Micrantherae* Stapf (*Poa* sect. *Ochlopoa*; species nos. 8–11).

- 1a. Culms with bulbous bases due to basally swollen sheaths; spikelets frequently viviparous (*P.* sect. *Arenariae*).
 - 2a. Lemma entirely glabrous; plants of mountain slopes and meadows 5. *P. bactriana*
 - 2b. Lemma somewhat pilulose to villous in lower part of the veins (if spikelets viviparous, the pubescence is retained only on a few of the least modified lemmas or is absent); plants from lower (hilly steppe) regions and plains.
 - 3a. Plants usually over 15 cm tall; ligules of tillers usually hyaline or slightly milky-white, 1/15–1/7(–1/5) as long as blade; panicle 2–8 cm 6. *P. bulbosa*
 - 3b. Plants (3–)5–15(–20) cm tall; ligules of tillers white, 2–5 mm long, usually 1/5–1/2 as long as blade; panicle 0.8–2.3 cm 7. *P. timoleontis*
- 1b. Culms without basally swollen sheaths (rarely culm base swollen); spikelets infrequently viviparous.
 - 4a. Palea keels usually scabrid; panicle branches smooth or distally sparsely scabrid (*P.* sect. *Alpinae*) 4. *P. alpina*
 - 4b. Palea keels smooth; panicle branches smooth (*P.* sect. *Micrantherae*).
 - 5a. Anthers 0.2–1 mm; annuals; lemma with intermediate veins pubescent (rarely the whole lemma glabrous), area between veins glabrous.
 - 6a. Anthers 0.6–1 mm, more than 1.5 × longer than wide; panicle branches ascending to widely spreading or reflexed 8. *P. annua*
 - 6b. Anthers 0.2–0.5 mm, not more than 1.5 × longer than wide; panicle branches ascending 9. *P. infirma*
 - 5b. Anthers 1.2–3.5 mm; perennials; lemma with intermediate veins glabrous or pubescent, area between veins glabrous or pubescent.
 - 7a. Palea keels shortly villous, smooth; lemmas glabrous between veins; anthers (1.2–)1.5–1.8(–2.5) mm 10. *P. supina*
 - 7b. Palea keels glabrous, scabrid; lemmas sparsely pubescent or glabrous between veins; anthers 1.7–3.25 mm 11. *P. veresczaginii*

4. *Poa alpina* Linnaeus, Sp. Pl. 1: 67. 1753.

高山早熟禾 gao shan zao shu he

Perennials, densely tufted; shoots intravaginal. Culms erect or obliquely ascending, (5–)10–30(–45) cm tall, usually several per tuft, smooth, nodes often 2, 1 exserted. Leaf sheath smooth, glabrous, 2 or more × as long as blade, basal ones persistent, investing culm bases, uppermost closed for 1/4 length; ligule white, 2–4(–5) mm, abaxially smooth, of tillers 1–2 cm long; blade grayish green, flat or folded, thickly papery, withering, 3–10(–16) cm, 2–6 mm wide, surfaces glabrous, margins smooth or sparsely scabrid, apex prow-tipped. Panicle loosely contracted to open, ovoid to oblong (pyramidal at anthesis), 2–7 × 2–3 cm, purple tinged; branches ascending to spreading, 2 per node, rounded, smooth or distally sparsely scabrid, longest 2(–3) cm, divaricately rebranched with moderately crowded spikelets in distal 1/2. Spikelets broadly ovate, 4–8 mm, florets 3–5(–7); vivipary absent in China; rachilla internodes ca. 0.5 mm, smooth, glabrous (rarely slightly pilulose); glumes broadly ovate, membranous-papery, subequal, faintly 3-veined, keel arched, scabrid, surfaces smooth, margins membranous, smooth, apex acute, lower glume 2.5–3(–4) mm, upper glume 3.4–4.5 mm; lemmas broadly ovate, membranous-papery, apex and margins broadly membranous, keel arched, keel villous for 2/3 of length, marginal veins for 1/2 length, intermediate veins indistinct, area between veins pilulose to short villous; callus glabrous; palea glabrous or proximally infrequently pilulose between keels, keels scabrid, often medially pilulose to shortly villous. Anthers 1.2–2 mm. Fl. and fr. Jul–Sep. *2n* = 22, 28, 32, 33, 34, 35, 42, 44, 58.

Low arctic to subalpine meadows, sporadic in taiga, slopes, crevices along ditch banks, sandy places; 2400–3800 m. Qinghai, Xinjiang,

Xizang [Afghanistan, India, Japan, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan; SW Asia (Iran), Europe, North America].

This species has spikelets broadly ovate, lower glumes 3-veined, lemma proximally pubescent between veins, callus glabrous, old sheaths persistent and closely overlapping, anthers more than 1.2 mm, and palea keels shortly villous, together making it quite distinct from other species. Gatherings from arctic regions and European mountains are often viviparous, but such plants have not been recorded from China.

5. *Poa bactriana* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 93. 1923.

荒漠早熟禾 huang mo zao shu he

Perennials, densely tufted; shoots with bulbous bases. Culms (2–)8–60 cm tall, erect, base with swollen, withered leaf sheaths. Leaf sheath smooth, glabrous, uppermost culm sheath closed for 1/4 length; blade flat or folded, thin, 2–15 cm, 1–3 mm wide, surfaces and margins scabrid, apex slender prow-tipped; ligules 1.5–3 mm, apex obtuse, rounded, of tillers 0.7–1.5 mm. Panicle loosely contracted to open, oblong to pyramidal, well exserted, 2–10 cm; branches obliquely ascending or spreading, 2–3(–4) per node, smooth, longest with sparse to moderately crowded spikelets. Spikelets green or apices purple, ovate to elliptic, (3–)4–7 mm, florets 2–4(–6); vivipary present or absent; glumes unequal, lower glume 2–3 mm, 1-veined, upper glume wider, 3–3.5 mm, 3-veined; lemmas elliptic to lanceolate, 2–3.5(–4) mm, veins glabrous throughout, keel and marginal veins scabrid; callus glabrous; palea keels scabrid. Anthers (0.6–)1.2–2 mm. Fl. and fr. Apr–May.

Juniperus forests, among shrubs, mountainous areas, dry grassy places on slopes, stony and silty slopes, desert grasslands; 400–4000 m. Xinjiang, Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

This species is uncommon or rare in the mountains of far W and NW China.

- 1a. Panicle loosely contracted; normal lemmas 2.7–3.2 mm; spikelets viviparous in China 5a. subsp. *bactriana*
- 1b. Panicle fairly diffuse; lemmas 2–2.7 mm; spikelets normal flowered in China 5b. subsp. *glabriflora*

5a. *Poa bactriana* subsp. *bactriana*

荒漠早熟禾(原亚种) huang mo zao shu he (yuan ya zhong)

Culms 20–60 cm. Leaf blade 2–15 cm × 1–3.5 mm, surfaces and margins scabrid. Panicle loosely contracted, oblong, sometimes lobed, usually well exerted, 3–10 cm. Spikelets green or tips purple, (3–)4–7 mm, florets 2–4(–6); vivipary present in most spikelets; glumes unequal, lower glume 2–3 mm, 1-veined, upper glume wider, 3–3.5 mm, 3-veined; lemmas elliptic to lanceolate, 2.7–3.2 mm, abaxial surface glabrous, keel and marginal veins scabrid. Anthers 1.2–1.8 mm. Fl. and fr. Apr–May.

Mountainous areas, desert grasslands; 400–2700 m. Xinjiang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan].

The Chinese material all belongs to var. *vivipara* Tzvelev (Novosti Sist. Vyssh. Rast. 10: 96. 1973).

5b. *Poa bactriana* subsp. *glabriflora* (Roshevitz) Tzvelev, Novosti Sist. Vyssh. Rast. 10: 96. 1973.

光滑早熟禾 guang hua zao shu he

Poa bulbosa Linnaeus var. *glabriflora* Roshevitz, Fl. Turkm. 1: 143. 1932; *P. bactriana* subsp. *zaprjagajevii* (Ovczinnikov) Tzvelev; *P. glabriflora* (Roshevitz) Roshevitz ex Ovczinnikov; *P. scitula* Bor; *P. zaprjagajevii* Ovczinnikov.

Culms (2–)8–40 cm. Leaf blade ca. 2 cm × 0.5–2 mm, surfaces scabrid, in tillers flat or folded with margins inrolled or not, elongated, narrower. Panicle oblong to lanceolate, fairly diffuse, 2.5–10 × 1–2 cm. Spikelets tawny, purple tinged, ca. 4 mm; vivipary commonly present, or absent (in Chinese material); glumes, lower glume ca. 1.5 mm, upper glume ca. 2 mm; lemmas 2–2.7 mm, keel and veins only slightly scabrid, otherwise glabrous. Anthers 0.6–1.2(–1.5) mm. Fl. and fr. May–Jul.

Middle and upper mountain zones, dry grassy places on slopes, stony and silty slopes; 2400–4000 m. ?Xinjiang, Xizang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

The distinction between subsp. *zaprjagajevii* and subsp. *glabriflora* is between plants from alpine habitats with distinctly purple, open panicles, sparsely scabrid branches with only a few spikelets (subsp. *zaprjagajevii*), and plants from middle mountains with pale green or pinkish violet tinged, loosely contracted panicles with several (often viviparous) spikelets (subsp. *glabriflora*). From the limited material seen we doubt the value of keeping them apart. *Poa scitula* Bor is an excellent match for subsp. *zaprjagajevii*.

Poa (sect. *Arenariae*) *vvedenskyi* Drobow was reported in FRPS (9(2): 224. 2002) from alpine grassy places at ca. 3000 m in Xinjiang, but no voucher has been seen by us and it is probably not present in China. Tzvelev (Zlaki SSSR, 451. 1976) wrote that *P. vvedenskyi* is

endemic to the Uzbekistan Chulbair Range of the Gissar Mountains and adjacent Afghanistan as reported by Bor (in Rechinger, Fl. Iran. 70: 28. 1970). The report in FRPS from Xinjiang more likely represents *P. bactriana* subsp. *glabriflora* or (if separated) subsp. *zaprjagajevii*. *Poa vvedenskyi* can be distinguished from normal-flowered plants of *P. bactriana* by the pubescent lemmas, and from normal-flowered plants of *P. bulbosa* by having panicles sparse, with almost smooth branches, bearing 1–3 spikelets each; lemmas lanceolate, 3–5 mm, pinkish violet, apex gradually tapering, slightly pilose along veins proximally; spikelets always normal-flowered; alpine plants, 10–15 cm tall.

6. *Poa bulbosa* Linnaeus, Sp. Pl. 1: 70. 1753.

鳞茎早熟禾 lin jing zao shu he

Perennials, densely tufted; shoots with bulbous bases. Culms erect or geniculate ascending, (9–)15–55 cm tall, base with bulbous withered leaf sheaths, nodes 2 or 3, exerted. Leaf sheath smooth, uppermost culm sheath closed for 1/4 of length, tiller sheaths usually less than 1/15–1/7(–1/5) length of blades; blades flat or folded, thin, soon withering, mostly basal, 2–10 cm, 0.5–2(–2.5) mm wide, surfaces smooth, margins scabrid, not cartilaginous; ligule hyaline or milky-white, 1–2(–3.5) mm, apex acuminate. Panicle contracted (looser in viviparous inflorescences), oblong to ovate, 2–8 cm; branches obliquely ascending, 2–4 per node, scabrid, longest to 2 cm. Spikelets purple tinged, 3.5–5(–7.5) mm, florets 2–6 (when normal); vivipary commonly present; rachilla smooth, glabrous; glumes subequal, ovate, 3-veined, 2–3 mm, keel sparsely scabrid; lemmas normal or viviparous, lower 1 or 2 normal, (2.5–)3–3.5 mm, apex acute, keel villous to 2/3 of length, marginal veins to 1/2, area between veins glabrous, often glabrous throughout in viviparous spikelets; callus webbed, hairs moderately dense, commonly glabrous in viviparous spikelets; palea keels scabrid. Anthers (1–)1.4–1.6 mm, usually abortive in viviparous spikelets. Fl. and fr. May–Jul. $2n = 14, 28, 39, 42, 45$.

Plains, sandstone slopes, desert grasslands, river shores, wastelands near fruit gardens; 700–4700 m. Xinjiang, Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia (Siberia), Tajikistan, Turkmenistan, Uzbekistan; Africa, SW Asia, Europe; introduced in Australia, New Zealand, North and South America, and Pacific Islands].

This widespread and weedy species is probably introduced in China. It is a useful spring forage. It is readily recognizable by the bulbous sheathed bases of the shoots and common occurrence of vivipary. FRPS (9(2): 212. 2002) reported viviparous material of *Poa sinaica* Steudel from Qinghai and Xinjiang, but this normally non-viviparous species is unlikely to be present in China. It occurs from SW Asia to Afghanistan and W Pakistan. Normal-flowered material is needed to see the key distinctions of lemma length (3.5–4.5 mm) and glabrous calluses. The Chinese material seems a better match for *P. bulbosa*, and we conclude that *P. sinaica* does not occur in China.

- 1a. Viviparous spikelets present 6c. subsp. *vivipara*
- 1b. Viviparous spikelets absent.
 - 2a. Callus with a tuft of long sinuate hair on dorsal surface 6a. subsp. *bulbosa*
 - 2b. Callus glabrous; pubescence of lemma less dense, sometimes almost glabrous 6b. subsp. *nevskii*

6a. *Poa bulbosa* subsp. *bulbosa*

鳞茎早熟禾(原亚种) lin jing zao shu he (yuan ya zhong)

Poa psammophila Schur.

Culms (9–)15–40 cm tall. Spikelets normal flowered, vivipary absent; lemmas 3–3.5 mm, apex acuminate, lower keel and marginal veins villous; callus webbed. Anthers (1–)1.4–1.6 mm. $2n = 42$.

Plains, sandstone slopes, desert grasslands; 700–4700 m. Xinjiang [Afghanistan, Pakistan (rare), Russia (European part), Turkmenistan (rare); SW Asia, Europe; introduced in North America].

This subspecies was reported from China in FRPS (9(2): 223. 2002, as var. *bulbosa*) and Fl. Xinjiang. (6: 84. 1996), but these records have not yet been confirmed by us.

6b. *Poa bulbosa* subsp. *nevskii* (Roshevitz ex Ovczinnikov) Tzvelev, Novosti Sist. Vyssh. Rast. 10: 95. 1973.

尼氏早熟禾 ni shi zao shu he

Poa nevskii Roshevitz ex Ovczinnikov, Izv. Tadz. Bazy Akad. Nauk SSSR 1: 10. 1933.

Culms 35–60 cm tall. Leaf blade 2–2.5 mm wide, narrower in tillers. Vivipary absent; lemmas 2.5–3.5 mm, keel and marginal veins sparsely shortly villous or glabrous throughout; callus glabrous. Anthers ca. 2 mm. Fl. and fr. May–Jun.

Grassy places on slopes; 3000–4000 m. Xinjiang [Tajikistan, Turkmenistan, Uzbekistan].

This subspecies was reported from Xinjiang in FRPS (9(2): 224. 2002, as *P. nevskii*), but not in Fl. Xinjiang. (6, 1996). The presence of this taxon in China has not been confirmed by us.

6c. *Poa bulbosa* subsp. *vivipara* (Koeler) Arcangeli, Comp. Fl. Ital. 785. 1882.

胎生鳞茎早熟禾 tai sheng lin jing zao shu he

Poa bulbosa var. *vivipara* Koeler, Descr. Gram. 189. 1802; *P. desertorum* Trinius; *P. crispa* Thuillier.

Culms 15–55 cm tall. All or most spikelets viviparous; lemmas 3–4 mm, glabrous or basal 1 or 2 pubescent; distal florets viviparous, forming bulbils, bulbil lemmas becoming swollen and purple at base, apex elongated and developing a blade; callus glabrous or webbed. Anthers occasionally well developed in proximal floret. $2n = 21, 28, 39, 42$.

River shores, wastelands near fruit gardens, desert grasslands; 700–4300 m. Xinjiang, Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia (Siberia), Tajikistan, Turkmenistan, Uzbekistan; Africa, SW Asia, Europe; introduced in Australia, North and South America, and Pacific Islands].

Pubescence is often poorly developed or absent in proximal florets of viviparous spikelets.

7. *Poa timoleontis* Heldrich ex Boissier var. *dshilgensis* (Roshevitz) Tzvelev, Novosti Sist. Vyssh. Rast. 10: 94. 1973.

季莠早熟禾 ji gen zao shu he

Poa dshilgensis Roshevitz in Komarov, Fl. URSS 2: 377. 1934.

Perennials, densely tufted; shoots with bulbous bases. Culms 2–10(–19) cm tall, densely tufted, smooth. Leaf sheath margins hyaline, basal culm sheaths persistent, uppermost closed for 1/4 of length; blades folded, thin, 1–2 cm × 0.5–1

(–2.5) mm, surfaces scabrid, margins scabrid; ligules of tillers white, (2–)3–6 mm, 1/5–1/2 as long as blade. Panicle loosely contracted, oblong, compact, 0.8–2.3 cm; branches purplish violet, 1–3 per node, longest 0.5–1.5 cm. Spikelets 4–10 mm (2.5–4 mm in normal spikelets), florets 3–7; vivipary present in all or most spikelets; rachilla smooth, glabrous; glumes subequal, lower glume ca. 2 mm, upper glume ca. 2.5 mm; lemmas 1.8–2.5 mm, margins membranous, veins indistinct, keel and marginal veins proximally sparsely villous or more commonly glabrous throughout in viviparous spikelets; callus glabrous; palea keels scabrid. Anthers 1–1.5 mm (rarely developed in viviparous spikelets). Fl. and fr. Jun–Aug.

Mountain slopes, grasslands; ca. 2500 m. Xinjiang (Artux) [Afghanistan, Kazakhstan; SW Asia, S Europe].

Normal-flowered *Poa timoleontis* var. *timoleontis* occurs only in the Mediterranean region. The viviparous var. *dshilgensis* is known only from a few C Asian countries and one gathering from China, but we have expanded the circumscription to include taller viviparous plants from SW Asia and Europe; the long, white ligule and dwarf, bulbous-based habit make it readily recognizable. FRPS (9(2): 224–225. 2002) additionally reported viviparous *P. timoleontis* s.s. from China. Bor (in Rechinger, Fl. Iran. 70: 26. 1970) and Tzvelev (Zlaki SSSR, 449. 1976) gave the range of *P. timoleontis* var. *timoleontis* as Greece and SW Asia to Iran. No material from China seen by us matches the taller viviparous form, and it is possible that the material reported in FRPS belongs to *P. bulbosa*. In the former USSR, the viviparous var. *dshilgensis* is known only from the type, from Kazakhstan. Bor gave the range of *P. dshilgensis* as Afghanistan and Tajikistan, but no Russian or Tajikistani Flora has reported it from Tajikistan.

8. *Poa annua* Linnaeus, Sp. Pl. 1: 68. 1753.

早熟禾 zao shu he

Poa annua f. *reptans* (Haussknecht) T. Koyama; *P. annua* var. *reptans* Haussknecht; *P. crassinervis* Honda.

Annuals, sometimes over wintering, infrequently stoloniferous. Culms loosely tufted, erect or oblique, often decumbent, often geniculate, soft, 6–30(–45) cm tall, smooth, nodes 1 or 2(or 3), 1(or 2) exserted. Leaf sheath slightly compressed, thin, smooth, uppermost closed for ca. 1/3 of length; blade light to dark green, flat or folded, thin, 2–12 cm × (0.8–)1–3.5 mm, margins slightly scabrid, apex acutely prow-tipped; ligules 0.6–3 mm, abaxially smooth, glabrous, apex obtuse, margin irregularly dentate, smooth. Panicle open, moderately congested, broadly ovoid to pyramidal, (1–)3–10 cm, as long as wide; branches ascending, spreading, or a few reflexed, 1 or 2(–3) per node, smooth, longest with usually 3–5 spikelets in distal 1/2. Spikelets ovate to oblong, dark to light green, (3–)4–5.5 mm, florets 3–5, distal fertile florets often female; vivipary absent; rachilla internodes 0.5–1.5 mm, smooth, glabrous, hidden or exposed; glumes unequal, smooth or rarely keeled with hooks, lower glume lanceolate and acute to subflabellate and obtuse, 1.5–2(–3) mm, 1-veined, upper glume elliptic, 2–3(–4) mm, 3-veined, the margin angled; lemmas ovate, 2.2–3.5 mm, apex and margins broadly membranous, intermediate veins prominent, keel and marginal, and usually intermediate, veins villous in the lower 1/2, rarely glabrous throughout; callus glabrous; palea keels smooth, densely pilulose to short villous. Anthers 0.6–1 mm, usually at least 2 × as long as wide, or vestigial. Fl. Apr–May, fr. Apr–Jul. $2n = 28$.

Weed of disturbed, often moist and shady ground; near sea level to 4800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Mongolia, Myanmar, Nepal, New Guinea, Pakistan, Russia, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Europe, North and South America, Pacific Islands].

Poa annua is easily distinguished from other short-anthered *Poa*, other than *P. infirma*, by the annual habit, absence of a web on the callus, and the near absence of hooks on the panicle branches and spikelet bracts, in combination with densely pubescent palea keels that lack hooked prickly hairs at the apex. Plants with glabrous florets are sporadically encountered.

Plants perennating by short stolons rooting at the nodes appear to develop repeatedly but sporadically at various elevations with prolonged, cool, mesic growing conditions, possibly in response to trampling. These are sometimes placed in var. *reptans*. Such plants have been recorded from Yunnan.

9. *Poa infirma* Kunth in Humboldt et al., Nov. Gen. Sp. 1: 158. 1816 ["1815"].

低矮早熟禾 di ai zao shu he

Poa annua Linnaeus subsp. *exilis* (Tommasini ex Freyn) Ascherson & Graebner; *P. annua* var. *exilis* Tommasini ex Freyn; *P. exilis* (Tommasini ex Freyn) Murbeck.

Annuals. Culms loosely tufted, erect or oblique, often decumbent, often geniculate, soft, 5–25 cm tall, smooth, nodes 1 or 2(–3), 1(or 2) exserted. Leaf sheaths, thin, smooth, uppermost closed for ca. 1/3 of length; blade light green, flat or folded, thin, 2–8 cm × 1–3 mm, margins smooth or sparsely scabrid, apex acutely prow-tipped; ligule membranous, 1–3 mm, abaxially smooth, glabrous. Panicle open, ovoid-oblong, 2–10 cm, 1–2 × as long as wide; branches ascending, 1–3 per node, smooth, longest usually with 5–9 moderately crowded spikelets in distal 1/2. Spikelets ovate to oblong, light green, 3–4 mm, florets 4–6, distal fertile florets often female; vivipary absent; rachilla internodes 1–1.5 mm, smooth, glabrous, often exposed; glumes unequal, margins broadly membranous, smooth, lower glume lanceolate and acute to subflabellate and obtuse, 1–1.5 mm, 1-veined, upper glume elliptic, margin angled, 1.8–2.5 mm, 3-veined; lemmas ovate, membranous-papery, 2–2.5 mm, keel densely villous, marginal and lateral veins densely villous; callus glabrous; palea keels without hooks, densely pilulose to short-villous. Anthers 0.2–0.5 mm, round to short elliptical, less than 1.5 × as long as wide, or vestigial. Fl. and fr. May–Aug. $2n = 14$.

Sporadic in moist meadows, gardens, sandy places, shady disturbed ground; 1000–2000 m. Fujian, Shanxi, Sichuan, Zhejiang [India, Pakistan, Tajikistan; Africa, SW Asia, Australia, Europe, Japan, New Zealand, North America, Pacific Islands, South America].

Poa infirma differs from *P. annua* in its shorter, more spherical or slightly lozenge-shaped anthers, and diploid chromosome number. It also has more ascending branches with more crowded spikelets.

10. *Poa supina* Schrader, Fl. Germ. 1: 289. 1806.

仰卧早熟禾 yang wo zao shu he

Poa variegata A. Haller, Cat. Pl. Helv. 38. 1800, not Lamarck (1791); *P. annua* Linnaeus var. *supina* (Schrader) Link; *P. supina* subsp. *ustulata* (S. E. Fröhner) Å. Löve & D. Löve; *P. ustulata* S. E. Fröhner.

Perennials, sometimes stoloniferous; shoots mostly extra-vaginal. Culms tufted or isolated, oblique, decumbent at base, frequently geniculate above, soft, (4–)8–20(–30) cm tall, 0.5–0.7 mm in diam., smooth, nodes 1 or 2(–3), 1(or 2) exserted. Leaf sheaths thin, smooth, basal ones drying pale brown and soon withering, enclosing culm bases, uppermost closed for 1/4–1/3 of length, 1.5–5 × longer than blade; blade light green, flat or folded, thin, 2–6 cm × 2–3 mm, surfaces smooth, margins smooth or sparsely scabrid, apex acutely prow-tipped; ligule 0.6–1.5 mm, abaxially smooth, glabrous, apex obtuse. Panicle open to loosely contracted, compactly pyramidal to ovoid, diffuse to moderately congested, (1.5–)2–5 cm, 1–2 × as long as wide; branches ascending to spreading, 1 or 2 per node, rounded, smooth, longest to 2 cm with 2–8 spikelets in distal 1/2. Spikelets ovate to oblong, light green, frequently purple tinged, 3.5–5(–6) mm, florets 3–6, distal fertile florets often female; vivipary absent; rachilla internodes 0.5–0.8 mm, smooth, glabrous; glumes unequal, smooth or sparsely scabrid, membranous-papery, lower glume lanceolate and acute to subflabellate and obtuse, ca. 1.5 mm, 1-veined, upper glume elliptic, 2–2.5 mm, margin angled, 3-veined; lemmas elliptic or oblong to ovate, membranous-papery, 1.4–3.5(–4) mm, keel and marginal veins sparsely villous or glabrous, smooth, intermediate veins distinct, margins smooth, apex obtuse; callus glabrous; palea keels smooth, hooks absent, shortly villous for most of length. Anthers (1.2–)1.5–1.8(–2.5) mm, or vestigial. Fl. and fr. Jun–Aug. $2n = 14, 28$.

Alpine and subalpine meadows on slopes, moist places; 1000–3100 m. Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kashmir, Mongolia, Nepal, Pakistan, Russia (Far East, Siberia), Tajikistan; SW Asia, Europe, North America].

Poa supina has been divided into two taxa since the plants from C Asia, the Himalayas, and Xizang, including some but not all of the material from China, are more densely tufted and less stoloniferous than material from elsewhere. In addition, the branches are reduced to 1 per node, often rebranched near the base, and the palea looks minutely bumpy because of the globose, short cells between the veins. This material could be distinguished as *P. supina* subsp. *ustulata*. However, aside from the habit, the differences cited do not seem constant in the material from China, and material from NW China matches *P. supina* s.s.

11. *Poa veresczaginii* Tzvelev, Novosti Sist. Vyssh. Rast. 11: 34. 1974.

薇早熟禾 wei zao shu he

Perennials, loosely tufted or weakly stoloniferous; shoots extravaginal and intravaginal. Culms erect, sometimes decumbent at base, few per tuft, 17–60 cm tall, 0.8–1.3 mm thick, smooth, nodes 2 or 3, 1 or 2 exserted, uppermost to 1/4–1/2 way up culm. Leaf sheaths mostly 1.5–2.5 mm wide, ribs not distinctly raised, smooth, glabrous, lower leaves bladeless or with short blades, uppermost closed for 1/2–3/4 of length, 5–8 cm, 1.5–5 × as long as blade; blade green, flat, thin, 2–5 cm × 1.5–3.5 mm, surfaces smooth and glabrous, margins scabrid, longer upward along culm; ligule 2.5–4 mm, abaxially smooth,

of tillers 0.5–1.5 mm, collars smooth, glabrous. Panicle open, lax, 3.5–12 × 3–8 cm; branches spreading, 1 or 2 per node, capillary, rounded, smooth, longest 2.5–5 cm with 1–3 (or 4) spikelets in distal 1/4. Spikelets rosy-violet tinged and a little grayish, 4.5–7 mm, florets usually 3–5, mostly perfect, infrequently female; vivipary absent; rachilla internodes to 1–1.5 mm, smooth, glabrous; glumes unequal, submembranous-papery, smooth or upper keel with a few hooks, lower glume 2.7–4.1 mm, 1- or 3-veined, upper glume 3.7–4.7 mm, 3-veined; lemmas oblong, membranous-papery, 3.5–4.5 mm, margins broadly membranous, apex obtuse, blunt, intermediate veins moderately distinct, keel loosely villous for up to 2/3 of length, marginal veins to 1/2, surfaces smooth, abaxially glabrous or loosely pilulose; callus glabrous or sparsely webbed,

usually on proximal florets, hairs less than 1/2 as long as lemma; palea smooth and glabrous between keels, keels scabrid. Anthers 1.7–3.25 mm, vestigial or later aborted (up to 1.5 mm). Fl. and fr. Aug.

Alpine swales, stony slopes, glacial outwash; 2800–3600 m. Xinjiang (Altay Shan, Tian Shan) [Kazakhstan, Russia (Altai)].

The paratype cited from Mongolia is now within Xinjiang, in the Altay Shan very close to the new Mongolia-Russia border. Tzvelev (Zlaki SSSR, 460. 1976) placed this species in *Poa* sect. *Nivicolae*, based on the membranous-papery spikelet bracts and nearly smooth palea keels, to which features we would add the presence of female flowers in some spikelets. However, chloroplast and nuclear DNA markers place it in *P.* sect. *Micrantherae*.

3. *Poa* subg. *Pseudopoa* (K. Koch) Stapf in J. D. Hooker, Fl. Brit. India 7: 337. 1896 [“1897”].

假早熟禾亚属 *jia zao shu he ya shu*

Zhu Guanghua (朱光华), Liu Liang (刘亮); Robert J. Soreng

Festuca [unranked] *Pseudopoa* K. Koch, Linnaea 21: 409. 1848; *Eremopoa* Roshevitz.

Slender annuals or ephemerals, shoots intravaginal. Culms erect. Inflorescence an open panicle; branches whorled, scabrid angled. Spikelets slightly compressed, elliptic, florets (1 or) 2 to many, distant or only slightly overlapping; rachilla filiform, scabrid; glumes unequal, shorter than floret, lower glume 1-veined, upper glume 3-veined; lemmas lanceolate to narrowly oblong in side view, rounded on back or slightly keeled at base, herbaceous, 5-veined, apex obtuse to acuminate or mucronate, glabrous or keel and marginal veins pilulose to short villous, intermediate veins faint; palea equaling or shorter than lemma, keels scabrid; callus glabrous. Stamens (2–) 3. Caryopsis partly adherent to lemma and palea, faintly grooved; hilum oval.

About five species: NE Africa, C and SW Asia, Europe; one species in China.

Species of *Poa* subg. *Pseudopoa* have a delicate, annual habit and whorled, scabrid-angled panicle branches. The subgenus comprises two widespread, variable species, which are sometimes subdivided, and a few local species in SW Asia. Since 1934, they have usually been recognized as a separate genus, *Eremopoa*, but molecular data place them in the middle of *Poa*. *Poa persica* Trinius occurs from Turkey to Afghanistan and Pakistan, but has not yet been found in China. It can be recognized by its lemmas with broad, membranous margins and obliquely truncate tips in side view, and by having anthers 1.4–2.5 mm.

12. *Poa diaphora* Trinius, Bull. Sci. Acad. Imp. Sci. Saint-Petersbourg 1: 69. 1836.

阿尔泰旱禾 *a er tai han he*

Annual. Culms 5–45 cm tall, solitary or tufted, slender. Leaf blade 2–10 cm × 1–4 mm, flat or folded, abaxial surface scabrid or smooth, adaxial surface scabrid, apex acuminate; ligule 1–3 mm. Panicle delicate, narrowly to broadly ovate in outline, 2–20 cm; branches 3–10 per node, subcapillary, scabrid. Spikelets elliptic, 4–6.5 mm, florets 2–6, green or purple tinged; lower glume lanceolate, 1–2 mm, apex acute, up to 1/2 as long as lowest lemma; upper glume narrowly ovate, 1.5–2.5 mm, apex acute or subacute; lemmas 2–4 mm, glabrous or scantily hairy to densely appressed-pubescent along lower part of veins, margins narrowly membranous, apex acuminate or often with a mucro to 0.5 mm; palea a little shorter than lemma. Anthers 0.4–1 mm. Fl. and fr. May–Aug. $2n = 28, 42$.

Borders of streams and drying ponds, dry stony or sandy places; 1300–4000 m. Xinjiang, Xizang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Poa diaphora is a widespread and variable species and is sometimes divided into infraspecific taxa. The most distinct is subsp. *oxyglumis*, with hairy lemma veins appearing as silky-white stripes, although

intermediates do occur. Small plants (up to 15 cm) with relatively long lemmas (over 3.5 mm) are sometimes distinguished, as subsp. *diaphora*, from the bulk of the species, which would then be placed in a “subsp. *songarica*,” but this distinction is much less clear-cut and is not followed here.

- 1a. Lemmas glabrous or scantily hairy
along proximal part of veins 12a. subsp. *diaphora*
- 1b. Lemmas densely pubescent along
proximal part of veins 12b. subsp. *oxyglumis*

12a. *Poa diaphora* subsp. *diaphora*

阿尔泰旱禾(原亚种) *a er tai han he* (yuan ya zhong)

Aira altaica Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 2: 526. 1835; *Catabrosella songarica* (Schrenk) Czerepanov; *Eremopoa altaica* (Trinius) Roshevitz; *E. altaica* subsp. *songarica* (Schrenk) Tzvelev; *E. persica* (Trinius) Roshevitz var. *songarica* (Schrenk) Bor; *E. songarica* (Schrenk) Roshevitz; *Glyceria songarica* Schrenk; *Nephelochloa altaica* (Trinius) Grisebach; *N. songarica* (Schrenk) Grisebach; *Poa persica* Trinius var. *songarica* (Schrenk) Stapf; *P. songarica* (Schrenk) Boissier.

Lemmas glabrous or scantily hairy near base of veins. Anthers 0.4–0.6 mm.

Borders of streams and drying ponds, stony slopes; 1300–4000 m. Xinjiang, Xizang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Fl. Orient. 5: 610. 1884; *Eremopoa altaica* subsp. *oxyglumis* (Boissier) Tzvelev; *E. oxyglumis* (Boissier) Roshevitz; *E. persica* var. *oxyglumis* (Boissier) Grossheim.

12b. *Poa diaphora* subsp. *oxyglumis* (Boissier) Soreng & G. Zhu, *comb. nov.*

Lemmas densely pubescent along lower parts of keel and marginal veins. Anthers 0.6–1 mm.

旱禾 han he

Basionym: *Poa persica* Trinius var. *oxyglumis* Boissier,

Dry stony or sandy places; 1900–2300 m. Xinjiang [Kazakhstan, Turkmenistan, Uzbekistan; SW Asia].

4. *Poa* subg. *Poa*

早熟禾亚属 zao shu he ya shu

Zhu Guanghua (朱光华), Liu Liang (刘亮); Robert J. Soreng

Annuals or perennials, with or without rhizomes, without bulbs; shoots extravaginal and intravaginal. Sheaths sometimes strongly keeled, uppermost closed for more than (1/5–)1/4 of length; ligules membranous, milky-white or hyaline. Panicle with or without unisexual flowers, loosely contracted to open; branches smooth or scabrid, round or angled; lower glumes 1- or 3-veined; lemmas distinctly keeled, glabrous or pubescent, outer margin smooth or sparsely scabrid, glabrous, intermediate veins faint or more commonly conspicuous; callus glabrous or mostly dorsally webbed, rarely diffusely villous; palea keels glabrous or pubescent, usually scabrid at least distally. Anthers 0.2–4 mm.

About 400 species; distribution as for genus; 51 species (13 endemic) in China.

The Chinese species belong to three sections: *Poa* sect. *Macropoa* F. Hermann ex Tzvelev (species nos. 13–16); *P. sect. Poa* (species nos. 17–29), which is further subdivided into *P. subsect. Nivicolae* (Roshevitz) Tzvelev (species nos. 17–19), *P. subsect. Poa* (species nos. 20–22), and *P. subsect. Cenisiae* (Ascherson & Graebner) V. Jirásek (species nos. 23–29); and *P. sect. Homalopoa* Dumortier (species nos. 30–63).

Poa raduliformis (species no. 22) could not be included in Key 2 below because the taxon is insufficiently known to the authors. No specimens definitely referable to *P. raduliformis* were seen for this treatment.

- 1a. Anthers 0.2–1 mm Key 1
1b. Anthers more than 1 mm Key 2

Key 1 (species with anthers up to 1 mm long: *Poa* sect. *Homalopoa* in part, species nos. 43–63).

- 1a. Palea keels pubescent at least medially.
2a. Palea keels without apical hooks; ligule abaxially pilulose; panicle branches proximally scabrid angled.
3a. Panicle branches erect to steeply ascending, 2–6 cm; lemmas glabrous or sparsely pilulose between veins 46. *P. hisauchii*
3b. Panicle branches spreading, 3–11 cm; lemmas usually sparsely to densely pilulose between veins 47. *P. acroleuca*
2b. Palea keels scabrid at least at the apex (if without hooks then upper culm ligule smooth and glabrous, or at most sparsely scabrid or pilulose); ligule abaxially smooth or scabrid, glabrous or sparsely pilulose; panicle branches proximally smooth or scabrid angled.
4a. Callus glabrous; glumes distinctly shorter than lowest lemma; lemma surface and intermediate veins glabrous.
5a. Lemmas 4–5 mm; panicle 18–22 cm 49. *P. imperialis*
5b. Lemmas 2.5–3.5 mm; panicle 3–15(–19.5) cm 50. *P. sikkimensis*
4b. Callus webbed or if glabrous, then lower glume as long as to longer than lowest lemma; lemma surfaces and/or intermediate veins glabrous or pubescent.
6a. Ligule 2–6 mm, apex obtuse to acute; collar glabrous; lower glume only slightly narrower than upper glume, 1- or 3-veined.
7a. Annuals or short-lived perennials; leaf sheath ca. 2 × as long as blade; upper glume as long as or longer than lowest lemma 60. *P. hirtiglumis*
7b. Perennials; leaf sheath slightly shorter than blade; upper glume shorter than lowest lemma 51. *P. stapfiana*
6b. Ligule 0.8–1.5(–2.5) mm, apex truncate to obtuse; collar usually ciliate; lower glume distinctly narrower than upper glume, 1-veined.
8a. Palea keels densely pilulose to villous to near apex; lemma ca. 4 × as long as wide, apex obtuse to acute; roots commonly 0.2–0.3 mm in diam. 48. *P. nepalensis*
8b. Palea keels pilulose only around middle, sometimes obscurely so; lemma ca. 5 × as long as wide, apex acute to acuminate; most roots ca. 0.1 mm in diam.
9a. Lemma surfaces pubescent 52. *P. burmanica*
9b. Lemma surfaces glabrous.
10a. Lemma surface smooth or minutely bumpy near the base at most; ligule abaxially smooth 53. *P. himalayana*
10b. Lemmas surface minutely bumpy over much of length; ligule abaxially scabrid or pilulose 56. *P. khasiana*
1b. Palea keels scabrid only, not pubescent.
11a. Lower glume mostly 3-veined.

- 12a. Plants 4–8 cm tall; panicle 1–2.5 cm, branches 0.5–1.5 cm; lemmas and callus glabrous 44. *P. pseudamoena*
 12b. Plants 30–51 cm tall; panicle 8–25 cm, branches 2–7 cm; lemma and callus pubescent 43. *P. eleanorae*
 11b. Lower glume 1-veined, or if sometimes 3-veined then lemmas glabrous and panicle over 5 cm long.
 13a. Lemmas 1.5–2.6 mm, surface finely scabrid, keel glabrous or pilulose to short villous; anthers
 0.2–0.5 mm 63. *P. szechuensis*
 13b. Lemmas 2.7–6 mm, surface smooth or finely scabrid, keel glabrous to villous, if glabrous then
 lemma 3–4.5 mm; anthers 0.5–1 mm (sometimes longer).
 14a. Callus glabrous; lemmas glabrous or with a few short hairs at base of keel.
 15a. Ligule 0.7–1.2; lower glume 1.5–2.2 mm, upper glume 2.1–2.6 mm; lemmas 2.7–3.3 mm; larger
 roots mostly ca. 0.1 mm in diam. 55. *P. wardiana*
 15b. Ligule 2.5–6.5; lower glume 2.2–4 mm, upper glume 2.8–4.5 mm; lemmas 3.1–4.4 mm; larger
 roots mostly 0.2–0.3 mm in diam. 62. *P. dzongicola*
 14b. Callus webbed; lemmas glabrous or pubescent.
 16a. Lemma glabrous.
 17a. Lemma densely scabrid, 3.7–5.2 mm, papery; palea subequal to lemma 61. *P. sunbisinii*
 17b. Lemma smooth, 3–4 mm, membranous-papery; palea distinctly shorter than lemma 58. *P. takasagomontana*
 16b. Lemma pubescent at least on the keel.
 18a. Glumes subequal, lower glume not more than 0.5 mm shorter than lowest lemma; ligule abaxially
 smooth or sparsely scabrid.
 19a. Lemmas green, 4–5 mm, papery, surface minutely bumpy, otherwise glabrous 57. *P. nankoensis*
 19b. Lemmas usually purple tinged, 2–4(–5) mm, membranous to membranous-papery, surface
 smooth to sparsely scabrid, glabrous or pilulose 60. *P. hirtiglumis*
 18b. Glumes unequal, lower glume usually more than 0.5 mm shorter than lowest lemma; ligule
 abaxially smooth to densely scabrid.
 20a. Lemma surface pubescent 52. *P. burmanica*
 20b. Lemma surface glabrous.
 21a. Leaf sheaths very compressed with a winged keel, uppermost closed for 2/3–3/4 of length;
 collar glabrous; panicle broad, branches scabrid angled from base, longest to 12 cm 45. *P. ussuriensis*
 21b. Leaf sheaths somewhat compressed, with or without a slightly winged keel, uppermost
 closed for 1/2–2/3 of length; collar often ciliate; panicle narrow, branches smooth or
 sparsely scabrid angled from base; longest to 7 cm.
 22a. Lower glume subulate to wedge-shaped, less than 1/2 as long as lower lemma 54. *P. rajbhandarii*
 22b. Lower glume narrowly lanceolate, slightly arched to sickle-shaped, more than 1/2 as
 long as lower lemma 56. *P. khasiana*
- Key 2** (species with anthers more than 1 mm long: *Poa* sect. *Macropoa*, species nos. 13–16; *P.* sect. *Poa*, species nos.
 17–29; *P.* sect. *Homalopoa* in part, species nos. 30–42).
- 1a. Lemma and callus totally glabrous and ligule less than 3(–4) mm (if plants tufted, ligules 2.5–6 mm, and anthers
 1.1–1.5 mm, see 62. *P. dzongicola*).
 2a. Plants densely tufted, all or most shoots flowering, extravaginal, rhizomes absent; leaf blade thin, 1–2 mm wide,
 scabrid; lemma thinly finely scabrid or minutely bumpy throughout; branches distally moderately scabrid 32. *P. perennis*
 2b. Plants densely or loosely tufted, sterile shoots usually present, intra- and extravaginal, rhizomes present or
 absent, if all shoots extravaginal then rhizomes well developed; leaf blade thick or thin, usually 1.5–4 mm
 wide; lemmas smooth or variously scabrid; panicle branches distally smooth or scabrid.
 3a. Flowering shoots fewer than sterile shoots, rhizomes absent or poorly developed; panicle branches rounded,
 smooth or sparsely scabrid.
 4a. Lemma surfaces smooth; paleas smooth between the keels 24. *P. hissarica*
 4b. Lemma surfaces scabrid; paleas scabrid between the keels 26. *P. qinghaiensis*
 3b. Flowering shoots as many or more than sterile shoots, rhizomes well developed or not; panicle branches
 smooth or more commonly scabrid at least distally (*Poa* sect. *Macropoa*).
 5a. Major roots ca. 0.1 mm in diam.; plants (apparently) without rhizomes; uppermost leaf sheath shorter
 than blade 13. *P. bomiensis*
 5b. Major roots 0.2–1 mm in diam.; plants with rhizomes; uppermost leaf sheath 1–4 × as long as blade.
 6a. Major roots to 1 mm in diam.; sheaths of tillers retrorsely hispidulous to pilulose near collar; uppermost
 culm leaf sheath 3–4 × as long as blade 14. *P. binodis*
 6b. Major roots 0.2–0.4 mm in diam.; sheaths of tillers smooth or scabrid near the collars; uppermost culm
 leaf sheath ca. 1–4 × as long as blade.
 7a. Palea keels scabrid for 1/3–1/2 of length, smooth or minutely bumpy between keels; plants almost
 always pinkish violet; panicle branches smooth or scabrid; alpine plants from C Asia 15. *P. bucharica*
 7b. Palea keels scabrid for 2/3–3/4 of length, with sparse slender spinules between keels; plants with or
 without pinkish violet coloration; panicle branches scabrid; plants widespread 16. *P. sibirica*

- 1b. Lemma or callus pubescent with at least a few short hairs; ligule 0.2–10 mm.
- 8a. Culms with 5–12 nodes, mostly 50–150 cm; longest panicle internodes usually more than 4 cm; leaf blade commonly over 4 mm wide; sheaths prominently compressed-keeled.
- 9a. Branches moderately to densely scabrid distally 30. *P. remota*
- 9b. Branches smooth or very sparsely scabrid.
- 10a. Longest branches with 2–5 spikelets; culms glabrous below all nodes, not rebranched except at base 41. *P. gammieana*
- 10b. Longest branches with 7–26 spikelets; culms strigose below lowest nodes, frequently rebranched above 42. *P. grandis*
- 8b. Culms with 1–4 nodes, mostly 10–80 cm; longest panicle internodes usually less than 4 cm; leaf blade usually less than 4 mm wide; sheaths indistinctly to prominently compressed-keeled.
- 11a. Collars of at least the lower leaves with a distinct wedge-shaped area on either side, usually densely scabrid to strigose or villous on wedge but not above or below it; blade margins not abruptly flared; ligule truncate, 0.5–1.5 mm 34. *P. mairei*
- 11b. Collars usually with an indistinct narrow junction, rarely pubescent much back from margin but then hairs not confined to junction; blade margins abruptly flared or not; ligule truncate to acuminate, 0.4–10 mm.
- 12a. Callus glabrous.
- 13a. Palea keels medially pilulose to villous; panicle open.
- 14a. Culm blades 3 or 4, flat, middle culm ones medially smooth on the margins and surfaces, 4–5 mm wide, apex abruptly prow-tipped; glumes distinctly punctate-papillate; lemmas conspicuously 5–7-veined, pubescent between the veins 40. *P. polyneuron*
- 14b. Culm blades 2 or 3, flat, folded or involute, middle culm ones scabrid at least on the margins, 1–3 mm wide, apex gradually prow-tipped; glumes not or indistinctly punctate-papillate; lemmas 5-veined, lateral veins faint to moderately conspicuous, glabrous or pubescent between the veins.
- 15a. Lemmas moderately densely scabrid to crisply pilulose between veins near base; plants loosely tufted 39. *P. nitidespiculata*
- 15b. Lemmas smooth or sparsely scabrid, sometimes loosely soft pilulose, between veins near base; plants densely to loosely tufted 25. *P. lipskyi*
- 13b. Palea keels scabrid throughout; panicle open or contracted.
- 16a. Longest ligules to 1(–1.5) mm, truncate; panicle branches moderately to densely scabrid.
- 17a. Plants densely tufted, without rhizomes, tillers all or most intravaginal with blades firm involute, abaxially scabrid, ribs indistinct; lemmas glabrous between veins 34. *P. mairei*
- 17b. Plants densely to loosely tufted, with or without rhizomes, tillers intra- and extravaginal with blades thin involute, abaxially smooth or scabrid, ribs distinct; lemmas glabrous or pilulose between veins 18. *P. polycolea*
- 16b. Longest ligules 1.5–8 mm, truncate to acuminate; panicle branches smooth to densely scabrid.
- 18a. Panicle branches distally rounded or faintly angled, smooth or very sparsely scabrid.
- 19a. Glumes membranous, surfaces minutely punctate with purple pigment in papillate cells, not shiny, otherwise smooth or with sparsely scabrid keels 37. *P. pagophila*
- 19b. Glumes membranous to sub-papery, surfaces not evidently minutely punctate, or only near apex, shiny or not, keels smooth or scabrid.
- 20a. Uppermost sheaths closed for 1/2–3/4 of length; palea keels sparsely scabrid (*P. subg. Ochlopoa*) 11. *P. veresczaginii*
- 20b. Uppermost sheaths closed for 1/3–1/2 of length; palea keels moderately to densely scabrid 25. *P. lipskyi*
- 18b. Panicle branches distally angled, sparsely to densely scabrid.
- 21a. Lower culm leaf ligule less than 0.8(–1) mm, truncate, to 1.5(–2.2) mm for upper culm leaves.
- 22a. Sterile tiller shoots common, intra- and extravaginal, laterally pointing shoots commonly present; basal sheaths persistent, straw colored, shiny; spikelet bracts acute, rachilla internodes mostly less than 1 mm 18. *P. polycolea*
- 22b. Sterile tiller shoots infrequent, mostly extravaginal, laterally pointing shoots absent; basal sheaths not persisting, not shiny; spikelet bracts sharply acute to acuminate, rachilla internodes often reaching 1.2 mm 32. *P. perennis*
- 21b. Lower culm leaf ligule more than 1 mm, truncate to acute, to 2–8 mm for upper culm leaves.
- 23a. Panicle branches usually 3–5 per node, moderately to densely scabrid angled in distal 1/2, longest with 6–26 moderately crowded spikelets; uppermost ligules 3–8 mm, often lacerate 31. *P. asperifolia*
- 23b. Panicle branches usually 1–2 per node, sparsely to moderately scabrid in distal 1/2, longest with 1–8 loosely arranged spikelets; uppermost ligules (1–)2–6 mm, generally entire.
- 24a. Culm leaf blades reaching the panicle, uppermost node above the middle; glumes distinctly covered by papillate cells; plants not glaucous 38. *P. falconeri*

- 24b. Culm leaf blades not reaching the panicle, uppermost node in the lower 1/3; glumes with a few indistinct papillate cells; plants distinctly glaucous 39. *P. nitidespiculata*
- 12b. Callus pubescent.
- 25a. Panicle narrowly pyramidal with 5 densely scabrid branches per node, the longest to 3 cm with 6–9 spikelets from near the base; palea hyaline, distinctly shorter than lemma 29. *P. xingkaiensis*
- 25b. Panicle not narrowly pyramidal with 5 densely scabrid branches per node, or if so then longest branch more than 3 cm with florets in the distal 1/2; paleas distinctly colored in part, not mostly hyaline, distinctly shorter to as long as lemma.
- 26a. Plants less than 25 cm tall.
- 27a. Ligule 0.1–1.2 mm, truncate.
- 28a. Lower culm sheaths thin with prominent ribs; blade thin, with distinct abaxial ribs; lower glume subulate 18. *P. polycolea*
- 28b. Lower culm sheaths without distinct abaxial ribs; lower glume broader 35. *P. langtangensis*
- 27b. Ligule of upper leaves more than 1.5 mm, truncate to acuminate.
- 29a. Glumes membranous-papery, weakly keeled, covered by punctate-papillate cells, keel smooth or with sparse hooks, apex obtuse or acute, often blunt, lower glume 1(or 3)-veined.
- 30a. Plants with slender rhizomes and isolated shoots; glumes green, upper one to 2–2.7 mm; lowest lemmas 2.5–3.3 mm 35. *P. langtangensis*
- 30b. Plants loosely to moderately densely tufted, not rhizomatous or infrequently with some isolated shoots; glumes usually purple, upper one 3–3.5 mm; lowest lemmas 3.2–4.8(–5) mm 37. *P. pagophila*
- 29b. Glumes very thinly to thickly papery, not or only sparsely covered by punctate papillae (or if so then strongly keeled, and upper with prominent lateral veins, and sharply acuminate; *P. tenuicula*), keels smooth or densely scabrid.
- 31a. Plants densely tufted, without rhizomes; glumes sharply acute to acuminate, the upper one prominently 3-veined; lemmas pubescent between the veins; rachilla densely pilulose to short villous 59. *P. tenuicula*
- 31b. Plants with distinct lateral tending shoots, rhizomatous to weakly stooling, with isolated flowering shoots, or with few shoots per tuft; glumes acute or acuminate, apex generally not so sharply pointed; lemmas glabrous or pilose between the veins; rachillas glabrous or pilulose.
- 32a. Palea keels with 2–6 hooks per keel; lemmas in the upper 1/4–1/2 membranous, turning golden-brown; panicle branches round, smooth to sparsely scabrid, to 2.5 cm with 2–12 spikelets clustered distally 17. *P. calliopsis*
- 32b. Palea keels with more than 6 hooks per keel, lemmas distally thicker, membranous only in the upper 1/5 or less, with at most a narrow golden-brown band; branches smooth or scabrid, round or angled in part, usually without spikelets distinctly clustered distally.
- 33a. Uppermost sheaths closed 1/4–2/5; lemmas glabrous between the veins; paleas glabrous between the keels; plants with well-developed branching rhizome systems; panicle branches sometimes scabrid, longest branch with (3–)7–18, small to moderate-sized spikelets 21. *P. pratensis*
- 33b. Uppermost sheaths closed over 1/2; lemmas usually pubescent between the veins; plants loosely tufted, with short, unbranched rhizomes or stooling; panicle always smooth or nearly so, longest branch with 1–3(–7) large spikelets.
- 34a. Palea keels sparsely scabrid, glabrous, between keels glabrous; callus hairs sparse, dorsal or diffuse; viviparous spikelets unknown (*P. subg. Ochlopoa*) 11. *P. veresczaginii*
- 34b. Palea keels distinctly scabrid and usually often pilulose to short-villous medially, between keels usually pilulose; callus hairs dorsal, well developed; spikelets infrequently viviparous 27. *P. smirnowii*
- 26b. Plants more than 25 cm tall.
- 35a. Lemmas glabrous, but densely scabrid over most of surface; paleas densely scabrid between keels 61. *P. sunbisinii*
- 35b. Lemmas pilulose to villous at least on the keel, between veins smooth, minutely bumpy, scabrid, glabrous or pubescent; paleas smooth or scabrid, glabrous or pubescent between keels.
- 36a. Lower glume subulate, keel straight or slightly arched, usually 1-veined, less than 1/2 the width of upper glume, both glumes smooth throughout or sparsely to moderately scabrid on the keel only, not punctate-papillate on the sides, generally shiny; shoots intra- and extravaginal, some lateral tending shoots usually present; rachillas well exposed mostly with upper internodes exceeding 1.2 mm; female flowers common; normal anthers 2.3–3 mm; lemma sides glabrous or pilulose in the basal part, with conspicuous intermediate veins; ligule of lower culm and tiller leaves less than 0.5 mm, of upper culm leaves to 1(–2.2) mm, truncate to obtuse; lower culms covered by closely overlapping, long, narrow sheaths 18. *P. polycolea*

- 36b. Lower glume subulate or broader, keel slightly to distinctly arched, 1–3-veined, often more than 1/2 as wide as upper glume, glume texture as above or scabrid or punctate-papillate, shiny or not; shoots sometimes all intra- or all extravaginal, lateral tending shoots present or absent; rachillas hidden to well exposed, often with most internodes less than 1.2 mm; female flowers common or absent; normal anthers 1.2–3.5 mm; ligule of lower shoots often longer than 0.5 mm, those of the upper leaves often more than 2 mm, truncate to acuminate; lower culms mostly not covered in closely overlapping, long, narrow sheaths; in any case not with the above combination of characters.
- 37a. Lower lemmas pubescent between veins.
- 38a. Plants definitely not rhizomatous; lower glume 1(–3)-veined; glume surfaces distinctly covered with punctate-papillate cells; culms to 40 cm.
- 39a. Anthers 1.2–1.5 mm; flowers all perfect; glumes papery, strongly keeled, green, and a bit glaucous; panicle loosely contracted, branches ascending, moderately scabrid on angled branches distally (if in the Himalayas see *P. stapfiana*, a species with anthers to 1.2 mm and glumes membranous) 59. *P. tenuicula*
- 39b. Anthers 2–3.5 mm; flowers sometimes female; glumes membranous to membranous-papery, often weakly keeled, usually purple; panicle open, branches spreading, smooth and round throughout, or sparsely scabrid angled distally.
- 40a. Lemmas subpapery, minutely bumpy, not or sparsely scabrid above; all shoots intravaginal 36. *P. nubigena*
- 40b. Lemmas membranous-papery, not minutely bumpy, moderately to densely scabrid above; some shoots extravaginal 37. *P. pagophila*
- 38b. Plants with at least some distinct laterally tending shoots to clearly rhizomatous, or lower glume distinctly 3-veined; glume surfaces not or only slightly punctate-papillate in the margins; culms 25–120 cm.
- 41a. Panicle branches moderately to densely scabrid angled (distally at least); basal sheaths becoming fibrous; uppermost ligules 3–8 cm, entire to long lacerate; lower glumes 1(–3)-veined; web usually absent, when present, always dorsal, usually scanty 31. *P. asperifolia*
- 41b. Panicle branches smooth or sparsely scabrid, round or weakly angled; basal sheaths becoming papery or soon withering; ligules 1–4(–6) cm, entire; lower glumes commonly 3-veined in most spikelets (1-veined in *P. tangii*); callus hairs usually present, dorsal or diffuse.
- 42a. Ligules ca. 1 mm long; hairs diffuse or dorsal on the callus; lower glumes 1-veined 19. *P. tangii*
- 42b. Ligules 2–6 cm; hairs of the callus all dorsal, or some diffuse; lower glumes 1- or 3-veined.
- 43a. Leaf sheaths of upper culm leaves closed 1/4 to 1/3 of length 23. *P. arctica*
- 43b. Leaf sheaths of upper culm leaves closed over (2/5–)1/2 of length.
- 44a. Plants glaucous throughout, with at most a scant dorsal web of 1 to few hairs; panicle branches distally sparsely scabrid; sheaths closed 2/5–1/2 of length 39. *P. nitidespiculata*
- 44b. Plants not or little glaucous, with a well-developed dorsal or diffuse web; panicle branches smooth, or sparsely scabrid; sheaths closed over 1/2–3/4 of length.
- 45a. Palea keels sparsely to moderately scabrid, glabrous, between keels glabrous; callus hairs scant, dorsal or diffuse; panicle branches totally smooth; plants without distinct rhizomes, sometimes weakly stoloniferous (*P. subg. Ochlopoa*) 11. *P. veresczaginii*
- 45b. Palea keels scabrid and usually medially pilulose to short villous, between keels usually pilulose; callus hairs dorsal, well developed; panicle branches smooth or sparsely (moderately) scabrid; plants with distinct rhizomes 27. *P. smirnowii*
- 37b. Lemmas between veins glabrous throughout (intermediate veins infrequently pubescent).
- 46a. Glume surfaces distinctly covered with punctate-papillate cells; anthers 2–3.5 mm; lower glume 1(–3)-veined, often weakly keeled; plants definitely not rhizomatous (infrequently with short delicate rhizomes in *P. pagophila*); flowers sometimes female; panicle open, branches spreading, smooth and round throughout, or sparsely scabrid angled distally.
- 47a. Lemmas almost papery, minutely bumpy, not or sparsely scabrid above; all shoots intravaginal 36. *P. nubigena*
- 47b. Lemmas membranous-papery, not minutely bumpy, moderately to densely scabrid above; some shoots extravaginal 37. *P. pagophila*
- 46b. Glume surfaces not or only slightly punctate-papillate in the margins; or anthers shorter than 2 mm, or branches distinctly scabrid distally, or glumes 3-veined, or plants strongly rhizomatous.
- 48a. Plants tufted, without rhizomes; sheaths smooth, glabrous; panicle branches scabrid angled; ligules (1–)1.5–3 mm, obtuse; blades flat, smooth on both surfaces, 1–3 mm wide; lower glumes 3-veined; lemmas 4–5.5 mm, villous along keel and marginal veins, between veins glabrous; palea keels pilulose; anthers 2.5–3 mm 28. *P. macroanthera*

- 48b. Plants tufted or not, with or without rhizomes, sheaths smooth or scabrid, sometimes pubescent; panicle branches smooth or sparsely to densely scabrid; ligules 1–8 mm, truncate to acuminate; blades flat, folded or involute, surfaces smooth or scabrid, 1–5 mm wide; lower glumes 1- or 3-veined; lemmas 2.5–6 mm, pilulose to villous along keel at least; palea keels scabrid only or medially pilulose to villous; anthers 1.2–3.5 mm; in any case not with the above combination of characteristics.
- 49a. Sheaths closed 2/5–3/4 of length; panicle branches smooth; anthers 2.5–3.5 mm, or sometimes vestigial; lemmas 4–5.5 mm long; uppermost ligules ca. 1 mm; callus hairs dorsal or diffuse, loose; lemma keel hairs sparse, long and soft 19. *P. tangii*
- 49b. Sheaths closed (1/5–)1/4–3/5 of length; panicle branches smooth or scabrid; anthers 1.2–2.5(–3) mm, sometimes vestigial or not; uppermost ligules mostly 1–8 mm; callus hairs dorsal only; lemma keel hairs not sparse, long and soft.
- 50a. Lemma keel short villous or pilulose in lower 1/3; callus web scanty; palea keels glabrous.
- 51a. Ligules of upper culm leaves (2–)3–8 mm, of lower culm more than ca. 1 mm 31. *P. asperifolia*
- 51b. Ligules of upper culm leaves to 2.2 mm, of lower culm less than ca. 1 mm.
- 52a. Plants densely tufted, without lateral tending shoots 32. *P. perennis*
- 52b. Plants loosely tufted, subrhizomatous 33. *P. zhongdianensis*
- 50b. Lemma keel villous to lanate in 1/2–3/4 of length; callus web dense; palea keels glabrous or pilulose-villous medially.
- 53a. Uppermost culm leaf blades 0.6–0.9 × as long as their sheaths; panicle branches proximally sparsely to moderately scabrid, distally densely scabrid angled 20. *P. lhasaensis*
- 53b. Uppermost culm leaf blades 0.1–0.7 × as long as their sheaths; panicle branches smooth or variously scabrid.
- 54a. Uppermost culm sheaths closed over (1/2–)2/3 of length; culm blades 1–5 cm × 2–4 mm, flat or folded, not much different from tillers; panicle branches smooth or nearly so, longest with 1–3(–7) large spikelets; palea keels with a few soft hairs medially and between keels of some lemmas; anthers 2–2.5 mm 27. *P. smirnowii*
- 54b. Uppermost culm sheaths closed 1/4–2/5 of length; culm blades various in length and width, but generally not consistently short and broad, or if so, the tillers commonly involute; panicle branches smooth to densely scabrid angled, longest usually with 7 or more spikelets; palea keels glabrous or rarely pilulose; anthers mostly (1.2–)1.4–2.5(–2.8) mm 21. *P. pratensis*

13. *Poa bomiensis* C. Ling, Acta Phytotax. Sin. 17(1): 101. 1979.

波密早熟禾 *bo mi zao shu he*

Annuals (?or perennials), tufted, not rhizomatous; shoots extravaginal. Culms erect, solitary or few per sparse tuft, 20–35(–55) cm tall, 0.8–1.5 mm in diam., compressed, scabrid below nodes, nodes 2 or 3, 0–3 exserted. Leaf sheaths longer to slightly shorter than internodes 8–12 cm, slightly shorter than blade, uppermost closed for 3/7–1/2 of length, finely retrorsely scabrid, glabrous, keel slightly raised; blade flat, thin, 6–11 cm (uppermost often longest), 2–5 mm wide, adaxially smooth or scabrid on keel and veins, adaxially scabrid on and between veins, margins smooth to finely scabrid; ligule 1–2.5 mm, abaxially smooth, apex truncate, obtuse or acute. Panicle open, narrow, slightly lax, 7–14 × 1–3 cm, longest internodes 2–2.5 cm; branches ascending to spreading, 2 per node, slender, flexuous, proximally smooth or scabrid, distally scabrid on and sometimes between angles, longest 3–5 cm with 1–4 spikelets in distal 1/3. Spikelets elliptic, green or slightly purple tinged, 5–6 mm, florets 2 or 3; vivipary absent; rachilla scabrid, glabrous; glumes unequal, apex acuminate, upper keel and surface scabrid, lower glume subulate to narrowly lanceolate, 2.3–3.5 mm, 1- or 3-veined, upper glume lanceolate, 3.3–4.5 mm, 3-veined; lemmas ovate to oblong to lanceolate, 3.2–5 mm, apex acuminate, intermediate veins 5(–7), prominent, surfaces minutely

scabrid; callus glabrous; palea finely scabrid, keels scabrid 2/3–3/4 of length. Anthers (1–)1.2–1.7 mm. Fl. and fr. Jun–Sep.

• Mountain meadows among thickets; 4000–4200 m. SE Xizang (Bomi).

Though originally described as a perennial, the two specimens seen appear to be slender-rooted annuals.

14. *Poa binodis* Keng ex L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 388. 2002.

双节早熟禾 *shuang jie zao shu he*

Perennials, rhizomatous; shoots extra- and intravaginal. Plants grayish green. Culms erect, decumbent at base, loosely tufted, 40–80 cm tall, 1–2 mm in diam., smooth, nodes 2, 1 exserted. Leaf sheath pale, prominently keeled with a short ± leathery wing, smooth, lower ones hispidulous to pilulose, to 16 cm, 3–4 × as long as blade, uppermost closed for 2/3 of length, smooth, glabrous; blade folded with slightly inrolled margins, or involute, leathery, 4–10 cm × ca. 3 mm, surfaces smooth to sparsely scabrid, of tillers to 15 cm, abaxially somewhat reflexed hispid; ligule 1–2 mm, collar smooth, scabrid or hispidulous or ciliate. Panicle loosely contracted, 12–20 × 3–5 cm; branches ascending to spreading, 2 or 3 per node, slender, proximally smooth or scabrid along angles throughout, longest 3–9 cm with 10–17 moderately crowded spikelets in distal 1/2, pedicels 0.5–1 mm, terminal one ca. 2 mm. Spikelets pale,

sometimes purplish near apex, (3.5–)4–7 mm, florets 3 or 4(–6); vivipary absent; rachilla internodes 0.5–1.5 mm, scabrid; glumes unequal, apex acute, keel scabrid, area between veins sparsely, minutely scabrid, lower glume 2–2.5 mm, 1-veined, upper glume 2.8–3.5 mm, 3-veined; lemmas (3–)3.5–4 mm, minutely bumpy and moderately scabrid from base, glabrous throughout, keel finely scabrid for most of length, prominently 5(–7)-veined, margins smooth, apex acute; callus glabrous; palea minutely bumpy between keels, hooks sparse or absent, keels scabrid in distal 1/3–1/2 (30–50 hooks per keel). Anthers ca. 2 mm. Fl. and fr. Jul–Aug.

- Ditch banks, grassy places on slopes; ca. 3800 m. W Sichuan.

This species is similar to *Poa sibirica*, but differs in its grayish green coloration, stout roots (to 1.2 mm thick), 2-noded culms, and hispid leaves. It is known from only two gatherings.

15. *Poa bucharica* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 94. 1923.

布查早熟禾 *bu cha zao shu he*

Perennials, loosely tufted, rhizomatous; shoots extravaginal. Culms erect, decumbent at base, 50–80 cm tall, 1–2 mm in diam., nodes 2 or 3, 1 or 2 exerted, lower internodes smooth or scabrid. Leaf sheaths pale green, compressed, moderately keeled, smooth or scabrid, glabrous, 2–4 × as long as blade, uppermost closed for 1/3–2/5 of length; blade flat or folded with margins slightly inrolled, thin to moderately thin, 5–20 cm × 1–3 mm, abaxially smooth or sparsely to densely scabrid, margins scabrid, of tillers and lower culm to 30 cm; ligule 0.5–1(–2.7) mm, abaxially smooth or scabrid, glabrous, apex truncate or infrequently obtuse, collar margins scabrid, glabrous. Panicle loosely contracted to open, (3–)5–15 × 1–9 cm; branches contracted to spreading, 2–5 per node, slender, proximally round and smooth, distally scabrid angled, longest 0.5–7 cm with 2–10 spikelets in distal 1/3–1/2. Spikelets pale green and rosy to dark purple, 4–6 mm, florets 3–4(–6); vivipary absent; rachilla internodes 0.5–1.5 mm, smooth or sparsely scabrid; glumes subequal, keel sparsely scabrid, apex acuminate, lower glume 2–3 mm, 1- or 3-veined, upper glume 3–3.5(–4.5) mm, 3-veined; lemmas pale green and violet to dark purple above, papery-membranous to papery, 4–5 mm, abaxially smooth or minutely bumpy, adaxially smooth or sparsely scabrid, glabrous throughout, keel distally scabrid, intermediate veins prominent, margins smooth, apex acute; callus glabrous; palea smooth or minutely bumpy between keels, keels scabrid in distal 1/2, 5–40 hooks per keel. Anthers 1.5–3 mm. Fl. and fr. Jun–Jul.

Alpine grassy places on slopes, swales and stony slopes; 2800–3500 m. Xinjiang [Afghanistan (rare), Kashmir, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

Poa koksueensis Goloskokov is expected from the Jungarian Alatau border of China. It can be distinguished from *P. bucharica* by the totally smooth panicle branches and palea keels with only 1–6 short spinules or entirely smooth.

- 1a. Culms 50–80 cm tall; panicle loosely contracted, branches scabrid over most or all of length, longest with

3–10 spikelets; palea with 5–40

hooks per keel 15a. subsp. *bucharica*

- 1b. Culms 20–65(–70) cm tall; panicle open, pyramidal, diffuse, branches smooth or distally sparsely scabrid, longest with 2–5 spikelets; palea with 5–15 hooks per keel 15b. subsp. *karateginensis*

15a. *Poa bucharica* subsp. *bucharica*

布查早熟禾(原亚种) *bu cha zao shu he* (yuan ya zhong)

Culms 50–80 cm tall, lower internodes scabrid. Uppermost leaf sheaths 2–3 × as long as blade; ligule 0.5–1 mm; uppermost blades 4–9 cm. Panicle loosely contracted, ovoid to lanceolate, interrupted or not, 5–10 × 1–3 cm; branches contracted to steeply ascending, 3–5 per node, sparsely to moderately scabrid over most or all of length, longest 0.5–4 cm with 3–10 moderately crowded spikelets in distal 1/2. Spikelets 4–6 mm, florets 3–4(–6); rachilla internodes 0.5–1.5 mm, smooth or sparsely scabrid; lower glume 2–3 mm, upper glume 3–3.5 mm; lemmas thinly papery to papery, ca. 4 mm, intermediate veins prominent; palea with 5–40 hooks per keel. Anthers 1.5–2.8 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Alpine grassy places on slopes; 2800–3500 m. Xinjiang [Afghanistan (rare), Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

15b. *Poa bucharica* subsp. *karateginensis* (Roshevitz ex Ovczinnikov) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 28. 1974.

卡拉蒂早熟禾 *ka la di zao shu he*

Poa karateginensis Roshevitz ex Ovczinnikov, Izv. Tadz. Bazy Akad. Nauk SSSR 1: 12. 1933; *P. suruana* H. Hartmann.

Culms 20–65(–70) cm tall, lower internodes smooth. Leaf sheaths, uppermost 3–4 × as long as blade; ligules 0.3–2.7 mm; uppermost blades 1–4 cm. Panicle open, pyramidal, diffuse, (3–)6–15 × 3–9 cm; branches ascending to spreading, 2 or 3(or 4) per node, smooth or distally sparsely scabrid, longest 2–7 cm with 2–5 spikelets in distal 1/2. Spikelets 6–7 mm, florets 3 or 4(–5); rachilla internodes 1–1.5 mm, smooth; lower glume 3–3.5 mm, upper glume 3.5–4 mm; lemmas thinly papery, 4–5 mm, intermediate veins moderately distinct; palea with 5–15 hooks per keel. Anthers 2–3 mm. Fl. and fr. Jul–Aug.

Alpine grassy slopes; ca. 3000 m. Xinjiang [Kashmir, W Tajikistan (Karateginsky Range)].

The type of *Poa suruana*, from Kashmir (Karakorum Mountains), resembles subsp. *karateginensis* in its open panicle with fairly smooth branches, but seems intermediate to subsp. *bucharica* in its more typical glumes and longer panicle with a few more spikelets per branch, distinct ligules to ca. 2 mm long, and height of 65–70 cm. *Poa bucharica* subsp. *aksuensis* Roshevitz ex Tzvelev keys out to subsp. *karateginensis* but has palea keels each with 15–40 spinules. It comprises plants from the Tien Shan on or near the Kyrgyzstan-China border and potentially occurs in China.

16. *Poa sibirica* Roshevitz, Izv. Imp. S.-Peterburgsk. Bot. Sada 12: 121. 1912.

西伯利亚早熟禾 *xi bo li ya zao shu he*

Perennials, rhizomatous; shoots extravaginal and a few

intravaginal. Culms erect, decumbent at base, (20–)40–120 cm tall, 1–4 mm in diam., loosely tufted, shiny, smooth or sparsely short scabrid below panicle, nodes 3 or 4, 1 or 2 exerted, with a few persistent whitish sheaths. Leaf sheaths green, compressed, with keel up to 0.4 mm deep, smooth or finely scabrid, glabrous, 8–20 cm, 1–2 or more × as long as blade, uppermost closed for 1/2–2/3 of length; blade flat or folded, thin, 4–25 cm × (1.5–)2–6(–8) mm, abaxially smooth, adaxially smooth to scabrid, margins scabrid, apex prow-tipped, of tillers often folded, abaxially smooth; ligule (0.5–)1–2.7 mm, abaxially smooth or scabrid, glabrous or puberulent, apex truncate to obtuse, irregularly dentate, collar margins smooth or coarsely scabrid, glabrous. Panicle loosely contracted to wide open, exerted, (4–)6–15(–18) cm, longest internodes 1–4 cm; branches ascending to spreading, 2–5 per node, slender, round to weakly angled, proximally smooth or scabrid along angles throughout, longest 3–9 cm with 3–17 moderately crowded spikelets in distal 1/2. Spikelets pale green to dark purple, (3.5–)4–5.5(–6.5) mm, florets 2–5; vivipary absent; rachilla internodes 0.5–1 mm, smooth or scabrid; glumes lanceolate, acute, upper keel and veins scabrid, lower glume (1.2–)2–2.5(–3.5) mm, 1(or 3)-veined, upper glume 2.5–3(–4.5) mm, 3-veined; lemmas pale green or sometimes violet to dark purple above, 2.5–4(–5.5) mm, proximally minutely bumpy to scabrid, distally scabrid, glabrous throughout (sometimes obscurely strigulose on keel base), keel scabrid, intermediate veins prominent, apex and margins narrowly membranous, apex acute; callus glabrous; palea minutely bumpy and with slender hooks between keels, keels finely and densely scabrid to subciliate for (1/2–)2/3–3/4 of length, 40–60 hooks per keel. Anthers 1.5–2.5 mm. Fl. and fr. Jun–Jul.

Forest margins, meadows among thickets, grassy places on slopes in river valleys, subalpine meadows; 1700–2800 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi, Sichuan, NW Xinjiang, Yunnan [Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia (Far East, Siberia); Europe (Russia to W of Ural Mountains)].

- 1a. Lower lemmas within spikelets 2.8–3.8 mm; panicle branches spreading; leaf blade 1.5–4 mm wide; culm 1–2 mm in diam. at lower nodes 16a. subsp. *sibirica*
 1b. Lower lemmas within spikelets (3.5–)3.8–5.2 mm; panicle branches erect to ascending; blade 2–8 mm wide; culm 2–4 mm in diam. at lower nodes 16b. subsp. *uralensis*

16a. *Poa sibirica* subsp. *sibirica*

西伯利亚早熟禾(原亚种) xi bo li ya zao shu he (yuan ya zhong)

Culms 50–100 cm tall, 1–2 mm in diam. at lower nodes. Leaf sheaths shorter than internodes, uppermost 8–18 cm, 1.5–4 × longer than blade; ligule (0.5–)1–2.7 mm, abaxially scabrid; blade 1.5–4(–5) mm wide, uppermost to 10 cm. Panicle loosely contracted to open, ovoid to pyramidal, 4–15 cm, longest internodes 1–2.5(–3) cm. Spikelets 2–5-flowered; lower glume 2–2.5 mm, upper glume 2.5–3 mm; lemmas 2.5–3.8 mm. Anthers 1.5–2.5 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Forest margins, meadows among thickets, grassy places on slopes

in river valleys, subalpine meadows; 1700–2800 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi, Sichuan, NW Xinjiang, Yunnan [Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia (Far East, Siberia); Europe (Russia to W of Ural Mountains)].

This subspecies is quite variable, but is readily distinguishable from other species over most of its range. Material from Sichuan, however, looks somewhat different and needs further study.

16b. *Poa sibirica* subsp. *uralensis* Tzvelev, Novosti Sist. Vyssh. Rast. 9: 50. 1972.

显稃早熟禾 xian fu zao shu he

Poa insignis Litvinov; *P. sibirica* subsp. *insignis* (Litvinov) Olonova; *P. sibirica* var. *insignis* (Litvinov) Sergievskaja.

Culms up to 120 cm tall, 2–4 mm in diam. at lower nodes. Leaf sheaths longer than their internodes, nearly equaling its blade; ligules ca. 1.5 mm, abaxially sparsely scabrid to pilulose; blades moderately thin, 2–8 mm wide, uppermost to 20 cm. Panicle loosely contracted, ovoid to cylindrical, 10–20 cm, longest internodes 2.5–4 cm. Spikelets (1–)2(–3)-flowered; lower glume 2.5–3.5 mm, upper glume 3–4.5 mm; lemmas (3.5–)3.8–5.2(–5.5) mm. Anthers 2–2.5 mm. Fl. and fr. Jun–Aug. $2n = 28$.

Grasslands on slopes, meadows along forest margins; 2000–2800 m. NW Xinjiang (Toli) [Kazakhstan, Korea, Russia (Siberia); Europe (Russia: Ural Mountains)].

17. *Poa calliopsis* Litvinov ex Ovczinnikov, Izv. Tadzh. Bazy Akad. Nauk SSSR 1: 11. 1933.

花丽早熟禾 hua li zao shu he

Poa phariana Bor.

Perennials, with small tufts or isolated shoots, with slender rhizomes; shoots extravaginal. Culms erect, mostly solitary, 3–15(–25) cm tall, 0.5–1 mm in diam., smooth, nodes 1 or 2(–3), none or 1 exerted, uppermost 1/5–1/3 way up. Leaf sheaths smooth, ribs indistinct, lower ones 1.5–2 mm wide, 1.5–6.5 cm, 1–4 × as long as blade, uppermost closed for 1/3 of length, basal ones soon becoming fibrous, not persisting; blade flat or folded, moderately thin, 0.3–4 cm × 1–3 mm, abaxially smooth, adaxially smooth or finely scabrid, glabrous, margins scabrid, apex prow-tipped, of tillers and lower culm frequently curved, 1–4(–7) cm; ligule 0.5–2(–3) mm, abaxially smooth, apex truncate to obtuse, collars smooth, glabrous, uppermost erect or slightly divergent. Panicle initially contracted, ovoid, later open and pyramidal, 1.2–5 × 1.5–4 cm, longest internodes 0.25–1.3 cm; branches (1 or) 2 per node, eventually spreading to reflexed, flexuous, rounded, smooth or distally scabrid, longest 0.7–2.5 cm, with 2–12 spikelets clustered distally; flowers perfect or female, sometimes whole inflorescence female. Spikelets broadly elliptic or ovate, golden tawny or purple, 3.5–4.5 mm, florets (1–)2 or 3; vivipary usually absent; rachilla internodes 0.3–0.6 mm, smooth, glabrous; glumes elliptic or ovate or subflabellate, subequal, smooth or keel with a few hooks, lower glume (2–)2.25–3.3 mm, 1- or 3-veined, upper glume (2.2–)2.5–3.8 mm, 3-veined; lemmas broadly oblong, slightly arched along keel, 2.75–4.2(–4.7) mm, upper 1/4–1/2 membranous, turning gold-

en-brownish, apex obtuse to acute, keel villous for 1/2 of length, marginal veins villous for 1/4 of length, area between veins smooth, glabrous or infrequently proximally pilulose; callus webbed, hairs dense, 1/2 as long as lemma; palea glabrous or proximally pilulose between keels, keels sparsely scabrid, 2–6 hooks per keel. Anthers 1.5–2 mm, or vestigial, ca. 0.1 mm. Fl. and fr. Jul–Aug. $2n = 28$.

Alpine areas, meadows, waterside grassy places; 3000–3700 (–5400) m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Kyrgyzstan, Nepal, Pakistan, Tajikistan].

Most material placed here is of low-growing plants with long, slender rhizomes and delicate panicles with pendent spikelet clusters. Hybrids with *Poa qinghaiensis* are occasionally found in the NE Xizang–Qinghai Plateau. Intermediates are stouter and have larger spikelets and more scabrid lemma and palea keels than are typical for *P. calliopsis*, but the lemmas are strongly pubescent on the keel and marginal veins. Such plants are difficult to separate from *P. lipskyi*, except that they have the more pendent spikelet clusters typical of *P. calliopsis* and *P. qinghaiensis*, and often a trace of webbing on the callus, and might be referred to *P. pratensis* subsp. *staintonii*.

18. *Poa polycolea* Stapf in J. D. Hooker, Fl. Brit. India 7: 342. 1896 [“1897”].

多鞘早熟禾 duo qiao zao shu he

Poa chalarantha Keng ex L. Liu; *P. gilgitica* Dickoré; *P. lithophila* Keng ex L. Liu; *P. maerkangica* L. Liu; *P. triglumis* Keng ex L. Liu.

Perennials, loosely to densely tufted, often shortly stoloniferous or rhizomatous; shoots extra- and intravaginal. Culms erect, decumbent, or ascending, usually several per tuft, 10–60 (–75) cm tall, 0.5–1 mm in diam., smooth, nodes 1–3, 1 or 2 exserted, uppermost usually 1/4–1/3 way up. Lowermost leaf sheaths closely overlapping, straw colored, often somewhat thickly papery and persistent, not or only slightly fibrous, lower and middle sheaths 1–1.3 (–1.5) mm wide distally, with distinct closely spaced ribs, membranous between ribs, smooth or scabrid, sometimes retrorsely hispidulous, uppermost smooth, glabrous, 4–20 cm, 1/2–4 × as long as blade, closed for ca. 1/2 of length; blade flat or folded with inrolled margins, thin, 2–10 (–20) cm × 0.8–1.5 (–2.5) mm, abaxially often shiny, smooth, ribs distinct, margins finely scabrid, adaxially smooth or sparsely scabrid, glabrous or strigose, of tillers with margins inrolled, to 20 (–30) cm, adaxially smooth or scabrid, glabrous or pilulose to strigose, visible veins 5–9 including keel; lower ligules 0.1–0.5 mm, adaxially smooth or scabrid, apex truncate, glabrous or ciliolate, upper to 0.5–1 (–2.2) mm, apex truncate to obtuse, collar margins abruptly flared, smooth or scabrid, glabrous or lower ones ciliate to strigose. Panicle open, erect or diffuse, 5–15 (–20) × 2–9 cm, longest internodes 1–3 (–3.5) cm; branches spreading to reflexed, 2–5 per node, capillary, usually angled, scabrid, longest 3–9 cm with 2–9 spikelets in distal 1/3–1/2. Spikelets lanceolate, green or purple tinged, 4–7 mm, florets 2–4 (–5), commonly female, sometimes whole inflorescence female; vivipary absent; rachilla internodes 0.7–1.6 mm, smooth or slightly bumpy, or scabrid, usually visible laterally; glumes membranous-papery, generally shiny, keel and veins scabrid, surface smooth (rarely slightly scabrid distally), apex acute to acuminate, lower glume subulate, 1.5–3 (–4) mm, 1/3–

1/2 as wide as upper, 1 (or 3)-veined, upper glume elliptic, 3–4 (–5) mm, 3-veined; lemmas lanceolate, very thinly papery, 3–5 (–5.5) mm, keel straight, 5 (or 7)-veined, margins membranous, apex acute to acuminate, glabrous, or keel sparsely pilulose to shortly villous for 2/3 of length, marginal veins for 1/2 of length, intermediate veins conspicuous, area between them smooth or sparsely scabrid, glabrous or basally pilulose; callus usually sparsely webbed, hairs less than 1/2 as long as lemma; paleas smooth, minutely bumpy, or scabrid, glabrous or pilulose between keels, keels scabrid, sometimes medially pilulose. Anthers (2–)2.3–3 mm, or vestigial. Fl. and fr. Jun–Aug.

Common in alpine rocky slopes, mountain slopes, meadows among thickets, coniferous, *Quercus*, and *Larix* forests on slopes; 3000–5000 m. Qinghai, W Sichuan, SW Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Nepal, Pakistan].

Poa polycolea is a distinctive and common species of the upper mountains from west to east along the Himalayas, extending northward through Hengduan Shan. It has slender culms and blades, short ligules, and long anthers, or florets, spikelets, or inflorescences that are female. It is quite variable in floret vestiture, and in the east it grades toward *P. asperifolia*, which has stouter culms with more raised nodes and longer leaf blades and ligules, and *P. tangii*, which has softer leaves and smooth branches, broader first glumes, and more often blunt lemmas. Infrequently some spikelets have an additional sterile bract above the 2 normal glumes as in the type of *P. triglumis*.

19. *Poa tangii* Hitchcock, Proc. Biol. Soc. Washington 43: 94. 1930.

唐氏早熟禾 tang shi zao shu he

Poa shansiensis Hitchcock.

Perennials, loosely tufted, sometimes short rhizomatous; shoots mainly extravaginal. Culms erect, sometimes abruptly decumbent at base, few per tuft, 25–50 cm tall, 0.5–1 mm in diam., smooth, nodes 2 or 3, 1 or 2 exserted, uppermost usually 1/3–1/2 way up. Lower leaf sheaths mostly 1.2–1.5 mm wide, with well-spaced moderately raised ribs, thin between the ribs, smooth or scabrid, sometimes hispidulous, lowermost ones not closely overlapping, papery, withering, longest 4–10 cm, smooth, glabrous, 2–4 × as long as blade, uppermost closed for 2/5–3/4 of length; blade flat, papery to thickly papery, 2–4 (–10) cm × 1–2 (–3) mm, abaxially smooth, adaxially smooth or scabrid, glabrous, margins finely scabrid, of tillers flat or folded, 5–20 cm, generally with only primary veins expressed abaxially (3–5 veins visible including keel); ligule 0.5–1 mm, apex truncate, erose to fimbriate, adaxially smooth or scabrid, collar margins not or weakly flared, smooth or scabrid, glabrous or the lower ones sometimes ciliate. Panicle open, erect or lax, diffuse, exserted, 2–8 × 2–4 cm, longest internodes 1.2–3.5 cm; branches spreading, 2 per node, slender, rounded, smooth, longest 1.5–4 cm with 1–3 spikelets in distal 1/3; flowers female or perfect, sometimes whole inflorescences female. Spikelets ovate, grayish green, 5–8 mm, florets 3–6; vivipary absent; rachilla internodes 0.7–2.5 mm, smooth or sparsely scabrid, glabrous or sparsely pilulose; glumes very thinly papery, surface smooth, keel smooth or sparsely scabrid, apex obtuse to acute, blunt or pointed, lower glume lanceolate, 2.5–3.5 mm, 1/2–3/4 as wide as upper, 1-veined, upper glume 3–5.5 mm, 3-veined; lemmas oblong, very thinly papery, 4–5.5 mm, apex

obtuse, veins glabrous or keel loosely villous for 1/2 of length, marginal veins to 1/3, area between veins smooth or distally scabrid, proximally glabrous or laxly pilulose; callus webbed or diffusely hairy, hairs less than 1/2 as long as lemma; palea, smooth or minutely bumpy (or with sparse minute hooks), glabrous between keels, keels sparsely scabrid, sometimes medially pilulose. Anthers 2.5–3.5 mm, or vestigial. Fl. and fr. May–Jul.

• Wet grassy places along forest margins; 1500–3600 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi.

Poa tangii is variable in spikelet pubescence, but the variation is not geographically correlated. The species becomes especially difficult to distinguish from *P. polycolea* in Gansu and Qinghai, except by its smooth, rounded branches and sparsely scabrid palea keels. Compare *P. tangii* also with *P. vereschaginii* in *P. subg. Ochlopoa*.

20. *Poa lhasaensis* Bor, Bull. Bot. Surv. India 7: 132. 1965.

江萨早熟禾 *jiang sa zao shu he*

Poa jaunsarensis Bor.

Plants grayish to tawny grayish, perennials, rhizomatous. Culms 40–80 cm tall, 1.5–2 mm in diam., nodes 3 or 4. Lower leaf sheaths retrorsely scabrid, 14–19 cm, 1.1–1.6 × as long as blade, uppermost closed for (1/5–)1/4 of length; blades flat or folded, moderately thin, 8.5–19 cm × 2.5–4 mm, uppermost 8.5–13 cm, surfaces and margins scabrid, apex slender pro-w-tipped; ligule 2.5–5 mm, apex entire to lacerate, abaxially scabrid. Panicle loosely contracted or somewhat open, oblong to pyramidal, 10–19 × 2–5 cm; branches loosely ascending, 3–5 per node, proximally rounded, sparsely scabrid, distally densely scabrid on and between angles, longest 4–8 cm with spikelets moderately crowded in distal 1/2. Spikelets elliptic, 4–5 mm, florets 2–4; vivipary absent; rachilla glabrous; glumes thinly papery, scabrid on keels and marginal veins, lower glume lanceolate to oblong, 2.3–3.5 mm, 1- or 3-veined, apex acuminate, upper glume elliptic to oblong, 3.5–3.8 mm; lemmas 3.5–4 mm, keel villous for 1/2 of length, marginal veins to 1/3; callus webbed; palea keels scabrid, glabrous. Anthers 1.4–2 mm. Fl. and fr. Jun–Aug.

High-elevation grassy places on slopes; 3300–4500 m. Sichuan, Xizang [India, Kashmir, Nepal].

Poa lhasaensis needs further study. The types of *P. jaunsarensis* and *P. lhasaensis* are large plants with long upper culm leaves (10–13 cm), upper sheaths closed for only 1/4 their length, and the lowest sheaths moderately to densely retrorsely scabrid; *P. jaunsarensis* has the uppermost ligule to 5 mm long and lacerate. The few specimens referable to *P. jaunsarensis* could be accommodated in *P. pratensis* except for the several long, relatively scabrid leaf blades along the culms, their unusually open sheaths, long ligules, and the thin glumes, which in combination suggest the specimens might be something else, perhaps intermediates between *P. pratensis* and *P. asperifolia*. The anthers are longer and the panicle branches more numerous in the type specimens than in the original descriptions of both *P. lhasaensis* and *P. jaunsarensis*.

21. *Poa pratensis* Linnaeus, Sp. Pl. 1: 67. 1753, nom. cons.

草地早熟禾 *cao di zao shu he*

Poa florida N. R. Cui.

Perennials, loosely tufted or with isolated shoots, strongly rhizomatous, often forming turf; shoots extra- and often intravaginal. Plants green to pale or yellowish green, or purplish to strongly grayish glaucous. Culms 10–120 cm, 1–2.5 mm in diam., erect or decumbent, 1 to several per tuft, smooth, nodes (1–)2–4, 1 or 2 exserted. Leaf sheaths moderately compressed and keeled, uppermost closed for (1/4–)1/3–2/5 of length, smooth or infrequently retrorsely scabrid or pilulose; blades flat or folded, papery to thickly papery, 1–5 mm wide, surfaces smooth or sparsely scabrid, margins scabrid, adaxially glabrous or frequently sparsely hispidulous to strigulose, of tillers, flat or folded with margins inrolled, intravaginal ones when present often folded, 0.5–2 mm wide, extravaginal ones flat or folded (1–)1.5–5 mm wide; ligule whitish, 0.5–4(–5) mm, abaxially nearly smooth to densely scabrid, apex truncate to rounded, often finely scabrid to ciliolate or pilulose. Panicle loosely contracted to open, oblong to broadly pyramidal, erect or slightly lax, (2–)5–20(–25) cm, longest internodes 1–4.2 cm; branches steeply ascending to widely spreading, (2–)3–5(–9) per node, rounded or distally angled, nearly smooth to distally scabrid with hooks on and between angles, longest branch 1.5–5(–10) cm with (3–)7–18 spikelets in distal 1/3–2/3, sometimes clustered distally. Spikelets ovate, green or grayish, frequently purple tinged, 3–7(–9) mm, florets 2–5(–9); vivipary absent in China; rachilla internodes 0.5–1(–1.2) mm, smooth, glabrous (rarely sparsely pilulose); glumes subequal, strongly keeled, keels and sometimes lateral veins dorsally scabrid, first glume 1.5–3(–4) mm. 1–3-veined, upper glume 2–4 mm, 3(or 5)-veined; lemmas ovate to lanceolate (or narrowly lanceolate), 2.5–4(–5) mm, apex slightly obtuse to acuminate, keel villous for 3/4 of length, marginal veins to 1/2 length, intermediate veins prominent, glabrous (rarely sparsely pilulose), glabrous between veins, minutely bumpy, sparsely scabrid distally; callus webbed, hairs as long as lemma, frequently with less well-developed tufts from below marginal veins; palea usually narrow, glabrous or with sparse hooks, usually minutely bumpy, glabrous between keels, keels scabrid, infrequently medially pilulose in subsp. *pruinosa*. Anthers (1.2–)1.4–2.5(–2.8) mm, infrequently poorly formed, but not vestigial. Fl. and fr. Jun–Sep. $2n = 28–144$.

Temperate to arctic, moderately moist to wet conditions, from coastal meadows to forest shade, to alpine and tundra, often in disturbed sites; 500–4400 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Myanmar, Nepal, New Guinea, Pakistan, Russia, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan; Africa, SW Asia, Australia, Europe, North America, Pacific Islands, South America].

Poa pratensis is a valuable species for soil stabilization and forage. Its taxonomy is complicated by the occurrence of facultative apomixis and an extensive polyploid series. It comprises many local and variable, widespread races. It is possible to recognize the widespread forms as subspecies, but there are many intermediates between them that do not fit well and we can only treat them as *P. pratensis* s.l. The type of *P. florida* appears to belong to this species, but has many more florets per spikelet (6–9) than is usual.

- 1a. Blades somewhat tough and slightly fleshy, folded, not setiform, 2–5 mm wide, grayish green, sterile shoot leaves usually curved outward; panicle somewhat lax, branches \pm smooth; plants from somewhat saline habitats in mountains and steppe basins of C Asia 21d. subsp. *pruinosa*
- 1b. Blades flat or folded, sometimes setiform, not fleshy, 0.5–4(–5) mm wide, sometimes with a bluish tinge, but not grayish green; sterile shoot leaves mostly straight (sometimes curved in subsp. *alpigena*).
- 2a. Lemmas 4–4.5 mm, lower glume 3–4 mm.
- 3a. Panicle 4–8 cm; branches 2 per node, distally sparsely scabrid, spikelets clustered in distal 1/3, clusters somewhat pendent 21f. subsp. *staintonii*
- 3b. Panicle 10–15 cm; branches 3–5 per node, distally moderately scabrid, spikelets loosely arranged in distal 1/2, not pendant 21g. subsp. *stenachyra*
- 2b. Lemmas 2.5–3.5(–5) mm, lower glume 2–3.5(–4) mm.
- 4a. Innovations and flowering shoots in small clusters, usually enclosed by dead leaf sheaths; shoots connected by long rhizomes; blades of the innovation leaves usually setiform, convolute, 0.4–1 mm in diam.; plants 20–100 cm tall; panicle usually slightly lax, compressed after anthesis; branches slightly scabrid; lemmas 2.5–3.5 mm; ligule glabrous 21b. subsp. *angustifolia*
- 4b. Innovation shoots usually solitary, rarely somewhat appressed, but not forming dense clusters.
- 5a. Sheaths of lower leaves somewhat scabrid due to very short hairs; innovation leaf blades usually convolute, moderately firm, 0.4–0.7 mm in diam.; panicle lax, branches scabrid; lemmas 2.8–3.5 mm; culms 30–80 cm tall; forest plants of Heilongjiang basin 21e. subsp. *sergievskajae*
- 5b. Sheaths of lower leaves glabrous and smooth (rarely pilulose, but then blades broader and flat); panicle branches usually slightly scabrid or smooth; lemmas 2.5–4(–5) mm.
- 6a. Plants 8–30(–50) cm tall, with bluish coating, especially prominent on glumes; blades 1.3–4 mm wide, flat; panicle broad, lax; branches slightly scabrid, 1 or 2(or 3) per node; ligule abaxially pilulose subsp. *irrigata*
 . (see note under 21c. subsp. *pratensis*)

- 6b. Plants usually larger, usually without bluish coating; panicle branches usually 3–5 per node at lowest nodes.
- 7a. Panicle branches with scattered spinules, sometimes nearly smooth; leaf blade usually flat; plants often with compact aerial shoots; widespread 21c. subsp. *pratensis*
- 7b. Panicle branches smooth or nearly so; leaf blade often convolute; plants almost always with solitary shoots; arctic and alpine 21a. subsp. *alpigena*

21a. *Poa pratensis* subsp. *alpigena* (Lindman) Hiitonen, Suom. Kasvio. 205. 1933.

高原早熟禾 gao yuan zao shu he

Poa alpigena Lindman, Sv. Fanerogamfl. 91. 1918; *P. pratensis* var. *alpigena* Blytt, nom. illeg. superfl.; *P. pratensis* var. *contracta* Keng; *P. pratensis* var. *iantha* Laestadius.

Plants green or more often purplish, with slender rhizomes; shoots extravaginal. Culms 10–70 cm tall, 0.7–1 mm in diam., mostly solitary, nodes 1 or 2. Leaf sheaths smooth, glabrous; blades flat or more often folded, 2–5 cm \times 0.6–2(–3) mm, surfaces and margins slightly scabrid or smooth, adaxially frequently sparsely hairy, of tillers often curved upward, to 12 cm; ligules 0.8–2.5 mm, abaxially smooth or sparsely scabrid. Panicle loosely contracted or eventually open, erect, 5–10(–20) \times 1–3.5(–5) cm; branches spreading at anthesis, slightly flexuous, 2–4 per node, slender, smooth or sparsely scabrid, longest 1.5–4 cm, with 9–15 spikelets in distal 1/2. Spikelets purple-violet, 3–5 mm, florets 2 or 3; glumes subequal, lower glume 2–3.5 mm, upper glume 2.5–4 mm; lemmas ovate, 3.3–4.3 mm, keel villous for 2/3 of length, marginal veins for 1/2, intermediate veins glabrous or sparsely pilulose to short villous; palea smooth or proximally with sparse hooks between keels, keels scabrid, sometimes medially pilulose. Anthers (1.2–)1.3–1.8 mm. Fl. and fr. Jul–Aug. $2n = 28, 35, 42, 56, 63, 70, 74–78, 84$.

Mountain meadows, alpine cold grasslands, riverside sandy places; 700–1000 m. Hebei, Heilongjiang, Nei Mongol [Russia; Europe, North and South America].

Only a few specimens from NE China seem to be of this race. Records from western provinces cited in FRPS (9(2): 101–102. 2002, as *P. alpigena*) seem to be based on material better placed in subsp. *pruinosa* or subsp. *staintonii*.

21b. *Poa pratensis* subsp. *angustifolia* (Linnaeus) Lejeun, Comp. Fl. Belg. 82. 1828.

细叶早熟禾 xi ye zao shu he

Poa angustifolia Linnaeus, Sp. Pl 1: 67. 1753; *P. pratensis* var. *angustifolia* (Linnaeus) Smith.

Plants pale green, sometimes purplish, forming tufts, not turf; shoots extra- and intravaginal, with fascicles of slender intravaginal shoots. Culms (15–)20–80 cm tall, several per tuft. Leaf sheaths longer than basal internodes, shorter than upper internodes, several times as long as blades; blades flat or folded with margins inrolled, thin to moderately thin, 3–9 cm × 1–2 mm, of tillers intravaginal ones setiform, folded with inrolled margins, papery to thickly papery, to 45 cm × 0.5–1 mm, surfaces smooth, often adaxially pubescent; ligule 0.5–2 mm, apex truncate, abaxially scabrid. Panicle open, oblong to narrowly pyramidal, 5–10(–15) × 2–4(–5) cm; branches ascending or spreading, 3–5 per node, scabrid, longest 2–5 cm with 6–18 spikelets in distal 1/2–2/3. Spikelets ovate, frequently purple tinged, 4–5 mm, florets 2–5; glumes subequal, apex acuminate, keel scabrid, lower glume 2.2–3 mm, 1-veined, upper glume 2.5–3.2 mm, 3-veined; lemmas 2.5–3.5(–4) mm, apex acute, narrowly membranous, keel villous for 2/3 of length, marginal veins for 1/2 length, intermediate veins glabrous; palea smooth to minutely bumpy between keels, keels scabrid. Anthers 1.3–2 mm. Fl. and fr. Jun–Jul, fr. Jul–Sep. $2n = 28, 46, 51, 56, 63, 66, 72$.

Coniferous and *Quercus* forest margins, grasslands on slopes; 500–4400 m. Gansu, Guizhou, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; introduced in North America].

This subspecies is probably introduced, at least in part, in China. It grades into subsp. *pratensis*.

21c. *Poa pratensis* subsp. *pratensis*

草地早熟禾(原亚种) cao di zao shu he (yuan ya zhong)

Poa angustiglumis Roshevitz; *P. pratensis* [unranked] *anceps* Gaudin; *P. pratensis* var. *anceps* (Gaudin) Grisebach; *P. viridula* Palibin.

Plants green or pale green, often forming turf, strongly rhizomatous; shoots extra- and intravaginal. Culms (15–)20–80(–120) cm, few to several per tuft, erect, nodes 2–4. Leaf sheaths smooth or retrorsely scabrid, lower ones longer than internodes, usually distinctly longer than blade, uppermost to 20 cm; blades flat, moderately papery to thickly papery, 2–10 cm × 2–4(–5) mm, surfaces smooth or adaxial surface and margins sparsely scabrid, abaxially glabrous or less often sparsely pubescent, of tillers flat and folded or all flat with margins inrolled or not, papery to thickly papery, to 45 cm × 1–4(–5) mm; ligules 1–4(–5) mm, abaxially scabrid. Panicle loosely contracted to open, oblong to broadly pyramidal, 5–20(–25) × 3–5(–10) cm; branches spreading, straight or flexuous and slightly lax, 3–7(–9) per node, smooth or scabrid, longest 5–10 cm with 3–10(–18) spikelets in distal 1/2. Spikelets ovate, frequently purple tinged, 4–7(–9) mm, florets 3–5(–8); glumes ovate to lanceolate (narrowly lanceolate), apex acute to acuminate, keel distally scabrid, lower glume 1.5–3(–4) mm, 1- or 3-veined, upper glume 2–3(–5) mm, 3-veined; lemmas ovate to lanceolate 2.5–4(–5) mm, apex slightly obtuse to acute, keel villous for 3/4 of length, marginal veins for 1/2 length, intermediate veins glabrous; palea smooth or minutely bumpy, rarely with

a few hooks between keels, keels scabrid. Anthers (1.2–)1.5–2.2(–2.8) mm. Fl. May–Jun, fr. Jul–Sep. $2n = 28, 35, 42, 49, 50, 52, 56, 58, 63, 64, 66, 70, 77, 84, 91, 98, 105, 112, 119, 126, 133, 140$.

Moist meadows, sandy places, grassy slopes; 500–4000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Myanmar, Nepal, New Guinea, Pakistan, Russia (Far East, Siberia), Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan; Africa, SW Asia, Australia, Europe, North America, Pacific Islands, South America].

The race is widely cultivated for forage, soil stabilization, and lawns. It is probably also native to China. Cultivated, soft-leaved plants are sometimes called subsp. *irrigata* (Lindman) H. Lindberg, but such cultivated plants are not readily classified. *Poa pratensis* subsp. *irrigata* was reported from Xinjiang in FRPS (9(2): 194, 2002, as *P. irrigata* Lindman), but, while it is potentially present there, no authentic material has been seen by us. It was mapped for the Russian Far East only from the Commander Isles by Probatova (in Tzvelev, Sosud. Rast. Sovetsk. Dal'nego Vostoka 1: 279, 1985).

21d. *Poa pratensis* subsp. *pruinosa* (Korotky) Dickoré, Stapfia 39: 173, 1995.

粉绿早熟禾 fen lü zao shu he

Poa pruinosa Korotky, Repert. Spec. Nov. Regni Veg. 13: 291, 1914; *P. grisea* Korotky; *P. macrocalyx* var. *tianschanica* Regel; *P. markgrafii* H. Hartmann; *P. pachyantha* Keng ex Shan Chen; *P. pamirica* Roshevitz ex Ovczinnikov; *P. tianschanica* (Regel) Hackel ex O. Fedtschenko.

Plants grayish green, loosely tufted, not forming turf; shoots mainly extravaginal, often curved upward. Culms often decumbent, 15–70 cm tall, solitary or infrequently few per tuft, 1–2 mm in diam., nodes 2 or 3, uppermost node less than 1/3 way up. Blades flat or usually folded with margins inrolled, moderately papery to thickly papery, 2–5 mm wide, of tillers folded, thickly papery and firm, usually distinctly curved, 3–10(–18) cm × (1–)2–5 mm, often adaxially sparsely pubescent; ligule 0.5–4 mm, abaxially scabrid (rarely smooth). Panicle usually loosely contracted, oblong to pyramidal, somewhat lax, 4–10(–15) cm; branches ascending to spreading, (1–)2–5(–7) per node, smooth or distally scabrid, longest with spikelets in distal 1/3–1/2. Spikelets usually grayish and purple tinged, 3–6(–7) mm, florets 2–5(–7); lower glume 2.5–3.5 mm, 1- or 3-veined, upper glume 3–4 mm, 3-veined; lemmas ovate to lanceolate, 3–4.5 mm, apex acute, keel villous for 2/3 of length, marginal veins for 1/2; palea keels scabrid, glabrous or infrequently medially pilulose. Anthers 2–2.5 mm. Fl. and fr. Jun–Sep. $2n = 42$.

Mountains, moist weakly saline or alkaline grassy places, alpine river banks, marshy grasslands in the north. Gansu, Heilongjiang, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia (Siberia), Tajikistan].

This race is native to China. The inclusion of *Poa tianschanica* s.s. needs further study. *Poa pruinosa* s.s. (including *P. grisea*) includes plants from E Siberia with a profuse, waxy bloom and culms strongly flattened at the base. The types of *P. markgrafii* and *P. pamirica* seem typical of the subspecies. Plants without a waxy bloom, with stiff culms that are weakly flattened at base, occurring from the Altai, Khakass, and

Tuva in Siberia southward through C Asia, are sometimes distinguished as *P. tianschanica* s.s. Tzvelev (Zlaki SSSR, 459. 1976) treated these as one species, possibly derived from hybridization between *P. pratensis* and *P. tibetica*. *Poa pachyantha* seems to fit within *P. pratensis* subsp. *pruinosa*; although the culms are not flattened, the lower sheaths are flattened and somewhat keeled, and the plants are gray with anthocyanic spikelets that are somewhat clustered. *Poa sabulosa* (Turczaninow ex Roshevitz) Turczaninow ex Roshevitz was reported in FRPS (9(2): 102. 2002) from Heilongjiang, in low, wet, sandy places by river banks, lake shores, seashores, and saline meadows. No voucher was seen, and it is doubtfully present in China. In Russia it is considered a narrow endemic of subsaline meadows in the Baikal region of Siberia and N Mongolia, and is treated as a low-growing (10–30 cm), small-spikeleted (lemmas 2.3–2.8 mm) race, as *P. pratensis* subsp. *sabulosa* (Turczaninow ex Roshevitz) Tzvelev, or lumped within *P. pratensis* subsp. *pruinosa* s.l.

21e. *Poa pratensis* subsp. *sergievskajae* (Probatova) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 27. 1974.

色早熟禾 se zao shu he

Poa sergievskajae Probatova, Novosti Sist. Vyssh. Rast. 8: 28. 1971.

Plants loosely tufted, not forming a turf, slender rhizomatous, shoots mainly extravaginal. Culms solitary, erect, slender, 20–80 cm tall. Leaf sheaths of lower leaves retrorsely hispidulous, blades flat with slightly inrolled margins, 1–3 mm wide, adaxially sparsely pubescent, of tillers folded, to 25 cm × 0.8–1.4 mm. Panicle open, pyramidal, 5–15 cm; branches slightly flexuous, slender, nearly smooth to moderately scabrid, longest with 3–10 spikelets. Spikelets pale green, 3–5 mm; glumes unequal, lower glume 1-veined; lemmas 2.5–3.5 mm, keel and marginal veins loosely villous; palea glabrous between keels, keels scabrid. Anthers 1.3–1.8 mm. Fl. and fr. Jul.

Betula and *Picea* forests, shade of shrubs, moist ground. ?Heilongjiang, ?Jilin, ?Xizang [Russia (Far East, Siberia)].

A number of gatherings from China fits this taxon, which may merely represent a minor variation within *Poa pratensis*, possibly from low nutrient (acidic), shady, moist habitats.

21f. *Poa pratensis* subsp. *staintonii* (Melderis) Dickoré, Stapfia 39: 174. 1995.

长稃早熟禾 chang fu zao shu he

Poa alpigena subsp. *staintonii* Melderis in H. Hara et al., Enum. Fl. Pl. Nepal 1: 142. 1978; *P. dolichachyra* Keng ex P. C. Keng & G. Q. Song.

Plants green or purplish, not forming a turf. Culms 30–40 cm tall, nodes 2, uppermost node to 1/3 of way up. Leaf sheaths smooth, weakly keeled, uppermost 9–11 cm, several times longer than blade; blades folded, moderately papery to thickly papery, 3–7 cm × 2–3 mm, abaxially smooth, adaxially sparsely pubescent, of tillers 20–25 cm × 1–2 mm; ligules 1.5–3 mm, apex obtuse, abaxially smooth. Panicle open, 4–8 cm; branches spreading, 2 per node, proximally smooth, distally sparsely scabrid, longest 3–5 cm with spikelets clustered in distal 1/3, clusters somewhat pendent. Spikelets ovate, purple tinged, 4.5–6 mm, florets 2–4; glumes sparsely scabrid on keels, smooth or very sparsely scabrid on lateral veins, smooth between veins, lower glume ca. 3 mm, 1-veined, upper glume ca. 4 mm, 3-veined; lemmas 4–4.5 mm, keel villous for 2/3 of length, mar-

ginal veins for 1/2, intermediate veins glabrous; palea keels medially scabrid or pilulose. Anthers ca. 2 mm. Fl. and fr. Jul–Aug.

River banks in high mountain areas, waterside grassy slopes; 3400–3800 m. Qinghai, N Sichuan, Xizang, Yunnan [Nepal].

This race is native to the Xizang-Qinghai Plateau. It has larger spikelets than *Poa calliopsis*, but seems intermediate to it in the possession of spikelets crowded near the somewhat pendent branch tips.

21g. *Poa pratensis* subsp. *stenachyra* (Keng ex P. C. Keng & G. Q. Song) Soreng & G. Zhu, **comb. et stat. nov.**

窄颖早熟禾 zhai ying zao shu he

Basionym: *Poa stenachyra* Keng ex P. C. Keng & G. Q. Song, Acta Biol. Plateau Sin. 12: 10. 1994.

Plants green or pale green, loosely tufted, not forming a turf, shoots mainly extravaginal. Culms erect, solitary or few per tuft, 80–110 cm tall, smooth, rounded or slightly compressed, nodes 2–4, 1 or 2 exserted, uppermost node 1/5–1/4 way up. Leaf sheaths smooth, somewhat keeled, uppermost to 19 cm, ca. 2 × as long as blade; blades flat with margins slightly inrolled, leathery, 10–16 cm × 3–4 mm, adaxially sparsely scabrid; ligule 1–2 mm, abaxially scabrid, margin erose, apex obtuse. Panicle open, 10–15 × 4–8 cm, longest internode 3.7–4.2 cm; branches widely spreading to nodding, 3–5 per node, proximally rounded and smooth, distally moderately scabrid, longest 6–8 cm with 8–13 spikelets in distal 1/2. Spikelets 5–6 mm, florets 3; glumes subequal, keel moderately scabrid, surfaces sparsely scabrid, lower glume 3.5–4 mm, 1- or 3-veined, upper glume 4–5 mm, 3-veined, as long or slightly longer than first lemma; lemma narrowly lanceolate, 4–4.5 mm, apex acuminate, yellow bronze, intermediate veins prominent, keel villous for 1/2 length, marginal veins to 1/3, surfaces indistinctly minutely bumpy, sparsely scabrid; palea glabrous between keels, keels finely scabrid. Anthers ca. 2.3 mm. Fl. and fr. Jun–Aug.

● Forest margins on slopes, grassy places among thickets; 3700–4300 m. Qinghai, NW Sichuan.

This rare race differs from the others by having glumes and lemmas narrowly acuminate, the glumes subequal to the lowest lemma.

22. *Poa raduliformis* Probatova, Novosti Sist. Vyssh. Rast. 8: 25. 1971.

糙早熟禾 cao zao shu he

Poa remota Forselles subsp. *raduliformis* (Probatova) Voroschilov.

Perennials, shortly rhizomatous, rhizomes yellowish orange to reddish brown, slender. Plants yellowish green. Culms 35–90 cm tall, 3–4 mm in diam., nodes 2 or 3, uppermost node ca. 1/2 way up, often slightly scabrid below the panicle and nodes. Leaf sheaths compressed, keeled, 10–20 cm, lower ones distinctly retrorsely hispidulous, uppermost closed for 1/3 of length; blade flat or infrequently folded, moderately thin, 8–15 cm × (1.5–)3–5 mm, adaxial surface of basal blades sparsely pilulose; ligules 2–3.5 mm, apex ciliolate, abaxially sparsely puberulent. Panicle open, oblong, 8–20 cm; branches ascending, spreading in anthesis, scabrid throughout, longest 3–

5 cm with 3–10 spikelets in distal 1/2. Spikelets green, 3.5–6 mm, florets 2–4; vivipary absent; glumes strongly keeled, keel almost straight, keel and lateral veins moderately densely scabrid, surface sometimes moderately scabrid above, 3-veined, apex acuminate, lower glume 2–3 mm, upper glume 2.5–3.5 mm; lemmas lanceolate, 3.3–4.5 mm, keel and marginal veins with lower part sparsely pilulose, surfaces glabrous, finely minutely bumpy; callus webbed; palea glabrous between keels, keels scabrid. Anthers 1.8–2.4 mm. Fl. and fr. Jun–Jul. $2n = 70$.

Forest margins, roadside thickets; ca. 2600 m. ?Shanxi [Japan, Mongolia, Russia (Far East, E Siberia)].

Tzvelev (Zlaki SSSR, 451. 1976) considered *Poa raduliformis* as probably “a result of hybridization of *P. pratensis* with *P. remota*, *P. radula*, or *P. sibirica*.” It seems few gatherings from China might be called *P. raduliformis*, and the report from Shanxi in FRPS (9(2): 130–131. 2002) is doubtful. The species should be looked for in Heilongjiang.

23. *Poa arctica* R. Brown subsp. *caespitans* Simmons ex Nannfeldt, Symb. Bot. Upsal. 4: 71. 1940.

极地早熟禾 *ji di zao shu he*

Poa tolmachewii Roshevitz.

Perennials, densely tufted, short rhizomatous or not (Chinese plants); shoots extravaginal and some intravaginal. Culms solitary to several (rarely up to 20, Chinese plants), 7.5–60 cm tall, 0.5–2 mm in diam., smooth, glabrous, nodes 1 or 2, none or 1 exserted, uppermost to 1/3 way up, base of culms with sheaths soon withering (in Chinese plants). Leaf sheaths weakly keeled, smooth, glabrous, 2–15 cm, 1.5–5 × as long as blade, uppermost closed for 1/4–1/3 of length; blades flat or folded, papery to thickly papery, 1–6 mm wide, surfaces smooth or sparsely scabrid, of tillers folded, 2–15 cm; ligule 2–4 mm, abaxially smooth or sparsely scabrid, apex obtuse to acute. Panicle open, ovoid to pyramidal, well exserted, 3–10 (–15) × 2–6 cm, internodes 0.8–1.5 (–3) cm; branches spreading early, sinuous and flexuous to strict, (1–)2–5 per node, slender to moderately stout, rounded, smooth or distally scabrid, longest 1.5–5 cm with 2–7 spikelets in distal 1/3. Spikelets ovate, strongly purple tinged, 4–5 (–5.5) mm, florets (2–)3–4 (–6); vivipary absent (within China); rachilla internodes 0.8–1.2 mm, smooth, glabrous, or short villous (within China); glumes subequal, lanceolate, very thinly papery, 3-veined, weakly keeled, smooth or sparsely scabrid, lower glume (2–)2.5–4.5 mm, upper glume (2.5–)3–5 mm; lemmas lanceolate to broadly lanceolate, 3.5–4.5 mm, margins broadly membranous, apex acute, keel densely long-villous for 3/4 of length, marginal veins to 2/3, intermediate veins prominent, area between veins smooth to moderately bumpy, distally smooth or sparsely scabrid, proximally (sparsely to) densely shortly villous; callus webbed, hairs usually dense, to 1/2 as long as lemma; palea sparsely to moderately pilulose between keels, keels scabrid, medially pilulose. Anthers 1.4–2.5 mm. Fl. and fr. Jul–Aug. $2n = 77$.

Wet places along glacial rivers or lakes, alpine meadows, grassy places on rocky slopes; ca. 2100 m. Heilongjiang, Jilin [Russia; Europe (Scandinavia), North America].

The only Chinese material seen by the authors is from Jilin (Changbai Shan), and this is tentatively placed within subsp. *caespitans*.

The specimens have no evident rhizomes, like subsp. *caespitans*. The rachillas are strongly pilose as in subsp. *lanata* (Scribner & Merrill) Soreng (incl. *Poa malacantha* Komarov), but the leaf blades are too thin and the spikelets too small for that taxon. *Poa arctica* subsp. *arctica* is distinguished by its loose, rhizomatous habit, mostly solitary culms, and generally glabrous rachillas. These gatherings had been identified as *P. shinoana* Ohwi (*P. malacantha* subsp. *shinoana* (Ohwi) T. Koyama; *P. malacantha* var. *shinoana* (Ohwi) Ohwi). FRPS (9(2): 132. 2002) reported *P. tolmachewii* from Heilongjiang, but we have not seen a voucher specimen. Specimens named as *P. arctica* subsp. *arctica* from Gansu, Hebei, Nei Mongol, Qinghai, and Xinjiang have been redetermined as other species, mostly *P. tangii*. *Poa arctica* subsp. *arctica* is a circumboreal arctic and alpine species, and is known as far south as ca. 50°N in the mountains S of Lake Baikal (but not from Mongolia) and from northernmost Korea (*P. deschampsoides* Ohwi), but there seems to be little or no suitable habitat in adjacent parts of China.

24. *Poa hissarica* Roshevitz ex Ovczinnikov, Izv. Tadzh. Bazy Akad. Nauk SSSR 1: 12. 1933.

希萨尔早熟禾 *xi sa er zao shu he*

Poa laudanensis Roshevitz ex Ovczinnikov.

Perennials, densely tufted, with or without short lateral shoots; shoots extravaginal and intravaginal. Culms few to several per tuft, erect or obliquely ascending, (10–)15–40 cm tall, 0.5–0.8 mm in diam., smooth, nodes 2 or 3, 1 or 2 exserted, uppermost to 1/4 way up, base enclosed by persistent pale brown leaf sheaths. Leaf sheaths smooth, glabrous, 3–9 cm, 4–5 × as long as blade, uppermost closed for 1/3–2/3 of length; blades folded with margins inrolled or not, moderately papery to thickly papery, ca. 2 mm wide, abaxially smooth, adaxially smooth or sparsely scabrid, margins scabrid, longest intravaginal ones to 3–8 cm; ligule 1–2 mm, abaxially smooth or sparsely scabrid, margin dentate to lacerate, sometimes ciliate, apex truncate to obtusely rounded, collars smooth, glabrous. Panicle loosely contracted or open, erect, exserted, (3–)4–10 × 3–7 cm; branches spreading, straight or slightly flexuous, 2 per node, slender, rounded and smooth throughout or distally slightly angled and pedicels sparsely scabrid, longest (1.2–)2–5 cm with 1–5 spikelets in distal (1/3–)1/2. Spikelets ovate, tinged pale purple, (4–)5–8 (–10) mm, florets (2–)3–6; vivipary absent; rachilla internodes 0.8–1.2 mm, smooth, glabrous; glumes unequal to subequal, very thinly papery, shiny, smooth or keel sparsely scabrid distally, lower glume (2–)2.5–3.5 mm, 1- or 3-veined, upper glume 3–4 mm, 3-veined; lemmas ovoid to broadly lanceolate, 3–4.8 mm, intermediate veins indistinct, smooth throughout to sparsely and finely scabrid on and along margins, glabrous throughout, margins broadly membranous, apex obtuse to acute; callus glabrous; palea smooth, glabrous between keels, keels medially scabrid to ciliate, distally scabrid. Anthers ca. 2 mm. Fl. and fr. Jun–Jul.

Alpine moist rocky grassy slopes; (2800–)3700–4000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan].

Poa hissarica is possibly endemic to the W slope of the C Asian Republics, but one specimen from Xinjiang (Tian Shan, 2800 m), with very sparse callus web and very sparsely hispid between the lemma veins, is close to this species. Perhaps *P. hissarica* would be better treated as a subspecies of *P. lipskyi*.

25. *Poa lipskyi* Roshevitz, Izv. Bot. Sada Akad. Nauk SSSR 30: 303. 1932.

疏穗早熟禾 shu sui zao shu he

Perennials, densely tufted, with or without short lateral shoots; shoots extra- and intravaginal. Culms several per tuft, erect or obliquely ascending, (5–)10–55 cm tall, 1–2 mm in diam., smooth, nodes (1–)2 or 3, none or 1 exserted, uppermost to 1/4–1/2 way up, base enclosed in layers of old, pale brown sheaths. Leaf sheaths smooth or the lower ones scabrid, glabrous, 4–10 cm, 1.5–4 × as long as blade, uppermost closed for 1/3–1/2 of length; blades flat or folded, thickly papery, 2–10 cm × 1–3(–4) mm, abaxially smooth, adaxially densely scabrid, less often nearly smooth, glabrous, margins scabrid, apex pro-tipped, of tillers 3–12 cm; ligule 1.6–4 mm, abaxially scabrid, apex truncate to obtuse, dentate to lacerate, sometimes ciliate, collar usually smooth, glabrous. Panicle open or loosely contracted, erect or somewhat lax, exserted, 4–10(–15) × 3–8 cm; branches ascending to spreading, straight or slightly flexuous, 1 or 2(–5) per node, slender, rounded and smooth throughout or distally slightly angled and very sparsely scabrid, longest 2–7 cm with 2–4(–8) spikelets in distal 1/4–1/3. Spikelets ovate, 6–9 mm, florets 3–5(–6), purple tinged; vivipary present or commonly absent; rachilla internodes 0.8–1.2 mm, smooth, glabrous; glumes unequal to subequal, very thinly papery, shiny, smooth or keel sparsely scabrid distally, lower glume 3.5–4 (–5.2) mm, 1- or 3-veined, upper glume 3.5–5(–6) mm, 3-veined; lemmas broadly lanceolate, 4.5–6.2 mm, acute, intermediate veins indistinct, keel villous for 1/2 of length, marginal veins for 1/3, intermediate veins and surfaces proximally smooth, glabrous or loosely pilulose to short villous, keel and surfaces sparsely scabrid distally, apex acute; callus glabrous (rarely with a few hairs less than 1 mm); palea smooth, glabrous or sparsely pilulose between keels, keels scabrid, some medially pilulose to short villous. Anthers 2–2.8 mm. Fl. and fr. Jun–Aug.

Alpine meadows, swales, moist gravel slopes; 2200–3600 m. Qinghai, Xinjiang, Xizang [?Kashmir, Kazakhstan, Kyrgyzstan, NW Mongolia, Tajikistan, Uzbekistan].

Poa lipskyi is fairly common at high altitudes in C Asian mountains bordering W China and in the Kunlun Shan. Two geographically overlapping subspecies are commonly recognized.

- 1a. Lemma glabrous between veins 25a. subsp. *dschungarica*
- 1b. Lemma loosely pilulose to short villous
between veins 25b. subsp. *lipskyi*

25a. *Poa lipskyi* subsp. *dschungarica* (Roshevitz) Tzvelev, Novosti Sist. Vyssh. Rast. 11: 26. 1974.

准噶尔早熟禾 zhun ga er zao shu he

Poa dschungarica Roshevitz, Izv. Bot. Sada Akad. Nauk SSSR 30: 778. 1932.

Leaf blade papery to thickly papery, 2–3(–5) mm wide. Panicle open, 6–12 × 6–8 cm; lemmas glabrous between veins; palea keels scabrid, sometimes medially sparsely pilulose. Fl. and fr. Jun–Jul.

Alpine grassy places; ca. 3000 m. Xinjiang [Kazakhstan, Kyrgyzstan, NW Mongolia, Tajikistan, Uzbekistan].

25b. *Poa lipskyi* subsp. *lipskyi*

疏穗早熟禾(原亚种) shu sui zao shu he (yuan ya zhong)

Poa bedeliensis Litvinov; *P. contracta* Ovczinnikov & Czukavina (1957), not Retzius (1783); *P. kungeica* Goloskokov; *P. lipskyi* var. *contracta* Tzvelev; *P. macroanthera* D. F. Cui subsp. *meilitzyka* D. F. Cui; *P. ovczinnikovii* Ikonnikov; *P. pseudodisecta* Ovczinnikov.

Blades thickly papery, 1–3(–4) mm wide. Panicle open or loosely contracted, 5–15 × 3–8 cm; lemmas loosely pilulose to short villous between veins; palea keels medially pilulose. Fl. and fr. Jun–Aug. $2n = 70$.

Alpine meadows, gravel slopes; 2200–3600 m. Qinghai, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Tajikistan].

Poa macroanthera subsp. *meilitzyka* would seem to fall here, although we have not seen the type.

26. *Poa qinghaiensis* Soreng & G. Zhu, sp. nov.

青海早熟禾 qing hai zao shu he

Type: China. Qinghai: Dulan Xian, Ngola Shan, 36°28'N, 98°14'E, steep S-facing slope, in duff in open *Picea* stand, ca. 3900 m, 22 Sep 1997, R. J. Soreng, P. M. Peterson & Sun Hang 5461 (holotype, US; isotypes, KUN, PE, others to be distributed).

Haec species a P. hissarica Roshevitz ex Ovczinnikov *et P. lipskyi* Roshevitz *lemmate glabris vel carina ad basim paulo pilosula abaxialiter modice ad dense scabro nervis intermediis prominentibus praedito atque palea inter carinas scabra ad carinas dense scabra; a P. pagophila* Bor *spiculis plerumque longioribus, 5–9(–10) mm, glumis non papillatis differt*.

Perennials, tufted, with or without short rhizomes; shoots extravaginal and intravaginal. Culms few to several, erect (5–) 15–55, nodes 1–3, 0–2 exserted, uppermost to 1/4–1/2 way up, base enclosed in few to many layers of old pale brown sheaths. Leaf sheaths smooth or the lower ones coarsely scabrid, glabrous, 2–15 cm, 1.5–3 × as long as blade, uppermost closed for 1/2 of length; blades flat or folded, moderately thin, 2–10 cm × 2–3(–5) mm, abaxially smooth or scabrid, adaxially scabrid, of tillers to 20 cm; ligules 2–4 mm, abaxially smooth. Panicle open or loosely contracted, 2–10 × 1.5–6 cm, longest internodes 0.4–2.1 cm; branches spreading to reflexed, sinuously flexuous or arched, (1 or)2(–4) per node, rounded and smooth or distally sparsely scabrid and slightly angled, longest 1–6 cm with 2–6 spikelets clustered in distal 1/3, clusters frequently pendent; flowers female or perfect, sometimes whole inflorescences female. Spikelets ovate, purple tinged, 5–9(–10) mm, florets 2–4; vivipary present or commonly absent; rachilla internodes 0.5–1(–1.2) mm, smooth, glabrous; glumes subequal, smooth or keel sparsely scabrid, lower glume 3.5–6 mm, 1- to faintly 3-veined, upper glume 4–7 mm, 3-veined; lemmas (4–)4.5–7.5 mm, veins 5(–9), intermediate veins distinct, apex acute, keel and veins scabrid, hooks fine to coarse, sometimes elongated, occasionally developed into short villous hairs in the lower 1/3,

surfaces proximally moderately to densely scabrid, distally moderately to sparsely scabrid or minutely bumpy; callus glabrous; palea scabrid between keels, keels densely scabrid. Anthers 2–3 mm, or vestigial. Fl. and fr. Jul–Aug.

- Arid subalpine forests, alpine meadows, gravel slopes; 3500–5100 m. Gansu, Qinghai, SE Xinjiang, NE Xizang.

Poa qinghaiensis differs from other species in *P.* subsect. *Cenisiae* by the combination of the lemmas lacking villous hairs, being scabrid on the lower sides, and in having pronounced intermediate veins. Specimens were previously treated under the name *P. lipskyi* or remained unidentified. Although not well studied in *P. hissarica* or *P. lipskyi*, vestigial anthers are common in the new species and have not been found in other species in *P.* subsect. *Cenisiae*. In many respects, *P. qinghaiensis* approaches *P. pagophila*, but that species generally has smaller spikelets and the glumes are strongly papillate. Intermediates between *P. qinghaiensis* and *P. calliopsis* have been found at the Kunlun Pass and presumably represent hybridization between them.

27. *Poa smirnowii* Roshevitz, *Izv. Glavn. Bot. Sada SSSR* 28: 381. 1929.

史米诺早熟禾 *shi mi nuo zao shu he*

Perennials, loosely tufted, shortly rhizomatous; shoots all extravaginal, or a few intravaginal. Culms 1–5 per clump, 5–40 cm tall, nodes 1–3. Leaf sheaths smooth, glabrous, 4–8 cm, 1.5–3 × as long as upper blade, uppermost closed for over (1/2–)2/3 of length; blade flat or folded, moderately thin, 1–5 cm × 2–4 mm, surfaces smooth or adaxially sparsely scabrid, margins scabrid, apex prow-tipped, of tillers 2–15 cm; ligule 2–4 mm, abaxially smooth, collars smooth, glabrous. Panicle loosely contracted to open, slightly lax, exserted, 2–8 × 1.2–5 cm, longest internodes 1–2.5 cm; branches rounded, ascending or spreading, 2(–5) per node, smooth or sparsely (rarely moderately) scabrid, longest 1.5–4.5 cm with 1–3(–7) spikelets in distal 1/3. Spikelets ovate, usually purple tinged, 5–8 mm, florets 2–4(–5); vivipary present or absent; rachilla glabrous or sparsely pilulose to short villous; glumes subequal or equal, lower glume 3.5–4 mm, (1 or) faintly 3-veined, upper glume ca. 4 mm, 3-veined; lemmas 4.5–5 mm, mostly purple, margins membranous, keel villous for 3/4 of length, marginal veins for 2/3, area between veins proximally loosely pilulose or infrequently glabrous, distally smooth to sparsely scabrid; callus webbed, hairs long, dense; palea glabrous or pilulose between keels, keels scabrid, usually medially pilulose to short-villous. Anthers 2–2.5 mm. Fl. and fr. Jul–Aug.

Alpine shady grassy areas, open moist gravelly slopes, riversides; 2000–3300 m. Xinjiang [N Mongolia, Russia (C and E Siberia)].

Three subspecies are recognized, all of which appear to be rare in China.

- 1a. Spikelets viviparous 27c. subsp. *polozhia*
- 1b. Spikelets not viviparous.
 - 2a. Plants (5–)10–25(–33) cm tall, culms usually solitary or sometimes forming small tufts; panicle 1.2–3 cm wide 27a. subsp. *mariae*
 - 2b. Plants (15–)24–40(–55) cm tall, culms usually several in loose tufts; panicle 3.5–5 cm wide ... 27b. subsp. *smirnowii*

27a. *Poa smirnowii* subsp. *mariae* (Reverdatto) Tzvelev, *Novosti Sist. Vyssh. Rast.* 11: 26. 1974.

美丽早熟禾 *mei li zao shu he*

Poa mariae Reverdatto, *Sist. Zametki Mater. Gerb. Tomsk. Univ.* 1933(3–4): 2. 1933; *P. alpina* Linnaeus var. *saposhnikovii* Sergievskaja.

Culms 1(–3) per clump, (5–)10–25(–33) cm tall. Leaf blade 1–5 cm × 2–4 mm, of tillers 2–11 cm. Panicle loosely contracted to slightly open, slightly lax, 2–6(–8) × 1.2–3 cm; branches ascending to weakly spreading, longest 1.2–2.5(–4.5) cm. Callus hairs moderately dense. Fl. and fr. Jul–Aug.

Alpine shady grassy areas, open gravelly slopes, riversides; ca. 3300 m. Xinjiang (Altay Shan, Tian Shan) [Russia (Siberia)].

27b. *Poa smirnowii* subsp. *smirnowii*

史米诺早熟禾(原亚种) *shi mi nuo zao shu he* (yuan ya zhong)

Poa arctica R. Brown subsp. *smirnowii* (Roshevitz) Malyshev.

Culms (1–)2–5 per clump, (15–)24–40(–55) cm tall. Leaf blade 3–5 cm × 3–4 mm, of tillers 5–15 cm. Panicle open, lax, 5–8 × 3.5–5 cm; branches spreading, longest 2.5–4.5 cm. Callus hairs dense. Fl. and fr. Jul–Aug. $2n = 42, 70$.

Alpine shady grassy areas, open gravelly slopes, riversides; 2000–2600 m. Xinjiang (Altay Shan, Tian Shan) [N Mongolia, Russia (C and E Siberia)].

This subspecies differs from subsp. *mariae* mainly by its more tufted habit, greater height, and broader panicles.

27c. *Poa smirnowii* subsp. *polozhia* (Revjankina) Olonova, *Turczaninowia* 1(4): 7. 1998.

朴咯早熟禾 *po ka zao shu he*

Poa polozhia Revjankina, *Fl. Rastitel'n. Altaya* 1996: 102. 1996.

Culms several (ca. 5) per tuft, ca. 20 cm tall. Spikelets viviparous. Fl. and fr. Aug.

Alpine screes; ca. 3700 m. Xinjiang [Russia (Siberia)].

This taxon was described from Russia (Altai). One gathering is known from China.

28. *Poa macroanthera* D. F. Cui, *Acta Bot. Boreal-Occid. Sin.* 7: 97. 1987.

大药早熟禾 *da yao zao shu he*

Perennials, loosely to densely tufted, without rhizomes; shoots extra- and intravaginal. Culms 40–55 cm tall, rounded, smooth, glabrous, nodes 2–4, 1 or 2 exserted, uppermost at mid-culm. Leaf sheath shorter than internode, smooth, glabrous, 10–11 cm, slightly compressed, uppermost closed for over 1/5–1/4 of length, old basal sheaths persisting, becoming fibrous, overlapping; blade flat or folded, moderately thin, 3–15 cm, uppermost shortest, 1–3 mm wide, surfaces smooth or sparsely scabrid, glabrous; ligule (1–)1.5–3 mm, abaxially smooth or sparsely scabrid, apex obtuse. Panicle open, diffuse, 8–15 cm;

branches ascending to spreading, 2–3 per node, slender, smooth throughout or distally scabrid angled, longest to 5 cm with 8 spikelets in distal 1/2; flowers female or perfect. Spikelets elliptic to lanceolate, green or purple, 5.6–7 mm, florets 3 or 4; vivipary absent; rachilla internodes to 2 mm, smooth, glabrous, exposed; glumes lanceolate, smooth or sparsely scabrid on keel, lower glume 3–4 mm, 3-veined, upper glume 3.5–5 mm, 3-veined; lemmas lanceolate, very thinly papery, 4–5.5 mm, purple above veins, apex acuminate, keel villous for 1/2 length, marginal veins to 1/3, intermediate veins prominent, area between them glabrous, above sparsely scabrid; callus weakly webbed, hairs sparse, short; palea keels scabrid, medially pilulose to shortly villous. Anthers 2.5–3 mm. Fl. and fr. Jun–Jul.

• Riversides in ravines, subalpine meadows along forest margins; 2500–3300 m. Xinjiang (Kunlun Shan, Tian Shan).

The placement of this species near *Poa smirnowii* is controversial. The type, examined by M. V. Olonova, has sheaths open for 1/5–1/4 their length and scabrid-angled panicle branches. This argues against any relationship to *P. smirnowii* and inclines us to think it might be better placed in *P.* subg. *Stenopoa*.

29. *Poa xingkaiensis* Y. X. Ma, Bull. Bot. Res., Harbin 22: 387. 2002.

星早熟禾 xing zao shu he

Perennial, rhizomatous; shoots extravaginal. Culms erect, 40–50 cm, 1–2 mm in diam., nearly smooth, nodes 3 or 4. Leaf sheaths smooth, usually longer than internodes, uppermost ca. 11 cm, ca. 3/4 as long as blade; blades flat, thin, 5–20 cm × 2–3 mm, distinctly longer upward along culm, apex slender prow-tipped; ligules 2.5–3 mm, abaxially puberulent, apex truncate. Panicle open, narrowly pyramidal, 10–15 × 2–3 cm, longest internodes ca. 2 cm; branches ascending, usually 5 per node, capillary, scabrid, longest ca. 3 cm with 6–9 moderately crowded spikelets in distal 4/5. Spikelets narrowly lanceolate, 3.5–4 mm, florets 2; vivipary absent; glumes narrowly lanceolate, equal, as long as spikelet, apex acuminate, keels scabrid from near base, lower glume 3.8–4 mm, 3-veined, upper glume 4.1–4.5 mm, 3-veined; lemmas narrowly lanceolate, 3–3.3 mm, keel shortly villous for 1/2 of length, marginal veins for 1/4, area between veins glabrous; callus webbed, hairs short; palea “hyaline,” distinctly shorter than lemma. Anthers 0.7–0.8 mm (doubtfully mature, presumably over 1.2 mm at maturity). Fl. and fr. Aug.

• About 400 m. Heilongjiang.

Except for its rhizomatous habit, this species seems different from other members of *Poa* subg. *Poa* and is only tentatively placed here. It is known only from the type, which we have not seen, but the description and illustration suggest the plant may be immature. The illustration looks somewhat like immature specimens of *P. compressa*, with a *Koeleria*-like inflorescence at anthesis. We wonder if it could be a species of *P.* subg. *Stenopoa*, perhaps *P. sphondylodes* or *P. versicolor* subsp. *ochotensis* with an odd habit.

30. *Poa remota* Forselles, Linn. Inst. Skrift. 1: 6. 1807.

疏序早熟禾 shu xu zao shu he

Poa quadripedalis Ehrhart ex Koeler; *P. sudetica* Haenke var. *remota* (Forselles) Fries.

Perennials, loosely tufted, shortly rhizomatous; shoots mainly extravaginal. Culms erect, 50–150 cm tall, 1–3 mm in diam., compressed, smooth or sparsely scabrid, nodes 3–5, 1 or 2 exserted. Leaf sheath with keel winged, 0.4–0.8 mm deep, scabrid, 10–20 cm, about as long as blade, uppermost closed for (1/2–)2/3–9/10 of length; blade light green, flat, moderately thin, 3–11 mm, surfaces smooth or sparsely scabrid, margins densely scabrid, apex slender prow-tipped; ligule 2–3(–3.5) mm, abaxially smooth or sparsely scabrid, apex obtuse, collar margins abruptly flared, scabrid, glabrous or rarely pilulose. Panicle open, 15–30 × 7–20 cm, longest internodes 4–7 cm; branches spreading, 3–7 per node, slender, proximally scabrid angled, distally scabrid all around on angles, longest 7–15 cm with 12–40 spikelets in distal 1/2. Spikelets lanceolate, green, rarely purple tinged, 4.5–6 mm, florets 3–5; vivipary absent; rachilla internodes 0.7–1 mm, densely minutely bumpy; glumes narrowly lanceolate, keel and lateral veins prominently scabrid, area between veins sparsely scabrid, lower glume 2–3 mm, 1(or 3)-veined, upper glume 2.5–3.5 mm, 3-veined; lemmas lanceolate, 3–4.5 mm, veins prominent, edge finely scabrid, apex acute, keel pilulose for 1/3 of length, marginal veins for 1/4, area between veins minutely bumpy to sparsely scabrid, glabrous; callus sometimes webbed, hairs sparse, to 2 mm; palea minutely bumpy to sparsely scabrid, keels densely scabrid. Anthers 1.1–1.6 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Moist to wet ground, *Picea* and *Larix* forest openings. Xinjiang [Kazakhstan, Russia; Europe].

The occurrence of this species in China is based on a gathering by Regel, determined by Tzvelev. The only voucher so determined seen by us we placed in *Poa pratensis*.

31. *Poa asperifolia* Bor, Kew Bull. [7] 1952: 130. 1952.

糙叶早熟禾 cao ye zao shu he

Poa megalothyrsa Keng ex Tzvelev.

Perennials, green or grayish green, tufted, rhizomatous, rhizomes fairly stout, short; shoots extra- and intravaginal. Culms erect or decumbent, (35–)40–120 cm tall, 1–2(–2.5) mm in diam., usually several per tuft, nodes (2–)3 or 4, 1 or 2 exserted, smooth, commonly enveloped by fibrous lower sheaths. Leaf sheaths distinctly keeled, smooth or retrorsely scabrid, glabrous, 7–20 cm, 3/4–2 × as long as blade, uppermost closed for 1/4–2/5 of length; blade flat or folded, thin to moderately thin, 7–22 cm (longest at mid-culm), (1.5–)2–5 mm, surfaces scabrid along veins only, margins whitish, densely scabrid, apex slender prow-tipped; ligule hyaline, (2–)3–8 mm, abaxially smooth or sparsely scabrid, apex obtuse, entire or long-lacerate, those of lower culm usually ca. 1 mm or longer, collar margins scabrid, abruptly flared. Panicle open, erect to slightly lax, (9–)13–35 × 4–15 cm, longest internode 2–6 cm; branches ascending to widely spreading, somewhat flexuous, (2–)3–5 per node, fairly slender, proximally rounded to slightly angled, smooth or sparsely scabrid, distally slightly angled, scabrid on and between angles, longest (3–)4–15 cm with (3–)6–26 spikelets in distal 1/2. Spikelets narrowly lanceolate to lanceolate, green, or purple tinged, 4.5–6(–8.5) mm, florets 2–4(–6); vivipary absent; rachilla internodes 0.7–1.5 mm, minutely bumpy, scabrid, or infrequently smooth; glumes unequal, apex acute to acuminate, keel and veins scabrid, area between veins sparsely

scabrid, lower glume 2.5–3.5(–4) mm, 1(or 3)-veined, upper glume 3–4.5(–5.4) mm, 3-veined; lemmas lanceolate, elliptic to oblong or obovate, 3.5–4.5(–5.6) mm, apex acuminate, intermediate veins prominent, keel sparsely shortly villous for 1/3 (–1/2) of length, infrequently densely villous or glabrous, marginal veins villous for 1/5(–1/4), proximally densely scabrid to minutely bumpy, glabrous or sparsely pilulose, distally scabrid and minutely bumpy; callus glabrous or occasionally webbed, hairs few and usually short, or infrequently several to 1/2 as long as lemma; palea glabrous, area with slender hooks or crisply pilulose between keels, keels scabrid. Anthers 1.5–3 mm. Fl. and fr. May–Jul.

Fairly common, low alpine to upper forests, openings and thickets on granite, shale, limestone, or sandstone slopes; 3300–4500 m. Gansu, Qinghai, Sichuan, E Xizang, Yunnan [Bhutan].

Poa asperifolia is easily distinguished by the combination of large panicles, long, hyaline, and lacerate ligules, fairly stout, short rhizomes, and fibrous basal sheaths, but its lemma vestiture is highly variable. It approaches *P. pratensis* through *P. lhasaensis* (*P. jaunsarensis*), but differs in having leaf blades very scabrid and often thin, ligules long and lacerate, lemmas minutely hairy or densely scabrid proximally between the veins, and callus glabrous or nearly so. It appears to hybridize with species of *P.* subg. *Stenopoa*, but those species lack rhizomes and have more crowded and narrower culms in the regions where they overlap. Tzvelev reported it from SW Xinjiang (Pamirs), but all material seen by us is from the eastern Himalayas and Hengduan Shan, where it is fairly common.

32. *Poa perennis* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 276. 1982.

宿生早熟禾 *su sheng zao shu he*

Perennials, densely tufted; shoots all or mostly extravaginal, all or most shoots flowering. Culms erect to ascending, 20–60 cm tall, 0.5–1.5 mm in diam., rounded, smooth, not or only slightly ridged, nodes 2 or 3, 1 or 2 exserted. Leaf sheaths moderately firm, not persisting, not shiny, 4–10 cm, 1/2–2/3 as long as blade, lower sheaths glabrous or scabrid to retrorsely strigose near collars, uppermost closed for 1/4–1/2 of length; blade flat or folded with margins slightly inrolled, thin, 5–10 cm × 1–2 mm, surfaces smooth or scabrid, adaxially glabrous or retrorsely strigulose near base, margins scabrid; ligule 0.5–2 mm, apex dentate, collar margins glabrous or with some cilia. Panicle open, 6–13 × 2–7 cm, longest internodes 1.4–3.5 cm; branches flexuous, 2 or 3 per node, slender, proximally rounded and smooth, distally scabrid and weakly angled, longest 2–8 cm with 3–10 spikelets in distal 1/2. Spikelets green or purple tinged, 4–7 mm, florets 2–4; vivipary absent; rachilla internodes to 1.2 mm, smooth or scabrid; glumes unequal, lanceolate, usually purple, apex acuminate, lower glume 2–2.5 mm, 1-veined, upper glume 2.7–3.5 mm, keel scabrid to coarsely ciliate near apex, smooth elsewhere, distinctly shorter than first lemma; lemmas 3.3–4.8 mm, apex sharply acute to acuminate, intermediate veins faint to moderately distinct, keel lower part and marginal veins scabrid, glabrous or for 1/3 of length sparsely pilulose, area between veins scabrid to minutely bumpy throughout; callus glabrous, or infrequently with a few hairs to 2 mm; palea smooth or scabrid, glabrous between keels, keels scabrid. Anthers 1.5–2.3 mm. Fl. and fr. Jun–Aug.

• Grassy places on gravel slopes; 2500–3500 m. ?SE Xizang, NW Yunnan.

Poa perennis in its typical form is distinct from all other *Poa* species. The circumscription is challenging because many specimens do not agree in detail with the type, but are not readily assignable to other species. We have not seen any material from Xizang, but it is expected to occur there.

33. *Poa zhongdianensis* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 405. 2002.

中甸早熟禾 *zhong dian zao shu he*

Perennials, loosely tufted, subrhizomatous; shoots extravaginal, tillers few. Culms 40–70 cm tall, nodes 3 or 4, 2 exserted, 1–1.5 mm in diam., smooth. Lower leaf sheaths somewhat keeled, moderately compressed, proximally retrorsely scabrid to distally hispidulous to strigulose, 4.5–7.5 cm, 5/9–5/6 as long as blade, uppermost closed for ca. 3/5 of length, sometimes united further by a hyaline membrane; blades flat or folded with inrolled margins, moderately thin, 5–20 cm, uppermost 5–12 cm × 2–3 mm, abaxially smooth or sparsely scabrid, shiny, adaxially and margins scabrid, apex slender prow-tipped; ligule 1.7–2.2 mm, abaxially scabrid, apex truncate to obtuse, lower ligules 0.3–0.5 mm, scabrid margined, collar margins strigose to ciliate. Panicle open, well exserted, 10–18 × up to 10 cm, longest internodes 2–3.5 cm; branches spreading, 2(–4) per node, slender, proximally rounded, smooth or sparsely scabrid, distally scabrid angled, longest 4–7 cm with 4–12 spikelets in distal 1/2; flowers female or perfect. Spikelets 4–5.5 mm, florets 2(or 3); vivipary absent; rachilla internodes to 1(–1.2) mm, smooth, minutely bumpy, or scabrid; glumes unequal sublustrous, keel scabrid distally, lower glume 1.5–2.3 mm, to 1/2 as long as first lemma, to 1/2 as wide as upper glume, 1-veined, upper glume 2.5–3 mm, 3-veined; lemmas thinly papery, 3.5–4 mm, proximally moderately scabrid to minutely bumpy, distally minutely bumpy, apex acute, keel villous or short villous to 1/3 of length, marginal veins to 1/5, intermediate veins moderately prominent; callus webbed, hairs sparse, to 1/3 the lemma; palea minutely bumpy to densely scabrid between keels, keels scabrid, glabrous. Anthers 1.8–2 mm, vestigial in unisexual flowers. Fl. and fr. Jun–Jul.

• Open places, *Picea* and *Quercus* forests; 3400–3600 m. NW Yunnan.

This species differs from other species in *Poa* sect. *Homalopoa* in having leaf sheath sparsely and retrorsely strigose, sheath collar margins strigose to ciliate, leaf blade adaxial surface or both surfaces scabrid, spikelets 4–5.5 mm, with 2(or 3) florets, and lower glume short, 1.5–2.3 mm.

34. *Poa mairei* Hackel, Repert. Spec. Nov. Regni Veg. 12: 387. 1913.

毛稈早熟禾 *mao fu zao shu he*

Poa ludens R. R. Stewart; *P. patens* Keng ex P. C. Keng; *P. pseudopratensis* J. D. Hooker (1896), not Beyer (1891).

Perennials, densely tufted, not rhizomatous; shoots all intravaginal. Culms (10–)20–85 cm tall, 1–2 mm in diam., smooth, nodes 2 or 3, 1–3 exserted, uppermost node to 1/3–1/2 way up. Leaf sheaths keeled, smooth or infrequently sparsely

scabrid, glabrous, lowermost loose, short, firm, becoming papery, 7–15 cm, 1.5–5 × as long as blade, uppermost closed for 1/3 of length; blade usually folded with slightly inrolled margins, thickly papery, 3–9 cm × 1–2(–3) mm, abaxially smooth or infrequently sparsely scabrid, shiny, ribs indistinct, margins scabrid, adaxially often pale, scabrid, of tillers to 4–30 cm; ligule 0.5–1.2(–1.5) mm, apex truncate to obtuse, ciliate, abaxially scabrid or with coarse short hairs, collars of lower and tiller leaves with a distinctly wedge-shaped zone of dense, short, stiff strigose to subvillous hairs, margins sometimes with a few ciliate hairs. Panicle open, broadly triangular, well exserted, (4–)6–15(–20) × 3–10(–15) cm, longest internodes 1–3.5 cm; branches spreading, flexuous, (1–)2 or 3(–5) per node, proximally rounded or weakly angled, smooth or sparsely scabrid, distally smooth and rounded to densely scabrid on and between angles, longest 2.5–8 cm with 3–15 spikelets in distal 1/3–1/2; flowers rarely female. Spikelets elliptic to oblong, (3.7–)4–8 mm, florets 2–4(–6); vivipary absent; rachilla internodes to 1.2 mm, smooth or scabrid, glabrous or hispidulous to pilulose; glumes ovate to oblong, purplish, unequal to subequal, firm, surfaces minutely punctate with purple papillae, apex acute to acuminate, keel nearly smooth to quite scabrid, lower glume (2.1–)2.5–4 mm, 1- or 3-veined, upper glume (3–)3.5–5 mm, 3(–5)-veined, apex acuminate; lemmas proximally light green, becoming purplish distally, firm, (3.9–)4.2–5(–6) mm, 5–7-veined, apex acute to acuminate, keel villous to pilulose for 2/3 of length, marginal veins for 1/3, intermediate veins prominent, sometimes shortly villous to pilulose, proximally scabrid, or minutely bumpy throughout, glabrous or sparsely pilulose to shortly villous between veins; callus webbed or infrequently glabrous; palea scabrid or pilulose between keels, keels scabrid, sometimes medially pilulose. Anthers 1.8–2.5 mm, or vestigial. Fl. and fr. Jun–Sep.

Subalpine and alpine slopes, fairly common in grassy places among thickets, meadows; 2500–4100 m. SW Sichuan, SE Xizang, N Yunnan [Bhutan, India (Assam, Sikkim), Nepal].

Poa mairei is marked by the absence of extravaginal shoots, the short, firm, folded, lower culm leaf blades, the abaxially glabrous and smooth leaf sheaths and blades with triangular, lateral patches on the sides of the collar region that are strigose with upward or marginally directed hairs, and short truncate ligules. *Poa ludens* and *P. patens* do not differ substantially from the type of *P. mairei*.

35. *Poa langtangensis* Melderis in H. Hara et al., Enum. Fl. Pl. Nepal 1: 143. 1978.

朗坦早熟禾 lang tan zao shu he

Perennials, with isolated shoots, rhizomes present, slender. Culms isolated or few together, 9–25 cm tall, 0.6–0.8 mm in diam., erect, smooth, with 2 or 3 nodes above base, none or 1 exserted, and several short leaves at the base. Leaf sheaths smooth, glabrous, 3.5–5 cm, 1.5–2 × as long as blade, uppermost closed for just over 1/2 of length, lowermost soon withering, becoming fibrous, not persisting; blades flat or folded, thin, 1.5–5 cm × 1–1.5(–2) mm, surfaces and margins smooth, of tillers few, short; ligule 0.5–1 mm, abaxially smooth, glabrous, apex truncate to obtuse, smooth, collars smooth, glabrous. Panicle open, 3–5 × to 3 cm, longest internodes 1–2 cm; branches spreading, flexuous, (1 or)2 per node, capillary, smooth (hooks

very rare), longest 1.5–2.5(–3) cm with 3–4 spikelets in distal 1/2. Spikelets narrowly lanceolate, green or purple tinged, 3–3.5 mm, 2–3 × longer than broad, florets 2; vivipary absent; rachilla smooth, glabrous; glumes green, narrow, keel weak, veins inconspicuous, surfaces smooth, very thinly papery, minutely punctate-papillate, lower glume 1.5–2.2 mm, 1(or 3)-veined, keel smooth or sparsely scabrid, upper glume 2–2.7 mm, broader (to 0.6 mm), 3-veined, keel minutely scabrid; lemmas oblong, slightly arched along the keel, very thinly papery, 2.5–3.3 mm, apex acute, with a narrow bronze band below the narrow whitish tip, keel and marginal veins proximally pilulose to short villous, intermediate veins faint, area between veins glabrous (not minutely bumpy), distally smooth to sparsely scabrid; callus webbed with hairs to 1/2 as long as lemma on the lowest floret; palea smooth, glabrous between keels, keels finely scabrid, 3–16 hooks per keel. Anthers ca. 1.5 mm. Fl. and fr. Jun–Jul.

Grassy places in alpine river valleys; ca. 4000 m. ?Xizang [Nepal].

Poa langtangensis could be a weak form of *P. pagophila* from a cold, shady habitat. Unlike *P. calliopsis*, it has narrow spikelets that are not so clustered and deflexed. Although we have not found a voucher specimen for the record from Xizang, the type, from Nepal, is from within 10 km of the Xizang border.

36. *Poa nubigena* Keng ex L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 400. 2002.

云生早熟禾 yun sheng zao shu he

Perennials, densely tufted, not rhizomatous; shoots intravaginal. Culms 30–65 cm tall, ca. 1 mm in diam., smooth, nodes 2 or 3, 1–3 exserted, uppermost node to 1/3–1/2 way up culm. Leaf sheaths narrowly keeled, smooth or sparsely scabrid, glabrous, lowermost loose, short, moderately firm, becoming papery, 4.5–12 cm, 1.3–1.8 × as long as blade, uppermost closed for 3/7–4/7 of length; blades flat or folded with margins inrolled or not, thin to moderately thin, 3–11 cm × 1–2 mm wide, uppermost 3–7 cm, abaxially smooth except the upper keel scabrid, adaxial surface and margins scabrid, of tillers 4–20 cm, adaxially strigose in some; ligules 2–4.1 mm, abaxially smooth, apex obtuse to acute, of tillers ca. 0.5 mm, abaxially scabrid, apex truncate, scabrid, collars of lower and tiller leaves smooth, glabrous, or margins with a few ciliate hairs. Panicle open, lax, narrowly triangular, well exserted, diffuse, 5.5–14 × 3–8 cm, longest internodes 2–3.5 cm; branches spreading, flexuous, 2 per node, slender, round, smooth (or with a few hooks), longest 3–7.5 cm with 3–11 spikelets in distal 1/3; flowers female, perfect, or male. Spikelets elliptic, 3.5–6 mm, florets 2(or 3); vivipary absent; rachilla internodes to 1.2 mm, scabrid or densely hispidulous; glumes unequal, ovate to oblong, surfaces minutely punctate with purple papillae, membranous to very thinly papery, keels scabrid above, lower glume 2.3–3.5 mm, 1- to faintly 3-veined, upper glume 2.7–4.5 mm, faintly 3-veined, broadest above middle, 1.5–2 × broader than lower one, shorter than 1st lemma by 1–2 mm; lemmas thinly papery, 3.5–5.2 mm, apex narrowly membranous, acute, keel villous for 1/2 of length, marginal veins to 1/4, intermediate veins moderately prominent, area between veins proximally minutely bumpy, scabrid or crisply pilulose, distally smooth or sparsely scabrid,

minutely bumpy; callus webbed; palea proximally densely scabrid to hispidulous between keel, keels scabrid. Anthers ca. 2 mm or vestigial. Fl. and fr. Jun–Aug.

• Meadows on slopes, river bank rocky grassy places, ravines; 2200–3700 m. W Sichuan, E Xizang, NW Yunnan.

The type of *Poa nubigena* differs from *P. mairei* in its longer ligules, smooth, glabrous collars, presence of numerous female flowers, and slightly thinner leaf blades, branches, and glumes. The species approaches *P. pagophila*, but is generally taller and occurs at lower elevations.

37. *Poa pagophila* Bor in K. H. Rechinger, Fl. Iran. 70: 38. 1970.

曲枝早熟禾 qu zhi zao shu he

Poa levipes Keng ex L. Liu; *P. nigropurpurea* C. Ling.

Perennials, loosely to moderately densely tufted, usually not rhizomatous, infrequently with short delicate rhizomes; shoots extravaginal and pseudointravaginal. Culms erect or decumbent, often geniculate, 5–30(–40) cm tall, 0.5–1 mm in diam., round, smooth, nodes 2 or 3, none or 1(–2) exserted, nodes distinctly constricted and translucent, basal sheaths soon withering. Leaf sheaths smooth or finely scabrid, glabrous, loose, 2–10 cm, 1.25–5 × as long as blade, uppermost closed for 1/3–2/3 of length; blade flat, thin, 2–9 cm × 1.5–2.5 mm, surfaces and margins nearly smooth to scabrid, apex slender prow-tipped, uppermost erect or slightly divergent, 1–4.5 cm, of tillers 2–8 cm; ligule 1.5–4.3(–6) mm, abaxially smooth or sparsely scabrid, apex acute, sometimes blunt, collars smooth, glabrous. Panicle open, lax, exserted, 3–10 × 2–5 cm, longest internodes 1–3 cm; branches spreading to reflexed, flexuous, often arched upward, sometimes looping back, rounded, 1 or 2 per node, smooth or slightly scabrid distally on pedicels, longest 2–4 cm, with 2–6 spikelets in distal 1/2; flowers female or perfect. Spikelets elliptic, (4–)4.3–5.5(–5.8) mm, florets (1 or)2 or 3(or 4); vivipary absent; rachilla internodes 0.5–3 mm, smooth, bumpy, glabrous or rarely pilulose; glumes unequal to subequal, narrow, surfaces minutely punctate with purple papillae, keels weak, keels and veins sometimes sparsely scabrid distally, lower glume 2.5–3.5(–4) mm, 1-veined, often blunt, upper glume 3–3.5(–4.9) mm, 3-veined; lemmas very thinly papery, 3.2–4.8(–5) mm, intermediate veins faint to moderately prominent, keel and marginal veins proximally villous, area between veins proximally scabrid or pilulose, distally scabrid; callus glabrous or webbed, hairs sparse; palea smooth or scabrid, glabrous between keels, keels finely scabrid for over 3/4 of length. Anthers 2–3.5 mm or vestigial. Fl. and fr. Jun–Aug.

Alpine to subalpine grassy places on riversides, slopes, thickets; (3200–)3600–5200 m. Qinghai, W Sichuan, Xizang, NW Yunnan [Bhutan, N India, Kashmir, Nepal, Pakistan].

Poa pagophila is difficult to separate from *P. lipskyi* and *P. qinghaiensis*. It has shorter spikelets, glumes that are more evidently papillate-punctate, and less well-developed, dense basal tufts of leaves. Although it was reported in Fl. Qinghai. (4: 46. 1999), we have seen no authentic material from Qinghai. When *P. pagophila* was first described by Bor (Kew Bull. [4] 1949: 239. 1949), the name was not validly published.

38. *Poa falconeri* J. D. Hooker, Fl. Brit. India 7: 342. 1896 [“1897”].

福克纳早熟禾 fu ke na zao shu he

Perennials, not glaucous, loosely tufted, not rhizomatous; shoots extravaginal. Culms erect or decumbent at base, 10–80 cm tall, 1–2.5 mm in diam., smooth or finely scabrid, nodes 3 or 4, 2 or 3 exserted, uppermost more than 1/2 way up. Leaf sheaths smooth or scabrid, glabrous, lowermost becoming papery, 6–13 cm, 2/3–1.5 × as long as blade, uppermost closed for 1/2–3/5 of length; blades flat, thin, 4.5–20 cm × 1–4 mm, abaxially dull, surfaces and margins scabrid, uppermost reaching into the panicle; ligule milky-membranous, (1–)2–4 mm, abaxially smooth or scabrid, apex obtuse to acute, collar smooth or scabrid. Panicle open, lax, 6–20 × 1–5 cm, longest internode 2–5 cm; branches ascending, spreading or reflexed, flexuous, 1 or 2 per node, slender, proximally rounded and smooth, distally scabrid on and sparsely between angles, longest 3.5–9 cm with 1–7 well-spaced spikelets in distal 1/2. Spikelets elliptic-oblong, 5–7.5 mm, florets 2 or 3; vivipary absent; rachilla internodes 0.7–1.8(–2.5) mm, smooth, minutely bumpy, or pilulose; glumes unequal to subequal, narrowly lanceolate to lanceolate, apex acuminate, surfaces minutely punctate with purple papillae, smooth or sparsely scabrid, keel and sometimes lateral veins scabrid, lower glume (2.7–)3–5 mm, 1(or 3)-veined, upper glume (3.4–)4–6.3 mm, 3-veined; lemmas 4–6.3 mm, intermediate veins faint to moderately prominent, keel shortly villous or pilulose for 1/3 of length, marginal veins to 1/4, surfaces proximally densely crisply pilulose to finely scabrid or minutely bumpy, distally minutely bumpy to sparsely scabrid; callus glabrous; palea scabrid or pilulose between keels, keels scabrid. Anthers 1.6–2.8 mm. Fl. and fr. Jun–Aug. $2n = 42$.

Alpine meadows; 3700–4000 m. Xizang [India (Himachal Pradesh, Uttar Pradesh), Kashmir, Nepal].

Poa falconeri, *P. nitidespiculata*, and *P. pagophila* represent extremes that seem to grade toward one another. There are few plants from China that can be called *P. falconeri* with certainty.

39. *Poa nitidespiculata* Bor, Kew Bull. [3] 1948: 139. 1948 [“*nitide-spiculata*”].

闪穗早熟禾 shan sui zao shu he

Perennials, glaucous throughout, loosely tufted, subrhizomatous; shoots extra- and intravaginal. Culms erect or ascending, 30–60 cm, ca. 1 mm in diam., nodes 2, none or 1 exserted, smooth or sparsely scabrid below, uppermost less than 1/3 way up. Leaf sheaths glabrous or lowermost scabrid to covered with minute hairs, 8–11 cm, 1–1.5 × as long as blade, uppermost closed for 2/5–1/2 of length; blades flat or folded with margins inrolled, thickly papery, 4–12 cm × (1–)2–3.1 mm, abaxially smooth, adaxially sparsely scabrid, margins scabrid, apex slender prow-tipped, of tillers short; ligule milky-membranous, 2.7–6 mm, abaxially smooth, lower ones scabrid, of tillers 0.7–1 mm, abaxially scabrid, collar margins rounded, glabrous or sparsely ciliate. Panicle open, well exserted, 11–16 × 6–10 cm, longest internodes 3–3.5 cm; branches spreading, flexuous, 2 per node, proximally smooth, distally sparsely sca-

brid, longest 4–7 cm with 4–8 spikelets in distal 1/2; flowers female or perfect. Spikelets ovate to oblong, glaucous, 6.2–6.7 mm, florets 2 or 3; vivipary absent; rachilla internodes up to 1 mm, scabrid or pilulose; glumes unequal to subequal, lanceolate or oblong, keel distally scabrid, surfaces smooth or faintly punctate-papillate, lower glume 3.1–4.5 mm, 1- or 3-veined, upper glume 4.1–5 mm, 3-veined; lemmas oblong, 6–6.5 mm, apex obtuse, keel crisply pilulose to short villous for 2/5 of length, marginal veins to 1/3, intermediate veins moderately raised, area between veins proximally densely scabrid to crisply pilulose, distally smooth or sparsely scabrid; callus glabrous or sparsely webbed; palea scabrid or pilulose between keels, keels scabrid. Anthers 2.5–3 mm, or vestigial. Fl. and fr. Jun–Aug.

Alpine sunny slopes, grassy places in river valleys; 4400–4700 m. Xizang [India (Sikkim), Nepal].

The lemmas have a shortly pubescent abaxial surface and a broad, membranous margin, and the callus is glabrous. The species is similar to *Poa polyneuron*, but differs in having long leaf blades and ligules, larger spikelets up to 7 mm, long glumes and lemmas, and the lemma only 5-veined.

40. *Poa polyneuron* Bor, Kew Bull. [7] 1952: 223. 1952.

多脉早熟禾 *duo mai zao shu he*

Perennials, loosely tufted, rhizomatous; shoots extravaginal. Culm base slightly decumbent, 30–55 cm × 1–2.5 mm, nodes 3 or 4, 1 or 2 exserted. Leaf sheaths strongly keeled with a narrow wing, basal ones finely retrorse strigose, becoming fibrous, middle and upper ones smooth, 11–15 cm, ca. 3 × as long as blade, uppermost closed for 1/2–2/3 of length; blade flat or folded, moderately thin, 3–8 cm × (1.5–)4–5 mm, surfaces smooth, or adaxially sparsely scabrid, margins and keel smooth or scabrid, apex abruptly prow-tipped, tillers to 15 cm × 2 mm; ligules brown, membranous, ca. 2 mm, abaxially smooth, apex acuminate. Panicle open, lax, 10–17 × 2–6 cm, longest internode 3–4 cm; branches spreading, 2 per node, smooth throughout or with infrequent hooks, longest 3–8 cm with 3–6 well-spaced spikelets in distal 1/3. Spikelets elliptic, 5.5–7 mm, florets 3 or 4; vivipary absent; rachilla internodes to 1.2 mm, smooth, glabrous; glumes broadly lanceolate, keel scabrid above, surfaces minutely punctate with or without purple papillae, lower glume 4.5–5 mm, 3-veined, upper glume ca. 5 mm, 3(or 5)-veined, smooth or sparsely scabrid; lemmas broadly elliptic, ca. 5 mm, 5–7-veined, keel slightly arched, keel shortly villous for 2/3 of length, marginal veins for 1/2, intermediate veins prominent, surfaces proximally densely pilulose, distally sparsely scabrid; callus glabrous or scantily webbed with a few hairs to 1/2 as long as lemma; palea with slender hooks to proximally pilulose between keels, keels medially pilulose, distally scabrid. Anthers 1.6–2.2 mm. Fl. and fr. Jun–Aug.

High mountains, grassy slopes; ca. 4000 m. Xizang [India (Sikkim)].

The type of *Poa polyneuron* is from the India-Xizang border. Rajbhandari (Bull. Mus. Univ. Tokyo 34: 203. 1991) discussed it under *P. gammieana*. It also approaches *P. grandis*. The flowers examined were perfect, but if it were related to *P. grandis* it would be expected also to have female florets.

41. *Poa gammieana* J. D. Hooker, Fl. Brit. India 7: 345. 1896 [“1897”].

茛密早熟禾 *gen mi zao shu he*

Perennials, loosely tufted, not rhizomatous; shoots extravaginal. Culms decumbent, sometimes geniculate, (40–)50–85 cm tall, 1.5–3 mm in diam., smooth, glabrous, nodes 5–7, 1 or 2 exserted. Leaf sheaths keeled, 8–15 cm, 1–1.3 × as long as blade, uppermost closed for 2/3–5/7 of length, lower sheaths scabrid, upper sheaths smooth; blade flat, moderately thin, 8–12 cm × 2–7 mm, distinctly keeled, surfaces smooth, keel and margins smooth or scabrid, apex abruptly slender prow-tipped; ligule 3–6.5 mm, abaxially scabrid, apex obtuse to acute, basal and tiller ligules shorter, collars smooth to long scabrid on margins. Panicle open, lax, 10–20 × 1–6 cm, longest internodes 3–5 cm; branches ascending to spreading, 1 or 2 per node, proximally rounded, distally slightly angled, smooth, longest 3–9 cm with 2–5 well-spaced spikelets in distal 1/3. Spikelets green, sometimes glaucous, 5.5–9.2 mm, florets 3–5; vivipary absent; rachilla internodes 0.8–2.3 mm, smooth or minutely bumpy, glabrous or hispidulous; glumes surfaces minutely papillate-punctate, apex acuminate, keel distally scabrid, lower glume 3.3–4 mm, (1 or)3-veined, upper glume 4–4.7 mm, 3-veined; lemmas 4.5–5.2 mm, apex narrowly membranous, keels shortly villous for 2/3 of length, marginal veins for 1/3, intermediate veins prominent, glabrous or sparsely pilulose, area between veins finely scabrid throughout; callus webbed; palea scabrid between keels, keels scabrid, medially pilulose. Anthers 1.1–1.6(–2) mm. Fl. and fr. Jun–Aug.

Alpine grassy slopes; 4000–4300 m. Xizang [Bhutan, India (Assam, Sikkim)].

Poa gammieana is known in China from one gathering. It has fewer spikelets per branch and shorter glumes than *P. grandis*.

42. *Poa grandis* Handel-Mazzetti, Symb. Sin. 7: 1284. 1936.

阔叶早熟禾 *kuo ye zao shu he*

Poa spontanea Bor.

Perennials, loosely tufted, from a tough, shortly rhizomatous crown, tillers sometimes clambering; shoots extravaginal. Culms erect, 1 to several, somewhat compressed, (50–)70–120 cm tall, 2–5 mm in diam., smooth, nodes 5–12, several exserted, slightly swollen, usually with leafy lateral shoots from mid to upper nodes (these infrequently flowering), lowest to mid-culm nodes strigose above and below. Leaf sheaths strongly compressed, prominently keeled above, glabrous, or sometimes strigose near the base, ?pilulose also, 6–9 cm, ca. 1/2 as long as blade, uppermost closed for 3/4 of length to near the top; blade absent or nearly so on lowermost sheaths, flat, moderately thin, 7–25 cm, uppermost often longest, (2–)4–12 mm wide, distinctly keeled, surfaces smooth, margins smooth or scabrid, adaxially often pilulose, apex prow-tipped; ligule membranous, 2–6 mm, abaxially smooth or scabrid, apex truncate or rounded, collar margins often prominently flared. Panicle open, erect, diffuse, 15–35 × 10–20 cm, longest internodes (3–)4–5(–8) cm; branches eventually spreading to reflexed, strict, (2–)3–7(–9) per node, fairly stout, smooth throughout or distally very sparsely scabrid, longest 6–12 cm with 7–26 spikelets in distal 1/2; flowers female or perfect, some inflorescences entirely female. Spikelets elliptic, 5–7 mm, florets 2 or 3(–5); vivipary absent; rachilla internodes 0.3–1 mm, densely scabrid or smooth, glabrous, or pilulose to hispidulous; glumes lanceo-

late to ovate, surface minutely papillate-punctate, apex acuminate, keel and upper surface smooth or scabrid, lower glume 2.3–4 mm, 1(or 3)-veined, upper glume 3.5–5 mm, 3-veined; lemmas elliptic to lanceolate, 3.5–5 mm, keel sparsely shortly villous for 1/3 of length, marginal veins for 1/4, intermediate veins faint to prominent, area between veins proximally scabrid to crisply pilulose, distally scabrid; callus sparsely webbed or glabrous; palea densely scabrid or with slender hooks between keels, keels scabrid, sometimes medially pilulose. Anthers 1.8–2.8 mm, or vestigial. Fl. and fr. Jun–Aug.

High-elevation meadows and *Fargesia* thickets along streams in mountainous areas, alpine slopes and river valleys; 2700–4500 m. SW Sichuan, SE Xizang (Médog), NW Yunnan [Myanmar].

Poa grandis is unusual in its multinoded culms with branching shoots from the upper nodes, and dense, thick, shortly rhizomatous crowns. Keng (Fl. Ill. Pl. Prim. Sin. Gram. 163. 1959, as “*P. plurinodis*”) reported it as dioecious, but from population samples and additional gatherings it appears to be sequentially gynomonoeious. The types of *P. spontanea*, from adjacent Myanmar, and “*P. plurinodis*,” from NW Yunnan, are not significantly different. “*Poa plurinodis* Keng” (Claves Gen. Sp. Gram. Prim. Sin. 165. 1957 and loc. cit. 1959) was not validly published because no Latin description was provided. “*Poa plurinodis* Keng ex P. C. Keng” (Acta Bot. Yunnan. 4: 275. 1982) was not validly published because two types were indicated.

43. *Poa eleanorae* Bor, Kew Bull. [3] 1948: 142. 1948.

易乐早熟禾 *yi le zao shu he*

Perennials, loosely tufted, rhizomes not recorded; shoots extravaginal. Culms ascending, sometimes geniculate, 30–50 cm tall, 1–2 mm in diam., smooth, nodes 2 or 3, none or 1 exerted. Leaf sheaths loose, smooth, glabrous, lowermost scabrid, becoming fibrous, 8–13 cm, 3/5–1 × as long as blade, uppermost closed for ca. 1/9 of length; blade folded with margins inrolled, thin, 7–22 cm × 1–3 mm, abaxially shiny, smooth, adaxially scabrid, margins smooth; ligule 0.5–2(–2.5) mm, abaxially scabrid, apex truncate to obtuse, collar smooth, glabrous, or lowermost sparsely scabrid. Panicle open, 8–24 × 3–12 cm, longest internodes 2–7 cm; branches spreading to reflexed, flexuose, sometimes arched upward, 2 per node, proximally smooth to sparsely scabrid, distally scabrid on and between angles, longest with 5–15 well-spaced spikelets in distal 1/2, pedicel mostly shorter than spikelet. Spikelets cuneate, 5–7 mm, florets 2 or 3; vivipary absent; rachilla internodes 1.5–1.7 mm, smooth or scabrid, glabrous or pilulose; glumes subequal, surfaces minutely punctate with purple papillae, smooth or sparsely scabrid, keels straight, or slightly curved, finely scabrid, 3-veined, apex acuminate, lower glume 5.6–6.5 mm, upper glume 5.7–7 mm, as long as or slightly longer than first lemma; lemmas elliptic, 4.2–6.5 mm, apex acute, scabrid throughout, intermediate veins prominent, keel shortly villous for 1/3 of length, marginal veins sometimes near base; callus glabrous or sparsely webbed; palea scabrid throughout. Anthers (0.4–)0.6–1 mm. Fl. and fr. Jul–Aug.

Alpine grassy places; 3800–4000 m. ?Sichuan, ?Xizang, ?Yunnan [India (Sikkim), Nepal].

Poa eleanorae is unlike other species in the short-anthered group in having long, open sheaths and large spikelets with glumes as long as or longer than the first lemma. Specimens with well-preserved bases have not been seen, and it is possible that short rhizomes might be

produced. The species was reported from Sichuan, Xizang, and Yunnan in FRPS (9(2): 170. 2002), but not in the provincial Chinese Floras. No authentic material from China has been seen by us.

44. *Poa pseudamoena* Bor, Kew Bull. [8] 1953: 276. 1953.

拟早熟禾 *ni zao shu he*

Poa amoena Bor, Kew Bull. [3] 1948: 140. 1948, not (J. Presl) Kunth, 1833; *P. platyglumis* (L. Liu) L. Liu; *Puccinellia platyglumis* L. Liu.

Annuals or short-lived perennials, densely tufted. Culms included in the basal tufts or slightly exerted, erect or decumbent, 4–8 cm tall, smooth, nodes 1 or 2, hidden. Leaf sheaths smooth, glabrous, 1–3 cm, subequal to shorter than blade, uppermost closed for ca. 1/4 of length; blade flat or folded, thin, 1–4 cm × 1–1.6 mm, abaxially smooth, adaxially smooth or sparsely scabrid, margins smooth to scabrid; ligules 0.5–2.2 mm, abaxially smooth, apex acute, lacerate to dentate, collars smooth. Panicle contracted to subspiciform, or open at anthesis, ovoid to cylindrical, erect, 1–2.5 × 0.6–1 cm, longest internodes 0.4–0.8 cm; branches erect to ascending, 1 or 2 per node, proximally smooth, distally sparsely to moderately scabrid on weak angles, longest 0.5–1.5 cm with 1–3(–8) spikelets distally. Spikelets elliptic, pale green to purple tinged 3.2–6 mm, florets 2–4; vivipary absent; rachilla internodes 0.4–1 mm, smooth, glabrous; glumes subequal, keels smooth or sparsely scabrid, lower glume 1.8–4 mm, (1 or)3-veined, upper glume 2.4–4.6 mm, oblong, 3-veined; lemmas broadly elliptic, 2.5–4 mm, glabrous throughout, apex acute, occasionally mucronulate, keel sparsely scabrid, intermediate veins faint to moderately prominent, area between veins smooth; callus glabrous; palea smooth between veins, keels scabrid. Anthers 0.6–1 mm. Fl. and fr. Aug–Sep.

Xizang-Qinghai Plateau: grassy frost-heaved slopes, glacial outwash, lake shores; 2800–5600 m. Qinghai, S Xinjiang, Xizang [India (Uttar Pradesh)].

Poa pseudamoena is infrequently collected. It looks much like a form of *Poa annua* with glabrous lemmas, but with more congested panicles. The type of *Puccinellia platyglumis*, from SW Xizang, has smaller spikelets and a more open panicle, at least at anthesis. We have seen authentic *Poa pseudamoena* from S Xinjiang on mixed sheets with *Puccinellia*.

45. *Poa ussuriensis* Roshevitz in Komarov, Fl. URSS 2: 754. 1934.

乌苏早熟禾 *wu su zao shu he*

Poa ussuriensis f. *angustifolia* I. C. Chung; *P. ussuriensis* f. *scabra* I. C. Chung.

Weakly perennial, loosely tufted. Culms erect, 30–80 cm tall, ca. 0.8 mm in diam., scabrid below nodes, nodes 3 or 4(–5), 2 or 3 exposed. Leaf sheaths very compressed with a winged keel, 4–13 cm, 1/2–1 × as long as blade, uppermost closed for 2/3–3/4 of length; blade flat or weakly folded, thin, deeply keeled, 2–15 cm × (1.5–)2–3(–4.5) mm, adaxially scabrid, margins densely scabrid; ligule (0.5–)1–2(–2.5) mm, abaxially scabrid, apex truncate to obtuse, collars scabrid, margins glabrous. Panicle open, lax, diffuse, 7–20 cm, broad, longest internodes 3–5 cm; branches eventually spreading, lax, 2–5 per node, slender, scabrid on and between angles throughout, long-

est to 12 cm with 3–13 loosely arranged spikelets in distal 1/3. Spikelets oblong-lanceolate, light green, (3–)4–6 mm, florets 3–5(–6); vivipary absent; rachilla internodes ca. 1 mm, smooth, glabrous; glumes unequal, acute, keels sparsely scabrid, lower glume 1.5–2 mm, 1-veined, upper glume 2.5–3 mm, 3-veined; lemmas 3–4 mm, apex acuminate, keel villous for 2/3 of length, marginal veins for 1/3, intermediate veins prominent, area between veins minutely bumpy, glabrous; callus sparsely webbed; palea smooth or minutely bumpy between keels, keels scabrid. Anthers 0.4–1 mm. Fl. and fr. Jun. $2n = 28, 42$.

Deciduous forests, mixed forests, glades, riparian gravels. Heilongjiang, ?Jilin (expected) [Korea, Russia (Far East)].

Poa ussuriensis is common on the Russian side of the Chinese border east and west of Vladivostok. *Poa radula* Franchet & Savatier was reported in FRPS (9(2): 113–114. 2002) from Jilin, but it is doubtfully present in China. According to Probatova (in Tzvelev, Sosud. Rast. Sovetsk. Dal'nego Vostoka 1: 283. 1985), *P. radula* is a species of Sakhalin, the Kuril Islands, and S Kamchatka, but is not found elsewhere in the Russian Far East, China, or Japan. Chung (Korean Grass. 72. 1965) reported it from S Korea, but not N Korea or China; Japanese authors have not mentioned it for Korea or China; and Kitagawa (Neolineam. Fl. Manshur. 102–105. 1979) did not list it for Manchuria. *Poa radula* can be difficult to distinguish from *P. ussuriensis*: it has a broader leaf blade, (3–)4.5–10 mm wide, longer ligule, (1.5–)2.5–4 mm, larger spikelets (5–)6–8(–10) mm, and hexaploid chromosome number.

46. *Poa hisauchii* Honda, Bot. Mag. (Tokyo) 42: 132. 1928.

久内早熟禾 *jiu nei zao shu he*

Annuals or short-lived perennials. Culms ascending to erect, 20–60 cm tall, nodes 3 or 4. Leaf sheaths shorter than internodes, smooth or scabrid; blade flat, grayish green, 4–8 cm \times 1–3 mm, surfaces and margins scabrid; ligule 0.5–1.5 mm, abaxially pilulose, apex truncate to rounded, collar margin ciliate. Panicle narrowly oblong, 8–15 cm, longest internodes 3–5 cm; branches erect or curved ascending (sometimes spreading in fruit), 2 or 3(–5) per node, slender, scabrid angled from base, longest 2–6 cm with 5–15 spikelets in distal 1/2. Spikelets oblong to ovate, green, 4–5 mm, florets 3 or 4; vivipary absent; rachilla internodes 0.6–0.9 mm, glabrous; glumes slightly unequal, lanceolate, keel and veins distally scabrid, lower glume 2–2.4 mm, 1-veined, apex acuminate, upper glume oblong to lanceolate, 2.2–2.8 mm long, 3-veined, apex acuminate; lemmas 2.8–3.2 mm, keel villous for 3/4 of length, marginal veins to 1/2, area between veins glabrous or sparsely pilulose near keel; callus webbed; paleas distinctly shorter than the lemma, keels pilulose. Anthers (0.3–)0.4–0.7 mm. Fl. Jun–Jul. $2n = 28$.

Shady and moist forest openings, grassy places. Hebei, Zhejiang [Japan, Korea].

Records from Sichuan and Yunnan in FRPS (9(2): 155. 2002) were based on misidentifications. This species has the pilulose ligules and branches scabrid from the base characteristic of *Poa acroleuca*, but the branches are shorter and erect to steeply ascending, and the lemmas are somewhat longer and usually glabrous or with a few hairs between the veins.

47. *Poa acroleuca* Steudel, Syn. Pl. Glumac. 1: 256. 1854.

白顶早熟禾 *bai ding zao shu he*

Annuals or short-lived perennials. Culms ascending to

erect, sometimes slightly swollen at the base, sometimes with moniliform swelling, 30–85 cm tall, 0.6–1 mm in diam., smooth, glabrous to retrorsely strigulose, nodes 3 or 4, 2 exserted. Leaf sheaths weakly keeled, smooth or sparsely scabrid, glabrous or retrorsely strigulose, 8–13 cm, slightly shorter or longer than blade, uppermost closed for over 2/3 of length, lowermost becoming fibrous in age; blades flat, thin, 7–20 cm \times (1–)1.5–5(–11) mm, surfaces smooth to moderately scabrid, margins moderately to densely scabrid; ligule 0.5–1.5(–2) mm, abaxially pilulose, apex truncate to rounded, collar margins ciliate. Panicle open, elliptic, narrowly ovate, or pyramidal, exserted, 10–21 \times 3–10 cm, longest internodes 3–5.5 cm; branches ascending to widely spreading, or reflexed, 2–5 per node, slender, angular, scabrid from base, longest 3–11 cm with 9–40 spikelets in distal 1/2. Spikelets ovate, green, 2.5–5 mm, florets (2–)3–5; vivipary absent; rachilla internodes 0.5–0.8 mm, smooth to sparsely scabrid, glabrous or pilulose; glumes slightly unequal, lanceolate, keel and veins distally scabrid, lower glume 1.5–2.4 mm, 1-veined, upper glume 2–2.8 mm, 3-veined, often as long or slightly longer than lowest lemma; lemmas oblong, 1.6–2.6(–3) mm, apex obtuse to acute, keel shortly villous for 5/6 of length, marginal veins to 3/4, intermediate veins moderately prominent, area between veins pilulose for 4/5 of length, rarely glabrous; callus sparsely webbed; palea pilulose between keels, keels smooth, rarely with a few apical hooks, pilulose to shortly villous to apex. Anthers (0.4–)0.5–1(–1.3) mm. Fl. and fr. Apr–Jun. $2n = 28$.

Moist and shady grassy places, ditch banks, parks, disturbed ground; 500–1500(–2400) m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Korea, Japan].

Poa acroleuca is usually well marked by the pilulose lemma surfaces and palea keels, callus web presence, and scabrid branches. It appears to intergrade with *P. nepalensis*, but that species normally has glabrous lemma surfaces, shorter, more contracted panicles, upper glume shorter than the first lemma, smooth, glabrous ligules (at least on the upper culm leaves), and tends to be paler overall.

- 1a. Lemma surfaces and intermediate veins moderately to densely pubescent 47a. var. *acroleuca*
- 1b. Lemma surfaces and intermediate veins glabrous or sparsely pubescent 47b. var. *ryukyuensis*

47a. *Poa acroleuca* var. *acroleuca*

白顶早熟禾(原变种) *bai ding zao shu he* (yuan bian zhong)

Lemma surfaces and intermediate veins moderately to densely pubescent.

Moist and shady grassy places, ditch banks, parks, disturbed ground; 500–1500(–2400) m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Korea, Japan].

47b. *Poa acroleuca* var. *ryukyuensis* Koba & Tateoka, J. Jap. Bot. 67: 205. 1992.

如昆早熟禾 *ru kun zao shu he*

Lemma surfaces and intermediate veins glabrous or sparsely pubescent.

Sporadic at low elevations. Guangdong, Shandong, Zhejiang [Japan (Okinawa)].

It is not uncommon to find plants of *Poa acroleuca* in China with glabrous or nearly glabrous lemmas. The range of such plants, recently named from Okinawa as var. *ryukyuensis*, has not yet been fully documented. These can be confused with *P. hisauchii*, except that in that species the panicles are narrow with short, erect or ascending branches, and the anther to lemma length ratio is less than 1:5 (vs. 1.5–2.5); or with *P. nepalensis*, except that in that species all ligules are pilulose and the paleas are pilulose to the apex.

48. *Poa nepalensis* (G. C. Wallich ex Grisebach) Duthie, List Grasses N. W. India 40. 1883.

尼泊尔早熟禾 ni bo er zao shu he

Poa annua Linnaeus var. *nepalensis* G. C. Wallich ex Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 75. 1868.

Annuals to short-lived perennials, tufted or weakly stoloniferous. Culms erect, geniculate, or obliquely ascending, 15–50(–80) cm tall, 0.5–2 mm in diam., smooth, nodes 2–4, 0–2 exposed. Leaf sheaths loose, keeled, smooth, glabrous, 5–11 cm, about as long as blade, uppermost closed for 1/2(–3/4) of length; blades flat, thin to moderately thin, 4–20 cm × (1.5–)2–7(–11) mm, uppermost 3–10 cm, surfaces smooth to sparsely scabrid, margins scabrid, apex acutely to acuminately pro-tipped; ligule 0.5–1.5(–2) mm, abaxially smooth or scabrid, glabrous or rarely pilulose, apex truncate to obtuse, collar margins usually ciliate. Panicle open or loosely contracted, ovate or elliptic, exserted, 5–15(–22) × 3–10 cm, longest internodes 1–3 cm; branches ascending to reflexed, 2(–4) per node, proximally smooth or sparsely scabrid angled, distally nearly smooth to densely scabrid angled, longest 3–9 cm with 10–35 spikelets in distal 1/2. Spikelets elliptic, light green, 3.5–5(–7) mm, florets 3–6(–7); vivipary absent; rachilla internodes 0.5–0.8 mm, smooth, glabrous; glumes subequal to equal, keel and sometimes veins scabrid, lower glume narrow, 1.3–3.3 mm, 1-veined, upper glume broader, 1.5–3.4 mm, 3-veined; lemmas oblong to elliptic, 2.4–4(–5) mm, apex obtuse, rarely acute, keel villous to near apex, marginal veins for 3/4 of length, intermediate veins prominent, glabrous, rarely pilulose, areas between veins minutely bumpy, glabrous or infrequently pilulose proximally between keel and intermediate veins; callus webbed; palea smooth, glabrous, rarely sparsely pilulose, between keels, keels pilulose to short villous for most of length, distally pilulose or with a few hooks. Anthers (0.4–)0.6–1 mm. Fl. and fr. Apr–Jun.

Meadows on slopes, roadsides, disturbed ground, at lower elevations in E China; 1900–4000 m. Gansu, Hebei, Henan, Hubei, Jiangsu, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, N India, Japan, Kashmir, Korea, Myanmar, Nepal, Pakistan].

- 1a. Panicle branches proximally smooth or
sparsely scabrid angled 48a. var. *nepalensis*
1b. Panicle branches sparsely to moderately
scabrid from the base 48b. var. *nipponica*

48a. *Poa nepalensis* var. *nepalensis*

尼泊尔早熟禾(原变种) ni bo er zao shu he (yuan bian zhong)

Poa mariesii Rendle; *P. micrandra* Keng; *P. nephelophila* Bor.

Culms 15–50(–80) cm tall, 0.5–2 mm in diam. Uppermost leaf sheath subequal to blade, closed for 1/2(–3/4) of length; ligule 0.5–1.5(–2) mm. Panicle branches proximally smooth or sparsely scabrid angled, distally nearly smooth to shortly scabrid angled; lower glume 1.3–3.3 mm, upper glume 1.5–3.4 mm; lemmas with intermediate veins glabrous, infrequently pilulose, areas between veins minutely bumpy; palea keels distally pilulose or scabrid with few to several hooks. Fl. and fr. Apr–Jun. $2n = 42$.

Meadows on slopes, roadsides, disturbed ground, at lower elevations in E China; 1900–4000 m. Gansu, Hebei, Henan, Hubei, Jiangsu, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, N India, Kashmir, Myanmar, Nepal, Pakistan].

Poa nepalensis var. *nepalensis* is very variable, and more sensitive analyses might reveal additional taxa, but we were unable to divide the specimens in any meaningful way. This subspecies is much more widespread than was previously understood. The types of *Poa mariesii*, from Jiangsu, and *P. nephelophila*, from Myanmar (with branches nearly smooth throughout), are robust forms.

48b. *Poa nepalensis* var. *nipponica* (Koidzumi) Soreng & G. Zhu, **comb. et stat. nov.**

日本早熟禾 ri ben zao shu he

Basionym: *Poa nipponica* Koidzumi, Bot. Mag. (Tokyo) 31: 256. 1917.

Culms 20–40 cm tall, 1–2 mm in diam. Uppermost leaf sheaths slightly longer than blade, closed for ca. 1/2 of length; ligule 1–1.6(–2) mm. Panicle branches proximally sparsely to moderately scabrid angled from base, distally sparsely to moderately densely long scabrid angled; lower glume 2.5–3.3 mm, upper glume 2.5–3.4 mm; lemmas with intermediate veins glabrous or proximally pilulose to short villous, smooth between veins; palea keels pilulose only. Fl. and fr. May–Jul. $2n = 42, 56$.

Thickets, moist meadows on sunny slopes. Liaoning [Korea, Japan].

Poa nepalensis var. *nipponica* is generally more robust than var. *nepalensis*, and the lower glume to lower lemma length ratio is slightly greater. It is common in Japan, but seems to be absent from most of China.

49. *Poa imperialis* Bor, Kew Bull. [12] 1957: 414. 1958.

茁壮早熟禾 zhuo zhuang zao shu he

Annuals or short-lived perennials, stoloniferous. Culms decumbent ascending, 70–85 cm tall, 2–3 mm in diam., smooth, nodes 3–6, none or 1 exserted. Leaf sheaths loose, keeled, smooth, glabrous, 14–17 cm, slightly longer than blade, uppermost closed for ca. 3/4 of length; blade flat, thin, base abruptly narrowed, surfaces smooth, margins scabrid, apex long slender pro-tipped; ligule 3–6 mm, abaxially smooth, apex obtuse, collars smooth, glabrous. Panicle open, 18–22 cm, longest internodes 3.5–4 cm; branches spreading to reflexed, 2 per node, proximally smooth, angled, distally scabrid angled, longest 8–11 cm with 20–40 spikelets in distal 2/3. Spikelets up to 6–7 mm, florets 5 or 6; vivipary absent; glumes purple tinged, keel

and sometimes veins sparsely scabrid, lower glume elliptic, 3–3.5 mm, 1-veined, back convex, upper glume 3.7–4 mm, oblong, 3-veined; lemmas 4–5 mm, keel villous for 2/3 of length, marginal veins for 1/2, intermediate veins moderately prominent, areas between veins smooth, glabrous; callus glabrous; palea smooth, glabrous between keels, keels scabrid, medially pilulose. Anthers 0.6–0.9 mm. Fl. and fr. May–Jul.

Grassy places on slopes along *Abies* forest margins; 3700–4500 m. ?Sichuan [Nepal].

Poa imperialis could be simply a large form *P. sikkimensis*.

50. *Poa sikkimensis* (Stapf) Bor, Kew Bull. [7] 1952: 130. 1952.

锡金早熟禾 xi jin zao shu he

Poa annua var. *sikkimensis* Stapf in J. D. Hooker, Fl. Brit. India 7: 346. 1896 [“1897”]; *P. eragrostioides* L. Liu; *P. tunicata* Keng ex C. Ling.

Annuals or short-lived perennials, tufted to weakly stoloniferous. Culms erect or arching, or geniculate ascending, 4–42 cm tall, 0.5–2 mm in diam., smooth, nodes 1–3(–4), none or 1 exserted, uppermost to 1/3 way up culm. Leaf sheaths loose, smooth, glabrous, 2–8 cm, 1–3 × as long as blade, uppermost closed for 1/3–1/2 of length; blade flat, thin, 3–10 cm × (1.5–) 2–5 mm, surfaces smooth or sparsely scabrid, margins scabrid, apex acutely prow-tipped, of tillers 1–10 cm; ligule 1.5–4(–6) mm, abaxially smooth or sparsely scabrid, apex obtuse to acute, collars glabrous. Panicle loosely contracted to open, oblong to pyramidal, 3–15(–19.5) × 1.5–5 cm, longest internodes 0.5–3 cm; branches obliquely ascending, spreading, or reflexed, flexuous, 2 per node, proximally smooth, distally scabrid, longest to 1–7 cm with 4–30 spikelets in distal 2/3. Spikelets ovate, usually purple tinged, 3.8–5(–6) mm, florets 3–5; vivipary absent; rachilla internodes 0.4–0.9 mm, smooth, glabrous; glumes usually purple, subequal to unequal, broad, keels smooth or sparsely scabrid, lower glume 1.5–2.7 mm, 1-veined, upper glume 2–3.1 mm, 3-veined; lemmas broadly elliptic, 2.5–3.3 mm, apex obtuse to acute, keel pilulose to shortly villous, rarely glabrous, for 1/2 length, marginal veins to 1/3, intermediate veins prominent, areas between veins smooth, glabrous; callus glabrous; palea glabrous between keels, keels sparsely scabrid, some smooth, medially sparsely pilulose. Anthers 0.5–0.9 mm. Fl. and fr. Jul–Sep. $2n = 28, 42$.

Grassy slopes, meadows, marshy ground, sandy bottoms, roadsides, disturbed ground; 3000–4700 m. SW Gansu, S Qinghai, W Sichuan, E Xizang (Yadong, Zayü), NW Yunnan [Bhutan, India (Assam, Sikkim), Nepal].

Poa sikkimensis lacks a webbed callus and has ligules 2–6 mm. It is most difficult to distinguish from *P. annua*, but has sparsely scabrid palea keels and branches and no pubescence on the intermediate veins of the lemmas.

51. *Poa stapfiana* Bor, Kew Bull. [4] 1949: 239. 1949.

斯塔夫早熟禾 si ta fu zao shu he

Poa tremula Stapf in J. D. Hooker, Fl. Brit. India 7: 344. 1896 [“1897”], not Lamarck (1791); *P. tremula* var. *micranthera* Stapf.

Perennials, loosely tufted, weakly stoloniferous; shoots extra- and intravaginal. Culms 20–60 cm tall, 0.6–1.4 mm in diam., erect or obliquely ascending, smooth, glabrous, nodes 2 or 3, 1 or 2 exserted. Leaf sheaths loose, smooth, glabrous, 5–10 cm, slightly shorter than blade, uppermost closed for 1/4–1/3 of length; blade flat or folded, thin, 5–14 cm × 1–5 mm, adaxially sometimes scabrid, margins scabrid, apex slender prow-tipped or mucronate; ligule 2.5–5 mm, abaxially smooth, apex obtuse. Panicle open, lax, 8–25 cm, longest internodes 2.2–4 cm; branches widely spreading, flexuous, 2 per node, slender, proximally smooth, distally scabrid angled, longest 3.5–7 cm with 9–20 spikelets in distal 1/2. Spikelets elliptic to oblong, green or grayish, 4–6 mm, florets 3–6; vivipary absent; rachilla smooth, glabrous or pilulose; glumes subequal or lower to 1.5 mm shorter, scabrid only on keel, apex acuminate, faintly or not evidently punctate-papillate, lower glume lanceolate to elliptic, 2.7–3.9 mm, 1(or 3)-veined, upper glume oblong, 3–4.5 mm, faintly 3-veined; lemmas oblong, very thinly papery, 3–4.5 mm, apex acute, keel villous for 3/4 of length, marginal veins to 1/2, intermediate veins prominent, areas between softly pilulose; callus webbed; paleas shorter than the lemma, keels scabrid, medially pilulose. Anthers 0.7–1.2 mm. Fl. and fr. Jul–Sep.

Alpine meadows; 2500–4300 m. ?Xizang [N India, Kashmir, Nepal, Pakistan; SW Asia (Iran)].

This species approaches *Poa himalayana* on one end of its range of variation and *P. hirtiglumis* on the other, but it has longer lemmas and generally longer anthers than either of those species. The occurrence of this species in China requires confirmation.

52. *Poa burmanica* Bor, Kew Bull. [3] 1948: 141. 1948.

缅甸早熟禾 mian dian zao shu he

Annuals or short-lived perennials, weakly stoloniferous; shoots extra- and intravaginal. Culms loosely tufted, mostly flowering, 10–60 cm tall, 0.5–0.8 mm in diam., smooth or sparsely retrorse scabrid below lower nodes, glabrous, nodes 3–5, 3 or 4 exserted. Leaf sheaths smooth, glabrous or sparsely retrorsely strigulose, 7–12 cm, 1–2 × as long as blade, uppermost closed for 1/4–1/3 of length; blade flat, thin, 2–6 cm × 1.5–2.5 mm, adaxial surface and margins scabrid, apex slender prow-tipped; ligule 0.8–1.3 mm, abaxially smooth or scabrid, apex truncate to obtuse, collars smooth or slightly scabrid, margins glabrous or ciliate. Panicle open, lax, slightly exserted, 8–13 × 3–5 cm, longest internodes 2–3.5 cm; branches spreading, flexuous, 2 per node, capillary, scabrid throughout, distally angled, longest 2–5 cm with 2–5 spikelets, Spikelets 5–5.5 mm, florets 2 or 3; vivipary absent; rachilla internodes to 1 mm, smooth, glabrous; glumes lanceolate, unequal, lower glume subulate, 1.6–3 mm, distinctly shorter than the upper, keel nearly smooth, 1-veined, upper glume 3.2–4.1 mm, strongly 3-veined, keel scabrid; lemmas oblong, 3.7–4.6 mm, ca. 5 × as long as wide, 5(–7)-veined, apex slightly acuminate, keel shortly villous for 4/5 of length, marginal veins for 2/3, intermediate veins prominent, areas between veins basally pilulose, apically scabrid; callus densely webbed; palea distinctly shorter than lemma, sparsely pilulose between veins, keels scabrid, sometimes medially pilulose. Anthers 0.6–1 mm. Fl. and fr. May–Jun.

Alpine meadows; ca. 3700 m. SW Sichuan, SE Xizang, NW Yunnan [Myanmar].

Poa burmanica is distinguished from *P. himalayana*, *P. khasiana*, and *P. rajbhandarii* by the pubescent sides of the lemmas and by little else.

53. *Poa himalayana* Nees ex Steudel, Syn. Pl. Glumac. 1: 256. 1854.

史蒂瓦早熟禾 shi di wa zao shu he

Poa gracilior Keng ex L. Liu; *P. stewartiana* Bor.

Annuals or short-lived perennials. Culms 1 to several, erect or geniculate ascending, (12–)20–50(–70) cm tall, 0.5–0.8 mm in diam., smooth or scabrid below the lower nodes, glabrous, nodes 2–5, 1 or 2 exserted. Leaf sheaths smooth or scabrid or glabrous to strigulose near the collars, 5–15 cm, 1–3 × as long as blade, uppermost closed for 2/5–1/2 of length; blade flat, thin, 3–15 cm × (0.5–)1–2.5 mm, abaxially smooth or scabrid, adaxially and margins densely scabrid, glabrous, apex slender prow-tipped, of tillers up to 10 cm; ligule 0.8–2.5 mm, abaxially smooth, glabrous, apex truncate to obtuse, collar margins sparsely shortly ciliate or glabrous. Panicle open, ovoid, lax, (6–)9–20 × 3–8 cm, longest internodes 3–5 cm; branches ascending, spreading to reflexed, 2 per node, slender, proximally smooth or sparsely scabrid, distally scabrid angled, longest 4–9 cm with (3–)5–10 spikelets in distal 1/3. Spikelets narrowly elliptic, 3–5 mm, florets 2–4; vivipary absent; rachilla internodes to 1 mm, smooth, glabrous; glumes unequal, slender, acuminate, keels slightly convex, sparsely scabrid, surfaces apically smooth or sparsely scabrid, lower glume (2–)3–3.7 mm, 1-veined, upper glume (3–)3.5–4.5 mm, prominently 3-veined; lemmas oblong to elliptic, very thinly papery, 2.5–4.3 mm, ca. 5 × as long as wide, apex slightly acuminate, keel of at least some lemmas pilulose to short villous for 1/3(–1/2) of length, marginal veins for 1/4(–1/3), intermediate veins faint to prominent, areas between veins smooth or minutely bumpy only near base, glabrous; callus sparsely webbed; paleas distinctly shorter than the lemma, smooth, glabrous between keels, keels scabrid, medially sparsely pilulose, area margins narrowly hyaline. Anthers 0.6–1 mm. Fl. and fr. May–Jul.

Grassy places on slopes; 1900–3500 m. W Sichuan, ?Xizang, Yunnan [India (Himachal Pradesh, Uttar Pradesh), Kashmir, Pakistan].

Poa himalayana is the correct name for *P. stewartiana* Bor, and differs from *P. rajbhandarii* (*P. himalayana sensu* Bor and Rajbhandari) by the pilulose palea keels and relatively long glumes, especially the lower ones. It is common in the W Himalayas, but seems to be rare in China. However, as the two species are quite similar and some specimens seem intermediate, they might be better treated as subspecies. It was reported from Yunnan in FRPS (9(2): 145, 153, 154. 2002) under *P. himalayana*, *P. gracilior*, and *P. stewartiana*, but the voucher specimens from Yunnan belong to other species, mainly *P. khasiana*.

54. *Poa rajbhandarii* Noltie, Edinburgh J. Bot. 57: 288. 2000.

喜马拉雅早熟禾 xi ma la ya zao shu he

Annuals or short-lived perennials, loosely tufted, weakly stoloniferous. Culms 1 to several, erect or geniculate ascending, 16–45 cm tall, 0.5–1 mm in diam., smooth or sparsely retrorse

scabrid below lower nodes, glabrous, nodes 2 or 3, 1 or 2 exserted. Leaf sheaths smooth or sparsely scabrid near the collars, glabrous, 6–13 cm, slightly longer than blade, uppermost closed for 3/5 of length; blades flat, thin, 5–18 cm × 1–2.5 mm, abaxially nearly smooth to scabrid, adaxially and margins densely scabrid, apex slender prow-tipped; ligule 0.4–1.5(–2.3) mm, abaxially scabrid or puberulent, truncate to obtuse, collar margins often ciliate. Panicle open, lax, 8–18 × 3–8 cm, longest internodes 2.5–4 cm; branches ascending to spreading, flexuous, 1–4 per node, slender, scabrid throughout, longest 3–7 cm with 3–8 spikelets in distal 1/3. Spikelets narrowly elliptic, 3.7–5.2 mm, florets (1–)2–3(–4); vivipary absent; rachilla internodes to 1–1.5 mm, smooth, glabrous; glumes distinctly unequal, slender, acuminate, distinctly shorter than first lemma, keels scabrid, upper surface and edges smooth or scabrid, lower glume, subulate to wedge-shaped, 1.5–2.4 mm, straight or only slightly convexed, 1-veined, upper glume 2.2–3.3 mm, 3-veined; lemmas oblong to elliptic, very thinly to thinly papery, (2.8–)3.3–4.2 mm, ca. 5 × as long as wide, apex slightly acuminate, margins finely scabrid along edge, keel pilulose to shortly villous for 1/3–1/2 of length, marginal veins to 1/3, intermediate veins faint to prominent, areas between veins smooth or minutely bumpy over some or most of length, glabrous; callus webbed; palea distinctly shorter than lemma, smooth, glabrous between keels, keels scabrid, glabrous. Anthers 0.6–1 mm. Fl. and fr. May–Jul.

Alpine grassy places; 2700–4000 m. SC and SE Xizang, NW Yunnan [Bhutan, India (Assam, Sikkim), Nepal].

Poa rajbhandarii includes *P. himalayana sensu* Bor. *Poa himalayana* s.s. has panicles more lax and palea keels medially pilulose. *Poa rajbhandarii* is similar to *P. khasiana*, but differs in the lower glume being straighter and shorter, less than half the length of the first lemma.

55. *Poa wardiana* Bor, Kew Bull. [3] 1948: 143. 1948.

瓦迪早熟禾 wa di zao shu he

Annuals or short-lived perennials. Culms several, 28–35 cm tall, 0.6–0.8 mm in diam. base obliquely ascending, nodes 3 or 4, 1 or 2 exserted, scabrid below nodes. Leaf sheaths sparsely scabrid, 4.5–9 cm, 1.2–2 × as long as blade, uppermost closed for 1/2 of length; blades flat, thin, 2.5–8 cm × 1.5–2 mm, abaxially smooth to scabrid, adaxially and margins scabrid, slender prow-tipped; ligule 0.7–1.2 mm, abaxially scabrid, apex truncate to obtuse, erose, collars glabrous. Panicle open, 8–15 × 2–4 cm, longest internodes 2–3.5 cm; branches ascending to spreading, flexuous, 2 per node, capillary to slender, proximally smooth to scabrid, distally scabrid along weak angles, longest 3–7 cm with 5–13 spikelets in distal 1/3. Spikelets oblong to lanceolate, 4.5–5 mm, florets 2 or 3; vivipary absent; rachilla internodes 0.5–1 mm, smooth, glabrous; glumes subequal to slightly unequal, 2–2.5 mm, keel scabrid, apex acuminate, purplish violet, lower glume broadly subulate, 1.5–2.2 mm, 1-veined, upper glume 2.1–2.6 mm, 3-veined; lemmas oblong, 2.7–3.3 mm, apex acute, keel basally sparsely pilulose, area between veins scabrid, glabrous, intermediate veins moderately prominent; callus glabrous; palea shorter than lemma, scabrid on and between keels. Anthers 0.7–0.8 mm. Fl. and fr. Jul.

Grassy places among *Rhododendron* thickets on slopes; 3300–4000 m. Xizang, Yunnan [India (Assam)].

Poa wardiana is perhaps only a depauperate form of *P. rajbhandarii* with subglabrous lemmas, in which case the name *P. wardiana* has priority, but its lemmas are somewhat scabrid on the sides. The similar *P. lachenensis* Noltie, from India (Sikkim), differs as follows: lower glume 2.2–3 mm; lemma sides scabrid to minutely bumpy near base, keel glabrous; lower part of culms smooth, shiny, ligule margins smooth; palea smooth between keels, keels medially pilulose.

56. *Poa khasiana* Stapf in J. D. Hooker, Fl. Brit. India 7: 343. 1896 [“1897”].

喀斯早熟禾 ka si zao shu he

Poa formosae Ohwi.

Annuals or short-lived perennials, loosely tufted, weakly stoloniferous. Culms 1 to several, clambering to erect with base geniculate, 30–70 cm tall, 0.5–1.5 mm in diam., smooth to retrorsely scabrid or hispidulous below nodes, nodes 3 or 4, 1–3 exserted. Leaf sheaths finely retrorsely scabrid to strigulose near the collars, lower ones often tinged with purple, 6–15 cm, 1.4–4 × as long as blade, uppermost closed for 2/5–1/2 of length; blades flat, thin, 3–10 cm × 1.5–3 mm, abaxially smooth, margins smooth or finely scabrid, adaxially scabrid, apex slender prow-tipped; ligule 0.8–1(–1.5) mm, abaxially scabrid or pilulose, apex truncate or obtuse, rounded, collar margins usually shortly ciliate or strigulose. Panicle open, narrow, 7–21 × 2–5 cm, longest internodes 3–6 cm; branches ascending to spreading or reflexed, flexuous, 2–4 per node, slender, proximally smooth to scabrid, distally scabrid, angled, longest 3–6 cm with 2–8 spikelets in distal 1/3–1/2. Spikelets ovate to oblong, pale green, 4–6 mm, florets 3–4(–5); vivipary absent; rachilla internodes 0.7–1.2 mm, smooth, glabrous; glumes unequal, slender, apex acuminate, upper keel scabrid, upper surfaces and edges smooth to scabrid, lower glume 1.8–3.2 mm, narrowly lanceolate, slightly convex to often sickle-shaped, 1-veined, upper glume 2.7–3.7 mm, 3-veined; lemmas lanceolate to oblong, thinly papery to papery, 3.2–4.4 mm, ca. 5 × as long as wide, apex acute to acuminate, sparsely scabrid along edge, keel shortly villous to pilulose for 2/3 of length, marginal veins to 1/2, intermediate veins prominent, areas between veins minutely bumpy, glabrous; callus densely webbed; palea distinctly shorter than lemma, smooth, glabrous, or pilulose between keels, keels scabrid throughout or infrequently medially shortly ciliate to pilulose, margins minutely bumpy and then membranous-papery. Anthers 0.6–1 mm. Fl. and fr. Jul–Sep. $2n = 28$.

Alpine scattered forests, grassy places among thickets on slopes, roadsides, *Fargesia* thickets; 300–4000 m. Guizhou, W Sichuan, Taiwan, SE Xizang, NW Yunnan [India (Khasi Hills), Myanmar].

Poa khasiana has firmer lemmas than most other taxa in the complex except *P. rajbhandarii*, but the lower glumes are relatively long in comparison to the first lemma, and are more sickle-shaped than in that species. A report from India (Sikkim) by Rajbhandari (Bull. Univ. Mus. Univ. Tokyo 34: 214. 1991) was rejected by Noltie (Fl. Bhutan 3(2): 572. 2000).

57. *Poa nankoensis* Ohwi, Acta Phytotax. Geobot. 2: 165. 1933.

南湖大山早熟禾 nan hu da shan zao shu he

Perennials, tufted. Culms ascending, 10–20(–40) cm tall, 0.8–1 mm in diam., smooth, nodes 3–5, none exserted. Leaf

sheaths smooth, glabrous, several times longer than internodes, 5–8 cm, 1–3 × as long as blade, uppermost closed for 3/10–1/3 of length; blade flat or folded, thickly papery, 2–8 cm × 1.5–3(–4) mm, abaxially smooth, adaxially and margins smooth to sparsely scabrid, apex acute to acuminate, prow-tipped, of tillers to 16 cm; ligule 1–2(–3) mm, abaxially smooth or sparsely scabrid, apex obtuse to acute, collar glabrous. Panicle open, slightly included to exserted, 5–13 cm, longest internodes 2–3 cm; branches ascending to spreading, 1 per node, rounded, distally sparsely scabrid, longest 3–4 cm with 10–16 spikelets in distal 2/3. Spikelets green, (4–)5–6 mm, florets 2–3(–4); vivipary absent; rachilla internodes ca. 0.5 mm long, smooth, glabrous; glumes subequal, smooth, lower glume 3.5–4 mm, 1-veined, upper glume 3.5–5 mm, 3-veined; lemmas lanceolate, firm, 4–5 mm, apex acuminate, keel villous for 3/4 of length, marginal veins for 1/2, intermediate veins faint to moderately prominent, areas between veins minutely bumpy; callus densely webbed; palea distinctly shorter than lemma, minutely bumpy between keels, keels scabrid. Anthers 0.8–1 mm. Fl. and fr. Jun–Aug.

• Alpine grassy places. Taiwan.

58. *Poa takasagomontana* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 41. 1934.

高砂早熟禾 gao sha zao shu he

Annuals or short-lived perennials, weakly stoloniferous. Culms ascending, loosely tufted, 40–50 cm tall, 0.4–1 mm in diam., sparsely scabrid below the nodes, nodes 4 or 5, none or 1 exserted. Leaf sheaths sparsely scabrid, 9–12 cm, 5/7–1 × as long as blade, uppermost closed for ca. 3/5 of length; blade flat, thin, 10–15 cm × 1.5–3 mm, abaxially sparsely scabrid, adaxially and margins scabrid, apex slender prow-tipped; ligules 1–1.5(–2) mm, abaxially scabrid, apex obtuse, collars ciliate margined. Panicle open, lax, 10–15 cm, barely exserted, longest internodes 2.5–3 cm; branches spreading, 2 per node, densely scabrid angled throughout, longest 2–4 cm with 5–8 spikelets in distal 1/2. Spikelets 3.5–5 mm, florets (1 or)2; vivipary absent; rachilla to 1.2 mm, smooth, glabrous; glumes unequal, very thinly papery, keels scabrid, lower glume narrowly lanceolate, 1.5–3 mm, 1-veined, upper glume 3–4 mm, 3-veined; lemmas 3–4 mm, very thinly papery, glabrous, keel faintly scabrid toward the apex, intermediate veins moderately prominent, areas between veins smooth, minutely bumpy, apex sharply acute to acuminate; callus webbed; palea shorter than lemma, smooth between keels, keels scabrid. Anthers 0.7–1 mm. Fl. and fr. Jul–Aug.

• Alpine wet places along forest margins. Taiwan.

With its thin, smooth, glabrous lemmas and webbed callus, *Poa takasagomontana* stands out, but seems closely related to *P. khasiana*. However, it has longer anthers than most species in this group.

59. *Poa tenuicula* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 42. 1934.

细秆早熟禾 xi gan zao shu he

Perennials, densely tufted; shoots extra- and intravaginal. Culms ascending to erect, 19–40 cm tall, ca. 1 mm in diam., smooth, nodes 2–4, none or 1 exserted, uppermost node to 1/3–

1/2 way up culm. Leaf sheaths weakly keeled, smooth, 5–8 cm, 2–4 × as long as blade, uppermost closed for 2/5–3/5 of length; blade flat or folded, thin, 1.5–8 cm × 2–2.8 mm, apex prow-tipped, abaxially smooth, often ribbed, adaxially finely scabrid, margins smooth or scabrid, of tillers 1–3.5 cm; ligule 1–3 mm, abaxially smooth, apex obtuse to acute, of tiller and lower leaves 0.2–0.5 mm, abaxially scabrid, collar smooth. Panicle loosely contracted, 5–8 cm, longest internodes 1.5–2 cm; branches ascending, 1 or 2 per node, proximally rounded, smooth, distally scabrid angled, longest 2.5–4 cm with 6–12 spikelets in distal 1/2. Spikelets lanceolate, slightly purple tinged, 4–6.5 mm, florets 2–4; vivipary absent; rachilla internodes to 1 mm, pilulose to short villous or sparsely scabrid; glumes papery, strongly keeled, keel apically sparsely scabrid, sides punctate-papillate, somewhat glaucous, apex sharply acute to acuminate, lower glume 3–4.1 mm, 1(–3)-veined, upper glume 4–4.7 mm, prominently 3-veined, lateral veins to 2/3 as long; lemmas 3.5–4.7 mm, apex acute to acuminate, margins purple, keel villous for 3/4 of length, marginal veins for 2/3, and sometimes intermediate veins to 1/2 length, areas between veins proximally densely pilulose to shortly villous, distally minutely bumpy; callus densely webbed; palea densely pilulose to villous between keels, keels scabrid, medially densely pilulose to villous. Anthers (1–)1.2–1.5 mm. Fl. and fr. Jun–Aug.

- Alpine grassy slopes. Taiwan.

Poa tenuicula differs from *P. nankoensis* in being taller and having panicles longer, spikelets pubescent between lemma veins and on rachilla, and anthers longer.

60. *Poa hirtiglumis* J. D. Hooker, Fl. Brit. India 7: 343. 1896 [“1897”].

毛花早熟禾 *mao hua zao shu he*

Annuals or short-lived perennials, shoots extra- and intravaginal. Culms tufted, several, slightly arching, erect or geniculate at base, 4–35(–44) cm, 1–1.6 mm in diam., smooth, glabrous, nodes 1–3, none or 1 exserted, uppermost to 1/4 way up culm. Leaf sheaths thin, loose, soon withering, smooth, glabrous, 3–9 cm, ca. 2 × as long as blade, uppermost closed for 1/5–1/4 of length; blade flat or folded, thin, 2–8 cm × 1.5–3(–4) mm, surfaces smooth, margins and keel smooth to scabrid, apex acutely prow-tipped; ligules milky, ovate, 2–5 mm, abaxially smooth, glabrous, apex obtuse, entire to lacerate, collar smooth, glabrous. Panicle open, exserted, 3–7(–9) × 1.5–4 cm, longest internode 1–2 cm; branches spreading to reflexed, flexuous, often arched, 1 or 2(–3) per node, proximally sparsely scabrid, distally scabrid on and between angles, longest 1.5–4.5 cm with 9–25 spikelets in distal 1/2. Spikelets obovate, usually purple tinged, 2.5–4.5 mm, florets 2 or 3; vivipary absent; rachilla internodes 0.5–0.7(–1) mm, smooth or sparsely scabrid or pilulose; glumes lanceolate, subequal, upper often as long as or slightly longer than lower lemma, keel scabrid, surface smooth to distally sparsely scabrid, lower glume (1.5–)2.2–4 mm, 1- or 3-veined, upper glume (2–)2.3–5(–6) mm, 3-veined; lemmas broadly oblong, 2–4(–5) mm, intermediate veins distinct, keel shortly villous for 1/2–4/5 of length, marginal veins for 1/3–2/3, surfaces pilulose, sparsely scabrid near obtuse apex; callus glabrous or sparsely webbed; palea pilulose or minutely bumpy

between keels, keels distally scabrid, pilulose for most of length. Anthers 0.6–1 mm. Fl. and fr. May–Aug.

Subalpine and alpine meadows; 2700–4900(–5500) m. Gansu, Qinghai, Sichuan, Xizang [Bhutan, India (Assam, Sikkim), Nepal].

This species appears to be a derivative of *Poa stapfiana*, which is taller with longer lemmas and relatively shorter glumes.

- 1a. Lemmas between veins pilulose; palea keels pilulose over most of the length 60a. var. *hirtiglumis*
- 1b. Lemmas between veins glabrous or sparsely pilulose only near the base; palea keels scabrid only 60b. var. *nimuana*

60a. *Poa hirtiglumis* var. *hirtiglumis*

毛花早熟禾(原变种) *mao hua zao shu he* (yuan bian zhong)

Culms 1–1.6 mm in diam., nodes 1–2. Leaf sheaths smooth, glabrous, uppermost closed for 1/5–1/4 of length; ligule abaxially smooth, glabrous. Longest panicle branches 1.5–4.5 cm with 9–25 spikelets in distal 1/2. Spikelets 2.5–4.5 mm; rachilla internodes smooth, pilulose; upper glume 2.3–4 mm; lemmas 2–3.3 mm, keel densely villous for 4/5 of length, marginal veins for 2/3, surfaces pilulose, sparsely scabrid near obtuse apex; palea pilulose between keels, keels pilulose for most of length, distally scabrid. Fl. and fr. May–Aug.

Subalpine and alpine meadows; 2700–4900(–5500) m. Gansu, Qinghai, Sichuan, Xizang [Bhutan, India (Assam, Sikkim), Nepal].

Poa hirtiglumis var. *hirtiglumis* is usually well marked by the possession of spikelets with glumes subequal to each other and subequal to or slightly longer than the first lemmas, the lemmas commonly pilose between the veins, and the paleas pilose for much of their length. Plants from the E Xizang-Qinghai Plateau sometimes lack the hairs between the lemma veins and on the palea keels.

60b. *Poa hirtiglumis* var. *nimuana* (C. Ling) Soreng & G. Zhu, **comb. et stat. nov.**

尼木早熟禾 *ni mu zao shu he*

Basionym: *Poa nimuana* C. Ling, Acta Phytotax. Sin. 17(1): 103. 1979; *P. macrolepis* Keng ex C. Ling; *P. zhongbaensis* C. Ling.

Culms 0.6–1.5 mm in diam., 1–3 nodes. Lower leaf sheaths finely scabrid, uppermost closed for 1/4–2/5 of length; ligule smooth to sparsely scabrid. Longest panicle branches 2–7 cm with up to 5–11 spikelets in distal 1/2–2/3. Spikelets 3–5(–6) mm; rachilla internodes smooth or sparsely scabrid; upper glume (2–)3–5(–6) mm; lemmas (2.5–)3–4(–5) mm, keel villous for 1/2 of length, marginal veins to 1/3, surfaces scabrid or sparsely pilulose near base; palea minutely bumpy between keels, keels scabrid for 1/4–2/3 of length, glabrous. Fl. and fr. Jun–Aug.

- Grassy places on mountain tops, riverside fields, roadsides, frigid alpine crevices, frost scars, marshy ground; 3000–5500 m. Gansu, Qinghai, Sichuan, Xizang.

Poa hirtiglumis var. *nimuana* differs from var. *hirtiglumis* in the scabrid palea keels and glabrous and more scabrid lemma sides. *Poa macrolepis* is a taller form with larger spikelets, but there is nothing else

to distinguish it from *P. hirtiglumis*. *Poa zhongbaensis* is a shorter, smaller-spikeleted form that may be better placed in *P. szechuensis* var. *rossbergiana*.

61. *Poa sunbisinii* Soreng & G. Zhu, sp. nov.

孙必兴早熟禾 *sun bi xing zao shu he*

Type: China. Yunnan: Fugong Xian, above Bijiang ca. 9 km by road, W slope of Bilou Mts. (divide between Nu Jiang and Lancang Jiang drainages), 26°35'N, 98°59'E, opening in *Abies-Tsuga* forest–*Fargesia* thicket contact zone, 2900 m, 8 Sep 1997, R. J. Soreng, P. M. Peterson & Sun Hang 5222 (holotype, US; isotypes, KUN, PE, others to be distributed).

Haec species a P. eleanorae Bor *foliorum superiorum vaginarum marginibus per dimididum longitudinis connatis, lemmate glabro atque glumis 1.5 mm brevioribus quam lemmatibus*; *a P. gammieana* J. D. Hooker *inflorescentiae ramis scabris, lemmatis paleaeque carinis glabris atque ligula plerumque brevior, 1–2(–5) mm*; *a P. dzongicola* Noltie *callo dorso lanuginoso atque ligula brevior differt*.

Annuals or short-lived perennials. Major roots capillary to slender, 0.1–0.2 mm. Culms tufted, erect or slightly decumbent at base, 25–80 cm tall, 1–3.5 mm in diam., smooth or sparsely scabrid below nodes, nodes 2–4, 1 or 2 exserted, uppermost ca. 1/2 way up culm. Leaf sheaths smooth, glabrous, 6–15 cm, 0.5–1 × as long as blade, uppermost closed for ca. 1/2 of length; blades flat or folded, moderately thin, uppermost 8–30 cm × 1.5–5 mm, abaxial surface and margins smooth or sparsely scabrid, adaxially scabrid, keel and 4–10 primary veins abaxially pronounced, apex slender prow-tipped; ligule 1–2(–5) mm, apex obtuse, abaxially scabrid, collar glabrous. Panicle open, eventually exserted, 8–25 cm, longest internode ca. 4 cm; branches initially ascending and flexuous, eventually spreading or reflexed and lax, mostly 2 per node, scabrid all round, angled in part, longest 8–11 cm with 5–13 spikelets loosely arranged in distal 1/2. Spikelets lanceolate, purple tinged, (4–)5–7 mm, florets 2 or 3; vivipary absent; rachilla internodes ca. 1 mm, usually densely slender-scabrid to hispidulous; glumes thinner-textured than the lemmas, frequently purple on margins or all over, keel scabrid, surface uniformly minutely punctate, apex sharply acute, lower glume narrowly lanceolate, 3.3–4.6 mm, 1- or 3-veined, upper glume lanceolate 3.8–5 mm, 3-veined; lemmas 3.7–5.2 mm, moderately firm, apex sharply acute, margins very narrowly membranous, with a narrow purple band, keel and marginal veins scabrid, intermediate veins faint to moderately prominent, areas between veins usually densely scabrid over most of the surface; callus of proximal florets sparsely webbed, hairs short, callus of distal florets glabrous; palea scabrid throughout. Anthers 0.7–1.6 mm. Fl. and fr. Aug.

• Openings in upper forested and subalpine slopes, 2900–3900. NW Yunnan.

Poa sunbisinii differs from *P. eleanorae* by having more closed leaf sheaths, a lack of hairs on the lemma keels, and shorter spikelets with glumes shorter than the lemmas by (on average) ca. 1.5 mm. It has a long palea as in *P. gammieana*, but that species has smooth inflorescence branches, pilose lemma and palea keels, and longer ligules. *Poa dzongicola* has glabrous calluses and longer ligules.

62. *Poa dzongicola* Noltie, Edinburgh J. Bot. 57: 283. 2000.

雅江早熟禾 *ya jiang zao shu he*

Poa yakiangensis L. Liu.

Annuals or short-lived perennials, tufted to loosely tufted. Culms ascending to erect, (13–)25–76 cm, smooth or sparsely scabrid below nodes, nodes 3 or 4, 0–2 exserted. Leaf sheaths scabrid, 6–14 cm, slightly shorter than to 2 × as long as blade, uppermost closed for 1/4–1/2 of length; blade flat, thin to moderately thin, 5–22 cm × 2–4(–5) mm, surfaces and margins smooth to sparsely scabrid; ligules 2.5–6.5 mm, abaxially smooth or sparsely scabrid, apex truncate to acute, collars, smooth to scabrid, glabrous. Panicle open, narrowly pyramidal, 6.5–18 × 3–6 cm, longest internodes 2–6 cm; branches spreading to reflexed, flexuose, sinuous to twisted to arched, 1–3 per node, scabrid throughout, distally angled, longest 2–8 cm with 5–15(–28) spikelets in distal 1/2–2/3. Spikelets lanceolate, purple tinged, 4–7 mm, florets 2–4(–6); vivipary absent; rachilla internodes 0.8–0.9 mm, smooth to densely scabrid; glumes subequal to unequal, narrow, keel, veins and distal surface sparsely scabrid, lower glume 2.2–4 mm, 1- or 3-veined, upper glume 2.8–4.5 mm; lemmas lanceolate, 3.1–4.4 mm, glabrous throughout, apex acute to acuminate, keel and veins scabrid, intermediate veins prominent, areas between veins scabrid throughout, or partly minutely bumpy; callus glabrous; palea minutely bumpy, sometimes scabrid between keels, keels scabrid. Anthers 0.5–0.9(–1.5) mm. Fl. and fr. Jul–Sep.

Coniferous forests openings, low alpine moist sometimes rocky thickets, disturbed ground; 3700–4600 m. SW Sichuan, SE Xizang [Bhutan, India (Sikkim)].

Poa dzongicola differs from *P. szechuensis* s.l. by the longer ligules, longer, acute glumes and lemmas, and longer anthers. The type of *P. dzongicola* differs from *P. yakiangensis* only by the scabrid sheaths and slightly longer glumes.

63. *Poa szechuensis* Rendle, J. Bot. 46: 173. 1908.

四川早熟禾 *si chuan zao shu he*

Annuals or short-lived perennials, tufted. Culms 1–60 cm tall, 0.2–1.5 mm in diam., smooth or scabrid below nodes, glabrous, nodes 1–5, 0–3 exserted. Leaf sheaths smooth or scabrid, glabrous, 1–15 cm, slightly shorter than to 2 × as long as blade, uppermost closed for 1/3–1/2 of length; blade flat or infrequently folded, thin, 1–8 cm × 0.5–3(–4) mm, scabrid throughout, apex slender prow-tipped, of tillers 1–15 cm; ligule 0.5–6 mm, abaxially smooth or scabrid, apex truncate to acute, sometimes minutely dentate, collar glabrous. Panicle open, lax, ovoid to pyramidal, included to slightly exserted, (1–)2–20 cm, longest internode (0.5–)1–5 cm; branches ascending to spreading or reflexed, flexuous, 1 or 2(–3) per node, capillary, proximally smooth or scabrid angled, distally scabrid, longest 1–8 cm with 2–20 spikelets in distal 1/4–1/2. Spikelets ovate, green or purple tinged, 2.3–4 mm, florets 2–4(–5); vivipary absent; rachilla internodes 0.5–0.7 mm, smooth or scabrid, glabrous; glumes unequal to subequal, keel scabrid, surface distally scabrid, lower glume 1–2(–2.5) mm, 1(or 3)-veined, upper glume 1.5–2.5(–3) mm; lemmas elliptic, 1.5–2.6(–3.5) mm, apex obtuse to acute, keel scabrid only or pilulose to shortly villous for 1/2 of length, marginal veins for 1/4, veins distally scabrid, in-

intermediate veins prominent, areas between veins minutely bumpy for most of length, sparsely scabrid at least near apex, glabrous; callus glabrous or scantily webbed; palea smooth or minutely bumpy, and sometimes scabrid between keels, keels densely scabrid. Anthers 0.2–0.5 mm. Fl. and fr. May–Sep.

Grassy places among thickets, along forest margins on slopes, natural and disturbed places; (2000–)4700 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [India (Sikkim), Nepal].

Poa szechuensis, as treated here, includes a highly variable (phenotypically plastic) and strongly inbreeding complex of three varieties. The lemmas of the types of *P. szechuensis*, *P. chumbiensis*, and *P. tibetica* are glabrous, but there are many similar specimens with 1 to several hairs on some lemmas in some spikelets, and we therefore feel justified in applying a broader species concept. All have lemmas mostly 2–2.6 mm and anthers 0.2–0.5 mm.

- 1a. Lemmas glabrous throughout; callus glabrous 63c. var. *szechuensis*
- 1b. Lemmas pilulose to shortly villous on keel; callus glabrous or with a few dorsal hairs.
 - 2a. Culms not arching, 10–30 cm tall; callus of lowest florets with or without a few short hairs; plants of mid elevations 63a. var. *debilior*
 - 2b. Culms arching, 1.5–10 cm tall; callus glabrous; alpine plants 63b. var. *rossbergiana*

63a. *Poa szechuensis* var. *debilior* (Hitchcock) Soreng & G. Zhu, **comb. et stat. nov.**

垂枝早熟禾 *chui zhi zao shu he*

Basionym: *Poa debilior* Hitchcock, Proc. Biol. Soc. Washington 43: 93. 1930; *P. declinata* Keng ex L. Liu.

Annuals or short-lived perennials, slender tufted. Culms 20–60 cm tall, nodes 3–5. Leaf sheaths smooth or scabrid, uppermost 4–15 cm; ligule (0.5–)1.4–5 mm. Panicle 7–20 cm, longest internode 2–5 cm; longest branches 2–8 cm. Florets 2–3(–5); lemma keel and marginal veins usually partly hairy (at least in lower florets), apex acute; callus glabrous or scantily webbed (at least in basal florets). Fl. and fr. Jun–Aug.

• Shady moist places in ravines, streamsides on mountain slopes, thickets, subalpine meadows, grassy slopes; (2000–)4500 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, NW Sichuan, Yunnan.

Plants included here have at least some hairs on the lemma keels and are generally spindly in habit. The type of *Poa declinata* is tenta-

tively placed here. It has somewhat longer-than-average lemmas with denser pubescence on the keels, more crowded spikelets, slightly thicker roots, and longer anthers. It seems to be transitional between *P. szechuensis* and *P. nepalensis* or *P. khasiana*.

63b. *Poa szechuensis* var. *rossbergiana* (K. S. Hao) Soreng & G. Zhu, **comb. et stat. nov.**

罗氏早熟禾 *luo shi zao shu he*

Basionym: *Poa rossbergiana* K. S. Hao, Bot. Jahrb. Syst. 68: 581. 1938; *P. rohmooana* Noltie.

Annuals, densely tufted. Culms 1–10 cm tall, nodes 1 or 2. Leaf sheaths smooth, uppermost 1–3 cm; ligule 1–2 mm. Panicle (1–)2–4 cm, longest internodes 0.5–1.5 cm; longest branches 1–2 cm. Florets 3 or 4; glumes ovate to lanceolate; lemma keel and marginal veins partly hairy; callus glabrous. Fl. and fr. Jun–Sep.

Alpine grassy slopes, in and around *Kobresia* mats, moraine gravels, silts; 4200–4700 m. Qinghai, Xizang [India (Sikkim)].

Included here are densely tufted, dwarf, high-alpine forms with sparsely pubescent lemmas. This race is similar in form to *Poa pseudoabbreviata* Roshevitz, but that species is perennial and occurs in arctic Russia and North America. The other varieties comprise lower-elevation and some subalpine plants that are taller, with leafy culms.

63c. *Poa szechuensis* var. *szechuensis*

四川早熟禾(原变种) *si chuan zao shu he* (yuan bian zhong)

Poa gracillima Rendle, J. Linn. Soc., Bot. 36: 424. 1904, not Vasey (1893); *P. chumbiensis* Noltie; *P. omeiensis* Rendle, nom. illeg. superfl.; *P. tibetica* Bor.

Annuals. Culms 10–40 cm tall, nodes 2–4. Leaf sheaths smooth or scabrid, uppermost 2–15 cm; ligule (0.7–)1–4.3(–6) mm. Panicle 3.5–20 cm, longest internodes 1–5 cm. Florets 2 or 3; glumes lanceolate or elliptic to lanceolate; lemmas glabrous throughout; callus glabrous. Fl. and fr. May–Aug.

Mountainous areas, sparse forests, thickets, alpine grassy places; (3000–)4600–4700 m. Sichuan, Xizang, Yunnan [India (Sikkim), Nepal].

In var. *szechuensis* the lemmas are completely glabrous. There is a continuum of specimens between *Poa chumbiensis*, a tall and broad-leaved form, *P. tibetica*, an intermediate form, and the type of *P. szechuensis*, a spindly little plant.

5. *Poa* subg. *Stenopoa* (Dumortier) Soreng & L. J. Gillespie, Aliso, in press, 2006.

林地亚属 *lin di ya shu*

Zhu Guanghua (朱光华), Liu Liang (刘亮); Marina V. Olonova

Poa sect. *Stenopoa* Dumortier.

Perennials, tufted, some with thin, short rhizomes, sometimes stoloniferous (*P.* sect. *Pandemos*) or strongly rhizomatous (*P.* sect. *Tichopoa*). Shoots extra- and intravaginal. Culms usually rounded, sometimes strongly compressed (*P.* sect. *Tichopoa*), smooth or scabrid. Leaf sheaths mostly closed for 1/20–1/6(–1/4 in *P.* sect. *Pandemos*) of length; leaf blades flat, thin, soft to folded or in-rolled, firm and hard. Panicle lax to very dense, and spiciform, branches with dense short prickles on angles. Spikelets 3–5(–8) mm, florets 1–3(–8); vivipary absent; rachilla smooth, warty or pubescent; both glumes 3-veined; lemma soft, usually pubescent at least on keel and marginal veins, sometimes also lower part between veins, rarely entirely glabrous; veins slightly raised; callus webbed to glabrous or with a short crown of hairs; palea usually smooth, sometimes pubescent between keels, keels with short prickles, very rarely proximally ciliate. Anthers (1–)1.2–2 mm.

About 40 species: Asia, Europe, North America, a few species in South America; 18 species (one endemic, at least one introduced) in China.

The Chinese species belong to four sections: *Poa* sect. *Secundae* V. L. Marsh ex Soreng (species no. 64); *P.* sect. *Pandemos* Ascherson & Graebner (species no. 65); *P.* sect. *Tichopoa* Ascherson & Graebner (species no. 66); and *P.* sect. *Stenopoa* Dumortier (species nos. 67–81). The other two sections in the subgenus, namely *P.* sect. *Abbreviatae* Nannfeldt ex Tzvelev and *P.* sect. *Oreinos* Ascherson & Graebner, do not occur in China.

Many species in *Poa* sect. *Stenopoa* hybridize easily, and have formed a series of morphologically and genetically distinct populations. These are supposed to have been stabilized by apomixis. The situation is made more complex by *P. glauca*, *P. nemoralis*, and *P. palustris*, which are represented by many cytological races of vague taxonomic status. These have hybridized with other species of *P.* sect. *Stenopoa* to form agamic complexes, which are supposed to have arisen quite long ago, perhaps during the Pleistocene (Tzvelev, Fl. European Part USSR 1: 117–368. 1974). Four of these have differentiated sufficiently to be treated as the distinct hybridogenous species *P. albertii*, *P. araratica*, *P. lapponica*, and *P. urssulensis*. Some polytypic species are also accepted. Their subspecies are geographically separated; some may be of hybrid origin, but are close to one parent as result of introgression.

- 1a. Sheaths of upper culm leaves closed for 1/4–(1/3) of length; lower glume 1-veined, often sickle-shaped; lemma with or without a bronze-yellowish band below apex, lateral veins faint to prominent; vegetative shoots extravaginal and/or intravaginal; plants loosely tufted, stoloniferous (sometimes with short lateral shoots with small beadlike swellings); sheaths compressed, usually densely retrorsely scabrid, collars not ciliate; blade papery, flat, apex simple acuminate (*P.* sect. *Pandemos*) 65. *P. trivialis*
- 1b. Sheaths of upper culm leaves closed for 1/20–1/5(–1/4) of length; lower glumes (1 or)3-veined; lemma commonly with a bronze-yellowish band below apex, lateral veins mostly faint; vegetative shoots all or mostly extravaginal (rarely mostly intravaginal); plants rarely with well-developed rhizomes (but if rhizomatous then culms and nodes strongly compressed: *P.* sect. *Tichopoa*).
 - 2a. Plants with well-developed rhizomes; culms isolated, nodes and internodes strongly compressed; callus usually webbed (*P.* sect. *Tichopoa*) 66. *P. compressa*
 - 2b. Plants without rhizomes (or at most with poorly developed lateral shoots, or short upward-directed bladeless shoots, or somewhat stoloniferous in riparian forms of *Poa palustris*); culms usually closely clustered, nodes and internodes not or only slightly compressed, but if compressed then plants not rhizomatous; callus webbed or not.
 - 3a. Lemmas weakly keeled, glabrous; spikelets 2.5 or more × as long as wide; callus glabrous; panicle contracted, linear; spikelets not viviparous (*P.* sect. *Secundae*) 64. *P. secunda*
 - 3b. Lemmas strongly keeled, pubescent (infrequently glabrous); spikelets commonly 1.5–2 × as long as wide; callus with a dorsal web or glabrous; panicle open or contracted, linear to pyramidal; spikelets sometimes viviparous (*P.* sect. *Stenopoa*).
 - 4a. Panicle with viviparous spikelets 80. *P. albertii*
 - 4b. Panicle without viviparous spikelets.
 - 5a. Plants up to 25(–40) cm of alpine and subalpine belt (if from lower elevation steppe see 77. *P. versicolor*); upper node usually not exposed.
 - 5b. Plants (25–)30–100 cm, sometimes alpine; uppermost node usually exposed.
 - 11a. Mesomorphic plants; culm with uppermost node more than 1/3(–1/2) way up, leaf blade soft, flat, 1–5 mm wide, usually longer than sheath; ligule up to 1.5 × blade width; panicle open.
 - 12a. Ligule 2–3 mm, callus of lemma webbed 70. *P. palustris*
 - 12b. Ligule of uppermost leaves 0.2–1.5 mm, usually less than blade width (if C Asia, see also 75. *P. nemoraliformis*).
 - 11b. Plants up to 25(–40) cm of alpine and subalpine belt (if from lower elevation steppe see 77. *P. versicolor*); upper node usually not exposed.
 - 6a. Plants 20–30 cm, subalpine (to low alpine).
 - 7a. Ligule 3–8 mm, 2–4 × as long as blade width, lemma glabrous between veins 76. *P. hylobates*
 - 7b. Ligule 0.7–3 mm (if longer, lemma pubescent between veins), usually equal to blade width 78. *P. araratica*
 - 6b. Plants 5–15(–25) cm, alpine, if taller, then spikelets 5–8 mm, leaf blade green, soft.
 - 8a. Panicle contracted, densely ovoid to spiciform, longest branches 1(–1.5) cm, spikelets crowded, 3–4(–5) mm; uppermost internode not more than 1 mm wide; leaf blade firm in age, narrow, folded or inrolled; plant pale or grayish yellow, glumes sometimes with purplish bands.
 - 9a. Densely tufted, shoots mostly intravaginal; leaf blades inrolled, 0.5–1 mm wide 79. *P. attenuata*
 - 9b. Moderately tufted, shoots mostly extravaginal; leaf blades folded, 1–1.5 mm wide 80. *P. albertii*
 - 8b. Panicle elongated, sometimes quite open, longest branches 1.5–2 cm, spikelets moderately crowded to sparse, (3.8–)4–5.5(–6) mm; uppermost internode frequently up to 1.5–2 mm wide; leaf blade withering, folded or flat; plant glaucous, glumes and vegetative parts frequently strongly purplish.
 - 10a. Callus glabrous (rarely with a few short hairs) 80. *P. albertii*
 - 10b. Callus webbed 81. *P. glauca*

- 13a. Spikelets 4–8 mm, blades (2–)3–8 mm, plants with bluish bloom, scabrid near nodes 69. *P. sichotensis*
- 13b. Spikelets up to 4 mm; blades 1–3 mm, plants green, smooth near nodes.
- 14a. Rachilla pubescent.
- 15a. Ligule up to 1 mm; palea with prickles on keels and glabrous between them 67. *P. nemoralis*
- 15b. Ligule 1–2 mm; if less than 1 mm, then palea with short hairs on the lower part of keels and pubescent between them 68. *P. lapponica*
- 14b. Rachilla glabrous.
- 16a. Culm with uppermost node usually at or above middle, culm usually smooth; rachilla warty, never pilose (infrequently sparsely hispidulous) 68. *P. lapponica*
- 16b. Culm with uppermost node 1/3–1/2 way up; culm usually scabrid; rachilla warty or pilose.
- 17a. Plants firm and robust; leaf blade 1.5–2.5(–3) mm, firm; leaf sheath usually longer than blade; low-elevation grasslands of central and eastern provinces 72. *P. sphondylodes*
- 17b. Plants soft and slender; leaf blade 1–1.5(–2) mm, thin; leaf sheath usually shorter than blade; mountain forest margins and high-elevation grass slopes of central and western provinces 73. *P. faberi*
- 11b. Xeromorphic plants; culm with uppermost node up to 1/3 way up, if up to 1/2 way up and/or plant mesomorphic, then ligule more than $1.5 \times$ blade width; leaf blade firm or soft, folded or flat, 0.5–2.5(–3.5) mm broad, much shorter to infrequently longer than sheath.
- 18a. Plants with 2(or 3) nodes above 1 cm at the base; leaf blade firm or soft and withering in age; uppermost blade usually very narrow and folded, short, usually less than 1/2 as long as sheath to subequal; panicle open to densely spiciform.
- 19a. Panicle dense, contracted to spiciform, branches erect, the longest ones 1/5–1/3(–2/5) as long as panicle; uppermost node usually below 1/6 way up culm 77. *P. versicolor*
- 19b. Panicle usually open, especially while flowering, longest branches 1/3–1/2 as long as panicle; uppermost node usually ca. 1/6 way up culm.
- 20a. Plants robust, up to 100(–120) cm; uppermost internode 30–80 cm, up to 2.5 mm in diam. in fruiting material; plants of E and NE China 71. *P. alta*
- 20b. Plants slender, 30–45(–55) cm, uppermost internode up to 35 cm long, up to 1.5 mm in diam.
- 21a. Densely to sparsely tufted plants with few leaves; spikelets up to 5 mm; ligule (1–)2–7 mm; plants widespread 77. *P. versicolor*
- 21b. Loosely tufted, leafy plants; spikelets up to 6(–6.5) mm; ligule up to 1(–1.5) mm; plants of NW mountains 75. *P. nemoraliformis*
- 18b. Plants with 3–5 nodes above 1 cm at the base (if 2, then leaves long, soft, and flat), leaf blade soft and withering with age, never firm, uppermost blades frequently flat, usually more than 1/2 as long as sheath; panicle open or contracted (if contracted, then with blades soft and withering in age), with long erect branches, 1/2 as long as panicle, never dense and spiciform.
- 22a. Plants with 2 nodes; panicle with scattered spikelets; spikelets 4.5–5.5(–8) mm; uppermost internode frequently thick, up to 1.5–2 mm, but not elongated; plant glaucous, frequently dark purple; plants of alpine and subalpine belts go to lead 7
- 22b. Plants with 3–5 nodes; panicle usually with crowded spikelets; spikelets 3–5.5(–6) mm; uppermost internode usually 1–1.5 mm (if 1.5–2.5(–3) mm then very elongated); plants green or tinged purple, of hills to lower alpine belt.
- 23a. Ligule up to 2 mm.
- 24a. Ligule up to 1(–1.5) mm 71. *P. alta*
- 24b. Ligule 1–2 mm.
- 25a. Panicle elongated-pyramidal with quite dense to scattered spikelets 3–4 mm; plants of lower mountain belt in N China 74. *P. urssulensis*
- 25b. Panicle with long erect branches and scattered spikelets (3.5–)5–7 mm; plants of high mountain belt in W and NW China 75. *P. nemoraliformis*

- 23b. Ligule 2–8 mm.
 26a. Callus glabrous (sometimes with a few short hairs), panicle usually open 76. *P. hylobates*
 26b. Callus usually webbed; panicle usually loosely contracted.
 27a. Plants firm and robust; leaf blade 1.5–2.5(–3) mm, firm; leaf sheath usually longer than blade; low-elevation grasslands of C and E provinces 72. *P. sphondylodes*
 27b. Plants soft, slender; leaf blade 1–1.5(–2) mm, thin; leaf sheath usually shorter than blade; mountain forest margins and high-elevation grass slopes of C and W provinces 73. *P. faberi*

64. *Poa secunda* J. Presl subsp. **juncifolia** (Scribner) Soreng, Phytologia 71: 401. 1992 [“1991”].

巨早熟禾 *ju zao shu he*

Poa juncifolia Scribner, Bull. Div. Agrostol., U.S.D.A. 11: 52. 1898; *P. ampla* Merrill.

Plants bluish. Perennials, densely tufted, sterile shoots intra- and extravaginal. Culms erect, 40–120 cm tall. Leaf sheath smooth or scabrid, uppermost closed for 1/15–1/5 of length; blade flat or folded, papery to thickly papery, up to 25 cm × 1–3(–4) mm, adaxially scabrid; ligule 0.5–3 mm, abaxially scabrid, truncate to acute, of tillers all truncate, collar glabrous. Panicle narrow, dense, 10–15 × 1–3 cm; branches steeply ascending, scabrid angled, with spikelets from the base. Spikelets narrowly lanceolate, weakly compressed, 8–10 mm, florets 4–7; vivipary absent; glumes broad, subequal, lower glume 3–3.5 mm, upper glume 4–4.5 mm, nearly as long as lower lemma; lemmas weakly keeled, 4–6 mm, apex obtuse to acute, glabrous, abaxially scabrid; callus glabrous; palea keels scabrid. Anthers 1.5–3 mm. Fl. and fr. May–Jul. *2n* = 62, 63, 64, 65, 68, 70, 71, 97.

Introduced in China [India, Pakistan; SW Asia (Iran), Australia; native to North and South America].

Poa secunda subsp. *juncifolia* was introduced to China for forage and rangeland stabilization under the name *P. ampla*. A few vouchers exist from experimental stations, but whether or not it occurs outside of cultivation in China was not verified. *Poa secunda* subsp. *secunda* has acute to acuminate ligules, softer foliage, and crisply puberulent lemma surfaces.

65. *Poa trivialis* Linnaeus, Sp. Pl. 1: 67. 1753.

普通早熟禾 *pu tong zao shu he*

Perennials, tufted, stoloniferous, shoots with or without beadlike swellings. Culms decumbent to geniculate, 20–100 cm tall, 1–2 mm in diam., nodes 3 or 4, scabrid below panicle and nodes. Lower leaf sheaths usually densely retrorsely scabrid, 8–15 cm, subequal to blade, uppermost closed for ca. 1/4 of length; blade flat, papery, 8–20 cm × 2–5 mm, surfaces scabrid, apex acuminate; ligule 3.5–10 mm, abaxially scabrid, acute to acuminate, collar smooth or scabrid, glabrous. Panicle oblong to pyramidal, 9–20 × 2–4 cm; branches obliquely ascending to spreading, 4–5 per node, densely scabrid throughout, longest ca. 4 cm with many spikelets crowded in distal 1/2, pedicels very short. Spikelets 2.5–3.5(–4) mm, florets 2 or 3; vivipary absent; glumes scabrid on keel, lower glume narrow, often sickle-shaped, 1.5–2 mm, 1-veined, upper glume 2.2–3 mm, 3-veined; lemmas ca. 2.5 mm, abaxial surface slightly arched,

keel shortly villous for ca. 1/2 of length, marginal veins glabrous or pilulose to short-villous in lower 1/3, intermediate veins prominent, areas between veins minutely bumpy, glabrous; callus webbed, hairs long; palea subequal to lemma, minutely bumpy between keels, glabrous, keels minutely scabrid or bumpy. Anthers ca. 1.5 mm. Fl. and fr. May–Jul.

Moist places, grassy places on slopes; 1000–3500 m. Hebei, Jiangsu, Jiangxi, Nei Mongol, N Sichuan, Xinjiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in Africa, Australia, New Zealand, and North and South America].

Poa trivialis is sometimes seeded as a pasture and lawn species. It establishes well in cool, moist, shady sites, including gardens, trails, adjacent woods, and disturbed ground. It is probably introduced in China. Two races (or species) are usually recognized, with subsp. *trivialis* far more widely dispersed beyond the native European–SW Asian range of the species.

- 1a. Lemma marginal veins glabrous or pilulose for up to 1/4 of length; stolons without beadlike swellings 65a. subsp. *trivialis*
 1b. Lemma marginal veins pilulose to shortly villous for up to 1/3 of length; stolons with beadlike swellings 65b. subsp. *sylvicola*

65a. *Poa trivialis* subsp. **trivialis**

普通早熟禾(原亚种) *pu tong zao shu he* (*yuan ya zhong*)

Horizontal shoots without beadlike swellings. Lemma with marginal veins glabrous or pilulose for up to 1/4 of length. Fl. and fr. May–Jul. *2n* = 14, 28.

Moist places, grassy places on slopes. Hebei, Jiangsu, Jiangxi, Nei Mongol, Xinjiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in Africa, Australia, New Zealand, and North and South America].

This subspecies is commonly confused with *Poa khasiana*, a species with shorter ligules, often hairy collar margins, and scabrid palea keels.

65b. *Poa trivialis* subsp. **sylvicola** (Gussoni) H. Lindberg, Öfvers. Finska Vetensk.-Soc. Förh. 48(13): 9. 1906.

欧早熟禾 *ou zao shu he*

Poa sylvicola Gussoni, Enum. Pl. Inarim. 371. 1854; *P. trivialis* var. *sylvicola* (Gussoni) Hackel.

Horizontal shoots with beadlike swellings. Lemma with marginal veins pilulose to short-villous for up to 1/3 of length. Fl. and fr. Jun–Jul. *2n* = 14.

Meadows along forest margins on slopes, fields and grassy places in low mountainous areas; 1000–3500 m. N Sichuan, Xinjiang [Kyrgyzstan, W Russia, Tajikistan, Turkmenistan; N Africa, SW Asia, Europe].

This subspecies is native to W Eurasia. We have not seen vouchers from China.

66. *Poa compressa* Linnaeus, Sp. Pl. 1: 69. 1753.

加拿大早熟禾 *jia na da zao shu he*

Perennials, strongly rhizomatous, shoots extravaginal. Culms wiry, compressed, erect, often geniculate at base, simple or sparsely tufted, 15–50(–60) cm tall, 1.5–2 mm wide, nodes compressed, 3–6, 2–5 exerted. Leaf sheaths compressed to keeled, smooth, uppermost closed for 1/10–1/5 of length; blades flat, 5–12 cm × 1.4–4 mm, surfaces smooth or adaxially scabrid; ligule 1–3 mm, abaxially scabrid, truncate to obtuse. Panicle contracted or slightly open, erect, narrow, 4–11 × 0.5–1(–3) cm; branches erect or steeply ascending, or eventually spreading, 1–3 per node, densely scabrid angled from base, longest 2–4 cm with spikelets moderately crowded from the base or in distal 2/3. Spikelets ovate-lanceolate, 3.5–5 mm, florets 2–4; glumes lanceolate, nearly equal, 2–3 mm, 3-veined, apex acute or thinly mucronate, keel scabrid, rachilla smooth or minutely bumpy; lemmas oblong, 2.3–3.5 mm, apex obtuse, keel shortly villous for 2/3 of length, marginal veins to 1/3, intermediate veins faint, areas between veins glabrous; callus sparsely webbed or glabrous; palea keels scabrid. Anthers 1.3–1.8 mm. Fl. and fr. Jun–Aug. $2n = 14, 35, 42, 45, 49, 50, 56, 59$.

Moist grassy places in forests. Hebei, Jiangxi, Qinghai, Shandong, Taiwan, Xinjiang, Yunnan [India (Himachal Pradesh), Japan, Kazakhstan, Russia (Far East, Siberia); Africa, SW Asia, Australia, Europe, North and South America, Pacific Islands].

Poa compressa is native to W Eurasia. It is infrequent in China and is perhaps present only as an introduction in C to E Russia and China. It is distinguishable by its strong rhizome system, long, open sheaths, compressed culms and nodes, and scabrid-angled panicle branches. It is a good soil binder in riparian habitats. It is expected in Heilongjiang because it is frequent on the Russian side of the Chinese border.

67. *Poa nemoralis* Linnaeus, Sp. Pl. 1: 69. 1753.

林地早熟禾 *lin di zao shu he*

Culms loosely tufted, 30–80(–100) cm tall, erect or lightly geniculate, nodes 3–5(–6), uppermost at or above 1/2 way up. Leaf sheaths smooth or scabrid, shorter than blade; blade flat, soft, 5–12 cm × 1–3 mm, margins and both surfaces scabrid; ligule 0.2–1(–1.5) mm, truncate to obtuse. Panicle slender, 5–15(–22) cm, branches spreading, 2–5 per node, basal primary branch 1/2–2/3 as long as panicle with spikelets in distal 1/2. Spikelets lanceolate, 3.5–5(–6) mm, florets mostly 3; rachilla pilose; glumes narrowly lanceolate, 2.5–3.7 mm; lemma oblong-lanceolate, 2.5–3.7(–4.2) mm, keel shortly villous for 1/2 of length, marginal veins to 1/3, apex membranous; callus sparsely webbed, rarely glabrous; palea smooth and glabrous between keels. Anthers 1.3–1.5 mm. Fl. May–Jun. $2n = 14, 35, 70$.

Forested slopes, shady and moist places, forest margins, grassy

places among thickets; 1000–4200 m. Gansu, Guizhou, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, naturalized in North America].

Poa nemoralis is represented by many cytological races, which form a huge series of agamic complexes of very variable hybrid populations. Such a complex, arising from hybridization with *P. palustris*, is treated here as *P. lapponica* and is common in NE Europe, Siberia, and Mongolia. The many hybrids with *P. versicolor* subsp. *relaxa* and *P. nemoraliformis*, reported by Ovczinnikov (in Ovczinnikov & Chukavina, Fl. Tadzhiksk. SSR 1: 144. 1957), also seem to form agamic complexes. *Poa nemoralis* commonly hybridizes with *P. glauca* in Scandinavia, but obvious hybrids between these species have not yet been found in China. Pure populations of *P. nemoralis* usually occur in broad-leaved forests, quite far from *P. nemoraliformis*, *P. palustris*, and *P. versicolor* subsp. *relaxa*.

- 1a. Ligule of upper leaf 0.8–1 mm; rachilla pubescent; callus webbed 67a. var. *nemoralis*
- 1b. Ligule of upper leaf 0.8–1.5 mm; rachilla smooth or scabrid; callus glabrous or very sparsely villous 67b. var. *parca*

67a. *Poa nemoralis* var. *nemoralis*

林地早熟禾(原变种) *lin di zao shu he* (yuan bian zhong)

Ligule of upper leaf 0.8–1 mm. Panicle quite lax, 5–15(–22) cm. Spikelets 3.5–5(–6) mm; rachilla pubescent; callus webbed. $2n = 28, 33, 42, 56$.

Forested slopes, shady and moist places, forest margins, grassy places among thickets; 1000–4200 m. Gansu, Guizhou, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; naturalized in North America].

67b. *Poa nemoralis* var. *parca* N. R. Cui, Acta Bot. Borealo-Occid. Sin. 7(2): 103. 1987.

疏穗林地早熟禾 *shu sui lin di zao shu he*

Upper culm internode sometimes elongated, especially after flowering. Ligule of upper leaf 0.8–1.5 mm. Panicle effuse, 10–12 cm. Spikelets 3–5 mm; rachilla smooth or scabrid; callus glabrous or very sparsely villous.

- Meadows along forest margins; 1200–1600 m. Xinjiang.

In spite of the morphological resemblance to the hybrid complexes *Poa lapponica* and *P. urssulensis*, this variety seems to be closest to *P. nemoralis*. The glabrescence of the lemma callus and rachilla might be caused by mutation. Its status and relationship need to be defined more exactly.

Gatherings with a short ligule and unwebbed lemma callus, treated by Liu et al. (FRPS 9(2): 113. 2002) as *Poa rhomboidea* Roshevitz, might belong here. *Poa rhomboidea* is otherwise an endemic of limestone cliffs of the W Caucasus.

68. *Poa lapponica* Prokudin, Zhurn. Inst. Bot. Vseukraïns'k. Akad. Nauk 20: 198. 1939.

拉扒早熟禾 *la ba zao shu he*

Culms loosely tufted or with short rhizomes, 30–50(–75) cm tall, nodes 3–5, uppermost less than 1/2 way up. Leaf

sheaths smooth or slightly scabrid, subequal to blade; blade flat, quite soft, 7–15 cm × 1–3 mm, adaxial surface smooth or scabrid; ligule 0.5–1.5 mm, obtuse. Panicle effuse, 5–12(–18) cm, branches 2–5 per node, upper part with sparse spikelets. Spikelets 3.5–5(–8) mm, florets 2 or 3; glumes narrowly lanceolate, slightly unequal; rachilla glabrous or scabrid to densely hairy; lemma lanceolate, keel and marginal veins sparsely pubescent along proximal 1/3; callus sparsely villous or glabrous. Anthers 1.5–2 mm. Fl. Jun–Aug.

Open stony, rocky, and grassy slopes, alpine meadows; 300–4200 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Sichuan, Xinjiang, Yunnan [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia; Europe].

Hybridization between *Poa nemoralis* and *P. palustris* is very common in the northern parts of Eurasia. Both species form numerous cytological races, and apomixis is common. Members of this agamic complex are here accepted as a separate, polytypic species of ancient origin and stabilized by apomixis and selection, which needs to be distinguished from the products of recent hybridization and for which the name *P. ×intricata* Wein can be used.

1a. Rachilla glabrous; panicle narrow

..... 68a. subsp. *acmocalyx*

1b. Rachilla pubescent; panicle effuse 68b. subsp. *pilipes*

68a. *Poa lapponica* subsp. *acmocalyx* (Keng ex L. Liu) Olonova & G. Zhu, **comb. et stat. nov.**

尖颖早熟禾 *jian ying zao shu he*

Basionym: *Poa acmocalyx* Keng ex L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 388. 2002.

Culms loosely tufted, ca. 45 cm, erect. Leaf sheaths glabrous, longer than internodes, uppermost 10–15 cm, almost reaching panicle, slightly longer than blade; blade 7–14 cm × 2–3 mm, adaxially scabrid; ligule 0.5–0.8 mm. Panicle effuse, 12–15 cm; primary branch 5–10 cm. Spikelets 5–6 mm, florets 2 or 3; rachilla glabrous; callus sparsely villous. Anthers ca. 1.5 mm. Fl. and fr. Jun–Aug.

• Grassy places on sunny slopes; 1000–3900 m. Jilin, N Sichuan.

This subspecies combines the characters of *Poa nemoralis* (ligule not exceeding ca. 1 mm) and *P. palustris* (rachilla glabrous). The type material of *P. acmocalyx* is quite mesomorphic, with the uppermost node at about the middle of the culm, although FRPS (loc. cit.) gives it as in the lower 1/4, which would be a better match for *P. faberi*.

68b. *Poa lapponica* subsp. *pilipes* (Keng ex Shan Chen) Olonova & G. Zhu, **comb. et stat. nov.**

毛轴早熟禾 *mao zhou zao shu he*

Basionym: *Poa pilipes* Keng ex Shan Chen in Ma et al., Fl. Intramongol., ed. 2, 5: 594. 1994.

Culms 30–70 cm tall, slender and soft, nodes 3 or 4, usually with many tillers. Leaf sheath smooth, glabrous, subequal to blade; blade very soft to quite firm, 5–15 cm; ligule of terminal leaf 0.5–1.5 mm. Panicle narrow, (7–)10–18 cm, basal primary branch 2–4 cm, erect. Spikelets 3.5–5 mm; rachilla pilulose; first lemma 3–5 mm; callus sparsely villous or glabrous; palea keels distally with prickles, proximally shortly hairy, middle and upper parts longer ciliate; shortly hairy between keels. Anthers 1.5–2 mm, yellow. Fl. Jun–Aug.

• Grassy places on slopes, alpine meadows; 2000–4200 m. Hebei, Nei Mongol, Sichuan.

Poa lapponica subsp. *pilipes* is very close to *P. nemoralis*, but differs in having a longer ligule, as in *P. palustris*. The type differs by its unusual palea, which is pubescent between the keels proximally and has short, soft hairs on the middle part of the keels. These characters of the palea do not appear to be constant among Chinese material and subsp. *pilipes* might be a modern hybrid. Its variation at population level needs more research.

69. *Poa sichotensis* Probatova, Novosti Sist. Vyssh. Rast. 10: 68. 1973.

西可早熟禾 *xi ke zao shu he*

Poa hengshanica Keng ex L. Liu.

Culms loosely tufted, 60–120 cm tall, erect, or slightly geniculate, with bluish bloom; uppermost node above middle of culm. Lower leaf sheaths scabrid; leaf blade flat or folded, uppermost 3 or more × as long as sheath, (2–)3–6(–8) mm wide; ligule 0.5–1.5 mm. Panicle narrow, 15–26 cm, branches erect; lower ones 1/3–1/2 as long as panicle, with 6–16 spikelets. Spikelets slightly silverish, 4–7 mm, florets 3–6; rachilla hairy; glumes 2.8–6 mm; lemma 2.5–5 mm, keel and marginal veins proximally sparsely pubescent for 1/3 of length, glabrous between veins; callus villose; palea keels ciliate, proximally shortly and densely pubescent between keels. Anthers ca. 1.2–2 mm. Fl. Jun–Aug. $2n = 42, 49–50, 56, 70$.

Meadows among thickets in deciduous forests. Heilongjiang, Jilin [Russia (Far East)].

Poa sichotensis is closely allied to *P. alta*, but is less xeromorphic. The type of *P. hengshanica* and other material so named match *P. sichotensis*.

70. *Poa palustris* Linnaeus, Syst. Nat., ed. 10, 2: 874. 1759.

泽地早熟禾 *ze di zao shu he*

Culms loosely tufted, 40–80(–120) cm tall, erect or slightly geniculate, rarely branching near base; nodes 5 or 6, uppermost at or above middle of culm. Shoots extraxillary. Leaf sheath smooth or rarely scabrid; equal to or shorter than blade; blade flat, 8–20 cm × 2–3(–5) mm; ligule 2–3 mm. Panicle slightly contracted, 10–20(–30) cm; branches obliquely ascending, 3–8 per node, basal primary branch 1/2–2/3 as long as panicle with spikelets in distal 1/2. Spikelets ovate-oblong, yellowish green, 2.5–5(–7) mm, florets (2–)3–5(–7); rachilla scabrid or warty, rarely smooth; glumes almost equal, 2–3.5(–4) mm; lemma 3–3.5(–4) mm, keel shortly villous for 1/2 of length, marginal veins for 1/3, apex golden or rarely silvery, membranous; callus webbed; palea keel scabrid, area between keels smooth and glabrous. Anthers 1.2–1.5(–2) mm. Fl. Jun–Jul. $2n = 28, 30, 32, 42$.

Meadows among scattered thickets on slopes, marshy grasslands; 300–3500 m. Anhui, Hebei, Heilongjiang, Henan, Nei Mongol, Xinjiang [India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan; SW Asia, Europe, North America].

Poa palustris, like *P. nemoralis*, is one of the most complicated and polymorphic species. Hybridization with *P. nemoralis*, coupled with apomixis, has formed a series of morphologically and genetically distinct populations treated here as *P. lapponica*.

Despite its great polymorphism, *Poa palustris* has not been divided satisfactorily into stable taxa. Its distribution in China seems to be quite restricted, limited to the northern regions only. It is probably naturalized in central and southern areas. In the mountains of the south and southwest it is replaced by the allied species *P. faberi*. In E China, Japan, and Korea it is very close to, and probably replaced by, a third, related species, *P. sphondylodes*. Unusual plants in Anhui differ by the glumes and lemma being much narrower with a prominent vein. Some populations of *P. palustris* in N China and even in the Russian Far East differ from normal *P. palustris* by the appearance of characters of *P. sphondylodes*: ligule longer than 3–4 mm, upper node infrequently only to 1/3 way up culm, leaf blades soft and flat, panicle branches sometimes very short, spikelets crowded at very base of branches, and longest branches at 2nd node of panicle. Both Ohwi (Fl. Jap. 164. 1965) and Koyama (Grasses Japan Neighboring Regions, 96. 1987) reported *P. palustris* with a ligule to 5 mm from Japan; similarly Chung (Korean Grass. 71. 1965) and Lee (Man. Korean Grass. 154. 1966) from Korea. *Poa palustris* with such long ligules occurs in the Pacific area only, and these plants might be closer to *P. sphondylodes*. Such plants may also be found in coastal areas of China.

71. *Poa alta* Hitchcock, Proc. Biol. Soc. Washington 43: 93. 1930.

高株早熟禾 *gao zhu zao shu he*

Poa flavida Keng ex L. Liu; *P. mongolica* (Rendle) Keng ex Shan Chen; *P. nemoralis* Linnaeus var. *mongolica* Rendle; *P. pseudonemoralis* Skvortsov (1954), not Schur (1866); *P. pseudopalustris* Keng ex Shan Chen, nom. illeg. superfl.; *P. skvortzovii* Probatova; *P. vaginans* Keng.

Culms tufted, (40–)60–110(–120) cm tall, usually robust, erect, scabrid, nodes 3; upper internode elongated, to ca. 80 cm, ca. 2.5 mm thick. Leaf sheath scabrid, slightly longer than leaf blade; leaf blade flat, scabrid, 2–4 mm wide, ligule membranous, (0.2–)0.5–3.5 mm. Panicle narrow, 10–23 × (1–)2–4(–6) cm; branches straight, lower part naked, upper part with 4–6 spikelets. Spikelets 3.5–8 mm, florets 2–5(–6); rachilla pubescent, prickled, warty or glabrous; glumes subequal, lanceolate, apex slightly acuminate, 2.5–3.5(–5) mm; lemma broadly lanceolate, 3–4 mm; keel scabrid, lower half and lower 1/3 of marginal veins villous; callus sparsely villous; palea keels, scabrid or shortly pubescent, area between glabrous. Anthers 1.4–2 mm. Fl. Aug. $2n = 28, 35, 42$.

Mountain tops, open grassy slopes; ca. 2500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Mongolia, Russia].

The types of *Poa flavida* and, probably, *P. nemoralis* var. *mongolica* show these taxa to be less robust forms of *P. alta*. The type of *P. skvortzovii* (*P. pseudonemoralis* Skvortsov, not Schur; *P. pseudopalustris*) looks like the most common form of *P. alta*. According to the protologue, *P. vaginans* differs from *P. flavida* in having culms with 4 or 5 nodes, in having a panicle with 2 or 3 branches at the lowest node, in spikelet size, and in the lemma being pubescent proximally between the veins; however, the type of *P. vaginans* has the lemma smooth between the veins and culms with only 2 or 3 nodes, and it does not differ in the number of panicle branches or in spikelet size. All the species of this group should be treated as *P. alta*.

72. *Poa sphondylodes* Trinius in Bunge, Enum. Pl. China Bor. 71. 1833.

硬质早熟禾 *ying zhi zao shu he*

Culms loosely tufted, (15–)30–50(–70) cm tall, erect or obliquely ascending, firm and robust, scabrid below inflorescence, rarely smooth, nodes (2 or)3 or 4, uppermost up to 1/3(–1/2) way up. Shoots extraxillary. Leaf sheaths scabrid, much shorter than internodes, usually longer or equal to blade; blade flat and usually firm, (4–)6–12 × 0.15–0.25(–0.3) cm; ligule (2–)3–5(–10) mm. Panicle narrow and dense, (4–)6–10 cm, branches erect, 2–5 per node, basal ones 1/6–1/2 as long as panicle with spikelets crowded near branch base. Spikelets lanceolate, sometimes very narrow and elongated, green or grassy yellow, 3.5–5(–10) mm, florets 2–5(–11); rachilla glabrous or warty; glumes, narrowly lanceolate, unequal, 2.5–4(–4.5) mm; lemma lanceolate, 3–4 mm; callus webbed or glabrous.

Open sandy ground, frequently on river banks, meadows among scattered thickets on slopes, grassy places on sunny slopes; 100–3200 m. Anhui, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Zhejiang [Russia (Far East), Japan, Korea].

Poa sphondylodes is treated here as a polymorphic species with a broad ecological amplitude and many ecotypes. Its appearance depends on the environment, varying from quite mesomorphic to almost xeromorphic.

Tzvelev (Zlaki SSSR, 472. 1976) and Probatova (in Tzvelev, Sozd. Rast. Sovetsk. Dal'nego Vostoka 1: 283. 1985) considered this species to be synonymous with *Poa versicolor* subsp. *ochotensis*, but the type of *P. sphondylodes* and other gatherings so named differ from that subspecies in their broader leaf blades and quite soft habit. The most mesomorphic populations of *P. sphondylodes* seem to be confused with *P. palustris*, but the typical forms differ from the latter species as follows: uppermost node in lower part of culm; ligule of uppermost leaf much longer, 3–5(–8) mm; panicle usually with very short branches, longest branches at 2nd node of panicle; spikelets proximally crowded on branches. Specimens with rather more lax panicles and longer branches are common in C China.

- 1a. Spikelets 6–10 mm 72d. var. *subtrivialis*
- 1b. Spikelets 3.5–5 mm.
 - 2a. Panicle branches with spikelets proximal 72a. var. *sphondylodes*
 - 2b. Panicle branches with spikelets along distal half.
 - 3a. Ligule 2–3 mm, palea sometimes pubescent between keels 72b. var. *erikssonii*
 - 3b. Ligule 3–5 mm, palea never pubescent between keels 72c. var. *macerrima*

72a. *Poa sphondylodes* var. *sphondylodes*

硬质早熟禾(原变种) *ying zhi zao shu he* (yuan bian zhong)

Poa kelungensis Ohwi, Acta Phytotax. Geobot. 4: 60. 1935; *P. palustris* Linnaeus var. *strictula* (Steudel) Hackel; *P. sphondylodes* var. *kelungensis* (Ohwi) Ohwi; *P. strictula* Steudel.

Panicle quite dense, branches short, erect, with spikelets crowded from base. Spikelets 3.5–5 mm.

Open sandy ground, frequently on river banks, meadows among scattered thickets on slopes, grassy places on sunny slopes; 100–2500 m. Anhui, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Sichuan, Taiwan [Japan, Korea, Russia (Far East)].

The type and other gatherings of *Poa kelungensis*, which are quite soft and with the uppermost internode almost equal to its blade, closely resemble the type of *P. sphondylodes*. Gatherings from sandy beaches

are quite different from typical *P. sphondylodes*, but those from shady forests are closely allied and form intermediate populations. The extreme form probably represents a discrete (maybe apomictic) population, which cannot be treated without more research. The type of *P. strictula* and most gatherings so named represent a mesomorphic form of *P. sphondylodes*.

72b. *Poa sphondylodes* var. *erikssonii* Melderis in Norlindh, Fl. Mongol. Steppe 1: 99. 1949.

多叶早熟禾 duo ye zao shu he

Poa longiglumis Keng ex L. Liu; *P. plurifolia* Keng.

Ligule 2–3 mm. Panicle branches with spikelets in distal 1/2. Spikelets 3.5–5(–5.5) mm; palea sometimes pubescent between keels.

• Meadows among scattered thickets on slopes, grassy places on sunny slopes. Hebei, Henan, Nei Mongol, Shaanxi, Shanxi, Sichuan.

This variety is closer to *Poa palustris* in its shorter ligule than to typical *P. sphondylodes*, so it might be of hybrid origin. The variability of this variety depends very much on environment, and both the leaf characters and the panicle characters appear to vary. The panicles of the same clone may differ greatly in the shape, length, and width of their branches when grown in the wet seasons or when the habitat turns dry. The type of *P. longiglumis* is very close to this variety.

72c. *Poa sphondylodes* var. *macerrima* Keng, Sunyatsenia 6: 55. 1941.

瘦弱早熟禾 shou ruo zao shu he

Ligule 3–5 mm. Panicle branches with spikelets in distal 1/2. Spikelets 3.5–5(–6) mm.

Grassy places on sunny slopes; 1000–3200 m. Anhui, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea, Russia (Far East)].

This variety is quite common to the east. It resembles *Poa palustris* in its more open panicle, with panicle branches longer and spikelets crowded distally, probably forming intermediate populations.

72d. *Poa sphondylodes* var. *subtrivialis* Ohwi, Acta Phytotax. Geobot. 10: 126. 1941.

大穗早熟禾 da sui zao shu he

Poa grandispica Keng ex L. Liu.

Ligule 3–5(–5.5) mm. Panicle branches with spikelets in distal 1/2 or crowded from base. Spikelets 6–10 mm.

• Grassy places on sunny slopes; 1000–3200 m. Hebei, Henan, Sichuan, Shanxi.

Among the varieties of *Poa sphondylodes* this variety most closely resembles var. *macerrima*, but differs from them all in being more robust and in its longer spikelets, to 10 mm. It is quite rare, with sporadic occurrence, and has probably arisen independently in different areas. The type of *P. grandispica* seems to belong here.

73. *Poa faberi* Rendle, J. Linn. Soc., Bot. 36: 423. 1904.

法氏早熟禾 fa shi zao shu he

Culms loosely tufted, (25–)30–50(–70) cm tall, erect or obliquely ascending, soft and slender, scabrid, rarely smooth below inflorescence, nodes (2–)3 or 4, uppermost up to 1/3(–1/2) way up culm. Shoots extraxillary. Leaf sheaths scabrid, long, the uppermost only 2–5 cm shorter than internode

and usually shorter than blade; leaf blades flat, very thin and soft, (4–)6–12 × 0.1–0.15(–0.2) cm; ligule (2–)3–5(–8) mm. Panicle narrow, congested to loose, (4–)6–12 × 1–1.5(–2) cm, branches erect, 2–5 per node, basal ones 1/3–1/2 as long as panicle with spikelets distally crowded. Spikelets lanceolate, sometimes very narrow and elongated, green or bluish, 3.5–5(–8) mm long, florets 2–5; rachilla glabrous or pubescent; glumes narrowly lanceolate, unequal, 2.5–4(–4.5) mm; lemma lanceolate, sometimes very narrow, (2.5–)3–4 mm, rarely pubescent between veins, apex membranous; callus sparsely webbed (rarely glabrous).

• Mountain forest margins, meadows among scattered thickets on slopes, grassy places on sunny slopes; 200–1200(–4400) m. Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan.

Poa faberi resembles *P. sphondylodes* s.s. in the uppermost node position and long ligules, but differs from it in being softer and also in distribution and ecology, growing commonly at higher elevations in S and SW China. It is represented by many morphological types, some of them described as species, but material is lacking and further research is needed to confirm its taxonomic status. Some of these types have undeveloped spikelets and stamens and look like immature and sterile modern hybrids.

The highest concentration of different morphological variants of this species is in Sichuan and Xizang. These unusual and very soft plants with long leaf blades, very thin, almost smooth panicle branches, and abnormally narrow spikelets, glumes, and lemmas occur quite frequently in the highlands of Sichuan, Xizang, and Yunnan. They look like hybrids involving *Poa asperifolia* (*P. sect. Homalopoa*), which has a long ligule, thin panicle branches, elongated parts of the rachilla, and very narrow spikelets.

- 1a. Rachilla pubescent 73c. var. *longifolia*
- 1b. Rachilla glabrous.
 - 2a. Ligule (2–)3–6(–8) mm 73a. var. *faber*
 - 2b. Ligule ca. 10 mm 73b. var. *ligulata*

73a. *Poa faberi* var. *faber*

法氏早熟禾(原变种) fa shi zao shu he (yuan bian zhong)

Poa linearis Trinius (1833), not Schumacher (1827); *P. paucifolia* Keng ex Shan Chen; *P. proluxior* Rendle.

Ligule (2–)3–6(–8) mm. Rachilla glabrous; lemma callus sometimes not webbed.

• Meadows among scattered thickets on slopes, grassy places on sunny slopes; 200–1200(–3000) m. Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Sichuan, Xinjiang, Xizang, Yunnan.

Type material at BM and K is heterogeneous. Three of the syntypes differ clearly from *Poa sphondylodes* by the very thin, soft stems and leaves, the uppermost leaf sheaths almost reaching the panicle, and the rather long panicle branches. Although the fourth syntype has the uppermost node in the lower 1/3 of the culm, it matches *P. sphondylodes* in being robust with thick, dense culms and leaf blades and a narrow, dense panicle. Moreover, some of them have an unwebbed callus.

The type of *Poa paucifolia* looks like normal *P. faberi* var. *faber*. The protologue and syntypes of *P. proluxior* do not differ significantly from *P. faberi*.

73b. *Poa faberi* var. *ligulata* Rendle, J. Linn. Soc., Bot. 36: 424. 1904.

尖舌早熟禾 *jian she zao shu he*

Ligule up to 10 mm. Rachilla glabrous, lemma callus sometimes not webbed.

- Meadows among scattered thickets on slopes. Sichuan.

This is a very rare plant that requires further study.

73c. *Poa faberi* var. *longifolia* (Keng) Olonova & G. Zhu, **comb. nov.**

毛颖早熟禾 *mao ying zao shu he*

Basionym: *Poa orinosa* Keng var. *longifolia* Keng, Fl. Tsinling. 1(1): 439. 1976; *P. fascinata* Keng ex L. Liu; *P. leptota* Keng ex L. Liu; *P. malaca* Keng; *P. pubicalyx* Keng ex L. Liu.

Rachilla pubescent, lemma callus usually webbed.

- Meadows among scattered thickets on slopes, grassy places on sunny slopes; 2900–4400 m. Gansu, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan.

The type of *Poa orinosa* var. *longifolia*, which is mesomorphic with a long (ca. 3.5 mm) ligule, appears to be closer to *P. faberi* than to the quite xeromorphic *P. orinosa*, which is treated here as *P. versicolor* subsp. *orinosa*.

Poa malaca combines the characters of *P. nemoralis* and *P. palustris*, having a long ligule and pubescent rachilla. The type is very soft and thin. It seems to be much closer to the *P. faberi* complex, differing only by the shorter ligule, and occupies almost the same area.

Poa pubicalyx has lemmas not pubescent but sometimes with prickles, which is quite common with *P. sect. Stenopoa*. The types and all available gatherings of *P. leptota* and *P. fascinata* are poorly developed, feeble plants that look like unstabilized hybrids. Specimens with seeds or, at least, normally developed flowers are needed for confirmation of their status.

74. *Poa urssulensis* Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 2: 527. 1835.

乌苏里早熟禾 *wu su li zao shu he*

Culms loosely tufted, 35–60 cm tall, obliquely ascending, nodes 3–5, uppermost 1/3–1/2 way up culm. Shoots extravaginal. Leaf sheaths scabrid, rarely almost glabrous, shorter than internode; blade usually shorter than sheath, flat, or folded, (1–)1.5–2 mm wide, both surfaces scabrid; ligule 0.2–1.5(–2) mm. Panicle effuse, 6–10 × 2.5–5 cm, branches spreading, 2–5 per node, basal primary branch 1/3–1/2 as long as panicle with spikelets in distal 1/2. Spikelets ovate-lanceolate, (3–)3.5–4(–5) mm, florets 2–4; rachilla glabrous or warty, rarely ciliate or pilose; glumes narrowly lanceolate, lower glume 3–4 mm, upper glume 3.5–4.5 mm; lemma lanceolate, 3–4(–4.5) mm, keel shortly villous for 1/2 of length, marginal veins to 1/3, apex membranous; callus webbed to glabrous; palea smooth and glabrous between keels. Anthers ca. 1.2 mm. Fl. Jun–Aug.

Open grassy and rocky slopes, thickets; (300–)1000–3200(–4200) m. Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Shandong, Xinjiang, Xizang [Kazakhstan, Korea, Mongolia, Russia; Europe].

This is a variable species of hybrid origin, close to *Poa lapponica*, that might represent a complex of independently arisen populations. The diagnostic characters, such as the pubescence of the lemma and rachilla, and the length of the ligule, vary greatly, both within populations and between populations. Some variants have been recognized as species but are here treated as varieties.

1a. Callus webbed (rarely almost glabrous)

..... 74a. var. *urssulensis*

1b. Callus glabrous.

2a. Panicle quite spreading, ligule

0.5–1.5 mm, rachilla glabrous or

..... 74b. var. *kanboensis*

2b. Panicle narrow and dense, ligule

0.2–1 mm, rachilla pilose 74c. var. *korshunensis*

74a. *Poa urssulensis* var. *urssulensis*

乌苏里早熟禾(原变种) *wu su li zao shu he* (yuan bian zhong)

Ligule 0.5–1.5(–2) mm. Panicle spreading to contracted; rachilla warty, ciliate, or pilose; lemma callus webbed to almost glabrous. $2n = 28, 42$.

Open grassy and rocky slopes, thickets; (300–)1000–3200(–4200) m. Gansu, Heilongjiang, Nei Mongol, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia; Europe].

74b. *Poa urssulensis* var. *kanboensis* (Ohwi) Olonova & G. Zhu, **comb. et stat. nov.**

坎博早熟禾 *kan bo zao shu he*

Basionym: *Poa kanboensis* Ohwi, Acta Phytotax. Geobot. 10: 125. 1941; *P. krylovii* Reverdatto.

Ligule 0.5–1.5(–2) mm. Panicle spreading, with scattered spikelets; rachilla ciliate, pilose or glabrous; lemma callus glabrous.

Grassy places on slopes. Hebei, Liaoning, Shandong [Korea].

74c. *Poa urssulensis* var. *korshunensis* (Goloskokov) Olonova & G. Zhu, **comb. et stat. nov.**

柯顺早熟禾 *ke shun zao shu he*

Basionym: *Poa korshunensis* Goloskokov, Vestn. Akad. Nauk Kazakhsk. SSR 14: 72. 1955.

Ligule 0.2–1 mm. Panicle contracted and narrow; rachilla pilose; lemma callus glabrous.

Grassy places on slopes; 1300–3200 m. ?Xinjiang [Kazakhstan].

This variety differs from var. *kanboensis* in having a more narrow and contracted panicle, and geographically.

75. *Poa nemoraliformis* Roshevitz, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 11: 30. 1949.

林早熟禾 *lin zao shu he*

Poa major D. F. Cui.

Culms loosely to densely tufted, 30–50 cm tall, erect, usually hard, scabrid, nodes 2–5, uppermost in lower 1/3; base covered by withered leaf sheaths. Shoots extravaginal. Leaf sheath scabrid, longer than blade; blade usually flat, later folded or inrolled, 1.5–2.5 mm wide, scabrid; ligule (0.5–)1–1.5 mm.

Panicle oblong, conferted, 8–16(–20) cm, branches thin, 2–4.5 cm. Spikelets elliptic-lanceolate, green or tinged with purple, 4–6(–6.5) mm, florets 3 or 4, usually with upper floret rudimentary; rachilla usually glabrous; glumes oblong-lanceolate, apex acuminate, lower glume ca. 3.5 mm, upper glume 4–4.2 mm, margins dry membranous, keel scabrid; lemma oblong-lanceolate, 3.2–4 mm; margins membranous, keel and marginal veins usually short-villous to glabrous along lower 1/2; callus glabrous. Anthers ca. 2 mm. Fl. Jun–Aug.

Open grasslands on rocky slopes, meadows along forest margins, thickets; 1100–4300 m. Xinjiang, Xizang [India, Tajikistan].

Poa nemoraliformis differs from *P. nemoralis* in its longer ligule 1–1.5 mm (vs. 0.2–1 mm), glabrous rachilla, and unwebbed lemma callus, and differs from *P. versicolor* subsp. *relaxa* in never forming dense tufts. The syntypes represent a sequence of increasing xeromorphism (leaf blades more firm, position of uppermost node varying from 1/2 to 1/3 way up culm). The first two syntypes differ from the description in the protologue in having the rachilla shortly hairy; the second syntype differs in having a long ligule ca. 2.4 mm.

Records of *Poa sterilis* M. Bieberstein from China are probably based on this species. Examination of the type of *P. major* has shown that it was misplaced in *P. subg. Poa* and belongs here.

76. *Poa hylobates* Bor, Bull. Bot. Surv. India 7: 132. 1965.

喜巴早熟禾 xi ba zao shu he

Poa elanata Keng ex Tzvelev.

Culms tufted, 30–50 cm tall, erect, usually hard, scabrid, nodes 3 or 4, uppermost in lower 1/3; base covered by withered leaf sheaths. Shoots extraxillary. Leaf sheath scabrid, longer than blade; blade usually flat, later folded or inrolled, 1.5–2.5 mm wide, scabrid; ligule (2–)3–4.5(–6.5) mm. Panicle oblong, conferted, 7–15 cm, branches 2–3(–4.5) cm. Spikelets elliptic-lanceolate, green or tinged with purple, 4–6(–6.5) mm, florets 3–5(–7); rachilla glabrous; glumes oblong-lanceolate, apex acuminate, lower glume ca. 3.5 mm, upper glume 4–4.2 mm, margins dry membranous, keel scabrid; lemma oblong-lanceolate, 3.2–3.7(–4) mm; margins white or golden yellow membranous, keel and marginal veins usually shortly villous to glabrous along lower 1/2; callus glabrous. Anthers ca. 2 mm. Fl. Jun–Aug.

Grassy places along forest margins on slopes. 2900–4400 m. Qinghai, Sichuan, Xinjiang, Xizang [Nepal].

Poa hylobates is allied to *P. nemoraliformis* and quite frequently forms intermediate populations in Sichuan and Xizang. Quite common are specimens that combine a glabrous callus and rachilla with a ligule longer than ca. 5 mm or 1–3 mm, or a pubescent callus and rachilla with a ligule ca. 5 mm; these features exceed the bounds of known species, including *P. hylobates*.

The type of *Poa elanata* looks immature, but taking into account the length and panicle shape of dry culms from the preceding year, which are well represented, it may be attributed to *P. hylobates*.

77. *Poa versicolor* Besser, Enum. Pl. 41. 1821.

变色早熟禾 bian se zao shu he

Poa attenuata Trinius var. *versicolor* (Besser) Regel.

Culms erect, densely tufted, (25–)30–60(–75) cm tall,

nodes 2–3(–5), uppermost to 1/3 way up culm. Shoots extraxillary. Leaf sheath scabrid, usually longer than blade; blade narrowly linear, flat or inrolled, 0.5–2.5(–3) mm wide, scabrid; ligules 1–3(–7) mm. Panicle contracted, narrow to spiciform, (4.5–)6–15(–17) × 1–3(–5) cm; branches erect, 1 or 2 per node, (1/5–)1/4–1/3(–1/2) × as long as panicle. Spikelets lanceolate, (3–)3.5–6(–7) mm, green or tinged with purple, apex yellow, ± violet; florets (2–)3–5(–7); rachilla warty, rarely pilose; glumes subequal, lanceolate to oblong-lanceolate, 3–4.2 mm; lemma oblong-lanceolate, 3.2–4 mm, keel usually shortly villous for 1/2 of length, marginal veins for 1/3, area between veins glabrous or pubescent; callus webbed to glabrous; palea glabrous or pubescent between keels. Anthers 1.3–2 mm. Fl. Jun–Aug.

Meadows along forest and thicket margins, grasslands on slopes, steppes; 200–4300 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

Poa versicolor is supposed to be a xeromorphic derivative of *P. palustris*. It is interpreted here as a widespread complex of feebly differentiated geographic races, and it is perplexingly polymorphic. *Poa versicolor* s.s. is distributed in S Europe and is absent from China. All subspecies in this complicated species seem to be close allies, differing from one another by complexes of characters only and connected by intermediate populations. This complex is also connected with other species in *P. sect. Stenopoa* through hybridization.

- 1a. Lemma pubescent between veins 77d. subsp. *reverdattoi*
- 1b. Lemma glabrous between veins.
 - 2a. Panicle dense, contracted to spiciform, branches erect, the longest ones 1/5–1/3 (–2/5) as long as panicle; culm with uppermost node up to 1/6 way up culm.
 - 3a. Culm under panicle usually with dense prickles 77c. subsp. *orinosa*
 - 3b. Culm under panicle usually with few or no prickles, usually warty 77f. subsp. *ochotensis*
 - 2b. Panicle usually open, especially at anthesis, longest branches 1/3–1/2 as long as panicle; culm with upper node usually ca. 1/6 way up culm.
 - 4a. Ligule (3–)4–7 mm 77e. subsp. *varia*
 - 4b. Ligule 1–3 mm.
 - 5a. Culm under the panicle usually with dense prickles; spikelets usually green; plants of lower and middle elevations 77a. subsp. *stepposa*
 - 5b. Culm under the panicle usually with few or no prickles, usually warty; spikelets usually purplish; plants of middle and upper elevations 77b. subsp. *relaxa*

77a. *Poa versicolor* subsp. *stepposa* (Krylov) Tzvelev, Novosti Sist. Vyssh. Rast. 9: 51. 1972.

低山早熟禾 di shan zao shu he

Poa attenuata Trinius var. *stepposa* Krylov, Fl. Altai Gov. Tomsk 7: 1856. 1914; *P. attenuata* subsp. *botryoides* Tzvelev; *P. botryoides* (Trinius ex Grisebach) Komarov; *P. serotina* Ehrhart ex Hoffmann var. *botryoides* Trinius ex Grisebach; *P. stepposa* (Krylov) Roshevitz; *P. transbaicalica* Roshevitz.

Culms (15–)25–50(–70) cm tall, erect, scabrid; leaf blades narrowly linear, flat or folded, 0.5–1.2 mm wide, ligule (1–)2–3 mm. Panicle contracted, narrow, (4.5–)6–10(–12) cm; branches scabrid, up to 4 cm, with few spikelets. Spikelets 3–5(–7) mm; lemma 3.5–4 mm, glabrous between veins; callus sparsely webbed. Anthers 1.2–1.5 mm. Fl. Jun–Aug. $2n = 28$.

Grasslands on slopes, steppes; 200–1500 m. Heilongjiang, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia; Europe].

This subspecies is most polymorphic, and several of its populations were described as distinct species, but the characters on which these divisions were based are very unreliable and the entities cannot be recognized, even as subspecies.

Tzvelev (Novosti Sist. Vyssh. Rast. 11: 31. 1974) treated *Poa botryoides* as a lower-elevation subspecies of *P. attenuata*, the typical race of which he treated as alpine. Nevertheless, the type of *P. botryoides* appears to be closer to *P. versicolor* subsp. *stepposa*, being as tall as this taxon and with panicle branches as long. The type of *P. transbaicalica* looks like typical *P. versicolor* subsp. *stepposa*.

77b. *Poa versicolor* subsp. *relaxa* (Ovczinnikov) Tzvelev, Tadjikist. Bazy Akad. Nauk 1: 20. 1933.

新疆早熟禾 xin jiang zao shu he

Poa relaxa Ovczinnikov, Izv. Tadjikist. Bazy Ak. Nauk 1: 20. 1933; *P. acuminata* Ovczinnikov (1933), not Scribner (1896); *P. fragilis* Ovczinnikov.

Culms 30–50 cm tall, usually hard, scabrid, base covered by withered leaf sheaths slightly tinged with red. Leaf blade usually flat, later folded or inrolled, 1.5–2.5 mm wide; ligule 1–1.5(–6) mm. Panicle oblong, conferted, 7–15 cm, branches 1 or 2 per node, 2–3 cm. Spikelets elliptic-lanceolate, 4–6(–6.5) mm, green or tinged with purple, florets 3–5(–7); glumes oblong-lanceolate, apex acuminate, lower glume ca. 3.5 mm, upper glume 4–4.2 mm, keel scabrid; lemma 3.2–3.7(–4) mm; margins white or golden yellow membranous. Anthers ca. 2 mm. Fl. Jun–Aug. $2n = 42$.

Meadows along forest and thicket margins, open grasslands on rocky slopes; 1100–4300 m. Gansu, Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

This subspecies is probably of hybrid origin and forms numerous morphological variants. It appears to be intermediate between *Poa nemoralis* and *P. versicolor*, replacing the Siberian *P. urssulensis* and *P. versicolor* subsp. *stepposa* in C Asia. Pazij (Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. SSR 17: 18–42. 1962) has reported hybrids of subsp. *relaxa* with *P. attenuata*, *P. nemoralis*, and even *P. pratensis*. Ovczinnikov (in Ovczinnikov & Chukavina, Fl. Tadjiksk. SSR 1: 149. 1957) has reported that the extreme forms make subsp. *relaxa* very difficult to identify. Typical *P. fragilis*, with entirely glabrous lemmas, is rather rare, but in spite of its differing clearly from the type of subsp. *relaxa*, numerous intermediate samples form a continuum. For this reason, *P. fragilis* does not seem to deserve even subspecific rank.

77c. *Poa versicolor* subsp. *orinosa* (Keng) Olonova & G. Zhu, comb. et stat. nov.

山地早熟禾 shan di zao shu he

Basionym: *Poa orinosa* Keng, Fl. Tsinling. 1(1): 439. 1976; *P. incerta* Keng ex L. Liu; *P. schoenites* Keng ex L. Liu; *P. stereophylla* Keng ex L. Liu.

Culms (25–)30–45(–70) cm tall. Leaf blades flat or folded; ligule 0.9–3 mm. Panicle contracted, narrow, 8–10 × (0.5–)1–1.5 cm, basal branches (1/4–)1/3–1/2 as long as panicle. Spikelets 3–4 mm, florets 2–3(–5); rachilla pubescent or rarely glabrous; callus of lemma glabrous or webbed.

• Grassy places on slopes; 2500–3600 m. Hebei, Henan, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

This subspecies, described from C and S China, is quite close to *Poa versicolor* subsp. *stepposa*, and probably replaces it in this area. The types of *Poa incerta* and *P. schoenites* are allied to subsp. *orinosa*, and their populations appear to form a continuum with it. The type of *P. stereophylla* differs in its wiry culm, but this is not a constant feature and depends very much on the environment. *Poa versicolor* subsp. *orinosa* might be intermediate between *P. versicolor* and *P. alta*, but as the characters of *P. versicolor* are absolutely prevailing it is attributed here to that species.

77d. *Poa versicolor* subsp. *reverdattoi* (Roshevitz) Olonova & G. Zhu, comb. et stat. nov.

瑞沃达早熟禾 rui wo da zao shu he

Basionym: *Poa reverdattoi* Roshevitz in Komarov, Fl. URSS 2: 407. 1934; *P. argunensis* Roshevitz.

Culms densely tufted, (15–)35–45(–60) cm tall, erect, scabrid, sometimes tinged with grayish green, terminal node 1/6–1/3 way up culm. Leaf sheaths scabrid, shorter than internode, terminal sheath ca. 2 × as long as blade; blades folded or inrolled, hard, short, 0.5–1(–1.5) mm wide, abaxial surface and margin scabrid, adaxial surface minutely hairy; ligule (1–)2–2.5(–3) mm. Panicle contracted to spiciform, laxer at anthesis, 3–4 × (0.5–)1–5(–8) cm, branches 2 or 3 per node, with spikelets near base. Spikelets sometimes tinged with purple, 3–5(–6) mm, florets 2–4; rachilla glabrous or pilulose; glumes (2–)2.8–3(–3.5) mm; lemma keel shortly villous for 1/2 length, marginal veins for 1/3, area between veins minutely hairy for lower 1/3; callus usually moderately webbed to glabrous; palea minutely hairy in lower area between keels. Anthers ca. 2 mm. Fl. Jun. $2n = 28, 35, 42$.

Dry grasslands on rocky slopes; 200–1000 m. Liaoning, Nei Mongol [Mongolia, Russia (S Siberia)].

This is a variable subspecies with a rather restricted distribution limited to low elevations of China, Mongolia, and S Siberia. Records of this subspecies from Xinjiang and the Altai region belong to *Poa albertii*.

Poa argunensis differs from subsp. *reverdattoi* only in variable and unreliable characters and forms many intermediate populations.

77e. *Poa versicolor* subsp. *varia* (Keng ex L. Liu) Olonova & G. Zhu, comb. et stat. nov.

多变早熟禾 duo bian zao shu he

Basionym: *Poa varia* Keng ex L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 404. 2002.

Culms tufted, 30–40 cm tall, erect or geniculately ascending, scabrid, nodes 2–3(–4), uppermost to 1/6 way up culm.

Leaf sheath scabrid, longer than internode; blade narrow, 1–1.5 mm wide, both surfaces scabrid; ligule 4–7 mm. Panicle 5–10 × 2–5 cm, branches 2–5 per node, spikelets in distal 1/2, dense. Spikelets 4–5 mm; rachilla warty or glabrous; lemma 3–3.5 mm, slightly yellowish bronze below, keel shortly villous for 1/2 length, marginal veins for 1/3; callus sparsely villous; palea glabrous between keels. Anthers ca. 1.5 mm. Fl. and fr. Jun–Aug.

• Grassy places on slopes; 2500–3000 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xizang, Yunnan.

77f. *Poa versicolor* subsp. *ochotensis* (Trinius) Tzvelev, Zlaki SSSR, 472. 1976.

乌库早熟禾 *wu ku zao shu he*

Poa ochotensis Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1: 377. 1831; *P. nemoralis* Linnaeus subsp. *ochotensis* (Trinius) Tzelev; *P. subaphylla* Honda.

Culms 35–60 cm tall, slender, usually almost smooth under inflorescence, nodes 2–3(–4), uppermost node to 1/3 way up culm. Leaf sheaths longer than blade; blade narrowly linear, 1–1.5 mm wide, flat, scabrid; ligule (0.5–)1–2(–4) mm. Panicle narrow, sometimes almost spiciform, dense, 3–8 × 0.5–1.5 cm; basal branches 1/5–1/3 as long as panicle; rachilla warty, glabrous, rarely minutely pilose. Spikelets 3–5(–6) mm, florets 6 or 7; glumes narrowly lanceolate; lemma 3–3.5 mm, keel shortly villous for 1/2 of length, marginal veins for 1/3, other parts glabrous; callus nearly glabrous; palea sometimes pilulose between keels. $2n = 28, 42, 49$.

Grassy places on slopes; 200–1000 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi [Japan, Korea, Mongolia, Russia (Far East)].

This taxon seems to be a stabilized hybrid between *Poa sphondylodes* and *P. versicolor*. It is treated here as a subspecies of *P. versicolor* because the characters of that species prevail. Material with a glabrous callus was described as *P. subaphylla*.

Most gatherings identified by Chinese, Japanese, and Korean botanists as *Poa viridula* Palibin seem to belong here. True *P. viridula* has not been recorded from China.

78. *Poa araratica* Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 2: 486. 1875.

阿洼早熟禾 *a wa zao shu he*

Poa crymophila Keng ex C. Ling.

Culms tufted, 20–35(–45) cm tall, erect or slightly geniculate, scabrid or glabrous, nodes 2 or 3, at or above base, upper part often naked, uppermost internode frequently thick, up to 1–2 mm. Shoots extravaginal. Leaf sheath longer than blade; blade flat or folded, 3–8 cm × 1–2 mm, scabrid; ligule (0.5–)1.5–2.5(–7) mm. Panicle 3–5(–10) × 1–2 cm, branches 1–3(–5) per node, spikelets scattered. Spikelets 4.5–5.5(–8) mm, rachilla glabrous to pilose; glumes subequal, usually almost as long as spikelet; lemma 2.5–3.8 mm, keel, veins and area between veins hairy to entirely glabrous; callus webbed or glabrous; palea glabrous to pubescent between keels. Anthers 1.2–1.4 mm. Fl. Aug–Oct.

Open grassy slopes, subalpine forest margins; 2000–4200 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xinjiang, Xi-

zang, Yunnan [India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia].

Poa araratica is treated here as a hybrid complex comprising many populations of different stages of stabilization and of obscure taxonomic status. It seems to have arisen through hybridization between *P. versicolor* and *P. glauca*.

- 1a. Lemma pubescent between veins.
 - 2a. Ligule 1–3 mm 78c. subsp. *ianthina*
 - 2b. Ligule 3–7 mm 78e. subsp. *altior*
- 1b. Lemma glabrous between veins.
 - 3a. Lemma keel and marginal veins almost entirely glabrous, sometimes with minute or single hairs 78d. subsp. *psilolepis*
 - 3b. Lemma keel shortly villous for 1/2 of length, marginal veins for 1/3.
 - 4a. Ligule 1.5–2.5 mm 78a. subsp. *araratica*
 - 4b. Ligule 0.5–1 mm 78b. subsp. *oligophylla*

78a. *Poa araratica* subsp. *araratica*

阿洼早熟禾(原亚种) *a wa zao shu he* (yuan ya zhong)

Ligule 1.5–2.5(–3) mm. Lemma keel shortly villous for 1/2 of length, marginal veins for 1/3, area between veins glabrous; callus glabrous or minutely webbed.

Open grassy slopes, subalpine forest margins; 3300–4200 m. Xinjiang, Xizang [India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia].

78b. *Poa araratica* subsp. *oligophylla* (Keng) Olonova & G. Zhu, **comb. et stat. nov.**

贫叶早熟禾 *pin ye zao shu he*

Basionym: *Poa oligophylla* Keng, Fl. Tsinling. 1(1): 436. 1976; *P. arjinsanensis* D. F. Cui.

Ligule 0.5–1 mm. Lemma keel shortly villous for 1/2 of length, marginal veins for 1/3, area between veins glabrous; callus webbed or glabrous.

Open grassy slopes, subalpine forest margins; 3300–4200 m. Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang [Russia (Siberia)].

The type of *Poa arjinsanensis* looks like typical *P. araratica* s.l. but with a short ligule and lemmas glabrous between the veins.

78c. *Poa araratica* subsp. *ianthina* (Keng ex Shan Chen) Olonova & G. Zhu, **comb. et stat. nov.**

堇色早熟禾 *jin se zao shu he*

Basionym: *Poa ianthina* Keng ex Shan Chen in Ma et al., Fl. Intramongol. 7: 260. 1983; *P. sinoglaucha* Ohwi.

Ligule 1–3 mm. Lemma keel shortly villous for 1/2 of length, marginal veins for 1/3, areas between veins pubescent; callus webbed or glabrous.

• Open grassy slopes, subalpine forest margins; 3300–4200 m. Gansu, Hebei, Nei Mongol, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan.

The protologue of *Poa sinoglaucha* reported the lemma to be pubescent on the intermediate veins. The type proved to have the lemma quite frequently pubescent both on the intermediate veins and on the

area between the veins, and thus it is a better match with *P. araratica* subsp. *ianthina*.

78d. *Poa araratica* subsp. *psilolepis* (Keng) Olonova & G. Zhu, comb. et stat. nov.

光稃早熟禾 *guang fu zao shu he*

Basionym: *Poa psilolepis* Keng, Sunyatsenia, 6: 56. 1941.

Lemma almost entirely glabrous, sometimes with only minute or single hairs on keel and marginal veins. $2n = 28, 42$.

Open grassy slopes, subalpine forest margins; 3300–4200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Tajikistan].

The lemma indumentum is not consistent: spikelets with entirely glabrous lemmas and with obviously pubescent lemmas may be found on the same herbarium sheet.

78e. *Poa araratica* subsp. *altior* (Keng) Olonova & G. Zhu, comb. et stat. nov.

高阿洼早熟禾 *gao a wa zao shu he*

Basionym: *Poa attenuata* Trinius var. *altior* Keng, Sunyatsenia 6: 57. 1941.

Culms densely tufted, erect, 35–45(–50) cm tall, uppermost node in lower 1/6. Leaf sheath shorter than internode, scabrid; blade short, hard, folded, rarely flat, both surfaces and margin scabrid; ligule 4–6 mm. Panicle contracted, $4-6 \times 1-4$ cm, branches 2 or 3 per node. Spikelets 3–4(–5) mm, florets 2–4, tinged with purple; rachilla pubescent, glumes (2–)2.8–3(–3.5) mm; lemma keel shortly villous for 1/2 of length, marginal veins for 1/3 length, area between veins minutely hairy for lower 1/3; callus webbed; palea minutely hairy proximally between keels. Anthers 1.3–2 mm. Fl. Jun.

- Grassy places; 2000–3400 m. Gansu, Sichuan, Xizang.

The type of *Poa attenuata* var. *altior* has culms too tall to be *P. attenuata* and seems to have similarities to *P. glauca*.

79. *Poa attenuata* Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 2: 527. 1835.

渐尖早熟禾 *jian jian zao shu he*

Culms densely tufted, 7–15(–25) cm tall, pale, glabrous or slightly scabrid under the panicle, nodes 2, both near culm base. Shoots usually intravaginal. Leaf sheath usually slightly scabrid, uppermost 1/2 as long as internode; blade folded or inrolled to needle-shape, firm, usually up to 1/2 as long as sheath, 0.3–0.8(–1.5) mm wide, scabrid; ligule 1.5–2.5 mm. Panicle dense, contracted to spiciform, a bit more open at anthesis, $1.5-4 \times 0.4-1$ cm; branches 2 or 3 per node, 1/5–1/3 as long as panicle. Spikelets lanceolate, (2.5–)3–4.5(–5) mm, florets 2 or 3(–5); rachilla warty; glumes shorter than spikelet, usually equal to first lemma, lemma (2.5–)3–3.5 mm, keel shortly villous for 1/2 of length, marginal veins for 1/3, other parts glabrous; callus webbed or glabrous; palea glabrous between veins. Anthers 1.2–1.5 mm. Fl. Jun–Aug.

Dry grasslands, rocky and stepped slopes; 3300–5500 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia), Tajikistan, Uzbekistan].

Most botanists recognize *Poa attenuata* as one of the most complicated and problematic complexes in the flora of C Asia. It has hybridized with *P. glauca* to form an apomictic complex, which is treated here as *P. albertii*, while *P. attenuata* is supposed to be a more or less pure group of xeromorphic alpine populations.

1a. Callus webbed 79a. var. *attenuata*

1b. Callus glabrous 79b. var. *dahurica*

79a. *Poa attenuata* var. *attenuata*

渐尖早熟禾(原变种) *jian jian zao shu he* (yuan bian zhong)

Poa tetrantha Keng ex L. Liu.

Lemma callus webbed. $2n = 28, 42$.

Dry grasslands, rocky and stepped slopes; 3300–5500 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang [Bhutan, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia), Tajikistan, Uzbekistan].

79b. *Poa attenuata* var. *dahurica* (Trinius) Grisebach, Fl. Ross. 4: 371. 1852.

达呼里早熟禾 *da hu li zao shu he*

Poa dahurica Trinius, Mém. Imp. Acad. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4(2): 63. 1836.

Lemma callus glabrous.

Dry grasslands, rocky and stepped slopes; 3300–5500 m. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan, Uzbekistan].

The callus indumentum is known to be a rather unreliable character, varying not only in populations, but also in the same specimen and even the same panicle, so it cannot be the basis for species recognition.

80. *Poa albertii* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 7: 611. 1881.

阿拉套早熟禾 *a la tao zao shu he*

Culms dense to loosely tufted, 7–15(–25) cm tall, scabrid (sometimes only slightly), nodes 1 or 2, usually near base. Shoots extravaginal, rarely some intravaginal, sometimes with ascending tillers. Leaf sheath scabrid; blade flat, folded or inrolled, (0.5–)1.5–2(–3) mm wide, scabrid; ligule 1–2.5(–3.5) mm. Panicle oblong, narrow, dense to quite loose, (2–)4–6 \times 0.5–1.5 cm; branches 2–5 per node, primary basal branch 2/7–2/3 as long as panicle. Spikelets lanceolate, sometimes tinged with purple or variegated, 3–4(–6) mm, florets 2 or 3; sometimes upper floret viviparous; rachilla smooth, warty or papillose; lower glume 1.5–2 mm, upper glume 2–2.5 mm; lemma narrowly lanceolate, glabrous to uniformly pubescent, apex acuminate; callus webbed or glabrous; palea glabrous or smooth between keels. Anthers 1.2–1.5 mm. Fl. and fr. Jul–Aug. $2n = 28, 42$.

Alpine grasslands; 2000–5600 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia (Iran)].

Poa albertii represents an apomictic hybrid complex combining the characters of the parent species *P. attenuata* s.l. and *P. glauca* s.l., and perhaps additionally *P. versicolor* subsp. *relaxa*.

- 1a. Panicle with viviparous spikelets 80c. subsp. *arnoldii*
- 1b. Panicle without viviparous spikelets.
 - 2a. Lemma glabrous between veins.
 - 3a. Lemma distinctly pubescent on keel and marginal veins 80a. subsp. *albertii*
 - 3b. Lemma entirely glabrous (rarely with a few short hairs) 80d. subsp. *poophagorum*
 - 2b. Lemma pubescent between veins.
 - 4a. Panicle contracted, densely ovoid to spiciform, branches up to 1(–1.5) cm, spikelets crowded, 3–4(–5) mm; uppermost internode not more than 1 mm wide; leaf blade firm, narrow, folded or inrolled; plant pale or grayish yellow, glumes sometimes with purplish bands 80b. subsp. *kunlunensis*
 - 4b. Panicle elongated, sometimes quite open, branches up to 1.5–2 cm, spikelets moderately crowded to sparse; (3.8–)4–5.5(–6) mm; uppermost internode frequently up to 1.5–2 mm wide; leaf blade withering, folded or flat; plant glaucous, frequently glumes and vegetative parts strongly purplish 80e. subsp. *lahulensis*

80a. *Poa albertii* subsp. *albertii*

阿拉套早熟禾(原亚种) a la tao zao shu he (yuan ya zhong)

Poa breviligula Keng ex L. Liu; *P. densissima* Roshevitz ex Ovczinnikov; *P. juldusicola* Regel; *P. festucoides* N. R. Cui (1987), not Lamarck (1791); *P. litvinoviana* Ovczinnikov; *P. sinattenuata* Keng; *P. sinattenuata* var. *breviligula* Keng; *P. parafestuca* L. Liu; *P. poophagorum* Bor subsp. *hunczilapensis* Keng ex D. F. Cui.

Culms 6–20 cm tall, scabrid. Leaf blade folded or inrolled, 0.5–1 mm wide; ligule 1–2(–3.5) mm. Panicle oblong, narrow, dense to quite loose, 2–4 × 0.5–1.5 cm; branches 2 or 3 per node, basal primary branch 2/7–2/3 as long as panicle. Spikelets lanceolate, never viviparous; rachilla smooth or pilulose; lemma lanceolate to narrowly lanceolate, keel shortly villous for 1/2 of length, marginal veins for 1/3, other parts glabrous; callus glabrous. $2n = 28$.

Alpine grassy places; 2000–5200 m. Gansu, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Altai), Tajikistan, Uzbekistan].

The types of both *Poa densissima* and *P. juldusicola* match *P. albertii* subsp. *albertii* well. The type of *P. litvinoviana* seems to be of hybrid origin and resembles both *P. attenuata* and *P. glauca*, so it should be assigned to *P. albertii*. The types of both *P. sinattenuata* and its var. *breviligula* differ from *P. albertii* subsp. *albertii* only by the pilulose rachilla, but rachilla indumentum is too variable within this hybrid complex to be a reliable basis for recognizing even subspecies. The type of *P. parafestuca* has not been seen, but descriptions and other gatherings show that it should be assigned to subsp. *albertii*.

80b. *Poa albertii* subsp. *kunlunensis* (N. R. Cui) Olonova & G. Zhu, **comb. nov.**

高寒早熟禾 gao han zao shu he

Basionym: *Poa festucoides* N. R. Cui subsp. *kunlunensis* N. R. Cui, Acta Bot. Boreal.-Occid. Sin. 7(2): 97. 1987; *P. indattenuata* Keng ex P. C. Keng & G. Q. Song; *P. koelzii* Bor; *P. rangkulensis* Ovczinnikov & Czukavina; *P. roemerii* Bor; *P. scabriculumis* N. R. Cui [“*scabristemmed*”].

Culms 4–10(–20) cm tall. Leaf blades folded, short, 0.7–1(–1.5) mm wide; ligule 1–3 mm. Panicle dense, contracted, 1–2.5(–3) × 0.5–2 cm, branches mostly paired. Spikelets purple when old, never viviparous; rachilla glabrous; lemma laterally elliptic-oblong, keel and marginal veins proximally villous, areas between veins proximally densely shortly pubescent, apex obtuse; callus sparsely webbed or sometimes glabrous. $2n = 28$.

Alpine grasslands; 4000–5200 m. Qinghai, Xinjiang, Xizang [Afghanistan, India, Pakistan, Russia (Siberia), Tajikistan, Uzbekistan; SW Asia (Iran)].

The type of *Poa festucoides* subsp. *kunlunensis* has not been seen, but the protologue and illustration indicate that it belongs here and it therefore provides the earliest epithet at subspecific rank. *Poa roemerii* differs from *P. albertii* subsp. *kunlunensis* in having a loose panicle and thin, withering leaf blades. The two entities are connected by intermediate populations and differ in such negligible characters that *P. roemerii* cannot be recognized at any rank. The type of *P. scabriculumis* has also not been seen, but the protologue and illustration indicate that it cannot be separated from the other entities within this subspecies. The types of both *P. indattenuata* and *P. rangkulensis* look like type material of *P. festucoides* subsp. *kunlunensis* and do not differ from most gatherings so named.

80c. *Poa albertii* subsp. *arnoldii* (Melderis) Olonova & G. Zhu, **comb. et stat. nov.**

阿诺早熟禾 a nuo zao shu he

Basionym: *Poa arnoldii* Melderis in H. Hara et al., Enum. Fl. Pl. Nepal 1: 142. 1978; *P. mustangensis* Rajbhandari.

Culms 5–15(–25) cm tall. Leaf sheath usually smooth; blade flat, 1–2 mm wide, abaxial surface glabrous, adaxial surface scabrid; ligules 2.3–3 mm. Panicle loosely spreading, 4–6 cm; branches paired, lowermost 1–2 cm. Spikelets 4–4.5 mm, florets 2, upper floret viviparous; lemma elliptic-oblong, keel and marginal veins proximally villous, areas between veins usually proximally shortly pubescent; callus glabrous.

Alpine grassy places; 4000–5600 m. Gansu, Qinghai, Xizang [Nepal].

Viviparous spikelets are very rare within *Poa* sect. *Stenopoa* and are restricted to taxa closely allied to *P. glauca* or which have originated through hybridization with that species. *Poa mustangensis*, which was described from neighboring Nepal, seems not to be separable from this subspecies.

80d. *Poa albertii* subsp. *poophagorum* (Bor) Olonova & G. Zhu, **comb. et stat. nov.**

波伐早熟禾 bo fa zao shu he

Basionym: *Poa poophagorum* Bor, Kew Bull. [3] 1948: 143. 1948 [“*poiphagorum*”].

Culms 5–10(–18) cm tall, smooth or scabrid. Leaf blade flat, folded or inrolled, 1–1.5 mm wide, ligule 2–3.5 mm. Panicle narrow, 2–5 × 0.5–1.5 cm; branches short, scabrid. Spikelets 3–4(–5) mm, tinged with purple, florets 2–4; rachilla glabrous

or scabrid, sometimes minutely hairy; glumes subequal; lemma glabrous throughout, rarely along keel and marginal veins proximally sparsely minutely hairy; callus glabrous.

Alpine grasslands; 3000–5500 m. Qinghai, Xinjiang, Xizang, Yunnan [Bhutan, India, Nepal].

80e. *Poa albertii* subsp. *lahulensis* (Bor) Olonova & G. Zhu, comb. et stat. nov.

拉哈尔早熟禾 *la ha er zao shu he*

Basionym: *Poa lahulensis* Bor, Kew Bull. [3] 1948: 138. 1948; *P. borealitibetica* C. Ling.

Culms 10–20 cm tall, nodes 1 or 2. Leaf blade flat or folded, quite soft, 3–5 cm × 1.5–2.5 mm, both surfaces scabrid, frequently withering; ligule 1–3 mm. Panicle elliptic, 4–6 × 1.5–3 cm, branches 2 or 3 per node. Spikelets obovate, green or slightly tinged with purple, 4.5–6 mm, florets 3–6; glumes broadly lanceolate; lemma oblong-lanceolate, slightly membranous, keel and marginal veins densely pubescent below middle, areas between veins proximally pubescent; callus glabrous or minutely hairy.

Alpine grasslands; 2000–5500 m. Xizang, Yunnan [India].

The types of both *Poa lahulensis* and *P. borealitibetica* differ from other members of this complex by being more mesomorphic and look like dwarf plants of *P. versicolor* subsp. *relaxa*, with leaf blades softer and withering with age, panicles lax, and spikelets larger. The pubescence between the veins can vary, as far as complete absence, but other characters are quite constant. This might be evidence of the contribution of *P. versicolor* subsp. *relaxa* to the genotype of *P. albertii* subsp. *lahulensis*. More research is needed to find out the relationships and parentage of the subspecies of *P. albertii*, since subsp. *lahulensis* might not be of hybrid origin but instead a direct derivative of *P. versicolor* subsp. *relaxa*.

81. *Poa glauca* Vahl, Fl. Dan. 6(17): 3. 1790.

灰早熟禾 *hui zao shu he*

Culms erect, glaucous, sometimes strongly purplish, (5–) 10–15(–35) cm tall, nodes 1 or 2, uppermost to 1/5 way up culm, covered by sheath; uppermost internode up to 1.5–2 mm wide. Shoots always extravaginal, even when densely tufted. Leaf sheath longer than blade, flat or folded, sometimes quite soft, withering, 1–2 mm wide, margins and both sides of veins scabrid; ligule 1–1.5(–2) mm. Panicle contracted, later quite open, 4–7 cm; branches 1 or 2 per node, 2–3 cm, with a few scattered spikelets. Spikelets oblong-ovate, (3.8–)4–5(–7) mm, tinged with purple, florets 2–4; glumes narrowly lanceolate, unequal, as long as lower lemma; lemma narrowly lanceolate, lower lemma ca. 4 mm, keel shortly villous for 1/2 of length, marginal veins for 1/3; callus sparsely webbed or glabrous. Fl. Jun–Aug.

Dry gravel slopes, grassy places on river beaches; 2000–5200 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia (Iran), Europe, North America].

Poa glauca is probably one of the most polymorphic species in the genus. In C Asia it has probably been almost consumed by introgressive hybridization. Most gatherings seem to belong to the hybrid complexes *P. albertii* and *P. araratica* s.l. Pure populations of *P. glauca* are rather rare in China.

- 1a. Culms 5–15(–20) cm tall, usually glaucous or purplish; leaf blade usually folded; panicle branches quite thick, firm, obliquely ascending 81a. subsp. *glauca*
- 1b. Culms (10–)20–35 cm tall, usually green; leaf blade usually flat and broad; panicle branches thin, frequently curved, erect 81b. subsp. *altaica*

81a. *Poa glauca* subsp. *glauca*

灰早熟禾(原亚种) *hui zao shu he* (yuan ya zhong)

Deyeuxia hugoniana Rendle; *Poa taiwanicola* Ohwi.

Culms 5–15(–20) cm tall, usually glaucous or purplish. Leaf blade usually folded. Panicle branches quite thick, firm, obliquely ascending. Callus webbed. $2n = 42–49, 50, 56, 60, 63, 64, 65, 70, 72, 75, 78$.

Dry gravel slopes, grassy places on river beaches; 2000–5200 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Tajikistan; Europe, North America].

81b. *Poa glauca* subsp. *altaica* (Trinius) Olonova & G. Zhu, comb. et stat. nov.

阿尔泰早熟禾 *a er tai zao shu he*

Basionym: *Poa altaica* Trinius in Ledebour, Fl. Altaic. 1: 97. 1829; *P. tristis* Trinius ex Regel.

Culms (10–)20–35 cm tall, usually green. Leaf blade usually flat and broad, 1.5–2 mm wide. Panicle branches thin, frequently curved, erect. Callus webbed. $2n = 28, 42$.

Alpine grassy places; 2300–3600 m. ?Xinjiang [Kazakhstan, Russia (Altai)].

Poa glauca subsp. *altaica* is currently known only from high elevations in Kazakhstan and the SW Altai region of Russia. Although no examples have been seen from China, the subspecies might be found in the neighboring province Xinjiang. The type of *P. tristis* looks like an immature specimen of subsp. *altaica*.

67. DACTYLIS Linnaeus, Sp. Pl. 1: 71. 1753.

鸭茅属 *ya mao shu*

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennial. Leaf sheaths closed to middle; leaf blades linear, flat or folded. Inflorescence a lobed, 1-sided panicle, open or contracted; spikelets sessile, densely clustered in compact fascicles on the panicle branches. Spikelets strongly laterally compressed, florets 2–5, disarticulating above glumes and between florets; glumes lanceolate, subequal, shorter than lemmas, strongly

keeled, 1–3-veined; lemmas lanceolate to oblong in side view, papery or thinly leathery, strongly keeled, 5-veined, scabrid or ciliate along keel, apex cuspidate to briefly awned; palea slightly shorter than lemma, narrow, ciliolate along keels. Caryopsis oblong or slightly triangular; hilum round; endosperm soft.

One species: N Africa, temperate Asia, Europe; widely introduced elsewhere as a pasture grass.

One widespread, variable species is recognized here. There are many different races and ecotypes throughout its range, the more widespread being generally tetraploid with local diploid races particularly in the Mediterranean region. These forms are seldom clear-cut, and intermediates are common.

1. *Dactylis glomerata* Linnaeus, Sp. Pl. 1: 71. 1753.

鸭茅 ya mao

Dactylis altaica Besser; *D. glomerata* subsp. *altaica* (Besser) Domin; *D. glomerata* var. *altaica* (Besser) Keng; *D. glomerata* subsp. *sinensis* A. Camus; *D. glomerata* subsp. *himalayensis* Domin.

Perennial, coarse. Culms solitary or tufted, erect or geniculate at base, 40–140 cm tall. Leaf sheaths strongly keeled; leaf blades flat, (6–)10–30 cm × 4–9 mm, abaxial surface scabrid along midrib and margin; ligule 4–8 mm. Panicle oblong to ovate in outline, 5–15 cm; branches single or rarely paired at base, (3–)5–15 cm, horizontal or ascending, lower part naked, upper part with dense fascicles of spikelets. Spikelets oblong to wedge-shaped, 5–9 mm, florets closely overlapping, green or purplish; glumes 4–5(–6.5) mm, scabrid or ciliolate along keel, margins membranous, apex acute to acuminate; lemmas 4–7 mm, lowest subequal to spikelet, scabrid or flanks short-pilose, apex with stout awn up to 1.5 mm. Anthers ca. 2.5 mm. Fl. and fr. May–Aug. $2n = 14$, 28, 42.

Mountain slopes, light forest shade, other grassy places; 1400–3600 m. Gansu, Guizhou, Hubei, Ningxia, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang; cultivated in Hebei, Henan, Jiangsu, Shandong [Bhutan, N India, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Russia, Tajikistan, Turkestan, Uzbekistan; N Africa, SW Asia, Europe].

This is an important pasture and forage grass that has been widely introduced into temperate and subtropical regions throughout the world (Cocksfoot, Orchard Grass).

The typical form, subsp. *glomerata* ($2n = 28$), has a relatively compact panicle, broad spikelet fascicles, and conspicuously ciliate lemma keels. Other forms, widespread in China and the Himalayas, have a looser panicle with long flexuose branches, narrower spikelet fascicles, and only minutely ciliate lemma keels. The names subsp. *sinensis*, subsp. *himalayensis*, and the European name subsp. *slovenica* (Domin) Domin have been applied to these forms. A chromosome count of $2n = 14$ has been recorded for subsp. *himalayensis*. The basis of this variation, the correct application of these names, and their relationship to similar variants from outside China are not yet understood.

68. ANISELYTRON Merrill, Philipp. J. Sci. 5: 328. 1910.

沟稃草属 gou fu cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Aulacolepis Hackel (1907), not Ettingshausen (1893); *Neaulacolepis* Rauschert.

Perennials, tufted. Leaf blades linear to broadly linear, flat, flaccid; ligule membranous. Inflorescence an open panicle; branches whorled. Spikelets with 1 floret, laterally compressed, disarticulating above glumes, rachilla shortly extended beyond floret, glabrous; glumes much shorter than floret, unequal, lower glume sometimes very small or vestigial, upper glume lanceolate, margins broadly hyaline, apex acuminate; callus of floret shortly and inconspicuously hairy, lateral hairs longest; lemma lanceolate in side view, keeled, leathery, scabrid, strongly 5-veined, acute or rarely mucronate; palea subequaling and almost enclosed by lemma, keels close together, prominent, scabrid, depressed between keels. Caryopsis ellipsoid. $x = 7$.

Two species: N India to Indonesia and Japan; two species in China.

The two species, and their infraspecific combinations, have usually been known in the past under the generic name *Aulacolepis* Hackel, but this is an illegitimate later homonym. The genus is usually placed in *Aveneae* close to, or included within, *Calamagrostis*, but molecular evidence shows it is more accurately placed in *Poeae*.

- 1a. Lower glume 0.5–2.5 mm, 1-veined; lateral pedicels variable in length, some filiform; leaf blades 5–15 mm wide ... 1. *A. treutleri*
1b. Lower glume up to 0.75 mm, veinless; lateral pedicels short, up to 1 mm; leaf blades 3–6 mm wide 2. *A. agrostoides*

1. *Aniselytron treutleri* (Kuntze) Soják, Cas. Nar. Muz. Praze, Rada Prir. 148: 202. 1980 [“1979”].

沟稃草 gou fu cao

Milium treutleri Kuntze, Revis. Gen. Pl. 2: 780. 1891; *Aniselytron clemensiae* (Hitchcock) Soják; *A. japonica* (Hackel) Bennet & Raizada; *A. milioides* (Honda) Bennet & Raizada; *A. pseudopoa* (Jansen) Soják; *A. treutleri* var. *japonica* (Hackel) N. X. Zhao; *Aulacolepis clemensiae* Hitchcock; *A. japonica*

Hackel; *A. milioides* (Honda) Ohwi; *A. pseudopoa* (Jansen) Ohwi; *A. treutleri* (Kuntze) Hackel; *A. treutleri* subsp. *japonica* (Hackel) T. Koyama; *A. treutleri* var. *japonica* (Hackel) Ohwi; *A. treutleri* var. *milioides* (Honda) Ohwi; *Calamagrostis japonica* (Hackel) Govaerts; *C. treutleri* (Kuntze) U. Shukla; *Deyeuxia pseudopoa* Jansen; *D. treutleri* (Kuntze) Stapf; *Neaulacolepis clemensiae* (Hitchcock) Rauschert; *N. japonica* (Hackel) Rauschert; *N. treutleri* (Kuntze) Rauschert; *N. treutleri* var. *japonica* (Hackel) T. Osada; *Poa milioides* Honda.

Culms solitary or loosely tufted, erect or geniculate and rooting at lower nodes, 45–110 cm tall, leafy. Leaf sheaths smooth or scabrid; leaf blades linear-lanceolate, 8–25 cm × 5–15 mm, scabrid, apex acuminate; ligule 0.5–4 mm, truncate or rounded. Panicle open, ovate to pyramidal in outline, 10–25 cm; branches in distant whorls, slender, scabrid, bare in lower part, longest up to 13 cm; pedicels of lateral spikelets variable in length. Spikelets 2.5–5 mm, grayish green; glumes lanceolate, lower glume 0.5–2.5 mm, 1-veined, upper glume 2–3.5 mm, 1–3-veined, keel scabrid, apex acute; callus hairs 0.1–0.8 mm; lemma apex acute to acuminate, sometimes scarious and incurved, rarely mucronate; palea keels prominent, scabrid becoming ciliolate toward apex; rachilla 0.2–1.5 mm, glabrous. Anthers 0.7–1.5 mm. Fl. Jul.

Moist shady often rocky places; 1300–2000 m. Fujian, Guangxi, Guizhou, Hubei, Sichuan, Taiwan, Yunnan [Bhutan, India (Darjeeling, Sikkim), Indonesia (Sumatra), Japan, Malaysia (Sabah), N Myanmar, N Vietnam].

Populations of this grass from different parts of its geographic range have sometimes been separated at specific or varietal rank. However, variation is still little understood, so a broad species concept is followed here.

2. *Aniselytron agrostoides* Merrill, Philipp. J. Sci. 5: 329. 1910.

小颖沟稃草 xiao ying gou fu cao

Aniselytron agrostoides var. *formosana* (Ohwi) N. X. Zhao; *A. formosana* (Ohwi) L. Liu; *Aulacolepis agrostoides* (Merrill) Ohwi; *A. agrostoides* var. *formosana* Ohwi; *Calamagrostis aniselytron* Govaerts.

Culms slender, erect or geniculately ascending and rooting at lower nodes, 50–60 cm tall. Leaf sheaths smooth; leaf blades linear, 10–24 cm × 3–6 mm, scabrid, apex acuminate; ligule 0.3–1.5 mm, obtuse, erose or fimbriate. Panicle open with spreading branches, or somewhat contracted and narrower, 9–22 cm; branches whorled, smooth or scaberulous, bare in lower part, longest up to 7.5 cm; pedicels of lateral spikelets fairly uniform in length, up to 1 mm. Spikelets 2.5–4 mm, green; lower glume vestigial or very small, 0.2–0.7 mm, veinless, upper glume lanceolate, very variable, 1–2.7 mm, 1–3-veined, smooth, apex slenderly acuminate; callus hairs 0.05–0.2 mm; lemma as long as spikelet, attenuate upward, margins scarious, apex scarious, acute to acuminate, incurved; palea keels prominent, scabrid; rachilla 0.3–0.8 mm, glabrous. Anthers 1.2–1.5 mm. Fl. Jul.

Forests, grassy roadsides. Taiwan [Philippines].

69. *MILIUM* Linnaeus, Sp. Pl. 1: 61. 1753.

粟草属 su cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annual or perennial. Leaf blades flat; ligule membranous. Inflorescence a terminal open panicle. Spikelets elliptic or ovate, with 1 floret, bisexual, slightly dorsally compressed, disarticulating above glumes, rachilla extension absent; glumes subequal, as long as spikelet, herbaceous, persistent, 3-veined; callus very short, obtuse, glabrous; lemma elliptic, slightly shorter than glumes, leathery becoming indurated and glossy at maturity, smooth, glabrous, obscurely 5-veined, margins involute, apex acute, awnless; palea resembling lemma in texture, 2-veined, not keeled. Lodicules 2. Stamens 3.

Five species: Europe eastward to Japan, also in E North America; one species in China.

This genus has often been placed in *Stipeae*, but molecular evidence shows its relationship lies within *Poeae*.

1. *Milium effusum* Linnaeus, Sp. Pl. 1: 61. 1753.

粟草 su cao

Perennial, shortly rhizomatous. Culms loosely tufted, erect, slender, 0.9–1.5 m tall, smooth, glabrous, 3–5-noded. Leaf sheaths loose, slightly inflated, glabrous; leaf blades broadly linear to linear-lanceolate, thin, soft, 10–30 cm, 5–15 mm wide, glabrous, abaxial surface gray-green, adaxial surface green, margins scaberulous, apex acute; ligule lanceolate, 2–10 mm. Panicle ovate or pyramidal in outline, very lax, 10–30 cm; branches in clusters of up to 6, slender, flexuous, spreading or deflexed, smooth or scabrid, lower part bare. Spikelets 3–4 mm,

gray-green or tinged with purple; glumes elliptic-ovate, scaberulous, margins white, apex acute; lemma glossy, milky-white when young, brown at maturity. Anthers 2–3 mm. Fl. and fr. May–Jul. $2n = 14, 28$.

Forests, moist shady places; 700–3500 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, Japan, E Kazakhstan, Korea, Kyrgyzstan, Pakistan, Russia, Tajikistan; SW Asia, Europe, North America].

This is a good forage grass. The culms are used for weaving.

70. *COLPODIUM* Trinius, Fund. Agrost. 119. 1822.

小沿沟草属 xiao yan gou cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Catabrosella (Tzvelev) Tzvelev; *Colpodium* subg. *Catabrosella* Tzvelev; *Colpodium* subg. *Paracolpodium* Tzvelev; *Paracolpodium* (Tzvelev) Tzvelev.

Small perennials, tufted or rhizomatous. Leaf sheaths with partially connate margins, rarely split to base; leaf blades linear, flat or folded, apex hooded; ligule membranous. Inflorescence an open or contracted panicle or reduced to a raceme. Spikelets with 1–4 florets, glistening; rachilla disarticulating below each floret, extension above floret(s) short or absent; glumes unequal to subequal, upper glume 1/2 as long as to equaling or exceeding florets, lower glume 1-veined, upper glume 3-veined; lemmas ovate or oblong, thinly membranous becoming hyaline at apex, keeled, 3–5-veined below middle, intermediate veins often obscure or absent, veinless toward apex, glabrous or hairy on lower veins or back, apex obtuse to acute; palea about equal to lemma, keels smooth, glabrous or often hairy. Stamens 2 or 3. Caryopsis free or lemma and palea partially adherent; hilum elliptic to oblong. $x = 2, 4, 5, 6, 7, 9$.

Twenty-two species: Turkey eastward through the Caucasus to the Himalayas and E Siberia, also on a few mountains in Africa; five species in China.

Colpodium species usually occur on high mountains. They often resemble *Poa* morphologically, but can be distinguished by the thinner lemmas with veinless tips and smooth palea keels. Species with long glumes, a single floret, and 3-veined lemmas are not easily recognizable as members of tribe *Poeae*.

- 1a. Spikelet with 2–4 florets; plant densely tufted; culms tuberously thickened at base 1. *C. humile*
- 1b. Spikelet with 1 floret; plant shortly rhizomatous; culms not tuberously thickened.
 - 2a. Glumes equaling or longer than floret, lanceolate.
 - 3a. Leaf blades 3–4 mm wide; panicle branches bearing 3–4 clustered spikelets; lemma veins densely pilose below middle 2. *C. tibeticum*
 - 3b. Leaf blades 1–2 mm wide; panicle branches capillary, mostly with a single spikelet; lemma veins shortly pubescent below middle 3. *C. wallichii*
 - 2b. Glumes shorter than floret, at least the lower, oblong-lanceolate or ovate-lanceolate.
 - 4a. Leaf blades green, 2–5 mm wide; panicle contracted, lower branches spreading; spikelets usually purple 4. *C. altaicum*
 - 4b. Leaf blades glaucous, 1–3 mm wide; panicle very narrow, branches suberect to appressed; spikelets usually whitish green 5. *C. leucolepis*

1. *Colpodium humile* (M. Bieberstein) Grisebach in Ledebour, Fl. Ross. 4: 384. 1852 [“1853”].

矮小沿沟草 ai xiao yan gou cao

Aira humilis M. Bieberstein, Fl. Taur.-Caucas. 1: 57. 1808; *Catabrosa humilis* (M. Bieberstein) Trinius; *Catabrosella humilis* (M. Bieberstein) Tzvelev; *C. humilis* subsp. *songorica* Tzvelev; *C. songorica* (Tzvelev) Czerepanov.

Perennial, densely tufted; roots hairy. Culms tuberously thickened at base, clothed in fibrous sheath remnants, erect or geniculate at lowest node, 10–30 cm tall, 2–3-noded. Leaf sheaths closed in lower 1/6; leaf blades usually flat, 1–6 cm \times 1–2 mm, glabrous; ligule 1–2 mm. Panicle pyramidal, open, 3.5–7 \times 2–5 cm; branches 2–6 per node, ascending or spreading, smooth. Spikelets 3–5 mm, florets 2–3(–4), purplish brown or purplish green; glumes shorter than spikelet, unequal, lower glume ovate, 1.5–2 mm, upper glume broadly ovate, 2–2.3 mm, acute; lemmas ovate-oblong, 2.5–3 mm, keel and marginal veins densely silky villous below middle, intermediate veins inconspicuous or absent, apex truncate-erose; palea keels densely silky villous below middle; rachilla extension 0.3–0.8 mm. Stamens 3; anthers 1.5–1.8 mm. Fl. Apr–Jun. $2n = 10$.

Sandy steppe, mountain valleys, roadsides; 400–1700 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, N Uzbekistan; SW Asia (Caucasus, N Iran)].

This is a rather widespread species showing variation over its range, especially in lemma hairiness and venation, and several subspecies have been described. The Chinese material, with mainly 3-veined lemmas, and any weak intermediate veins glabrous, corresponds to *Catabrosella humilis* subsp. *songorica*. Typical *Colpodium humile* has distinctly 5-veined lemmas densely pilose on the proximal part of all veins.

2. *Colpodium tibeticum* Bor, Kew Bull. [8] 1953: 270. 1953.

藏小沿沟草 zang xiao yan gou cao

Paracolpodium tibeticum (Bor) E. B. Alexeev.

Perennial, shortly rhizomatous. Culms erect, 12–21 cm tall, 2–3-noded. Leaf sheaths slightly inflated, longer than internodes, purple at blade junction, old basal sheaths becoming fibrous; leaf blades folded or lower flat, up to 7 cm \times 3–4 mm, glabrous or puberulent; ligule 4–6 mm. Panicle oblong or pyramidal in outline, open, 3–7 \times 1–3 cm, shortly exserted from uppermost leaf sheath; branches 2 per node, up to 1.5 cm, 3–4 spikelets clustered at tips with lateral pedicels much shorter than spikelet, reflexed at maturity. Spikelets 5–6 mm, floret 1, purple; glumes lanceolate, equal, equaling or longer than floret, glabrous, apex acuminate, sometimes slightly recurved; lemma ca. 4 mm, 3-veined, densely pilose along veins below middle, apex rounded; palea keels pilose; rachilla extension present, short. Stamens 2; anthers 2.7–3 mm. Fl. and fr. Jun–Aug.

Moist grassy or stony places in high mountains; 4500–5500 m. S Xizang (Cona) [Bhutan, Nepal].

When describing *Colpodium tibeticum*, Bor annotated the herbarium specimen Ludlow, Sherriff & Hicks 20796 (BM) as the holotype, but in the protologue he indicated the specimen Kingdon Ward 11688 (BM) as the holotype. The Kingdon Ward specimen must therefore be taken as the correct holotype of the name.

3. *Colpodium wallichii* (Stapf) Bor, Kew Bull. [8] 1953: 270. 1953.

瓦小沿沟草 wa xiao yan gou cao

Catabrosa wallichii Stapf in J. D. Hooker, Fl. Brit. India 7: 312. 1896 [“1897”]; *Paracolpodium wallichii* (Stapf) E. B. Alexeev.

Perennial, shortly rhizomatous. Culms erect, 7–25 cm tall, 2–3-noded. Leaf sheaths longer than internodes; leaf blades narrowly linear to filiform, up to 10 cm × 1–2 mm, glabrous; ligule 2–2.5 mm. Inflorescence delicate, open, few-spicate, almost racemose, 2.5–5.5 cm; branches 1 or 2 per node, up to 1 cm, capillary, flexuous, mostly bearing only 1 spikelet, occasionally 2, equaling or longer than spikelet, gently reflexing at maturity. Spikelets 3.7–5.5 mm, floret 1, purple or less often greenish; glumes slightly shorter to slightly longer than floret, lower glume narrowly lanceolate, 3–5 mm, apex subacute, upper glume lanceolate-oblong, 3.5–5.5 mm, apex narrowly obtuse; lemma narrowly lanceolate-oblong, 3.2–4.3 mm, obscurely 3–5-veined, shortly pubescent along veins below middle, sometimes a few hairs on lower back, apex obtuse to truncate-denticulate; palea keels shortly pubescent; rachilla extension present, short. Stamens 2; anthers 2–2.5 mm.

Stony or sandy places in trickling water from snow melt; above 4000 m. ?Xizang [Bhutan, India (Sikkim), Nepal].

This species is very likely to occur in the mountains of S Xizang, but the illustration in Fl. Xizang. (5: 141. 1987, as *Catabrosa wallichii*) appears to be a form of *Catabrosa aquatica*.

4. *Colpodium altaicum* Trinius in Ledebour, Fl. Altaic. 1: 100. 1829.

柔毛小沿沟草 rou mao xiao yan gou cao

Catabrosa altaica (Trinius) Boissier; *Paracolpodium altaicum* (Trinius) Tzvelev.

Perennial, shortly rhizomatous, forming loose mats. Culms erect or ascending, 10–40 cm tall, 2–3-noded. Leaf sheaths closed up to middle, longer than internodes; leaf blades green, flat or sometimes folded, up to 8 cm × 2–5 mm, glabrous or rarely adaxial surface sparsely puberulous, apex obtuse or mucronate; ligule 2–4 mm. Panicle lanceolate to ovate in outline, 3–11 × 1–3 cm, fairly dense or lower branches spreading; branches paired. Spikelets 3.2–4.5 mm, floret 1(–2), usually purplish; glumes oblong-lanceolate or ovate-lanceolate, slightly

shorter than or upper subequaling floret, lower glume 2.3–2.7 mm, upper glume 3.1–3.6 mm, apex subacute; lemma broadly oblong, as long as spikelet, 3-veined, lanate along lower veins, apex obtuse, irregularly toothed; palea as long as or longer than lemma, keels lanate; rachilla extension absent. Stamens 2; anthers 2–3 mm, dark purple. Fl. and fr. Jun–Aug. $2n = 42$.

Stony or gravelly mountain slopes; 2500–4800 m. Xinjiang [NE Kazakhstan, Mongolia, Russia (Siberia)].

5. *Colpodium leucolepis* Nevski, Bull. Soc. Imp. Naturalistes Moscou 43: 224. 1934.

高山小沿沟草 gao shan xiao yan gou cao

Colpodium villosum Bor; *Paracolpodium altaicum* subsp. *leucolepis* (Nevski) Tzvelev; *P. leucolepis* (Nevski) Tzvelev.

Perennial, shortly rhizomatous, forming loose mats. Culms erect or ascending, 8–28 cm tall, 2-noded. Leaf sheaths closed up to middle, longer than internodes; leaf blades glaucous, folded, 2–12 cm × 1–3 mm, adaxial surface puberulous, abaxial surface usually glabrous, apex acute; ligule 1–3 mm. Panicle very narrow, spike-like, almost racemose, 3–7 cm, branches spaced, erect or almost so. Spikelets 3.4–4.2 mm, floret 1, usually pale green; glumes unequal, slightly shorter than floret, lower glume elliptic, 2.1–3 mm, upper glume lanceolate-elliptic, 2.6–3.5 mm, apex acute; lemma oblong, as long as spikelet, 5-veined, villous on veins or generally in lower half, apex obtuse-denticulate; palea keels villous, rachilla extension absent. Stamens 2; anthers 2–3 mm, dark purple. Fl. and fr. Jun–Aug.

Alpine grasslands, gravelly slopes, rocky fissures; 3900–5000 m. Xinjiang [NE Afghanistan, Kashmir, E Kazakhstan, Kyrgyzstan, N Pakistan, Tajikistan (Pamirs)].

This species is confined to the high mountains of the W Himalayas.

Colpodium himalaicum (J. D. Hooker) Bor, from Kashmir and the W Himalayas, is similar, but has a more densely tufted habit and much shorter glumes not exceeding 1/2 the length of the floret.

71. CATABROSA P. Beauvois, Ess. Agrostogr. 97. 1812.

沿沟草属 yan gou cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, rhizomatous or stoloniferous. Leaf sheaths closed to middle or above; leaf blades linear, flat, glabrous; ligule membranous. Inflorescence an open or infrequently contracted panicle of many spikelets; branches minutely papillose; pedicels short. Spikelets with (1–)2(–3) florets, subterete, disarticulating below each floret; rachilla extended above floret, glabrous; glumes unequal, much shorter than florets, membranous, lower less than 1/2 spikelet length, 0–1-veined, upper up to 2/3 spikelet length, prominently 1–3-veined, apex truncate or broadly obtuse; lemmas broadly ovate to oblong, herbaceous or thinly membranous becoming hyaline toward apex, rounded on back, prominently 3-veined, lateral veins marginal, glabrous, apex broadly obtuse to truncate, erose, awnless; floret callus short, glabrous; palea subequal to lemma, keels smooth. Stamens 3. Caryopsis ellipsoid, hilum shortly oblong. $x = 5$.

Two to four species: temperate regions of both hemispheres, Chile; two species in China.

- 1a. Panicle narrow, dense, almost spike-like, branches short, adpressed or suberect 1. *C. capusii*
1b. Panicle open or loosely contracted, branches loosely ascending to spreading 2. *C. aquatica*

1. *Catabrosa capusii* Franchet, Ann. Sci. Nat., Bot., sér. 6, 18: 272. 1884.

长颖沿沟草 chang ying yan gou cao

Catabrosa aquatica subsp. *capusii* (Franchet) Tzvelev.

Perennial, rhizomatous. Culms decumbent at base, up to 30(–60) cm tall. Leaf sheaths closed up to middle, loose, longer

than internodes; leaf blades flat, soft, 3–8 cm × 2–4 mm, apex acute; ligule ca. 2 mm, obtuse. Panicle narrow, contracted, almost spikelike, interrupted below, 2–12 × 0.8–1.5 cm; branches less than 5 cm, adpressed or suberect, compactly spiculate to base. Spikelets with (1–)2 florets, 3–4 mm; glumes oblong, obscurely 1–3-veined, apex obtuse or erose, lower glume 0.5–2 mm, upper glume 1.5–2.3 mm; lemma 2–2.7 mm, brown flushed purple, smooth, apex truncate, denticulate. Anthers 1–1.5 mm. Fl. Jun–Aug.

Marshy ground and water meadows on high mountains; 3700–4900 m. Nei Mongol, Xizang [Kyrgyzstan, Tajikistan, Uzbekistan; SW Asia (N Iran, N Iraq, E Turkey)].

Young panicles of *Catabrosa aquatica* can resemble the narrow panicle of this species.

2. *Catabrosa aquatica* (Linnaeus) P. Beauvois, Ess. Agrostogr. 97. 1812.

沿沟草 *yan gou cao*

Perennial, rhizomatous; rhizome stout, creeping. Culms erect, succulent, 20–70 cm tall, unbranched. Leaf sheaths closed up to middle, upper shorter than internodes; leaf blades equally wide throughout, soft, 5–20 cm × 2–8 mm, apex boat-shaped; ligule 2–5 mm, obtuse. Panicle open or loosely contracted at anthesis, ovate to oblong in outline, 10–30 × 4–12 cm; branches whorled, slender, usually obliquely ascending, up to 10 cm, often bare of spikelets in lower part. Spikelets with (1–)2(–3) florets, 2–4(–5.8) mm; glumes obtuse or subtruncate; lower glume ovate to suborbicular, 0.5–1.2(–2) mm; upper glume broadly elliptic, 1–2(–3) mm; lemma 1.5–3 mm, green becoming brown at maturity, usually glabrous, apex truncate. Anthers 1–2 mm. Fl. and fr. Apr–Aug. $2n = 20$.

Slow-moving, shallow water of river and streamsides, muddy pond margins, ditches; 800–4000 m. Gansu, Guizhou, Hebei, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe, North America].

Catabrosa aquatica is a widespread, polymorphic species of aquatic and marshy habitats, and extreme forms are sometimes accorded separate status, either at specific or infraspecific rank.

This species provides good forage.

- 1a. Culms 20–70 cm tall; panicle loose, open, branches to 10 cm; lemma 2–3 mm 2a. var. *aquatica*
- 1b. Culms up to 20 cm tall; panicle rather sparse, branches 1–2 cm; lemma 1.5–2.2 mm 2b. var. *angusta*

2a. *Catabrosa aquatica* var. *aquatica*

沿沟草(原变种) *yan gou cao* (*yuan bian zhong*)

Aira aquatica Linnaeus, Sp. Pl. 1: 64. 1753; *Glyceria aquatica* (Linnaeus) J. Presl & C. Presl; *Poa airoides* Koeler.

Culms 20–70 cm tall, creeping and spreading. Leaf blades 5–20 cm × 4–8 mm. Panicle loose, open; branches slender, 2–6 cm, obliquely ascending or rarely horizontal. Lemma 2–3 mm. Fl. and fr. Apr–Aug.

Shallow water of river and streamsides, pond margins; 800–4000 m. Gansu, Guizhou, Hebei, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe, North America].

2b. *Catabrosa aquatica* var. *angusta* Stapf, J. D. Hooker, Fl. Brit. India 7: 311. 1896 [“1897”].

窄沿沟草 *zhai yan gou cao*

Catabrosa angusta (Stapf) L. Liu.

Culms up to 20 cm tall, shortly creeping, forming loose tufts. Leaf blades up to 5 cm × 1–2 mm. Panicle narrow, open; branches 1–2 cm, suberect. Lemma 1.5–2.2 mm. Fl. and fr. Apr–Sep.

• Mountains, wet grassy places, streamsides, pond margins; near sea level to 4800 m. Nei Mongol, Qinghai, Sichuan, Xizang.

This variety may simply represent small, depauperate plants from high altitudes. The panicle is more open than in *Catabrosa capusii*. Other small forms from high altitudes in the Himalayas and Qinghai, with an open panicle and deep purple spikelets, have been described as *C. sikkimensis* J. D. Hooker. These also intergrade completely with the main body of the species.

72. *SCLEROCHLOA* P. Beauvois, Ess. Agrostogr. 97. 1812.

硬草属 *ying cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals. Leaf sheaths closed for lower 1/4–1/2 of their length; leaf blades linear, flat or involute. Inflorescence a contracted or dense, 1-sided panicle, often subracemose; branches short, stout, smooth, often bearing only 1 subsessile spikelet. Spikelets linear to oblong, florets 3–8, usually lower bisexual, upper male or sterile, tardily disarticulating between florets and below pedicel, lowest rachilla internode enlarged, very stout and tough; glumes unequal, herbaceous with broad scarious margins, keeled, lower glume 3–5-veined, upper glume 5–9-veined, apex obtuse; lemmas narrowly oblong, leathery with scarious margins, keeled, prominently 5–7-veined, glabrous, apex obtuse to rounded. Caryopsis with an apical beak formed from persistent style base; hilum oval. $x = 7$.

Two species: C and S Europe eastward to C Asia; introduced elsewhere; one species in W China.

1. *Sclerochloa dura* (Linnaeus) P. Beauvois, Ess. Agrostogr. 98. 1812.

硬草 *ying cao*

Cynosurus durus Linnaeus, Sp. Pl. 1: 72. 1753.

Annual forming small dense tuft. Culms ascending or decumbent, 5–15 cm tall. Leaf sheaths smooth, glabrous, lower papery, whitish; leaf blades flat, 1.5–7 cm × 2–4 mm, glabrous, adaxial surface scabrid; ligule 1–3 mm, acute. Panicle elliptic-oblong in outline, dense, stiff, 1–5 cm, scarcely exerted from

uppermost leaf sheath; branches bearing a single spikelet or shortly racemose near middle. Spikelets narrowly oblong, 6–10 mm, florets 3–5, lower 2–3 fertile, upper male or sterile; glumes ovate-oblong, lower glume 2–3 mm, upper glume 3.5–5 mm; lemmas ovate-oblong, lowest 4.8–6 mm, the upper much

shorter, all veins prominent, apex obtuse to emarginate. Anthers 0.8–1.3 mm. Caryopsis 2.5–3.5 mm, brown. $2n = 14$.

Hill slopes; 500–1000 m. Xinjiang (Tian Shan) [Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, C and S Europe; introduced in Australia and the United States].

73. PSEUDOSCLEROCHLOA Tzvelev, Bot. Zhurn. 89: 840. 2004.

假硬草属 *jia ying cao shu*

Liu Liang (刘亮); Nikolai N. Tzvelev

Annual, rarely biennial, tufted. Culms short. Leaf sheaths split; leaf blades linear, flat or loosely folded; ligule membranous. Inflorescence a moderately dense, 1-sided panicle; branches stiff, bearing spikelets to base; pedicels short, thick. Spikelets with 2–7 florets; rachilla thick, disarticulating below each floret; glumes shorter than lemmas, 1–3-veined, cartilaginous in lower part, apex obtuse or acute; lemmas oblong to ovate, subcartilaginous, 3–5-veined, glabrous, strongly keeled above middle, apex obtuse; palea as long as lemma, scabrid along keel. Caryopsis with small round hilum.

Two species: one in W Europe, one endemic to China.

This is one of the small, satellite, annual genera close to *Poa*. It is excluded from *Puccinellia* by its keeled lemmas and stiff, 1-sided panicles, and from *Sclerochloa* by its regularly disarticulating spikelets, 3-veined upper glume, and lack of a beak on the caryopsis.

1. Pseudosclerochloa kengiana (Ohwi) Tzvelev, Bot. Zhurn. 89: 841. 2004.

耿氏假硬草 *geng shi jia ying cao*

Puccinellia kengiana Ohwi, J. Jap. Bot. 12: 654. 1936, based on *P. stricta* Keng, Sinensia 4: 321. 1934, not Blom (1930); *Sclerochloa kengiana* (Ohwi) Tzvelev.

Annual, loosely tufted. Culms ascending, 15–30 cm tall. Leaf sheaths smooth, glabrous; leaf blades 5–14 cm × 3–4 mm, glabrous, smooth or adaxial surface scabrid; ligule 2–3.5 mm, truncate or toothed. Panicle lanceolate to narrowly ellip-

tic in outline, 8–12 × 1–3 cm, mostly shortly exerted from uppermost leaf sheath; branches stiffly ascending, usually paired, up to 2.5 cm, bearing several overlapping spikelets. Spikelets elliptic-oblong, 4–5.5 mm, florets 2–5(–7), all fertile; glumes ovate-oblong, lower glume 1.2–2 mm, 1-veined, upper glume 2–3 mm, 3-veined, apex obtuse or acute; lemmas broadly ovate, lowest ca. 3 mm, the upper decreasing gradually, midvein prominent, raised into keel in upper half, other veins inconspicuous, apex obtuse. Anthers ca. 1 mm. Caryopsis ca. 1.5 mm, dark gray. Fl. and fr. Apr–Jul.

• Fields, valleys, streamsides. Anhui, Henan, Jiangsu, Jiangxi.

74. PARAPHOLIS C. E. Hubbard, Blumea, Suppl. 3: 14. 1946.

假牛鞭草属 *jia niu bian cao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals. Leaf blades narrowly linear to linear-lanceolate. Inflorescence a slender cylindrical raceme, spikelets sessile in 2 alternating rows sunk in hollows of the rachis; rachis fragile, fracturing horizontally beneath each spikelet at maturity. Spikelets with 1 floret; glumes leathery, placed side by side in front of spikelet and appressed to rachis, closing rachis cavity and covering floret, asymmetrical, appearing like halves of a single split glume, strongly 3–7-veined, outer margin inflexed, apex acute; lemma hyaline, 3-veined, its side toward the rachis, awnless; palea slightly shorter than lemma. Ovary with lobed apical appendage; styles nearly absent. Caryopsis narrowly oblong; hilum round to narrowly oblong. Endosperm liquid.

Six species: C and SW Asia, Mediterranean region, northward along Atlantic coast of Europe to the Baltic Sea; introduced to most other temperate regions; one species (introduced) in China.

1. Parapholis incurva (Linnaeus) C. E. Hubbard, Blumea, Suppl. 3: 14. 1946.

假牛鞭草 *jia niu bian cao*

Aegilops incurva Linnaeus, Sp. Pl. 2: 1051. 1753; *Lepidurus incurvus* (Linnaeus) Janchen; *Lepturus incurvus* (Linnaeus) Druce; *Pholiurus incurvus* (Linnaeus) Schinz & Thellung; *Rottboellia incurva* (Linnaeus) Roemer & Schultes.

Culms tufted, decumbent at base, 10–25 cm tall, much branched in lower part. Leaf sheaths rounded, smooth, glabrous; leaf blades linear, flat or folded, 2.5–8 cm × 1–2 mm,

glabrous, abaxial surface smooth, adaxial surface and margins scabrid, finely acute; ligule 0.5–1 mm, truncate. Raceme slenderly cylindrical, 4–10 cm, falcately curved; rachis smooth, joints shorter than spikelets. Spikelets 6–8 mm; glumes as long as spikelet, narrowly oblong-subulate, 3–5-veined, glabrous, acute; lemma lanceolate, 4–5 mm, 3-veined, the laterals very short, glabrous. Anthers 0.5–1 mm. Caryopsis tawny, 3–3.5 mm. Fl. Apr–Jun. $2n = 38$.

Seashores, coastal salt marshes, introduced. Fujian, Zhejiang (Putuo) [Turkmenistan; N Africa, SW Asia, Europe; introduced in S Africa, America, and Australia].

Parapholis and a few other genera of mostly annual grasses adapted to saline conditions are sometimes placed in the tribe *Hainardi-eae*. They are distinguished from typical *Poeae* by the distinctive rat-tail

inflorescence and glumes placed side-by-side. However, they are clearly related to other less specialized annual members of *Poeae*, and recent molecular evidence places them within this tribe.

12. Tribe AVENEAE

燕麦族 *yan mai zu*

Wu Zhenlan (吴珍兰), Lu Shenglian (卢生莲), Chen Shouliang (陈守良), Chen Wenli (陈文俐); Sylvia M. Phillips

Annual or perennial. Leaf blades linear to setaceous; ligule membranous. Inflorescence an open, contracted, or spike-like panicle. Spikelets all alike, somewhat laterally compressed, with 1 to several fertile florets; rachilla usually disarticulating below each floret, occasionally strictly 3 florets with lower 2 staminate or barren and of different appearance from upper fertile floret, then disarticulating above glumes and florets falling together; glumes persistent, often equal to spikelet or at least longer than first floret, commonly membranous with broad, shining, hyaline margins; floret callus bearded; lemmas hyaline to leathery, 3- to several-veined (*Coleanthus* 1-veined), apex entire or denticulate, awned from back, rarely awnless; awn usually geniculate with twisted column; palea hyaline, subequaling or much shorter than lemma. Lodicules 2, rarely absent. Stamens (2 or) 3, rarely 1 (*Cinna*). Caryopsis mostly ellipsoid; hilum round or oval, endosperm sometimes soft or liquid. Starch-grains compound. Chromosomes large; basic number 7 (5 in *Anthoxanthum*). Leaf anatomy: non-Kranz, microhairs absent, silica-bodies oblong.

About 60 genera: temperate and cold regions of the world, extending to mountains in the tropics; 20 genera, one hybrid genus, and 144 species (40 endemic, 11 or 12 introduced) in China.

Recent molecular studies show the tribes *Poeae* and *Aveneae* to be closely related and to some extent interleaved, with certain genera traditionally placed in one tribe ordered at a molecular level within the other. On this account the tribes are sometimes united into a broadly defined *Poeae*. However, most genera can be easily assigned to one or other tribe on morphological characteristics, and therefore the traditional treatment is maintained here.

- 1a. Spikelets with 2 or more fertile florets.
 - 2a. Ovary hairy; spikelets large, 7–45 mm.
 - 3a. Perennial; glumes unequal, 1–7-veined 75. *Helictotrichon*
 - 3b. Annual; glumes subequal, 7–11-veined 77. *Avena*
 - 2b. Ovary glabrous or almost so; spikelets small, 2.5–10 mm.
 - 4a. Lemmas keeled.
 - 5a. Lemmas awned from back 78. *Trisetum*
 - 5b. Lemmas awnless or with a subapical awn-point 79. *Koeleria*
 - 4b. Lemmas rounded on back.
 - 6a. Annual; florets arising at about same level; rachilla extension absent 82. *Aira*
 - 6b. Perennial; florets separated by an internode; rachilla extension present.
 - 7a. Panicle glistening; lemma apex erose 80. *Deschampsia*
 - 7b. Panicle not glistening; lemma apex 4-toothed 87. *Deyeuxia*
- 1b. Spikelets with 1 fertile floret.
 - 8a. Inflorescence of several racemes along a central axis 92. *Beckmannia*
 - 8b. Inflorescence a panicle, sometimes spike-like.
 - 9a. Fertile floret accompanied by staminate or sterile florets.
 - 10a. Spikelets with 2 florets.
 - 11a. Spikelet disarticulating above glumes; lower floret staminate 76. *Arrhenatherum*
 - 11b. Spikelet disarticulating below glumes; upper floret staminate 81. *Holcus*
 - 10b. Spikelets with 3 florets, the 2 lower staminate or barren (reduced to small scales in *Phalaris*).
 - 12a. Lower lemmas rudimentary; plants without coumarin 83. *Phalaris*
 - 12b. Lower lemmas well developed; plants scented with coumarin 84. *Anthoxanthum*
 - 9b. Fertile floret solitary, with or without a rachilla extension.
 - 13a. Spikelets in compact umbellate clusters; glumes absent 85. *Coleanthus*
 - 13b. Spikelets in an open, contracted or spike-like panicle; glumes present.
 - 14a. Spikelets falling entire.
 - 15a. Spikelets shed with a basal stipe 89. *Polypogon*
 - 15b. Spikelets shed without a basal stipe.
 - 16a. Panicle open.
 - 17a. Glumes indistinctly 3-veined; lemma with awnlet; stamen 1 90. *Cinna*
 - 17b. Glumes prominently 3-veined; lemma awnless; stamens 3 91. *Cyathopus*
 - 16b. Panicle spike-like or capitate; stamens usually 3.
 - 18a. Lemma awned from back 93. *Alopecurus*

- 18b. Lemma awnless 94. *Phleum*
- 14b. Spikelets disarticulating above glumes.
 - 19a. Glumes slightly shorter than floret 87. *Deyeuxia*
 - 19b. Glumes equaling or longer than floret.
 - 20a. Glumes mucronate 86a. *×Agropogon*
 - 20b. Glumes acute to acuminate.
 - 21a. Spikelets usually less than 5 mm; callus glabrous or shortly hairy; lemma hyaline 86. *Agrostis*
 - 21b. Spikelets often more than 5 mm; callus bearded, hairs 1/3 as long as to longer than floret (if shorter, penicillate rachilla extension present); lemma membranous to firm.
 - 22a. Lemma at least 3/4 as long as glumes, usually firm; callus hairs almost as long as to clearly shorter than floret; rachilla extension present, penicillate 87. *Deyeuxia*
 - 22b. Lemma 1/2–2/3 as long as glumes, membranous; callus hairs often much exceeding floret; rachilla extension absent, or if present glabrous or shortly hairy 88. *Calamagrostis*

75. HELICTOTRICHON Besser ex Schultes & J. H. Schultes, Mant. 3
(Addit. I ad Mant. Cl. III): 526 [“326”]. 1827.

异燕麦属 *yi yan mai shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Avenastrum Opiz; *Avenula* (Dumortier) Dumortier; *Trisetum* sect. *Avenula* Dumortier.

Perennials, tussocky, often rhizomatous. Leaf blades linear to setaceous, flat, folded or rolled; ligule membranous. Inflorescence a panicle, open or often contracted, sometimes without secondary branching. Spikelets with 2 to several fertile florets and 1 or 2 reduced sterile florets above; rachilla pilose, disarticulating below each floret; glumes lanceolate, slightly unequal, usually shorter than spikelet and often shorter than lemmas, hyaline to membranous, lower glume 1–3-veined, upper glume 3–5-veined, keel scaberulous, apex acute; floret callus shortly bearded; lemmas lanceolate, firmly membranous to leathery, rounded or weakly keeled, 5–7(–9)-veined, glabrous, awned from middle of back or slightly above, apex minutely to deeply 2–4-toothed; awn geniculate with twisted column, sometimes weakly so or almost straight; palea slightly shorter than lemma and enclosed within lemma margins, keels scabrid-ciliate to ciliate. Ovary densely hairy toward apex. Caryopsis with linear hilum; endosperm sometimes liquid.

About 100 species: Europe eastward to Japan, North America, also on tropical mountains; 14 species (seven endemic) in China.

Most species provide good forage.

- 1a. Palea keels smooth, glabrous, back deeply sulcate; hairs at apex of each rachilla internode 4–6 mm 1. *H. pubescens*
- 1b. Palea keels scabrid to ciliate, back flat at maturity; hairs at apex of each rachilla internode 1–3 mm.
 - 2a. Leaf blades flat or folded, keeled, margins and abaxial midrib prominently white-thickened, adaxial surface not ribbed; leaf sheath margins connate for part of length; floret callus bearded on sides only.
 - 3a. Rhizomes present, plant forming loose turf; leaf sheaths closed for more than 1/2 of length; leaf blades 5–12 mm wide; spikelets 2–2.5 cm 2. *H. dahuricum*
 - 3b. Rhizomes absent, plant forming dense turf; leaf sheaths closed for less than 1/4 of length; leaf blades 2–5 mm wide; spikelets 1–1.8 cm 3. *H. hookeri*
 - 2b. Leaf blades flat or rolled, margins and midrib not thickened, adaxial surface closely ribbed with deep grooves between; leaf sheath margins free to base; floret callus evenly bearded.
 - 4a. Panicle open, sometimes nodding; branches ascending or spreading, up to 10 cm.
 - 5a. Lemma apex subentire or minutely denticulate.
 - 6a. Culms 20–45 cm; ligules to 0.5 mm; rachilla internodes hairy throughout length 4. *H. abietetorum*
 - 6b. Culms up to 80 cm tall; ligules ca. 1 mm; rachilla internodes hairy only in upper part 5. *H. leianthum*
 - 5b. Lemma apex 2-toothed.
 - 7a. Panicle branches in whorls of up to 8, with branchlets almost to base; lower culm internodes and sheaths villous 6. *H. yunnanense*
 - 7b. Panicle branches 2–4 per node (up to 6 in *H. altius*), bare in lower part; lower culm internodes glabrous (sheaths sometimes pilose).
 - 8a. Nodes of culm pubescent 7. *H. altius*
 - 8b. Nodes of culm glabrous.

- 9a. Leaf blades 10–25 cm, 3–5 mm wide; spikelets 1–1.4 cm 8. *H. junghuhnii*
 9b. Leaf blades 6–11 cm, ca. 2 mm wide; spikelets 0.8–1 cm 9. *H. delavayi*
 4b. Panicle laxly to densely contracted; branches erect or narrowly ascending, usually less than 4 cm.
 10a. Panicle 10–17 cm; lemmas densely scabrid; awn arising from upper 1/3 of lemma, recurved, scarcely twisted 10. *H. schmidii*
 10b. Panicle 2–9(–14) cm; lemmas smooth, scaberulous or puberulous; awn arising near middle of lemma, geniculate with twisted column.
 11a. Spikelets reddish violet; anthers 1–1.6 mm 11. *H. potaninii*
 11b. Spikelets brown or tinged violet; anthers 3–4.2 mm.
 12a. Panicle densely contracted; axis and branches densely pubescent; culm pubescent below panicle; spikelets golden brown 12. *H. tibeticum*
 12b. Panicle laxly contracted; axis and branches scabrid or puberulent only in upper part; culm glabrous below panicle; spikelets pale yellowish brown tinged violet.
 13a. Plant densely tufted; sheaths of culm leaves usually pilose; leaf blades scabrid on adaxial surface; anthers ca. 3 mm 13. *H. tianschanicum*
 13b. Plant loosely tufted; sheaths of culm leaves usually glabrous; leaf blades densely puberulous on adaxial surface; anthers ca. 4 mm 14. *H. mongolicum*

1. *Helictotrichon pubescens* (Hudson) Pilger, Repert. Spec. Nov. Regni Veg. 45: 6. 1938.

毛轴异燕麦 mao zhou yi yan mai

Avena pubescens Hudson, Fl. Angl. 42. 1762; *Avenastrum pubescens* (Hudson) Opiz; *Avenula pubescens* (Hudson) Dumortier.

Perennial, shortly rhizomatous. Culms solitary or few, erect, 30–120 cm tall, 3–4-noded. Leaf sheaths of lower leaves pubescent, upper and infrequently also lower glabrous, closed to above middle; leaf blades linear-lanceolate, flat, 10–30 cm, 4–10 mm wide, usually pubescent on both surfaces, abaxial surface with thin midrib, margins only slightly thickened, apex subacute; ligule lanceolate, 3–6 mm. Panicle lax, oblong in outline, 8–15 cm or more; branches 4–6 per node, up to 5 cm, fine, scaberulous. Spikelets 1.2–1.7 cm, pale green or variegated purple, florets 2–4; rachilla hairs 4–6 mm; glumes hyaline, lower glume 10–11 mm, 1–3-veined, upper glume 13–17 mm, 3-veined; lemmas firmly herbaceous, hyaline above awn insertion, lowest 9–11 mm, scabrid, apex irregularly 2-denticulate; awn 1.5–2 cm, geniculate, column twisted, terete; palea subequal to lemma, keels close together, smooth, glabrous, hyaline between keels. Anthers 5–7 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes, forest margins, among shrubs; 1000–2600 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; SW Asia (Caucasus, Turkey), Europe; introduced in North America].

This is a widespread, polymorphic species, varying especially in the degree of hairiness of the leaves and the width of the blades. The Chinese population probably corresponds to a broad-leaved, rather sparsely hairy form found in neighboring parts of Russia and C Asia, *Helictotrichon pubescens* var. *latifolium* (Printz) Tzvelev. No specimens from China have been seen. The typical variety has hairy leaves usually up to 5 mm wide.

Helictotrichon pubescens is distinguished from all other species in the genus by its palea with close, smooth keels. Molecular studies place it close to the group of species including *H. dahuricum* (see the comment under that species). However, it differs morphologically from those species in several characters besides the palea, including unthickened leaf blade margins, an evenly bearded (vs. laterally bearded) calus, and a hilum as long as the caryopsis (vs. half as long).

2. *Helictotrichon dahuricum* (Komarov) Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 3: App. 1, 77. 1939.

大穗异燕麦 da sui yi yan mai

Avena planiculmis Schrader subsp. *dahurica* Komarov, Fl. Kamtschatka 1: 159. 1927; *Avenastrum dahuricum* (Komarov) Roshevitz; *Avenula dahurica* (Komarov) W. Sauer & H. Chmelistschek.

Perennial, rhizomatous, forming loose turf. Culms solitary or few, erect from decumbent base, 50–100 cm tall, 2–3-noded. Leaf sheaths of cauline leaves closed for 1/2 or more of length; leaf blades linear-lanceolate, flat, 8–25 cm, 5–12 mm wide, abaxial surface smooth with thick white midrib, adaxial surface scaberulous, margins thick, white, scaberulous, base rounded, apex abruptly acute; ligule lanceolate, 5–7(–10) mm. Panicle loosely contracted, 7–15 cm; branches usually paired, ascending, scabrid or almost smooth. Spikelets 1.7–2.5 cm, golden brown and purple, florets 5–6; rachilla hairs 1.5–2.5 mm; glumes membranous, 3-veined, lower glume 9.5–11 mm, upper glume 12–15 mm; lemmas leathery, hyaline above awn insertion, lowest 11–14 mm, asperulous, apex irregularly 2-denticulate; awn 1.5–1.7 cm, geniculate, column twisted, flat; palea keels ciliate. Anthers 6.5–7 mm. Fl. and fr. Jul–Sep.

Open forests, grassy places, among shrubs; 700–1000 m. Heilongjiang, Nei Mongol [Mongolia, E Russia].

Helictotrichon dahuricum and *H. hookeri* belong to a group of species that have been shown by molecular studies to be only distantly related to *Helictotrichon* s.s. This group is sometimes separated as the genus *Avenula*. Some of the most obvious morphological distinctions are given in key couplet 2. Unfortunately the type species of *Avenula* is *H. pubescens*, which shows major morphological differences from the other species placed in *Avenula*, as noted above. For this reason *Helictotrichon* is maintained here in the traditional sense. Further morphological and molecular studies are required to clarify relationships within the group.

3. *Helictotrichon hookeri* (Scribner) Henrard, Blumea 3: 429. 1940.

异燕麦 yi yan mai

Perennial, rhizomes very short or absent, forming mats.

Culms tufted, erect, 20–70 cm tall, usually 2-noded. Leaf sheaths of cauline leaves closed for less than 1/4 of length; leaf blades flat or folded, 10–25 cm, 2–5 mm wide, smooth or scabrid, margins thick, white, base straight, apex subacute; ligule lanceolate, 3–6 mm. Panicle contracted, sometimes dense, 4–15 cm; branches usually paired, erect or ascending, scabrid, bearing 1–4 spikelets. Spikelets 1.1–1.7 cm, green or brown, florets 3–6; rachilla hairs 1–2 mm; glumes membranous, 3(–5)-veined, lower glume 9–12 mm, upper glume 10–13 mm; lemmas leathery, hyaline above awn insertion, lowest 10–13 mm, asperulous, apex 2-toothed; awn 1.2–1.5 cm, geniculate, column twisted, flat; palea keels minutely ciliate. Anthers ca. 4 mm. Fl. and fr. Jun–Sep.

Hill slopes in steppe, forest margins, moist meadows in high mountains; 100–3500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia; North America].

This is a variable species with higher-altitude forms distinguishable at subspecific rank. These forms correspond to plants from uplands in W North America, from where the species was first described.

- 1a. Panicle 4–8 cm, dense; spikelets golden brown 3a. subsp. *hookeri*
 1b. Panicle 5–15 cm, contracted; spikelets greenish 3b. subsp. *schellianum*

3a. *Helictotrichon hookeri* subsp. *hookeri*

异燕麦(原亚种) *yi yan mai* (yuan ya zhong)

Avena hookeri Scribner, True Grasses 123. 1890; *A. tentoensis* Honda; *Avenastrum asiaticum* Roshevitz; *A. tentoense* (Honda) Kitagawa; *Helictotrichon asiaticum* (Roshevitz) Grossheim.

Plant 20–50 cm tall. Panicle 4–8 cm, dense, branches usually bearing a single spikelet. Spikelets golden brown.

Mountain meadows and rocky mountain slopes; below 3500 m. Qinghai, Sichuan, Xinjiang, Yunnan [Mongolia, Russia; North America].

3b. *Helictotrichon hookeri* subsp. *schellianum* (Hackel) Tzvelev, Novosti Sist. Vyssh. Rast. 8: 68. 1971.

奢异燕麦 *she yi yan mai*

Avena schelliana Hackel, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 419. 1892; *Avenula hookeri* (Scribner) Holub subsp. *schelliana* (Hackel) M. N. Lomonosova; *A. schelliana* (Hackel) W. Sauer & H. Chmelistschek; *Helictotrichon schellianum* (Hackel) Kitagawa.

Plant 30–80 cm tall. Panicle 5–15 cm, contracted, branches bearing up to 4 spikelets. Spikelets silvery green, sometimes tinged brownish or violet.

Hill slopes in steppe, rocky slopes, forest margins. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

4. *Helictotrichon abietetorum* (Ohwi) Ohwi, Acta Phytotax. Geobot. 6: 151. 1937.

冷杉异燕麦 *leng shan yi yan mai*

Avena abietetorum Ohwi, Acta Phytotax. Geobot. 2: 162. 1933 [*“abietorum”*], emend. Ohwi, J. Jap. Bot. 17: 441. 1941; *Helictotrichon hideoi* (Honda) Ohwi subsp. *abietetorum* (Ohwi) T. Koyama.

Perennial. Culms tufted, erect, 20–45 cm tall, 1–3-noded. Leaf sheaths often longer than internodes, glabrous; leaf blades linear, flat or rolled, 10–30 cm, 2–4 mm wide, abaxial surface smooth, glabrous, adaxial surface densely puberulous; ligule ca. 0.5 mm or absent, margin ciliate. Panicle loose, narrowly lanceolate in outline, 10–15 cm; branches 2–4 per node, ascending, 4–5 cm, scabrid, bare in lower part, each bearing 1 or 2 spikelets. Spikelets ca. 1 cm, yellowish green or purplish, florets usually 3; rachilla hairs 2–2.5 mm; lower glume narrow ovate, 4.2–7 mm, 1(–2)-veined, upper glume 6.3–8.3 mm, 3-veined; lemmas herbaceous with membranous apex, 7-veined, first lemma 7.5–9 mm, smooth, apex usually subentire, occasionally splitting into 2 teeth; awn arising at upper 2/5 of lemma, 1.2–1.6 cm, geniculate, column loosely twisted, terete; palea keels ciliate. Anthers 2.5–3 mm.

- High mountain peaks; ca. 3000 m. Taiwan.

5. *Helictotrichon leianthum* (Keng) Ohwi, J. Jap. Bot. 17: 440. 1941.

光花异燕麦 *guang hua yi yan mai*

Avena leiantha Keng, Bull. Fan Mem. Inst. Biol., Bot. 7: 35. 1936.

Perennial. Culms tufted, erect, up to 80 cm tall, 2–3-noded, glabrous or sparsely retrorsely pubescent below nodes. Leaf sheaths lax, glabrous; leaf blades flat or involute when dry, 10–30 cm, 3–6 mm wide, abaxial surface glabrous, adaxial surface pubescent, apex acuminate; ligule truncate, ca. 1 mm. Panicle loose, 15–18 cm, nodding; branches in distant pairs, slender, often flexuous, scabrid, lower ca. 7 cm, bearing up to 4 spikelets in upper part. Spikelets 1–1.3 cm, pale green, florets 3–4; rachilla internodes glabrous toward base, hairs in upper part 1–2 mm; lower glume 4.6–5 mm, 1-veined, upper glume 5–7 mm, 3-veined; lemmas subleathery with hyaline apex, lowest 9–10 mm, 7-veined, smooth, apex subentire, minutely denticulate; awn 1.5–2 cm, weakly geniculate, column loosely twisted, terete; palea keels ciliate, hairs ca. 0.3 mm. Anthers 3–3.5 mm. Fl. and fr. May–Jul.

- Under forests in high mountains, mountain valleys, shady mountain slopes, damp places; 700–3700 m. Anhui, Gansu, Guizhou, Hubei, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang (Lin'an).

This is an element of the *Helictotrichon junghuhnii* complex with rather short rachilla hairs confined to the upper part of the rachilla internode, a more or less undivided lemma apex, and conspicuously ciliate palea keels. It is very similar to *H. hideoi* (Honda) Ohwi from Japan, which also has a subentire lemma apex, but differs by its pubescent leaf sheaths and awn arising slightly higher on the lemma back.

6. *Helictotrichon yunnanense* B. S. Sun & S. Wang, J. Yunnan Univ. 15: 188. 1993.

滇异燕麦 *dian yi yan mai*

Perennial, shortly rhizomatous. Culms loosely tufted, 60–70 cm tall, 3–4-noded, lower internodes villous, especially be-

low nodes. Leaf sheaths densely villous, usually longer than internodes; leaf blades broadly linear, flat, tough, 15–18 cm, 5–8 mm wide, abaxial surface asperulous, adaxial surface prominently ridged, hispid, apex subacute; ligule truncate, ca. 1 mm, back hairy, margin ciliate. Panicle loose, 20–30 cm, many spiculate; branches in whorls of up to 8, lower 8–10 cm, scabrid, with branchlets and spikelets throughout length. Spikelets 1.2–1.5 cm, green or tinged purplish, florets 3–5, spaced; rachilla filiform, hairs ca. 3.5 mm; glumes lightly keeled, keel scabrid, apex acuminate, lower glume ca. 5 mm, 1-veined, upper glume ca. 10 mm, 3-veined; lemmas papery with membranous apex, lowest ca. 10 mm, 5-veined, smooth, apex acuminate or splitting into 2 acuminate-mucronate teeth; awn ca. 1.5 cm, gently curved or almost straight, slightly twisted in lower half, terete; palea keels scabrid-ciliolate. Anthers 3.2–3.5 mm. Fl. and fr. summer to autumn.

- Mountain slopes; ca. 3500 m. NW Yunnan (Zhongdian).

This distinctive species is easily recognizable by its densely villous leaf sheaths and lower culm internodes, many-spiculate panicle with whorled branches, slender, elongate rachilla internodes, and only slightly curved awn.

7. *Helictotrichon altius* (Hitchcock) Ohwi, J. Jap. Bot. 17: 440. 1941.

高异燕麦 gao yi yan mai

Avena altior Hitchcock, Proc. Biol. Soc. Washington 43: 96. 1930; *Avenastrum trisetoides* Kitagawa.

Perennial, shortly rhizomatous. Culms erect from shortly decumbent base, solitary or few, 1–1.2 m tall, 3–4-noded, nodes pubescent. Leaf sheaths usually shorter than internodes, densely puberulous or basal sheaths glabrous; leaf blades broadly linear, flat, ca. 15 cm, 3–8 mm wide, abaxial surface pubescent, scabrid, adaxial surface pilose, or sometimes glabrous; ligule truncate or erose, 1–2 mm, margin ciliolate. Panicle loose, lanceolate to oblong in outline, 10–20 cm; branches 4–6 per node, ascending, slender, often flexuous, up to 7 cm, scabrid, lower part bare, upper part bearing 1–3 spikelets. Spikelets 0.8–1.4 cm, yellowish green or purplish green, florets 3–4(–5); rachilla hairs 2–3 mm; glumes thinly membranous, lower glume 4–7 mm, 1-veined, upper glume 8–11 mm, 3-veined; lemmas leathery, lowest ca. 9 mm, 5–7-veined, smooth; awn 1–1.5 cm, geniculate, column twisted, terete; palea keels ciliolate. Anthers 4–5 mm. Fl. and fr. Jul–Aug.

- Moist grassy slopes, under shrubs, *Picea* forests; 2000–4000 m. Gansu, Heilongjiang, Ningxia, Qinghai, Sichuan.

This is an element of the *Helictotrichon junghuhnii* complex, mainly distinguished by the hairy culm nodes.

8. *Helictotrichon junghuhnii* (Buse) Henrard, Blumea 3: 425. 1940.

变绿异燕麦 bian lü yi yan mai

Avena junghuhnii Buse in Miquel, Pl. Jungh., Gramineae, preprint, 15. 1854; *A. aspera* Munro ex Thwaites var. *roylei* J. D. Hooker; *Helictotrichon virescens* (Nees ex Steudel) Henrard; *Trisetum virescens* Nees ex Steudel.

Perennial. Culms loosely tufted, erect, 60–120 cm tall, 3–

5-noded. Leaf sheaths usually longer than internodes, basal sheaths densely pubescent, upper sheaths glabrous; leaf blades flat or margins involute, 10–25 cm, 3–5 mm wide, scabrid or adaxial surface thinly pubescent, apex acuminate; ligule truncate, 1–2 mm. Panicle loose, up to 20 cm, erect or nodding; branches 2–4 per node, ascending or spreading, lower 5–12 cm, slender, scabrid, bare in lower part, with up to 9 spikelets. Spikelets 1–1.4 cm, greenish or purplish, florets 2–5; rachilla hairs 1–2 mm; glumes hyaline at margins and apex, lower glume 4–9 mm, 1–3-veined, upper glume 7–10 mm, 3–5-veined; lemmas subleathery with hyaline apex, lowest 9–11 mm, 5–7-veined, scabrid at least toward apex, apex 2-lobed, lobes acuminate or shortly awn-pointed; awn 1–2 cm, weakly geniculate, column loosely twisted, terete; palea keels minutely ciliolate to ciliate with 0.1–0.2 mm hairs. Anthers 2–3.5 mm. Fl. and fr. Jun–Aug.

Grassy mountain slopes, forests, damp places; 2000–3900 m. Guizhou, Henan, Qinghai, Shaanxi, Sichuan, E Xizang, Yunnan [Bhutan, India, Indonesia, Myanmar, Nepal, Pakistan].

The publication of the name *Avena junghuhnii* in Buse's preprint in February 1854 shortly predates the publication of *Trisetum virescens* by Steudel in April 1854.

This taxon lies at the center of a polymorphic complex extending from Pakistan and India to China and mountains in SE Asia. Variation within the complex is poorly understood and requires further investigation. Variable characters include lemma scabridity and apex, length and quantity of rachilla hairs, length of the cilia on the palea keels, and anther length. The midline of the lemma above the awn insertion is very fragile, frequently splitting into acuminate lobes, but sometimes remaining almost entire, even within the same panicle.

The name *Helictotrichon polyneuron* (J. D. Hooker) Henrard has been misapplied in China to specimens of *H. junghuhnii*. This member of the *H. junghuhnii* complex is known only from the Nilgiri Hills of S India. It is distinguished by its open, ovate panicle with smooth, widely spreading panicle branches and large, brownish spikelets with many prominent veins.

9. *Helictotrichon delavayi* (Hackel) Henrard, Blumea 3: 427. 1940.

云南异燕麦 yun nan yi yan mai

Avena delavayi Hackel, Oesterr. Bot. Z. 52: 189. 1902.

Perennial. Culms erect, slender, 35–50 cm tall, 2–3-noded. Leaf sheaths tight, shorter than internodes, puberulous near margins, otherwise glabrous; leaf blades narrowly linear, flat or margins involute, stiff, 6–11 cm, 1.5–2 mm wide, abaxial surface of lower blades pubescent, both surfaces scabrid, apex acute; ligule truncate, 1.5–2 mm. Panicle ovate-oblong in outline, 5–10 cm, slightly nodding; branches usually paired, lower ca. 6 cm, scabrid, bearing 2–4 spikelets in distal part. Spikelets 0.8–1 cm, green variegated yellow and purple, florets 3–4; rachilla shortly bearded; lower glume 5.5–7 mm, 1-veined, upper glume 7–8 mm, 3-veined; lemmas firm with scarious apex, lowest 7.5–9 mm, 5-veined, scaberulous, apex 2-toothed, teeth acuminate-mucronate; awn 1.3–1.5 cm, geniculate with twisted column, terete; palea slightly shorter than lemma, keels ciliolate. Anthers 2–2.5 mm. Fl. and fr. Jun–Aug.

• Montane meadows, forests; 2100–3700 m. Shaanxi, Sichuan, Yunnan.

This is a small, narrow-leaved variant from the *Helictotrichon junghuhii* complex.

10. *Helictotrichon schmidii* (J. D. Hooker) Henrard, *Blumea* 3: 427. 1940.

粗糙异燕麦 *cu cao yi yan mai*

Perennial. Culms tufted, 50–70 cm tall, 3-noded. Leaf sheaths densely pubescent; leaf blades flat, folded or rolled, mainly basal, 7–12 cm, 2–4 mm wide, scabrid or pubescent; ligule truncate, ca. 2 mm, usually lacerate. Panicle narrowly contracted, linear-oblong, 10–17 cm; branches 2 or 3 per node, lowest up to 3.5 cm, erect, scaberulous or pubescent, bearing branchlets and short-pedicelled spikelets to base. Spikelets 0.7–1 cm, greenish or purplish, florets usually 3; rachilla hairs ca. 1 mm; glumes membranous, lower glume (1.5–)4–6 mm, 1-veined, upper glume (3–)5.5–7 mm, 3-veined, apex acuminate-mucronate; lemmas herbaceous with membranous apex, lowest 6–7 mm, 5–7-veined, densely scabrid, sometimes with a few scattered hairs, awned from upper 1/5–1/3, apex 2-toothed, teeth acuminate-aristulate; awn 0.5–1 cm, reflexed from near base, scarcely twisted, terete; palea keels scabrid-ciliolate, hairs ca. 0.1 mm. Anthers 1.4–2 mm. Fl. and fr. Apr–Aug.

Grassy clearings in forests, riversides, ditches; 2000–3300 m. Guizhou, Sichuan, Yunnan [S India].

This species is otherwise known only from the hills of S India. The awn arises higher on the lemma back than usual and is outwardly curved rather than geniculate. The Indian population has longer lemmas (7–9 mm).

Trisetum lautum Chrtk (Folia Geobot. Phytotax. 25: 333. 1990), described from Yunnan, may be the same as this species. The type has not been seen.

- 1a. Panicle densely spiculate; spikelets 0.8–1 cm; lower glume 4–6 mm, upper glume 5.5–7 mm 10a. var. *schmidii*
 1b. Panicle loose and delicate, branches spaced; spikelets ca. 0.7 cm; lower glume 1.5–3.5 mm, upper glume 3–5.5 mm 10b. var. *parviglumum*

10a. *Helictotrichon schmidii* var. *schmidii*

粗糙异燕麦(原变种) *cu cao yi yan mai* (yuan bian zhong)

Avena aspera Munro ex Thwaites var. *schmidii* J. D. Hooker, Fl. Brit. India 7: 277. 1896 [“1897”].

Culms relatively stout, erect. Panicle densely contracted, many spiculate; branches 2–3 per node. Spikelets 0.8–1 cm; lower glume 4–6 mm, upper glume 5.5–7 mm. Fl. and fr. Apr–Aug.

Grassy clearings in forests, ditches; 2000–3300 m. Guizhou, Sichuan, Yunnan [S India].

10b. *Helictotrichon schmidii* var. *parviglumum* Keng ex Z. L. Wu, Acta Biol. Plateau Sin. 2: 15. 1984.

小颖异燕麦 *xiao ying yi yan mai*

Culms slender, delicate. Panicle sparse; branches short,

spaced, bearing 1–3 spikelets. Spikelets ca. 0.7 cm; lower glume 1.5–3.5 mm, upper glume 3–5.5 mm. Fl. and fr. Apr–Sep.

• Riversides, moist places, forests; 2800–3300 m. Sichuan, Yunnan.

The identity and status of this taxon require confirmation.

11. *Helictotrichon potaninii* Tzvelev, Rast. Tsent. Azii 4: 101. 1968.

短药异燕麦 *duan yao yi yan mai*

Perennial, loosely tufted. Culms erect from ascending base, 25–50 cm tall, 2–3-noded. Leaf sheaths smooth, glabrous; leaf blades narrowly linear, flat, 5–20 cm, 2–4 mm wide, adaxial surface slightly scabrid or sparsely pilose, abaxial surface almost smooth; ligule 1.5–3.5 mm, margin lacerate. Panicle dense, spikelet-like, narrowly oblong in outline, 5–9 cm, often interrupted, slightly nodding; branches very short, scabrid. Spikelets 0.7–0.9 cm, reddish violet, florets 3–4; rachilla hairs 2–4 mm; glumes unequal, lower glume ca. 5 mm, 1-veined, upper glume ca. 7 mm, 3-veined; lemmas firm with membranous apex, 6–9.5 mm, scaberulous, apex finely 2-toothed; awn 1–1.4 cm, geniculate, column twisted, terete; palea keels ciliolate. Anthers 1–1.6 mm. Fl. Jun–Jul.

• High mountain forests; 3900–4200 m. Sichuan.

12. *Helictotrichon tibeticum* (Roshevitz) J. Holub, Preslia 31: 50. 1959.

藏异燕麦 *zang yi yan mai*

Perennial, densely tufted. Culms erect, 15–100 cm tall, 2–3-noded, pubescent below panicle. Leaf sheaths densely pubescent or sometimes glabrous; leaf blades filiform, often rolled, 15–30 cm, 1–2 mm wide, densely pubescent on both surfaces, or sometimes scabrid; ligule 0.3–0.5 mm, margin ciliate. Panicle contracted, often dense and spikelet-like, ovate to oblong in outline, 2–6(–14) cm, rachis, branches, and pedicels all densely pubescent; branches suberect, 0.5–5 cm, lower with 4–7 spikelets. Spikelets 0.7–1.2 cm, golden brown or dark brown, florets 2–4; rachilla hairs 1.5–2 mm; glumes membranous, lower glume 7–9 mm, 1-veined, upper glume 8–11 mm, 3-veined; lemmas firmly papery, lowest 6–8.5 mm, 5–7-veined, scaberulous or puberulous, apex minutely 2-toothed or entire; awn 1–1.5 cm, weakly geniculate, column loosely twisted, terete; palea keels ciliolate. Anthers 3–4.2 mm. Fl. and fr. Jun–Sep.

• Rocky mountain slopes, alpine steppe, among shrubs; 2600–4600 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xinjiang (Tian Shan), Xizang, Yunnan.

This is a handsome species with contracted, golden brown panicles.

- 1a. Panicle densely contracted, 2–6 cm; spikelets with 2(–3) florets 12a. var. *tibeticum*
 1b. Panicle laxly contracted, 6–14 cm; spikelets with 3–4 florets 12b. var. *laxiflorum*

12a. *Helictotrichon tibeticum* var. *tibeticum*

藏异燕麦(原变种) *zang yi yan mai* (yuan bian zhong)

Avena tibetica Roshevitz, Izv. Glavn. Bot. Sada RSFSR 27: 98. 1928; *A. suffusca* Hitchcock; *Helictotrichon suffusum* (Hitchcock) Ohwi; *H. tibeticum* var. *suffusum* (Hitchcock) Tzvelev.

Culms 15–70 cm tall. Panicle densely contracted, spike-like, ovate to oblong in outline, 2–6 cm; branches 0.5–1.3 cm. Spikelets with 2(–3) florets. Fl. and fr. Jun–Sep.

• Rocky mountain slopes, alpine steppe, among shrubs; 2600–4600 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xinjiang (Tian Shan), Xizang, Yunnan.

12b. *Helictotrichon tibeticum* var. *laxiflorum* Keng ex Z. L. Wu, Acta Biol. Plateau Sin. 2: 16. 1984.

疏花藏异燕麦 shu hua zang yi yan mai

Culms 50–100 cm tall. Panicle laxly contracted, narrowly elliptic in outline, 6–14 cm; branches up to 5 cm. Spikelets with 3–4 florets. Fl. Jun–Jul.

• Mountain slopes, meadow steppe; 3200–3400 m. Qinghai, Sichuan.

13. *Helictotrichon tianschanicum* (Roshevitz) Henrard, Blumea 3: 429. 1940.

天山异燕麦 tian shan yi yan mai

Avenastrum tianschanicum Roshevitz, Izv. Bot. Sada Akad. Nauk SSSR 30: 773. 1932.

Perennial, densely tufted. Culms erect, 14–50 cm tall, glabrous below panicle. Leaf sheaths usually densely pubescent; leaf blades filiform, 1/8–1/2 length of culms, 1.5–3 mm wide, scabrid on adaxial surface; ligule of basal leaves 2–3 mm, of culm leaves less than 1 mm. Panicle contracted, oblong in outline, 4–8 cm; branches suberect, short, puberulous, with few spikelets. Spikelets 0.9–1.1 cm, yellowish brown variegated violet, florets 2–3; rachilla bearded; lower glume 8–10 mm, 1–3-veined, upper glume 9–11 mm, 3–5-veined; lowest lemma 7–8 mm, 5–7-veined, apex denticulate; awn ca. 1.5 cm, geniculate, column twisted, terete; palea keels ciliate. Ovary apex hairy; hilum linear.

late, column twisted, terete; palea keels ciliate. Anthers ca. 3 mm. Fl. and fr. Jul–Sep.

Shady places on mountain slopes, forests; 1400–2700 m. Xinjiang (Tian Shan) [Kazakhstan (Tien Shan), Tajikistan (Pamirs)].

Several species of *Helictotrichon*, including *H. tianschanicum* and *H. mongolicum*, have been described by Russian authors from the mountain ranges bordering Xinjiang and Mongolia. The described differences between them are very slight and may perhaps refer to geographic races rather than species. It has not been possible to study variation nor to verify their identity.

Helictotrichon altaicum Tzvelev (*H. desertorum* subsp. *altaicum* (Tzvelev) Holub), described from Mongolia, has been reported in Xinjiang. It differs mainly in the presence of a continuous ring of subepidermal sclerenchyma in the leaf blades, which is lacking in *H. tianschanicum* and *H. mongolicum*.

14. *Helictotrichon mongolicum* (Roshevitz) Henrard, Blumea 3: 431. 1940.

蒙古异燕麦 meng gu yi yan mai

Avena mongolica Roshevitz, Izv. Glavn. Bot. Sada SSSR 27: 96. 1928.

Perennial, densely tufted. Culms erect, 12–16 cm tall, glabrous or scabrid, 1–2-noded. Leaf sheaths glabrous or minutely puberulous; leaf blades filiform, 15–30 cm, 1.5–2 mm wide, puberulous on adaxial surface; ligule of basal leaves 2–3 mm, of culm leaves ca. 0.5 mm, margin puberulous. Panicle contracted or rather lax, 3–9 cm, often somewhat 1-sided; branches paired, 1–2 cm, puberulous. Spikelets 1–1.2 cm, yellowish brown or variegated violet, florets 3; rachilla bearded; glumes 9–11 mm, lower glume 1-veined, upper glume 3-veined; lowest lemma 8–10 mm, 5–7-veined, apex 2-toothed; awn 1.3–1.5 cm, geniculate, column twisted, terete; palea keels scabrid. Anthers ca. 4 mm. Fl. and fr. Jun–Sep.

Montane forests, subalpine meadows, riversides; 1200–2700 m. Xinjiang [Kazakhstan (Tarbagatai Mountains), Mongolia, Russia (Siberia)].

76. *ARRHENATHERUM* P. Beauvois, Ess. Agrostogr. 55. 1812.

燕麦草属 yan mai cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennial. Culms tall, basal internodes often swollen into globose corms. Leaf blades linear, flat. Inflorescence a moderately dense panicle. Spikelets weakly laterally compressed, florets 2, dimorphic, sometimes with an additional rudiment, lower floret staminate and strongly awned, upper floret bisexual and weakly awned or awnless; rachilla disarticulating above glumes but not between florets, extended beyond terminal floret; glumes unequal, thin, lower glume 1/2 spikelet length or more, 1-veined, upper glume as long as spikelet, 3-veined; lemmas firmly membranous to subleathery, rounded on back, 5–9-veined, apex 2-denticulate; lower lemma awned from near base, awn geniculate with twisted column, exerted from spikelet; upper lemma with a short straight awn or awnless; palea slightly shorter than lemma, keels ciliate. Ovary apex hairy; hilum linear.

Seven species: SW Asia, Europe, Mediterranean region; one species (introduced) in China.

1. *Arrhenatherum elatius* (Linnaeus) P. Beauvois ex J. Presl & C. Presl, Fl. Čech. 17. 1819.

燕麦草 yan mai cao

Culms erect or geniculate at base, rather stout, 1–1.5 m

tall, 4–5-noded. Leaf sheaths loose, glabrous; leaf blades 14–30 cm, 3–9 mm wide, scabrid or abaxial surface smooth, apex acuminate; ligule 1–3 mm, obtuse or truncate. Panicle lanceolate to oblong in outline, loose to rather dense, 10–25 cm, greenish or purplish, shining; branches clustered, scabrid. Spikelets oblong, 7–9 mm, florets separated by short rachilla inter-

node not more than 0.6 mm; glumes lanceolate, apex acute; lower glume 4–6 mm, upper glume equal to spikelet, punctiform scabrid; lemmas oblong-lanceolate, 7–9 mm, sparsely pubescent in lower 1/3 or glabrous, scabrid in upper 1/3; awn of lower lemma 1–2 cm, arising from lower 1/3 of lemma back; awn of upper lemma 1–2 mm, arising above middle or near apex. Anthers 4–5 mm. $2n = 28$.

Introduced to China as an ornamental garden plant and for forage [native to Russia; N Africa, SW Asia, Europe; introduced to Australia and North America].

- 1a. Basal internodes of culm not swollen into globose corms 1a. var. *elatius*
 1b. Basal internodes of culm swollen into globose corms 1b. var. *bulbosum*

1a. *Arrhenatherum elatius* var. *elatius*

燕麦草(原变种) *yan mai cao* (yuan bian zhong)

Avena elatior Linnaeus, Sp. Pl. 1: 79. 1753.

Basal internodes of culm not swollen into globose corms; nodes usually glabrous.

Introduced to China as an ornamental and for forage [native to Russia; N Africa, SW Asia, Europe].

1b. *Arrhenatherum elatius* var. *bulbosum* (Willdenow) Spenner, Fl. Friburg. 1: 113. 1825.

球茎燕麦 *qiu jing yan mai*

Avena bulbosa Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 2: 116. 1799; *Arrhenatherum avenaceum* P. Beauvois var. *nodosum* Reichenbach, nom. illeg. superfl.; *A. bulbosum* (Willdenow) C. Presl; *A. elatius* subsp. *bulbosum* (Willdenow) Schübler & G. Martens; *A. elatius* var. *nodosum* Hubbard, nom. illeg. superfl.; *Holcus avenaceus* Scopoli var. *bulbosus* (Willdenow) Gaudin; *H. bulbosus* (Willdenow) Schrader.

Basal internodes of culm swollen into globose corms 6–10 mm in diam.; nodes often hairy.

Cultivated in China as an ornamental garden plant [native to SW Europe].

A variegated form with white margins to the leaf blades has been named *Arrhenatherum elatius* f. *variegatum* Hitchcock (银边草 *yin bian cao*).

77. *AVENA* Linnaeus, Sp. Pl. 1: 79. 1753.

燕麦属 *yan mai shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals. Culms erect, fairly robust. Leaf blades linear, flat; ligule membranous. Inflorescence a large loose panicle. Spikelets large, pendulous, oblong to gaping, florets 2 to several, the uppermost reduced; rachilla pilose or glabrous, disarticulating below each floret or only below the lowest, or not disarticulating (cultivated species); glumes lanceolate to elliptic, usually subequal and as long as spikelet, rarely strongly unequal or shorter than spikelet, herbaceous to membranous, 7–11-veined, back rounded, smooth, apex acuminate; floret callus acute to pungent, bearded; lemmas lanceolate-oblong, usually leathery, occasionally papery, back rounded, 5–9-veined, glabrous to hispid, awned usually from near middle of back, apex papery, 2-toothed to 2-fid, lobes sometimes extended into fine bristles, awn geniculate with twisted column, sometimes reduced or absent (cultivated species); palea usually shorter than lemma, keels ciliate. Ovary densely hairy. Caryopsis with long linear hilum.

About 25 species: centered on the Mediterranean region and SW Asia, extending to N Europe and N Asia, widely introduced to other temperate and cold regions; five species (all introduced) in China.

Avena includes several species cultivated as cereal crops (oats) and is also used for fodder and fiber production. A few species have become widespread as weeds of crops in temperate regions.

Avena barbata Pott ex Link and *A. eriantha* Durieu, native from the Mediterranean to C Asia, are mentioned (FRPS 9(3): 168. 1987) as cultivated in China.

- 1a. Rachilla tough, spikelets not regularly disarticulating; cultivated plants.
 2a. Glumes as long as spikelet; lemmas leathery, distinctly veined in upper half; rachilla internodes short, straight; grains not free threshing 1. *A. sativa*
 2b. Glumes conspicuously shorter than spikelet; lemmas papery, distinctly veined throughout; rachilla internodes elongate, sometimes sinuous; grains free threshing.
 3a. Spikelets 2.5–3.5(–4.5) cm, florets 3–7; lemma apex shortly and obtusely 2–4-toothed; grain ca. 8 mm 2. *A. chinensis*
 3b. Spikelets 2–2.5(–3.5) cm, florets 2–4; lemma apex with 2 slenderly acuminate teeth; grain ca. 6 mm 3. *A. nuda*
 1b. Rachilla disarticulating below each floret, or at least below lowest; wild plants.
 4a. Rachilla disarticulating only below lowest floret, only lowest floret with a basal callus.
 5a. Lower glume \pm equal to upper glume 4. *A. sterilis*
 5b. Lower glume much shorter than upper glume *A. eriantha* (see note above)
 4b. Rachilla disarticulating below each floret, each floret with a basal callus.
 6a. Lemma apex 2-toothed or 2-fid, but lacking apical bristles 5. *A. fatua*
 6b. Lemma apex 2-fid, each lobe with a fine apical bristle *A. barbata* (see note above)

1. *Avena sativa* Linnaeus, Sp. Pl. 1: 79. 1753.燕麦 *yan mai*

Annual. Culms solitary or tufted, erect, 40–180 cm tall, unbranched. Leaf sheaths usually glabrous; leaf blades 15–30 cm, 4–10 mm wide, glabrous, margins sometimes scaberulous; ligule 3–6 mm. Panicle loose and open or contracted, 20–40 cm, nodding; branches spreading or contracted. Spikelets 2–3 cm, florets 2(or 3); rachilla \pm glabrous, straight, not disarticulating or fracturing irregularly at maturity, florets lacking a basal bearded callus, internodes short, less than 0.5 mm; glumes lanceolate, subequal, as long as spikelet, 7–9-veined; lemmas 1.2–2.5 cm, leathery in lower half, herbaceous and distinctly veined above, glabrous or nearly so, apex minutely and irregularly 2–4-denticulate; awn 2.5–3.5 cm, weakly geniculate or rudimentary or absent. Grain adherent to lemma and palea at maturity. $2n = 42$.

Widely cultivated in China [of cultivated origin].

This species is cultivated as a cereal crop (oats) in north-temperate regions of the world, and also as a green fodder crop. Genetic evidence points to *Avena sterilis* as the wild ancestor of *A. sativa*, and *A. fatua* as a weedy derivative. Hybrids between *A. sativa* and *A. fatua* with hairy florets or well-developed awns may occur where the two species grow together.

2. *Avena chinensis* (Fischer ex Roemer & Schultes) Metzger, Eur. Cereal. 53. 1824.莠麦 *you mai*

Avena nuda Linnaeus var. *chinensis* Fischer ex Roemer & Schultes, Syst. Veg. 2: 669. 1817; *A. sativa* subsp. *chinensis* (Fischer ex Roemer & Schultes) Janchen ex Holub.

Annual. Culms 60–100 cm tall. Leaf blades 8–40 cm, 3–16 mm wide, scabrid. Panicle open, 12–20 cm; branches scabrid. Spikelets 2.5–3.5(–4.5) cm, florets 3–7; rachilla glabrous, not disarticulating at maturity, florets lacking a basal bearded callus, internodes elongate, sinuous, upper sometimes strongly curled; glumes broadly lanceolate, subequal, conspicuously shorter than spikelet, 1.5–2.5 cm, 7–11-veined; lemmas 2–2.5 cm, papery, distinctly veined throughout, glabrous, awned from upper 1/4 of lemma, apex with 2–4 small obtuse teeth; awn 1–2 cm, straight or bent, rarely awnless. Grain ca. 8 mm, free from lemma and palea at maturity (free threshing). Fl. and fr. Jun–Aug.

Cultivated, or naturalized along roadsides and on arable land; 1000–3200 m. Hebei, Henan, Hubei, Xinjiang, Yunnan [Russia; Europe].

More work is needed on *Avena chinensis*. It is very close to *A. nuda*, and may not be distinct from it. These naked wheats may be no more than free-threshing forms of *A. sativa*, caused by occasional mutations, and are perhaps better placed at infraspecific rank within *A. sativa*.

The name *Avena gracillima* Keng (Bull. Fan Mem. Inst. Biol., Bot. 7: 36. 1936), described from Hebei, is based on a very depauperate specimen with a panicle of only 1 or 2 spikelets. The spikelets are 1.4–1.8 mm long with herbaceous, glabrous lemmas and rudimentary awns. It is clearly a cultivated species, growing as a weed on grassy slopes, most likely referable to *A. chinensis*. The type has not been seen.

3. *Avena nuda* Linnaeus, Demonstr. Pl. 3. 1753.裸燕麦 *luo yan mai*

Avena sativa Linnaeus var. *nuda* (Linnaeus) Koernicke.

Annual. Culms 45–90 cm tall. Leaf blades up to 20 cm, 3–7 mm wide, scaberulous. Panicle somewhat contracted, up to 25 cm. Spikelets 1.8–2.5(–3.5) cm, florets 2–4, lower 1 or 2 florets awned, upper florets awnless; rachilla glabrous, not disarticulating at maturity, florets lacking a basal bearded callus; glumes lanceolate, subequal, conspicuously shorter than spikelet, 7–9-veined; lemmas 1.5–2 cm, papery, distinctly veined throughout, glabrous, awned from ca. upper 1/3, apex 2-toothed, teeth slenderly acuminate, up to 4 mm; awn 1.5–2 cm, bent but not twisted. Grain ca. 6 mm, free from lemma and palea at maturity (free threshing). $2n = 42$.

Cultivated; 2300–3300 m. Hubei, C and N Yunnan [Russia; Europe].

This is a minor crop, seldom cultivated nowadays. It is used for flour and also for animal fodder. It is a European species, but has been recently recorded as cultivated in Yunnan.

The place of publication of this species is sometimes cited as Amoen. Acad. 3: 401. 1756. The *Amoenitates Academicae* are a collection of reissued Linnaean dissertations. *Avena nuda* was validly published in the original dissertation in 1753.

4. *Avena sterilis* Linnaeus subsp. *ludoviciana* (Durieu) Nyman, Consp. Fl. Eur. 810. 1882.长颖燕麦 *chang ying yan mai*

Avena ludoviciana Durieu, Actes Soc. Linn. Bordeaux 20: 41. 1855.

Annual. Culms solitary or tufted, erect or ascending, 50–120 cm tall, unbranched, 2–4-noded. Leaf sheaths glabrous or basal sheaths puberulous; leaf blades up to 60 cm, 4–13 mm wide, scaberulous, glabrous; ligule 3–4 mm. Panicle loose, open, pyramidal, 13–30 cm, nodding; branches coarsely scabrid. Spikelets 2–3 cm, florets 2 or 3, 2-awned; rachilla disarticulating only below lowest floret, florets falling together at maturity, only lowest floret with a bearded callus, internodes glabrous; glumes narrowly elliptic-oblong, subequal, as long as spikelet, 7–9-veined, apex finely acuminate; callus hairs up to 5 mm; lemmas 1.8–2.5 cm, leathery, hispid, finally brown in lower half, green and scabrid above, awned at about lower 1/3, apex finely 2-fid; awn 3–6 cm, fairly slender, strongly geniculate, column dark brown, pubescent. $2n = 42$.

Arable weed, adventive. Yunnan [native to SW Asia and Europe].

This is a noxious weed of arable land, especially fields of cereals, native to the Mediterranean region and SW Asia, but now widespread in warm-temperate regions of the world. It has been recorded in China only from Yunnan.

The typical subspecies, *Avena sterilis* subsp. *sterilis*, is distinguished by its larger, 3–5 cm spikelets with 3–5 florets, 9–11-veined glumes, and stouter, 6–9 cm awns. Both subspecies occur over the whole range of the species.

5. *Avena fatua* Linnaeus, Sp. Pl. 1: 80. 1753.野燕麦 *ye yan mai*

Annual. Culms erect or geniculate at base, 50–150 cm tall, unbranched, 2–4-noded. Leaf sheaths glabrous or basal sheaths puberulous; leaf blades 10–30 cm, 4–12 mm wide, scabrid or adaxial surface and margins pilose; ligule 1–5 mm. Panicle narrowly to broadly pyramidal, 10–40 cm, nodding; branches scabrid. Spikelets 1.7–2.5 cm, florets 2 or 3, all florets awned; rachilla easily disarticulating below each floret at maturity, each floret with a bearded callus, internodes hirsute or glabrous; glumes lanceolate, subequal, herbaceous, 9–11-veined, apex finely acute; callus hairs up to 4 mm; lemmas 1.5–2 cm, leathery, glabrous to densely hispid in lower half, green and scaberulous above, awned from near middle, apex shortly 2–4-toothed; awn 2–4 cm, geniculate, column twisted, blackish brown. Fl. and fr. Apr–Sep. $2n = 42$.

Weed of cultivated fields, grassy mountain slopes, roadsides and other disturbed places; below 4300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India (Sikkim), Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

This is a noxious weed, especially in fields of wheat and cultivated oats, native to Europe and C and SW Asia, but now spread throughout temperate regions of the world.

- 1a. Lemmas hispid in lower half, dark brown at maturity 5a. var. *fatua*

- 1b. Lemmas glabrous, yellow at maturity 5b. var. *glabrata*

5a. *Avena fatua* var. *fatua*

野燕麦(原变种) ye yan mai (yuan bian zhong)

Avena fatua subsp. *meridionalis* Malzev; *A. meridionalis* (Malzev) Roshevitz.

Lemmas densely to sparsely hispid below middle with white or brownish hairs, becoming dark brown at maturity. Fl. and fr. Apr–Sep.

Disturbed places and as an arable weed; below 4300 m. Distribution as for the species.

5b. *Avena fatua* var. *glabrata* Petermann, Fl. Bienitz 13. 1841.

光稃野燕麦 guang fu ye yan mai

Avena fatua var. *mollis* Keng.

Lemmas glabrous (callus often bearded), yellowish at maturity.

Grassy mountain slopes, roadsides, farmlands; below 4300 m. Distribution as for the species.

Glabrous forms may be found growing with hairy forms, and are of little taxonomic importance.

78. *TRisetum* Persoon, Syn. Pl. 1: 97. 1805.

三毛草属 san mao cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, tufted, sometimes shortly rhizomatous. Leaf blades narrowly to broadly linear, usually flat; ligule membranous. Inflorescence a moderately lax to spikelike panicle, shining. Spikelets with 2 or 3 florets, disarticulating below each floret; rachilla shortly bearded, extended beyond uppermost floret, tipped by a reduced or vestigial floret; glumes lanceolate, unequal or subequal, shorter than spikelet, keeled, herbaceous or membranous, margins broad, hyaline, lower glume 1(–3)-veined, upper glume 3-veined, apex acute or acuminate; floret callus glabrous or shortly bearded; lemmas lanceolate, laterally compressed, membranous to thinly leathery, 5-veined, glabrous, awned from above middle of back, apex 2-toothed, teeth often aristulate; awn geniculate with twisted column or merely outwardly curved; palea hyaline, slightly to distinctly shorter than lemma, gaping free from lemma margins. Ovary glabrous or almost so. Caryopsis with punctiform hilum; endosperm sometimes liquid.

About 70 species: temperate regions of the world except Africa, also on tropical mountains; 12 species (five endemic) in China.

- 1a. Culm below panicle and panicle branches pubescent to tomentose (except *T. altaicum*); panicle contracted to dense and spikelike; plants often less than 50 cm tall.
- 2a. Culm glabrous; panicle branches smooth, glabrous 1. *T. altaicum*
- 2b. Culm pubescent to tomentose; panicle branches pubescent.
- 3a. Plant rhizomatous; culms stout, 2–3 mm thick; panicle scarcely exerted from uppermost leaf sheath 2. *T. kangdingense*
- 3b. Plant tufted; culms slender, 0.5–2 mm thick; panicle clearly exerted from uppermost leaf sheath.
- 4a. Palea keels densely ciliate; ovary pilose 5. *T. debile*
- 4b. Palea keels scabrid; ovary glabrous.
- 5a. Panicle dense, spikelike, cylindrical to ovoid, 1.5–11 cm; branches erect, appressed; glumes and lemmas lanceolate; anthers 0.7–1.3 mm 3. *T. spicatum*
- 5b. Panicle contracted but not dense and spikelike, lanceolate to subcylindrical, 5–18 cm; branches usually obvious, slightly spreading; glumes and lemmas narrowly lanceolate; anthers 1.3–1.6 mm ... 4. *T. clarkei*
- 1b. Culm and panicle branches glabrous; panicle lax; plants often more than 40 cm tall.
- 6a. Floret callus hairy.
- 7a. Lemmas conspicuously punctate-scabrid; palea 1/2–2/3 lemma length 6. *T. bifidum*
- 7b. Lemmas smooth; palea subequal to lemma 7. *T. yunnanense*

6b. Floret callus glabrous.

8a. Panicle branches single or paired; awns 9–14 mm, geniculate with twisted column; anthers 1–1.5 mm 8. *T. scitulum*

8b. Panicle branches in whorls of 3–8; awns 4.5–9 mm, recurved or basally slightly twisted; anthers 2–3 mm.

9a. Culm stout, 4–5 mm in diam.; lemmas pale yellowish green, herbaceous with broad hyaline margins 9. *T. henryi*

9b. Culm slender, 1.5–3 mm in diam.; lemmas brown at maturity, firm with narrow margins.

10a. Florets 2–4; lemmas 5–7 mm; awns up to 9 mm, strongly recurved 10. *T. sibiricum*

10b. Florets 1 or 2; lemmas 4.5–5.5 mm; awns up to 6.5 mm, recurved or straight.

11a. Margins of leaf sheaths joined below middle; awns almost straight 11. *T. umbratile*

11b. Margins of leaf sheaths joined to middle or above; awns recurved 12. *T. pauciflorum*

1. *Trisetum altaicum* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 85. 1922.

高山三毛草 gao shan san mao cao

Perennial, loosely tufted, shortly rhizomatous. Culms erect from ascending base, 15–45 cm tall, glabrous, 2–3-noded. Leaf sheaths pilose; leaf blades flat, 10–15 cm, 2–4 mm wide, pilose on both surfaces or only on margins; ligule 2–3 mm. Panicle contracted, fairly dense, linear to narrowly lanceolate-oblong in outline, 4–9 cm, greenish brown tinged violet; branches erect, up to 2.5 cm, smooth or rarely scaberulous. Spikelets 5–7 mm, florets 2 or 3; rachilla hairs 0.5–1 mm; glumes unequal, lower glume 3–4 mm, upper glume 4–5 mm, apex acuminate; lemmas ca. 5 mm, punctately scabrid; awned from slightly above middle to upper 1/3, apex 2-denticulate, teeth mucronate; awn 4–8 mm, recurved, lower part slightly twisted; palea keels scabrid. Anthers 0.8–1.2 mm. Fl. Jun–Sep. $2n = 14$.

Alpine meadows, among rocks in coniferous forests, grassy mountain slopes; 1900–2800 m. Xinjiang [E Kazakhstan, Mongolia, Russia (Siberia)].

2. *Trisetum kangdingense* (Z. L. Wu) S. M. Phillips & Z. L. Wu, *comb. et stat. nov.*

康定三毛草 kang ding san mao cao

Basionym: *Trisetum clarkei* (J. D. Hooker) R. R. Stewart var. *kangdingense* Z. L. Wu, Acta. Biol. Plateau Sin. 2: 16. 1984 [“*kangdingensis*”].

Perennial with slender rhizomes. Culms usually solitary, erect from ascending base, 40–50 cm tall, 2–3 mm in diam., pubescent below panicle, 2–3-noded. Leaf sheaths longer than internodes, loose, lower sheaths pilose; leaf blades broadly linear, flat, 7–10 cm, 4–5 mm wide, scaberulous on both surfaces and margins; ligule 1.5–3 mm, truncate, margin ciliate. Panicle scarcely exerted from uppermost leaf sheath, dense, elliptic in outline, lobed, 12–15 cm, pale yellowish; branches erect or slightly spreading, pubescent, densely clothed in branchlets and spikelets, lowest 6–8 cm. Spikelets 5.5–6 mm, florets 3; rachilla hairs ca. 1 mm; glumes slightly unequal, acuminate, lower glume narrowly lanceolate, ca. 5 mm, upper glume narrowly elliptic-oblong, 5.7–5.9 mm; lemma narrowly lanceolate-oblong, 5–5.3 mm, scabrid, awned from upper 1/4, apex entire; awn 3.2–3.4 mm, almost straight, slightly recurved at base, not twisted; palea keels scabrid. Anthers 1–1.1 mm. Fl. Aug.

• Damp ground near water; 3000–3700 m. Qinghai, Sichuan.

The spikelets of this species are the same as those of some forms of *Trisetum spicatum*, but it is excluded from both *T. spicatum* and *T.*

clarkei by its strikingly more robust rhizomatous habit and large, dense, scarcely exerted panicles.

3. *Trisetum spicatum* (Linnaeus) K. Richter, Pl. Eur. 1: 59. 1890.

穗三毛 sui san mao

Perennial, densely tufted. Culms erect, 3–60 cm tall, 1–2 mm in diam., pubescent to tomentose especially below panicle, 1–3-noded. Leaf sheaths pubescent; leaf blades flat or rolled, 2–15 cm, 2–4 mm wide, densely to sparsely hairy on both surfaces or only abaxial surface, or glabrous, margins often setose; ligule 1–2 mm. Panicle spike-like, dense, linear to ovate or oblong in outline, lower part sometimes interrupted, 1.5–11 cm; branches short, appressed, pubescent to tomentose. Spikelets 4–9 mm, florets 2(or 3); rachilla hairs 1–1.5 mm; glumes subequal or slightly unequal, lower glume 4–8 mm, upper glume 5–9 mm, apex acuminate, occasionally briefly aristulate; lemmas lanceolate, 4–7 mm, scaberulous to pubescent, awned from upper 1/4–1/3, apex usually 2-denticulate, teeth often mucronate, occasionally subentire; awn 2–7 mm, weakly geniculate with loosely twisted column, or recurved at base, or almost straight; palea keels scaberulous. Anthers 0.7–1.3 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows, on glacial moraine, among bushes, montane forests; 1900–5600 m. Gansu, Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, N India, Japan, Kazakhstan, Kyrgyzstan, Korea, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia (Caucasus), Australia, Europe, North and South America].

This extremely polymorphic species is one of the most widespread of all flowering plants, being present in arctic and alpine parts of all continents except Africa. A large number of subspecies and varieties has been described, and these are only weakly correlated with geography. In spite of difficulties in applying infraspecific names, it seems unacceptable to include the very large range of forms present in China without subdivision under a single species name. Therefore subspecific names that have previously been applied are maintained here to indicate the main nodes of variation. However, variation is still very imperfectly understood, especially in the Himalayas, and it is not possible to place all specimens within the given subspecies descriptions.

- 1a. Plant up to 50 cm tall; panicle 5–11 cm, linear to narrowly elliptic or oblong, often interrupted below, pointed at apex, usually greenish or brownish.
- 2a. Lowest lemma 4–5.5 mm, awn 3–5 mm; spikelets usually with 2 florets 3d. subsp. *virescens*
- 2b. Lowest lemma 5–7 mm, awn 5–7 mm; spikelets with 2 or 3 florets 3e. subsp. *alaskanum*

- 1b. Plant up to 30 cm tall; panicle 1.5–5 cm, oblong to ovate, dense, not interrupted, rounded at apex, usually purple or grayish.
- 3a. Lemmas densely pubescent; plant 3–12 cm tall; leaf blades tomentose 3b. subsp. *tibeticum*
- 3b. Lemmas scaberulous to puberulous; plant up to 30 cm tall; leaf blades pubescent to glabrous.
- 4a. Panicle narrowly oblong; awn 4–6 mm 3a. subsp. *spicatum*
- 4b. Panicle ovate or oblong-ovate; awn 3–4 mm 3c. subsp. *mongolicum*

3a. *Trisetum spicatum* subsp. *spicatum*

穗三毛(原亚种) sui san mao (yuan ya zhong)

Aira spicata Linnaeus, Sp. Pl. 1: 64. 1753; *A. subspicata* Linnaeus, nom. illeg. superfl.; *Trisetum subspicatum* (Linnaeus) P. Beauvois, nom. illeg. superfl.

Plant up to 30 cm tall. Culms, leaf blades, and sheaths nearly glabrous to densely pubescent. Panicle narrowly oblong, 2–4 cm, usually purplish or brownish, dense. Spikelet with 2 florets; lower glume 4–5.5 mm, keel scabrid, upper glume 5–6 mm; lowest lemma 4–5 mm, smooth or scaberulous; awn 4–6 mm, weakly geniculate, twisted below. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows; above 1900 m. Gansu, Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang [Russia; Europe, North America].

This is a panarctic taxon, extending southward into the mountains of C Asia and W North America. It is not known from the Himalayas.

3b. *Trisetum spicatum* subsp. *tibeticum* (P. C. Kuo & Z. L. Wu) Dickoré, Stapfia 39: 201. 1995.

西藏三毛草 xi zang san mao cao

Trisetum tibeticum P. C. Kuo & Z. L. Wu, Fl. Xizang. 5: 188. 1987.

Plant 3–12 cm. Culms woolly, leaf blades and sheaths tomentose. Panicle ovate to oblong, dense, 1.7–3 cm, usually purplish or brownish. Spikelets with 2 florets; lower glume 4–7 mm, keel sometimes hispid, upper glume 5–7 mm; lowest lemma 4.8–5 mm, densely pubescent, apex 2-denticulate-aristulate; awn 5–5.6 mm, weakly geniculate, twisted below. Fl. and fr. Jun–Sep.

- Among boulders, glacial moraines; 4800–5500 m. Xizang.

Plants from very high altitudes in Xizang are distinguished by their low stature, extremely hairy leaves and culms, and especially by their pubescent lemmas. They grade into subsp. *mongolicum* through forms with shorter hairs on the lemma back and less densely hairy leaves and culms.

3c. *Trisetum spicatum* subsp. *mongolicum* Hultén ex Veldkamp, Gard. Bull. Singapore 36: 135. 1983.

蒙古穗三毛 meng gu sui san mao

Plant 9–20 cm. Culms pubescent, leaf blades and sheaths glabrous to densely pubescent. Panicle elliptic-oblong to ovate,

dense, 1.5–2.5 cm, greenish or brownish, rarely purple. Spikelets with 2 florets, lower glume 4–5.5 mm, upper glume 4.6–6.3 mm; lowest lemma 5–6 mm, scaberulous to shortly pubescent, apex entire or 2-denticulate-aristulate; awn 2–4 mm, straight or outwardly curved at base, not twisted. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows, among shrubs; 2000–5200 m. Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang [Bhutan, India (Sikkim), Kyrgyzstan, Mongolia, Russia (Siberia)].

This is a less hairy form than subsp. *tibeticum*, distinguished also by its relatively short, almost straight awns. Some specimens from above 5000 m in Xizang match subsp. *mongolicum* except for their longer (5–6 mm), twisted awns.

“*Trisetum spicatum* var. *mongolicum* (Hultén) P. C. Kuo & Z. L. Wu,” as given in FRPS (9(3): 140. 1987), was not validly published because “*T. spicatum* subsp. *mongolicum* Hultén” (Svensk Bot. Tidskr. 53: 214. 1959), on which it was based, was also not validly published because no type was indicated.

3d. *Trisetum spicatum* subsp. *virescens* (Regel) Tzvelev, Novosti Sist. Vyssh. Rast. 7: 65. 1971 [“1970”].

喜马拉雅穗三毛 xi ma la ya sui san mao

Avena flavescens var. *virescens* Regel, Bull. Soc. Imp. Naturalistes Moscou 41(2): 299. 1868; *A. virescens* (Regel) Regel; *Trisetum spicatum* subsp. *himalaicum* Hultén ex Veldkamp; *T. virescens* (Regel) Roshevitz (1924), not Nees ex Steudel (1854).

Plant (20–)30–60 cm. Culms pubescent, leaf blades and sheaths densely pubescent to glabrous. Panicle linear to narrowly oblong, often interrupted below, 5–7(–11) cm, green or brownish. Spikelets with 2(–3) florets; lower glume 3.5–4.8 mm, upper glume 4.3–5.6 mm; lowest lemma 4–5.5 mm, scaberulous, apex entire or 2-denticulate; awn 3–5 mm, outwardly curved near base, not twisted.

Alpine grasslands, meadows, often on damp sand or gravel; 3200–5000 m. Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, N India, Kazakhstan, Kyrgyzstan, Nepal, N Pakistan, Tajikistan].

“*Trisetum spicatum* var. *himalaicum* (Hultén) P. C. Kuo & Z. L. Wu,” as given in FRPS (9(3): 141. 1987), was not validly published because “*T. spicatum* subsp. *himalaicum* Hultén” (Svensk Bot. Tidskr. 53: 213. 1959), on which it was based, was also not validly published because no type was indicated.

3e. *Trisetum spicatum* subsp. *alaskanum* (Nash) Hultén, Svensk Bot. Tidskr. 53: 210. 1959.

大花穗三毛 da hua sui san mao

Trisetum alaskanum Nash, Bull. New York Bot. Gard. 2: 155. 1901; *T. formosanum* Honda; *T. spicatum* var. *alaskanum* (Nash) Malte ex Louis-Marie; *T. spicatum* subsp. *formosanum* (Honda) Veldkamp; *T. spicatum* var. *formosanum* (Honda) Ohwi.

Plant up to 60 cm tall. Culms pubescent, leaf blades and sheaths glabrous or pilose. Panicle linear-elliptic, dense or slightly loose toward base, 5–11 cm, green or brownish. Spikelets with 2 or 3 florets; lower glume 5–8 mm, upper glume 5.5–9 mm; lowest lemma 5–7 mm, scabrid apex acute or 2-dentate;

awn 5–7 mm, slightly outwardly curved, not twisted. Fl. and fr. Jun–Sep.

Gravel slopes, alpine meadows; 3800–5600 m. Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India (Sikkim), Japan, Korea, Russia (Far East); North America (Canada, United States)].

This is the most robust member of the complex in China and has the largest spikelets. It has a general distribution along the mountain chains on both sides of the N Pacific, but specimens with these dimensions also occur in the Himalayas, where it intergrades with subsp. *virescens*. Conversely, specimens with the slightly smaller spikelet dimensions of subsp. *virescens* are known from Tianjin.

A robust form from Kashmir with pubescent lemmas has been named *Trisetum spicatum* var. *pubiflorum* (Hackel) L. Liu (*T. pubiflorum* Hackel). This has also been reported from the Hengduan Shan.

4. *Trisetum clarkei* (J. D. Hooker) R. R. Stewart, Brittonia 5: 431. 1945.

长穗三毛草 chang sui san mao cao

Avena clarkei J. D. Hooker, Fl. Brit. India 7: 278. 1896 [“1897”].

Perennial, loosely tufted. Culms erect from ascending base, (30–)50–70 cm tall, 0.5–1 mm in diam., pubescent especially below panicle, 1–3-noded. Leaf sheaths pubescent; leaf blades flat, 5–20 cm, 1.5–2(–4) mm wide, pubescent or scaberulous; ligule 1–2 mm. Panicle contracted, linear to lanceolate in outline, usually slightly loose, at least lower branches obvious, 5–18 cm, brown, green, or yellowish green; branches slender, erect or slightly spreading, pubescent. Spikelets 4–8.5 mm, florets 2 or 3; rachilla hairs ca. 1.5 mm; glumes unequal, narrowly lanceolate, lower glume 4–6 mm, upper glume 5–7.5 mm, apex sharply acute; lemmas narrowly lanceolate, 3.5–7 mm, scabrid, awned from near upper 1/3, apex usually 2-denticulate, teeth mucronate, occasionally subentire; awn strongly recurved at base, 4–8 mm, fine, not twisted; palea keels scabrid. Anthers 1.3–1.6 mm. Fl. Jul–Sep.

Montane forests, among bushes, moist grassy mountainsides; 1900–4300 m. Gansu, Hubei, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [E Afghanistan, NW India, Kashmir, Pakistan].

The boundary between *Trisetum spicatum* and *T. clarkei* is obscured by intermediates, which are probably the result of introgression between the two species. *Trisetum clarkei* tends to be a taller, more slender grass, with a slightly looser panicle of narrower spikelets with well-exserted awns.

5. *Trisetum debile* Chrtk, Folia Geobot. Phytotax. 25: 334. 1990.

柔弱三毛草 rou ruo san mao cao

Perennial. Culms slender, base ascending, ca. 25 cm tall, ca. 0.8 mm in diam., glabrous or appressed-pubescent, densely appressed-pilose with longer spreading hairs below panicle, 3-noded. Leaf blades narrowly linear, ca. 4 cm, 1–1.2 mm wide, both surfaces pubescent with scattered longer hairs, convolute toward acuminate apex; ligule ca. 0.7 mm. Panicle lanceolate in outline, dense, ca. 4 cm, with few spikelets; branches short, densely pubescent with scattered longer spreading hairs; pedicels ca. 2 mm. Spikelets 5–6 mm, florets 2, green or straw-colored; rachilla pilose; glumes lanceolate, unequal,

scabrid on keel, apex aristulate, lower glume 3–4 mm, 3-veined, upper glume 4–4.5 mm, 5-veined; lemmas 4–4.5 mm, inconspicuously 5-veined, keel scaberulous, awned from upper 1/3, apex 2-toothed; awn 5–7 mm, geniculate or recurved; palea subequal to lemma, keels densely ciliate. Ovary thinly pilose in upper part. Fl. Aug.

• Habitat unknown; ca. 3400 m. NW Yunnan.

This species is known only from the type gathering, which has not been seen.

6. *Trisetum bifidum* (Thunberg) Ohwi, Bot. Mag. (Tokyo) 45: 191. 1931.

三毛草 san mao cao

Bromus bifidus Thunberg in Murray, Syst. Veg., ed. 14, 119. 1784; *Avena bifida* (Thunberg) P. Beauvois; *Trisetum flavescens* (Linnaeus) P. Beauvois var. *bifidum* (Thunberg) Makino; *T. flavescens* var. *macranthum* Hackel; *T. flavescens* var. *papillosum* Hackel.

Perennial, tussocky. Culms erect or geniculate at base, 30–100 cm tall, glabrous, 2–5-noded. Leaf sheaths usually shorter than internodes, glabrous or pilose, margins joined in lower part; leaf blades flat, soft, up to 20 cm, 3–6 mm wide, glabrous or occasionally pilose; ligule 0.5–2 mm. Panicle lax, oblong to lanceolate-oblong in outline, 10–25 cm, often nodding, yellow-green or brown green; branches 2 or 3 at basal node, scaberulous, lowest up to 10 cm. Spikelets 6–8 mm, florets 2 or 3; rachilla hairs 0.2–0.5 mm; glumes unequal, lower glume 2–3.5 mm, upper glume 4–7 mm, apex acuminate; callus pubescent; lemmas 5–7 mm, firm, golden brown, punctate-scabrid, awned from upper 1/4, apex 2-toothed, teeth 1–2 mm, aristulate; awn 7–10 mm, fine, strongly recurved near base, not twisted; palea 1/2(–2/3) length of lemma, keels conspicuously convex, ciliate. Anthers 0.5–1 mm. Fl. Apr–Jun.

Forests, roadsides, moist grassy ditch banks; 500–2500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Korea, New Guinea].

7. *Trisetum yunnanense* Chrtk, Folia Geobot. Phytotax. 25: 334. 1990.

云南三毛草 yun nan san mao cao

Perennial, tufted, shortly stoloniferous. Culms 26–35 cm tall, ca. 1.5 mm in diam., glabrous, 2–3-noded. Leaf sheaths scabrid, pubescent with longer hairs toward blade; leaf blades linear, gray-green, 4–10 cm, 2–3 mm wide, abaxial surface prominently veined, both surfaces scaberulous, often pilose, margins long ciliate, apex acuminate; ligule 1.5–3 mm, margin ciliate. Panicle lanceolate in outline, fairly dense, 7–9 cm, spikelets many; branches scabrid; pedicels 2–6 mm, scabrid. Spikelets 6.5–9 mm, florets 3, uppermost reduced, green or violet tinged; rachilla densely pilose; glumes unequal, keel scabrid, margins narrowly hyaline, apex acuminate-aristulate, lower glume lanceolate, 4–5 mm, 1-veined, upper glume elliptic, 5–6.5 mm, 3-veined; callus hairs ca. 0.8 mm; lowest lemma 6.5–7 mm, upper part often violet-colored, keel scabrid, apex 2-toothed; awn 12–16 mm, geniculate or rarely recurved; palea subequal to lemma. Anthers 1.8–2.2 mm. Ovary long-pilose in upper part.

- Dry meadows; ca. 3000 m. Yunnan.

The hairy ovary is unusual in *Trisetum*. The type has not been seen.

8. *Trisetum scitulum* Bor, Kew Bull. [11] 1956: 212. 1956.

优雅三毛草 *you ya san mao cao*

Avena flavescens J. D. Hooker (1896), not Linnaeus (1753).

Perennial, loosely tufted. Culms erect from geniculate base, 12–80 cm tall, 1.5–2 mm in diam., glabrous, 2–3-noded. Leaf sheaths usually shorter than internodes, glabrous, margins joined near base; leaf blades flat, soft, 10–20 cm, 2–8 mm wide, adaxial surface scattered pilose; ligule 1–4 mm. Panicle lax, lanceolate in outline, 7–15 cm, gray-green, brown or purplish; branches 1–3 at basal node, capillary, flexuous, smooth, glabrous, up to 5 cm. Spikelets 6.5–9 mm, florets 1–3; rachilla filiform, villous; glumes unequal, narrowly lanceolate, lower glume 4.5–5.3 mm, upper glume 6–7.2 mm, apex finely acuminate; callus glabrous; lemmas 6.5–8 mm, firm, golden brown, scaberulous around keel, otherwise smooth, awned from upper 1/4–1/3, apex 2-toothed, teeth 2.5–3 mm, slenderly acuminate-aristulate; awn 9–14 mm, weakly geniculate, column twisted; palea 1/2–2/3 length of lemma, keels slightly convex, scabrid. Anthers 1–1.5 mm. Fl. Jul–Sep.

Alpine scrub, meadows, gravel river banks; 4000–5000 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), E Nepal].

This is a locally distributed, high-altitude species with a slender habit and large, brown, long-awned spikelets.

9. *Trisetum henryi* Rendle, J. Linn. Soc., Bot. 36: 400. 1904.

湖北三毛草 *hu bei san mao cao*

Perennial, shortly rhizomatous; roots thick, villous. Culms stout, rooting at lower nodes, ascending, 80–140 cm tall, 4–5 mm in diam., glabrous, 5–9-noded. Leaf sheaths longer than internodes, lower pubescent, usually closed to above middle, upper glabrous, outer margin ciliate; leaf blades broadly linear, 15–35 cm, 5–15 mm wide, scabrid or adaxial surface puberulent, margins stiffly ciliate toward ligule; ligule brown, thick, 1–2 mm. Panicle lax, elliptic to narrowly elliptic-oblong in outline, 10–22 cm, much branched, densely spiculate, silvery yellowish green; branches 4–6 or more at lowest node, smooth, longest 6–8 cm. Spikelets 5–7 mm, florets 2 or 3; rachilla hairs 1–1.2 mm; glumes unequal, lower glume 3–4 mm, upper glume 4–6 mm; callus glabrous; lemmas thinly herbaceous with broad hyaline margins, 5–6 mm, finely scabrid, awned from middle to upper 1/3, apex subentire, 2-mucronate; awn 4.5–6 mm, recurved or with short twisted column; palea 3/4 lemma length, keels scaberulous. Anthers 2.5–3 mm. Fl. and fr. Jun–Sep.

- Grassy roadsides, damp places in forests; below 2400 m. Anhui, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shanxi (Ruicheng, Yuanqu), SE Sichuan, Zhejiang (Lin'an).

This is the most robust species in China, remarkable for its thick, hairy roots, stout culms, large panicle of pale spikelets, and thin-textured spikelets.

10. *Trisetum sibiricum* Ruprecht, Beitr. Pflanzenk. Russ. Reiches 2: 65. 1845.

西伯利亚三毛草 *xi bo li ya san mao cao*

Trisetum flavescens (Linnaeus) P. Beauvois subsp. *sibiricum* (Ruprecht) T. Koyama; *T. flavescens* var. *sibiricum* (Ruprecht) Ohwi.

Perennial, loosely tufted, shortly rhizomatous. Culms solitary or few, 50–120 cm tall, 1.5–3 mm in diam., glabrous, 3–4-noded. Leaf sheaths mostly shorter than internodes, glabrous or lower shortly pubescent, margins joined near base; leaf blades broadly linear, 6–20 cm, 4–9 mm wide, glabrous or adaxial surface scattered pilose, ligule 1–2 mm. Panicle lax, narrowly oblong to lanceolate in outline, 10–20 cm, much branched, yellowish brown; branches 3–8 at lowest node, slightly scabrid, up to 6 cm. Spikelets 5–10 mm, florets 2–4; rachilla hairs ca. 1 mm; glumes unequal, lower glume 4–6 mm, upper glume 5–8 mm, apex acuminate; callus glabrous or with few very short hairs; lemmas 5–7 mm, firm, golden brown, finely but densely scabrid, awned from upper 1/3, apex 2-toothed, teeth triangular; awn 5–9 mm, strongly recurved, lower part straight or slightly twisted; palea 3/4 lemma length or longer, keels indistinctly scaberulous. Anthers 2–3 mm. Fl. and fr. Jun–Aug.

Grassy mountain slopes, open forest, marshy places among shrubs; 700–4200 m. Gansu, Hebei, Heilongjiang, Henan, Hubei (Shennongjia), Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [Japan, Kazakhstan, Korea, Mongolia, Russia; SW Asia (Caucasus), E Europe, North America (Alaska)].

This species is a good forage grass, closely related to *Trisetum flavescens* (Linnaeus) P. Beauvois from Europe. *Trisetum flavescens* has been introduced into many temperate countries for forage. It can be distinguished from *T. sibiricum* by its pilose lower leaf sheaths, geniculate awn with twisted column, and bearded callus.

11. *Trisetum umbratile* (Kitagawa) Kitagawa, J. Jap. Bot. 31: 302. 1956.

绿穗三毛草 *lü sui san mao cao*

Trisetum sibiricum Ruprecht var. *umbratile* Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 4: 77. 1940; *T. sibiricum* subsp. *umbratile* (Kitagawa) Tzvelev.

Culms erect, slender, 70–90 cm tall, glabrous. Leaf sheaths equaling or shorter than internodes, glabrous, outer margin ciliate at mouth, margins closed near base; leaf blades linear, 8–30 cm, 2–7 mm wide, scabrid; ligule 1–2 mm. Panicle lax, broadly lanceolate in outline, up to 22 cm, green; branches capillary, smooth in lower part, upper part scabrid. Spikelets 4–5(–6) mm, florets 1 or 2; rachilla hairs ca. 1.4 mm; glumes unequal, lower glume oblong-lanceolate, 2.5–4 mm, upper glume oblong, 4–5 mm; lemmas 4.5–5.5 mm, scabrid-papillose, awned from above middle, apex 2-toothed, teeth ca. 1.5 mm, acute; awn up to 6.5 mm, straight or almost so, not twisted; palea keels indistinctly scaberulous. Anthers ca. 2 mm. Fl. and fr. Jul–Sep.

Marshy meadows and in forest. Heilongjiang, Jilin, Liaoning, Nei Mongol (Yakeshi) [Korea, Russia (Ussuri)].

This is a locally distributed variant of *Trisetum sibiricum* with small spikelets and almost straight awns.

12. *Trisetum pauciflorum* Keng, Fl. Tsinling. 1(1): 441. 1976.贫花三毛草 *pin hua san mao cao*

Perennial, shortly rhizomatous. Culms erect from ascending base, 50–100 cm tall, 2–2.5 mm in diam., glabrous, 4–7-noded. Leaf sheaths closed up to middle or more, basal sheaths longer than internodes, upper shorter, glabrous, sometimes ciliate at margin and mouth; leaf blades soft, 15–30 cm, 5–8 mm wide, smooth or scabrid; ligule brown, ca. 1 mm. Panicle lax, lanceolate-oblong in outline, ca. 15 cm, much branched with many spikelets, silvery brown or purplish; branches whorled, smooth, up to 5 cm. Spikelets 4.5–5.5 mm, florets 1 or 2;

glumes unequal, lower glume 2.5–3 mm, upper glume 4–4.5 mm; rachilla hairs ca. 1.5 mm; lemmas 4.5–5 mm, scabrid-papillose, awned from upper 1/3, apex subentire; awn 3–4 mm, recurved and slightly twisted near base; palea keels scabrous. Anthers ca. 2.5 mm. Fl. and fr. Jul–Aug.

• Moist shady places in valleys, woodland margins on mountainsides; 1600–2100 m. Henan, Shaanxi, Sichuan.

This is a little-known variant close to *Trisetum sibiricum* and perhaps does not merit specific rank. It has small spikelets like those of *T. umbratile*, but with recurved awns, and occurs outside the known distribution of that taxon.

79. KOELERIA Persoon, Syn. Pl. 1: 97. 1805.落草属 *qia cao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, tufted, sometimes shortly rhizomatous. Culms unbranched. Leaf sheaths of tillering leaves usually closed; leaf blades mainly basal, narrow, flat, or inrolled and filiform to setaceous; ligule membranous. Inflorescence a dense spike-like panicle, shining; branches short, erect, hispidulous to woolly. Spikelets with 2 to several florets; rachilla puberulous or glabrous, disarticulating below each floret; glumes narrow, unequal or subequal, equaling or shorter than florets, strongly keeled, thinly herbaceous, 1–3(–5)-veined, margins broad, hyaline, shining; floret callus small, glabrous or very shortly hairy; lemmas membranous or papery, strongly compressed, sharply keeled, 3–5-veined, margins hyaline, shining, apex obtuse to acuminate, awnless or with a subapical mucro; palea subequaling lemma, hyaline, gaping free from lemma margins. Stamens 3. Ovary glabrous. Endosperm sometimes liquid.

About 35 species: temperate regions throughout the world, also on tropical mountains; four species in China.

This is a genus of narrowly defined, closely related species. They provide good forage in mountain steppe.

- 1a. Lemmas shortly awned, awns 0.5–2.5 mm; rachilla with 0.3–1 mm hairs 1. *K. litvinowii*
- 1b. Lemmas awnless or minutely mucronate; rachilla glabrous or puberulous.
 - 2a. Glumes and lemmas pilose 2. *K. altaica*
 - 2b. Glumes and lemmas glabrous, smooth or scabrid.
 - 3a. Plant densely tufted; culms hairy mainly below panicle; spikelets punctate scabrid 3. *K. macrantha*
 - 3b. Plant with short rhizomes, forming loose mats; culms hairy throughout; spikelets smooth 4. *K. atroviolacea*

1. *Koeleria litvinowii* Domin, Biblioth. Bot. 14(65): 116. 1907.芒落草 *mang qia cao*

Perennial, loosely to densely tufted. Culms up to 50 cm tall, thinly pubescent to tomentose below panicle, 1- or 2-noded, or node basal and obscured. Leaf sheaths glabrous or pubescent; leaf blades flat, 4–15 cm, 1–4 mm wide, pubescent or glabrous, margins sometimes setose near ligule; ligule 1–2 mm. Panicle elliptic-oblong to narrowly oblong in outline, 1.5–12 cm, sometimes interrupted, silvery green, grayish or purplish; axis and branches densely pubescent. Spikelets 4.7–6 mm, florets 2 or 3; rachilla hairs 0.3–0.5(–1) mm; glumes slightly unequal, lower glume narrowly lanceolate, 3.5–5 mm, keel scabrid, upper glume elliptic-oblong, 4.3–5.8 mm, keel scabrid or ciliate, margins broadly membranous; lemmas lanceolate, 3.7–5.5 mm, finely scabrid to shortly pubescent, shortly awned from upper 1/4 or above, apex acute or 2-mucronate; awn 0.5–2.5 mm, straight; palea keels scabrid to ciliate. Anthers 0.6–1.5 mm. Fl. and fr. Jun–Sep.

Grassy or stony mountain slopes, alpine meadows; 3000–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kashmir, E Kazakhstan, Kyrgyzstan, Tajikistan (Pamirs)].

This species is intermediate between the closely related genera

Trisetum and *Koeleria*, especially in the possession of a short, straight awn. A hybrid origin has been postulated (*T. spicatum* × *K. macrantha*). Variation in the high mountains of W China and neighboring regions is poorly understood. In particular, the boundary with short-awned forms of *T. spicatum* is obscured by intermediates. Forms with a very short, straight awn are here all included in *K. litvinowii*.

- 1a. Leaf sheaths densely pubescent; panicle grayish violet 1a. subsp. *litvinowii*
- 1b. Leaf sheaths glabrous or thinly pilose; panicle silvery green 1b. subsp. *argentea*

1a. *Koeleria litvinowii* subsp. *litvinowii*芒落草(原亚种) *mang qia cao (yuan ya zhong)*

Koeleria enodis Keng; *K. hosseana* Domin; *K. hosseana* var. *tafelii* Domin; *K. litvinowii* var. *tafelii* (Domin) P. C. Kuo & Z. L. Wu; *Trisetum litvinowii* (Domin) Nevski.

Perennial forming small dense tussocks. Culms tinged purple, tomentose below panicle. Leaf sheaths densely pubescent. Panicle grayish violet. Lemma apex acute.

Grassy or stony mountain slopes, alpine meadows; 3000–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [E Kazakhstan, Kyrgyzstan, Tajikistan (Pamirs)].

This subspecies tends to have a more northwestern distribution than subsp. *argentea*.

1b. *Koeleria litvinowii* subsp. *argentea* (Grisebach) S. M. Phillips & Z. L. Wu, **comb. nov.**

银落草 yin qia cao

Basionym: *Koeleria argentea* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 77. 1868; *K. argentea* var. *nepalensis* Domin; *Trisetum litvinowii* subsp. *argenteum* (Grisebach) Tzvelev; *T. litvinowii* var. *argenteum* (Grisebach) Tzvelev.

Perennial, loosely tufted. Culms green, pubescent or subglabrous below panicle. Leaf sheaths usually glabrous. Panicle pale silvery green. Lemma apex minutely 2-mucronate.

Damp meadows, alluvial gravel by rivers and mountain streams; ca. 4000 m. Qinghai, Xizang [Afghanistan, Kashmir].

2. *Koeleria altaica* (Domin) Krylov, Fl. Sibir. Occid. 2: 261. 1928.

阿尔泰落草 a er tai qia cao

Koeleria eriostachya Pančić var. *altaica* Domin, Biblioth. Bot. 14(65): 163. 1907.

Perennial, densely tufted or shortly rhizomatous; old basal sheaths encircling 2 or 3 culms together into bunches, finally splitting into fibers. Culms slender, 13–50 cm tall, pubescent below panicle, otherwise glabrous. Leaf sheaths densely pubescent at base, upper culm sheaths subglabrous; leaf blades usually rolled, hard, recurved, 2–13 cm, 0.5–2.5 mm wide, hirsute or sometimes glabrous; ligule 1–2 mm. Panicle 2–3 cm, very dense, lower part interrupted, yellowish green or tinged grayish violet. Spikelets 3.5–5 mm, florets 2(–3); glumes unequal, lanceolate or oblong-lanceolate, appressed pilose, keel ciliate, lower glume 3–3.5 mm, upper glume 4–4.5 mm; lemmas lanceolate, ca. 4.5 mm, shortly pilose, apex mucronate. Fl. and fr. Jun–Jul.

Dry stony grassy hills. Nei Mongol, Xinjiang [Kazakhstan (Tarbagatai Mountains), Mongolia, Russia (S Siberia)].

This is a good forage grass.

3. *Koeleria macrantha* (Ledebour) Schultes, Mant. 2: 345. 1824.

落草 qia cao

Aira macrantha Ledebour, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 5: 515. 1815; *Koeleria cristata* Persoon var. *poiformis* (Domin) Tzvelev; *K. cristata* subsp. *pseudocristata* (Domin) Domin; *K. cristata* var. *pseudocristata* (Domin) P. C. Kuo & Z. L. Wu; *K. gracilis* Persoon, nom. illeg. superfl.; *K. poiformis* Domin; *K. pseudocristata* Domin; *K. tokiensis* Domin.

Perennial, densely tufted; old basal sheaths papery, persistent around each culm base. Culms stiffly erect, 5–60 cm tall, woolly especially below panicle, 2–3-noded. Leaf sheaths glabrous or pubescent; leaf blades grayish green, usually rolled, sometimes flat, up to 30 cm, 1–2 mm wide, pubescent or adax-

ial surface glabrous; ligule 0.2–2 mm. Panicle linear-oblong in outline, 1.5–13 cm, lower part often interrupted and lobed, silvery green or tinged purple; axis and branches woolly. Spikelets 3–7 mm, florets 2–3(–4); rachilla hairs less than 0.4 mm or glabrous; glumes slightly unequal, punctate-scaberrulous, keel scabrid, lower glume narrowly lanceolate, 1.5–4 mm, upper glume elliptic-oblong, 2.5–5.5 mm, apex acute; lemmas lanceolate, 2.6–5.5 mm, punctate-scaberrulous, apex acute, cuspidate, or rarely keel extended up to 0.3 mm into apical mucro; palea keels ciliate. Anthers 1.2–2.3 mm. Fl. and fr. May–Sep.

Mountain slopes, grassland, roadsides; sea level to 3900 m. Anhui, Fujian, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Sichuan, Xinjiang, Xizang, Zhejiang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Japan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; North America, SW Asia, Europe; introduced to Australia and elsewhere].

This species has usually been known in the past as *Koeleria cristata* Persoon, an illegitimate, superfluous name that included the types of two earlier names in its circumscription. It is a highly polymorphic species, widespread in temperate parts of the N hemisphere, to which many infraspecific names have been applied. Variable characters include hairiness, stiffness, rolling and color of the leaf blades, panicle color, and spikelet size and hairiness. These variants are mostly ill-defined, intergrading, and of negligible practical value.

4. *Koeleria atrovioleacea* Domin, Biblioth. Bot. 14(65): 252. 1907.

匍茎落草 pu jing qia cao

Koeleria asiatica Domin subsp. *atrovioleacea* (Domin) Tzvelev; *K. asiatica* subsp. *ledebourii* (Domin) Tzvelev; *K. atrovioleacea* var. *tsinghaica* Tzvelev; *K. geniculata* Domin; *K. ledebourii* Domin.

Perennial, shortly rhizomatous, forming loose mats; old basal sheaths papery, persistent. Culms erect or geniculate at base, 10–50 cm tall, pilose throughout length, 2–3-noded. Leaf sheaths of cauline leaves inflated; leaf blades green, flat or rolled, 5–15 cm, 1–2 mm wide, smooth or scabrid, occasionally pilose; ligule ca. 0.2 mm. Panicle rather lax, pyramidal to oblong in outline, 2.5–8 cm, lower part often interrupted, grayish violet. Spikelets 4–6 mm, florets 2 or 3; glumes usually glabrous, occasionally shortly ciliate on keel, lower glume narrowly lanceolate, 3.5–4 mm, upper glume broadly lanceolate, 4.5–5 mm; lemmas narrowly ovate, ca. 5 mm, smooth, glabrous, awnless, apex acuminate; palea keels scabrid. Anthers ca. 2 mm. Fl. Jun–Aug.

Grassy places on dry mountain slopes; 2900–4600 m. Qinghai, Xizang [Mongolia, Russia (Altai and Sayan Mountains of S Siberia)].

This species is closely related to, and is sometimes regarded as a subspecies of, *Koeleria asiatica* Domin. That species, in the strict sense, is confined to arctic regions of E Europe, Russia, and W North America, and usually has densely hairy spikelets.

It is uncertain whether this grass does in fact occur in China, as was reported in FRPS (9(3): 134, fig. 33. 1987, as *Koeleria asiatica*), or whether that record relates to an unusually loosely tufted form of *K. macrantha*. No specimens have been seen.

80. DESCHAMPSIA P. Beauvois, Ess. Agrostogr. 91. 1812.

发草属 *fa cao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Avenella (Bluff & Fingeruth) Drejer; *Aira* sect. *Avenella* Bluff & Fingerhuth.

Perennials, densely tufted. Leaf blades mainly basal, linear to setaceous, flat, folded or rolled; ligule membranous. Inflorescence usually an open panicle, infrequently contracted or spike-like; branches and pedicels usually filiform. Spikelets oblong to gaping, shining, laterally compressed, florets 2–3(–5), disarticulating below each floret; rachilla pilose, extended beyond uppermost floret; glumes lanceolate to oblong, subequal, \pm equaling spikelet, membranous, shining, keeled, lower glume 1-veined, upper glume 1–3-veined; floret callus small, pubescent to conspicuously bearded; lemmas lanceolate to oblong, hyaline to shiny cartilaginous, back rounded, finely 4-veined (5th midvein extended into awn), glabrous, awned from near base or in lower half, apex membranous, broad, 4-toothed or denticulately truncate; awn straight or weakly geniculate, usually not exerted from spikelet; palea hyaline, subequal to lemma. Ovary glabrous. Caryopsis with solid endosperm.

About 40 species: temperate and cold regions of the world; three species in China.

- 1a. Awns geniculate, clearly exerted from spikelet; leaf blades setaceous, smooth 1. *D. flexuosa*
- 1b. Awns straight or almost so, included in spikelet or only shortly exerted; leaf blades linear, usually adaxially scabrid.
- 2a. Panicle dense, spike-like, 1–7 cm, ovate to oblong, brownish purple with golden sheen 2. *D. koelerioides*
- 2b. Panicle lax and open, or contracted but not spike-like, 6–30 cm, narrowly oblong to ovate 3. *D. cespitosa*

1. *Deschampsia flexuosa* (Linnaeus) Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4, 2(1): 9. 1836.

曲芒发草 *qu mang fa cao*

Aira flexuosa Linnaeus, Sp. Pl. 1: 65. 1753; *A. kawakamii* Hayata; *Avenella flexuosa* (Linnaeus) Drejer; *Deschampsia kawakamii* (Hayata) Honda; *Lerchenfeldia flexuosa* (Linnaeus) Schur.

Perennial, tufted, sometimes rhizomatous; old basal sheaths tightly overlapping. Culms slender, erect, 15–60 cm tall, 2- or 3-noded. Leaf sheaths longer than internodes, smooth or scabrous upward; leaf blades setaceous, rather stiff, 3–15 cm, 0.3–0.5 mm wide, abaxial (outer) surface smooth; ligule lanceolate, 2–4 mm. Panicle open, ovate in outline, 5–10 cm, silvery with purple or brown tinge; branches usually paired, capillary, flexuous, bearing spikelets on distal part. Spikelets 4–6(–8) mm, florets 2, rachilla internode short; glumes thinly membranous, 1-veined, lower shorter than upper, apex acute; callus hairs ca. 1 mm; lemmas 3.5–5(–6) mm, asperulous, awned from near base, apex denticulate or erose; awn 5–8 mm, exerted from spikelet, geniculate in middle, column dark brown, twisted. Anthers 1.5–2.5 mm. Fl. and fr. Jul–Sep. $2n = 28$.

Exposed mountain peaks, on stony soil and rocky slopes. Taiwan [Japan, Philippines (Luzon), Russia; Africa (high mountains), SW Asia (Caucasus), Europe, North America, South America (S Argentina, S Chile)].

A variant of this widespread species found on Yu Shan (Mt. Morrison) in Taiwan has larger spikelets than usual (6–8 mm), since the glumes are drawn out into long caudate tips, with the upper glume 1–2 mm longer than the lower. This variant is the basis of *Deschampsia kawakamii*. Typical *D. flexuosa* also occurs in Taiwan.

2. *Deschampsia koelerioides* Regel, Bull. Soc. Imp. Naturalistes Moscou 41: 299. 1868.

穗发草 *sui fa cao*

Deschampsia cespitosa (Linnaeus) P. Beauvois subsp. *koelerioides* (Regel) Tzvelev.

Perennial, forming small dense tussocks. Culms erect, 5–40 cm tall, 1–1.7 mm in diam., 1(or 2)-noded. Leaf sheaths loose, glabrous; leaf blades linear, flat or rolled, up to 20 cm, 1–3 mm wide, abaxial surface smooth, adaxial surface with coarse sharp ridges, smooth or scabrous; ligule acuminate, up to 8 mm. Panicle densely contracted to spike-like, ovoid to oblong, 1–7 cm, brownish purple with golden sheen; branches very short, visible or not. Spikelets 4–6 mm, florets 2, rachilla internode ca. 1 mm; glumes subequal to spikelet, lower glume slightly shorter than or equaling upper glume, 1-veined, upper glume 3-veined, apex acute or obtuse, often lacerate; callus hairs ca. 1/3 lemma length; lemmas 3–4 mm, awned from or near lower 1/4, apex broadly 2-toothed, teeth irregularly lacerate; awn straight or slightly bent, equaling or slightly longer than lemma. Anthers 1.5–2.2 mm. Fl. Jul–Aug.

Damp alpine meadows, wet places near rivers and stream banks; 3500–5100 m. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [E Afghanistan, Kashmir, Kazakhstan (Tarbagatai Mountains), Kyrgyzstan, Mongolia, N Pakistan, Russia (S Siberia), Tajikistan (Pamirs), Uzbekistan].

This is a distinctive, high-altitude variant from the *Deschampsia cespitosa* complex, distinguished by its short, spike-like, purple-brown panicles.

A specimen collected in S Xizang (N of Kumaon, N India) has been assigned to *Deschampsia cespitosa* subsp. *sikkimensis* Noltie, which is otherwise known only from India (Sikkim). It is a small plant with compact panicles, close to *D. koelerioides*, but differing in its pyramidal panicle with the spikelets aggregated into fascicles.

3. *Deschampsia cespitosa* (Linnaeus) P. Beauvois, Ess. Agrostogr. 91. 1812.

发草 *fa cao*

Aira cespitosa Linnaeus, Sp. Pl. 1: 64. 1753.

Perennial, densely tufted. Culms erect, slender to stout,

30–150 cm tall, 1–3 mm in diam., 1–3-noded. Leaf sheaths loose, glabrous; leaf blades linear, flat or folded, up to 30 cm, 1–5 mm wide, abaxial surface smooth, adaxial surface with coarse sharp ridges, densely scabrid; ligule obtuse to acuminate, 2–7(–12) mm. Panicle usually open, often nodding, infrequently loosely contracted, ovate to narrowly oblong in outline, up to 30 cm or more, greenish or purplish sometimes with golden sheen; branches slender, bearing spikelets on distal part. Spikelets 2.5–7 mm, florets (1–)2(–3), rachilla internode ca. 1 mm; glumes slightly longer to slightly shorter than florets, lower glume slightly shorter than or equaling upper glume, 1-veined, upper glume 3-veined, apex acute; callus hairs ca. 1/3 lemma length; lemmas 2.5–3.5 mm, awned from near base to near middle, rarely awnless, apex broad, toothed or erose; awn straight or slightly bent, slightly shorter to longer than lemma. Anthers 1.2–2 mm. Fl. and fr. Jul–Sep.

Wet meadows, river sand and gravel, among bushes, wet places; 1500–4500 m. Gansu, Heilongjiang, Nei Mongol, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Bhutan, India (Sikkim), Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America; introduced elsewhere].

Deschampsia cespitosa is an extremely polymorphic, widely distributed grass. Many regional and local variants have been accorded separate status, either at specific or infraspecific rank. Variation is complex due to polyploidy and introgression, and morphological and cytological variation often do not coincide. There is extensive overlapping of diagnostic characters leading to a lack of clear boundaries between taxa. Variation is nowadays usually consigned to subspecies, mostly strongly linked to geographic distribution. The main variants reported in China are given below.

The position of the awn on the lemma back refers to the lowest lemma. In general the awn arises higher up on the second lemma, and short awns arise higher on the lemma back than do longer awns. A specimen collected at 2800 m on a grassy spur in Shennongjia, Hubei, has been described as *Deschampsia cespitosa* var. *exaristata* Z. L. Wu (Acta Biol. Plateau Sin. 2: 15. 1984). In this plant the lower lemma has a ca. 0.5 mm awn arising from the upper 1/5, or both lemmas are awnless. It is not possible from the protologue to assign it to a subspecies.

- 1a. Panicle lax and open.
 - 2a. Plant robust, up to 120 cm tall; leaf blades 2–5 mm wide; panicle branches and adaxial leaf surface densely scabrid 3a. subsp. *cespitosa*
 - 2b. Plant slender, up to 70 cm tall; leaf blades 1–2 mm wide, panicle branches and adaxial leaf surface scaberulous or smooth 3b. subsp. *orientalis*
- 1b. Panicle loosely to densely contracted.
 - 3a. Spikelets 4.5–5 mm; glumes obtuse, subequal to adjoining lemmas 3c. subsp. *pamirica*
 - 3b. Spikelets 4.5–8 mm; glumes acuminate, much exceeding adjoining lemmas 3d. subsp. *ivanovae*

3a. *Deschampsia cespitosa* subsp. *cespitosa*

发草(原亚种) fa cao (yuan ya zhong)

Culms up to 120 cm tall. Leaf blades 2–5 mm wide, adax-

ially densely scabrid. Panicle open, broadly pyramidal, erect, 8–30 cm, silvery green or tinged purple and gold; branches spreading, densely scabrid. Spikelets 4–4.5 mm; glumes equaling or slightly shorter than spikelet, apex acute; lemmas usually awned from near base; awn not or only slightly longer than lemma.

Meadows, river banks, among bushes; 1500–4500 m. Qinghai, Xinjiang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America; introduced elsewhere].

This is the most widely distributed subspecies, either native or introduced in most cold-temperate regions of the world.

3b. *Deschampsia cespitosa* subsp. *orientalis* Hultén, Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 5: 109. 1927.

小穗发草 xiao sui fa cao

Aira sukatschewii Poplavskaia; *Deschampsia cespitosa* var. *festucifolia* Honda; *D. cespitosa* var. *microstachya* Roshevitz; *D. cespitosa* subsp. *sukatschewii* (Poplavskaia) Chiapella & Probatova; *D. orientalis* (Hultén) B. S. Sun; *D. sukatschewii* (Poplavskaia) Roshevitz; *D. sukatschewii* subsp. *orientalis* (Hultén) Tzvelev.

Culms 10–70 cm tall. Leaf blades 1–2 mm wide. Panicle open, 6–18 cm; branches flexuous, smooth or scaberulous. Spikelets 2.5–5 mm; glumes subequaling spikelet; lemmas awned between lower 1/3–1/2; awn usually longer than lemma.

Flood plains, river sand and gravel, wet meadows; below 3800 m. Heilongjiang, Nei Mongol, Qinghai, Taiwan, Xinjiang, Yunnan [Japan, Korea, Mongolia, Russia (Far East, Siberia); North America].

Deschampsia cespitosa subsp. *orientalis* is the most common subspecies in E Asia, where it is a vicariant of subsp. *cespitosa*, which is native in Europe and western parts of Asia and introduced in E Asia.

3c. *Deschampsia cespitosa* subsp. *pamirica* (Roshevitz) Tzvelev, Zlaki SSSR, 285. 1976.

帕米尔发草 pa mi er fa cao

Deschampsia pamirica Roshevitz in Komarov, Fl. URSS 2: 750. 1934.

Culms 30–80 cm tall. Leaf blades 2–3 mm. wide. Panicle contracted but not spikelike, narrowly elliptic or narrowly oblong in outline, erect, 6–15 cm, greenish yellow or gray-green, infrequently tinged violet-brown; branches suberect, smooth, lowest up to 5 cm. Spikelets 4.5–5 mm; glumes slightly shorter than or subequaling adjoining lemmas, apex obtuse, often lacerate; lemmas awned from slightly below middle to lower 1/4, or awnless; awn shorter than lemma. Fl. Jun–Aug.

Swampy, often saline, montane grasslands; 1800–3100 m. Xinjiang [Tajikistan (Pamirs)].

This is a local variant, intermediate between typical *Deschampsia cespitosa*, with an open panicle, and *D. koelerioides*. This subspecies is a taller, stouter plant than *D. koelerioides*, with a paler, less dense panicle, and occurs at somewhat lower altitudes.

3d. *Deschampsia cespitosa* subsp. *ivanovae* (Tzvelev) S. M. Phillips & Z. L. Wu, **comb. et stat. nov.**

短枝发草 duan zhi fa cao

Basionym: *Deschampsia ivanovae* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 21: 49. 1961; *D. littoralis* (Gaudin) Reuter var. *ivanovae* (Tzvelev) P. C. Kuo & Z. L. Wu; *D. multiflora* P. C. Kuo & Z. L. Wu.

Culms 30–70 cm. Leaf blades 1–3 mm wide. Panicle usually loosely contracted, often nodding, 5–15 cm, purplish brown tinged golden; branches flexuous, smooth or scaberulous, lowest up to 7 cm. Spikelets 4.5–8 mm; glumes much longer than adjoining lemmas, apex acuminate; lemmas awned from near base or near middle; awn not or only slightly longer than lemma. Fl. and fr. Jul–Sep.

• Alpine meadows, pebbly river beds, roadsides, damp places; 3200–5100 m. Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan.

Deschampsia cespitosa subsp. *ivanovae* is distinguished mainly by its long-acuminate glumes. The name *D. littoralis* (Gaudin) Reuter has been misapplied to this taxon in Chinese literature. Genuine *D. littoralis* refers to a variant from Switzerland with short ligules and proliferating spikelets.

Deschampsia multiflora appears to be based on an aberrant gathering from Qinghai with 3–5 florets per spikelet. The type has been lost.

81. *HOLCUS* Linnaeus, Sp. Pl. 2: 1047. 1753, nom. cons.

绒毛草属 rong mao cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Sorghum Adanson (1763), not *Sorghum* Moench (1794).

Annuals or perennials. Leaf blades flat. Inflorescence a moderately to densely contracted panicle. Spikelets laterally compressed, disarticulating below glumes, florets 2, lower floret bisexual, upper floret staminate; rachilla usually curved and hooked below bisexual floret, often shortly extended above staminate floret; glumes subequal, papery, enclosing florets, strongly keeled, lower glume 1-veined, upper glume 3-veined; lemmas cartilaginous, shiny, rounded on back, veins indistinct, apex obtuse or 2-toothed, upper lemma or both awned; awn arising from upper 1/3 of lemma back, geniculate, hooked or straight; palea slightly shorter than lemma, membranous.

Eight species: N Africa, SW Asia, Europe; one species (introduced) in China.

1. *Holcus lanatus* Linnaeus, Sp. Pl. 2: 1048. 1753.

绒毛草 rong mao cao

Avena lanata (Linnaeus) Koeler; *Notholcus lanatus* (Linnaeus) Nash ex Hitchcock.

Perennial, softly hairy. Culms tufted, erect or geniculate at base, 30–80 cm tall, pubescent, 4–5-noded. Leaf sheaths loose, tomentose with reflexed hairs; leaf blades flat, 6–18 cm, 3–9 mm wide, soft, both surfaces pubescent, apex acute; ligule 2–3 mm, truncate or toothed. Panicle lanceolate to oblong or ovate in outline, rather loose to very dense, 3–12 cm; branches narrowly ascending, pubescent. Spikelets oblong or gaping, 3.5–6

mm, pale grayish green or purplish; glumes lanceolate, keel and veins hispidulous, surface scabrid or puberulent to villous, lower glume apex acute, upper glume wider and sometimes slightly longer than lower glume, apex mucronate; florets subequal, 2–2.5 mm; rachilla ca. 0.5 mm; lower lemma awnless, anthers 1.8–2 mm; upper lemma with hooked 1–2 mm awn, anthers ca. 1.5 mm. Fl. and fr. May–Oct.

Open ground, meadows, moist places; an adventive occasionally cultivated as a meadow grass. Jiangxi, Taiwan, Yunnan [native to Europe].

This European grass is now introduced as a weed in most temperate parts of the world.

82. *AIRA* Linnaeus, Sp. Pl. 1: 63. 1753.

银须草属 yin xu cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals, small. Leaf blades rolled. Inflorescence an open or contracted panicle. Spikelets small, laterally compressed, florets 2, both alike, bisexual, separated by very short internode, disarticulating below each floret; rachilla not extended beyond upper floret; glumes persistent, equal, enclosing florets, ovate, membranous, shining, 1(–3)-veined, apex acute; floret callus small, usually shortly bearded laterally, rarely glabrous; lemmas ovate, rounded on back, membranous becoming firm at maturity, indistinctly 5-veined, glabrous, upper part scaberulous to scabrid, awned from lower back or lower floret awnless, apex 2-toothed; awn geniculate with twisted column; palea slightly shorter than lemma. Anthers small. Caryopsis fusiform. $2n = 14, 28$.

Eight species: centered on the Mediterranean region, extending northward to Scandinavia and eastward to Iran and Afghanistan; introduced in other temperate regions; one species in China.

1. *Aira caryophylla* Linnaeus, Sp. Pl. 1: 66. 1753.

银须草 yin xu cao

Culms solitary or tufted, erect or slightly geniculate, very slender, 5–30 cm tall, scabrid. Leaf sheaths scaberulous; leaf

blades narrowly linear to filiform, 1–5 cm, 2–3 mm wide; ligule lanceolate, 1–4 mm, acute becoming lacerate. Panicle open, ovate in outline, up to 10 cm; branches 2–5 cm, capillary, scabrid, bearing spikelets in clusters toward tips; pedicels 2–4 mm, up to twice spikelet length, a pear-shaped swelling below spike-

let. Spikelets ovate-oblong in outline, 2–3.5 mm, shining, silvery-gray or tinged purplish; glumes as long as spikelet, keel scaberrulous; florets both awned; lemmas brown, 3/4 length of glumes, scabrid, narrowed to 2-toothed apex; awn 2.5–4 mm, arising from lower 1/3 of lemma. Anthers 0.3–0.6 mm.

Dry grassy places in mountains; ca. 3600 m. W Xizang [India, Russia; N Africa, SW Asia, Europe; introduced in North and South America and Australia].

This pioneer of dry, open places is now widespread in temperate regions.

83. *PHALARIS* Linnaeus, Sp. Pl. 1: 54. 1753.

蔺草属 *ge cao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annual or perennial, tufted or rhizomatous. Leaf blades linear, flat; ligule membranous. Inflorescence a contracted or spike-like panicle. Spikelets strongly laterally compressed, florets 3 with lower 2 usually reduced to sterile lemmas and uppermost floret bisexual, disarticulating above glumes, rachilla not or very rarely extended beyond uppermost floret; glumes subequal, boat-shaped, as long as spikelet and enclosing florets, herbaceous, prominently 3-veined, strongly keeled and often winged along midvein; sterile lemmas up to 1/2 as long as fertile lemma, narrow, often hairy, or one or both reduced to a vestigial fleshy scale at base of fertile floret; fertile floret shorter than glumes, leathery often becoming cartilaginous and shiny, rounded on back, obscurely 5-veined, awnless; palea resembling lemma, 2-veined. Caryopsis tightly enclosed by lemma and palea; embryo small; hilum linear. $x = 7$.

Eighteen species: mainly in the Mediterranean region and warm-temperate parts of the New World, one species circumboreal; several species widely distributed as adventives; five species (four introduced) in China.

- 1a. Spikelets falling in clusters of 7, a single fertile spikelet encircled by 6 reduced sterile spikelets 5. *P. paradoxa*
- 1b. Spikelets all alike, not in clusters, disarticulating above the persistent glumes.
 - 2a. Glumes not or very narrowly winged; perennial with spreading rhizomes 1. *P. arundinacea*
 - 2b. Glumes winged; annual or tufted perennial.
 - 3a. Perennial, culm bases often bulbously thickened 2. *P. aquatica*
 - 3b. Annuals, culm bases not thickened.
 - 4a. Sterile lemmas 2, equal; anthers ca. 3 mm 3. *P. canariensis*
 - 4b. Sterile lemma 1; anthers 1.5–1.8 mm 4. *P. minor*

1. *Phalaris arundinacea* Linnaeus, Sp. Pl. 1: 55. 1753.

蔺草 *ge cao*

Typhoides arundinacea (Linnaeus) Moench.

Perennial, rhizomatous; rhizomes extensively spreading. Culms reedlike, erect, leafy, 0.6–1.5 m tall, 6–8-noded. Leaf sheaths glabrous, not inflated; leaf blades 10–35 cm × 10–18 mm, tapering to a fine apex; ligule 2–3 mm. Panicle contracted, linear-oblong in outline, lobed, interrupted, 8–15 cm; branches short, erect, densely spiculate. Spikelets oblong, laterally compressed, 4–6 mm; glumes narrowly lanceolate, glabrous or puberulous, pale green streaked darker green or purplish, keel scabrid, wingless or very narrowly winged upward, apex sharply acute; sterile lemmas equal, subulate, 1.5–1.8 mm, villous; fertile lemma broadly lanceolate, 3–4 mm, appressed-pubescent upward, shiny; palea boat-shaped, keels ciliate. Anthers 2.5–3 mm. Fl. and fr. Jun–Aug. $2n = 28$.

Marshy grassland, river and lake margins, forming colonies; 100–3200 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang (Lin'an) [widely distributed in temperate parts of the N hemisphere].

An ornamental form of this species with green- and cream-striped leaf blades, *Phalaris arundinacea* var. *picta* Linnaeus (丝带草 *si dai cao*), is sometimes cultivated in gardens.

2. *Phalaris aquatica* Linnaeus, Cent. Pl. 1: 4. 1755.

水蔺草 *shui ge cao*

Perennial, tufted. Culms 50–150 cm tall, often bulbously thickened at base. Uppermost leaf sheaths not inflated; leaf blades 3–8 mm wide; ligule 3–7 mm. Panicle spike-like, cylindrical, 1.5–11 cm, sometimes lobed at base. Spikelets elliptic-oblong; glumes 5–7 mm, winged, wing margin entire, apex acute; sterile lemma 1(–2), subulate, 0.2–2.2 mm, pubescent, second lemma (when present) up to 0.5 mm; fertile lemma lanceolate, 3–4.6 mm, densely pubescent. Anthers 3–3.5 mm. $2n = 28$.

Introduced for grazing; Yunnan [Pakistan (introduced); N Africa, SW Asia, S Europe].

This species is widely cultivated as a pasture and forage grass in many parts of the world. It is best suited to upland areas with high rainfall.

3. *Phalaris canariensis* Linnaeus, Sp. Pl. 1: 54. 1753.

加那利蔺草 *jia na li ge cao*

Annual, loosely tufted. Culms 30–60(–100) cm tall. Uppermost leaf sheaths inflated with short blade; leaf blades 3–10 mm wide; ligule 3–5 mm. Panicle spike-like, very dense, ovate to oblong-ovate in outline, 1.5–4 cm. Spikelets obovate, strongly flattened, 7–10 mm; glumes oblanceolate, glabrous or puberulent, whitish with green veins, keel broadly winged above middle, wing margin entire, apex acute; sterile lemmas 2, equal, narrowly elliptic, chaffy, 2.5–4 mm, appressed-pilose; fertile

lemma lanceolate, 5–6 mm, densely appressed-pubescent, shiny. Anthers 3–4 mm. Fl. and fr. Oct.

Roadsides and other disturbed places, introduced; below 3000 m. Hebei, Shanghai, Taiwan [W Mediterranean region, SW Asia (Caucasus)].

This species is widely cultivated for bird seed (Canary Grass) and is adventive in most warm-temperate countries.

4. *Phalaris minor* Retzius, Observ. Bot. 3: 8. 1783.

细蔺草 *xi ge cao*

Annual, tufted. Culms 20–100 cm tall. Uppermost leaf sheaths not inflated; leaf blades 3–9 mm wide; ligule 4–6 mm. Panicle dense, ovate to oblong, 1–6 cm. Spikelets elliptic, 4.5–5.5 mm; glumes winged on upper part of keel, wing margin erose-denticulate; sterile lemma 1, ca. 1 mm, appressed-pilose; fertile lemma lanceolate-ovate, 2.7–4 mm, pubescent, becoming cartilaginous and shiny. Anthers 1.5–1.8 mm. $2n = 28$.

Wheat fields, introduced. Yunnan [Bhutan, N India, Pakistan; N Africa, SW Asia, S Europe].

This annual weed, native in the Mediterranean region, is now widely distributed in many parts of the world. It was introduced to

China accidentally in wheat seed imported from Mexico about 1974 and is becoming naturalized in parts of Yunnan.

5. *Phalaris paradoxa* Linnaeus, Sp. Pl., ed. 2, 2: 1665. 1763.

奇蔺草 *qi ge cao*

Annual, tufted. Culms 15–100 cm tall. Uppermost leaf sheath inflated; leaf blades 2–9 mm wide; ligule 2–8 mm. Panicle dense, narrowly oblong, 4–10 cm, base enclosed in uppermost leaf sheath. Spikelets arranged in clusters composed of 1 fertile spikelet encircled by 6 sterile spikelets, clusters falling entire, sterile spikelets sometimes reduced to club-shaped clusters of glumes. Fertile spikelet: glumes 4.5–6 mm, prominently 7–9-veined, narrowly winged, wing expanded near middle into large tooth, pale green or straw-colored with dark green stripe above tooth, apex attenuate; sterile lemmas abortive, represented by 2 minute fleshy scales at base of fertile lemma; fertile lemma elliptic, 2.8–3.2 mm, cartilaginous, shiny, sparsely pilose toward apex. Anthers 1–1.8 mm. $2n = 14$.

Wheat fields, introduced. Yunnan [N Africa, SW Asia, S Europe].

Like the previous species, this widespread, annual weed was introduced to China accidentally in wheat seed imported from Mexico about 1974.

84. *ANTHOXANTHUM* Linnaeus, Sp. Pl. 1: 28. 1753.

黄茅属 *huang hua mao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Hierochloë R. Brown.

Perennial, fragrant herbs. Inflorescence an open or contracted panicle. Spikelets lanceolate to plumply elliptic or oblong, weakly laterally compressed, florets 3, brown, lower 2 florets staminate or sterile, terminal floret bisexual; rachilla disarticulating above glumes but not between florets. Glumes persistent, unequal to subequal, lanceolate to ovate, lower glume shorter, 1(–3)-veined, upper glume 3(–5)-veined, about as long as spikelet, apex acute. Lower 2 florets subequal, with a palea and 3 stamens, or sterile and epaleate, or a combination of both; lemmas equal to or shorter than upper glume, firmly membranous to leathery, often brown-pilose on back and ciliate along margins, apex emarginate to deeply 2-lobed, awnless, with a short straight awn from above middle, or geniculately awned from near base. Bisexual floret equaling or shorter than 2 lower florets; lemma cartilaginous, glossy, 3–5-veined, margins convolute and covering palea, apex awnless, rarely mucronate; palea 1–3-veined, without keels; lodicules absent or 2; stamens 2; stigmas plumose. $x = 5, 7$.

About 50 species: temperate and cold regions of both hemispheres, also on tropical mountains; ten species (three endemic) in China.

All species are scented with coumarin ($C_9H_6O_2$), and some are used medicinally for their coumarin content.

Hierochloë has traditionally been recognized on the basis of the two lower florets being staminate, paleate, and awnless or only shortly awned, in contrast to the sterile, epaleate, geniculately awned lower florets in typical *Anthoxanthum*. Lodicules are also absent in typical *Anthoxanthum*. However, it is now known that a considerable number of species is intermediate in these characters, including some in China, and also some (e.g., *A. hookeri*) where the sex of the lower florets is variable within the species. There is no justification for continuing to recognize two separate genera. The species are all clearly related by their unusual spikelet structure and by the presence of coumarin.

1a. Lemma of both lower florets awnless or mucronate.

2a. Spikelets 3.5–6 mm; lower florets slightly shorter than glumes; plants up to 60 cm tall; panicle 4–10 cm 1. *A. nitens*

2b. Spikelets 2.5–4 mm; lower florets equal to or longer than glumes; plants up to 30 cm tall; panicle 3–6 cm 2. *A. glabrum*

1b. Lemma of both lower florets awned, or at least lemma of second floret.

3a. Lower florets both staminate, with a palea and stamens, or second floret sterile.

4a. Culms 50–120 cm tall; leaf blades 6–15 mm wide; panicle 10–22 cm; 2 lower lemmas scabrid 3. *A. potaninii*

4b. Culms 10–50 cm tall; leaf blades 2–8(–10) mm wide; panicle 1.5–10 cm; 2 lower lemmas pubescent.

5a. Panicle 1.5–5 cm; awn of second lemma arising near middle, 3–7 mm, straight or weakly geniculate; bisexual floret hairy toward apex.

6a. Lemma of second floret with straight ca. 3 mm awn 4. *A. tibeticum*

6b. Lemma of second floret with weakly geniculate 4–7 mm awn 5. *A. monticola*

- 5b. Panicle 6–10 cm; awn of second lemma arising near base, 6–11 mm, clearly geniculate; bisexual floret glabrous 6. *A. hookeri*
- 3b. Lower florets both sterile, without a palea or stamens.
- 7a. Spikelets ca. 3 mm, obovate 7. *A. pallidum*
- 7b. Spikelets more than 3 mm, lanceolate to oblong.
- 8a. Leaf blades up to 3 mm wide; spikelets 3–5 mm; glumes ovate 8. *A. sikkimense*
- 8b. Leaf blades up to 7 mm wide; spikelets 4.3–9 mm; glumes lanceolate.
- 9a. Spikelets 4.3–5.5 mm; lower glume 3/4 length of the upper glume; sterile lemmas ca. 4/5 length of spikelet 9. *A. horsfieldii*
- 9b. Spikelets 6–9 mm; lower glume 1/2 length of upper glume; sterile lemmas 1/2–2/3 length of spikelet 10. *A. odoratum*

1. *Anthoxanthum nitens* (Weber) Y. Schouten & Veldkamp, Blumea 30: 348. 1985.

茅香 mao xiang

Poa nitens Weber, Prim. Fl. Holsat., Suppl. 2, no. 6. 1787; *Hierochloë bungeana* Trinius; *H. glabra* Trinius subsp. *bungeana* (Trinius) Peschkova; *H. odorata* (Linnaeus) P. Beauvois; *H. odorata* f. *pubescens* Krylov; *H. odorata* subsp. *pubescens* (Krylov) H. Hara ex T. Koyama; *Holcus odoratus* Linnaeus.

Plant with slender creeping rhizomes. Culms 20–60 cm tall, 3–4-noded. Leaf sheaths glabrous or ± pubescent, longer than internodes; basal leaf blades up to 30 cm, 3–10 mm wide, culm leaves much shorter, glabrous or adaxial surface puberulous, margins scabrid, apex acuminate; ligule 2–5 mm, obtuse. Panicle pyramidal, loose, 4–10 cm; branches spreading, smooth, bare in lower half. Spikelets plumply elliptic, 3.5–6 mm, light brown, shining; glumes subequal, as long as spikelet, 1–3-veined; callus of staminate florets stiffly hairy (or glabrous in E Asia); lower florets staminate, lemmas slightly shorter than glumes, puberulous on back above middle, margins shortly ciliate, apex acute or minutely mucronate; bisexual floret ca. 3.5 mm, appressed-pubescent toward apex; palea 1-veined; anthers ca. 2.5 mm. Fl. and fr. Jun–Sep.

Mountain slopes, floodplains, wet grasslands; 500–3800 m. Gansu, Guizhou, Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Japan, Korea, Kyrgyzstan, Mongolia, Russia; SW Asia (Caucasus), Europe, North America].

Over much of the range of this species, the callus of the staminate florets bears a circlet of short, stiff bristles. However, forms from E Asia with a glabrous callus like that of *Anthoxanthum glabrum* and the panicle and spikelet characters of *A. nitens* are difficult to place and have been assigned to both species at infraspecific rank. The names *Hierochloë bungeana* and *H. odoratum* subsp. *pubescens* belong here.

Unfortunately, the epithet “*odorata*,” by which this widespread species has long been known in *Hierochloë*, cannot be used in *Anthoxanthum* because the heterotypic name *A. odoratum* Linnaeus already exists.

Anthoxanthum nitens is used for medicine, weaving, and soil retention.

2. *Anthoxanthum glabrum* (Trinius) Veldkamp, Blumea 30: 347. 1985.

光稃香草 guang fu xiang cao

Hierochloë glabra Trinius in Sprengel, Neue Entdeck.

Pflanzenk. 2: 66. 1821; *H. odorata* (Linnaeus) P. Beauvois subsp. *glabra* (Trinius) Tzvelev.

Plant with slender creeping rhizomes. Culms 10–30 cm tall, 2- or 3-noded. Leaf sheaths pubescent with reflexed hairs, longer than internodes; basal leaf blades 2–5 cm × ca. 3 mm, culm leaves much shorter, glabrous or adaxial surface puberulous, apex acuminate; ligule 2–5 mm, obtuse. Panicle ovate or oblong in outline, 3–6 cm; branches spreading or ascending, smooth. Spikelets plumply elliptic, 2.5–4(–4.5) mm, yellowish brown, shining; glumes subequal, slightly shorter than spikelet, 1–3-veined; callus of staminate florets glabrous; lower florets staminate, lemmas equal to or longer than glumes, subglabrous or minutely puberulous on back near apex, margins ciliate, apex obtuse or emarginate and mucronate, mucro up to 0.5 mm; bisexual floret 2–2.5 mm, pubescent toward apex; palea 1-veined; anthers 1.7–2 mm. Fl. and fr. Jun–Sep.

Mountain slopes in wet grassy places; 500–3300 m. Anhui, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Xinjiang, Yunnan, Zhejiang (Lin'an) [Kazakhstan, Mongolia, Russia].

This species is very close to *Anthoxanthum nitens* and is not clearly separable from the Asian forms of that species that have a glabrous callus. There is a tendency in *A. glabrum* to smaller panicles and spikelets and relatively shorter glumes, thereby imparting a slightly different habit.

3. *Anthoxanthum potaninii* (Tzvelev) S. M. Phillips & Z. L. Wu, Novon 15: 476. 2005.

松序茅香草 song xu mao xiang cao

Hierochloë potaninii Tzvelev, Rast. Tsent. Azii 4: 35. 1968.

Plant loosely tufted, shortly rhizomatous, brown scales at base. Culms 50–120 cm tall, 4-noded, nodes black-brown. Leaf sheaths glabrous, smooth or scaberulous, shorter than internodes below and longer above; leaf blades broadly linear, 15–25 cm, 6–15 mm wide, both surfaces scabrid; ligule up to 1 cm, lanceolate. Panicle fairly loose, 10–22 × 2–6 cm; branches smooth. Spikelets 3.5–6 mm; glumes unequal, lower glume about half spikelet length, 1-veined, upper glume a little shorter than spikelet, 3-veined; lower florets staminate, lemmas ca. 5 mm, scabrid on back, margins ciliate, apex emarginate; first lemma awnless or mucronate; second lemma with subapical awn up to 4 mm; bisexual floret similar to staminate but smooth on back, scabrid near apex; palea 1(–2)-veined; anthers 2–3.5 mm. Fl. Jun.

• Grassy places in mountain valleys, forest margins and among shrubs; 2500–3000 m. S Gansu, W Sichuan.

Anthoxanthum laxum (R. Brown ex J. D. Hooker) Veldkamp (*Hierochloë laxa* R. Brown ex J. D. Hooker) has been confused with this species. *Anthoxanthum laxum* occurs on high-mountain ledges and in alpine pastures above 3000 m in E Afghanistan, Kashmir, Nepal, and N Pakistan. It can be distinguished by its smooth leaf blades, subequal glumes, and pilose or hirsute apex of the bisexual floret.

4. *Anthoxanthum tibeticum* (Bor) Veldkamp, *Blumea* 30: 350. 1985.

藏茅香 zang mao xiang

Hierochloë tibetica Bor, *Kew Bull.* [8] 1953: 271. 1953.

Plants with slender creeping rhizomes. Culms 20–35 cm tall, 2-noded. Leaf sheaths smooth, glabrous; leaf blades flat or involute, basal 2–5 cm, 2–3 mm wide, culm blades shorter and broader, both surfaces smooth and glabrous, margins scabrid; ligule 2–2.5 mm. Panicle loose or contracted, 2.5–5 × 1–3 cm, with ca. 10 spikelets; branches capillary, smooth, flexuous, pubescent. Spikelets obovate, 5–6 mm, purplish; glumes subequal, as long as spikelet, broadly ovate-oblong, 3-veined, apex hyaline, otherwise purple, back glabrous or a few scattered hairs; lower florets staminate, lemmas densely pubescent; first lemma bilobed, awnless; second lemma 2-cleft to about middle, short-awned from sinus, awn straight, 2–3 mm; bisexual floret ca. 2.5 mm, pubescent above middle; palea 2-veined; anthers 1.2–1.5 mm.

- Exposed mountain ridges and slopes; ca. 5000 m. Xizang.

5. *Anthoxanthum monticola* (Bigelow) Veldkamp, *Blumea* 30: 347. 1985.

高山茅香 gao shan mao xiang

Holcus monticola Bigelow, *New England J. Med. Surg.* 5: 334. 1816; *Hierochloë alpina* (Swartz ex Willdenow) Roemer & Schultes; *H. monticola* (Bigelow) Á. Löve & D. Löve; *Holcus alpinus* Swartz ex Willdenow.

Plant forming loose mats, shortly rhizomatous, base clothed in papery old sheaths. Culms solitary or few, erect, 10–40 cm tall, 2–3-noded. Leaf sheaths smooth, glabrous, longer than internodes, upper slightly inflated; leaf blades glossy, basal inrolled, 20–30 cm, 2–3 mm wide, culm blades shorter, flat; ligule 1–2 mm. Panicle contracted, oblong or ovate in outline, 1.5–4 × 1–2 cm; branches short, paired. Spikelets broadly oblong, 5–6 mm; glumes subequal, as long as spikelet, lower 1–3-veined, upper 3–5-veined; lower florets staminate, lemmas scabrid-pubescent on back, hispid toward apex, margins ciliate; first lemma emarginate with 1–3 mm, straight sub-apical awn; second lemma 2-cleft to middle or below, awned from sinus, awn weakly geniculate, 4–7 mm; bisexual floret ca. 4 mm, pilose toward apex; palea 1-veined, ciliolate along upper part of vein; anthers ca. 2.5 mm. Fl. and fr. Jul–Aug. *2n* = 56 (also 58, 63, 64, 66, 68, 71, 72, 74–78).

Alpine steppe; ca. 2300 m. NE China [Japan, Korea, Mongolia, Russia; N Europe, North America].

This is an arctic-alpine species of both the Old and New Worlds.

The specific epithet of *Holcus alpinus* cannot be used when this name is transferred to *Anthoxanthum* because the heterotypic name *A. alpinum* Á. Löve & D. Löve already exists.

6. *Anthoxanthum hookeri* (Grisebach) Rendle, *J. Linn. Soc., Bot.* 36: 380. 1904.

藏黄花茅 zang huang hua mao

Ataxia hookeri Grisebach, *Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ.* 3: 77. 1868; *Anthoxanthum elongatum* (Handel-Mazzetti) Veldkamp; *A. latifolium* B. S. Sun & S. Wang; *A. latifolium* var. *purpurascens* B. S. Sun & S. Wang; *Hierochloë elongata* Handel-Mazzetti; *H. hookeri* (Grisebach) Maximowicz.

Plant loosely tufted, shortly rhizomatous. Culms 20–50 cm tall, 3–4-noded. Leaf sheaths glabrous or puberulous; leaf blades linear or broadly linear, 5–25 cm, 3–8 mm wide, pubescent or abaxial surface glabrous, apex acuminate; ligule 1.5–5 mm, truncate-lacinate. Panicle rather loose or contracted, lanceolate or lanceolate-oblong in outline, 6–10 cm. Spikelets lanceolate-oblong, 5.5–8 mm, green when young, maturing purplish brown; glumes unequal, lanceolate, lower glume 3–5(–6) mm, 1(–3)-veined, upper glume equal to spikelet, 3(–5)-veined; lower florets pubescent on back, apex 2-lobed, lobes acute; first floret usually staminate with palea (rarely stamens abortive), lemma 5–6 mm, lobed in upper 1/3, awned from sinus, awn fine, straight, 1–4 mm; second floret often sterile and epaleate (but sometimes staminate with palea), lemma awned from lower 1/4, apical lobes short or back splitting to awn insertion, awn geniculate, 6–11 mm; bisexual floret 2.5–3.2 mm, smooth, shiny, (3–)5-veined; palea veinless; anthers 2.5–3.5 mm. Fl. and fr. May–Dec.

Open grassy mountainsides, dry rocky ridges, forests; 2100–4000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

The sexuality of the 2 lower florets is very variable in this species. *Anthoxanthum latifolium* is based on a particularly broad-leaved form from Yunnan.

7. *Anthoxanthum pallidum* (Handel-Mazzetti) Tzvelev, *Rast. Tsent. Azii* 4: 35. 1968.

淡色黄花茅 dan se huang hua mao

Hierochloë pallida Handel-Mazzetti, *Akad. Wiss. Wien, Math.-Naturiss. Kl., Anz.* 57: 273. 1920.

Culms geniculate at base, shortly stoloniferous, 7–16 cm tall. Leaf sheaths glabrous; leaf blades flat, lanceolate, 5–12 cm, 2–4 mm wide; ligule 1–2.5 mm. Panicle contracted, 2.5–4 × 0.4–0.5 cm; branches single or in pairs; pedicels very short, setulose-pilose. Spikelets obovate, ca. 3 mm; glumes subequal, ovate, pale with green keel, 3-veined, sparsely setose, apex acute; lower florets as long as glumes, sterile, composed only of lemmas, densely appressed-pilose on back, apex 2-lobed; first lemma with awn arising from middle, awn straight, equaling lemma body; second lemma deeply bifid, awned from sinus, awn straight; bisexual floret less than 1/2 length of glumes, smooth, shiny; anthers ca. 3 mm. Fl. and fr. spring to summer.

- Mountain slopes, damp meadows, ca. 2700 m. Sichuan, NE Yunnan.

8. *Anthoxanthum sikkimense* (Maximowicz) Ohwi, Bull. Tokyo Sci. Mus. 18: 8. 1947.

锡金黄花茅 xi jin huang hua mao

Hierochloë sikkimensis Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 626. 1888; *Anthoxanthum gracillimum* (J. D. Hooker) Mez; *Hierochloë gracillima* J. D. Hooker.

Plant probably shortly rhizomatous. Culms solitary or few, very slender, 30–45 cm, 2–3-noded. Leaf blades narrowly linear, often involute when dry, 5–17 cm, ca. 0.3 mm wide; ligule 2–4 mm, truncate-erose. Panicle contracted, linear-oblong in outline, 3.8–5 cm; branches very short, with few spikelets. Spikelets oblong-ovate, 3–5 mm, yellow or purplish; glumes unequal, lower glume ovate, ca. 3 mm, upper glume oblong-ovate, as long as spikelet; lower florets sterile, composed only of lemmas, pilose on back, apex 2-lobed, lobes truncate-ciliate; first lemma 3–3.8 mm, lobed in upper 1/3, awned from sinus, awn straight, 1.7–1.8 mm; second lemma 3.9–4 mm, awned from lower 1/4, awn geniculate, 6–6.7 mm; fertile floret ca. 2.3 mm, smooth, shiny; palea 1-veined.

Grassy mountainsides, among bushes; 2000–2500 m. Yunnan (Kunming, Chengjiang) [India (Sikkim), Nepal].

9. *Anthoxanthum horsfieldii* (Kunth ex Bennett) Mez ex Reeder, J. Arnold Arbor. 24: 327. 1950.

台湾黄花茅 tai wan huang hua mao

Ataxia horsfieldii Kunth ex Bennett, Pl. Jav. Rar. 8. 1838; *Anthoxanthum formosanum* Honda; *A. horsfieldii* var. *formosanum* (Honda) Veldkamp; *A. horsfieldii* var. *viridescens* (Honda) Veldkamp; *A. japonicum* (Maximowicz) Hackel ex Matsumura subsp. *luzoniense* (Merrill) T. Koyama; *A. luzoniense* Merrill; *A. viridescens* Honda; *Hierochloë horsfieldii* (Kunth ex Bennett) Maximowicz.

Plant loosely tufted, shortly rhizomatous. Culms 10–60 cm tall, 3–5-noded. Leaf sheaths glabrous or sparsely pilose; leaf blades loosely involute, 6–13 cm, 2–5 mm wide, glabrous or adaxial surface pubescent; ligule 2–4 mm, truncate. Panicle narrow, contracted, 2.5–7 cm; branches up to 5 cm; pedicels pubescent. Spikelets lanceolate-oblong, 4.3–5.5 mm; glumes unequal, glabrous, lower glume 2/3 to 3/4 length of upper glume, 1-veined, upper glume as long as spikelet, 3-veined; lower florets sterile, composed only of lemmas, ca. 4 mm, pilose on back, apex 2-lobed, lobes obtuse; first lemma awned from above middle, awn straight, 0.8–1.5 mm; second lemma awned from lower 1/4–1/3, awn geniculate, 4.5–6 mm; bisexual floret 2.5–3 mm, smooth, shiny; anthers 1.5–2 mm. Fl. Oct.

Mountains, grassy places, in sun or shade; 2500–3300 m. Guizhou, Taiwan [India, Japan, Malaysia, New Guinea, Philippines, Thailand].

Anthoxanthum horsfieldii is a variable species of mountains in SE Asia, extending into India. There are small differences between the populations from different islands or mountain areas, and these populations are sometimes recognized at varietal rank. However, this approach has led to a proliferation of varieties based on overlapping, only partially segregating characters and is not followed here.

Both lower florets appear to be sterile and epaleate in Taiwan, but in SE Asia the first floret may sometimes be staminate with a palea.

Anthoxanthum horsfieldii is in fact very close to *A. hookeri* from the Himalayas, which differs in little more than its rather looser panicle and acute lemma lobes.

10. *Anthoxanthum odoratum* Linnaeus, Sp. Pl. 1: 28. 1753.

黄花茅 huang hua mao

Plant loosely tufted, sometimes rhizomatous. Culms 15–60(–100) cm tall, 1–3-noded. Leaf sheaths glabrous or loosely pilose, mouth glabrous or bearded; leaf blades flat, up to 12 cm, 2–7 mm wide, glabrous or loosely pilose, smooth or scabrid, apex acuminate; ligule 1–3 mm, obtuse. Panicle dense, spike-like, lanceolate to narrowly oblong in outline, 2–7(–10) × 0.4–1 cm; branches short; pedicels pubescent or glabrous. Spikelets lanceolate, 6–9 mm; glumes unequal, pubescent or punctiform-scabrid, margins sometimes ciliate, lower glume ca. 1/2 length of upper glume, 1-veined, upper glume subequal to spikelet, 3-veined; lower florets sterile, composed only of lemmas, 2.5–3.5 mm, pilose on back, apex 2-lobed, lobes short, obtuse; first lemma awned from near middle, awn straight, 2–4 mm; second lemma awned near base, awn geniculate, 7–9 mm; bisexual floret 2–3 mm, smooth, shiny; palea 1-veined; anthers 3–4.5 mm. Fl. and fr. May–Aug.

Meadows, alpine steppe; 1400–2900 m. Jiangxi, Taiwan (introduced), Xinjiang, NE China [Japan, Korea, Mongolia, Russia; Europe].

1a. Pedicels and glumes pubescent 10a. subsp. *odoratum*
1b. Pedicels and glumes glabrous 10b. subsp. *alpinum*

10a. *Anthoxanthum odoratum* subsp. *odoratum*

黄花茅(原亚种) huang hua mao (yuan ya zhong)

Leaf blades hairy or glabrous. Panicle up to 7(–10) cm; pedicels pubescent. Spikelets with pubescent glumes. $2n = 20$.

Meadows, introduced. Jiangxi (Lu Shan), Taiwan [Russia; Europe].

This is a polymorphic grass, introduced in grass seed or adventive in many temperate countries.

10b. *Anthoxanthum odoratum* subsp. *alpinum* (Á. Löve & D. Löve) Tzvelev, Zlaki SSSR, 354. 1976.

日本黄花茅 ri ben huang hua mao

Anthoxanthum alpinum Á. Löve & D. Löve, Rep. Univ. Inst. Appl. Sci., Reykjavik, Dept. Agric., Ser. B 3: 105. 1948; *A. nipponicum* Honda; *A. nipponicum* var. *furumii* Honda; *A. odoratum* var. *alpinum* (Á. Löve & D. Löve) Uechtritz; *A. odoratum* subsp. *furumii* (Honda) Koyama; *A. odoratum* subsp. *nipponicum* (Honda) Tzvelev; *A. odoratum* var. *nipponicum* (Honda) Tzvelev.

Leaf blades always glabrous. Panicle 2–3 cm; pedicels glabrous. Spikelets with glabrous glumes. Fl. and fr. Jun–Aug. $2n = 10$.

Alpine bush and steppe; 1400–2900 m. Xinjiang, NE China [Japan, Korea, Russia; Europe].

Diploid variants of *Anthoxanthum odoratum* occur mainly in the arctic and on mountains. They tend to be glabrous, but cannot be reliably separated from the widespread, tetraploid form on the basis of morphological characters.

85. COLEANTHUS Seidel in Roemer & Schultes, Syst. Veg. 2: 11. 1817, nom. cons.

莎禾属 suo he shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Dwarf ephemeral. Leaf blades broadly linear, flat or folded, falcate. Inflorescence a sparsely branched panicle, spikelets arranged in distant, compact, umbellate clusters, base enclosed in inflated, funnel-like uppermost leaf sheath. Spikelets laterally compressed, floret 1, rachilla extension absent; glumes absent; lemma ovate, hyaline, 1-veined, keeled, apex extended into a subulate cusplike awn; palea variable in size, frequently about 2/3 lemma length, broad, 2-toothed, keels extended into mucros. Lodicules absent. Stamens 2. Caryopsis elliptic-oblong, protruding from floret and shed from it at maturity; hilum oval.

One species: C and N Europe to NE Asia; probably introduced in North America.

This is a widely distributed, but rather rare little grass, occurring sporadically in scattered localities.

1. *Coleanthus subtilis* (Trattinnick) Seidel in Roemer & Schultes, Syst. Veg. 2: 276. 1817.

莎禾 suo he

Schmidtia subtilis Trattinnick, Fl. Österr. Kaiserth. 1: 12. 1816; *Wilibalda subtilis* (Trattinnick) Roth; *Zizania subtilis* (Trattinnick) Raspail.

Culms spreading, forming small mat, branching at lower nodes, ascending up to 5(–10) cm. Leaf sheaths inflated; leaf

blades ca. 1 cm × 1–4 mm, smooth, glabrous; ligule 0.5–3 mm. Panicle 0.5–3 cm; pedicels verticillate, 1–2 mm, setulose. Spikelets lanceolate; lemma 0.8–1.3 mm, vein scabrid; awn ca. 1 mm; palea 0.5–1 mm, keels scabrid or almost smooth. Anthers 0.3–0.4 mm. Caryopsis 1.7–2.1 mm, dark brown. Fl. and fr. spring to summer. $2n = 14$.

Muddy streamsides, lake margins, other wet places, forming colonies. NE China, Jiangxi [Russia; Europe; probably introduced in North America (NW United States)].

86. AGROSTIS Linnaeus, Sp. Pl. 1: 61. 1753.

剪股颖属 jian gu ying shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Pentatherum Nábelek.

Annuals or perennials, tufted or sometimes with rhizomes or stolons. Leaf blades linear to filiform or setaceous, flat or rolled; ligule membranous. Inflorescence a panicle, open to contracted or spike-like. Spikelets with 1 floret, small, often gaping, without rachilla extension; rachilla disarticulating above glumes; glumes persistent, longer than floret, subequal or lower a little longer, membranous, 1-veined, apex subacute to acuminate; floret callus glabrous or shortly pilose; lemma oblong to elliptic, thinner than glumes, often hyaline, 5-veined, rounded on back, glabrous or hairy, lateral veins sometimes excurrent, awnless or awned from back, apex truncate or toothed; awn usually geniculate, sometimes weakly so or straight when short; palea shorter than lemma, sometimes very small. Stamens 3. Caryopsis oblong, sulcate on ventral side.

About 200 species: temperate and cold regions of the N hemisphere, also on tropical mountains; 25 species (eight endemic) in China.

The genus includes some good fodder and lawn plants.

Some species are superficially very similar, and correct identification depends on careful observation of spikelet details. It is also important to collect the basal parts to show the presence or absence of rhizomes and stolons. When the palea is long it is normally obvious, but small paleas usually adhere to the mature caryopsis and may appear to be absent. The presence or absence of awns is useful for identification, but awned species may have awnless variants, and vice versa, and the position of the awn on the lemma back can also be rather variable.

1a. Lemma hairy.

2a. Spikelets 1.5–3 mm; palea almost equaling lemma 1. *A. munroana*

2b. Spikelets 3–4 mm; palea clearly shorter than lemma.

3a. Palea ca. 1/3 length of lemma; ligule 2.5–6 mm 2. *A. pilosula*

3b. Palea ca. 2/3 length of lemma; ligule 1.5–2.5 mm 3. *A. dshungarica*

1b. Lemma glabrous.

4a. Palea well developed, more than 1/3 lemma length.

5a. Culms up to 20 cm tall; alpine grass in Taiwan 17. *A. fukuyamae*

5b. Culms up to 130 cm tall; not alpine grasses.

6a. Anthers 0.5–0.8 mm; palea slightly under 1/2 lemma length 16. *A. arisan-montana*

6b. Anthers 0.8–1.5 mm; palea 1/2–3/4 lemma length.

7a. Plant stoloniferous, rhizomes absent; panicle contracted after anthesis 4. *A. stolonifera*

7b. Plant tufted or rhizomatous, stolons absent; panicle open after anthesis.

8a. Ligule on non-flowering shoots shorter than wide; panicle branches almost smooth;

plants up to 70 cm 5. *A. capillaris*

- 8b. Ligule on non-flowering shoots as long as or longer than wide; panicle branches scabrid; plants up to 150 cm.
 9a. Panicle green or violet tinged, branches moderately slender, branched from near base; floret callus shortly bearded, hairs 0.2–0.5 mm 6. *A. gigantea*
 9b. Panicle dark purple tinged brown, branches very fine, bare in lower 1/3; floret callus subglabrous 7. *A. divaricatissima*
- 4b. Palea small, 1/3 length of lemma or less, often tiny.
 10a. Lemma awnless (occasionally a short awnlet present, included within the spikelet).
 11a. Panicle dense, spikelike, linear or linear-oblong; culms less than 30 cm.
 12a. Leaf blades filiform, 0.4–0.8 mm wide; spikelets ca. 2.5 mm; callus subglabrous 8. *A. mackliniae*
 12b. Leaf blades linear, 1–3 mm wide; spikelets 2.8–4 mm; callus hairs ca. 0.2 mm 9. *A. hugoniana*
 11b. Panicle open to laxly contracted, not spikelike; culms 20–100 cm.
 13a. Culms weak, scrambling, 100–130 cm long; panicle ovate, ca. 30 cm, very delicate, branches and pedicels divaricate 10. *A. brachiata*
 13b. Culms erect, tufted, usually less than 100 cm; panicle narrowly oblong to ovate, 3–25 cm, branches and pedicels not divaricate.
 14a. Spikelets usually dark purple; glumes unequal; plant often less than 30 cm tall 11. *A. nervosa*
 14b. Spikelets usually green or grayish green, occasionally violet tinged; glumes subequal; plant (20–)40–100 cm tall.
 15a. Anthers 0.3–0.5(–0.7) mm; spikelets 1.3–1.8 mm (if longer, anthers small).
 16a. Leaf blades (2.5–)4–11 mm wide; glumes subacute; lemma 3/4–9/10 spikelet length; palea 0.3–0.6 mm 12. *A. micrantha*
 16b. Leaf blades 1–5 mm wide; glumes acuminate; lemma 2/3–3/4 spikelet length; palea less than 0.25 mm 13. *A. clavata*
 15b. Anthers 0.5–1.5 mm; spikelets 1.8–3.2 mm.
 17a. Spikelets 2.5–3.2 mm; anthers 1–1.5 mm 14. *A. kunmingensis*
 17b. Spikelets 1.9–2.8 mm; anthers 0.5–1 mm.
 18a. Panicle open, elliptic to narrowly ovate; branches bare in lower part; palea less than 0.2 lemma length 15. *A. infirma*
 18b. Panicle usually contracted, lanceolate-oblong; branches often bearing spikelets from base; palea 0.2–0.4 lemma length 16. *A. arisan-montana*
- 10b. Lemma awned, awn flexuous or geniculate, exserted from spikelet.
 19a. Awn usually arising from middle of lemma back or above; anthers 0.5–1.2 mm.
 20a. Panicle open, ovate to broadly elliptic; branches widely spreading to divaricate, up to 10 cm, bare in lower part.
 21a. Leaf blades 2–5 mm wide; panicle elliptic, branches ascending; spikelets 1.8–2.7 mm 18. *A. sozanensis*
 21b. Leaf blades 0.5–2 mm wide; panicle ovate, branches divaricate; spikelets 2.6–3.5 mm 19. *A. hookeriana*
 20b. Panicle laxly contracted, lanceolate; branches ascending, up to 3.5 cm, with spikelets from near base.
 22a. Culms 12–20 cm tall; cauline leaf blades 1–2 mm wide; spikelets dark purple; awn arising from middle of lemma 20. *A. sinorupestris*
 22b. Culms 30–50 cm tall; cauline leaf blades 3–5 mm wide; spikelets greenish gray; awn arising from upper 1/4–1/3 of lemma 21. *A. sinocontracta*
- 19b. Awn usually arising from below middle of lemma back; anthers 1–1.6 mm.
 23a. Plant with creeping surface stolons 22. *A. canina*
 23b. Plant with subterranean rhizomes or tufted.
 24a. Leaf blades smooth on abaxial surface; panicle branches smooth 23. *A. flaccida*
 24b. Leaf blades scabrid on abaxial surface; panicle branches smooth or scabrid.
 25a. Rhizomes present, plant loosely tufted; panicle open, at least at anthesis; callus subglabrous, hairs 0.1–0.3 mm 24. *A. vinealis*
 25b. Rhizomes absent, plant densely tufted; panicle contracted; callus bearded, hairs 0.3–0.4 mm 25. *A. turkestanica*

1. *Agrostis munroana* Aitchison & Hemsley, J. Linn. Soc., Bot. 19: 192. 1882.

Calamagrostis munroana (Aitchison & Hemsley) Boissier.

长稃剪股颖 chang fu jian gu ying

Annual. Culms solitary or in small tufts, erect or geniculate at base, 10–45(–70) cm high, 3–5-noded. Leaves all cau-

line; leaf sheaths loose, smooth; leaf blades linear, flat, 3–15 cm × 1.5–5 mm, smooth or slightly scaberulous; ligule 2.5–4 mm, apex obtuse. Panicle contracted to open, narrowly oblong to broadly lanceolate in outline, 3–15(–20) cm; branches 2–7 per node, ascending to spreading, capillary, scaberulous, bare in lower part. Spikelets 1.5–3 mm, usually purple tinged; glumes lanceolate-elliptic, equal, keel scabrid, apex acute; callus hairs ca. 0.5 mm; lemma 3/4–4/5 spikelet length, back villous, awnless or a fine straight awn up to 3 mm arising at or below middle, apex truncate-denticulate; palea almost as long as lemma. Anthers 0.4–0.8 mm.

Grassy slopes, moist meadows; ca. 3700 m. NE Xizang, Yunnan (Gongshan) [Afghanistan, NW India, Kashmir, Nepal, N Pakistan].

2. *Agrostis pilosula* Trinius, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3–4): 372. 1841.

柔毛剪股颖 *rou mao jian gu ying*

Agrostis beimushanica J. L. Yang; *A. ciliata* Trinius (1845), not Thunberg (1784); *A. erirolepis* Keng ex Y. C. Yang; *A. muliensis* J. L. Yang; *A. pilosula* var. *wallichiana* (Steudel) Bor; *A. royleana* Trinius; *A. wallichiana* Steudel; *Calamagrostis pilosula* (Trinius) J. D. Hooker; *Pentatherum pilosulum* (Trinius) Tzvelev.

Annual or short-lived perennial, tufted. Culms loosely ascending or decumbent at base and rooting from lower nodes, 30–90 cm tall, 3- or 4-noded. Leaf sheaths glabrous; leaf blades linear, flat, 3–20 cm × 3–5 mm, both surfaces scabrid; ligule 2.5–6 mm, apex lacerate. Panicle lanceolate to ovate in outline, 10–30 cm, open or somewhat contracted; branches 2–7 at each node, 2–5 cm, scabrid, bearing branchlets mainly in distal half. Spikelets 3–4 mm, green or purple; glumes oblong-lanceolate, lower glume slightly longer than upper glume, keel conspicuously scabrid-hispidulous, apex acuminate, upper glume scabrid upward on keel, apex acute; callus hairs 0.4–0.5 mm; lemma ca. 2/3 spikelet length, back villous except below apex, awned at or near lower 1/3, apex truncate, erose; awn geniculate, 3–4 mm; palea usually ca. 1/3 length of lemma. Anthers 0.7–1.5 mm. Fl. Aug.

Grassy mountain slopes; 3600–4200 m. Qinghai, W Sichuan, Yunnan [Bhutan, India, Nepal, Pakistan, Sri Lanka].

This is a polymorphic species in which several rather ill-defined varieties have been distinguished. *Agrostis pilosula* var. *pilosula* has a large, effuse panicle with branches to 10 cm. The name *A. pilosula* var. *wallichiana* has been misapplied to a variant with a smaller, stiffly branched panicle and small, purple spikelets. The type of *A. wallichiana* has a pale green panicle with long, flexuous branches.

3. *Agrostis dshungarica* (Tzvelev) Tzvelev, Rast. Tsentr. Azii 4: 292. 2001.

线序剪股颖 *xian xu jian gu ying*

Pentatherum dshungaricum Tzvelev, Rast. Tsentr. Azii 4: 77. 1968; *Agrostis sinkiangensis* Y. C. Yang.

Annual or short-lived perennial, tufted. Culms 20–50 cm tall, 2–4-noded. Leaf sheaths smooth, glabrous; leaf blades nar-

rowly linear, flat, 4–10 cm × 1–3 mm, abaxial surface sub-smooth, adaxial surface scaberulous; ligule 1.5–2.5 mm. Panicle contracted, linear, 5–10 cm; branches short, erect, almost smooth, bearing spikelets to base; pedicels usually pubescent. Spikelets 3–4 mm, purple; glumes oblong-lanceolate, lower glume slightly longer than upper glume, keel scaberulous; callus hairs ca. 1 mm; lemma 1/2–2/3 spikelet length, back villous except below apex, awned from lower 1/3, apex irregularly toothed; awn weakly geniculate, 3–4.3 mm; palea ca. 2/3 length of lemma. Anthers 0.7–0.9 mm. Fl. and fr. Aug–Sep.

• Mountain slopes. Xinjiang.

This is a local variant of the variable species *Agrostis pilosula*, distinguished mainly by its longer palea in combination with a narrow, purple panicle. It is also geographically disjunct.

4. *Agrostis stolonifera* Linnaeus, Sp. Pl. 1: 62. 1753.

西伯利亚剪股颖 *xi bo li ya jian gu ying*

Agrostis palustris Hudson; *A. sibirica* V. A. Petrov.

Perennial, tufted, stoloniferous; stolons slender, leafy, widely spreading, developing after anthesis. Culms erect or geniculate and rooting at base, 30–50(–100) cm tall. Leaf sheaths smooth; leaf blades linear, flat or inrolled, 4–10 cm × 2–5 mm, scaberulous, apex acute to acuminate; ligule on non-flowering shoots 2–3.5 mm, rounded to truncate, often lacerate. Panicle narrow, linear to lanceolate in outline, 5–20 cm, open only at anthesis, otherwise contracted, often dense; branches several per node, closely divided, ascending, scabrous, main branch at a node often bare in lower 1/3, but accompanied by shorter branches bearing spikelets to base. Spikelets 1.8–3 mm, yellowish green; glumes lanceolate, subequal or lower glume slightly longer, lower glume scabrous along keel distally, upper glume often smooth, apex acute; callus minutely hairy; lemma 3/4 as long to subequaling spikelet, usually awnless, apex rounded; palea 1/2–3/4 length of lemma. Anthers 0.8–1.5 mm. Fl. Aug.

Moist places along roadsides. Anhui, Gansu, Guizhou, Heilongjiang, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Mongolia, Nepal, Russia; C and SW Asia, Europe].

This is a widespread and polymorphic species, adventive in many temperate countries.

5. *Agrostis capillaris* Linnaeus, Sp. Pl. 1: 62. 1753.

细弱剪股颖 *xi ruo jian gu ying*

Agrostis sylvatica Hudson; *A. tenuis* Sibthorp; *A. vulgaris* Withering.

Perennial, rhizomatous; rhizomes scaly, short. Culms tufted, geniculate or decumbent and rooting at base, 20–70 cm tall. Leaf sheaths smooth; leaf blades linear, flat or inrolled, 2–15 cm × 1–4 mm, scabrous or nearly smooth, apex acuminate; ligule on non-flowering shoots 1–2 mm, shorter than wide, truncate. Panicle elliptic in outline, up to 20 cm, open, very lax; branches 2–5 per node, spreading, capillary, 1.5–3.5 cm, slightly flexuous, smooth or almost so, bare in lower half, spikelets well spaced. Spikelets 1.5–2.5 mm, purplish brown; glumes

elliptic-lanceolate, subequal or lower glume slightly longer, lower glume scabrid along keel distally, upper glume often smooth, apex acute; callus minutely hairy; lemma 2/3–3/4 spikelet length, glabrous, midrib slightly prominent, usually awnless, apex truncate; palea 1/2–3/4 length of lemma. Anthers 0.8–1.5 mm. Fl. Aug.

Moist grassy places, probably introduced; 1000–1500 m. Henan, Nei Mongol, Ningxia, Shanxi, Xinjiang [Afghanistan, W Russia; N Africa, SW Asia (Caucasus, Turkey), Europe; introduced in North America and other temperate countries].

6. *Agrostis gigantea* Roth, Tent. Fl. Germ. 1: 31. 1788.

巨序剪股颖 ju xu jian gu ying

Agrostis stolonifera Linnaeus var. *gigantea* (Roth) Koch; *A. stolonifera* subsp. *gigantea* (Roth) Maire & Weiler; *A. stolonifera* var. *ramosa* (S. F. Gray) Veldkamp; *Vilfa alba* (Linnaeus) P. Beauvois var. *ramosa* S. F. Gray.

Perennial, rhizomatous; rhizomes tough, scaly, spreading. Culms loosely tufted, ascending to prostrate at base, rooting and branching from lower nodes, up to 130 cm tall. Leaf sheaths smooth or scaberulous; leaf blades linear, flat, 5–30 cm × 3–10 mm, scabrid, apex acuminate; ligule on tillers 1.5–6 mm, as long as or longer than wide, toothed. Panicle oblong or conical in outline, 8–25 cm, contracted at first, open after anthesis; branches 5 or more per node, spreading, very scabrous, bearing branchlets nearly to base, spikelets clustered at the branch apices. Spikelets 2–3 mm, yellowish green or purplish; glumes elliptic-lanceolate, subequal or lower glume slightly longer, scabrid or pilosulous along upper keel and margins, apex acute; callus hairs 0.2–0.4 mm; lemma 2/3–3/4 spikelet length, glabrous, usually awnless, apex obtuse; palea 1/2–3/4 length of lemma. Anthers 1–1.5 mm. Fl. and fr. summer and autumn.

Moist ground, rough grasslands, as a field weed. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, NW India, Japan, Korea, Mongolia, Nepal, Pakistan, Russia; N Africa, SW Asia, Europe].

This is a widespread and polymorphic species, introduced for pasture or adventive in Australia, North America, and elsewhere. The name *Agrostis alba* Linnaeus has sometimes been used for this species, but the correct application of that name is uncertain.

Agrostis gigantea, *A. capillaris*, and *A. stolonifera* are closely related, widespread weeds, which sometimes hybridize. While the lemma is usually awnless, a small awnlet from at or near the apex may be present in some spikelets.

7. *Agrostis divaricatissima* Mez, Repert. Spec. Nov. Regni Veg. 18: 4. 1922.

歧序剪股颖 qi xu jian gu ying

Agrostis koreana Ohwi.

Perennial, loosely tufted, sometimes shortly rhizomatous. Culms usually many, erect, 40–100 cm tall, ca. 2 mm in diam., 4–5-noded. Leaf sheaths smooth; leaf blades linear, soft, 7–8 cm × 1–3 mm, sharply scabrid on both surfaces, narrowly acuminate; ligule on tillers 2–2.5 mm, on culm leaves 2.5–4 mm. Panicle ovate in outline, 10–25 cm, remaining open after

anthesis; branches 6–8 per node, widely spreading, very slender, slightly flexuous, up to 15 cm, sharply scabrid, bare in lower half. Spikelets 1.8–2.3 mm, dark purple; glumes lanceolate, equal, keel of lower glume scabrid above middle, apex acuminate; callus glabrous or nearly so; lemma 2/3–3/4 spikelet length, awnless or sometimes with awnlet up to 1 mm, apex obtuse; palea 1/2–2/3 length of lemma. Anthers 0.8–1.2 mm. Fl. and fr. Jul–Aug.

Riversides, lakesides, marshy meadows, often on saline soils; 500–1500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Korea, Mongolia, Russia].

Agrostis mongolica, from Mongolia and Siberia, is very similar, but has a shorter panicle rarely exceeding 12 cm and smaller 1.5–2 mm spikelets. There is some overlap, and it is sometimes placed in synonymy under *A. divaricatissima*.

8. *Agrostis mackliniae* Bor, Kew Bull. [12] 1957: 417. 1958.

歧颖剪股颖 qi ying jian gu ying

Agrostis inaequiglumis Grisebach var. *nana* Y. C. Yang.

Perennial; rootstock present, tough. Culms erect from an ascending base, up to 30 cm tall, 0.5–0.8 mm in diam., 2–3-noded. Leaf sheaths glabrous, lower scarious; leaf blades filiform, rolled, basal blades 8–10 cm × 0.4–0.8 mm, culm blades 2–4 cm, abaxial (outer) surface scabrid toward apex, otherwise smooth, adaxial (inner) surface closely ribbed, scabrid on ribs; ligule 0.7–1 mm, ca. 2 mm on culm leaves. Panicle linear, dense, spikelike, 5–8 cm; branches short, erect, bearing spikelets from base; pedicels scabrid. Spikelets ca. 2.5 mm, green tinged pale purple; glumes narrowly oblong-lanceolate, slightly unequal with lower longer, keel scabrid, apex acuminate; callus subglabrous; lemma 2/3 spikelet length, smooth, usually awnless, apex acute; palea to 0.25 mm. Anthers ca. 1 mm. Fl. Aug.

Alpine grassy slopes; 3000–4000 m. SE Xizang, NW Yunnan [N Myanmar].

Agrostis mackliniae usually has awnless lemmas, but rarely a few lemmas have a short, straight awn from above the middle. *Agrostis inaequiglumis* Grisebach is a similar, small species, occurring in Bhutan, India (Sikkim), and Nepal. It also has a narrow, spikelike panicle and awnless spikelets, but is distinguished by its delicate, annual habit.

9. *Agrostis hugoniana* Rendle, J. Linn. Soc., Bot. 36: 389. 1904.

甘青剪股颖 gan qing jian gu ying

Agrostis shensiana Mez.

Perennial, densely tufted; old basal sheaths fibrous. Culms erect or geniculate at base, 8–30 cm tall, 1–2 mm in diam., 2-noded. Leaf sheaths lax, overlapping; leaf blades linear, 2–8 cm × 1–3 mm, scabrid on both surfaces; ligule ca. 2 mm, back scabrid, apex rounded. Panicle dense, spikelike, linear-oblong in outline, 3–9 cm; branches 3–6 at each node, short, erect, up to 4 cm, smooth or scabrid, bearing spikelets from base; pedicels 0.7–2 mm, scabrid. Spikelets 2.8–4 mm, green flushed dark purple; glumes lanceolate, unequal, lower glume ca. 0.2 mm longer than upper glume, keel scabrid, upper back and margins puberulous, apex acuminate; callus hairs ca. 0.2 mm; lemma ca. 2/3 spikelet length, awnless or with short awnlet below apex, apex obtuse or slightly toothed; palea 0.45–0.5 mm. Anthers 0.7–1 mm. Fl. and fr. Aug–Sep.

• Alpine grasslands, rocky slopes; 2500–4200 m. Gansu, Qinghai, W Shaanxi, NW Sichuan.

This species is similar in habit to *Agrostis mackliniae*, which has filiform leaf blades, shorter spikelets, a subglabrous callus, and a shorter palea.

10. *Agrostis brachiata* Munro ex J. D. Hooker, Fl. Brit. India 7: 256. 1896 [“1897”].

大锥剪股颖 da zhui jian gu ying

Agrostis megathyrsa Keng ex P. C. Keng.

Perennial, tufted from a rootstock. Culms weak, scrambling, 1–1.3 m tall, 5–7-noded. Leaf sheaths smooth or scabrid, leaf blades linear, thin, 7–20 cm × 2–7 mm, both surfaces scabrid, base contracted, apex acuminate; ligule 2–4 mm, back scabrid, apex truncate. Panicle large, effuse, delicate, ovate in outline, 27–30 cm; branches 3–5 per node, branches, branchlets, and pedicels all divaricate, slightly flexuous, capillary, scabrid or smooth; pedicels 1.5–3 mm. Spikelets hyaline, 1.5–1.8 mm, green or greenish purple at maturity; glumes finally deciduous from pedicel, narrowly ovate, subequal, scarcely keeled, lower glume scabrid on vein below apex, upper glume smooth, apex acute; callus glabrous or almost so; lemma 3/4 spikelet length or more, midvein terminating at middle of back, awnless, apex narrowly truncate; palea ca. 0.5 mm. Anthers 0.5–0.7 mm. Fl. and fr. Jul–Sep.

Mountain tops, roadsides; 600–2500 m. Gansu, Guizhou, Hubei, Sichuan, Yunnan [Bhutan, Nepal].

This distinctive species is readily recognizable by its scrambling habit, very large, delicate panicle with divaricate branchlets, and thin-textured spikelets with deciduous glumes. The panicle is remarkably reminiscent of *Sporobolus*.

11. *Agrostis nervosa* Nees ex Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3–4): 328. 1841.

泸水剪股颖 lu shui jian gu ying

Agrostis clarkei J. D. Hooker; *A. limprichtii* Pilger; *A. lushuiensis* B. S. Sun & Y. Cai Wang; *A. schneideri* Pilger; *A. schneideri* var. *brevipes* Keng ex Y. C. Yang; *A. sikkimensis* Bor; *A. taliensis* Pilger.

Perennial, tufted. Culms very slender, erect, 20–30(–50) cm tall, 0.5–0.8 mm in diam., 1–4-noded. Leaf sheaths loose, smooth; leaf blades narrowly linear to setaceous, flat or involute, 3–13 cm × 0.8–3 mm, abaxial surface smooth, adaxial surface scabrid; ligule 0.5–3 mm, back smooth or scaberulous, apex obtuse. Panicle open to laxly contracted, narrowly lanceolate to ovate in outline, 3–15 cm; branches 2–5 per node, very fine, ascending to spreading, 1–6.5(–8) cm, smooth or almost so, bare below middle. Spikelets 1.7–3.2 mm, dark purple or purplish green; glumes lanceolate, unequal, lower glume 1.7–3.2(–3.5) mm, keel scabrid above middle, long acuminate, upper glume 1.6–2.9 mm, apex acute; callus glabrous; lemma 2/3–4/5 spikelet length, awnless or a fine awnlet up to 0.6 mm below apex, apex obtuse or emarginate; palea 0.2–0.5 mm, 0.2–0.4 lemma length. Anthers 0.5–0.75 mm. Fl. and fr. Aug–Sep.

Grassy or stony mountain slopes, meadows, broad-leaved wood-

lands, bamboo forests; 2000–4000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India (Darjeeling, Sikkim), N Myanmar, Nepal].

This is a variable species with a wide range of spikelet size, but usually with clearly unequal, purple glumes and awnless lemmas. The name *Agrostis sikkimensis* refers to slender, delicate variants with small spikelets and very fine leaf blades, often growing among moss on rocks. There is continuous variation to taller forms with larger spikelets growing in meadows and woodlands. Forms with a short, straight, subapical awnlet (*A. limprichtii*, *A. lushuiensis*) may have arisen by hybridization with *A. sinorupestris*.

Agrostis szechuanica (Y. C. Tong ex Y. C. Yang) L. Liu (Vasc. Pl. Hengduan Mts. 2: 2247. 1994; *A. clavata* Trinius var. *szechuanica* Y. C. Tong ex Y. C. Yang, Bull. Bot. Res., Harbin 4(4): 99. 1984) may belong here. The type, from Sichuan (Hanyuan), has not been seen. It is also reported from Yunnan.

12. *Agrostis micrantha* Steudel, Syn. Pl. Glumac. 1: 170. 1854.

多花剪股颖 duo hua jian gu ying

Agrostis clavata Trinius subsp. *micrantha* (Steudel) Y. C. Tong; *A. micrandra* Keng ex J. L. Yang; *A. milioides* Mez; *A. myriantha* J. D. Hooker; *A. myriantha* var. *yangbiensis* B. S. Sun & Y. Cai Wang.

Perennial, tufted. Culms weak, erect to decumbent and rooting at lower nodes, 40–100 cm tall, 4(–8)-noded. Leaf sheaths smooth, loose; leaf blades linear to lanceolate, flat, thin, 5–14 cm × (2.5–)4–11 mm, both surfaces scaberulous, margins finely scabrid; ligule 2–3(–6) mm, back scabrid, apex truncate, lacerate. Panicle effuse, 10–15(–20) cm, usually narrowly oblong in outline when young, spreading at flowering, usually contracted in fruit; branches several at each node, capillary, up to 10 cm, bare in lower part. Spikelets 1.3–1.8(–2.2) mm, olive green, occasionally violet tinged; glumes narrowly lanceolate-oblong, lower glume usually slightly longer than upper, sometimes equal, keeled, keel scabrid to aculeate, apex subacute; callus glabrous or nearly so; lemma 3/4–9/10 spikelet length, awnless, apex obtuse; palea 0.3–0.6 mm, (1/4–)1/3(–1/2) lemma length. Anthers 0.3–0.5(–0.7) mm. Fl. and fr. Jul–Sep.

Roadsides, riversides, forests, swampy places; 1600–3500 m. Anhui, Fujian, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

This variable species is the most common *Agrostis* in the E Himalayas. It is a lush, leafy species, with a green panicle of small, awnless spikelets with subacute glumes, a relatively long floret, and short anthers. Habit is greatly influenced by environmental factors, from compact tufts to much laxer, almost stoloniferous growth in moister situations. Forms with short, lanceolate leaf blades differ in appearance from those with longer, narrower leaf blades, but the variation is continuous.

13. *Agrostis clavata* Trinius, Neue Entdeck. Pflanzenk. 2: 55. 1821.

华北剪股颖 hua bei jian gu ying

Agrostis clavata subsp. *matsumurae* (Hackel ex Honda) Tateoka; *A. clavata* var. *nukabo* Ohwi; *A. formosana* Ohwi; *A. matsumurae* Hackel ex Honda.

Annual or short-lived perennial, loosely tufted. Culms erect or geniculate at base, slender, 30–70 cm tall, 2–4-noded. Leaf sheaths smooth; leaf blades linear, flat, thin, 6–15 cm × 1–

5 mm, both surfaces scabrid; ligule 1.5–3 mm, back scabrid, apex obtuse or lacerate. Panicle lax, lanceolate to narrowly oblong in outline, 8–25 cm; branches 2–7 at each node, ascending, capillary, 8–15 cm, scabrid, bare in lower 1/3–1/2 or sometimes with spikelets from base. Spikelets 1.5–2.5 mm, yellowish green; glumes lanceolate, subequal, lower slightly longer, keeled, keels aculeate-scabrid, apex acuminate; callus glabrous or nearly so; lemma 2/3–3/4 spikelet length, awnless, apex obtuse; palea to 0.25 mm. Anthers 0.3–0.5 mm. Fl. and fr. summer and autumn.

Roadsides, riversides, forest margins, disturbed grassy places, often in moist situations; below 4000 m. Anhui, Fujian, Gansu, Guangdong, Guizhou, Hebei, Henan, Heilongjiang, Jilin, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan [Japan, Korea, Mongolia, Russia; SW Asia (Caucasus), N Europe, North America (Alaska)].

Agrostis clavata is distinguished by the combination of scabrid leaves and panicle branches, small, pale green spikelets, acuminate glumes, an awnless lemma, and very small palea and anthers.

Agrostis clavata subsp. *matsumurae* (*A. clavata* var. *nukabo*) is often recognized, mainly on the basis of a dense, narrow panicle bearing spikelets from the base of the primary branches. In contrast, subsp. *clavata* has panicle branches divergent at flowering and bare in the lower 1/3–1/2. However, short, densely spiculate branches are often present at the panicle nodes among the longer, bare-based branches in subsp. *clavata*, contributing to a denser panicle appearance when frequent. All the panicle branches become erect in the fruiting stage, further blurring the boundary with subsp. *matsumurae*. It has not been possible to distinguish two subspecies satisfactorily in herbarium material.

14. *Agrostis kunmingensis* B. S. Sun & Y. Cai Wang, Acta Phytotax. Sin. 30: 364, pl. 2. 1992.

昆明剪股颖 *kun ming jian gu ying*

Agrostis hookeriana (C. B. Clarke ex J. D. Hooker) var. *longiflora* Y. C. Tong ex Y. C. Yang; *A. poluninii* Bor var. *longiflora* (Y. C. Tong ex Y. C. Yang) B. S. Sun.

Perennial, rhizomatous. Culms erect from geniculate base, up to 70(–100) cm tall, 1–2.5 mm in diam., 3–7-noded. Leaf sheaths smooth; leaf blades linear, flat or rolled when dry, 10–16 cm × 2.5–4 mm, both surfaces scabrid, apex acuminate; ligule 2–4.5 mm, back scabrid, apex obtuse. Panicle open or laxly contracted, narrowly lanceolate to narrowly ovate in outline, 15–20(–25) cm; branches 2–6 per node in well-spaced whorls, ascending to laxly spreading, slender, 7–12 cm, scabrid, bare below middle. Spikelets 2.5–3.2 mm, green tinged purplish gray or purple; glumes narrowly lanceolate, subequal, keel scabrid, upper indistinctly keeled, almost smooth, acute; callus hairs ca. 0.3 mm; lemma ca. 2/3 spikelet length, awnless or with up to 1 mm awnlet from middle or above, lateral veins slightly keeled and scaberulous above middle, apex truncate; palea 0.2–0.5 mm, 0.15–0.3 lemma length. Anthers 1–1.5 mm. Fl. and fr. Jun–Aug.

• Moist grassy slopes, riversides; 2000–3600 m. Sichuan, Yunnan.

Agrostis kunmingensis closely resembles awnless forms of *A. canina* in spikelet size and anther length, but appears to lack the spreading stolons typical of that species. It is also close to *A. infirma*, a predominantly SE Asian species.

15. *Agrostis infirma* Buse, Pl. Jungh., Gramineae, preprint, 2. 1854.

玉山剪股颖 *yu shan jian gu ying*

Agrostis flaccida Hackel var. *morrisonensis* (Hayata) Honda; *A. macilenta* Keng; *A. morrisonensis* Hayata; *A. rigidula* Steudel; *A. shandongensis* F. Z. Li; *A. sozanensis* Hayata var. *exaristata* Handel-Mazzetti; *A. wulingensis* Honda.

Perennial, densely tufted. Culms slender, erect or geniculate at base, 20–100 cm tall, 0.5–2.5 mm in diam., 2–3-noded. Leaves mainly basal, leaf sheaths smooth; leaf blades often involute and acicular or narrowly linear and flat, 4–14 cm × 0.3–5 mm, smooth or slightly scaberulous; ligule of culm blades 2.25–2.75 mm, apex rounded. Panicle open or slightly contracted, elliptic in outline, 8–14(–25) cm; branches 4–6 per node, laxly ascending, 3–8(–10) cm, smooth, lower part bare. Spikelets 2–2.8 mm, purplish green; glumes lanceolate, unequal with lower longer, keel scabrid, apex acute; callus glabrous or almost so; lemma 3/4 spikelet length, awnless or rarely mucronate above middle, apex obtuse; palea 0.15–0.35 mm, less than 0.2 lemma length. Anthers 0.5–1 mm. Fr. Nov.

Mountains; 2600–4000 m. Heilongjiang, Hunan, Shandong, Taiwan, Yunnan [Indonesia, New Guinea, Philippines].

Agrostis infirma is a variable species widespread in SE Asia. *Agrostis sozanensis* is very similar, but has awned spikelets.

16. *Agrostis arisan-montana* Ohwi, Acta Phytotax. Geobot. 2: 161. 1933.

阿里山剪股颖 *a li shan jian gu ying*

Agrostis arisan-montana var. *megalandra* Y. C. Yang; *A. megathyrsa* Keng ex P. C. Keng var. *angustispicata* D. Z. Ma & J. N. Li; *A. perarta* Keng.

Perennial, loosely tufted. Culms geniculate at base, rooting at lower nodes, 40–100 cm tall, 1–1.7 mm in diam., 3–6-noded. Leaf sheaths smooth; leaf blades linear, soft, 5–14 cm × 2–6 mm, both surfaces scabrid, abaxial surface densely so, apex acuminate; ligule 2–3.5 mm, back scabrid, apex obtuse. Panicle contracted, narrowly lanceolate-oblong in outline, 10–20 cm, much branched; branches 3 per node or rebranched at base, narrowly ascending, longest 5–8 cm, scabrid, bearing spikelets from base. Spikelets 1.9–2.3 mm, yellowish green often with purplish tinge; glumes narrowly ovate-oblong, subequal, keel scabrid, apex subacute or acute; callus glabrous; lemma ca. 3/4 spikelet length, midvein terminating from slightly below middle to apex, awnless, apex broadly rounded, minutely denticulate; palea 0.35–0.75 mm, 0.2–0.4 lemma length. Anthers 0.5–0.8 mm. Fr. Jul.

• Grassy mountain slopes; 900–3200 m. Guangxi, Henan, Ningxia, Shaanxi, Sichuan, Taiwan, Yunnan.

In this species the lemma is awnless, with the midvein terminating anywhere from slightly below the middle up to the apex, varying even within the same panicle. The length of the palea is also rather variable, sometimes almost reaching the middle of the lemma.

Agrostis arisan-montana is close to *A. micrantha*, but tends to have a narrower panicle and more sharply acute glumes. It is also close to *A. infirma*, but with a more open panicle. The relationship between

these three taxa, extending from the Himalayas through China into SE Asia, requires further investigation. *Agrostis fukuyamae* and *A. sozanensis* also belong to this group.

17. *Agrostis fukuyamae* Ohwi, Repert. Spec. Nov. Regni Veg. 36: 39. 1934.

舟颖剪股颖 zhou ying jian gu ying

Agrostis infirma Buse var. *fukuyamae* (Ohwi) Veldkamp; *A. rigidula* Steudel subsp. *fukuyamae* (Ohwi) T. Koyama; *A. rigidula* var. *fukuyamae* (Ohwi) Veldkamp.

Perennial, tufted. Culms erect, 15–20 cm tall, 0.5–1 mm in diam., 2-noded. Leaf sheaths longer than internodes, smooth; leaf blades narrowly linear to setaceous, folded, 5–10 cm × 0.6–1 mm (when folded), abaxial surface smooth or scaberulous, adaxial surface scabrid; ligule 0.8–1.5 mm, apex rounded or truncate. Panicle contracted when young, later open, narrowly ovate in outline, 7–10 cm; branches 3–4 per node, ascending to spreading, longest 3.5–6 cm, almost smooth, bearing spikelets from near base. Spikelets 1.5–2 mm, purplish green; glumes lanceolate-oblong, equal, keel scaberulous toward apex, apex acute; callus hairs 0.2–0.3 mm; lemma more than 3/4 spikelet length, awnless, midvein terminating near middle of back, apex broadly obtuse; palea 0.6–0.8 mm, slightly less to slightly more than 1/2 lemma length. Anthers 0.7–1 mm. Fl. Jul.

- Exposed rocks near mountain summits. Taiwan.

This species is perhaps no more than a local, high-altitude variant of *Agrostis infirma*, differing by its smaller spikelets with a relatively longer lemma and longer palea.

18. *Agrostis sozanensis* Hayata, Icon. Pl. Formosan. 7: 85. 1918.

台湾剪股颖 tai wan jian gu ying

Agrostis canina Linnaeus var. *formosana* Hackel; *A. transmorrissonensis* Hayata; *A. transmorrissonensis* var. *opienensis* Keng ex Y. C. Yang.

Perennial, loosely tufted, shortly rhizomatous. Culms erect or ascending, up to 90 cm tall, 1–1.2(–2.5) mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades narrowly linear, flat or weakly involute toward apex, 7–20 cm × 2–5 mm, both surfaces scabrid; ligule 2–6 mm, apex obtuse or truncate. Panicle open, lax, broadly elliptic to narrowly ovate in outline, 15–30 cm; branches 2–4(–10) per node, capillary, widely ascending, flexuous, up to 10 cm, scabrid, lower 1/2–2/3 bare. Spikelets 1.8–2.7(–3) mm, green or tinged purplish red; glumes subequal or lower glume slightly longer than upper glume, keel scabrid, apex acute or acuminate; callus hairs 0.1–0.2 mm; lemma 2/3–3/4 spikelet length, awned from middle or above, apex obtuse or truncate; awn variable, up to 2(–3) mm, straight or slightly bent; palea 0.25–0.5 mm, 1/4–1/3 lemma length. Anthers 0.7–1.2 mm. Fl. and fr. summer and autumn.

- Moist ground, near roads, on slopes; below 2700 m. Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

The development and position of the awn are variable in this species. It is usually bent and exerted from the spikelet, but may be shorter and straight. It may arise from the middle to the upper quarter of the

lemma back. Occasionally, awnless spikelets may occur in a panicle where most spikelets are awned. The distinction from *Agrostis infirma* is based mainly on the presence of awns, coupled with slightly longer paleas and anthers.

Agrostis sozanensis is very close to *A. canina* Linnaeus. *Agrostis canina* is distinguished by the presence of creeping surface stolons, an awn arising from the lower part of the lemma back, and anthers 1–1.5 mm.

The name *Agrostis perennans* (Walter) Tuckerman has been misapplied to *A. sozanensis*. *Agrostis sozanensis* and *A. transmorrissonensis* were published simultaneously, but *A. sozanensis* has priority when they are regarded as synonyms, since *A. sozanensis* was chosen first, by Koyama (Grasses Japan Neighboring Regions, 485. 1987). The identity of the taxon named *A. transmorrissonensis* var. *kunyushanensis* F. Z. Li (Bull. Bot. Res., Harbin 11(2): 28. 1991), described from Shandong (Kunyu Shan), is uncertain. The type has not been seen.

19. *Agrostis hookeriana* C. B. Clarke ex J. D. Hooker, Fl. Brit. India 7: 256. 1896 [“1897”].

疏花剪股颖 shu hua jian gu ying

Agrostis perlaxa Pilger; *A. poluninii* Bor; *A. pubicallis* Keng ex Y. C. Yang.

Perennial, tufted. Culms erect or slightly geniculate at base, up to 50 cm tall, 0.5–1.2 mm in diam., 2–4-noded. Leaf sheaths smooth; leaf blades very narrowly linear, flat, 5–10 cm × 0.5–2 mm, smooth except toward apex; ligule 2–3 mm, apex lacerate. Panicle very lax, ovate in outline, 7–20 cm, open at and after anthesis; branches 2–3 per node, whorls distant, widely ascending to divaricate, capillary, slightly flexuous, longest up to 9 cm, smooth or slightly scabrid, lower half bare. Spikelets 2.6–3.5 mm, usually violet tinged; glumes unequal, lower glume narrowly lanceolate, longer than upper, upper glume oblong-lanceolate, keel scabrid, apex acuminate; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, back smooth or scaberulous, awned from just above middle, apex truncate-denticulate; awn weakly geniculate, 2–4 mm; palea ca. 0.3 mm. Anthers 0.6–1 mm. Fl. and fr. Aug–Sep.

Montane forests, among bushes, ditches, damp places; 1900–3600 m. Qinghai, W Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

The spikelets of *Agrostis hookeriana* are similar to those of *A. sozanensis*, but in the former species the panicle is very open and broad, with divaricate branches, and the geographic distribution is more westerly.

20. *Agrostis sinorupestris* L. Liu ex S. M. Phillips & S. L. Lu, sp. nov.

岩生剪股颖 yan sheng jian gu ying

Type: China. Yunnan: E slopes of Lijiang Snow Range, Yangtze watershed, 1923–1924, J. F. Rock 10774 (holotype, US-1214302).

Haec species A. rupestris Allioni *affinis*, sed ab ea arista ex medio (non prope basim) lemmatis exorienti atque antheris brevioribus (0.6–0.8 mm, non 1–2 mm) differt.

Agrostis hugoniana Rendle var. *aristata* Keng ex Y. C. Yang.

Perennial, densely tufted. Culms erect, slender, 12–20(–30) cm tall, ca. 0.5 mm in diam., 2–3-noded. Leaf sheaths longer or shorter than internodes; leaf blades linear, flat or involute, 3–15 cm × 1–2 mm, scabrid; ligule very short, apex round or truncate. Panicle slightly contracted, lanceolate in outline, 3–8 cm; branches 2–6 per node, up to 4 cm, smooth or sparsely scabrid. Spikelets 2.8–3.5 mm, dark purple; glumes lanceolate, unequal, lower glume ca. 0.3 mm longer than upper glume, keel scabrid, apex acute; callus hairs ca. 0.2 mm; lemma ca. 2 mm, awned from middle of back, apex slightly toothed; awn weakly geniculate, 3.5–5 mm; palea 0.4–0.6 mm. Anthers 0.6–0.8 mm. Fl. and fr. summer and autumn.

• Stony mountain slopes; 3500–4000 m. Sichuan, Xizang, Yunnan.

There is a good illustration of *Agrostis sinorupestris* in Keng (Fl. Ill. Pl. Prim. Sin. Gram. 545. 1959, as “*Agrostis rupestris*”). The species is very similar to delicate forms of *A. nervosa*, but differs by the presence of awns.

The name “*Agrostis sinorupestris* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2252. 1994) belongs here, but was not validly published because no Latin description was provided. The name *Agrostis rupestris* Allioni has been misapplied to this species in the Chinese literature. That species is confined to mountains in Europe and differs by its lower awn insertion on the lemma back (near the base to the lower 1/3) and longer anthers 1–2 mm.

21. *Agrostis sinocontracta* S. M. Phillips & S. L. Lu, nom. nov.

紧序剪股颖 jin xu jian gu ying

Replaced synonym: *Agrostis contracta* Y. C. Tong ex Y. C. Yang, Bull. Bot. Res., Harbin 4(4): 100. 1984, not *Agrostis contracta* F. Mueller ex J. D. Hooker, Fl. Tasman. 2: 116. 1858.

Perennial, tufted. Culms erect, 30–50 cm tall, 1–2 mm in diam., 3–4-noded. Leaf sheaths loose, smooth; leaf blades linear, soft, culm blades 10–14 cm × 3–5 mm, blades of tillers ca. 1 mm wide, abaxial surface scabrid or almost smooth, adaxial surface scabrid; ligule 1–2.5 mm, apex truncate. Panicle laxly contracted, lanceolate in outline, 10–15 cm; branches 1–3 at each node or sometimes secondary branching from base, narrowly ascending, 2.5–3.5 cm, almost smooth, a few widely scattered scabridities, bearing spikelets for most of length. Spikelets 2.5–3 mm, green tinged purplish gray; glumes narrowly lanceolate, lower glume slightly longer than upper glume, keel scabrid, apex acuminate; callus hairs 0.1–0.2 mm; lemma ca. 1/2 spikelet length, awned from upper 1/4–1/3, apex emarginate-denticulate; awn recurved in right angle from lower 1/3, slightly twisted below bend, 3–3.3 mm; palea ca. 0.25 mm. Anthers 0.5–0.7 mm. Fl. and fr. Aug–Oct.

• Alpine meadows; ca. 4000 m. NW Yunnan (Bijiang, Gongshan).

Agrostis filipes J. D. Hooker, from Kashmir and the Khasi Hills of NE India, also has awns arising from above the middle of the lemma back and a small palea. It differs in having narrower culm leaf blades 1–2.5 mm wide, a densely contracted panicle, and a fine awn 1–2 mm.

22. *Agrostis canina* Linnaeus, Sp. Pl. 1: 62. 1753.

普通剪股颖 pu tong jian gu ying

Perennial, loosely tufted, stoloniferous, turf-forming. Culms erect or geniculate at base, 20–60 cm tall, 1–1.2 mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades linear, flat or involute toward apex, 3–20 cm × 1–3 mm, scaberulous; ligule 1.5–4 mm, back scaberulous, apex obtuse or acute. Panicle lax, lanceolate to ovate in outline, 5–12(–20) cm; branches 3–6 per node, spreading at anthesis, usually erect in fruit, capillary, up to 8 cm, scabrid, bare in lower half. Spikelets 1.5–3 mm, purplish brown; glumes lanceolate, subequal, keel scabrid, apex acute; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, awned from near base to slightly below middle of back, lateral veins minutely exserted, apex obtuse-denticulate; awn weakly geniculate, up to 4.5 mm; palea ca. 0.5 mm. Anthers 1–1.5 mm. Fl. Jul.

Damp grasslands; 1400–3800 m. Xinjiang, Xizang, Yunnan [Japan, Kashmir, Mongolia, Russia; Europe, NE America].

This is a European species, introduced as a lawn grass or adventive in some other temperate countries. Some variants are awnless or have poorly developed awns. It is distinguished from *Agrostis vinealis* and other awned species with short paleas by the combination of leafy stolons and long anthers.

23. *Agrostis flaccida* Hackel, Bull. Herb. Boissier 7: 649. 1899.

柔软剪股颖 rou ruan jian gu ying

Perennial, tufted, shortly rhizomatous. Culms erect or geniculate at base, slender, 15–30(–50) cm tall, ca. 1 mm in diam., 3-noded. Leaf sheaths smooth; leaf blades narrowly linear, weakly rolled or infrequently flat, soft, 5–10 cm × 0.5–2 mm, smooth, uppermost culm blade elongate, widely divergent from culm; ligule 1–2 mm, apex obtuse. Panicle open, diffuse, narrowly ovate in outline, 4–8 cm; branches 2–5 per node, spreading, capillary, 5–7 cm, smooth or almost so, bare in lower half. Spikelets 2.5–3 mm, purple or purplish green; glumes lanceolate, slightly unequal, keel scabrid, apex acuminate; callus hairs 0.2–0.5 mm; lemma 2/3–3/4 spikelet length, indistinctly granular-scaberulous, awned from lower 1/4–1/3 of back, lateral veins sometimes minutely exserted, apex truncate-denticulate; awn weakly geniculate, 3–5 mm; palea ca. 0.25 mm. Anthers 1–1.6 mm. Fl. and fr. Jul–Aug. $2n = 14$.

Rocky slopes, open forest; 1500–2300 m. E Jilin, Liaoning [Japan, Korea, Russia (Kamchatka, Kuril Islands, Sakhalin)].

Agrostis flaccida is distinguished from other members of the *A. vinealis* complex mainly by its smooth leaf blades and panicle branches (see the comment under the next species).

24. *Agrostis vinealis* Schreber, Spic. Fl. Lips. 47. 1771.

芒剪股颖 mang jian gu ying

Agrostis canina subsp. *montana* (Hartman) Hartman; *A. canina* subsp. *trinii* (Turczaninow) Hultén; *A. canina* var. *montana* Hartman; *A. coarctata* subsp. *trinii* (Turczaninow) H. Scholz; *A. flaccida* subsp. *trinii* (Turczaninow) T. Koyama; *A. flaccida* var. *trinii* (Turczaninow) Ohwi; *A. trinii* Turczaninow; *A. vinealis* subsp. *trinii* (Turczaninow) Tzvelev.

Perennial, tufted, shortly rhizomatous. Culms erect from a geniculate base, 30–60 cm tall, ca. 1 mm in diam., 3-noded. Leaf sheaths smooth; leaf blades narrowly linear, flat or weakly rolled, grayish green, 5–8 cm × 0.5–2 mm, scabrid; ligule 1.5–3 mm, apex obtuse. Panicle lanceolate to narrowly ovate, 7–12 cm; branches 2–5 per node, laxly ascending, slender, moderately scabrid. Spikelets 2–2.5 mm, purple; glumes oblong-lanceolate, subequal, lower slightly longer, keel scabrid or almost smooth on upper glume, apex acuminate; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, awned from slightly below middle to lower 1/3, or awnless, apex obtuse; awn geniculate, 3–3.5 mm; palea very small. Anthers 1–1.5 mm. Fl. and fr. summer and autumn.

Damp grassy places; 1500–1700 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Pakistan, Russia; America, Europe].

Agrostis vinealis lies at the center of a complex of closely related taxa, including in China *A. flaccida* and *A. turkestanica*. Characters separating the taxa are very slight, which has led to differences in opinion as to their taxonomic status. *Agrostis vinealis* itself is widespread in Eurasia, but other members are usually of more restricted distribution. *Agrostis trinii*, based on an E Asian element with very scabrid leaf blades, has been reported from NE China. Other characters used to

distinguish it are conflicting in the literature, and it seems impossible to maintain it as distinct.

25. *Agrostis turkestanica* Drobow, Fl. Uzbekistan. 1: 537. 1941.

北疆剪股颖 bei jiang jian gu ying

Agrostis vinealis subsp. *turkestanica* (Drobow) Tzvelev.

Perennial, densely tufted. Culms slender, slightly geniculate at base, 20–35 cm tall, ca. 1 mm in diam., 2-noded. Leaves mainly crowded in basal tuft; leaf sheaths lax, smooth, longer than internodes; leaf blades setaceous, involute or flat, 3–4 cm × 0.8–1 mm; ligule 1.5–3 mm, apex rounded. Panicle contracted, linear-oblong, 4–9 cm; branches 1–3 per node, ca. 2 cm, smooth or scabrid. Spikelets 2–2.2 mm, dull purple; glumes lanceolate, subequal or lower glume slightly longer, lower glume aculeolate along keel, apex acute; lemma ca. 1.9 mm, distinctly 5-veined, awned from upper 2/3–4/5, apex obtuse or subrounded; awn weakly geniculate, 2.5–3 mm; palea ca. 0.2 mm. Anthers ca. 1.2 mm. Fl. and fr. Aug–Sep.

River valleys, roadsides; 2300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; SW Asia (NE Iran)].

This is a regional variant from the *Agrostis vinealis* complex, with a densely tufted habit, fine leaf blades, and a contracted panicle.

86a. ×**AGROPOGON** P. Fournier, Quatre Fl. France 50. 1934.

剪棒草属 jian bang cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Agrostis Linnaeus × *Polypogon* Desfontaines.

1. ×*Agropogon lutosus* (Poirot) P. Fournier, Quatre Fl. France 50. 1934.

糙颖剪股颖 cao ying jian gu ying

Agrostis lutosa Poirot, Encycl., Suppl. 1: 249. 1810, based on *A. littoralis* Withering, Arr. Brit. Pl., ed. 3, 2: 129. 1796, not Lamarck (1791); ×*Agropogon littoralis* C. E. Hubbard, nom. illeg. superfl.; *Agrostis subaristata* Aitchison & Hemsley; *Polypogon littoralis* Smith, nom. illeg. superfl.; *P. lutosus* (Poirot) Hitchcock; *P. subaristatus* (Aitchison & Hemsley) Bhat-tacharya & S. K. Jain; *Vilfa lutosa* (Poirot) P. Beauvois.

Perennial, often shortly stoloniferous. Culms solitary or loosely tufted, ascending or decumbent and rooting at lower nodes, up to 80 cm tall. Leaf sheaths loose, glabrous; leaf blades linear, 9–20 cm, 2–10 mm wide, scabrid along margins and veins, apex acute or acuminate; ligule 5–8 mm, scarious, scabrid on back, lacerate at apex. Panicle densely contracted, lanceolate to oblong in outline, lobed, 2–18 cm; branches subverticillate; pedicels pubescent. Spikelets 2–3 mm, disarticulating above glumes; glumes persistent, subequal or upper glume

slightly shorter than lower, elliptic, hispidulous, apex acute or emarginate with awn to 0.5(–3) mm; callus glabrous; lemma oblong, 1.4–1.6 mm, firmly hyaline, glossy, 5-veined, apex truncate-denticulate, awnless or with subapical awn up to 3 mm; palea 2/3 length of lemma. Anthers 0.5–1 mm, indehiscent. Fl. Jun–Jul.

Moist and saline ground; 1000–3000 m. S Gansu, Sichuan, Xizang, Yunnan [Afghanistan, NW India, Pakistan; NE Africa, Europe].

This is the name given to hybrids between *Agrostis stolonifera* and *Polypogon monspeliensis*. The spikelets resemble *Polypogon* in their scabrid, often shortly awned glumes, but these lack clearly 2-lobed tips, whereas spikelet disarticulation is usually like *Agrostis*. The plants are infertile, producing neither good pollen nor ripe seed.

The name ×*Agropogon littoralis*, based on *Polypogon littoralis* (1816), in turn a *nomen novum* for *Agrostis littoralis* Withering, has frequently been used in the literature. However, *A. lutosa* (1810), also a *nomen novum* for *A. littoralis*, is the earliest legitimate name and provides the correct specific epithet. Therefore both *P. littoralis* and ×*A. littoralis* were nomenclaturally superfluous when published and are consequently illegitimate.

87. **DEYEUXIA** Clarion ex P. Beauvois, Ess. Agrostogr. 43. 1812.

野青茅属 ye qing mao shu

Lu Shenglian (卢生莲), Chen Wenli (陈文俐); Sylvia M. Phillips

Anisachne Keng.

Perennials, tufted or also rhizomatous. Leaf blades linear, usually flat, sometimes inrolled; ligule membranous. Inflorescence a panicle, loosely contracted to spike-like, rarely open. Spikelets with 1 floret (very rarely 2), rachilla disarticulating above glumes, with penicillate extension lying against the palea; glumes subequal, usually slightly longer than the floret, rarely slightly shorter, membranous, 1–3-veined, apex acute or acuminate; floret callus bearded, hairs usually 1/3 as long up to about equaling floret; lemma thinly to firmly membranous, (3–)5-veined, dorsally awned or awnless, apex erose, denticulate or 2–4-toothed; awn geniculate or straight, its position varying from near base to near apex, usually inconspicuous, up to twice length of lemma but occasionally reduced to a subapical mucro or absent; palea 2/3 as long to subequaling lemma. Stamens usually 3, rarely 2 or 1.

About 200 species: temperate regions throughout the world, also on tropical mountains; 34 species (15 endemic) in China.

The genera *Agrostis*, *Calamagrostis*, and *Deyeuxia* form an intergrading complex of three incompletely separated entities. The majority of species can be placed without difficulty, but there is a number of troublesome intermediates, and no character combinations provide a definitive way of distinguishing the genera. *Agrostis*, with small spikelets and short callus hairs, has always been maintained separately, while *Deyeuxia* is sometimes maintained and sometimes sunk into *Calamagrostis*. However, the boundary between *Agrostis* and *Calamagrostis* is just as ill-defined as that between *Calamagrostis* and *Deyeuxia*. For this reason, three separate genera are maintained here, which complies with the usual practice in Chinese floras and avoids the need for many new combinations.

The taxonomy of this group is complicated by the presence of a number of apomictic complexes and frequent hybridization. Many infraspecific taxa have been described in an attempt to order this variation. However, intermediates are to be expected in an actively evolving group such as this, and most of these infraspecific taxa have not been enumerated separately here.

1a. Lemma awnless; panicle open.

2a. Callus hairs 2/3 as long as lemma or more; culms up to 120 cm; panicle 15–30 cm.

3a. Spikelets 2–3 mm; lemma 1.5–2.5 mm; callus hairs equaling or subequaling lemma 1. *D. diffusa*

3b. Spikelets 3–4.2 mm; lemma 3–4 mm; callus hairs 2/3–4/5 as long as lemma 2. *D. flaccida*

2b. Callus hairs not more than 1/2 as long as lemma; culms up to 60 cm; panicle 6–12 cm.

4a. Spikelets 3–3.7 mm; rachilla 1.5–2.5 mm; anthers ca. 2 mm 3. *D. yanyuanensis*

4b. Spikelets 2–2.5 mm; rachilla ca. 0.6 mm; anthers ca. 0.5 mm.

5a. Spikelets 1.9–2.5(–3) mm; glumes slightly shorter than floret; callus hairs less than 1 mm, not visible between glumes; leaf sheaths smooth 4. *D. petelotii*

5b. Spikelets 2.5–3.5 mm; glumes equaling or longer than floret; callus hairs 1.2–2 mm, visible between glumes; leaf sheaths scabrid 5. *D. abnormis*

1b. Lemma awned; panicle open or contracted.

6a. Callus hairs less than 1/2 as long as lemma.

7a. Awn arising near or above middle of lemma.

8a. Spikelets with 2 florets 6. *D. himalaica*

8b. Spikelets with 1 floret.

9a. Plant with slender, elongate, creeping rhizomes.

10a. Awn 1–2.5(–6) mm, arising from upper 1/3 of lemma or above; glumes scabrid 7. *D. pulchella*

10b. Awn 5–6 mm, arising from middle of lemma; glumes smooth or scabrid only on keel 8. *D. rosea*

9b. Plant tufted or shortly rhizomatous.

11a. Panicle contracted, branches straight, scabrid; lower glume ciliate on margins; anthers 2–3 mm 9. *D. scabrescens*

11b. Panicle open, branches capillary, curving, smooth; lower glume not ciliate on margins; anthers ca. 1 mm 10. *D. nyingchiensis*

7b. Awn arising from below middle of lemma.

12a. Panicle loosely contracted to dense, sometimes spike-like.

13a. Anthers 0.5–1.2 mm; culms 1–2-noded 11. *D. nivicola*

13b. Anthers 2–3 mm; culms (2–)3–5-noded.

14a. Glumes membranous, shining 25. *D. anthoxanthoides*

14b. Glumes not shining.

15a. Leaf blades involute, filiform; spikelets 4–5.5 mm 12. *D. mazzettii*

15b. Leaf blades flat, stiff; spikelets 5–7 mm 14. *D. korotkyi*

12b. Panicle open with spreading branches, (5–)15–35 cm wide.

16a. Callus hairs less than 1/5 length of lemma; ligule 0.5–2(–4) mm.

17a. Plant ca. 65 cm tall; panicle 5–9(–16) cm; spikelets with 1(–2) florets 15. *D. suizanensis*

17b. Plant 80–120 cm tall; panicle 20–35 cm; spikelets with 1 floret 16. *D. effusiflora*

16b. Callus hairs 1/5–2/5 length of lemma; ligule 2.5–20 mm.

18a. Lemma apex erose; anthers (1.3–)2–3 mm 17. *D. pyramidalis*

18b. Lemma apex with 0.5–1.5 mm mucros; anthers 0.5–1.2 mm 13. *D. flavens*

6b. Callus hairs 1/2 as long as lemma or longer.

19a. Panicle open or slightly contracted.

- 20a. Panicle branches usually paired; glumes smooth, scabrid on keel only; ligule 1–1.5 mm 18. *D. hakonensis*
 20b. Panicle branches fascicled; glumes scabrid; ligule 3–20 mm.
 21a. Awn sub-basal 19. *D. sinelatio*
 21b. Awn arising near or above middle of lemma.
 22a. Culms (4–)6–8-noded, usually branched 20. *D. purpurea*
 22b. Culms 2–4-noded, unbranched.
 23a. Lemma awned from near middle; awn ca. 1.2 mm, not exerted from
 spikelets 21. *D. sichuanensis*
 23b. Lemma awned from near apex; awn 3–6 mm, exerted from spikelet 22. *D. nepalensis*
 19b. Panicle dense, often spikelike.
 24a. Awn geniculate with twisted column, conspicuously exceeding glumes.
 25a. Culm densely pubescent below panicle; panicle branches pubescent 26. *D. tibetica*
 25b. Culms scabrid below panicle; panicle branches scabrid.
 26a. Anthers 1.5–2 mm; spikelets 4–6 mm, purple 27. *D. tianschanica*
 26b. Anthers 2–4 mm; spikelets 5–9 mm, yellowish brown, purplish at base 28. *D. holciformis*
 24b. Awn slender, straight, slightly curved or indistinctly twisted in lower part, included within
 glumes (exserted in *D. moupinensis*).
 27a. Lemma apex deeply 2-lobed; awn arising from between lobes; ligule ca. 0.5 mm 29. *D. moupinensis*
 27b. Lemma apex denticulate or minutely 4-toothed; ligule 1.5–7 mm.
 28a. Anthers ca. 0.5 mm; culms 15–45 cm tall 30. *D. debilis*
 28b. Anthers 1.5–2.2 mm.
 29a. Awn arising from lower 1/3 of lemma or slightly above.
 30a. Awn poorly developed, 1–2 mm; spikelets 3–4 mm 23. *D. neglecta*
 30b. Awn 3–6 mm; spikelets 4–7 mm.
 31a. Panicle 10–25 cm; glumes subequal 24. *D. lapponica*
 31b. Panicle 5–8 cm; glumes unequal 31. *D. zangxiensis*
 29b. Awn sub-basal.
 32a. Callus hairs equal to or slightly longer than lemma 32. *D. conferta*
 32b. Callus hairs 1/2–4/5 as long as lemma.
 33a. Leaf sheaths scabrid; spikelets purple with bronze at apex 33. *D. kokonorica*
 33b. Leaf sheaths smooth; spikelets yellowish green or pinkish 34. *D. macilenta*

1. *Deyeuxia diffusa* Keng, Sunyatsenia 6(2): 94. 1941.

散穗野青茅 *san sui ye qing mao*

Calamagrostis diffusa (Keng) P. C. Keng, Bull. Bot. Res., Harbin 4(3): 195. 1984.

Perennial, very loosely tufted, stoloniferous; stolons long, slender. Culms slender, decumbent, 30–80 cm tall, 1–2 mm in diam., 4–6-noded. Leaf blades flat or inrolled, 10–20 cm, 1–3 mm wide; ligule 1.5–3 mm, toothed. Panicle loose, open, 15–30 × 5–15 cm; branches paired or in whorls, up to 15 cm, very slender, flexuous, bare below middle, di- or trichotomously branched above, smooth, branchlets and pedicels capillary, drooping. Spikelets 2–3 mm, brownish purple; glumes unequal, lower glume narrowly lanceolate, 2–2.5 mm, apex acuminate, upper glume broadly lanceolate, 1.5–2 mm, apex obtuse; callus hairs equal to or slightly shorter than lemma; lemma 1.5–2.5 mm, apex obtuse or emarginate, awnless; palea 1/2–2/3 as long as lemma; rachilla ca. 0.5 mm, including hairs up to 1–1.5 mm. Anthers ca. 0.5 mm. Caryopsis oblong, ca. 1.5 mm. Fl. and fr. summer and autumn. $2n = 28^*$.

• Grassy slopes, among shrubs, on wasteland; 1900–3800 m. Guizhou, Sichuan, Yunnan.

The name "*Deyeuxia agrostioides* L. Liou" (Vasc. Pl. Hengduan Mts. 2: 2240. 1994) belongs here, but was not validly published because no Latin description was provided.

2. *Deyeuxia flaccida* (P. C. Keng) Keng ex S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 223. 1987.

柔弱野青茅 *rou ruo ye qing mao*

Calamagrostis flaccida Keng ex P. C. Keng, Bull. Bot. Res., Harbin 4(3): 195. 1984.

Perennial, very loosely tufted. Culms slender, weakly ascending, 60–120 cm tall, 1–2 mm in diam., 4–6-noded. Leaf sheaths scabrid; leaf blades flat, thin, 5–20 cm, 1–4 mm wide, glabrous, apex acuminate; ligule 1–4 mm, usually tattered. Panicle loose, open, soft, 15–20 × 8–14 cm; branches in whorls of 2–5, up to 10 cm, slender, flexuous, bare below middle, di- or trichotomously branched above, smooth, branchlets and pedicels capillary, drooping. Spikelets 3–4.2 mm, gray-green or purplish at apex; glumes lanceolate, lower glume 3–4 mm, 1-veined, scabrid along vein, apex acute, upper glume 2.5–3.5 mm, 3-veined with lateral veins obsolete, midvein smooth, apex obtuse; callus hairs 2/3–3/4 length of lemma; lemma 3–4 mm, awnless; palea 1/2–2/3 as long as lemma; rachilla ca. 0.8 mm, including hairs up to 1.5–2 mm. Anthers 0.5–0.7 mm. Caryopsis brown, fusiform, ca. 2 mm. Fl. and fr. Jul–Aug.

• Bamboo forests, roadsides on moist ground; 2000–2600 m. Sichuan, Yunnan.

3. *Deyeuxia yanyuanensis* (J. L. Yang) L. Liu, Vasc. Pl. Hengduan Mts. 2: 2241. 1994.

盐源野青茅 *yan yuan ye qing mao*

Calamagrostis yanyuanensis J. L. Yang, Acta Bot. Yunnan. 5: 48. 1983.

Perennial, loosely tufted. Culms slender, erect, 40–60 cm, ca. 1 mm in diam., 2- or 3-noded. Leaf sheaths scabrid; leaf blades involute, 5–9.5 cm, ca. 1.5 mm wide, scabrid; ligule oblong, ca. 3 mm. Panicle lanceolate, rather loose, 6–11 × 2–3 cm; branches ascending, lowermost whorled, ca. 2.5 cm, capillary, smooth. Spikelets 3–3.7 mm, yellowish; glumes lanceolate, subequal, smooth, apex acute; callus hairs 1/7–1/5 length of lemma; lemma 2.7–3.5 mm, apex obtuse, awnless or with a very small apical mucro; palea 2/3–3/4 as long as lemma; rachilla 1.5–2.5 mm, including hairs 2–3 mm. Anthers ca. 2 mm.

• Woodlands; 2600 m. Sichuan.

This species is known only from the type.

4. *Deyeuxia petelotii* (Hitchcock) S. M. Phillips & Wen L. Chen, Novon 13: 319. 2003.

异颖草 *yi ying cao*

Aulacolepis petelotii Hitchcock, J. Wash. Acad. Sci. 24: 291. 1934; *Agrostis continentalis* Handel-Mazzetti; *A. petelotii* (Hitchcock) Noltie; *Anisachne gracilis* Keng; *A. gracilis* var. *multinodis* Y. Y. Qian; *Aniselytron gracilis* (Keng) N. X. Zhao; *A. petelotii* (Hitchcock) Soják; *Calamagrostis petelotii* (Hitchcock) Govaerts; *Deyeuxia continentalis* (Handel-Mazzetti) L. Liu; *Neoaulacolepis petelotii* (Hitchcock) Rauschert.

Perennial, densely tufted, old basal sheaths fibrous. Culms slender, erect or geniculate at base, 11–25 cm tall, 2–4-noded. Leaf sheaths smooth; leaf blades linear to filiform, flat or involute, 2–10 cm, 0.5–4 mm wide, scabrid, apex acute; ligule 0.5–2 mm, truncate to lacerate. Panicle narrowly pyramidal, lax, 6–16 cm; branches ascending, lowest in whorls of 2–6, 3–8 cm, capillary, scabrid, bare below middle, secondary branches usually short. Spikelets 2–3 mm, pale green or tinged purple; glumes lanceolate, shorter than floret, 1.8–2.3 mm, lower glume 1-veined, upper glume 1–3-veined, keel scabrid, apex subacute; callus hairs ca. 0.5 mm; lemma as long as spikelet, apex acute or midvein exerted into ca. 0.2 mm mucro; palea 2/3–3/4 as long as lemma; rachilla penicillate, including hairs 0.9–2 mm. Anthers 0.5–0.8 mm. Fl. Jul. $2n = 28^*$.

Grassy places on sandy acid soils; 1400–3000 m. Guizhou, Yunnan [Bhutan, NE India, N Vietnam].

The type of *Anisachne gracilis* var. *multinodis* has not been seen.

5. *Deyeuxia abnormis* J. D. Hooker, Fl. Brit. India 7: 268. 1896 [“1897”].

不育野青茅 *bu yu ye qing mao*

Agrostis nagensis Bor; *Calamagrostis abnormis* (J. D. Hooker) U. Shukla; *Deyeuxia nagensis* (Bor) Veldkamp.

Perennial, loosely tufted. Culms laxly ascending from a decumbent base, often scrambling, 30–90 cm tall, 4–10-noded,

sometimes branched. Leaf sheaths scabrid; leaf blades linear, flat, 9–12 cm, 2–5 mm wide, apex acute; ligule 1–2 mm, truncate. Panicle effuse, 8–30 cm; branches loosely spreading, secondary and tertiary branches well developed. Spikelets 2.5–3.5 mm, green or purplish; glumes lanceolate, equaling or slightly exceeding floret, lower glume 2.6–3.4 mm, upper glume 2.5–3.1 mm, keel scabrid above middle, apex acuminate; callus hairs 1/3–1/2 length of lemma; lemma slightly shorter than or subequaling glumes, apex narrowly obtuse, awnless; palea 2/3 as long as lemma; rachilla penicillate, including hairs 1.8–2.6 mm. Anthers ca. 0.5 mm. Fl. and fr. Nov.

Grassy and stony places in uplands; ca. 1900 m. Yunnan [Bhutan, NE India].

This grass lies on the boundary between *Agrostis* and *Deyeuxia*. It has an open panicle of small spikelets as in *Agrostis*, but a bearded callus and rachilla extension as in *Deyeuxia*. It is sometimes known as *A. zenkeri* Trinius (*Calamagrostis zenkeri* (Trinius) Davidse; *D. zenkeri* (Trinius) Veldkamp), a name which probably applies only to a grass from S India. *Deyeuxia abnormis* is very similar to *D. petelotii*, with which it is often confused, but is more robust with a laxer, spreading habit and a larger, more branched panicle. Other differences are given in the key.

6. *Deyeuxia himalaica* L. Liu ex Wen L. Chen, Acta Phytotax. Sin. 39: 447. 2001.

喜马拉雅野青茅 *xi ma la ya ye qing mao*

Perennial, subdensely tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 15–60 cm tall, 2–3 mm in diam., smooth, (2–)3–4-noded. Leaf sheaths smooth or slightly scabrid; leaf blades flat or involute, 9–20 cm, 2–5 mm wide, cm, slightly scabrid, apex long-acuminate; ligule 2–4 mm, toothed. Panicle loosely contracted, lanceolate-oblong in outline, 6–17 × 3–6 cm; branches in whorls of 3–5, ascending, 3.5–8 cm, slightly scabrid. Spikelets 5–6.5 mm, dark purple, florets (1–)2, upper floret slightly smaller; glumes subequal, 1-veined, slightly scabrid, lower glume broadly lanceolate, apex acute or slightly obtuse, upper glume lanceolate, apex acuminate; callus hairs 1/4–1/3 length of lemma; lower lemma 4–5 mm, upper lemma 3–3.5 mm, upper part purplish and scabrid, margins white, membranous, apex 4-toothed; awn arising from upper 1/5–2/5 of lemma, 8–10 mm, geniculate; palea 2/3 as long as lemma; rachilla internode between florets and extension above upper floret ca. 1 mm, pilose with hairs 0.8–1.5 mm. Anthers 2–2.5 mm. Fl. Sep.

• Alpine meadows, under alpine shrubs; 3900–4000 m. Xizang.

This species is unusual in *Deyeuxia* in that most spikelets have 2 florets. However, spikelets with 2 florets do occur sporadically in other normally 1-flowered species. The rachilla is also well developed, so possibly this species represents a primitive state within the genus. The spikelets are otherwise typical of *Deyeuxia*.

7. *Deyeuxia pulchella* J. D. Hooker, Fl. Brit. India 7: 268. 1896 [“1897”].

小丽茅 *xiao li mao*

Calamagrostis pulchella Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 78. 1868, not Reichenbach (1830); *C. lahulensis* Singh; *C. megalantha* (Keng ex P. C. Keng) P. C. Keng; *Deyeuxia gyirongensis* P. C. Kuo & S. L.

Lu; *D. megalantha* Keng ex P. C. Keng; *D. pulchella* var. *laxa* P. C. Kuo & S. L. Lu.

Perennial, densely tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 10–40 cm tall, 1–1.5 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths scabrid; leaf blades flat or involute when dry, 2–13 cm, 1–4 mm wide, scabrid, apex acute; ligule 2–4 mm, lacerate. Panicle dense, spike-like, lanceolate-oblong in outline, or sometimes laxer, 3–7(–13) × 0.8–1.5(–5) cm; branches 1–5 cm, scabrid. Spikelets 3–5(–6) mm, dark purple; glumes lanceolate, subequal or lower glume slightly shorter than upper, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; callus hairs ca. 1/3 length of lemma; lemma 3–4.5 mm, papery, hyaline at margins and apex, sometimes scabrid; apex irregularly 4-toothed; awn arising from upper 1/3 of lemma back or above, 1–2.5(–6) mm, straight or slightly curved; palea ca. 2/3 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs up to 5 mm. Anthers 1.4–2.3 mm. Fl. Jul–Aug.

Alpine meadows, in woodlands, among bushes; 2700–5200 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

This is a polymorphic species, varying especially in the compactness of the panicle and the length and position of the awn on the lemma back. Looser-panicled forms (var. *laxa*) are somewhat intermediate with *Deyeuxia scabrescens*. These two species are closely related, and hybridization is possibly occurring.

The spikelets in the type of *Deyeuxia megalantha* are enlarged due to nematode infection.

8. *Deyeuxia rosea* Bor, Kew Bull. [9] 1954: 498. 1954.

玫红野青茅 mei hong ye qing mao

Calamagrostis borii Tzvelv.

Perennial, tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 25–35 cm tall, smooth, 2–3-noded. Leaf sheaths smooth or scabrid at base; leaf blades flat, 4–8 cm, 3–4.5 mm wide, scabrid; ligule 3–7 mm. Panicle dense, spike-like, narrowly oblong in outline, 6–9 × 1.5–2 cm; branches erect, appressed, scabrid. Spikelets 4.5–6(–7) mm, rose or purplish red; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, smooth or scabrid only along keel, apex sharply acuminate; callus hairs 1/3–1/2 length of lemma; lemma 4–5 mm, membranous, upper part scabrid, apex obtuse or denticulate; awn arising from or a little below middle of lemma, straight or slightly geniculate, 5–6 mm; palea ca. 3/4 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs 4–5 mm. Anthers 2–2.5 mm. Fl. and fr. Jul–Sep.

• Alpine meadows, grassy mountainsides; 3500–5000 m. W Sichuan, Xizang.

This species is very close to *Deyeuxia pulchella*, but has a more compact panicle and an awn arising lower down the lemma back.

9. *Deyeuxia scabrescens* (Grisebach) Munro ex Duthie in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 628. 1882.

糙野青茅 cao ye qing mao

Calamagrostis scabrescens Grisebach, Nachr. Königl. Ges.

Wiss. Georg-Augusts-Univ. 3: 79. 1868; *C. scabrescens* var. *humilis* Grisebach; *Deyeuxia scabrescens* var. *humilis* (Grisebach) J. D. Hooker; *D. sikangensis* Keng.

Perennial, tufted, shortly rhizomatous. Culms erect, 60–150 cm tall, 1–4 mm in diam., scabrid or almost smooth below panicle, 2–4-noded. Leaf sheaths smooth or scabrid; leaf blades erect, convolute or flat, stiff, 10–45 cm, 2–8 mm wide, scabrid; ligule 2–6 mm, obtuse. Panicle loosely contracted, narrowly lanceolate in outline, 6–25 × 1.5–4 cm; branches several per node, erect or ascending, scabrid; pedicels very scabrid. Spikelets 4–6 mm, yellowish green or purple; glumes oblong-lanceolate, subequal or lower glume slightly longer than upper, densely scabrid, lower glume ciliate along margin, 1-veined, upper glume 3-veined at base, apex sharply acuminate; callus hairs ca. 1/3 lemma length; lemma 3.5–5 mm, scabrid, apex denticulate; awn arising from or above middle of lemma, 5–9 mm, weakly geniculate; palea 2/3–3/4 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs 3–4 mm. Anthers 2–3 mm. Fl. and fr. Jul–Oct.

Grassy slopes, among shrubs, in woods; 2000–4600 m. Gansu, Hubei, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan].

This is one of the more common species of *Deyeuxia* in China, occurring mainly at higher altitudes in the southwest. *Deyeuxia pyramidalis* is a closely related species with a similarly robust habit, but this occurs mainly at lower altitudes in eastern and northern areas. *Deyeuxia scabrescens* is very variable, but recognizable by its very scabrid panicle and spikelets, conspicuously penicillate rachilla, but short callus hairs, and awn arising from the upper part of the lemma back.

Deyeuxia scabrescens intergrades with *D. pulchella*, and intermediates occur causing problems for identification. *Deyeuxia scabrescens* var. *humilis* is based on a short plant with an almost straight awn, which is probably an introgression product of these two species.

The name “*Deyeuxia dispar* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2237. 1994) belongs here, but was not validly published because no Latin description was provided. The specimen indicated as the holotype has some enlarged spikelets, typical of nematode infection.

10. *Deyeuxia nyingchiensis* P. C. Kuo & S. L. Lu, Fl. Xizang. 5: 221. 1987.

林芝野青茅 lin zhi ye qing mao

Perennial, tufted. Culms erect, 50–80 cm tall, 2–3-noded. Leaf sheaths smooth or scabrid; leaf blades flat or involute, 10–15 cm, 1–3 mm wide, scabrid; ligule 4–5 mm. Panicle open, ovate in outline, 7–12 × 5–8 cm; branches in whorls of 3–6, curving, spreading or ascending, 2–8 cm, smooth or scabrid, lower 1/2–2/3 bare; pedicels curved, slightly scabrid. Spikelets 5–7 mm, purple; glumes narrowly lanceolate, subequal or lower glume slightly longer than upper, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; callus hairs ca. 1/3 length of lemma; lemma ca. 3 mm, apex 4-toothed; awn arising from upper 1/4–1/3 of lemma, straight, ca. 4 mm; palea ca. 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 3.5–4 mm. Anthers ca. 1 mm. Fl. Aug.

• Grassy mountainsides, among alpine shrubs; 3500–4700 m. Sichuan, Xizang.

Specimens from Xizang are sometimes confused with *Deyeuxia*

pulchella or *D. scabrescens*, but can be distinguished by the laxer panicle with curving branches and by the narrower glumes.

11. *Deyeuxia nivicola* J. D. Hooker, Fl. Brit. India 7: 267. 1896 ["1897"].

微药野青茅 *wei yao ye qing mao*

Calamagrostis nivicola (J. D. Hooker) Handel-Mazzetti; *Deyeuxia levipes* Keng.

Perennial, tufted, rhizomatous; rhizomes slender, spreading. Culms erect or ascending, very slender, up to 20 cm tall, 0.5–1 mm in diam., smooth, 1–2-noded. Leaf sheaths tight, smooth; leaf blades flat or involute, 1–10 cm, 1–3 mm wide, adaxial surface scabrid, apex acute; ligule 1–3 mm, entire or irregularly denticulate. Panicle contracted, spikelike, linear to narrowly oblong in outline, 1.5–8 × 0.3–1 cm; branches 1–2 cm, erect, smooth. Spikelets 4–7 mm, purple or green tinged purple; glumes narrowly lanceolate, lower glume slightly longer than upper, both 1-veined, smooth or slightly scabrid along vein, apex acuminate; callus hairs 1/5–1/4 length of lemma; lemma 3–4.5 mm, herbaceous, scabrid above middle, apex distinctly 4-toothed, lateral veins shortly excurrent; awn sub-basal, 5–7 mm, geniculate; palea 2/3–3/4 as long as lemma; rachilla 2–3.5 mm, including hairs 3–4 mm. Anthers 0.5–1.2 mm. Fl. and fr. Aug–Sep. $2n = 28^*$.

Grassy and stony mountain slopes; 3000–5000 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

See the comment on dimorphic anthers under *Deyeuxia flavens* (species no. 13).

12. *Deyeuxia mazzettii* Veldkamp, Gard. Bull. Singapore 37: 222. 1985 ["1984," as "*mazzettii*"].

会理野青茅 *hui li ye qing mao*

Calamagrostis stenophylla Handel-Mazzetti, Symb. Sin. 7: 1298. 1936; *Deyeuxia grata* Keng; *D. stenophylla* (Handel-Mazzetti) P. C. Kuo & S. L. Lu (1987), not Jansen (1952).

Perennial, tufted. Culms erect, 20–60 cm tall, ca. 1 mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades filiform, involute, 10–20 cm, ca. 0.5 mm wide, both surfaces smooth, margins scabrid, apex subacute; ligule 1–3 mm, truncate or lacerate. Panicle loosely contracted, broadly lanceolate, 6–14 × 2–5 cm; branches whorled, 2–4 cm, smooth, lower 1/3–1/2 bare. Spikelets 4–5.5 mm, greenish or purple; glumes lanceolate, subequal or lower glume slightly longer than upper, margins broadly membranous, smooth, lower glume 1-veined, upper glume 3-veined, apex acuminate; callus hairs 1/5–1/4 length of lemma; lemma 3.8–4.8 mm, scabrid, apex minutely 2-toothed or erose; awn sub-basal, long exserted, 8–10 mm, geniculate; palea 2/3–3/4 length of lemma; rachilla 1.5–2 mm, including hairs up to 3.5 mm. Anthers 2–2.5 mm. Fl. Jul–Aug.

• Alpine meadows, shrubby and grassy mountainsides, montane woodlands, sometimes dominant; 2200–3800 m. Sichuan, Yunnan.

The name "*Deyeuxia stenophylla* var. *muliensis* L. Liou" (Vasc. Pl. Hengduan Mts. 2: 2236. 1994) belongs here, but was not validly published because no Latin description was provided.

The name *Deyeuxia grata* was applied to specimens of this species with some spikelets with 2 florets.

Deyeuxia filipes Keng (*Calamagrostis filipes* (Keng) P. C. Kuo & S. L. Lu ex J. L. Yang) may be based on a hybrid between *D. mazzettii* and *D. flavens*.

13. *Deyeuxia flavens* Keng, Sunyatsenia 6: 67. 1941.

黄花草青茅 *huang hua ye qing mao*

Calamagrostis longiflora P. C. Keng; *C. venusta* (Keng) Tzvelev; *Deyeuxia longiflora* (P. C. Keng) B. S. Sun & Y. H. Wang; *D. venusta* Keng.

Perennial, loosely tufted. Culms erect or geniculate at base, slender, (12–)30–60 cm tall, 1–2 mm in diam., glabrous, 2–3-noded. Leaf sheaths smooth; leaf blades flat, 3–12 cm, 2–5 mm wide, scabrid; ligule 2.5–6 mm, toothed. Panicle open, very loose, 4–15 × 2–12 cm; branches usually paired, rarely in whorls of 3–4, distant, ascending or widely spreading, scabrid, lower 1/2 bare. Spikelets 3–7 mm, yellowish brown or purple; glumes ovate-lanceolate, lower glume slightly longer than upper, 1-veined or obscurely 3-veined, scabrid, apex acuminate; callus hairs 1/4–1/3 length of lemma; lemma 3.5–5 mm, equaling or slightly shorter or longer than glumes, lateral and intermediate veins prolonged into 0.5–1.5 mm mucros with the outermost mucros longest; awn sub-basal, 5–6 mm, geniculate with twisted column; palea ca. 2/3 as long as lemma; rachilla 0.5–1 mm, including hairs up to ca. 2.5 mm. Anthers dimorphic, 0.5–0.6 mm when ovary sterile, 1–1.2 mm when ovary fertile. Fl. and fr. Aug–Sep. $2n = 28^*$.

• Alpine meadows, grassy slopes, open woodlands or shrublands, especially along river banks; 2700–4500 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

Deyeuxia flavens is close to *Agrostis triaristata* (J. D. Hooker) Bor (*D. triaristata* J. D. Hooker; *Calamagrostis tripilifera* J. D. Hooker) from Bhutan and India (Sikkim), but that species has smooth panicle branches, a smaller floret, more pronounced mucros at the lemma apex, and a minute rachilla extension. *Deyeuxia flavens* lies on the boundary between *Agrostis* and *Deyeuxia* because of the short callus hairs but penicillate rachilla extension. Dimorphic anthers are also known in other species from the Himalayas, e.g., *D. mazzettii*, *D. nivicola*, and *D. nyingchiensis*.

14. *Deyeuxia korotkyi* (Litvinov) S. M. Phillips & Wen L. Chen, Novon 13: 321. 2003.

兴安野青茅 *xing an ye qing mao*

Calamagrostis korotkyi Litvinov, Schedae Herb. Fl. Ross. 55: no. 2750. 1918; *C. korotkyi* subsp. *turczaninowii* (Litvinov) Tzvelev; *C. turczaninowii* Litvinov; *Deyeuxia turczaninowii* (Litvinov) Y. L. Chang ex S. L. Lu.

Perennial, tufted. Culms erect, 30–80 cm tall, 1.5–3 mm in diam., 2–3-noded. Leaf sheaths smooth, rarely puberulous; leaf blades grayish green, flat, stiff, (4–)10–20 cm, 4–11 mm wide, both surfaces smooth, margins scabrid, apex finely acuminate; ligule 3–5 mm, truncate. Panicle dense, spikelike, 3–15 × 1–1.5 cm; branches in whorls of 3–5, appressed to rachis, 1–2 cm, scabrid. Spikelets 5–7 mm, yellowish green or purplish; glumes

lanceolate, subequal or lower glume ca. 1 mm longer than upper, lower glume 1-veined, upper glume 3-veined, smooth or scabrid only along midvein, apex acuminate; callus hairs ca. 1/3 length of lemma, sparse, unequal; lemma 4–5 mm, firmly membranous, apex denticulate; awn sub-basal, 7–11 mm, well exerted from spikelet, geniculate with twisted column; palea subequal to or slightly shorter than lemma; rachilla 1.5–2 mm, including hairs 2.5–4 mm. Anthers ca. 3 mm. Fl. Aug.

Grassy slopes, dry woodlands; 300–2500 m. N Heilongjiang, N Nei Mongol, NW Xinjiang [Mongolia, E Russia].

Deyeuxia turczaninowii var. *nenjiangensis* S. L. Lu (Acta Biol. Plateau Sin. 2: 19. 1984) has been described from N Heilongjiang and Nei Mongol. It may be the hybrid *D. korotkyi* × *Calamagrostis epigeios*. It differs from typical *D. korotkyi* by its looser panicle, narrower glumes, and longer callus hairs ca. 3/4 as long as the lemma. It is intermediate between the putative parents in these characters.

15. *Deyeuxia suizanensis* (Hayata) Ohwi, J. Jap. Bot. 33: 211. 1958.

水山野青茅 shui shan ye qing mao

Agrostis suizanensis Hayata, Icon. Pl. Formosan. 7: 83. 1918; *Calamagrostis filifolia* Merrill; *C. suizanensis* (Hayata) Honda; *Deyeuxia biflora* Keng; *D. chaseana* Bor; *D. stenophylla* Jansen (1952), not (Handel-Mazzetti) P. C. Kuo & S. L. Lu (1987).

Perennial, densely tufted. Culms slender, erect, up to 65 cm tall, 2–3-noded, retrorsely puberulent below nodes. Leaf sheaths glabrous or retrorsely puberulent toward base; leaf blades filiform, stiff, strongly involute, 6–8(–15) cm, 3–5 mm wide, apex acute; ligule 0.75–2.5 mm, minutely erose. Panicle contracted, narrowly oblong in outline, 5–16 × 0.6–1 cm, axis scaberulous; lowest branches in groups of 2–3(–4), 2.5–5 cm. Spikelets 4–5.5(–6) mm, florets (1–)2, upper floret slightly smaller and bisexual or sometimes rudimentary; glumes lanceolate, slightly unequal with upper glume as long as spikelet, lower glume 1-veined, upper glume 1–3-veined, midvein scabrid, apex acuminate; callus hairs 1/8–1/5 length of lemma; lemma 3.5–4.6(–5.5) mm, scaberulous, apex usually erose; awn arising from lower 1/4–1/3 of lemma, 5–8 mm, geniculate; palea 3/4–7/8 as long as lemma; rachilla 1.6–3 mm including hairs. Anthers 1–2 mm.

Montane grasslands; ca. 3000 m. Taiwan [New Guinea, Philippines].

Specimens from Malesia tend to have longer leaf blades and ligules and a shorter rachilla extension. They have been referred to different varieties from the typical variety in Taiwan: var. *stenophylla* (Jansen) Veldkamp in the Philippines and var. *chaseana* (Bor) Veldkamp in New Guinea. Cleistogamous forms with anthers ca. 0.5 mm are known from the Philippines. The name *Deyeuxia biflora* applies to an aberrant form with a well-developed second floret.

16. *Deyeuxia effusiflora* Rendle, J. Linn. Soc., Bot. 36: 392. 1904.

疏穗野青茅 shu sui ye qing mao

Calamagrostis effusiflora (Rendle) P. C. Kuo & S. L. Lu ex J. L. Yang; *Deyeuxia arundinacea* P. Beauvois var. *laxiflora*

(Rendle) P. C. Kuo & S. L. Lu; *D. sylvatica* (Schrader) Kunth var. *laxiflora* Rendle.

Perennial, densely tufted. Culms erect, 80–120 cm tall, 3–5 mm in diam., pubescent just below panicle and on nodes, 2–4-noded. Leaf sheaths with minute retrorse hairs between veins; leaf blades flat or slightly involute, 30–70 cm, 5–10 mm wide, adaxial surface densely pubescent, abaxial surface scabrid; ligule 1–2(–4) mm, truncate or obtuse. Panicle large, open, 20–35 × 15–23 cm; branches in whorls of 3–5, spreading, scabrid, lower part bare. Spikelets 3–4.5 mm, grayish green or purple at base; glumes lanceolate, equal, lower glume 1-veined, upper glume 3-veined, scabrid; callus hairs 1/7–1/5 length of lemma; lemma slightly shorter than glumes, apex 4-toothed; awn sub-basal, 4–5.5 mm, weakly geniculate, column slightly twisted; palea subequal to lemma; rachilla 0.5–0.7 mm, including hairs 2–3 mm. Anthers 1.5–2 mm. Fl. and fr. Jul–Oct.

• Wet places, especially river banks; 600–2900 m. Gansu, Guizhou, Henan, Ningxia, Shaanxi, Sichuan, Yunnan, Zhejiang.

Deyeuxia arundinacea var. *laxiflora* is not taxonomically a variety of *D. arundinacea*, which is a different grass; see the comment under *D. pyramidalis* below.

17. *Deyeuxia pyramidalis* (Host) Veldkamp, Blumea 37: 230. 1992.

野青茅 ye qing mao

Calamagrostis pyramidalis Host, Icon. Descr. Gram. Austriac. 4: 28, 1809; *Agrostis arundinacea* Linnaeus; *Arundo sylvatica* Schrader, nom. illeg. superfl.; *C. arisanensis* Honda; *C. arundinacea* (Linnaeus) Roth; *C. arundinacea* var. *brachytricha* (Steudel) Hackel; *C. arundinacea* var. *ciliata* Honda; *C. arundinacea* var. *hirsuta* Hackel; *C. arundinacea* var. *latifolia* (Rendle) Kitagawa; *C. arundinacea* var. *robusta* (Franchet & Savatier) Honda; *C. arundinacea* var. *sciuroides* (Franchet & Savatier) Hackel; *C. austrojeholensis* Honda; *C. brachytricha* Steudel; *C. brachytricha* var. *ciliata* (Honda) Y. Ibaragi & H. Ohashi; *C. collina* Franchet; *C. formosana* Hayata; *C. matsudana* Honda; *C. morrisonensis* Hayata; *C. niitakayamensis* Honda; *C. nipponica* Franchet & Savatier; *C. robusta* Franchet & Savatier; *C. sciuroides* Franchet & Savatier, nom. hom. illeg.; *Deyeuxia ampla* Keng; *D. brachytricha* (Steudel) Chang; *D. collina* (Franchet) Pilger; *D. formosana* (Hayata) C. C. Hsu; *D. henryi* Rendle; *D. hupehensis* Rendle; *D. matsudana* (Honda) Keng; *D. sylvatica* Kunth, nom. illeg. superfl.

Perennial, tufted, sometimes shortly rhizomatous. Culms erect, slender or robust, (40–)100–150 cm tall, 2.5–5 mm in diam., 2–3-noded. Leaf sheaths glabrous to densely pubescent, or sheath-collar pilose; leaf blades flat or involute, 5–60 cm, 2–12 mm wide, smooth, scabrid or pubescent; ligule 4–13 mm, obtuse or lacerate. Panicle contracted to slightly open, lanceolate-ovate in outline, 6–35 × 1–10 cm; branches in whorls, ascending, erect or appressed, 1–2 cm; pedicels scabrid. Spikelets 3–5(–6.5) mm, yellowish green or purplish green; glumes lanceolate, subequal or lower glume slightly longer than upper, 1–3-veined, scabrid, apex acute; callus hairs 1/5–2/5 length of lemma; lemma 3.8–6.5 mm, subequal to glumes, scabrid, apex erose; awn arising from ca. lower 1/5 of lemma, 7–12 mm, geniculate with twisted column; palea as long as or slightly

shorter than lemma; rachilla (0.5–)1.5–2 mm, including hairs 2.5–4 mm. Anthers (1.3–)2–3 mm. Fl. and fr. Jun–Oct.

Grassy slopes, open woods; 100–4200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Heilongjiang, Hubei, Hunan, Jilin, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Kashmir, Korea, Pakistan, Russia; Europe].

This is a highly polymorphic complex, with many local variants.

The name *Deyeuxia sylvatica* Kunth, based on *Arundo sylvatica* Schrader (1806), is illegitimate because Schrader cited *Agrostis arundinacea* Linnaeus (1753) in synonymy. Varietal combinations under *D. sylvatica* should be transferred to *D. pyramidalis* if it is wished to maintain them (*D. sylvatica* var. *borealis* Rendle, var. *brachytricha* (Steudel) Rendle, var. *hirsuta* (Hackel) Rendle, var. *latifolia* Rendle, var. *ligulata* Rendle, and var. *sciuroides* (Franchet & Savatier) Rendle).

The name *Deyeuxia arundinacea* P. Beauvois is often presumed to be based on *Agrostis arundinacea* Linnaeus, but this is not the case. In fact, *D. arundinacea* is a synonym of the Mediterranean grass *Ampelodesmos mauritanicus* (Poir.) T. Durand & Schinz. Varietal combinations under *D. arundinacea* should be transferred to *D. pyramidalis* if it is wished to maintain them (*D. arundinacea* var. *borealis* (Rendle) P. C. Kuo & S. L. Lu, var. *brachytricha* (Steudel) P. C. Kuo & S. L. Lu, var. *ciliata* (Honda) P. C. Kuo & S. L. Lu, var. *hirsuta* (Hackel) P. C. Kuo & S. L. Lu, var. *latifolia* (Rendle) P. C. Kuo & S. L. Lu, var. *ligulata* (Rendle) P. C. Kuo & S. L. Lu, var. *robusta* (Franchet & Savatier) P. C. Kuo & S. L. Lu, and var. *sciuroides* (Franchet & Savatier) P. C. Kuo & S. L. Lu).

The name "*Calamagrostis zhongdianensis* L. Liou" (Vasc. Pl. Hengduan Mts. 2: 2235. 1994) belongs here, but was not validly published because no Latin description was provided.

18. *Deyeuxia hakonensis* (Franchet & Savatier) Keng, Sinen-sia 11: 411. 1940.

箱根野青茅 xiang gen ye qing mao

Calamagrostis hakonensis Franchet & Savatier, Enum. Pl. Jap. 2: 599. 1879.

Perennial, subloosely tufted from a short, knotty rhizome. Culms slender, erect or base geniculate, 30–70 cm tall, 0.5–1 mm in diam., 2–4-noded. Leaf sheaths glabrous or with caducous retrorse hairs between veins, margins ciliate, mouth auriculate, auricles shortly pilose; leaf blades flat or involute, 10–25 cm, 2–8 mm wide, adaxial surface pubescent, abaxial surface glabrous, apex acute; ligule 1–1.5 mm, obtuse or truncate. Panicle open or slightly contracted, 6–15 × 1–4 cm; branches 2(–3) per node, scabrid, usually bare below middle. Spikelets 3.5–6 mm, yellowish green or purplish; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, flanks smooth, slightly glossy, midvein scabrid, apex subacute; callus hairs 3/4–4/5 length of lemma; lemma 3–4 mm, conspicuously scabrid-hirtellous, apex obtuse or denticulate; awn sub-basal, 2–4 mm, straight, included within spikelet; palea subequal to lemma; rachilla 1–1.5 mm, including hairs 2.5–3 mm. Anthers 1.5–2 mm. Fl. Jul–Aug.

Forests, streamsides, shady valleys; 600–2500 m. Anhui, Guangdong, Guizhou, Hebei, Hubei, Jiangxi, Sichuan, Zhejiang [Japan, Russia (Kamchatka, Kuril Islands, Sakhalin)].

19. *Deyeuxia sinelator* Keng, Fl. Tsinling. 1(1): 441. 1976.

华高野青茅 hua gao ye qing mao

Calamagrostis sinelator (Keng) P. C. Kuo & S. L. Lu ex J. L. Yang.

Perennial, densely tufted. Culms erect, 1.3–1.8 m tall, 2–5 mm in diam., scabrid below panicle, otherwise smooth, 3–5-noded. Leaf sheaths smooth or rarely scabrid; leaf blades linear, 10–60 cm, 8–12 mm wide, adaxial surface puberulous, abaxial surface scabrid; ligule oblong-elliptic, 4–20 mm, apex lacerate. Panicle open, 22–35 × 6–18 cm; branches in whorls of 3–5, spreading or ascending, scabrid, lower 1/4–1/2 bare. Spikelets 4–6 mm, yellowish or purplish green; glumes subequal or upper glume shorter than lower, lower glume 1-veined, scabrid along vein, apex acuminate, upper glume 3-veined, scabrid along upper part of veins, apex obtuse; callus hairs 2/3–3/4 length of lemma; lemma 3.5–4 mm, apex obtuse, denticulate; awn sub-basal, ca. 5 mm, geniculate with twisted column; palea subequal to or slightly shorter than lemma; rachilla ca. 1 mm, including hairs up to 4 mm. Anthers ca. 2 mm. Fl. Aug–Sep.

• Forests, forest margins; 1000–3200 m. Henan, Shaanxi, Sichuan.

20. *Deyeuxia purpurea* (Trinius) Kunth, Révis. Gramin. 1: 77. 1829.

大叶章 da ye zhang

Arundo purpurea Trinius in Sprengel, Neue Entdeck. Pflanzenk. 2: 52. 1820 ["1821"]; *A. langsdorfii* Link; *Calamagrostis angustifolia* Komarov; *C. langsdorfii* (Link) Trinius; *C. langsdorfii* var. *angustifolia* (Komarov) Jaroschenko; *C. langsdorfii* subsp. *angustifolia* (Komarov) Voroshilov; *C. langsdorfii* var. *manshurica* (Baranov & Skvortzov) Kitagawa; *C. manshurica* Baranov & Skvortzov; *C. purpurea* (Trinius) Trinius; *C. purpurea* subsp. *langsdorfii* (Link) Tzvelev; *Deyeuxia angustifolia* (Komarov) Y. L. Chang (1959), not Vickery (1940); *D. langsdorfii* (Link) Kunth.

Perennial, tussocky, rhizomatous; rhizomes short or elongate. Culms erect, slender to stout, up to 1.5 m tall, 1–4 mm in diam., usually branched, (4–)6–8-noded. Leaf sheaths smooth, glabrous; leaf blades linear, flat, 10–30 cm, 4–20(–40) mm wide, scabrid; ligule oblong-elliptic, 3–10 mm, obtuse or lacerate. Panicle loosely contracted, narrowly elliptic in outline, 5–20 × 2.5–8 cm; branches slender, ascending or spreading, 2–8 cm, scabrid, bare below middle. Spikelets 3.5–5 mm, yellowish green, purplish, or yellowish brown; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, ciliate along midvein, apex acute or acuminate; callus hairs equaling or slightly longer than lemma; lemma 3–4 mm, membranous, apex 2-denticulate; awn arising near or above middle of lemma, 1–4 mm, slender, straight; palea 1/2–2/3 as long as lemma; rachilla 0.5–1 mm, including hairs 2–4 mm. Anthers 2–2.5 mm. Fl. Jul–Sep.

Moist meadows, grassy slopes, woodlands; below 100–3600 m. Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang [Japan, Korea, Mongolia, Russia; Europe, North America].

Deyeuxia purpurea encompasses a widespread, apomictic complex of morphologically very variable and intergrading forms. These have been treated by different authors either as separate species, or at subspecific or varietal rank within *D. purpurea*. Most are based on types from outside China, and no attempt is made here to relate these names to variation in the complex within China.

The name *Calamagrostis angustifolia* refers to a particularly narrow-leaved form (blades 1.5–3.5 mm wide) from NE China.

21. *Deyeuxia sichuanensis* (J. L. Yang) S. M. Phillips & Wen L. Chen, *Novon* 13: 320. 2003.

四川野青茅 si chuan ye qing mao

Calamagrostis sichuanensis J. L. Yang, *Acta Bot. Yunnan.* 5: 47. 1983.

Perennial, rhizomatous; rhizomes slender. Culms up to 80 cm tall, 2–3 mm in diam., unbranched, 2–3-noded. Leaf sheaths smooth; leaf blades flat, 11–25 cm, 4–5 mm wide, adaxial surface smooth, abaxial surface scabrid; ligule 3–4 mm, truncate. Panicle open or lightly contracted, 11–22 × 1–6 cm; branches in whorls of 3–4, slender, flexuous, almost smooth, often bare below middle; pedicels scabrid. Spikelets 3.5–4 mm, yellowish green, tinged purple; glumes lanceolate, the upper slightly shorter than the lower, scabrid, apex acute; callus hairs about as long as lemma; lemma 2.5–2.8 mm, scabrid, apex 2-denticulate; awn arising from near middle of lemma, not exerted from spikelet, ca. 1.2 mm, straight; palea ca. 2/3 as long as lemma; rachilla ca. 0.8 mm, including hairs ca. 2.3 mm. Anthers ca. 1 mm.

• Woodland margins, among shrubs; 2800–4300 m. Gansu, Sichuan.

22. *Deyeuxia nepalensis* Bor, *Kew Bull.* [12] 1957: 411. 1958.

顶芒野青茅 ding mang ye qing mao

Calamagrostis staintonii G. Singh.

Perennial, loosely tufted, shortly rhizomatous. Culms 50–90 cm tall, 2–3 mm in diam., smooth, unbranched, 3–4-noded. Leaf sheaths smooth; leaf blades usually involute, ca. 25 cm, 2–5 mm wide, both surfaces glabrous, smooth or sometimes scabrid on margin; ligule 3–5(–7) mm, obtuse or subacute. Panicle open, 10–18 × ca. 12 cm; branches ascending or spreading, lowermost whorled, 4–8 cm, smooth, bare below middle. Spikelets 3.5–4.5 mm, greenish or yellowish green tipped with purple; glumes lanceolate, lower glume 1-veined, upper glume 3-veined, scabrid, apex acute or abruptly acuminate; callus hairs about as long as lemma; lemma 2.5–3 mm, scabrid, apex 4-toothed; awn arising from upper 1/5–1/4 of lemma, well exerted from spikelet, 3–6 mm, very slightly bent; palea ca. 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 2.5–3 mm. Anthers ca. 2 mm. Fl. Jul–Aug.

Dry slopes; 3100–3500 m. Sichuan, Yunnan [Nepal].

Calamagrostis staintonii is the correct name for this species in *Calamagrostis* because the heterotypic name *C. nepalensis* Nees ex Steudel already exists.

23. *Deyeuxia neglecta* (Ehrhart) Kunth, Révis. *Gramin.* 1: 76. 1829.

小花野青茅 xiao hua ye qing mao

Arundo neglecta Ehrhart, *Beitr. Naturk.* 6: 137. 1791; *Calamagrostis micrantha* Kearney; *C. neglecta* (Ehrhart) Gaertner; *Deyeuxia micrantha* (Kearney) L. Liu.

Perennial, tufted. Culms erect, 60–100 cm tall, 1–3 mm in diam., smooth or slightly scabrid below panicle, usually 2–3-noded. Leaf sheaths smooth, glabrous; leaf blades flat or involute, 10–30(–60) cm, 1–5 mm wide, adaxial surface scabrid with obvious veins, abaxial surface smooth; ligule 1.5–4 mm, obtuse or truncate, denticulate. Panicle dense, interrupted, lanceolate to narrowly ovate in outline, 5–20 × 2–4 cm, axis smooth or scabrid; branches short, fascicled, scabrid. Spikelets 3–4(–4.5) mm, pale green to purplish brown; glumes narrowly ovate, subequal, lower glume 1-veined, upper glume 3-veined, prominently scabrid throughout, apex acute; callus hairs 2/3–3/4 length of lemma; lemma 2.5–3.5 mm, apex obtuse, denticulate; awn arising near or below middle of lemma, poorly developed, 1–2 mm, straight; palea 2/3 as long as lemma; rachilla ca. 2 mm, including hairs up to 3.5 mm. Anthers ca. 2 mm. Fl. and fr. Aug–Sep. $2n = 42^*$.

Grassy places in forests, damp ground near ditches; 1200–4300 m. Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Shanxi, Sichuan, Xinjiang [Japan, Kyrgyzstan, Mongolia, Russia, Tajikistan; Europe, North America].

This is a widespread, highly polymorphic species, to which the name *Deyeuxia kashmeriana* Bor has been misapplied (by Liou, *Vasc. Pl. Hengduan Mts.* 2: 2241. 1994). *Deyeuxia kashmeriana* is a synonym of *Calamagrostis decora* J. D. Hooker from Kashmir, which has slightly larger spikelets and a longer, sub-basal awn.

24. *Deyeuxia lapponica* (Wahlenberg) Kunth, Révis. *Gramin.* 1: 76. 1829.

欧野青茅 ou ye qing mao

Arundo lapponica Wahlenberg, *Fl. Lapp.* 27. 1812; *Calamagrostis lapponica* (Wahlenberg) Hartman.

Perennial, loosely tufted, shortly rhizomatous. Culms erect from a geniculate base, 60–130 cm tall, 2–3 mm in diam., smooth, 3-noded. Leaf sheaths smooth; leaf blades flat or involute, 10–30 cm, 2–6 mm wide, adaxial surface loosely pubescent, abaxial surface scabrid; ligule 2–4(–6) mm, lacerate. Panicle loosely contracted, (5–)10–25 × 2–3(–8) cm; branches erect or ascending, 1–3(–4) cm, scabrid, lower 1/3 bare. Spikelets 4–6 mm, purplish brown or yellowish green; glumes ovate-lanceolate, subequal, 4–5 mm, lower glume 1-veined, upper glume 3-veined, scabrid on upper back and veins, apex acuminate; callus hairs 3/4–4/5 length of lemma; lemma 3–4(–5) mm, apex denticulate; awn arising from lower 1/3 of lemma, ca. 3 mm, weakly geniculate, slightly twisted; palea 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 3–4 mm. Anthers ca. 2 mm. Fl. Jul–Aug.

Grassy slopes, forests, among shrubs, especially along river banks; 400–4100 m. Gansu, Heilongjiang, Nei Mongol, Sichuan, Xinjiang, Xizang [Mongolia, Korea, Russia; Europe, North America].

25. *Deyeuxia anthoxanthoides* Munro ex J. D. Hooker in Henderson & Hume, *Lahore to Farkand*, 339–340, pl. opp. p. 340. 1873.

短毛野青茅 duan mao ye qing mao

Calamagrostis anthoxanthoides (Munro) Regel; *Stilpnophleum anthoxanthoides* (Munro) Nevski.

Perennial, subloosely tufted, shortly rhizomatous. Culms erect, 10–35 cm, 2–3-noded. Leaf sheaths smooth or slightly scabrid; leaf blades flat, 3–8(–15) cm, 2–5 mm wide, scabrid or almost smooth, apex acuminate; ligule 4–6 mm. Panicle very dense, spike-like, broadly oblong to ovate in outline, 2–6 × 1.2–2 cm, light brownish purple becoming golden; branches abbreviated, spikelets crowded close to main axis. Spikelets narrowly lanceolate, 5–7 mm, shining; glumes lanceolate, subequal, ca. 1/3 longer than lemma, membranous, smooth, 1-veined, apex finely acuminate; callus hairs 1/6–1/3 length of lemma; lemma 4–6 mm, ca. 2/3 length of glumes, hyaline, apex 4-denticulate; awn sub-basal, 6–9 mm, geniculate; palea as long as lemma; rachilla 1–1.5 mm, including hairs 2–2.5 mm. Anthers 2–2.5 mm. Fl. and fr. Jun–Jul.

Rocky hillsides, screes, moraines; 3100–4500 m. Xinjiang, Xizang [NE Afghanistan, Tajikistan, Uzbekistan].

The typical subspecies is described above. A second subspecies, *Calamagrostis anthoxanthoides* subsp. *laguroides* (Regel) Tzvelev (which name has never been transferred to *Deyeuxia*), occurs in Tajikistan. It is distinguished by a somewhat laxer, paler panicle and a lemma less than 2/3 as long as the glumes.

26. *Deyeuxia tibetica* Bor, Kew Bull. [4] 1949: 66. 1949.

藏野青茅 zang ye qing mao

Perennial, loosely tufted, rhizomatous; rhizomes elongate, slender. Culms erect or decumbent, (5–)10–20 cm tall, ca. 1 mm in diam., densely pubescent below panicle, 1–2-noded. Leaf sheaths scabrid, tight on tillers, inflated on culm; leaf blades involute, rarely flat, 0.5–8 cm, 1.5–2.5 mm wide, scabrid, apex obtuse; ligule 2–4 mm, hirtellous, lacerate. Panicle very dense, spike-like, broadly oblong to ovate in outline, 1–2.5 × 1–1.5 cm, axis densely pubescent; branches abbreviated. Spikelets 4.5–6 mm, purple or brownish purple; glumes lanceolate, subequal, thin, margins subhyaline, dorsally densely villous to scabrid-hirtellous or subglabrous, lower glume 1-veined, upper glume 3-veined, apex acute to apiculate; callus hairs ca. 3/4 length of lemma; lemma ca. 4 mm, apex 4-denticulate; awn sub-basal, 5–8 mm, geniculate with twisted column; palea subequal to lemma; rachilla 2–3 mm, including hairs 4–5 mm. Anthers 2–2.5 mm. Fl and fr. Jul–Aug.

Alpine meadows, grassy slopes, wet sandy or gravelly places in montane regions; 3000–5500 m. Qinghai, Xizang [India].

This species occurs at higher altitudes than any other species of *Deyeuxia* in China.

- 1a. Glumes densely villous 26a. var. *tibetica*
 1b. Glumes scabrid-hirtellous to subglabrous 26b. var. *przevalskyi*

26a. *Deyeuxia tibetica* var. *tibetica*

藏野青茅(原变种) zang ye qing mao (yuan bian zhong)

Calamagrostis tibetica (Bor) Tzvelev.

Glumes densely villous.

Alpine meadows, grassy slopes, wet sandy or gravelly places; 3000–5500 m. Qinghai, Xizang [India].

26b. *Deyeuxia tibetica* var. *przevalskyi* (Tzvelev) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 212. 1987.

矮野青茅 ai ye qing mao

Calamagrostis przevalskyi Tzvelev, Rast. Tsent. Azii 4: 85. 1968.

Glumes scabrid-hirtellous to subglabrous.

• Alpine meadows, wet sandy places; 3000–5000 m. Qinghai, Xizang.

27. *Deyeuxia tianschanica* (Ruprecht) Bor, Kew Bull. [4] 1949: 66. 1949.

天山野青茅 tian shan ye qing mao

Calamagrostis tianschanica Ruprecht, Sert. Tianschan. 34. 1869.

Perennial, loosely tufted, rhizomatous; rhizomes slender, spreading. Culms erect, 15–50 cm tall, 1–2 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths smooth or scabrid, slightly inflated; leaf blades flat with involute margins, 4–10 cm, 2–3 mm wide, adaxial surface scabrid with numerous short spinules, apex acute; ligule 3–4 mm, lacerate. Panicle contracted, spike-like, dense or branches distinct, 3–8 × 1–1.5 cm; branches 1–2 cm, scabrid. Spikelets 4–6 mm, purple; callus hairs 1/3–1/2 length of lemma; glumes narrowly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; lemma 3–4.5 mm, apex 4-denticulate; awn arising from lower 1/4 of lemma, 5–6 mm, geniculate with twisted column; palea slightly shorter than lemma; rachilla ca. 2 mm, including hairs up to 3.5 mm. Anthers 1.5–2 mm. Fl. Jul–Sep.

Stony mountain slopes and alpine meadows, especially along riversides; 1000–5200 m. Gansu, Qinghai, Xinjiang [Kyrgyzstan, Tajikistan (Pamirs)].

This species is close to the variable *Deyeuxia holciformis*, but the different upper leaf surface provides a definite distinguishing character.

28. *Deyeuxia holciformis* (Jaubert & Spach) Bor, Grasses Burma, Ceylon, India, Pakistan, 398. 1960.

青藏野青茅 qing zang ye qing mao

Calamagrostis holciformis Jaubert & Spach, Ill. Pl. Orient. 4: 61. 1851; *C. compacta* (Munro ex J. D. Hooker) Hackel ex Paulsen; *Deyeuxia compacta* Munro ex J. D. Hooker.

Perennial, loosely tufted, rhizomatous; rhizomes slender, spreading. Culms erect, 15–30 cm tall, 1–3 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths scabrid, culm sheaths loose, subinflated; leaf blades involute, rarely flat, stiff, glaucous, 2–5(–12) cm, 2–7 mm wide, adaxial surface scabrid with fairly long setiform spinules, apex acute; ligule 1–4 mm, lacerate. Panicle spike-like, oblong-ovate in outline, dense, sometimes lobed, 1.5–6(–10) × 1–1.5 cm; branches 1–2 cm, scabrid. Spikelets 5–9 mm, yellowish brown, purplish at base; glumes narrowly to broadly lanceolate, subequal, lower glume 1-

veined, upper glume 3-veined, scaberulous, apex acute to acuminate; callus hairs ca. 1/2 length of lemma; lemma 4–6 mm, scabrid, apex 4-denticulate; awn sub-basal, 5–7 mm, weakly geniculate, lower part slightly twisted; palea 2/3 as long to equaling lemma; rachilla 1.5–2.5 mm, including hairs 3–4.5 mm. Anthers 2–4 mm. Fl. and fr. Aug–Sep.

Grassy slopes and wet sandy places in montane regions; 3800–4500 m. Gansu, Qinghai (Yushu), Xizang [Kashmir, Kyrgyzstan (W Tien Shan), Tajikistan (Pamirs)].

Deyeuxia compacta, with a small panicle and unusually broad glumes, represents an extreme form of this variable species.

29. *Deyeuxia moupinensis* (Franchet) Pilger, Bot. Jahrb. Syst. 29: 225. 1901 [“1900”].

宝兴野青茅 *bao xing ye qing mao*

Calamagrostis moupinensis Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 2: 106. 1888.

Perennial, loosely tufted, shortly rhizomatous. Culms erect, 40–70 cm tall, 2–3 mm in diam., 3–4-noded. Leaf sheaths retrorsely pubescent or glabrous; leaf blades flat or involute, 10–25 cm, 2–6 mm wide, both surfaces scabrid; ligule ca. 0.5 mm, truncate. Panicle contracted or slightly loose, base usually included in terminal leaf sheath, 8–14 × 1.5–3 cm; branches in whorls of 2–5, very slender, densely spiculate, erect or narrowly ascending. Spikelets 3.5–4 mm, yellowish green or purplish; glumes narrowly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, apex acute; callus hairs as long as lemma; lemma ca. 3 mm, apex bidentate or 2-lobed to awn insertion; awn arising below apex or between lobes, 5–6 mm, slender, almost straight, much exceeding spikelet; palea 2/3 as long as lemma; rachilla ca. 0.5 mm, sparsely penicillate, 2.5–3.5 mm including hairs. Anthers ca. 1.2 mm. Fl. Aug–Sep. $2n = 28^*$.

• Grassy places in montane forests; 1300–2600 m. Sichuan.

30. *Deyeuxia debilis* (J. D. Hooker) Veldkamp, Gard. Bull. Singapore 37: 220. 1985 [“1984”].

细弱野青茅 *xi ruo ye qing mao*

Calamagrostis debilis J. D. Hooker, Fl. Brit. India 7: 262. 1896 [“1897”]; *Agrostis debilis* (J. D. Hooker) Bor (1960), not Poiret (1810); *A. neodebilis* Bennet & Raizada.

Perennial, rhizomatous; rhizome very slender. Culms loosely tufted, very slender, ascending, 15–45 cm, ca. 1 mm in diam., 2–3-noded, sparsely leafy. Leaf sheaths scaberulous near blade, otherwise smooth; leaf blades narrowly linear, thin, 2–5 cm, 1.5–2 mm wide, smooth, apex acute; ligule 1.5–2 mm, truncate-lacerate. Panicle narrow, loosely contracted, 2.5–12.5 × 1–2 cm; branches in whorls of 2–5, narrowly ascending to suberect, up to 3 cm, smooth; pedicels capillary. Spikelets 3–4 mm, light brownish purple to grayish; glumes subequal, lanceolate, 1-veined, smooth on keel, apex acuminate; callus hairs equal to or exceeding lemma; lemma 2.2–2.8 mm, hyaline, smooth, apex minutely toothed; awn arising from upper 1/4–1/3 of lemma back, weakly geniculate, 4.5–5 mm; palea slightly

shorter than lemma; rachilla extension absent. Anthers ca. 0.5 mm.

Alpine meadows; 3300–3400 m. Xizang [India (Sikkim)].

This is a very seldom collected species with a delicate habit and exceptionally small anthers. Its generic position is anomalous, as it lies on the boundaries with both *Agrostis* (small spikelets, no rachilla extension) and *Calamagrostis* (long callus hairs, hyaline lemma). It is retained here in *Deyeuxia* because of its relatively long floret in relation to the glumes and its general similarity to other slender montane species of *Deyeuxia*.

31. *Deyeuxia zangxiensis* P. C. Kuo & S. L. Lu, Fl. Xizang. 5: 228. 1987.

藏西野青茅 *zang xi ye qing mao*

Perennial, tufted, shortly rhizomatous. Culms erect, 15–30 cm tall, ca. 1.5 mm in diam., 2-noded. Leaf sheaths glabrous; leaf blades usually involute, stiff, 4–10 cm, 1–3 mm wide, both surfaces scabrid; ligule 5–7 mm, lanceolate, acute or lacerate. Panicle dense, spike-like, 5–8 × ca. 1 cm; branches fascicled, short, scabrid. Spikelets 6–7 mm, purple; glumes narrowly lanceolate, lower glume 6–7 mm, 1-veined, upper glume 5–6 mm, 3-veined, keel scabrid, apex acuminate; callus hairs equal to or slightly shorter than lemma; lemma 4–5 mm, awned, apex shortly toothed; awn arising from lower 1/3 of lemma back, 5–6 mm, slender, straight or slightly curved; palea 3/4 as long as lemma; rachilla ca. 0.5 mm, loosely penicillate, up to 4 mm including hairs. Anthers ca. 2 mm. Fl. Jul–Aug.

• Alpine meadows, especially along river banks; 3200–4600 m. Gansu, W Xizang.

32. *Deyeuxia conferta* Keng, Sunyatsenia 6: 68. 1941.

密穗野青茅 *mi sui ye qing mao*

Calamagrostis conferta (Keng) P. C. Kuo & S. L. Lu.

Perennial, loosely tufted. Culms erect, 60–120 cm tall, 2–3 mm in diam., 2–3-noded. Leaf sheaths smooth or scabrid at base; leaf blades involute or flat, 10–45 cm, 3–6 mm wide, both surfaces scabrid or abaxial surface smooth; ligule 4–6 mm, lacerate. Panicle dense, spike-like, rarely interrupted at base, 9–20 × 1–3 cm; branches 1–3 cm, scabrid. Spikelets 4–6(–7) mm, yellowish green or purplish; glumes narrowly lanceolate, subequal or upper glume slightly shorter than lower, lower glume 1-veined, upper glume 3-veined, scabrid along veins, apex acuminate; callus hairs equal to or slightly longer than lemma; lemma 3.5–4(–5) mm, apex 2-lobed or denticulate; awn sub-basal, 2.5–4 mm, straight; palea ca. 2/3 as long as lemma; rachilla ca. 0.5 mm, including hairs up to 3 mm. Anthers 1.5–2.2 mm. Fl. and fr. Jul–Sep.

• Light shade in woodlands, forming colonies, wet sandy places along rivers; 3000–3500 m. Gansu, Nei Mongol, Qinghai, Shaanxi.

Deyeuxia conferta var. *guoxuniana* N. X. Zhao & M. F. Li (Acta Bot. Yunnan. 16: 230. 1994), described from Xizang, does not agree well with this species, and is perhaps of hybrid origin. It has not been possible to see the type specimen.

33. *Deyeuxia kokonorica* (Keng ex Tzvelev) S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 216. 1987.

Calamagrostis kokonorica Keng ex Tzvelev, Rast. Tsentr. Azii 4: 84. 1968.

青海野青茅 qing hai ye qing mao

Perennial, loosely tufted. Culms erect, 10–40 cm tall, 1–1.5 mm in diam., usually 2–3-noded. Leaf sheaths scabrid; leaf blades flat or involute, 3–10(–12) cm, (0.5–)1.5–4 mm wide, adaxial surface and margins scabrid, abaxial surface smooth; ligule 1–3 mm, obtuse, denticulate. Panicle contracted, spike-like, narrowly oblong in outline, 2–6.5 × 0.6–1 cm; branches short, erect, scabrid. Spikelets 3–5 mm, purple, bronze at apex; glumes broadly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid or minutely hispid, apex acute; callus hairs laterally 2/3–4/5 length of lemma, much shorter at lemma back; lemma 2.5–3.5 mm, scabrid or minutely hispid above middle, apex denticulate; awn sub-basal, 2–3 mm, erect or slightly curved, lower part slightly twisted; palea slightly shorter than lemma, purple along keels; rachilla ca. 1.5 mm, including hairs 2.5–3.5 mm. Anthers ca. 2 mm. Fl. Aug–Sep.

• Alpine meadows, especially lakeside banks; 3000–4500 m. Gansu, Qinghai.

34. *Deyeuxia macilenta* (Grisebach) Keng ex S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 215. 1987.

瘦野青茅 shou ye qing mao

Calamagrostis varia P. Beauvois var. *macilenta* Grisebach in Ledebour, Fl. Ross. 4: 427. 1852; *C. macilenta* (Grisebach) Litvinov.

Perennial, shortly rhizomatous, mat-forming. Culms erect, 15–60 cm tall, ca. 1.5 mm in diam., usually 3-noded. Leaf sheaths smooth, usually purplish at base; leaf blades flat or involute, stiff, 5–15 cm, 2–4(–7) mm wide, adaxial surface very scabrid; ligule 1.5–3 mm, triangular or irregularly dentate. Panicle narrowly spike-like, dense, 6–9 × 0.8–1.5 cm; branches short, fascicled, scabrid. Spikelets 4–5 mm, usually yellowish green or pinkish; glumes lanceolate, subequal, scabrid, lower glume 1-veined, upper glume 3-veined, apex acute; callus hairs 1/2 length of lemma; lemma 3–4 mm, upper part scabrid, apex obtuse or denticulate; awn sub-basal, about as long as lemma, 2.5–3 mm, weakly geniculate; palea slightly shorter than lemma; rachilla 1.5–2.2 mm, including hairs 3.5–4 mm. Anthers 2–2.2 mm. Fl. summer.

Meadows, damp sand-pebble ground; 2700–3400 m. Nei Mongol, Qinghai, Xinjiang [Mongolia, E Russia].

88. CALAMAGROSTIS Adanson, Fam. Pl. 2: 31, 530. 1763.

拂子茅属 fu zi mao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials, often robust, sometimes rhizomatous. Leaf blades linear, usually flat; ligule membranous. Inflorescence a panicle, loosely contracted to dense and spike-like, often plumose, branches usually whorled, bearing numerous spikelets. Spikelets with 1 floret; rachilla disarticulating above glumes, extension beyond floret absent or small and glabrous, rarely better developed and penicillate; glumes persistent, subequal or unequal with lower longer, narrowly lanceolate, much exceeding floret, lower glume 1-veined, upper glume 3-veined at base, apex finely acuminate or subulate; floret callus conspicuously bearded, hairs much exceeding floret; lemma ca. 1/2 as long as glumes, hyaline, 3–5-veined, awned, apex erose, denticulate or deeply 2-lobed; awn very slender, straight or almost so, arising from lemma back, apex or between teeth; palea 1/2 as long to slightly shorter than lemma. Stamens usually 3, rarely 1.

About 20 species: N temperate and arctic regions; six species (one endemic) in China.

Calamagrostis intergrades with both *Agrostis* and *Deyeuxia*, and the number of species in the genus is very uncertain. As in *Deyeuxia*, the taxonomy is complicated by polymorphic species complexes arising from polyploidy, apomixis, and hybridization.

1a. Awn arising from lemma apex or between apical teeth.

2a. Lemma 5-veined, apex deeply 2-toothed; awn 5–9 mm, arising between teeth; stamen 1 1. *C. emodensis*

2b. Lemma 3-veined, apex entire or slightly toothed; awn 0.5–3 mm, arising from apex; stamens 3.

3a. Culms 40–150 cm; nodes (2–)3–6; panicle fairly lax, 10–30 cm 2. *C. pseudophragmites*

3b. Culms 20–70 cm; nodes 2–3; panicle dense, 4–13 cm 3. *C. hedinii*

1b. Awn arising from lemma back.

4a. Spikelets 7–11 mm; glumes unequal, upper 1–1.5 mm shorter than lower 4. *C. macrolepis*

4b. Spikelets 3–7 mm; glumes subequal, upper less than 1 mm shorter than lower.

5a. Culms 15–45 cm; spikelets 3–4 mm; awn 4.5–5 mm 30. *Deyeuxia debilis* (see p. 358)

5b. Culms 45–150 cm; spikelets 4–7 mm; awn 1.5–3 mm.

6a. Awn arising near middle of lemma back; lemma 3–3.5 mm; rachilla extension absent or glabrous if

present 5. *C. epigeios*

6b. Awn arising from upper 1/3 of lemma back; lemma 4–5 mm; rachilla extension present, penicillate 6. *C. kengii*

1. *Calamagrostis emodensis* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 80. 1868.

单蕊拂子茅 dan rui fu zi mao

Calamagrostis garwhalensis Hubbard & Bor.

Perennial, densely tufted, rhizomatous; rhizomes spreading. Culms erect, stout, 1–1.3 m tall, 3–4 mm in diam., smooth

or slightly scabrid below panicle. Leaf sheaths with auricle on one side; leaf blades broadly linear, flat, 25–45 cm, 5–20 mm wide, adaxial surface scabrid, abaxial surface smooth, apex finely acuminate; ligule 0.5–3 mm, truncate. Panicle loosely contracted, lanceolate in outline, 15–25 cm, nodding, plumose; branches in whorls, bare at base, slightly scabrid. Spikelets silvery-green or tinged pale purple, 5.5–8 mm; glumes linear-lanceolate, subequal or lower glume slightly longer, keel scabrid, apex subulate; callus hairs 2–3 times length of lemma; lemma ca. 1/2 as long as glumes, 2–2.7 mm, 5-veined, deeply 2-toothed by up to 1/3 its length; awn 5–9 mm, arising between teeth, straight, usually projecting beyond glumes; palea slightly shorter than lemma; rachilla extension absent or rudimentary, glabrous. Stamen 1, anther 0.7–1 mm. Fl. and fr. Aug–Sep.

Grassy slopes in montane regions; 1900–5000 m. Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, N Pakistan].

This is a well-defined species with relatively broad leaf blades, a pale, shining panicle, and a deeply toothed lemma. The floret contains a single plump anther.

2. *Calamagrostis pseudophragmites* (A. Haller) Koeler, Descr. Gram. 106. 1802.

假苇拂子茅 *jia wei fu zi mao*

Arundo pseudophragmites A. Haller, Arch. Bot. (Leipzig), 1(2): 11. 1797; *Calamagrostis nepalensis* Nees ex Steudel.

Perennial, tufted, rhizomatous; rhizomes spreading. Culms erect, 40–150 cm tall, 1.5–4 mm in diam., 2–6-noded, scabrid below panicle. Leaf sheaths smooth or scabrid; leaf blades flat or weakly inrolled, 10–30 cm, 2–5(–7) mm wide, adaxial surface and margins scabrid, abaxial surface smooth; ligule 4–10 mm, obtuse or lacerate. Panicle oblong-lanceolate, rather lax, 10–30 × 2–5 cm, primary branches distinct, nodding; branches in dense whorls, scabrid. Spikelets 5–9 mm, yellowish green or purple; glumes linear-lanceolate, unequal, upper glume 2/3–3/4 length of lower glume, keel scabrid, apex acuminate-subulate; callus hairs 2–3 times length of lemma; lemma about 1/2 as long as glumes, 3–4 mm, 3-veined, apex entire or 2-denticulate; awn arising just below lemma apex, 1–3 mm, scarcely projecting from glumes, straight; palea 1/2–2/3 as long as lemma. Stamens 3; anthers 1–2 mm; rachilla not extended. Fl. and fr. Jul–Sep.

Damp grassy slopes, near riversides; 300–2500 m. Gansu, Guizhou, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan and NE China [Bhutan, India (Darjeeling), Japan, Kazakhstan, Korea, Pakistan, Turkmenistan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia, Europe].

3. *Calamagrostis hedinii* Pilger in Hedin, S. Tibet, Bot. 6(3): 93. 1922.

短芒拂子茅 *duan mang fu zi mao*

Calamagrostis littorea (Schrader) P. Beauvois var. *tartarica* J. D. Hooker; *C. pseudophragmites* (A. Haller) Koeler subsp. *tartarica* (J. D. Hooker) Tzvelev; *C. pseudophragmites* var. *tartarica* (J. D. Hooker) R. R. Stewart; *C. tartarica* (J. D. Hooker) D. F. Cui, nom. illeg. superfl.

Perennial, densely tufted, rhizomatous. Culms erect, 20–70 cm tall, 1–3 mm in diam., 2–4-noded, smooth. Leaf sheaths smooth; leaf blades often involute, 5–10(–20) cm, 1–3 mm wide, adaxial surface and margin scabrid, abaxial surface smooth; ligule 3–5 mm, apex lacerate. Panicle dense, cylindrical, 4–13 cm, slightly lobed but primary branches congested; branches scabrid. Spikelets 4.5–6.5 mm, grayish brown or purplish; glumes narrowly lanceolate, unequal, upper glume 2/3–7/8 length of lower glume, keel scabrid, apex acuminate-subulate; callus hairs equaling or longer than lemma; lemma about 1/2 as long as glumes, 2–4 mm, apex slightly denticulate; awn arising from apex, 0.5–1(–2) mm, straight, not projecting from glumes; palea 1/2 as long as lemma; rachilla not extended. Stamens 3, anthers ca. 2 mm. Fl. Aug–Sep.

Damp sandy or stony places; 700–3000 m. Qinghai, Sichuan, Xinjiang, Xizang [NW India, Kashmir, Kyrgyzstan, Pakistan, Tajikistan].

This taxon represents a small form of *Calamagrostis pseudophragmites* with a congested, usually purple panicle. It is often recognized at infraspecific rank (*C. pseudophragmites* subsp. *tartarica*), but at the specific rank the epithet “*hedinii*” has priority.

4. *Calamagrostis macrolepis* Litvinov, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 125. 1921.

大拂子茅 *da fu zi mao*

Calamagrostis epigeios (Linnaeus) Roth subsp. *macrolepis* (Litvinov) Tzvelev; *C. macrolepis* var. *rigidula* T. F. Wang.

Perennial, densely tufted, rhizomatous; rhizomes spreading. Culms erect, 90–120 cm tall, 3–4 mm in diam., 4–5-noded, scabrid below panicle. Leaf sheaths smooth; leaf blades flat or margins involute, grayish green, 15–40 cm, 5–10 mm wide, scabrid; ligule 5–12 mm, apex tattered. Panicle fairly dense, lobed, 15–25 × 3–4.5 cm; branches erect, 1–3 cm, scabrid. Spikelets 7–11 mm, greenish, purplish or yellowish green; glumes lanceolate-subulate, unequal, lower glume 7–11 mm, upper glume 1–1.5 mm shorter, keel scabrid; callus hairs 1.5 times length of lemma; lemma 3–5 mm, 3-veined, smooth or scabrid, apex slightly 2-lobed; awn arising near middle of lemma back, 3–4 mm, straight or slightly curved; palea 2/3 as long as lemma. Rachilla extension usually absent. Stamens 3, anthers 2.5–3 mm. Fl. and fr. Jul–Sep.

Grassy slopes in montane regions, sandy places near rivers, on waste ground; 100–3200 m. Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shanxi, Xinjiang [SW Asia (Caucasus), Japan, Mongolia, Russia, Tajikistan].

This is an element from the *Calamagrostis epigeios* complex and is often included within that species.

5. *Calamagrostis epigeios* (Linnaeus) Roth, Tent. Fl. Germ. 1: 34. 1788.

拂子茅 *fu zi mao*

Perennial, tufted, rhizomatous; rhizomes spreading. Culms erect, 45–150 cm tall, 2–3 mm in diam., 4–7-noded, smooth or scabrid below panicle. Leaf sheaths smooth or scabrid; leaf blades flat or weakly inrolled, 15–30 cm, 4–8(–13) mm wide, adaxial surface and margins scabrid, abaxial surface smooth, apex finely acuminate; ligule 5–9 mm, oblong, lacerate. Panicle

densely contracted, linear to lanceolate in outline, spikelike or interrupted, erect, 10–30 × 1.5–4 cm; branches erect or ascending, scabrid. Spikelets (4–)5–7 mm, silvery green or tinged light purple; glumes equal or upper glume slightly shorter, linear-lanceolate, scaberrulous, keel scabrid, apex acuminate; callus hairs ca. 2 times length of lemma; lemma ca. 1/2 length of glumes, 3-veined, smooth, apex shortly 2-toothed; awn arising near middle of lemma back, (1.5–)2–3 mm, straight, scarcely projecting from glumes; palea ca. 2/3 length of lemma; rachilla extension absent or rarely present, glabrous. Stamens 3, anthers ca. 1.5 mm. Fl. and fr. May–Sep.

Damp places, especially riversides; 100–3900 m. Common in China [Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

This is a polymorphic, polyploid complex, in which some forms have been given separate infraspecific names. However, intermediates are common and such names are of very limited use.

This species provides forage and has soil-holding qualities.

- 1a. Spikelets 5–7 mm; lemmas 3–3.5 mm; awn 2–3 mm 5a. var. *epigeios*
 1b. Spikelets 4–4.5 mm; lemmas ca. 2.5 mm; awn ca. 1.5 mm 5b. var. *parviflora*

5a. *Calamagrostis epigeios* var. *epigeios*

拂子茅(原变种) fu zi mao (yuan bian zhong)

Arundo epigeios Linnaeus, Sp. Pl. 1: 81. 1753; *Calamagrostis epigeios* var. *densiflora* Grisebach; *Calamagrostis epigeios* var. *sylvatica* T. F. Wang.

Panicle dense, interrupted, 10–30 cm. Spikelets 5–7 mm; lemma 3–3.5 mm; awn 2–3 mm; rachilla extension absent or rudimentary.

Moist ground near ditches and along riversides; 100–3900 m. Common in China [Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

A small, glabrous rachilla process is occasionally present (the basis of var. *sylvatica*), but this is of no taxonomic significance.

5b. *Calamagrostis epigeios* var. *parviflora* Keng ex T. F. Wang, Acta Phytotax. Sin. 10: 309. 1965.

小花拂子茅 xiao hua fu zi mao

Plants dwarfish. Panicle spikelike, 6–9 cm. Spikelets 4–4.5 mm, lemma ca. 2.5 mm; awn ca. 1.5 mm.

Moist ground near ditches and along riversides. Heilongjiang, W Sichuan (alpine regions) [E Russia].

Calamagrostis extremiorientalis (Tzvelev) Probatova (*C. epigeios* subsp. *extremiorientalis* Tzvelev; *C. epigeios* var. *extremiorientalis* (Tzvelev) Kitagawa), from the Russian Far East and NE China, has similar dimensions to this variety, but the awn arises further up the lemma back. It has not been possible to see any authentic material.

6. *Calamagrostis kengii* T. F. Wang, Acta Phytotax. Sin. 10: 312. 1965.

东北拂子茅 dong bei fu zi mao

Perennial, densely tufted. Culms 90–135 cm tall. Leaf sheaths glabrous; leaf blades linear, involute when dry, 25–35 cm, ca. 5 mm wide, adaxial surface very scabrid, abaxial surface smooth, margin scabrid; ligule 3–4(–7) mm, truncate or lacerate. Panicle lanceolate in outline, often lobed in lower half, 12–17(–22) × 1.2–1.5 cm. Spikelets 6–7 mm; glumes lanceolate-subulate, subequal, scabrid along keel, apex long acuminate; callus hairs 5.5–6.8 mm; lemma 4–5 mm, 3-veined, apex 2-toothed; awn arising from upper 1/3 of lemma back, 2.5–3 mm, straight; palea 3/4 as long as lemma; rachilla 0.5–0.8 mm, upper part or apex penicillate with a few or many long silky hairs. Fl. and fr. Jul–Aug.

• Forests, forest margins, moist places, waste ground. Heilongjiang, Jilin.

89. POLYPOGON Desfontaines, Fl. Atlant. 1: 66. 1798.

棒头草属 bang tou cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Panicle contracted to dense and spikelike, often bristly with numerous small deciduous spikelets. Spikelets with 1 floret, laterally compressed, without rachilla extension, falling entire, pedicel or upper part of it articulated and remaining attached to spikelet as a stipe; glumes equal, longer than floret, papery, scabrid, 1-veined, apex entire to 2-lobed, often with slender awn from apex; lemma about 1/2 as long as glumes, rounded, thin, smooth, shiny, obscurely 5-veined, veins usually shortly excurrent from truncate apex, awnless or with fine subapical awnlet or geniculate dorsal awn; palea 1/2 as long to equaling lemma. Stamens 1–3.

Twenty-five species: warm-temperate regions of the world and on tropical mountains, especially in damp places; six species (one endemic) in China.

Polypogon is closely related to *Agrostis*, with which it hybridizes. It is distinguished mainly by its deciduous spikelets falling with a slender, basal stipe attached.

- 1a. Glumes awnless.
 2a. Spikelets 1.5–2.5 mm; palea almost as long as lemma; anthers 0.5–0.7 mm 1. *P. viridis*
 2b. Spikelets 3–4 mm; palea 2/3 lemma length; anthers 1–1.5 mm 2. *P. hissaricus*
 1b. Glumes awned.
 3a. Awn of glumes shorter than or up to 1.5 times as long as glume body.

- 4a. Panicle very dense; spikelet stalks short, the longest articulated much above their base; palea almost as long as lemma 3. *P. fugax*
 4b. Panicle lax; spikelet stalks long, all articulated only at their base; palea 2/3 lemma length 4. *P. ivanovae*
 3b. Awn of glumes 2.5–4 times as long as glume body.
 5a. Glumes emarginate; lemma with 1.5–2 mm awn 5. *P. monspeliensis*
 5b. Glumes deeply 2-lobed; lemma awnless 6. *P. maritimus*

1. *Polypogon viridis* (Gouan) Breistroffer, Bull. Soc. Bot. France 110(89 Sess. Extraord.): 56. 1966.

苔绿棒头草 *tai lü bang tou cao*

Agrostis viridis Gouan, Hortus Regius Monspeliensis: 546. 1762; *Agrostis semiverticillata* (Forsskål) C. Christensen; *Phalaris verticillata* Forsskål; *Polypogon semiverticillatus* (Forsskål) Hylander.

Perennial, stoloniferous; stolons slender, spreading, rooting at nodes. Culms geniculately ascending, 20–100 cm tall. Leaf blades linear, flat, 3–12 cm, 2–8 mm wide, scaberulous on both surfaces, apex acute; ligule 2–5 mm. Panicle contracted, lanceolate to oblong, lobed and often interrupted, 5–15 cm; branches semiverticillate, ascending, bearing densely clustered spikelets. Spikelets narrowly oblong, 1.5–2.5 mm; glumes narrowly elliptic-oblong, scabrid, lightly keeled upward, apex obtuse, awnless; lemma broadly elliptic, ca. 1 mm, awnless, apex truncate, minutely denticulate; palea almost as long as lemma. Stamens 3, anthers 0.4–0.7 mm. Caryopsis oblong, ca. 1 mm.

Aquatic grass rooting in sand and mud of streams, marshy grasslands; ca. 2600 m. Yunnan [Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, S Europe, NW India; introduced in S Africa, America, Australia].

2. *Polypogon hissaricus* (Roshevitz) Bor in K. H. Rechinger, Fl. Iran. 70: 307. 1970.

糙毛棒头草 *cao mao bang tou cao*

Agrostis hissarica Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 93. 1923; *A. hissarica* subsp. *pamirica* (Ovczinnikov) Tzvelev; *A. pamirica* Ovczinnikov; *A. stewartii* Bor; *A. tianschanica* Pavlov.

Perennial. Culms erect or procumbent and rooting from lower nodes, 60–110 cm tall. Leaf blades linear, flat, 7–25 cm, 3–7.5 mm wide, scabrid on both surfaces, apex acute; ligule 3–6 mm. Panicle lanceolate to narrowly lanceolate, lobed, rather dense or sometimes loose, 10–20 cm; branches subverticillate, densely spinulose. Spikelets lanceolate, 3–4 mm; glumes oblong, scabrid or shortly bristly, apex acute, awnless; lemma 2–2.5 mm, apex obtuse or with deciduous awnlet up to 1.5 mm; palea 2/3 as long as lemma. Stamens 3, anthers 1–1.5 mm.

Wet meadows in river valleys; 2000–3000 m. Xinjiang [Afghanistan, SE Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan; SW Asia (NE Iran)].

3. *Polypogon fugax* Nees ex Steudel, Syn. Pl. Glumac. 1: 184. 1854.

棒头草 *bang tou cao*

Nowodworskya fugax (Nees ex Steudel) Nevski; *Polypogon demissus* Steudel; *P. higegaweri* Steudel; *P. littoralis* var. *higegaweri* (Steudel) J. D. Hooker.

Annual, tufted. Culms geniculate, sometimes trailing and rooting at lower nodes, 10–75 cm tall. Leaf blades linear or broadly linear, 2.5–15 cm, 3–10 mm wide, scabrid or adaxial surface smooth, apex acute; ligule 3–8 mm. Panicle densely cylindrical, slightly lobed, or looser and narrowly ovate, 4–15 cm, pale green or flushed purple; branches narrowly ascending, up to 4 cm, bearing densely clustered spikelets. Spikelets narrowly oblong, 2–2.5 mm; glumes narrowly oblong, puberulous, vein scabrid-aculeate, margins shortly ciliate in lower half, apex emarginate, awned from sinus; awn shorter than or up to 1.5 times as long as glume body; lemma elliptic, 1–1.2 mm, apex slightly 4-toothed, midvein extended into a fine, straight, ca. 2 mm awn; palea as long as lemma. Stamens 3, anthers ca. 0.7 mm. Caryopsis elliptic, ca. 1 mm. Fl. and fr. Apr–Sep.

Moist places, near farmlands; 100–3600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Jiangsu, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, N India, Japan, Kazakhstan, Korea, Kyrgyzstan, Myanmar, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia; introduced elsewhere].

The names *Polypogon littoralis* Smith and *P. lutosus* (Poiret) Hitchcock have both been misapplied to this species. They are in fact synonyms of *Agropogon lutosus*.

4. *Polypogon ivanovae* Tzvelev, Rast. Tsentr. Azii 4: 72. 1968.

伊凡棒头草 *yi fan bang tou cao*

Perennial, forming small loose tufts. Culms geniculately ascending, 8–20 cm, scaberulous below panicle. Leaf blades linear, flat or folded, 3–20 cm × 0.8–2.5 mm wide, scabrid on both surfaces; ligule 2–4.5 mm. Panicle narrow, fairly lax, 2.5–7 cm; tinged pinkish violet; branches short, scabrid. Spikelets 2.2–2.8 mm; glumes oblong, scabrid, apex obtuse, awned, awn straight, 0.5–2 mm; lemma ovate, 1.4–1.8 mm, apex aristulate-denticulate, midvein extended into a straight or curved 2.3–3.5 mm awn; palea 2/3 lemma length. Stamens 3, anthers 0.5–0.8 mm. Fl. Jun.

• Wet valley arable land, flooded meadows; 1300–1700 m. Xinjiang (Kunlun Shan).

5. *Polypogon monspeliensis* (Linnaeus) Desfontaines, Fl. Atlant. 1: 67. 1798.

长芒棒头草 *chang mang bang tou cao*

Alopecurus monspeliensis Linnaeus, Sp. Pl. 1: 61. 1753.

Annual, tufted. Culms erect or geniculate, up to 60 cm tall. Leaf blades narrowly to broadly linear, 2–13 cm, 2–9 mm wide, adaxial surface and margins scabrid, abaxial surface smooth, apex acute; ligule 2–8 mm. Panicle narrowly oblong in outline, dense, spikelike, sometimes slightly lobed, 1–10 cm, pale green,

thickly clothed in yellow bristles. Spikelets narrowly oblong, 1.5–2.5 mm; glumes narrowly obovate-oblong, puberulous, vein scabrid-aculeate, margins ciliate, apex emarginate, apex of lobes slightly acute, awned from sinus; awn 2.5–4 times as long as glume body; lemma obovate, 1–1.2 mm, apex slightly 4-toothed, midvein extended into a fine, straight, readily deciduous, 1.5–2 mm awn; palea as long as lemma. Stamens 3, anthers ca. 0.8 mm. Caryopsis obovate-oblong, ca. 1 mm. Fl. and fr. May–Oct.

Moist places, streamsides; below 3000 m. Anhui, Fujian, Gansu, Guangdong, Hebei, Henan, Jiangsu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N and S Africa, SW Asia (Caucasus), Europe].

This is a widely introduced weed naturalized in most warm-temperate regions.

6. *Polypogon maritimus* Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 3: 442. 1801.

裂颖棒头草 lie ying bang tou cao

Annual, tufted. Culms erect or geniculate, up to 35 cm tall. Leaf sheaths scabrid, uppermost slightly inflated; ligule 1–6 mm, apex irregularly toothed; leaf blades linear, 5–10 cm, 1–5 mm wide, both surfaces scabrid, apex acuminate. Panicle dense, spike-like, sometimes lobed, 5–7 cm, often purple tinged. Spikelets 2–3 mm, yellowish green; glumes obovate-oblong, hispid, margins ciliate, apex deeply 2-lobed, lobes obtuse, awned from sinus; awn 6–7 mm; lemma 1–1.2 mm, awnless; palea as long as lemma. Stamens 3, anthers 0.3–0.4 mm. Caryopsis obovate-oblong, 0.7–0.9 mm. Fl. and fr. Jun–Aug.

Moist grassland on mountain slopes, marshy meadows; 400–3300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in North America].

90. *CINNA* Linnaeus, Sp. Pl. 1: 5. 1753.

单蕊草属 dan rui cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials. Leaf blades flat; ligule membranous. Inflorescence an open panicle. Spikelets laterally compressed, floret 1, rachilla extension usually present, varying from minute stub to slender bristle, disarticulating below glumes; glumes equal or lower somewhat shorter, lanceolate, membranous with broad hyaline margins, 1–3-veined, apex acute; lemma herbaceous with hyaline margins, equal to or slightly shorter than glumes, keeled, 3–5-veined, awnless or with mucro or short straight awn arising below apex, apex subacute; palea as long as or slightly shorter than lemma, 1-keeled, 1-veined or 2-veined with veins very close together, keel scabrid. Stamens 1(or 2). Ovary oblong, styles united at base. Endosperm liquid.

Four species: temperate regions of the N hemisphere, Mexico to Peru; one species in China.

1. *Cinna latifolia* (Treviranus ex Göppert) Grisebach in Ledebour, Fl. Ross. 4: 435. 1852 [“1853”].

单蕊草 dan rui cao

Agrostis latifolia Treviranus ex Göppert, Beschr. Bot. Gaert. Breslau 82. 1830.

Culms solitary or loosely tufted, 0.6–1.6 m tall, 2–3 mm in diam., smooth or scabrid below nodes, 7–9-noded. Leaf sheaths scabrid; leaf blades broadly linear, 15–30 cm, 10–15 mm wide, both surfaces and margin scabrid; ligule 3–6 mm. Panicle droop-

ing, 15–40 cm; branches slender, 3–6 per node, up to 10 cm, ascending or spreading with spikelets in clusters along branchlets, scabrid. Spikelets 2.5–4 mm, green; glumes subequal, narrowly lanceolate, lower glume 1-veined, upper glume 1–3-veined; floret raised on 0.1–0.5 mm stipe; lemma oblong-lanceolate, 2.5–3.8 mm, 3(–5)-veined, scabrid; awnlet 0.2–1(–2) mm. Anthers 0.6–0.8 mm. Caryopsis ca. 2 mm. Fl. and fr. Jul–Sep. $2n = 28$.

Damp places in woodlands, thickets, along riversides. Heilongjiang, Jilin [Japan, Korea, Mongolia, Russia; N Europe, North America].

91. *CYATHOPUS* Stapf, Hooker's Icon. Pl. 24: t. 2395. 1895.

杯禾属 bei he shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennial, tufted, scabrid throughout. Culms ascending, moderately stout, unbranched. Leaf blades linear, flat; ligule membranous. Inflorescence an open panicle; branches whorled, distant, bare in lower part; pedicels densely scabrid, apices pale, shallowly cuplike. Spikelets laterally compressed, floret 1, rachilla extension absent or almost so, disarticulating below glumes; glumes equal, lanceolate, papery, prominently 3-veined, apex cuspidate; lemma membranous, slightly shorter than glumes, weakly keeled, 5-veined, apex subacute, awnless; palea as long as lemma, 2-keeled. Stamens 3.

One species: Bhutan, China, India (Sikkim).

1. *Cyathopus sikkimensis* Stapf, Hooker's Icon. Pl. 24: t. 2395. 1895.

锡金杯禾 xi jin bei he

Culms ca. 80 cm tall, 3–4 mm in diam., scabrid, 4–5-noded, nodes dark. Leaf sheaths subequaling internodes, pappery, scaberulous; leaf blades 20–35 cm, 7–7.5 mm wide, scabrid, apex acute; ligule 6–9 mm, lacerate. Panicle 23–27 cm;

branches 3–5 per node, up to 10 cm, laxly ascending, densely scabrid. Spikelets lanceolate, 2–3 mm, green; glumes as long as spikelet, scabrid on back and veins, apices exceeding floret; lemma lanceolate, 1.7–2.5 mm, pallid, scaberulous near apex, glabrous below. Anthers ca. 0.9 mm. Fl. Sep.

Conifer forests (*Abies-Tsuga*) and bamboo thickets (*Fargesia*) on steep slopes; 2900–3200 m. W Yunnan [Bhutan, India (Sikkim)].

This apparently rare grass is known from only a few gatherings.

92. *BECKMANNIA* Host, Icon. Descr. Gram. Austriac. 3: 5. 1805.

蔺草属 wang cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Inflorescence composed of many unilateral racemes along a central axis; racemes dense, the lower often branched; spikelets subsessile, closely imbricate, biseriate. Spikelets orbicular, disarticulating below glumes, bisexual floret 1, with or without a second staminate floret above it; rachilla extension absent; glumes equal, gibbously inflated, enclosing all but apex of floret, not or weakly keeled, herbaceous with thinner white margins, 3-veined, apex obtuse or acute; floret callus short, glabrous; lemma lanceolate, cartilaginous, rounded on back, 5-veined, apex acute or tapering to a cusplike awn-point; palea somewhat shorter than lemma. Caryopsis terete.

Two species: temperate regions of the N hemisphere; one species in China.

The second species in the genus, *Beckmannia eruciformis* (Linnaeus) Host, occurs from Europe and the Mediterranean region to C Asia and E Russia. It is a perennial with short, creeping rhizomes, sometimes with tuberous basal internodes, spikelets usually with 2 florets, globose, inflated glumes, and longer anthers 1.2–1.8 mm.

1. *Beckmannia syzigachne* (Steudel) Fernald, Rhodora 30: 27. 1928.

蔺草 wang cao

Annual. Culms tufted, erect, soft, 15–90 cm tall, 2–4-noded. Leaf sheaths glabrous, usually longer than internodes; leaf blades 5–20 cm, 3–10 mm wide, grayish green, scabrid or abaxial surface smooth, apex acute; ligule 3–8 mm. Inflorescence 10–30 cm; racemes erect or narrowly ascending, 1–4 cm. Spikelets orbicular-cuneate in outline, flattened, 2.5–3 mm, gray-green, floret 1(–2); glumes glabrous or hispid, slightly inflated, laterally compressed, veins prominent, linked by oblique transverse veinlets; lemma scaberulous, apex cuspidate-aristate. Anthers 0.4–1 mm. Caryopsis oblong, ca. 1.5 mm, with a tuft of hairs at apex. Fl. and fr. Apr–Oct. $2n = 14$.

Riversides, swampy meadows, damp places; below 3700 m. Anhui, Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia; Europe, North America].

- 1a. Glumes glabrous, or almost so; anthers usually 0.6–1 mm 1a. var. *syzigachne*
- 1b. Glumes densely hispid throughout; anthers usually 0.4–0.6 mm 1b. var. *hirsutiflora*

1a. *Beckmannia syzigachne* var. *syzigachne*

蔺草(原变种) wang cao (yuan bian zhong)

Panicum syzigachne Steudel, Flora 29: 19. 1846; *Beckmannia baicalensis* (I. V. Kusnezow) Hultén; *B. eruciformis* subsp. *baicalensis* (I. V. Kusnezow) Koyama & Kawano; *B. eruciformis* var. *baicalensis* I. V. Kusnezow.

Glumes glabrous or with a few short stiff hairs at base; anthers usually 0.6–1 mm.

Riversides, swampy meadows, damp places; below 3700 m. Gansu, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia; Europe, North America].

1b. *Beckmannia syzigachne* var. *hirsutiflora* Roshevitz in Komarov, Fl. URSS 2: 291. 1934.

毛颖蔺草 mao ying wang cao

Beckmannia hirsutiflora (Roshevitz) Probatova; *B. syzigachne* subsp. *hirsutiflora* (Roshevitz) Tzvelev.

Glumes hispid; anthers usually 0.4–0.6 mm.

Streamsides, moist meadows; below 3000 m. NE China [E Russia].

93. *ALOPECURUS* Linnaeus, Sp. Pl. 1: 60. 1753.

看麦娘属 kan mai niang shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Inflorescence a spike-like panicle, densely cylindrical, spikelets

numerous, closely packed; pedicels very short, apices cuplike. Spikelets protogynous, strongly laterally compressed, floret 1, falling entire from pedicel; rachilla extension absent; glumes equal, \pm equaling and enclosing floret, broadly lanceolate to oblong, membranous to thinly leathery, prominently 3-veined, strongly keeled, keel usually ciliate, infrequently winged, lower margins almost free or connate for up to half their length, apex obtuse, acute or shortly awned; lemma broadly lanceolate to ovate, usually thinly membranous, keeled, obscurely 5-veined, smooth, glabrous, lower margins often connate, awned from lower back, apex truncate to acute; awn straight when short or geniculate when longer, column smooth, usually twisted at maturity, bristle scabrid; palea absent or very small. Lodicles absent; ovary glabrous. Caryopsis obliquely obovate in side view; endosperm sometimes liquid.

Between 40 and 50 species: temperate and cold regions of the N hemisphere, South America; eight species in China.

1a. Perennial; short or long creeping rhizomes present.

2a. Panicle 1.5–4 cm, ovoid or shortly and broadly cylindrical; glumes densely and conspicuously hairy with 1.5–3 mm hairs.

3a. Glume apex sharply acuminate to awnlike; lemma shorter than glumes 1. *A. himalaicus*

3b. Glume apex subacute; lemma subequal to glumes 2. *A. brachystachyus*

2b. Panicle (3–)4–8 cm, cylindrical; glumes ciliate on keel, otherwise glabrous or shortly hairy on lateral veins.

4a. Glume apices divergent; awn usually included, arising near middle of lemma 3. *A. arundinaceus*

4b. Glume apices straight or slightly converging; awn long exserted, arising from lower 1/4 of lemma 4. *A. pratensis*

1b. Annual; rhizomes absent.

5a. Spikelets 2–3 mm; anthers bright orange, 0.5–0.8 mm.

6a. Awn 1.5–3.5 mm, included within spikelet or exserted up to 1.2 mm 5. *A. aequalis*

6b. Awn 6–10 mm, exserted 3 mm or more from spikelet 6. *A. longearistatus*

5b. Spikelets 4–6 mm; anthers pale yellow or white, 1–4 mm.

7a. Glumes winged on keel; glume margins connate in lower 1/3–1/2; anthers 2.5–4 mm 7. *A. myosuroides*

7b. Glumes not winged on keel, ciliate; glume margins almost free; anthers ca. 1 mm 8. *A. japonicus*

1. *Alopecurus himalaicus* J. D. Hooker, Fl. Brit. India 7: 238. 1896 [“1897”].

喜马拉雅看麦娘 xi ma la ya kan mai niang

Perennial, loosely tufted or culms solitary, rhizomatous. Culms erect, 15–50 cm tall, 3-noded. Leaf sheaths smooth, upper sheaths inflated; leaf blades 5–12 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 2–3 mm. Panicle ovoid to shortly and broadly cylindrical, densely hairy, 1.5–3 cm, gray-green or tinged light purple. Spikelets narrowly ovate-oblong, slightly urn-shaped, 4–6 mm; glumes submembranous, densely villous on keel, lateral veins and near margins, hairs soft, spreading, 2–3 mm, margins connate at base, apices sharply acuminate to mucronate, slightly divergent; lemma shorter than glumes, margins connate in lower 1/3–1/2, upper margins shortly pubescent, awned from lower 1/5–1/4, apex broadly acute; awn exserted 4–8 mm from spikelet, geniculate. Anthers yellow, 2–3 mm. Fl. Jun. $2n = 56$.

Damp alpine grasslands, wet places on rocky slopes; 3000–4100 m. SW Xinjiang (Taxkorgan) [NE Afghanistan, Kashmir, Kyrgyzstan, N Pakistan, Tajikistan].

2. *Alopecurus brachystachyus* M. Bieberstein, Fl. Taur.-Caucas. Suppl. 3: 56. 1819.

短穗看麦娘 duan sui kan mai niang

Perennial, with long slender rhizomes. Culms solitary, erect, 15–80 cm tall, 3–5-noded. Leaf sheaths smooth, uppermost sheath inflated; leaf blades gray-green, 3–15 cm, 2–6 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 1–4 mm. Panicle shortly and broadly cylindrical to ovoid, 1.5–4 cm, yellow-green tinged violet. Spikelets ovate-elliptic, 3.5–5 mm; glumes thinly herbaceous, keels ciliate with 1.5–2 mm silky hairs, lateral veins and flanks silky pilose, margins connate near base, apices subacute, straight or indistinctly diver-

gent; lemma subequaling or slightly shorter than glumes, margins connate in lower 2/5, awned from lower 1/4–1/3, apex puberulous, obliquely truncate; awn exserted 4–8 mm from spikelet, geniculate. Anthers yellow, 2–2.5 mm. Fl. and fr. Jun–Sep.

Damp montane grasslands, alpine meadows, other wet places; below 3800 m. Hebei, Heilongjiang, Nei Mongol, Qinghai [Mongolia, Russia (Far East, Siberia)].

3. *Alopecurus arundinaceus* Poir., Encycl. 8: 776. 1808.

苇状看麦娘 wei zhuang kan mai niang

Perennial, loosely tufted, with long, slender rhizomes. Culms sometimes solitary, erect, up to 100 cm tall, 3–5-noded. Leaf sheaths loose, smooth, upper sheaths slightly inflated; leaf blades gray-green, 5–20 cm, 3–8 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 2–5 mm. Panicle broadly cylindrical, 4–8 cm, gray-green, blackish at maturity. Spikelets narrowly oblong, slightly urn-shaped, 4–6 mm; glumes herbaceous, upper part scabrid, keels densely pilose, glabrous or thinly pilose near margins or more generally on flanks, margins connate in lower 1/5, apices acute, slightly divergent (keel shallowly concave below apex); lemma slightly shorter than glumes, margins connate in lower 1/3–1/2, awned from slightly below middle, apex puberulous, obliquely truncate; awn usually included in spikelet, sometimes exserted up to 2.5 mm, usually straight, weakly geniculate with twisted column when longer. Anthers yellow, 2–3 mm. Fl. and fr. Jul–Sep. $2n = 28$.

Damp grasslands; 600–3300 m. Gansu, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, N Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in North America].

4. *Alopecurus pratensis* Linnaeus, Sp. Pl. 1: 60. 1753.

大看麦娘 da kan mai niang

Alopecurus alpinus Smith var. *songaricus* Schrenk ex Fischer & Meyen; *A. songaricus* (Schrenk ex Fischer & Meyen) V. Petrov.

Perennial, loosely tufted, shortly rhizomatous. Culms erect, slightly geniculate at base, up to 100 cm tall, 3–5-noded. Leaf sheaths loose, smooth, slightly inflated; leaf blades 5–25 cm, 3–10 mm wide, abaxial surface smooth, adaxial surface scaberulous; ligule 2–4 mm. Panicle cylindrical, 3–8 cm, gray-green. Spikelets elliptic, 4–6 mm; glumes herbaceous, smooth, keels stiffly ciliate, lateral veins shortly pilose, margins connate in lower 1/3, apices acute, slightly convergent; lemma equaling or slightly shorter than glumes, margins connate below middle, awned from lower 1/4, apex puberulous, subacute; awn exerted 3–6 mm from spikelet, weakly geniculate, column not twisted. Anthers yellow, 2–3.5 mm. Fl. and fr. Apr–Aug. $2n = 28$.

Montane meadows, forest margins, river valleys; 1500–2500 m. Heilongjiang, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; introduced elsewhere].

This species has been introduced to Japan, North America, and some other temperate countries as a pasture and forage grass.

5. *Alopecurus aequalis* Sobolewski, Fl. Petrop. 16. 1799.

看麦娘 kan mai niang

Alopecurus aequalis subsp. *amurensis* (Komarov) Hultén; *A. aequalis* var. *amurensis* (Komarov) Ohwi; *A. aequalis* subsp. *aristulatus* (Michaux) Tzvelev; *A. aequalis* var. *aristulatus* (Michaux) Tzvelev; *A. amurensis* Komarov; *A. aristulatus* Michaux; *A. geniculatus* var. *aequalis* (Sobolewski) Paunero.

Annual, loosely tufted. Culms weak, geniculately ascending, occasionally rooting and branching from lower nodes, 15–40 cm tall. Leaf sheaths smooth, glabrous, slightly inflated; leaf blades light green, soft, 3–10 cm, 2–6 mm wide, abaxial surface smooth, glabrous, adaxial surface closely ribbed, scaberulous; ligule 2–5 mm. Panicle narrowly cylindrical, 2–7 cm, pale gray-green. Spikelets elliptic or oblong, 2–3 mm; glumes membranous, smooth, keels ciliate-hispid, lateral veins hispid on lower part, margins connate at base, apices obtuse; lemma equaling or slightly longer than glumes, margins connate below middle, awned from lower 1/4–1/3, apex obtuse; awn included within spikelet or exerted up to 1.2 mm, straight. Anthers orange, 0.5–0.8 mm. Fl. and fr. Apr–Aug. $2n = 14$.

Irrigation ditches, rice fields, damp grasslands, other wet weedy places; below 3500 m. Anhui, Fujian, Guangdong, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe, North America].

This is a widespread, semi-aquatic weed of N temperate regions of the world, now introduced to Australia and elsewhere.

East Asian forms tend to have more obvious awns than usual, perhaps due to introgression from *Alopecurus longearistatus*. *Alopecurus amurensis* and *A. aristulatus* are both based on such forms. A form from South America with glabrous glumes has been separated as *A.*

hitchcockii Parodi. A specimen of this species has been found on waste ground in Chengdu, Sichuan.

6. *Alopecurus longearistatus* Maximowicz, Prim. Fl. Amur. 327. 1859.

长芒看麦娘 chang mang kan mai niang

Alopecurus mandshuricus Litvinov.

Annual, loosely tufted. Culms geniculately ascending, 15–30 cm tall. Leaf sheaths lax, smooth, glabrous, upper sheaths sometimes inflated; leaf blades soft, 3–9 cm, 1–3.5 mm wide, abaxial surface smooth, glabrous, adaxial surface closely ribbed, scaberulous; ligule 2–4 mm. Panicle narrowly cylindrical, 4–7 cm, pale green, appearing villous from long slender awns, base often included in uppermost leaf sheath. Spikelets narrowly oblong, 2.5–3 mm; glumes membranous, smooth, keels and lateral veins ciliate, margins connate at base, apices obtuse; lemma equaling or slightly longer than glumes, margins connate below middle, awned from lower 1/4–1/3, apex obtuse; awn exerted 3 mm or more from spikelet, straight. Anthers orange, 0.4–0.8 mm. Fl. and fr. May–Jun. $2n = 14$.

Damp sandy or muddy river banks and lake shores. Heilongjiang [Russia (Far East)].

7. *Alopecurus myosuroides* Hudson, Fl. Angl. 1: 23. 1762.

大穗看麦娘 da sui kan mai niang

Alopecurus agrestis Linnaeus.

Annual, tufted. Culms erect or geniculately ascending, up to 80 cm tall. Leaf sheaths smooth, glabrous, upper sheaths slightly inflated; leaf blades 3–16 cm, 2–9 mm wide, glabrous, abaxial surface smooth or scabrid, adaxial surface scabrid; ligule 2–5 mm. Panicle narrowly cylindrical, up to 10 cm, tapering toward apex, yellow-green, pale green, or purplish. Spikelets narrowly oblong, 4.5–7.5 mm; glumes leathery, punctate-scabrid, keels narrowly winged, wings shortly pilose below, scabrid above, lateral veins very shortly pilose near base, margins connate in lower 1/3–1/2, apices acute; lemma slightly longer than glumes, margins connate in lower 1/3–1/2, awned from near base, apex acute; awn exerted 4–8 mm from spikelet, geniculate. Anthers pale yellow, 2.5–4 mm. $2n = 14$.

Fields, introduced. Taiwan (Taipei) [Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

This species is adventive or introduced as a fodder grass in North America, Australia, and other temperate regions.

8. *Alopecurus japonicus* Steudel, Syn. Pl. Glumac. 1: 149. 1854.

日本看麦娘 ri ben kan mai niang

Annual, tufted, often forming large clump. Culms erect or geniculately ascending, sometimes branching from lower nodes, 25–50 cm tall, 3–4-noded. Leaf sheaths lax, smooth, glabrous, upper sheaths inflated; leaf blades soft, glaucous, 3–12 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scaberulous; ligule 2–5 mm. Panicle cylindrical, 3–10 cm, yellow-green.

Spikelets ovate-oblong, 4.8–7 mm; glumes herbaceous, smooth, keels wingless, stiffly ciliate, lateral veins pubescent near base or glabrous, margins connate only at extreme base, apices subacute; lemma slightly longer than glumes, herbaceous, margins connate in lower 2/5, awned from near base, apex subacute;

awn exerted 5–8 mm from spikelet, weakly geniculate, column not twisted. Anthers white, ca. 1 mm. Fl. and fr. Feb–May.

Wet places; below 2000 m. Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Jiangsu, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

94. *PHLEUM* Linnaeus, Sp. Pl. 1: 59. 1753.

梯牧草属 *ti mu cao shu*

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial, often shortly rhizomatous. Leaf blades linear, flat. Inflorescence a spike-like, cylindrical panicle, elongate to ovoid or capitate; branches short, sometimes adnate to axis, spikelets densely crowded, sessile. Spikelets strongly laterally compressed, floret 1, disarticulating above glumes; rachilla extension present or absent; glumes equal, oblong or obovate in side view, longer than and enclosing floret, herbaceous, 3-veined, strongly keeled, keel often pectinate-ciliate, margins overlapping but not connate, apex truncate to acute, with stout mucro or short stiff awn; lemma broadly oblong or ovate, thinly membranous, dorsally convex, 3–7-veined, apex truncate to subacute, awnless or mucronate; palea slightly shorter than lemma, ciliate along keels; lodicules 2; stamens 3. Caryopsis ellipsoid to ovoid.

Sixteen species: temperate and cold regions of the N hemisphere, extending southward in America along mountain chains into Chile; four species in China.

- 1a. Annual, lacking non-flowering shoots at anthesis; spikelets obovate-cuneate; glumes firm, inflated 1. *P. paniculatum*
- 1b. Perennial, with non-flowering shoots at anthesis; spikelets oblong; glumes membranous, not inflated.
- 2a. Panicle broadly cylindrical or ovoid; glumes with 1.5–3 mm awns; spikelets purplish 2. *P. alpinum*
- 2b. Panicle narrowly cylindrical; glumes with 0.3–1.5 mm awns; spikelets gray-green.
- 3a. Glumes pectinate-ciliate along keel; culms swollen at base 3. *P. pratense*
- 3b. Glumes scabrid along keel; culms not swollen at base 4. *P. phleoides*

1. *Phleum paniculatum* Hudson, Fl. Angl. 23. 1762.

鬼蜡烛 *gui la zhu*

Chilochloa paniculata (Hudson) P. Beauvois; *Phleum asperum* Jacquin; *P. japonicum* Franchet & Savatier.

Annual, tufted. Culms erect or geniculate at base, slender, 3–45 cm tall, 3–5-noded. Leaf sheaths glabrous, upper slightly inflated; leaf blades soft, 1.5–15 cm, 2–6 mm wide, glabrous, margins scabrid, apex acute; ligule 2–4 mm, obtuse. Panicle narrowly cylindrical, 1–10 × 0.4–0.8 cm, yellowish green; branches free from central axis. Spikelets obovate-cuneate, 2–3 mm; rachilla extension present; glumes inflated toward apex, narrowed toward base, deeply channeled between veins, scabrid, keel glabrous or shortly pectinate, apex truncate, cuspidate into a hard 0.3–0.6 mm mucro; lemma 1.3–2 mm, 5-veined, sparsely appressed-pubescent, apex subobtusely; anthers 0.4–0.8 mm. Caryopsis ca. 1 mm. Fl. and fr. Apr–Aug. $2n = 28$.

Mountain slopes, riversides, field margins, roadsides; ca. 1800 m. Anhui, Gansu, Henan, Hubei, Jiangsu, Shaanxi, Shanxi, Sichuan, Xinjiang, Zhejiang (Lin'an) [Afghanistan, NW India, Japan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

2. *Phleum alpinum* Linnaeus, Sp. Pl. 1: 59. 1753.

高山梯牧草 *gao shan ti mu cao*

Phleum commutatum Gaudin.

Perennial, shortly rhizomatous. Culms loosely tufted, erect or decumbent at base, 5–40(–60) cm tall, 3–4-noded. Leaf sheaths glabrous, upper slightly inflated; leaf blades broadly linear, 2–13 cm, 2–9 mm wide, the upper shorter than the low-

er, glabrous, apex acute; ligule 2–3 mm, obtuse. Panicle broadly cylindrical to ovoid, 1–6 × 0.6–1.2 cm, usually purplish; branches adnate to central axis. Spikelets oblong, 3–4 mm (excluding awns); rachilla extension absent; glumes oblong, membranous, scaberrulous, lower softly hairy on margins, keel conspicuously pectinate-ciliate, apex truncate, cuspidate into a stiff, 1.5–3 mm, glabrous or ciliate awn; lemma ca. 2 mm, 5-veined, veins puberulent, apex truncate; anthers 1–1.5 mm. Caryopsis ca. 1.5 mm. Fl. and fr. Jun–Oct. $2n = 14, 28$.

Wet alpine meadows, damp soil around bushes, riversides; 2500–3900 m. Gansu, Heilongjiang, Henan, Hubei, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India (Sikkim), Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan; SW Asia, N Europe, North America, South America (Andes)].

This is a species of arctic and alpine regions of the N hemisphere, extending down the Andes in South America as far as Chile.

3. *Phleum pratense* Linnaeus, Sp. Pl. 1: 59. 1753.

梯牧草 *ti mu cao*

Perennial forming loose or dense tussocks. Culms erect or geniculately ascending, 40–120 cm tall, 5–6-noded, lowest nodes usually swollen and cormlike. Leaf sheaths glabrous, loose; leaf blades 10–50 cm, 3–8 mm wide, glabrous, both surfaces and margins scabrid, apex acuminate; ligule 2–5 mm, rounded. Panicle narrowly cylindrical, 4–15 × 0.5–1 cm, gray-green; branches adnate to central axis. Spikelets obovate-oblong, 3–3.5 mm; rachilla extension absent; glumes oblong, membranous, scaberrulous, lower softly hairy on margins, keel conspicuously pectinate-ciliate, apex truncate with stout, 0.5–

1.5 mm, scabrid awn; lemma ca. 2 mm, 7-veined, puberulent, especially along veins, apex obtuse; anthers 1.5–2 mm. Caryopsis ca. 1 mm. Fl. and fr. Jun–Aug. $2n = 28, 42$.

Grasslands, steppe, forest margins; ca. 1800 m. Anhui, Hebei, Heilongjiang, Henan, Shaanxi, Shandong, Xinjiang (Zhaosu), Yunnan [Russia; Europe].

This is a native of Europe and Russia, now widely introduced in temperate regions of the world as a pasture grass (Timothy Grass).

4. *Phleum phleoides* (Linnaeus) H. Karsten, Deut. Fl. 374. 1880.

假梯牧草 *jia ti mu cao*

Phalaris phleoides Linnaeus, Sp. Pl. 1: 55. 1753.

Perennial, densely tufted. Culms erect or often geniculate

at base, 15–75 cm tall, 2–4-noded. Leaf sheaths smooth, loose; leaf blades 2–20 cm, 1–5 mm wide, the upper shorter than the lower, adaxial surface and margins scabrid, apex acuminate; ligule 1–3 mm, obtuse. Panicle narrowly cylindrical, gradually tapering to apex, 2.5–10 × 0.4–0.7 cm, gray-green; branches free from central axis. Spikelets oblong, 2–3 mm; rachilla extension present; glumes oblong, membranous, keel scabrid, apex obtuse, abruptly narrowed into a stout, 0.3–0.7 mm, scabrid mucro; lemma 1.5–2 mm, 5-veined, glabrous or puberulent, apex obtuse; anthers 1–1.5 mm. Caryopsis 1.3–1.5 mm. Fl. and fr. Jun–Sep. $2n = 14$.

Grassy mountain slopes, among shrubs, forest margins; 800–2600 m. Heilongjiang, Nei Mongol, N Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan; NW Africa, SW Asia (Caucasus), Europe].

13. Tribe BRACHYPODIEAE

短柄草族 *duan bing cao zu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, or rarely annual. Leaf blades linear or convolute; ligule membranous. Inflorescence a loose raceme; spikelets (rarely only 1 spikelet) alternating on opposite sides of, and lying broadside to the rachis; rachis tough; pedicels very short. Spikelets elongate, with 5–20 florets, subterete to lightly laterally compressed, rarely strongly laterally compressed, disarticulating above glumes and between florets; glumes unequal, lanceolate, shorter than lowest lemma, herbaceous to membranous, rounded on back, distinctly 3–9-veined, apex obtuse to shortly awned; lemmas lanceolate, herbaceous to firmly membranous, sometimes becoming leathery at maturity, rounded on back, 7–9-veined, awned from entire acuminate apex; awn straight; palea subequal to lemma, ciliate on keels. Lodicules ciliate. Stamens 3. Ovary with hairy apical appendage. Caryopsis tightly enclosed by lemma and palea, ventrally furrowed, apex hairy, embryo small, hilum elongate, linear. $x = 5, 7, 9$.

One genus and ca. 16 species: temperate Asia and Europe, mountains in Africa, America from Mexico to Bolivia; five species (two endemic) in China.

95. BRACHYPODIUM P. Beauvois, Ess. Agrostogr. 100. 1812.

短柄草属 *duan bing cao shu*

Description and distribution as for tribe.

- 1a. Annual; spikelets laterally compressed; anthers 0.5–1 mm 1. *B. distachyon*
- 1b. Perennial; spikelets subterete; anthers 3–5 mm.
 - 2a. Raceme with 1–3 spikelets; culms 10–30 cm tall; leaf blades needle-like 2. *B. kawakamii*
 - 2b. Raceme with 3–6(–15) spikelets; culms usually more than 30 cm tall; leaf blades linear.
 - 3a. Lemmas of all florets with 1–6 mm awn; plant with spreading rhizomes 3. *B. pinnatum*
 - 3b. Lemmas of upper florets with 5–14 mm awn; plant without rhizomes.
 - 4a. Pedicels of spikelets less than 2 mm 4. *B. sylvaticum*
 - 4b. Pedicels of spikelets 2–5.5 mm 5. *B. pratense*

1. *Brachypodium distachyon* (Linnaeus) P. Beauvois, Ess. Agrostogr. 155. 1812.

二穗短柄草 *er sui duan bing cao*

Bromus distachyos Linnaeus, Cent. Pl. 2: 8. 1756; *Agropyron distachyon* (Linnaeus) Chevallier; *Festuca distachya* (Linnaeus) Roth; *Trachynia distachya* (Linnaeus) Link; *Zerna distachya* (Linnaeus) Panzer ex B. D. Jackson.

Annual. Culms tufted, usually ascending, infrequently erect, up to 15(–40) cm tall. Leaf sheaths loosely to densely pilose; leaf blades lanceolate, flat, rather stiff, glaucous, 1–12

cm, 3–4 mm wide, loosely pilose, margins scabrous-pectinate, apex acuminate; ligule ca. 1 mm. Raceme 2–4 cm, spikelets 1–3 crowded at apex of peduncle. Spikelets 2–3 cm, laterally compressed, florets 10–16; glumes pilose or glabrous, apex acute, lower glume lanceolate, 5–6 mm, 5-veined, upper glume lanceolate-oblong, 7–8 mm, 7-veined; lemmas 7.5–10 mm, glabrous, thinly setose or pubescent; awn 7–15 mm. Anthers 0.5–1 mm.

Dry stony places. Xizang (Mainling) [Afghanistan, Pakistan, Tajikistan, Turkmenistan; N Africa, SW Asia, S Europe; introduced elsewhere].

2. *Brachypodium kawakamii* Hayata, Bot. Mag. (Tokyo) 21: 51. 1907.

川上短柄草 chuan shang duan bing cao

Perennial. Culms densely tufted, very slender, wiry, 10–30 cm tall, fasciculately branched, many-noded. Leaf sheaths smooth, glabrous; leaf blades convolute, needle-like, stiff, 5–9 cm, 1–2 mm wide, abaxial surface glabrous, adaxial surface minutely pubescent with scattered longer hairs; ligule 0.5–1 mm. Raceme composed of 1–3 fertile spikelets with 1 or 2 vestigial spikelets below them. Spikelets 2.5–3 cm, subterete, florets 5–9; glumes glabrous or pubescent, lower glume narrowly lanceolate, 6–10 mm, 5–7-veined, apex acute, upper glume lanceolate, 10–13 mm, 7–9-veined, apex with a short hard mucro; lemmas lanceolate, 10–12 mm, densely pubescent, prominently 7-veined; awn 3–7 mm. Anthers ca. 3 mm. Fl. and fr. Jul–Nov.

- Exposed rocky mountainsides; ca. 3000 m. Taiwan.

3. *Brachypodium pinnatum* (Linnaeus) P. Beauvois, Ess. Agrostogr. 155. 1812.

羽状短柄草 yu zhuang duan bing cao

Bromus pinnatus Linnaeus, Sp. Pl. 1: 78. 1753; *Agropyron pinnatum* (Linnaeus) Chevallier.

Perennial with widely spreading slender rhizomes. Culms tufted, 30–40(–120) cm tall, unbranched, 3–8-noded. Leaf sheaths glabrous or pubescent; leaf blades linear, flat, pale green, 5–15(–40) cm, 3–8 mm wide, pubescent or scabrous on both surfaces; ligule 1.5–2.5 mm, margin ciliate. Raceme 5–20 cm, usually erect, spikelets 4–15; pedicels 1–2 mm. Spikelets 1.8–4 cm, subterete, florets 8–24; glumes lanceolate or oblong-lanceolate, 3–6-veined, glabrous or thinly pubescent, acute, lower glume 3–5(–6) mm, upper glume 5–7(–8) mm; lemmas oblong-lanceolate, 7–11 mm, pubescent above middle and near margins, prominently 7-veined; awn 1–6 mm. Anthers 3–3.5 (–5) mm.

Grassy mountainsides. Nei Mongol, Shanxi, W Xizang, Yunnan (Zhaotong, Huize) [Kazakhstan, Kyrgyzstan, Mongolia, Russia; N Africa, SW Asia, Europe; introduced in North America].

4. *Brachypodium sylvaticum* (Hudson) P. Beauvois, Ess. Agrostogr. 101. 1812.

短柄草 duan bing cao

Festuca sylvatica Hudson, Fl. Angl. 1: 38. 1762; *Agropyron sylvaticum* (Hudson) Chevallier; *Brachypodium formosanum* Hayata; *B. hayatanum* Honda; *B. kelungense* Honda; *B. manshuricum* Kitagawa; *B. sylvaticum* var. *breviglume* Keng ex P. C. Keng; *B. sylvaticum* var. *gracile* (Weigel) Keng; *B. sylvaticum* var. *kelungense* (Honda) C. C. Hsu; *B. sylvaticum* subsp. *luzoniense* Hackel; *B. sylvaticum* var. *luzoniense* (Hackel) H. Hara; *Brevipodium sylvaticum* (Hudson) Á. Löve & D. Löve; *Bromus gracilis* Weigel; *B. sylvaticus* (Hudson) Lyons; *Triticum sylvaticum* (Hudson) Moench.

Perennial. Culms loosely tufted, erect, slender, (20–)40–90

cm tall, 3–7-noded. Leaf sheaths sparsely to densely pilose, or sometimes glabrous; leaf blades linear, usually flat, mid or dark green, 8–35 cm, 3–9 mm wide, glabrous to pilose on one or both surfaces, or hispid along veins; ligule 0.5–2 mm. Raceme 8–12 cm, suberect or nodding, spikelets 3–9; pedicels less than 2 mm. Spikelets 1.5–3 cm, subterete, florets 5–12; glumes lanceolate, glabrous, pubescent or scabrous on veins, apex acuminate or midvein extended into awn-point, lower glume 3–10 mm, 3–7-veined, upper glume 5–14 mm, 5–9-veined; lemmas 7–14 mm, pilose or hispid on margins and upper back, sometimes sparsely, or glabrous throughout; awn 5–14 mm. Anthers 2.5–5 mm. Fl. and fr. Jul–Sep.

Mountain slopes, understory of forests. Anhui, Gansu, Guizhou, Jiangsu, Liaoning, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, N India, Indonesia, Japan, Kyrgyzstan, Nepal, Pakistan, Philippines, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

This species is the most widespread in the genus and is extremely polymorphic throughout its range. This has resulted in the description of many infraspecific variants. These are usually based on differences in pubescence of the vegetative parts and spikelets, but these characters are extremely plastic. The relative size of the spikelet parts is also variable and of doubtful taxonomic significance.

The name *Brachypodium sylvaticum* var. *kelungense* is based on specimens from Taiwan with mucronate glumes, but these are found throughout the range of the species. Spikelets with acute and mucronate glumes may even occur in the same raceme. The name *B. sylvaticum* var. *gracile* has been applied to small forms in China, but it is based on a type from Germany, and such specimens are probably only depauperate. Thus, while phenotypic variants may appear very different, the characters on which they are based occur in all combinations throughout the range of the species, making the recognition of infraspecific taxa very uncertain. No detailed comparison has ever been made between the European and E Asian populations.

In tropical SE Asia *Brachypodium sylvaticum* occurs only on mountains.

5. *Brachypodium pratense* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 278. 1982.

草地短柄草 cao di duan bing cao

Perennial. Culms tufted, erect or geniculate at base, slender, up to 90 cm tall, 3–5-noded. Leaf sheaths glabrous or pilose; leaf blades linear, flat, 10–18 cm, 3–8 mm wide, abaxial surface glabrous, adaxial surface pilose with scattered hairs; ligule ca. 2 mm. Raceme 10–15 cm, spikelets 3–6; pedicels 2–3(–5.5) mm. Spikelets 2.2–4 cm, florets 10–18, glumes lanceolate, glabrous, apex acuminate, lower glume 4–7 mm, usually 5-veined, upper glume 7–9 mm, 7-veined; lemmas 9–10 mm, smooth, glabrous, 7-veined, the veins prominent toward apex; awn 5–8 mm. Anthers ca. 4 mm. Fl. and fr. autumn.

- Grasslands. W Sichuan, NW Yunnan (Lijiang).

Brachypodium sylvaticum var. *wattii* (Clarke) J. D. Hooker, from the Naga Hills in NE India, has pedicellate spikelets like *B. pratense*, but differs in its pubescent lemmas. *Brachypodium pratense* is probably also a local variant of the extremely polymorphic *B. sylvaticum*.

14. Tribe BROMEAE

雀麦族 que mai zu

Liu Liang (刘亮), Chen Shouliang (陈守良), Zhu Guanghua (朱光华); Klaus H. Ammann, Sylvia M. Phillips

Annual or perennial. Leaf sheaths often tubular with connate margins; leaf blades linear; ligule membranous. Inflorescence a panicle, large and open or contracted. Spikelets all alike, florets several to many with the uppermost reduced, laterally compressed, disarticulating below each floret; glumes persistent, shorter than lowest lemma, entire; lemmas herbaceous to leathery, keeled or rounded, 5–13-veined, apex \pm 2-lobed, with straight or recurved subapical awn, rarely awnless; lodicules glabrous; ovary with an apical hairy lobed appendage, stigmas subterminal, plumose. Caryopsis narrowly ellipsoid to linear, hollowed on hilar face, embryo small, hilum linear. Leaf anatomy non-Kranz; microhairs absent; starch grains of endosperm simple, rounded. $x = 7$.

Two or three genera and ca. 150 species: mainly in temperate regions of the N hemisphere; two genera and 59 species (11 endemic, at least three introduced) in China.

Bromeae resembles *Poeae* morphologically, but is characterized by the distinctive, hairy, apical appendage on the ovary, persisting on the mature grain. The simple, rounded starch grains in the endosperm are another unusual feature, linking the tribe to *Triticeae*.

- 1a. Margins of leaf sheaths free and overlapping 96. *Littledalea*
 1b. Margins of leaf sheaths connate for most of their length 97. *Bromus*

96. LITLEDALEA Hemsley, Hooker's Icon. Pl. 25: t. 2472. 1896.

扇穗茅属 shan sui mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, often rhizomatous. Leaf sheaths with free margins overlapping almost to the base. Panicle open or loosely contracted, composed of few spikelets. Spikelets large, wedge-shaped to oblong, flat, florets few to several; glumes unequal, membranous or scarious, shorter than florets, lower glume 1–3-veined, upper glume 3–5-veined; floret callus small, rounded; lemmas elliptic-oblong, usually papery, rounded on back, 7–9-veined, glabrous or puberulous, apex obtuse to truncate and erose, awnless or infrequently mucronate; palea shorter and narrower than lemma, scabrid to ciliate along keels, apex 2-toothed. Anthers 3, usually nearly as long as palea.

Four species: China, Kazakhstan, Kyrgyzstan, ?Nepal, Tajikistan; four species (three endemic) in China.

This is a small genus of decorative, mountain grasses with large, usually papery spikelets, almost endemic to China.

- 1a. Culms 15–25 cm; panicle contracted, branches erect, much shorter than spikelets 1. *L. alaica*
 1b. Culms 25–70 cm; branches flexuously spreading, longer than spikelets.
 2a. Lemma apex narrowly obtuse or emarginate and mucronate; palea 2/3–7/8 lemma length, keels ciliate 2. *L. przewalskyi*
 2b. Lemma apex rounded, sometimes erose; palea 1/2–2/3 lemma length, keels scabrid-ciliate.
 3a. Lemmas puberulous, lowest 1.2–1.5 cm; leaf blades pubescent; pedicels scabrid; if panicle branch
 2-spiculate, lower spikelet sessile 3. *L. tibetica*
 3b. Lemmas almost smooth, lowest 1.4–2.7 cm; leaf blades subglabrous; pedicels smooth; if panicle branch 2-
 spiculate, both spikelets on long pedicels 4. *L. racemosa*

1. *Littledalea alaica* (Korshinsky) Petrov ex Nevski, Fl. URSS 2: 553. 1934.

帕米尔扇穗茅 pa mi er shan sui mao

Bromus alaicus Korshinsky, Zap. Imp. Akad. Nauk Fiz.-Mat. Otd. 4: 101. 1896.

Culms erect, 15–25 cm tall. Leaf sheaths pubescent, auriculate, auricles linear, reflexed; leaf blades gray-green, usually convolute, abaxial surface smooth, adaxial surface scabrid; ligule densely puberulous. Panicle contracted, racemose; branches erect, 1–1.5 cm, much shorter than spikelets. Spikelets 2.5–3.5 cm, florets 5–11; lower glume 8–10 mm, 1–3-veined, upper glume 10–13 mm, 3–5-veined; lemmas elliptic-lanceolate, lowest 1.5–1.7 cm, purple with brown apex, faintly 7–13-veined, back glabrous, margins ciliate toward apex, apex obtuse or emarginate; palea 2/3 lemma length. Fl. and fr. Jun–Aug.

Stony mountain slopes, scree and sand. Qinghai, Xizang [Kazakhstan, Kyrgyzstan (Alai Mountains), Tajikistan (Pamirs)].

2. *Littledalea przewalskyi* Tzvelev, Rast. Tsent. Azii 4: 173. 1968.

泽沃扇穗茅 ze wo shan sui mao

Perennial, rhizomatous, basal sheaths papery, in tight bunches, eventually becoming fibrous. Culms solitary or tufted, 25–70 cm tall, ca. 2 cm in diam. Leaf sheaths glabrous, scaberrulous toward ligule; leaf blades convolute, gray-green, 9–20 cm \times 0.8–3 mm, abaxial surface smooth, adaxial surface scabrid, apex acute; ligule 1–2.5 mm. Panicle 5–19 cm, lax, racemose, few-spiculate; branches mostly unbranched, flexuous, scabrid or almost smooth, bearing 1 or rarely 2 spikelets. Spikelets wedge-shaped, 1.6–3 cm, florets 5–11; rachilla scabrid; glumes lanceolate to oblong, apex obtuse to acute with ciliate margin, lower glume 4–9 mm, upper glume 6–14 mm; lemmas

elliptic-oblong, lowest 1.1–1.8 cm, herbaceous with scarious margins and apex, back scabrid on lateral veins and toward apex, otherwise smooth, apex narrowly obtuse or emarginate, often with mucro to 2.5 mm from sinus; palea 2/3–7/8 lemma length, longer than anthers, keels ciliate. Anthers 4–6.7 mm.

- Steep clay slopes; 2200–5700 m. Gansu, Qinghai, Xizang.

The name “*Littledalea tibetica* var. *paucispica*” (Keng, Claves Gen. Sp. Gram. Prim. Sin. 173. 1957) belongs here, but was not validly published because no Latin description was provided.

3. *Littledalea tibetica* Hemsley, Hooker’s Icon. Pl. 25: t. 2472. 1896.

藏扇穗茅 zang shan sui mao

Perennial, rhizomatous. Culms tussocky, 40–70 cm tall, ca. 1.5 mm in diam. Leaf sheaths glabrous or lower pubescent; leaf blades usually convolute, 2–10(–15) cm × 0.2–4 mm, both surfaces pubescent or abaxial surface glabrous, subacute; ligule 1–4 mm. Panicle 7–11 cm, lax, sometimes reduced to a few-spicate raceme; branches mostly unbranched, flexuous, scabrid, lower often binate, each bearing 1 spikelet or a close pair, lateral spikelet on ca. 1 mm pedicel, slightly narrower than terminal spikelet. Spikelets oblong to wedge-shaped, 1.3–2.5 cm, purple and golden brown, florets 2–8; rachilla scabrid or smooth; glumes variable, apex obtuse with ciliolate margin, lower glume oblong to oblanceolate, 2.5–9 mm, upper glume broadly oblong to oblanceolate, 5–11 mm; lemmas elliptic-oblong, lowest 1.2–1.5 cm, papery becoming membranous toward apex, veins scaberulous, back scaberulous-puberulous especially lower flanks, apex rounded, minutely ciliolate; palea 1/2–2/3 lemma length, keels scabrid-ciliolate. Anthers 4–5 mm. Fl. and fr. Jul–Aug.

- Rocky slopes, river gravel; 5000–5500 m. Xizang, Yunnan [?Nepal].

This species is very close to *Littledalea racemosa*, but the spikelets are slightly smaller and, when paired, more bunched on the panicle branches. The leaf blades are also hairier.

Hara et al. (Enum. Fl. Pl. Nepal 1: 137. 1978) cited *Stainton 4356* and *Stainton 4357* from Nepal.

4. *Littledalea racemosa* Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9: 136. 1934.

扇穗茅 shan sui mao

Perennial, rhizomatous. Culms solitary or tufted, 25–40 cm tall, ca. 2 mm in diam. Leaf sheaths loose, papery, smooth, glabrous; leaf blades flat or loosely convolute, 3.5–22 cm × 2–5 mm, abaxial surface glabrous, adaxial surface puberulous, subacute; ligule 1–5 mm. Panicle 7–16 cm, usually reduced to a lax raceme of 3–9 spikelets; branches unbranched, flexuous, smooth, lower binate, each bearing 1 or 2 spikelets, lateral spikelets on pedicels ca. 1 cm or more long. Spikelets wedge-shaped, 2.2–3.2 cm, purple and golden brown, florets 5–8; rachilla smooth; glumes narrowly lanceolate to elliptic, apex acute to erose, lower glume lanceolate, (3–)7–9 mm, upper glume broadly lanceolate or elliptic, 12–15 mm; lemmas narrowly elliptic-oblong, lowest 1.4–2.7 cm, papery, membranous, smooth or scaberulous near margins and apex, apex rounded or erose; palea 1/2 lemma length or less, keels scabrid-ciliolate. Anthers 4.5–7.5 mm. Fl. and fr. Jul–Aug.

- Stony mountainsides, alpine steppe, river gravel; 2700–5000 m. Qinghai, Sichuan, Xizang, Yunnan.

The spikelets are variable in size, but always striking because of their colorful, conspicuously papery texture and very obtuse lemmas.

97. *BROMUS* Linnaeus, Sp. Pl. 1: 76. 1753.

雀麦属 que mai shu

Liu Liang (刘亮), Zhu Guanghua (朱光华); Klaus H. Ammann

Bromopsis (Dumortier) Fourreau; *Ceratochloa* P. Beauvois; *Nevskiella* Kreczetowicz & Vvedensky.

Annuals or perennials. Culms erect, tufted or with rhizomes. Leaf sheaths closed; leaf blades linear, usually flat; ligules membranous. Panicles spreading or contracted, branches scabrid or pubescent, elongated or arched. Spikelets large, with 3 to many florets, upper florets often sterile; rachilla disarticulating above glumes and between florets, scabrid or shortly hairy; glumes unequal or subequal, shorter than spikelet, lanceolate or nearly ovate, (1–)5–7-veined, apex acute or long acuminate or aristiform; floret callus glabrous or both sides thinly hairy; lemmas rounded on back or compressed to keel, 5–9(–11)-veined, herbaceous or nearly leathery, margins often membranous, apex entire or 2-toothed; awn terminal or arising from lemma between teeth slightly under apex, rarely awnless or 3-awned; palea narrow, usually shorter than lemma, keels ciliate or scabrid. Lodicules 2. Stamens 3. Ovary apex with appendage; styles 2, arising from lower front of appendage. Caryopsis oblong, apex hairy, adaxial surface sulcate. Chromosomes large, $x = 7$, $2n = 14, 28, 42, 56, 70$.

About 150 species: temperate regions, mainly in the N hemisphere, also on mountains in the tropics; 55 species (eight endemic, at least three introduced) in China.

In addition to the species treated below, *Bromus pubescens* Muhlenberg ex Willdenow (Enum. Pl. 120. 1809) was recorded by Jung et al. (Taiwania 51: 2. 2005) from a roadside at 2400 m in Taiwan (Nantou).

1a. Spikelets strongly laterally compressed, lemmas 7–13-veined, keeled (*B.* sect. *Ceratochloa* (P. Beauvois) Grisebach).

2a. Perennial; leaf sheaths retrorsely pubescent; lemmas often hairy, awn 5–7 mm 53. *B. marginatus*

2b. Annual; leaf sheaths glabrous; lemmas mostly glabrous, mucronate or awned.

- 3a. Lemmas awnless or with mucro, ca. 1 mm; palea 1/2 lemma length 54. *B. catharticus*
 3b. Lemmas with ca. 10 mm awn; palea subequal to lemma 55. *B. carinatus*
 1b. Spikelets slightly laterally compressed to \pm cylindrical, lemmas 5–9-veined, rounded on back.
 4a. Perennials, tufted or rhizomatous.
 5a. Glumes subequal to lower florets; awn stout, recurved, mostly as long as lemma; panicle narrow, branches simple (*B. sect. Sinobromus* Keng ex P. C. Keng).
 6a. Lower glume 5–8 mm, upper glume 7–12 mm; lemmas 8–10 mm 24. *B. himalaicus*
 6b. Lower glume 8–15 mm, upper glume 11–17 mm; lemmas 9–16 mm.
 7a. Glumes glabrous.
 8a. Culms 50–70 cm tall, nodes 3; lemmas glabrous 26. *B. epilis*
 8b. Culms up to 100 m tall, nodes 7–8; lemmas marginally and distally pubescent 27. *B. mairei*
 7b. Glumes pubescent.
 9a. Panicle branches each with 1–5 spikelets; spikelets 12–20 mm; awn arising near lemma apex 28. *B. sinensis*
 9b. Panicle branches each with 1 apical spikelet; spikelets 18–25 mm; awn arising between apical lobes 25. *B. porphyranthos*
 5b. Glumes conspicuously shorter than lower florets; awn slender, straight, mostly shorter than lemma; panicle contracted to effuse (*B. sect. Bromopsis* Dumortier).
 10a. Plants usually more than 1 m tall; lemma with long or short awn.
 11a. Plants tufted, without rhizomes or stolons; culms with 6–9 nodes.
 12a. Lemma 3–5-veined; rachilla clearly visible from side in mature spikelet.
 13a. Rachilla internodes 3–4 mm; lemma 5-veined, ca. 12 mm 1. *B. magnus*
 13b. Rachilla internodes 1–2 mm; lemma 3-veined, ca. 10 mm 2. *B. plurinodis*
 12b. Lemma often 7-veined; rachilla not visible from side of intact mature spikelet.
 14a. Panicles contracted; lemmas 10–12 mm 3. *B. erectus*
 14b. Panicles spreading; lemmas 12–15 mm.
 15a. Panicle branches 3–5 cm, with 1–3 spikelets 4. *B. pseudoramosus*
 15b. Panicle branches up to 20 cm, with 2–9 spikelets 5. *B. ramosus*
 11b. Plants rhizomatous; culms often with fewer than 6 nodes.
 16a. Plants with long creeping rhizomes.
 17a. Panicles spreading 7. *B. pumpellianus*
 17b. Panicles narrow.
 18a. Panicles racemelike; lemmas glabrous 6. *B. stenostachyus*
 18b. Panicles narrowly contracted; lemmas pubescent on veins.
 19a. Lemma pubescent along keel and marginal veins to middle or slightly above; awn 1–5 mm 8. *B. sibiricus*
 19b. Lemma pubescent on marginal veins almost to apex; awn up to 2 mm 14. *B. korotkiji*
 16b. Plant with short rhizomes.
 20a. Panicle branches (2–)6–9 per node.
 21a. Awns 1–1.5 mm; rachilla not visible from side, internodes very short 13. *B. inermis*
 21b. Awns 5–10 mm; rachilla clearly visible from side, internodes 3–4 mm 12. *B. remotiflorus*
 20b. Panicle branches 2–5 per node.
 22a. Leaf blades 3–5 mm wide 9. *B. staintonii*
 22b. Leaf blades 5–12 mm wide.
 23a. Lemmas 11–14 mm; anthers 2.5–3 mm 10. *B. benekenii*
 23b. Lemmas 10–12 mm; anthers 1–1.2 mm 11. *B. ciliatus*
 10b. Plants less than 1 m tall (if more than 1 m, then lemma awn shorter than 3 mm, sometimes absent).
 24a. Awns absent or less than 2(–4) mm; plants with long rhizomes.
 25a. Lemmas glabrous, scabrid near base; anthers 3–4 mm 13. *B. inermis*
 25b. Lemmas pilose, at least on keel and marginal veins; anthers 5–6 mm 14. *B. korotkiji*
 24b. Awns more than 2 mm; plants tufted or rhizomatous.
 26a. Plants with long downwardly extending rhizomes 15. *B. formosanus*
 26b. Plants tufted or with short rhizomes.
 27a. Plants loosely tufted, or with short inconspicuous rhizomes.
 28a. Plants ca. 20 cm tall; panicle contracted, lower branches crowded 20. *B. variegatus*
 28b. Plants 20–60 cm tall; panicle open, lower branches not crowded, spreading.
 29a. Plants ca. 60 cm tall, with short rhizomes 21. *B. confinis*
 29b. Plants ca. 20–50 cm tall, tufted.
 30a. Awns ca. 3 mm 17. *B. paulsenii*
 30b. Awns 8–12 mm.
 31a. Panicle branches each with 2–4 spikelets; spikelets 2–2.5 cm 22. *B. morrisonensis*
 31b. Panicle branches each with 1 or 2 spikelets; spikelets 3–4 cm 23. *B. nepalensis*

- 27b. Plants densely tufted.
- 32a. Plants 40–90 cm tall.
- 33a. Lower glume 8–10 mm, upper glume 10–12 mm 17. *B. paulsenii*
- 33b. Lower glume 5–6 mm, upper glume 7–8 mm 19. *B. tytholepis*
- 32b. Plants up to 40(–50) cm tall.
- 34a. Awns 6–8 mm 16. *B. riparius*
- 34b. Awns 3–5 mm.
- 35a. Leaf blades ca. 5 mm wide; panicles 10–12 cm 17. *B. paulsenii*
- 35b. Leaf blades 1.5–2 mm wide; panicles 5–9 cm.
- 36a. Panicle branches scabrid, shorter than spikelet; lemmas glabrous, often scabrid 17. *B. paulsenii*
- 36b. Panicle branches slender, flexuous, often longer than spikelets; lemmas pubescent 18. *B. cappadocicus*
- 4b. Annuals.
- 37a. Spikelets broadened upward, wedge-shaped; glumes narrow, lower glume 1(–3)-veined, upper glume 3(–5)-veined.
- 38a. Awn 4–6 times length of lemma; lemma apex minutely 2-toothed (*B. sect. Nevskiella* (Kreczetowicz & Vvedensky) Tournay) 35. *B. gracillimus*
- 38b. Awn 1–3 times length of lemma; lemma apex clearly 2-toothed, teeth 3–7 mm (*B. sect. Genea* Dumortier).
- 39a. Panicle lax, branches spreading or drooping.
- 40a. Panicle much branched, branches longer or shorter than spikelets, pubescent; spikelets 1–8 per branch, secund 29. *B. tectorum*
- 40b. Panicle simple, branches up to 10 cm, with 1 or no branchlets; spikelets sparse, 1 or 2(or 3) per branch 30. *B. sterilis*
- 39b. Panicle contracted, branches erect or ascending, never drooping.
- 41a. Lower glume 15–20 mm; lemmas 20–30 mm, awn 30–40 mm 31. *B. rigidus*
- 41b. Lower glume 6–10 mm; lemmas 10–15 mm, awn 10–20 mm.
- 42a. Panicle lax; branches 2–3 cm, scabrid; culms glabrous below inflorescence; stamens 2 32. *B. madritensis*
- 42b. Panicle contracted; branches shorter than spikelets, ca. 1 cm, culms pubescent below inflorescence; stamens usually 3.
- 43a. Plants 5–15 cm tall; panicle ca. 5 cm, branches each with 1 or 2 spikelets; lemmas 13–15 × 1–1.5 mm 33. *B. fasciculatus*
- 43b. Plants 30–40 cm tall; panicle ca. 10 cm, branches each with 4 or 5 spikelets; lemmas 10–13 × ca. 2 mm 34. *B. rubens*
- 37b. Spikelets narrowed upward, oblong-lanceolate; glumes broad, lower glume 3–5-veined, upper glume 5–9-veined (*B. sect. Bromus*).
- 44a. Lemmas 3-awned 52. *B. danthoniae*
- 44b. Lemmas 1-awned.
- 45a. Spikelets (2–)3–4 cm; lemmas 14–18 mm.
- 46a. Spikelets oblong-lanceolate, ca. 6 mm wide; lemma apex deeply toothed, teeth (1.5–)3–4 mm; panicle open, branches several times longer than spikelets, nodding.
- 47a. Lower glume ca. 10 mm; lemma 15–18 mm, awn 20–25 mm, lower part slightly flattened, twisted, conspicuously recurved 48. *B. oxyodon*
- 47b. Lower glume 5–8 mm; lemma 10–15 mm, awn 8–17 mm, terete, straight, usually erect 49. *B. pectinatus*
- 46b. Spikelets broadly elliptic, ca. 10 mm wide; lemma apex shallowly toothed, teeth 1–2 mm; panicle slightly contracted, branches not longer than spikelets, obliquely ascending.
- 48a. Lemma scabrid; awn 5–10 mm, straight; anthers 2–3 mm; panicle branches on 1 side of axis 50. *B. grossus*
- 48b. Lemma smooth; awn 10–20 mm, conspicuously recurved; panicle branches on all sides on axis 51. *B. lanceolatus*
- 45b. Spikelets (1–)1.5–2.5(–3) cm; lemmas 5–11 mm.
- 49a. Lemma margins inrolled, not covering adjacent florets; rachilla internodes exposed in mature spikelets 36. *B. secalinus*
- 49b. Lemma margins overlapping adjacent florets; rachilla internodes enclosed in mature spikelets.
- 50a. Lemmas 5–7 mm; awn shorter than lemma body, straight; spikelets 1–1.5(–2.5) cm.
- 51a. Lemmas 6–11 mm; anthers 1.5–3 mm; caryopsis enclosed by lemma, not exposed 41. *B. racemosus*
- 51b. Lemmas 5–6 mm; anthers 0.5–1.5 mm; caryopsis longer than lemma, exposed.
- 52a. Culms 30–50 cm tall; leaf blades ca. 10 cm; panicle 5–10 cm; lemmas 5.5–6.5 mm 37. *B. lepidus*
- 52b. Culms ca. 10 cm tall; leaf blades 3–4 cm; panicle ca. 3 cm; lemmas 4–5 mm 38. *B. brachystachys*
- 50b. Lemmas 8–12 mm, awn as long as or longer than lemma body, straight or recurved; spikelets (1.5–)2–3 cm.

- 53a. Lemmas broadly ovate-elliptic, 3–4 mm wide in side view, margins broadly membranous with a conspicuous obtuse angle about halfway between base and apex; panicle subracemose, branches each with 1 or 2 apical spikelets 39. *B. squarrosus*
- 53b. Lemmas elliptic, ca. 2 mm wide in side view, margins without any conspicuous angle; panicle laxly spreading or contracted.
- 54a. Panicle lax, open, 15–25 cm, branches and pedicels longer than spikelets.
- 55a. Anthers ca. 4 mm; palea subequal to lemma; leaf sheaths glabrous 40. *B. arvensis*
- 55b. Anthers 0.5–3 mm; palea conspicuously shorter than lemma; leaf sheaths pubescent.
- 56a. Awns straight; all awns within a spikelet subequal 41. *B. racemosus*
- 56b. Awns curved outward, lower awns within a spikelet shorter than upper awns.
- 57a. Lemma 10–15 mm, apex deeply 2-lobed, acuminate; awn arising 3–4 mm below apex, terete, spreading 49. *B. pectinatus*
- 57b. Lemma 8–10 mm, apex with short, obtuse teeth; awn arising 1–2 mm below apex, base slightly flattened, recurved outward when mature 42. *B. japonicus*
- 54b. Panicle contracted, 3–10 cm, branches and pedicels shorter than spikelets.
- 58a. Lemmas glabrous; awn as long as or slightly longer than lemma body.
- 59a. Panicle ca. 10 cm; lower glume ca. 7 mm, awn straight, arising ca. 1 mm below lemma apex; anthers ca. 1 mm 43. *B. sewerzowii*
- 59b. Panicle 3–7 cm; lower glume 3–4 mm; awn curved downward, arising 1.5–3 mm below lemma apex; anthers 0.3–0.6 mm.
- 60a. Panicle with few spikelets, 1-sided; lemmas 8–10 mm, apical teeth 0.5–1 mm 44. *B. tythanthus*
- 60b. Panicle dense, with many clustered spikelets; lemmas 7–8 mm, apical teeth 1.3–2.5 mm 45. *B. scoparius*
- 58b. Lemmas pubescent; awn slightly shorter than lemma body.
- 61a. Plant 40–80 cm tall; culms pubescent on nodes and below panicle, panicle branches and pedicels pubescent; awns slender, straight 46. *B. hordeaceus*
- 61b. Plant 20–40(–60) cm tall; culms, panicle branches, and pedicels glabrous; awns conspicuously recurved, base slightly flattened, twisted.
- 62a. Spikelets 10–15 mm; lower glume 2/3 as long as upper glume; lemma apex with 2–3 mm teeth; anthers ca. 1 mm 47. *B. intermedius*
- 62b. Spikelets 15–50 mm; glumes subequal; lemma apex with 1–1.5 mm teeth; anthers 1–1.5 mm 39. *B. squarrosus*

1. *Bromus magnus* Keng, Sunyatsenia 6: 53. 1941.

大雀麦 *da que mai*

Perennial. Culms 1–1.2 m tall, loosely tufted, (3–)6–8-noded. Leaf sheaths pubescent; leaf blades 20–30 cm × 6–8 mm, adaxial surface pubescent, scabrid; ligule 3–4 mm, apex lacerate. Panicle spreading, ca. 30 cm, slightly nodding; branches 2 per node, up to 15 cm. Spikelets ca. 25 × 5–6 mm, florets 5–7(–9); rachilla internodes 3–4 mm, shortly hairy, laterally visible and conspicuously exposed; glumes narrow, margins membranous, lower glume 7–8 mm, 1-veined, upper glume 9–11 mm, 3-veined; lemmas narrow, ca. 12 × ca. 1 mm in side view, 5-veined, intermediate veins inconspicuous, proximally sparsely scabrid, awned from apex; awn 4(–7) mm, slender, straight. Anthers ca. 3 mm. Fl. and fr. Jul–Aug.

• *Picea* forest margins, gravel thickets, river banks, meadows; 2300–3800 m. Gansu, Qinghai, Sichuan, Xizang.

2. *Bromus plurinodis* Keng, Fl. Tsinling. 1(1): 439. 1976.

多节雀麦 *duo jie que mai*

Perennial. Culms erect, up to 1 m tall, ca. 5 mm in diam., glabrous, 7–9-noded. Leaf sheaths longer than internodes, scabrid, persistent when dry; brown membranous; leaf blades 20–30 cm × 6–8 mm, adaxial surface pubescent, margins scabrid; ligule 2–4 mm. Panicle 20–30 cm; branches 2–4 per node,

obliquely ascending, up to 15 cm, scabrid. Spikelets 15–20 × ca. 2 mm, florets 5–7; rachilla internodes 2–2.5 mm, shortly hairy, laterally visible; glumes narrow, margins membranous, lower glume ca. 5 mm, 1-veined, apex acuminate, upper glume 6–9 mm, 3-veined, apex long acuminate; lemmas narrow, ca. 10 × ca. 1 mm in side view, 3-veined, keel scabrid, lower margins and veins proximally minutely hairy, pubescent throughout, awned from apex; awn 10(–14) mm, slender, straight; palea 6–7 mm, keels thinly ciliate. Anthers ca. 2 mm. Fl. and fr. Jun–Aug.

• Thickets, meadows, ditch banks, grassy places on rocky slopes; 2000–3600 m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, SE Xizang, Yunnan.

3. *Bromus erectus* Hudson, Fl. Angl. 39. 1762.

直立雀麦 *zhi li que mai*

Bromopsis erecta (Hudson) Fourreau; *Festuca erecta* (Hudson) Wallroth; *Forasaccus erectus* (Hudson) Bubani; *Schedonorus erectus* (Hudson) Gaudin ex Roemer & Schultes; *Zerna erecta* (Hudson) Panzer.

Perennial. Culms erect, densely tufted, 40–100 cm tall, slender or stout. Leaf sheaths glabrous or scattered pubescent; leaf blades 20–35 cm, lower leaves inrolled, 2–3 mm wide, upper leaf blades flat, 2–3 mm wide, glabrous or scattered pubes-

cent, apex acuminate; ligule ca. 2 mm. Panicle erect, 10–20 cm, contracted; branches obliquely ascending, each bearing 1–4 spikelets; pedicels as long as or shorter than spikelets. Spikelets lanceolate-oblong, ca. 15–25(–30) mm, florets 5–12; rachilla internodes ca. 2.5 mm; lower glume 7–12 mm, 1–3-veined, upper glume 8–14 mm, 3-veined; lemmas 10–12 mm, glabrous or sometimes hairy, 7-veined, margins inrolled when mature; awn (1–)2–6 mm, slender, straight; palea slightly shorter than lemma. Anthers 4–7 mm. Fl. May–Jul. $2n = 28, 56, 70$.

River valleys, plains, wet grassy places on dry river beds; ca. 4600 m. Xizang [Europe].

4. *Bromus pseudoramosus* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 347. 1982.

假枝雀麦 jia zhi que mai

Perennial. Culms loosely tufted, erect, 70–120 cm tall, 2–3 mm in diam., glabrous, 5–8-noded. Leaf sheaths glabrous or with sparse hairs, upper sheaths with leaf auricles; leaf blades 20–45 cm × 4–9 mm, abaxial surface and margins scabrid, adaxial surface pubescent; ligule ca. 1.5 mm. Panicle spreading, 20–30 cm, nodding; branches 2 per node, 3–5 cm, scabrid, slender, curved, each bearing 1–3 spikelets. Spikelets 20–25 × 6–10 mm, tinged with purple, florets 6–10; rachilla internodes ca. 2 mm, minutely hairy, laterally visible; lower glume ca. 8–10 mm, 1-veined, upper glume 11–13 mm, 3-veined, margins pubescent, not membranous, apex acuminate-mucronate; lemmas lanceolate, 12–15 × 1.5–2 mm in side view, inconspicuously 7-veined, margins pubescent, awned from apex; awn 4(–9) mm, slender, straight; palea slightly shorter than lemma and narrow, keels ciliate. Anthers ca. 2 mm.

• Alpine meadows; ca. 3600 m. Xizang, NW Yunnan.

No material has been seen of *Bromus pseudoramosus* var. *sedgioides* B. S. Sun & H. Peng (Guihaia 13: 224. 1993), described from Guizhou (Hezhang).

5. *Bromus ramosus* Hudson, Fl. Angl. 40. 1762.

类雀麦 lei que mai

Bromopsis ramosa (Hudson) Holub; *Bromus asper* Murray; *Forasaccus asper* (Murray) Bubani; *Zerna aspera* (Murray) Panzer; *Z. ramosa* (Hudson) Lindman.

Perennial. Culms loosely tufted, erect, 60–150 cm tall, ca. 6 mm in diam., 7–8-noded; densely and shortly pubescent. Leaf sheaths pubescent with reflexed 1–2 mm hairs, narrow auricles present at mouth; leaf blades soft, 10–40 cm × 7–15 mm, scattered pubescent; ligule ca. 2 mm, glabrous. Panicle 15–40 cm, broad, loosely nodding; branches 2 per node, up to 20 cm, each bearing 2–9 spikelets, lowermost branches with ciliate bracts at base. Spikelets elliptic-oblong, 20–30 × 4–6 mm, florets 4–10; lower glume subulate, 6–8 mm, 1-veined, upper glume lanceolate, 9–11 mm, 3-veined, apex mucronate or shortly awned; lemmas lanceolate, 10–13 mm, 7-veined, veins and margins pubescent; awn 5–8 mm, straight; palea conspicuously shorter than lemma, keels minutely ciliate. Anthers 2–3 mm. Fl. and fr. Jun–Aug. $x = 21$; $2n = 42$.

Thickets in forested areas, roadsides, grassy places; 2900–3500 m. Xizang (Yadong) [Kashmir, Pakistan; N Africa, SW Asia, Europe].

Bromus ramosus is closely related to *B. benekenii*, but they hybridize only very rarely.

6. *Bromus stenostachyus* Boissier, Fl. Orient. 5: 643. 1884.

窄序雀麦 zhai xu que mai

Bromopsis stenostachya (Boissier) Holub; *Zerna stenostachya* (Boissier) Nevski.

Perennial, with slender creeping rhizomes, base covered by dry leaf sheaths. Culm base decumbent, later erect, up to 100 cm tall, slender. Leaf sheaths pubescent to hispid, with auricles at mouth; leaf blades linear-acuminate, grayish green, ca. 15 cm × 2–3 mm, both surfaces very shortly pubescent, margins scabrid. Panicle 11–18 cm, racemelike; branches short, each bearing 1 spikelet. Spikelets oblong or cuneate, 20–25 mm, later lax, florets 7–9; lower glume 6–8 mm, 3-veined, upper glume 9–12 mm, 3-veined, glabrous, apex acuminate; lemmas oblong, 10–16 mm, 5–9-veined, glabrous, shiny, apex acuminate, emarginate; awn 3–4 mm; palea shorter than lemma, keels ciliate. Anthers 4–5 mm. Fl. May–Jul.

High-elevation slopes; 3000–4200 m. Xinjiang [Afghanistan, Pakistan; SW Asia (Iran)].

7. *Bromus pumpellianus* Scribner, Bull. Torrey Bot. Club 15: 9. 1888.

紧穗雀麦 jin sui que mai

Bromopsis pumpelliana (Scribner) Holub; *Bromus inermis* (Leysser) Holub subsp. *pumpellianus* (Scribner) Wagnon; *B. uralensis* Govoruchin; *Zerna pumpelliana* (Scribner) Tzvelev.

Perennial, with creeping stolons. Culms erect, 60–120 cm tall, 4–6-noded, with dense, reflexed hairs. Leaf sheaths glabrous or sparsely reflexed pubescent; leaf blades ca. 15 cm × 6–7 mm, adaxial surface sparsely pubescent, abaxial surface and margin scabrid; ligule ca. 1 mm, apex erose. Panicle spreading, ca. 20 cm; branches 2–4 per node, 2–6 cm, each bearing 1 or 2 spikelets. Spikelets 25–40 × 5–8 mm wide, florets 9–13; rachilla internodes 2–2.5 mm, pubescent or spinulose; lower glume 7–9 mm, 1-veined, upper glume 9–11 mm, 3-veined, margins membranous, apex acuminate; lemmas lanceolate, 10–14 × ca. 1.5 mm in side view, 7-veined, intermediate and marginal veins short or inconspicuous, margins membranous, keel and margins often proximally stiffly pubescent, hairs 1–2 mm, awned from apex; awn 2–5 mm; palea slightly shorter than lemma, keels stiffly ciliate. Anthers 4–6 mm. Fl. and fr. Jun–Aug. $2n = 28$.

Mid-mountain meadows, thickets, grassy areas in river valleys; 1000–2500 m. Heilongjiang, Nei Mongol, Shanxi [Russia; W North America].

The stiff hairs of the spikelets are the only consistent and easily interpreted character by which this species can be separated from *Bromus inermis*. However, this is generally not a very reliable character in *Bromus*.

This species has been incorrectly named *Bromus richardsonii* Link by some authors.

8. *Bromus sibiricus* Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 12: 229. 1914.

西伯利亚雀麦 xi bo li ya que mai

Bromus inermis Leysser var. *sibiricus* (Drobow) Krylov.

Perennial, with creeping stolons, base brown, covered by dry leaf sheaths. Plants 20–100 cm tall, nodes pubescent. Leaf sheaths smooth, glabrous; leaf blades flat, ca. 15 cm, scabrid, glabrous or scattered pubescent; ligule ca. 0.5 mm. Panicle 8–15(–20) cm, erect, narrow, contracted, sometimes nodding; branches shorter than spikelets, each bearing 1 or 2 spikelets. Spikelets narrowly oblong, 15–25 mm, purple, florets 4–8; rachilla thinly hairy; glumes glabrous, lower glume 6–8 mm, 1- or 3-veined, upper glume 7–10 mm, 3-veined; lemmas lanceolate, 10–12 mm, 5–7-veined, marginal veins densely pubescent to middle or slightly above, midrib and intermediate veins pubescent or scabrid; awn 1–5 mm; palea shorter than lemma, keels ciliate. Anthers 2–4 mm. Fl. and fr. Jun–Aug.

Plains, grassy places; 500–1000 m. Hebei, Heilongjiang, Nei Mongol [Mongolia, Russia (Siberia); Europe].

It is difficult to distinguish *Bromus sibiricus* from *B. inermis*, and the former species could well be merely a dwarf form of the latter.

9. *Bromus staintonii* Melderis in H. Hara et al., Enum. Fl. Pl. Nepal 1: 125. 1978.

大序雀麦 da xu que mai

Perennial, with short rhizomes. Culms tufted, ca. 1 m tall. Leaf sheaths pubescent or with reflexed hairs, scabrid along veins, mouth with auricles; leaf blades soft, ca. 20 cm × 3–5 mm, abaxial surface and margins scabrid, adaxial surface pubescent; ligule ca. 1 mm, abaxial surface hairy. Panicle spreading, ca. 25 cm; branches 2–5 per node, up to 12 cm, scabrid, each bearing 2 or 3 spikelets. Spikelets ca. 20 mm, florets 7–9; rachilla internodes 3–4 mm, shortly hairy; glumes scabrid, margins membranous, lower glume 6–7 mm, 1-veined, upper glume 8–10 mm, 3-veined, apex long acuminate to aristiform; lemmas narrow, 10–12 mm, 5–7-veined, pubescent; awn 4–11 mm, not recurved, scabrid; palea subequal to lemma, keels shortly stiffly ciliate. Anthers ca. 3 mm. Fl. and fr. Jun–Aug.

Grassy slopes; 2700–3200 m. S Xizang [Bhutan, N India, Kashmir, Nepal].

10. *Bromus benekenii* (Lange) Trimen, J. Bot. 10: 333. 1872 [*“benekeni”*].

密丛雀麦 mi cong que mai

Schedonorus benekenii Lange, Fl. Dan. 48: 5. 1871; *Bromus asper* Murray var. *benekenii* (Lange) Syme; *B. ramosus* Hudson var. *benekenii* (Lange) Ascherson & Graebner.

Perennial, rhizomes crowded. Culms densely tufted, 50–120 cm tall, erect, minutely hairy. Leaf sheaths densely pubescent with reflexed hairs or upper part glabrous; leaf blades flat, 10–25 cm × 5–12 mm, scattered pubescent, margins densely hairy. Panicle spreading, 12–20 × 10–15 cm, 1-sided, apex nodding; branches elongate, slender, bearing 1–4 spikelets, lowermost branches with basal non-ciliate bracts. Spikelets lanceolate-acuminate, 15–30 mm, florets 5–9; glumes scabrid, lower glume linear-lanceolate, 7–8 mm, 1-veined, upper glume oblong-lanceolate, 9–11 mm, 3-veined; lemmas narrowly lanceolate, 11–14 mm, pubescent; awn 5–8 mm, straight; palea conspicuously shorter than lemma. Anthers 2.5–3 mm. Fl. Jun–Jul. $2n = 28$.

Forest margins, thickets, upland meadows, river valley grasslands. Xinjiang [Kazakhstan, Russia; SW Asia, Europe].

11. *Bromus ciliatus* Linnaeus, Sp. Pl. 1: 76. 1753.

加拿大雀麦 jia na da que mai

Bromopsis canadensis (Michaux) Holub; *Bromus canadensis* Michaux; *B. yezoensis* Ohwi; *Zerna yezoensis* (Ohwi) Sugimoto.

Perennial, with short rhizomes. Culms 70–120 cm tall, pubescent with reflexed hairs, 6-noded. Leaf sheaths pubescent; leaf blades 2–3 cm × 6–10 mm, glabrous or sparsely pilose on adaxial surface; ligule ca. 1 mm. Panicle broadly ovoid, nodding, 15–25 cm; branches 2 or 3 per node, curved, each bearing 1–3 spikelets. Spikelets 15–20 mm, green with membranous yellowish brown apex, florets 6 or 7; rachilla 1–2 cm, sparsely pubescent; glumes scabrid on keel, lower glume 6–7 mm, 1-veined, upper glume narrow, 8–9 mm, 3-veined; lemmas 10–12 mm, 5–7-veined, pilose near margins in lower half and along lower 1/3 of midrib, back glabrous, apex obtuse or bilobed, awned from between teeth; awn 2–6 mm, erect; palea 8–9 mm, keels ciliate. Anthers 1–1.5 mm. Fl. and fr. Jul–Sep. $2n = 14$.

Mid-elevation mountains, low-elevation wet forested places, meadows. Nei Mongol [Japan, Mongolia, Russia (Far East); North America].

12. *Bromus remotiflorus* (Steudel) Ohwi, Acta Phytotax. Geobot. 4: 58. 1935.

疏花雀麦 shu hua que mai

Festuca remotiflora Steudel, Syn. Pl. Glumac. 1: 315. 1854; *Bromus pauciflorus* (Thunberg) Hackel (1899), not Schumacher (1801); *F. pauciflora* Thunberg.

Perennial, with short rhizomes. Culms 60–120 cm tall, 6- or 7-noded, nodes pubescent. Leaf sheaths densely retrorsely pubescent; leaf blades 20–40 cm × 4–8 mm, adaxial surface pubescent; ligule 1–2 mm. Panicle large, lax, 20–30 cm; branches 2–6 per node, long, slender, scabrid, nodding when mature, spikelets few. Spikelets (15–)20–25(–40) × 3–4 mm, florets 5–10; rachilla internodes 3–4 mm, clearly laterally visible; glumes narrowly lanceolate, lower glume 5–7 mm, 1-veined, upper glume 8–12 mm, 3-veined, apex acuminate to mucronate; lemmas narrowly lanceolate, 10–12(–15) × ca. 1.2 mm in side view, 7-veined, glabrous, margins membranous, apex acuminate; awn 5–10 mm; palea narrow, shorter than lemma, keels thinly ciliate. Anthers 2–3 mm. Caryopsis 8–10 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Slopes, forest margins, roadsides, riverside grassy places; 1800–3200(–4100) m. Anhui, Fujian, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Korea].

13. *Bromus inermis* Leysser, Fl. Halens. 16. 1761.

无芒雀麦 wu mang que mai

Bromopsis inermis (Leysser) Holub; *Bromus pskemensis* Pavlov; *Zerna inermis* (Leysser) Lindman.

Perennial, with spreading rhizomes. Culms loosely tufted, erect, 50–120 cm tall, glabrous or retrorsely hairy below nodes. Leaf sheaths glabrous or shortly hairy; leaf blades flat, 20–30 cm × 4–8 mm, both surfaces and margins scabrid, glabrous or margins sparsely ciliate, apex acuminate, ligule 1–2 mm. Panicle dense at first, spreading after anthesis, 10–20 cm; branches 3–5 per node, up to 10 cm, scabrid, each bearing 2–6 spikelets. Spikelets 15–25 mm, florets 6–12; rachilla internodes 2–3 mm, spinulose; glumes lanceolate, margins membranous, lower glume 4–7 mm, 1-veined, upper glume 6–10 mm, 3-veined; lemmas oblong-lanceolate, 8–12 mm, 5–7-veined, glabrous, base scabrid, apex obtuse or emarginate; awn up to 3–4 mm, or awnless; palea shorter than lemma, keels ciliate. Anthers 3–4 mm. Fl. and fr. Jul–Sep. $2n = 14, 28, 56$.

Gullies on slopes, roadsides, river banks, dominant species of mountain meadows; 1000–3500 m. Gansu, Guizhou, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan; SW Asia (Caucasus), Europe].

This species has been spread worldwide through seed production for pasture and fodder.

14. *Bromus korotkiji* Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 12: 238. 1914.

甘蒙雀麦 gan meng que mai

Bromopsis korotkiji (Drobow) Holub; *B. pumpelliana* (Scribner) Holub subsp. *korotkiji* (Drobow) Tzvelev; *B. pumpelliana* var. *ircutensis* (Komarov) Tzvelev; *Bromus ircutensis* Komarov; *Zerna korotkiji* (Drobow) Nevski.

Perennial, with long, creeping rhizome; old basal sheaths lacerate to fibrous. Culms erect, 70–90 cm tall, stout, hard, densely retrorsely pubescent below nodes and in inflorescence. Leaf sheaths longer than internodes, densely pubescent to glabrous; leaf blades hard, 15–30 cm × 3–6 mm, adaxial surface pubescent; ligule brown, ca. 1 mm, hard. Panicle erect, narrow, 7–15 cm; branches 2–5 per node, erect, ca. 1–2(–5) cm, shortly hairy, each bearing 1 or 2 spikelets. Spikelet 1.5–3.5 × ca. 1 cm, florets 5–10, light brown sometimes violet tinged; rachilla 2–4 mm, laterally visible, sparsely to densely pilose; glumes membranous, glabrous, lower glume narrowly lanceolate, 6–8 mm, 1-veined, upper glume narrowly lanceolate, 6–11 mm, 3-veined; lemmas broadly lanceolate, 10–15 mm, 5–7-veined, margins densely pubescent with white, 1–2 mm hairs, apex obtuse; awn absent; palea narrow, subequal to lemma, keels ciliate in upper part. Anthers 5–7 mm. Fl. and fr. May–Sep.

Wet riverside sands, sand dunes. Gansu, Nei Mongol, Xinjiang [Mongolia, Russia (Siberia)].

15. *Bromus formosanus* Honda, Bot. Mag. (Tokyo) 42: 136. 1928.

台湾雀麦 tai wan que mai

Perennial, with downwardly extending long rhizomes and dense, fibrous roots up to 20 cm deep. Culms 20–30 cm tall, ca. 1 mm in diam. Leaf sheaths persistent; leaf blades 10–20 cm × 3–5 mm, glabrous, apex acuminate; ligule ca. 0.5 mm. Panicle

10–12 cm, nearly racemose; branches paired, slender, bearing few spikelets. Spikelets elliptic-lanceolate, ca. 20 × 5–9 mm, purplish brown, florets 5–7; rachilla internodes exposed, 2–3 mm, loosely pubescent; glumes pubescent, apex acute, lower glume linear-lanceolate, 8–9 mm, 1-veined, upper glume 10–12 mm, 3-veined; lemmas long elliptic, 15(–18) × ca. 2 mm in side view, 7-veined, scabrid, margins densely pubescent, awned from apex; awn 3–7 mm, straight; palea ca. 9 mm, keels densely ciliate. Anthers ca. 2 mm. Fl. Jul–Aug, fr. Sep–Oct.

• Alpine areas, rock crevices, cliffs, exposed rocks; 3500–3800 m. Taiwan.

16. *Bromus riparius* Rehmann, Verh. Naturf. Vereins Brünn. 10: 8. 1872 [“1871”].

山丹雀麦 shan dan que mai

Bromopsis riparia (Rehmann) Holub; *Zerna riparia* (Rehmann) Nevski.

Perennial, with short rhizomes, base covered by fibrous dry leaf sheaths. Culms densely tufted, 30–50(–90) cm tall. Leaf sheaths ± scattered villous; leaf blades narrowly linear, 15–20 cm × 1–2 mm, scabrid, margins ciliate; ligule short. Panicle lax, 10–15 × ca. 10 cm; branches obliquely erect, scabrid, bearing 1 or 2 spikelets. Spikelets wedge-shaped, 25–35 × 6–7 mm, florets 5–7, lax; rachilla 3–4 mm, shortly hairy, laterally visible; glumes apex acuminate, lower glume 8–10 mm, 1–3-veined, upper glume 9–12 mm; lemmas 11–13 mm, puberulous along sides or throughout, 5–7-veined, membranous, apex acuminate; awn 5–8 mm, slender, straight; palea shorter than lemma, keels spinulose. Anthers ca. 6 mm. Fl. and fr. May–Jul. $2n = 56$.

Dry meadows, grasslands, forest margins, low-mountain thickets, on calcareous soils. Gansu [Russia (European part, adventive in Far East); SW Asia, Europe].

No specimens of this species were found in PE.

17. *Bromus paulsenii* Hackel ex Paulsen, Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1903: 174. 1903.

波申雀麦 bo shen que mai

Bromopsis angrenica (Drobow) Holub; *B. pamirica* (Drobow) Holub; *B. paulsenii* (Hackel ex Paulsen) Holub; *B. paulsenii* subsp. *angrenica* (Drobow) Tzvelev; *B. paulsenii* subsp. *pamirica* (Drobow) Tzvelev; *B. paulsenii* subsp. *turkestanica* (Drobow) Tzvelev; *B. turkestanica* (Drobow) Holub; *Bromus angrenicus* Drobow; *B. pamicus* Drobow; *B. turkestanicus* Drobow; *Zerna angrenica* (Drobow) Nevski; *Z. pamirica* (Drobow) Nevski; *Z. paulsenii* (Hackel ex Paulsen) Nevski subsp. *pamirica* (Drobow) Tzvelev; *Z. turkestanica* (Drobow) Nevski.

Perennial, often with rhizomes, basal sheaths persistent, fibrous or lacerate. Culms densely tufted, erect or geniculately ascending, 20–40 cm tall, pubescent or upper part often glabrous, 2-noded. Leaf sheaths smooth, glabrous; leaf blades linear-acuminate, hard, erect, flat or slightly inrolled, 8–15 cm × (2–)3–5 mm, densely pubescent; ligule short. Panicle ovoid, erect or spreading, (6–)10–12 × 5–6 cm; branches paired or single, often shorter than spikelet, scabrid, each bearing 1 spike-

let. Spikelets lanceolate, 20–25 mm, florets 5–7, yellow; glumes lanceolate, glabrous, apex acuminate, lower glume 6–8 mm, 3–5-veined, upper glume 8–10 mm, 3–5-veined; lemmas broadly lanceolate, ca. 10 mm, 7-veined, glabrous, smooth or scabrid, margins and apex dry membranous; awn 3–5 mm, straight. Fl. Jun–Aug.

Grassy slopes; 2000–4000 m. Nei Mongol, Xinjiang [Afghanistan, Kazakhstan (Tien Shan), Kyrgyzstan, Tajikistan (Pamirs), Uzbekistan].

18. *Bromus cappadocicus* Boissier & Balansa, Bull. Soc. Bot. France 4: 306. 1857.

卡帕雀麦 ka pa que mai

Bromus tomentellus Boissier subsp. *cappadocicus* (Boissier & Balansa) Tzvelev.

Perennial, old basal sheaths persistent, fibrous. Culms densely tufted, slender, 25–45 cm tall. Leaf sheaths smooth, glabrous; leaf blades flat or inrolled, 4–10 cm × ca. 1.5 mm, scattered pubescent or glabrous, apex acuminate, cauline leaves short. Panicle ovate-elliptic, 5–9 cm, erect; branches 2–3 per node, slender, reflexed, nodding, each bearing 1 or 2 spikelets. Spikelets 15–25 × 3–5 mm, florets 5 or 6, green or grayish white; glumes unequal, lower glume 5–7 mm, upper glume 7–8 mm; lemmas lanceolate, 8–10 mm, pubescent, thin, awned from apex; awn 4–5(–10) mm, straight or slightly recurved; palea shorter than lemma. Anthers 2–2.5 mm. Fl. Jun–Jul. $2n = 42, 56$.

Dry slopes; 1000–3200 m. Gansu [SW Asia (Caucasus, Iran, Turkey), Europe].

19. *Bromus tythholepis* (Nevski) Nevski in Komarov, Fl. URSS 2: 563. 1934.

土沙雀麦 tu sha que mai

Zerna tythholepis Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 16. 1934; *Bromopsis tythholepis* (Nevski) Holub.

Perennial, base enclosed in old withered leaf sheaths. Culms densely tufted with many tillers, 50–90 cm tall, 4–6-noded, uppermost node ca. 1/2 way up culm, pubescent below nodes. Leaf sheaths glabrous or pubescent; leaf blades narrowly linear, flat, 15–20 cm × 3–5 mm, densely pubescent or glabrous, margins scabrid; ligule ca. 1.5 mm. Panicle narrow, contracted, 7–15 cm, axis scabrid; branches 2–6 per node, each bearing 1 or 2 spikelets. Spikelets linear-lanceolate, 20–25 mm, pale green or slightly yellow or tinged with purple, florets 5–11; lower glume 5–6 mm, 1-veined, upper glume 7–8 mm, 3-veined; lemmas 5–7-veined, 8–9 mm, glabrous, scabrid, awned from apex; awn 2–3 mm, scabrid. Fl. and fr. Jun–Jul.

Dry rocky slopes. Xinjiang [E Kazakhstan, Kyrgyzstan, Tajikistan].

20. *Bromus variegatus* M. Bieberstein, Fl. Taur.-Caucas. 3: 79. 1819.

变色雀麦 bian se que mai

Bromopsis variegata (M. Bieberstein) Holub; *Zerna variegata* (M. Bieberstein) Nevski.

Perennial, old basal sheaths persistent. Culms ca. 20 cm tall, glabrous. Leaf sheaths densely pubescent in lower part; leaf blades ca. 5 cm × 2–4 mm, glabrous or both surfaces pubescent, adaxial surface and margins scabrid. Panicle contracted, 5–10 cm; lower branches crowded, erect, each bearing 5–15 clustered spikelets. Spikelets 15–25 mm, green or tinged with purple, florets 5–7; glumes acuminate, lower glume 7–10 mm, 1-veined, upper glume oblong, 8–12 mm, 5-veined; lemmas 10–12 mm, glabrous or scabrid, awned from apex; awn 4–9 mm. $2n = 14$.

Grassy slopes; (1600–)2400–3800 m. Xizang [Afghanistan; SW Asia].

21. *Bromus confinis* Nees ex Steudel, Syn. Pl. Glumac. 1: 320. 1854.

毗邻雀麦 pi lin que mai

Bromopsis confinis (Nees ex Steudel) Holub; *Bromus inermis* Leysser var. *confinis* (Nees ex Steudel) Stapf; *B. munroi* Boissier.

Perennial, with short rhizomes. Culms erect, ca. 60 cm tall, ca. 5 mm in diam., 3- or 4-noded. Leaf sheaths smooth, glabrous; leaf blades firm, 20–40 cm × 3–4 mm, adaxial surface and margins scattered pubescent; ligule ca. 2 mm. Panicle 10–16 cm; branches scabrid, varying in length, 2–4 per node, often with a single apical spikelet. Spikelets 15–25 mm, often purple, florets 5–7(–11); glumes narrowly lanceolate, pubescent or scabrid along keels; rachilla pubescent; lower glume ca. 7 mm, 1-veined, upper glume ca. 9 mm, 3-veined; lemmas 10–15 mm, abaxially pubescent, marginal veins densely hairy, awned from apex; awn 2.5(–6) mm, straight; palea as long as lemma, keels ciliate. Anthers ca. 4 mm. Fl. Jun–Aug.

Open grassy places; 1000–2000 m. Gansu [NW India, Pakistan; SW Asia].

22. *Bromus morrisonensis* Honda, Bot. Mag. (Tokyo) 43: 137. 1928.

玉山雀麦 yu shan que mai

?*Bromus piananensis* (Ohwi) L. Liu; ?*B. remotiflorus* (Steudel) Ohwi var. *piananensis* Ohwi.

Perennial. Culms tufted ca. 30 cm tall, ca. 1 mm in diam. Leaf sheaths densely pubescent; leaf blades ca. 15 cm × ca. 3 mm; ligule ca. 0.5 mm. Panicle spreading, ca. 15 cm; branches 5–8 cm, each bearing 2–4 spikelets in upper part. Spikelets 20–25 mm, florets 9–11; rachilla ca. 2 mm, shortly hairy; lower glume narrow, ca. 5 mm, 1-veined, upper glume ca. 7 mm, 3-veined; lemmas 7–9 × ca. 1.2 mm in side view, thickly chartaceous, 5-veined, intermediate veins inconspicuous, awned from apex; awn 5(–9) mm, straight; palea slightly shorter than lemma, keels sparsely ciliate. Anthers ca. 2 mm. Fl. and fr. Jul–Aug.

● Grassy places on gravel slopes; ca. 2800 m. Taiwan.

The identity of *Bromus piananensis* is uncertain. The type, a specimen from Taiwan, has not been seen.

23. *Bromus nepalensis* Melderis in H. Hara et al., Enum. Fl. Pl. Nepal 1: 125. 1978.

尼泊尔雀麦 ni bo er que mai

Perennials. Culms tufted, erect from an oblique base, ca. 50 cm tall, glabrous. Lower leaf sheaths shortly pilose, upper sheaths glabrous; leaf blades flat, 5–10 cm × 2.5–4 mm, veins fine, abaxial surface glabrous, adaxial surface scattered pubescent, apex acuminate; ligule 0.5–1 mm, lacerate. Panicle spreading, 8–15 cm, nodding, rachis glabrous; branches 3–5 per lower node, 2–4 cm, slender, recurved, scabrid, each bearing 1 or 2 spikelets. Spikelets 3–4 cm, keel distally scabrid, compressed; rachilla internodes ca. 2 mm, thick, pubescent; lower glume lanceolate, 5–6 mm, 3-veined, apex acuminate, upper glume ca. 8 mm, broadly lanceolate, 5–7-veined, apex acute or obtuse; lemmas 11–13 mm, conspicuously 5–7-veined, abaxial surface pubescent, awned from apex; awn 8–12 mm, straight; palea subequal to lemma. Anthers 0.8–1 mm, brownish purple. Fl. May–Aug.

River banks, grassy places, thickets on slopes; ca. 3000 m. Xizang [Nepal].

24. *Bromus himalaicus* Stapf in J. D. Hooker, Fl. Brit. India 7: 358. 1896 [“1897”].

喜马拉雅雀麦 xi ma la ya que mai

Bromopsis himalaica (Stapf) Holub; *Zerna himalaica* (Stapf) Henrard.

Perennial, loosely tufted. Culms erect, 50–70 cm tall, 3–4-noded, nodes pubescent with retrorse hairs. Leaf sheaths pubescent; leaf blades flat, 10–20 cm × 4–6 mm, adaxial surface pubescent, abaxial surface and margin scabrid; ligule 1–3.5 mm, brown. Panicle 10–25 cm, simple; branches 1–3 per node, spreading or drooping, bearing 1–3 spikelets. Spikelets 1.5–2.5 cm, florets 6–12; lower glume narrow, 5–8 mm, 1-veined, apex acute to awned, upper glume 7–12 mm, 3(–5)-veined, keel scabrid, apex often shortly awned; lemmas 8–10 mm, herbaceous, 5–7-veined, hairy near margins, apex acuminate; awn as long as or longer than lemma, 10–15 mm, scabrid, recurved outward; palea shorter than lemma, apex obtusely rounded, keels spinulose. Anthers 2–3 mm. Fl. and fr. Jun–Aug. $2n = 14$.

Alpine meadows; 3000–3500 m. Xizang (Yadong), Yunnan (Gaoiligong Shan) [Bhutan, India (Darjeeling, Sikkim), Nepal].

25. *Bromus porphyranthos* Cope, Fl. Pakistan 143: 574. 1982.

大药雀麦 da yao que mai

Bromus himalaicus Stapf var. *grandis* Stapf in J. D. Hooker, Fl. Brit. India 7: 359. 1896 [“1897”]; *B. grandis* (Stapf) Melderis (1978), not (Shear) Hitchcock (1912).

Perennial. Culms loosely tufted, 50–70 cm tall. Leaf sheaths glabrous or hairy when young; leaf blades 10–20 cm × 3–5 mm, abaxial surface and margins scabrid, adaxial surface hairy. Panicle simple, lax, 10–20 cm; branches arched, often with a single apical spikelet. Spikelets 18–25 mm, florets 5–9; rachilla internodes later exposed; glumes pubescent, lower glume 12–15 mm, 1-veined, apex acuminate, upper glume 14–17 mm, 3-veined, apex shortly aristiform; lemmas 12–16 mm, 7-veined, densely pubescent throughout, apex shortly 2-toothed, awned from sinus; awn 12–18 mm, stout, scabrid, straight, later recurved; palea shorter than lemma, keels ciliate, abaxial surface minutely hairy. Anthers 1.5–2 mm. Fl. May–Aug.

Sandy places, meadows; ca. 3700 m. Xizang, Yunnan [Bhutan, India (Sikkim), Nepal, Pakistan].

26. *Bromus epilis* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 348. 1982.

光稃雀麦 guang fu que mai

Perennial. Culms loosely tufted, 50–70 cm tall, 1–2 mm in diam., 3-noded, uppermost node ca. 1/2 way up culm. Leaf sheaths glabrous, uppermost sheath ca. 10 cm; leaf blades 15–30 cm × 2–4 mm, rolled when dry, glabrous, abaxial surface and margins scabrid; ligule ca. 1 mm, ciliate. Panicle spreading, 15–20 cm, nodding; branches 2–4 per node, basal primary branch 4–6 cm, each bearing 1 or 2 spikelets. Spikelets 15–20 × ca. 10 mm, tinged with purple, florets 5–7; rachilla ca. 3 mm, spiny scabrid; glumes lanceolate, subequal to lower florets, upper keel scabrid, apex acuminate-mucronate, lower glume 10–12 mm, 1-veined, upper glume 12–15 mm, 3–5-veined; lemmas oblong-lanceolate, 12–15 × ca. 2 mm in side view, 5–7-veined, glabrous, margins narrowly membranous, yellowish brown, awned from apex; awn 8–14 mm, later recurved; palea ca. 10 mm, keels ciliate. Anthers 2.5–3 mm. Fl. and fr. Jul–Aug.

• Mountain slopes, *Pinus yunnanensis* forests, grassy places, scrub; 2800–3300 m. NW Yunnan.

27. *Bromus mairei* Hackel ex Handel-Mazzetti, Symb. Sin. 7: 1290. 1936.

梅氏雀麦 mei shi que mai

Zerna mairei (Hackel ex Handel-Mazzetti) Henrard.

Perennials. Culms loosely tufted, up to 100 cm tall, 7–8-noded. Leaf sheaths sparsely pubescent; leaf blades 20–30 cm × 4–6 mm, adaxial surface thinly pubescent; ligule ca. 1 mm, finely toothed. Panicle spreading, ca. 20 cm; branches 3–5 per node, 5–7 cm, nodding, finely spinulose, each bearing 1–3 spikelets in upper part. Spikelets 20–25 × ca. 10 mm wide, florets 6–8; rachilla ca. 3 mm, sparsely hairy; glumes with membranous margins, apex acuminate into 1–3 mm awn, lower glume 8–10 mm, 1-veined, upper glume 10–13 mm, 3-veined; lemmas lanceolate, 9–12 × 2–3 mm in side view, 7-veined, 3 median veins conspicuously thick, scabrid to hirsute throughout or near margins, awned from apex; awn 10–15 mm, recurved; palea ca. 8 mm, keels ciliate. Anthers ca. 3 mm. Fl. Aug.

• Thickets along margins of *Abies* forests, river beaches, grassy places; 3900–4300 m. Qinghai, Sichuan, Xizang, N Yunnan.

This species is sometimes misinterpreted as *Bromus sinensis*.

28. *Bromus sinensis* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 349. 1982.

华雀麦 hua que mai

Perennial. Culms loosely tufted, 30–70 cm tall, ca. 2 mm in diam., glabrous or with retrorse hairs, 3- or 4-noded. Leaf sheaths pubescent, auricles present; leaf blades erect, flat or rolled when dry, 10–25 cm × 2–5 mm, ± pubescent, midrib raised abaxially; ligule 1–3 mm, abaxial surface and margin hairy, toothed. Panicle spreading, 12–24 cm, nodding; branches (1–)2–4 per node, up to 10 cm, scabrid, each bearing 1–3 spikelets, or basal branch with branchlets and 4–5 spikelets.

Spikelets 12–20 × 6–8 mm, hairy throughout, florets (2–)5–8, lax, flabellate at anthesis; rachilla internodes 1–3 mm, pubescent; glumes shortly hairy, apex acuminate to aristiform, lower glume ca. 8 mm, 1-veined, upper glume 10–15 mm, 3-veined; lemmas lanceolate, 10–15 × ca. 1.5 mm in side view, 5-veined, back pubescent, awned from apex; awn 8–15 mm, recurved; palea 8–10 mm, keels ciliolate. Anthers 2–3 mm. Fl. Jul.

• *Cupressus* forests, grassy places, sunny slopes, exposed crevices; 3500–4300 m. Qinghai, W Sichuan, Xizang, Yunnan.

- 1a. Panicle branches 2–4 per node; culms 50–70 cm tall; spikelets ca. 15 mm, florets 5–8 28a. var. *sinensis*
 1b. Panicle branches 1 or 2 per node; culms ca. 30 cm tall; spikelets 10–14 mm, florets 2 or 3 28b. var. *minor*

28a. *Bromus sinensis* var. *sinensis*

华雀麦(原变种) hua que mai (yuan bian zhong)

Culms loosely tufted, 50–70 cm tall. Leaf blades 15–25 cm × 3–5 mm. Panicle branches 2–4 per node, bearing 1–3 spikelets, or lower branches with branchlets and 4 or 5 spikelets. Spikelets 15–20 mm, florets 5–8.

• Grassy places, sunny slopes, exposed crevices; 3500–4300 m. Qinghai, W Sichuan (Kangding, Xiangcheng), Xizang, Yunnan.

28b. *Bromus sinensis* var. *minor* L. Liu, Fl. Xizang. 5: 136. 1987.

小华雀麦 xiao hua que mai

Culms tufted, ca. 30 cm tall. Leaf blades ca. 10 cm × 2–3 mm. Panicle branches 1 or 2 per node, slender, bearing 1 or 2 spikelets at apex. Spikelets 10–14 mm, florets 2 or 3.

• *Cupressus* forests, sunny slopes; ca. 3800 m. Qinghai, Xizang.

29. *Bromus tectorum* Linnaeus, Sp. Pl. 1: 77. 1753.

旱雀麦 han que mai

Annual. Culms erect, 20–60 cm tall, 3- or 4-noded. Leaf sheaths pubescent; leaf blades 5–20 cm, 2–4 mm wide, pubescent; ligule 1.5–2 mm. Panicle spreading, 8–15 cm, secund; branches 3–5 at lower nodes, slender, mostly curved, scabrid, pubescent, each bearing 1–8 slightly nodding spikelets. Spikelets 10–35(–50) mm; florets 4–8; rachilla internodes 2–3 mm; glumes narrowly lanceolate, margins membranous, lower glume 8–15 mm, 1–3-veined, upper glume 11–17 mm, 3–7-veined, apex acute, obtuse, or shortly aristiform; lemmas 9–22 mm, 1–1.5 mm wide in side view, 5–7-veined, scabrid or pubescent, margins thinly membranous, shiny, apex acuminate, acute, or obtuse, 2-toothed, awned from sinus, awn 12–25(–40) mm, slender, straight; palea shorter than or subequal to lemma, keels ciliate. Stamens 3; anthers 0.5–2 mm. Fl. and fr. May–Sep.

Grassy places, dry slopes, river beaches, dry sandy places, wastelands, roadsides; 100–3400(–4200) m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [NW India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in America and Australia].

This species is a widespread weed, adventive in most temperate regions of the world.

- 1a. Lower glume 1-veined, upper glume 3-veined; lemmas 9–13 mm, awn 12–18 mm 29a. subsp. *tectorum*
 1b. Lower glume 3-veined, upper glume 5–7-veined; lemmas 15–22 mm, awn 15–25(–40) mm 29b. subsp. *lucidus*

29a. *Bromus tectorum* subsp. *tectorum*

旱雀麦(原亚种) han que mai (yuan ya zhong)

Anisantha tectorum (Linnaeus) Nevski; *Festuca tectorum* (Linnaeus) Jessen; *Genea tectorum* (Linnaeus) Dumortier; *Schedonorus tectorum* (Linnaeus) Fries.

Culms erect, 20–60 cm tall. Panicle branches scabrid, pubescent, slender, with 4–8 spikelets. Spikelets 10–18 mm; lower glume 12–15 mm, 1-veined, apex acuminate, upper glume 14–17 mm, 3-veined, apex shortly aristiform; lemmas 9–13 mm, 7-veined, densely pubescent throughout, awn 12–18 mm; palea shorter than lemma, abaxial surface minutely hairy. Fl. and fr. Jun–Sep. $2n = 14$.

Grassy places, dry slopes, river beaches, wastelands, roadsides; 100–2300(–4200) m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in America and Australia].

29b. *Bromus tectorum* subsp. *lucidus* Sales, Fl. Veg. Mundi 9: 32. 1991.

绢雀麦 juan que mai

Bromus sericeus Drobow in Vvedensky et al., Key Fl. Tashkent 1: 36. 1923, not Tenore (1811); *Anisantha sericea* Nevski.

Culms erect or geniculately ascending, 20–30 cm tall. Panicle branches shorter than spikelets, thinly hairy or scabrid, curved or reflexed, apex with 1 or 2 spikelets; rachis glabrous. Spikelets 20–35(–50) mm; lower glume 8–10(–14) mm, 3-veined, apex acuminate, upper glume broadly lanceolate, 11–15 mm, 5–7-veined, apex acute or obtuse; lemmas 15–22 mm, conspicuously 5–7-veined, abaxial surface pubescent, awn 15–25(–40) mm, straight; palea subequal to lemma. Fl. and fr. May–Aug. $2n = 14$.

Dry sandy places; 2700–3400 m. Xizang, Yunnan [NW India, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan; SW Asia (Iran, Iraq, Turkey)].

30. *Bromus sterilis* Linnaeus, Sp. Pl. 1: 77. 1753, nom. cons.

贫育雀麦 pin yu que mai

Anisantha sterilis (Linnaeus) Nevski; *Festuca sterilis* (Linnaeus) Jessen; *Genea sterilis* (Linnaeus) Dumortier; *Schedonorus sterilis* (Linnaeus) Fries; *Zerna sterilis* (Linnaeus) Panzer.

Annual. Culms simple or loosely tufted, erect or geniculately ascending, 50–100 cm tall, ca. 5 mm in diam., glabrous. Leaf sheaths pubescent; leaf blades soft, 5–20 cm × 4–10

mm, pubescent; ligule 2–4 mm. Panicle lax, open, 10–20 × 7–12 cm, nodding; branches spreading, up to 10 cm, each bearing 1–3 nodding spikelets. Spikelets oblong, wedge-shaped when mature, 20–35 × 4–8 mm, florets 5–9; lower glume subulate, 8–14 mm, 1-veined, upper glume oblong-lanceolate, 10–20 mm, 3-veined; lemmas lanceolate, 15–20 × 2–4 mm in side view, 7-veined, margins white membranous, apex 2-toothed, teeth 1–2 mm, awned from sinus; awn 15–30 mm, as long as or longer than lemma body, slender, straight; palea subequal to lemma, keels sparsely ciliate. Stamens 3, anthers ca. 1 mm. Fl. May–Jun. $2n = 14$.

Wastelands; 600–3200 m. Jiangsu, Sichuan [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in America and Australia].

This species is a widespread weed, adventive in most temperate regions of the world.

31. *Bromus rigidus* Roth, Bot. Mag. (Römer & Usteri) 4(10): 21. 1790.

硬雀麦 ying que mai

Anisantha diandra (Roth) Tutin ex Tzvelev subsp. *rigida* (Roth) Tzvelev; *A. rigida* (Roth) Hylander; *Bromus diandrus* Roth subsp. *rigidus* (Roth) O. Bolòs, R. M. Masalles & J. Vigo; *B. diandrus* var. *rigidus* (Roth) F. Sales; *B. gussonii* Parlatores var. *rigidus* (Roth) H. Lindberg; *B. madritensis* Linnaeus var. *rigidus* (Roth) Babington ex Syme; *B. rubens* Linnaeus var. *rigidus* (Roth) Mutel; *B. villosus* Scopoli var. *rigidus* (Roth) Ascherson & Graebner; *Genea rigida* (Roth) Dumortier.

Annual. Culms tufted, erect, 20–70 cm tall, pubescent below inflorescence. Leaf sheaths with spreading hairs; leaf blades 10–25 cm × 4–6 mm, both surfaces densely pubescent; ligule 3–5 mm. Panicle contracted, stiffly erect, 10–25 cm; branches short, scabrid, hairy, bearing erect spikelets. Spikelets wedge-shaped, 15–30 × 7–8 mm, florets 5–7; glumes linear-lanceolate, lower glume 15–20 mm, 1-veined, upper glume 20–25 mm, 3-veined; floret callus pointed, scar elliptic; lemmas narrowly lanceolate, 20–30 × 1–1.5 mm in side view, conspicuously 7-veined, scabrid, apex 2-toothed, awned from sinus; awn 20–40 mm, straight, stiff, scabrid; palea shorter than lemma. Stamens 2, anthers ca. 1 mm. Fl. and fr. Apr–Jul. $2n = 42$, 56, 70.

Stream-sides, moist places; ca. 1000 m. Jiangxi, Taiwan [N Africa, C and SW Europe, SW Asia, Mediterranean region; introduced in America and Australia].

Bromus diandrus Roth has been recorded from Xizang, but this is most probably based on a misidentification. It is distinguished from *B. rigidus* by a laxer, spreading panicle and a rounded floret callus with a circular scar.

32. *Bromus madritensis* Linnaeus, Cent. Pl. 1: 5. 1755.

马德雀麦 ma de que mai

Anisantha madritensis (Linnaeus) Nevski; *Festuca madritensis* (Linnaeus) Desfontaines; *Genea madritensis* (Linnaeus) Dumortier; *Zerna madritensis* (Linnaeus) Panzer ex B. D. Jackson.

Annual. Culms loosely tufted, simple, erect or geniculately ascending, 40–60 cm tall, glabrous. Leaf sheaths hairy, at least

the lower; leaf blades linear-lanceolate, flat, ca. 20 cm × 2–4 mm, glabrous or pubescent, margins scabrid, apex acuminate; ligule 1.5–4 mm. Panicle dense or slightly lax, erect, 4–15 × 2–6 cm; branches 2–3 per node, 1–3 cm, hairy, sometimes branched. Spikelets oblong, flabellate at maturity, 35–60 mm, florets 6–13, lax; lower glume subulate, 6–11 mm, 1-veined, upper glume linear-lanceolate, 10–16 mm, 3-veined; lemmas oblong, 12–19 × 3–3.5 mm in side view, 7-veined, glabrous or pubescent, margins inrolled, apex acuminate, 2-toothed; awn 12–18 mm, straight or weakly recurved; palea shorter than lemma. Stamens 2, anthers ca. 1 mm. Fl. May–Aug. $2n = 14$, 28.

Sunny slopes, dry sandy grassy places; ca. 3500 m. Xizang [N Africa, America, SW Asia (Iran, Iraq), Europe].

33. *Bromus fasciculatus* C. Presl, Cyper. Gramin. Sicul. 39. 1820.

束生雀麦 shu sheng que mai

Anisantha fasciculata (C. Presl) Nevski; *Bromus rubens* Linnaeus subsp. *fasciculatus* (C. Presl) Trabut; *Genea fasciculata* (C. Presl) Dumortier.

Annual. Culms erect or geniculately ascending, 5–20(–25) cm tall, pubescent below inflorescence. Leaf sheaths pubescent; leaf blades 2–10 cm × 1–2 mm, hairy. Panicle racemelike, stiffly erect, 2–5 × 0.7–2 cm; branches shorter than spikelets, rigid, each bearing 1 or 2 spikelets. Spikelets broadly wedge-shaped, 10–30 mm; glumes narrowly lanceolate, lower glume 7–8 mm, upper glume 12–14 mm; lemmas 13–15 × 1–1.5 mm in side view, glabrous or hairy, margins sometimes incurved, recurved outward when mature, apex 2-toothed, teeth ca. 3 mm; awn 13–18 mm, subequal to lemma body, stout, straight or slightly divaricate at maturity; palea shorter than lemma. Stamens 3, anthers ca. 1 mm. Fl. May–Jun. $2n = 14$.

Wastelands. Xinjiang [Europe, Mediterranean region].

The presence of this species in China has not been confirmed.

34. *Bromus rubens* Linnaeus, Cent. Pl. 1: 5. 1755.

红雀麦 hong que mai

Anisantha rubens (Linnaeus) Nevski; *Bromus madritensis* Linnaeus subsp. *rubens* (Linnaeus) Husnot; *B. scoparius* Linnaeus var. *rubens* (Linnaeus) Saint-Amans; *Festuca rubens* (Linnaeus) Persoon; *Zerna rubens* (Linnaeus) Grossheim.

Annual. Culms tufted, erect or ascending, 15–35 cm tall, pubescent below inflorescence. Leaf sheaths pubescent; leaf blades 5–10 cm × 3–5 mm, both surfaces pubescent. Panicle densely contracted, narrowly elliptic in outline, stiffly erect, 4–7 × ca. 2 cm, often tinged with purple; branches 2–5 mm, much shorter than spikelets, branches and pedicels pubescent. Spikelets 15–25 mm, florets 4–9, upper florets sterile, reduced; glumes minutely hairy, keel ciliate, lower glume 7–9 mm, upper glume 10–12 mm; lemmas 12–16 mm, scabrid to pubescent, 2-toothed, apical teeth 4–5 mm, awned from sinus; awn 10–20 mm, scabrid, spreading at maturity; palea shorter than lemma, keels sparsely villous. Stamens (2 or) 3, anthers to 2 mm. Fl. May–Jul. $2n = 14$, 28.

Dry slopes; ca. 3900 m. Xinjiang [Tajikistan, Turkmenistan; N Africa, SW Asia, S Europe; introduced in America and Australia].

Many Chinese gatherings identified as *Bromus rubens* were misidentified specimens of *B. tectorum*. The presence of this species in China has not been confirmed.

35. *Bromus gracillimus* Bunge, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 7: 527. 1851.

细雀麦 xi que mai

Nevskiella gracillima (Bunge) V. I. Kreczetowicz & Vvedensky.

Annual. Culms slender, erect or geniculately ascending, 20–40 cm tall, sparsely hairy. Leaf sheaths pubescent; leaf blades flat, 10–15 cm × ca. 3 mm, both surfaces pubescent, margins scabrid; ligule ca. 2 mm. Panicle ovate in outline, lax, 4–10 × 3–5 cm; branches whorled, 4–8 per node, 2–6 cm, glabrous, each bearing 1–4 spikelets. Spikelets broadly elliptic, 5–8 mm, florets 3–6; internodes exposed; lower glume lanceolate, 3–4 mm, 1-veined, upper glume narrowly ovate, 4–5 mm, 3-veined, margins membranous, apex acuminate; lemmas oblanceolate, 3.5–4.5 mm, 5–7-veined, margins strongly inrolled and sparsely ciliate, apex minutely 2-toothed, awned from sinus; awn 15–20 mm, slender, straight; palea subequal to lemma, keels ciliate. Anthers 0.3–0.5 mm. Fl. and fr. Jun–Aug. $2n = 14$.

Mountain slopes, river banks, grassy places among thickets; 2000–3400(–4200) m. Xinjiang, W Xizang [Afghanistan, Kashmir, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

36. *Bromus secalinus* Linnaeus, Sp. Pl. 1: 76. 1753.

黑麦状雀麦 hei mai zhuang que mai

Avena secalina (Linnaeus) Salisbury; *Bromus mollis* Linnaeus var. *secalinus* (Linnaeus) Hudson; *Forasaccus secalinus* (Linnaeus) Bubani; *Serrafalcus secalinus* (Linnaeus) Babington.

Annual. Culms stout, erect, 30–60(–100) cm tall. Leaf sheaths usually glabrous; leaf blades 5–15 cm × 3–6 mm, pubescent; ligule 1–2 mm. Panicle lax, 5–15 × 2–6 cm, oblique, nodding; branches subwhorled, up to 8 cm, each bearing 1–4 spikelets. Spikelets narrowly oblong, 15–20 × 6–8 mm, florets 5–15, not overlapping at maturity; rachilla internodes exposed; glumes subequal, firm, veins inconspicuous, scabrid, lower glume 4–5 mm, 3–5-veined, upper glume 6–7 mm, 7-veined, apex obtuse, mucronate; lemmas elliptic, 8–9 × 4–5 mm in side view, herbaceous, 7-veined, glabrous, margins inrolled, apex obtuse, awned from back below apex; awn 5–7 mm, shorter than lemma body, slightly reflexed; palea as long as or slightly shorter than lemma. Anthers ca. 2 mm. Caryopsis ca. 5 × 1 mm, longitudinally inrolled, brownish red. Fl. and fr. May–Aug. $2n = 28$.

Slopes, grassy places; 500–1500 m. Gansu, Taiwan, Xinjiang, Xizang [Japan, Russia; SW Asia, Europe; introduced in America].

This species is adventive in many temperate countries as a field weed.

37. *Bromus lepidus* Holmberg, Bot. Not. 1924: 326. 1924.

鳞稃雀麦 lin fu que mai

Bromus gracilis Krösche, Repert. Spec. Nov. Regni Veg.

19: 329. 1924, not Leysser (1761), nor Weigel (1772); *Bromus hordeaceus* Linnaeus subsp. *lepidus* (Holmberg) A. Pedersen.

Annual or biennial. Culms slender, erect, 20–50 cm tall, 2–6-noded. Leaf sheaths pubescent or upper sheaths glabrous; leaf blades flat, 5–20 cm × 2–4 mm, pubescent; ligule up to 1 mm. Panicle erect, narrow, lax or dense, 2–10 cm; branches clustered, up to 4 cm, each bearing 1–3 spikelets. Spikelets lanceolate, 7–15 × 2.5–4 mm, glabrous, shiny, florets 3–11, overlapping at first, later slightly separated; glumes unequal, lower glume ca. 6 mm, upper glume 7–8 mm; lemmas broadly ovate, 7–8 mm, 7-veined, scaberrulous, margins membranous, sharply incurved at maturity, apex 2-toothed; awn 2–5 mm, straight; palea shorter than lemma, keels ciliate. Anthers 0.5–2 mm. Caryopsis longer than palea. $2n = 28$.

Waste ground; ca. 700 m. Xinjiang [Europe; introduced in America].

38. *Bromus brachystachys* Hornung, Flora 16: 417. 1833.

短轴雀麦 duan zhou que mai

Annual. Culms loosely tufted with basal branches, erect or geniculately ascending, ca. 10 cm tall, glabrous. Leaf sheaths sparsely pubescent; leaf blades flat, 3–4 cm × ca. 2 mm, both surfaces densely pubescent; ligule ca. 1 mm. Panicle contracted, ca. 3 cm, with few spikelets; pedicels short, minutely pubescent. Spikelets ca. 10 × 4 mm, florets 5–8; glumes with membranous margins, apex acuminate, lower glume ca. 4 mm, 3-veined, upper glume 4–5 mm, 5-veined; lemmas broadly elliptic, 4–5 × 3–4 mm in side view, 7-veined, smooth or scabrid, margins membranous, ciliate, apex 2-toothed, teeth ca. 0.5 mm, awned from sinus; awn 4–7 mm, recurved at maturity; palea 4–5 mm, keels sparsely ciliate. Anthers ca. 1 mm. Fl. and fr. Jul–Sep.

Riversides, grassy places; ca. 1000 m. Gansu [Afghanistan; SW Asia, Europe].

The treatment here is doubtful and is probably based on a misidentification of *Bromus pseudobrachystachys* H. Scholz (Bot. Jahrb. Syst. 91: 462. 1972), recorded from Afghanistan, Iran, Iraq, Syria, and Turkey. *Bromus brachystachys* is a little-known species described from Germany.

39. *Bromus squarrosus* Linnaeus, Sp. Pl. 1: 76. 1753.

偏穗雀麦 pian sui que mai

Bromus wolgensis Fischer ex J. Jacquin; *Forasaccus squarrosus* (Linnaeus) Bubani; *Serrafalcus squarrosus* (Linnaeus) Babington.

Annual. Culms erect or geniculately ascending, 20–60 cm tall, 3–4(–5)-noded. Leaf sheaths pubescent; leaf blades flat, up to 15 cm × 2–5 mm, pubescent; ligule ca. 1 mm. Panicle lax, (5–)20 × 4–6 cm, usually 1-sided; branches few, shorter than or equaling spikelets, each bearing 1 or 2 pendent spikelets. Spikelets ovate, upper part gradually narrowed, (15–)20–50 × 5–15 mm, florets (6–)10–25; rachilla ca. 2 mm, smooth or scabrid; glumes oblong to elliptic, margins membranous, glabrous, lower glume 5–7 mm, 5-veined, apex acuminate, upper glume 6–8 mm, 9-veined, apex obtuse; lemmas obovate, 8–11 × (2–)3–6 mm in side view, 9-veined, glabrous or pubescent, margins

white-membranous and angled near halfway point, apex entire or shallowly 2-toothed, awned from sinus ca. 2 mm below apex; awn 7–12 mm, longer on upper lemmas than lower lemmas, base flattened, slightly twisted, divaricate at maturity; palea 1/3 length of lemma, keels stiffly ciliate. Anthers 1–1.5 mm. Fl. and fr. May–Jul. $2n = 14$.

Field margins, grasslands, waste ground; 500–3000 m. Gansu, Xinjiang [Kazakhstan, Mongolia, Russia; N Africa, SW Asia, Europe; introduced in America].

The name *Bromus wolgensis* has been applied to a variant with pubescent spikelets.

40. *Bromus arvensis* Linnaeus, Sp. Pl. 1: 77. 1753.

田雀麦 tian que mai

Avena arvensis (Linnaeus) Salisbury; *Bromus arvensis* Linnaeus var. *phragmitoides* (A. Nyárády) Borza; *B. erectus* Hudson var. *arvensis* (Linnaeus) Hudson; *B. phragmitoides* A. Nyárády; *Forasaccus arvensis* (Linnaeus) Bubani; *Serrafalcus arvensis* (Linnaeus) Godron.

Annual. Culms loosely tufted, 40–100 cm tall, 2–5-noded. Leaf sheaths hairy; leaf blades 10–20 cm × 3–6 mm, scattered pubescent, margins and adaxial surface scabrid; ligule 2–4 mm. Panicle lax, 15–30 × 10–20 cm; branches clustered, spreading or nodding, scabrid, each bearing 5–8 spikelets. Spikelets oblong-lanceolate, 12–22 × 3–4 mm, tinged with purple, florets 5–8, overlapping; rachilla ca. 2 mm; glumes unequal, margins membranous, apices acuminate, lower glume 4–6 mm, 3-veined, upper glume 6–8 mm, 5–7-veined; lemmas broadly elliptic or obovate, 7–9 mm, back rounded, 7-veined, glabrous, margins membranous with obtuse angle, apex minutely 2-toothed, awned from ca. 2 mm below apex; awn 7–10 mm, slender, straight; palea subequal to lemma, keels ciliate. Anthers 3–4.5 mm. Caryopsis blackish brown, 7–9 × ca. 1 mm. Fl. and fr. Jun–Aug. $2n = 14$.

Roadsides, fields, forest margins, moist places. Gansu, Jiangsu [Russia; N Africa, SW Asia, Europe; introduced in America].

41. *Bromus racemosus* Linnaeus, Sp. Pl., ed. 2, 1: 114. 1762.

总状雀麦 zong zhuang que mai

Brachypodium commutatum (Schrader) P. Beauvois; *Bromus arvensis* Linnaeus var. *racemosus* (Linnaeus) Neileich; *B. commutatus* Schrader; *B. mollis* Linnaeus var. *commutatus* (Schrader) Sanio; *B. mutabilis* F. W. Schultz var. *commutatus* (Schrader) F. W. Schultz; *B. popovii* Drobow; *B. racemosus* subsp. *commutatus* (Schrader) Maire & Weiller; *B. racemosus* var. *commutatus* (Schrader) Cosson & T. Durand; *B. squarrosus* Linnaeus var. *racemosus* (Linnaeus) Regel; *Forasaccus commutatus* (Schrader) Bubani; *F. racemosus* (Linnaeus) Bubani; *Serrafalcus commutatus* (Schrader) Babington; *S. racemosus* (Linnaeus) Parlatores; *S. racemosus* subsp. *commutatus* (Schrader) Rouy; *S. racemosus* var. *commutatus* (Schrader) Husnot.

Annual. Culms slender, loosely tufted, erect or ascending, 25–80(–100) cm tall, glabrous or pubescent, 2–5-noded. Leaf sheaths hairy toward base, upper sheaths sparsely hairy or glabrous; leaf blades 5–30 cm × 2–8 mm, pubescent; ligule 1–3

mm. Panicle erect, narrow, 12–15 × 2–4 cm, sometimes nodding at maturity; branches 2–6 per node, lowest up to 6 cm, each bearing 1–4 spikelets. Spikelets oblong, slightly compressed, 12–20 × 4–6 mm, florets 5–10, overlapping; glumes unequal, apex acuminate, lower glume 4–6 mm, 3-veined, upper glume 4.5–7 mm, 5–7-veined; lemmas elliptic, 6–10 × 2–2.5 mm in side view, scabrid, 7–9-veined, apex obtuse, awned from ca. 1 mm below apex; awn 3–9 mm, straight; palea shorter than lemma. Anthers 1.5–3 mm. Caryopsis thin, flat, ca. 7 × 2 mm, slightly shorter than palea. Fl. and fr. Jun–Aug. $2n = 14$, 28, 56.

River valleys, moist grasslands, roadsides, grassy places; 2700–4400 m. Gansu, Qinghai, Xinjiang, Xizang [Afghanistan, Bhutan; N Africa, Europe].

42. *Bromus japonicus* Thunberg in Murray, Syst. Veg., ed. 14, 119. 1784.

雀麦 que mai

Serrafalcus japonicus (Thunberg) Wilmott.

Annual. Culms erect, 40–90 cm tall. Leaf sheaths pubescent; leaf blades 12–30 cm × 4–8 mm, both surfaces pubescent; ligule 1–2.5 mm. Panicle effuse, 20–30 × 5–10 cm, nodding; branches 2–8, 5–10 cm, slender, each bearing 1–4 spikelets. Spikelets lanceolate-oblong, 12–20 × ca. 5 mm, yellowish green, florets 7–11, closely overlapping; rachilla internodes shortly clavate, ca. 2 mm; glumes subequal, keel scabrid, margins membranous, lower glume 5–7 mm, 3–5-veined, upper glume 5–7.5 mm, 7–9-veined; lemmas elliptic, 8–10 × ca. 2 mm in side view, herbaceous, 9-veined, usually glabrous, margins membranous with conspicuous angle at maturity, scabrid, apex obtuse, minutely 2-toothed, awned from 1–2 mm below apex; awn 5–10 mm, longer on upper lemmas than lower lemmas, base slightly flattened, conspicuously recurved at maturity; palea shorter than lemma, ca. 1 mm wide, keels stiffly ciliate. Anthers ca. 1 mm. Caryopsis 7–8 mm. Fl. and fr. May–Jul. $2n = 14$.

Forest margins, roadsides, waste ground, river beaches; near sea level to 2500(–3500) m. Anhui, Gansu, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Japan, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in North America].

43. *Bromus sewerzowii* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 75: 601. 1881.

密穗雀麦 mi sui que mai

Annual. Culms 30–70 cm tall, pubescent on nodes and below panicle. Leaf sheaths pubescent; leaf blades flat, 10–20 cm × 3–5 mm, pubescent; ligule 2–3 mm, abaxial surface and margin ciliate. Panicle contracted, oblong in outline, erect, ca. 10 × 3–4 cm; branches short, pubescent, each bearing 1–3 erect spikelets. Spikelets lanceolate, 15–25 mm, florets 6–10; glumes unequal, acuminate, lower glume linear-lanceolate, ca. 7 mm, 3-veined, upper glume 5-veined, slightly longer than lower glume; lemmas lanceolate, 9–11 mm, glabrous or pubescent, margins broadly membranous, apex 2-toothed, teeth acute, awned from sinus ca. 1 mm below apex; awn 8–15 mm, straight

or slightly divergent; palea ca. 2 mm shorter than lemma. Anthers ca. 1 mm. Caryopsis long elliptic, ca. 5 × ca. 1 mm, pale brown. Fl. and fr. Jun–Jul. $2n = 28$.

Desert grasslands; 700–1400 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; SW Asia (NE Iran)].

44. *Bromus tythanthus* Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 30. 1934.

裂稃雀麦 lie fu que mai

Bromus gracilis Popov (1922), not Weigel (1772).

Annual. Culms 10–30 cm tall. Leaf sheaths pubescent; leaf blades 6–10 cm × ca. 2 mm, both surfaces pubescent. Panicle contracted, 3–7 cm, 1-sided, spikelets few; branches short, straight, scabrid, shorter than spikelets. Spikelets lanceolate, 12–18 mm, florets 4–8; glumes linear-lanceolate, apex acute to acuminate, veins 3, lateral veins sometimes inconspicuous, lower glume ca. 4 mm, upper glume ca. 5 mm; lemmas lanceolate, 8–10 mm, pubescent, apex 2-toothed, teeth lanceolate, 0.5–1 mm, awned from ca. 3 mm below apex; awn as long as lemma body, base slightly flattened, recurved at maturity; palea shorter than lemma. Anthers 0.5–1 mm. Fl. Jun–Jul.

Mountain thickets, stony slopes. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; SW Asia (NE Iran)].

45. *Bromus scoparius* Linnaeus, Cent. Pl. 1: 6. 1755.

帚雀麦 zhou que mai

Serrafalcus scoparius (Linnaeus) Parlatores.

Annual. Culms erect or geniculately ascending, 20–50 cm tall. Leaf sheaths glabrous or scattered hirsute; leaf blades 10–20 cm × 2–5 mm, adaxial surface hairy. Panicle densely contracted, oblong or ovate in outline, sometimes interrupted, base wedge-shaped, top rounded, 4–7 × 2–3 cm, with many spikelets; branches very short, straight, spikelets subsessile. Spikelets oblong-lanceolate, 12–20 × 2–3 mm, florets 7–12, overlapping; rachilla internodes thick, ca. 1 mm, not exposed; glumes lanceolate, margins membranous, lower glume 4–5 mm, 3-veined, upper glume 5–7 mm, 5–7-veined; lemmas oblong-lanceolate, 7–8(–10) × ca. 1 mm in side view, 7-veined, glabrous or pubescent, margins and apex membranous, apex 2-toothed, teeth 1.3–2.5 mm, acute, awned from sinus; awn 7–10 mm, slightly flattened at base, recurved at maturity; palea slightly shorter than lemma, keels ciliate. Anthers 0.3–0.6 mm. Fl. May–Jul. $2n = 14$.

Waste ground, moist fields; 400–2300 m. Jiangsu, W Xinjiang [NW India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

46. *Bromus hordeaceus* Linnaeus, Sp. Pl. 1: 77. 1753.

毛雀麦 mao que mai

Avena mollis (Linnaeus) R. A. Salisbury; *Bromus mollis* Linnaeus; *B. secalinus* Linnaeus var. *hordeaceus* (Linnaeus) Linnaeus; *Serrafalcus hordeaceus* (Linnaeus) Grenier & Godron; *S. mollis* (Linnaeus) Parlatores.

Annual. Culms erect from a creeping or obliquely ascending base, 30–80 cm tall, minutely hairy immediately below in-

florescence, nodes thinly hairy. Leaf sheaths pubescent; leaf blades linear, flat, 3–5 mm wide, soft, both surfaces pubescent; ligule ca. 1 mm. Panicle erect, usually dense, 5–10 cm; branches short; pedicels mostly shorter than spikelets, pubescent, spikelets many. Spikelets oblong, 12–20 × 4–6 mm, usually hairy, florets 6–12(–16), distal florets mostly sterile; rachilla internodes ca. 1 mm, with small bristles; glumes unequal, margins membranous, pubescent, obtuse, lower glume 4–5 mm, 3–5-veined, upper glume 5–8 mm, 5–7-veined; lemmas elliptic, 8–11 × ca. 2 mm in side view, papery, glabrous, prominently 7–9-veined, pubescent, margins membranous, apex obtuse, minutely 2-toothed, awned from 1–2 mm below apex; awn 5–10 mm, stout, straight; palea shorter than lemma, keels ciliate. Anthers 0.2–1 mm. Caryopsis shorter than or as long as palea. Fl. and fr. May–Jul. $2n = 28$.

Gansu, Hebei, Qinghai, Taiwan, Xinjiang [Pakistan, Russia; SW Asia, Europe; adventive in America and Australia].

This species is widely introduced in temperate parts of the world.

47. *Bromus intermedius* Gussone, Fl. Sicul. Prodr. 1: 114. 1827.

中间雀麦 zhong jian que mai

Bromus hordeaceus Linnaeus var. *intermedius* (Gussone) Shear; *B. lanceolatus* Roth subsp. *intermedius* (Gussone) Lloret; *Serrafalcus hughii* Todaro.

Annual. Culms erect or obliquely ascending, 20–60 cm tall, glabrous. Leaf sheaths pubescent; leaf blades 5–10 cm × 2–4 mm, flat, scattered pubescent. Panicle lax, 5–10 cm, erect or nodding; branches 1 or 2(–5) per node, slender, recurved, glabrous, each bearing 1–3 spikelets; pedicels about as long as or longer than spikelet. Spikelets lanceolate, 10–15(–25) mm, with curved pubescence; rachilla internodes short, not exposed; glumes unequal, lower glume 4–5 mm, upper glume 6–8 mm; lemmas oblong-lanceolate, 7–9 mm, pubescent, margins narrowly membranous, apex deeply 2-toothed, teeth 2–3 mm; awn 5–9 mm, base slightly flattened and twisted, spreading or recurved; palea shorter than lemma. Anthers ca. 1 mm. Fl. and fr. Apr–Jul. $2n = 14$.

Moist places in fields, deciduous forests; 1200–1800 m. Xinjiang [N Africa, SW Asia, S Europe].

The presence of this species in China has not been confirmed.

48. *Bromus oxyodon* Schrenk, Bull. Sci. Acad. Imp. Sci. Saint-Petersbourg 10: 355. 1842.

尖齿雀麦 jian chi que mai

Bromus lanceolatus Roth subsp. *oxyodon* (Schrenk) Tzvelev; *B. macrostachys* Desfontaines var. *oxyodon* (Schrenk) Grisebach.

Annual. Culms loosely tufted, erect or geniculately ascending, 30–60 cm tall. Lower leaf sheaths retrorsely pubescent, upper sheaths glabrous; leaf blades linear, 10–20 cm × 4–8 mm, both surfaces pubescent. Panicle lax, spreading, 10–25 × 10–15 cm, often purplish; branches whorled, usually much longer than spikelets, filiform, flexuous, scabrid, each bearing 2–4 nodding spikelets. Spikelets lanceolate, 25–35 mm, florets 6–10, overlapping; glumes unequal, lanceolate, margins mem-

branous, apex acuminate, lower glume 9–11 mm, upper glume 11–14 mm; lemmas oblong-elliptic, 12–15 mm, 7-veined, glabrous or pubescent, margins broad, hyaline, apex 2-toothed, teeth acuminate, 1.5–3 mm, awned from sinus; awn 15–25 mm, base flattened and slightly twisted, recurved at maturity; palea 2/3 as long as lemma, keels ciliate. Anthers 1.2–1.8 mm. Caryopsis lanceolate, 8–10 × ca. 2 mm. Fl. and fr. May–Aug. $2n = 28$.

Desert grasslands, semi-dry slopes, mountain ravines, roadsides; 500–2600 m. Xinjiang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, W Mongolia, Pakistan, Tajikistan, Uzbekistan].

This is a short-lived forage grass in deserts and dry mountains.

49. *Bromus pectinatus* Thunberg, Prodr. Fl. Cap. 1: 22. 1794.

篦齿雀麦 bi chi que mai

Bromus japonicus Thunberg var. *pectinatus* (Thunberg) Ascherson & Graebner; *B. patulus* Mertens & W. D. J. Koch var. *pectinatus* (Thunberg) Stapf; *B. gedrosianus* Pénzes; *B. rechingeri* Melderis.

Annual. Culms loosely tufted, geniculately ascending, 50–80 cm. Leaf sheaths pubescent; leaf blades 15–30 cm × 4–8 mm. Panicle lax, spreading, 15–25 cm; branches and pedicels longer than spikelets, ascending or nodding, filiform, flexuous. Spikelets lanceolate, 20–30 mm, florets 6–10; glumes unequal, lower glume 5–8 mm, narrowly lanceolate, 3-veined, apex acuminate, upper glume 8–10 mm, 5-veined, apex acute; lemmas narrowly oblanceolate, (8–)10–15 mm, herbaceous, margins membranous, inrolled at maturity, apex 2-toothed, teeth acuminate, 2–3 mm, awned from sinus; awn 8–17 mm, usually straight, erect or weakly recurved; palea keels pectinate-ciliate, hairs ca. 0.5 mm. Anthers 0.5–1.4 mm. Fl. and fr. May–Sep.

Slopes, grassy places, ditch banks; 700–1400 m. Gansu, Hebei, Henan, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang Xizang, Yunnan [Afghanistan, Bhutan, India, Kashmir, Nepal, Pakistan, Tajikistan; Africa, SW Asia, Europe].

50. *Bromus grossus* Desfontaines ex Candolle in Lamarck & Candolle, Fl. Franç., ed. 3, 3: 68. 1805.

粗雀麦 cu que mai

Serrafalcus grossus (Desfontaines ex Candolle) Rouy.

Annual. Culms erect, stout, 60–120 cm tall. Leaf sheaths hairy or glabrous; leaf blades large. Panicle erect, effuse, 15–20 cm, one-sided at maturity. Spikelets ovate-lanceolate, 20–40 × ca. 10 mm, florets 10–12; glumes leathery, veins conspicuous, sometimes with a short mucro at apex; lemmas 11–14 mm, scabrid, margins obtusely angled, apex shallowly 2-toothed, awned from below sinus; awn 5–10 mm, straight, stout; palea slightly shorter than lemma. Anthers 2–3 mm. Caryopsis 10–20 mm, inrolled when mature, slightly shorter than lemma. Fl. and fr. Jun–Sep. $2n = 28$.

Waste ground on slopes. Xizang [Europe].

The presence of this species in China has not been confirmed.

51. *Bromus lanceolatus* Roth, Catal. Bot. 1: 18. 1797.

大穗雀麦 da sui que mai

Forasaccus lanceolatus (Roth) Bubani; *Serrafalcus lanceolatus* (Roth) Parlato.

Annual. Culms erect or geniculately ascending, 60–80 (–100) cm tall. Leaf sheaths pubescent; leaf blades 15(–20) cm × 3–6 mm, both surfaces pubescent. Panicle narrow, 8–15 cm; branches erect, shorter than spikelets, scabrid, rather stout. Spikelets lanceolate cylindrical, 20–30 × 6–10 mm, florets 10–16, overlapping; rachilla internodes not visible; lower glume 6–8 mm, 3–5-veined, apex acuminate, upper glume 9–11 mm, 5–7-veined; lemmas elliptic, 12–15 × 2–2.5 mm in side view, herbaceous, smooth, glabrous or pubescent, margins membranous, 7–9-veined, apex 2-toothed, teeth acuminate, 1–2 mm, awned from sinus; awn 10–20 mm, base slightly flattened, twisted, recurved at maturity; palea slightly shorter than lemma, keels ciliate. Anthers 1.5–2.5 mm. Fl. and fr. Apr–Jul. $2n = 28$.

Forest margins, slopes, thickets, grasslands; 300–1800 m. Xinjiang [Afghanistan, Pakistan, Turkmenistan; N Africa, SW Asia, S Europe].

52. *Bromus danthoniae* Trinius ex C. A. Meyer, Verz. Pfl. Casp. Meer. 24. 1831.

三芒雀麦 san mang que mai

Boissiera danthoniae (Trinius) A. Braun; *Bromus lanceolatus* Roth var. *danthoniae* (Trinius) Dinsmore; *B. macrostachys* Desfontaines var. *danthoniae* (Trinius) Ascherson & Graebner; *Triniusia danthoniae* (Trinius) Steudel.

Annual. Culms erect or geniculately ascending, 30–50 cm tall, pubescent below inflorescence. Leaf sheaths pubescent; leaf blades 10–15 cm × 2–4 mm, both surfaces densely pubescent or later glabrescent. Panicle contracted or racemelike, dense, ovate in outline, 5–10 × 1–5 cm; branches and pedicels shorter than spikelets, ascending, scabrid. Spikelets oblong-lanceolate, 20–40 × 6–12 mm, florets 8–16, overlapping; rachilla internodes not visible; glumes broad, lower glume 5–8.5 mm, 3–5-veined, upper glume 7–9 mm, 7–9-veined; lemmas broadly elliptic, 9–12 mm, glabrous, pubescent or villous, 9–11-veined, veins scabrid, margins broadly membranous, broader and obtusely angled in upper half, apex lacerate, lowest lemmas shortly 1-awned, upper lemmas 3-awned from 2–4 mm below apex; central awn 15–25 mm, base flattened, twisted, recurved, lateral awns 4–10 mm, straight or recurved; palea shorter than lemma, keels ciliate. Anthers 1–1.8 mm. Fl. May–Aug.

Wastelands, dry grassy places on gravel slopes; 1500–3000 m. W Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Mediterranean (Cyprus)].

Bromus danthoniae has been placed in *B. sect. Triniusia* (Steudel) Nevski. However, the available molecular data indicate that the species is nested within *B. sect. Bromus*.

53. *Bromus marginatus* Nees ex Steudel, Syn. Pl. Glumac. 1: 322. 1854.

山地雀麦 shan di que mai

Ceratochloa marginata (Nees ex Steudel) W. A. Weber; *Forasaccus marginatus* (Nees ex Steudel) Lunell.

Perennial. Culms tufted, ca. 50 cm tall, ca. 5 mm in diam. Leaf sheaths retrorsely pubescent; leaf blades 10–20 cm × 4–10 mm, pubescent. Panicle erect, rather narrow, 10–15 cm; primary branches 3–5 cm, lower branches erect or spreading, each bearing 1 or 2 spikelets. Spikelets 20–30 × 5–8 mm, florets 9–13, overlapping; rachilla internodes not visible; lower glume 6–7 mm, upper glume ca. 8 mm, apex acuminate; lemmas 10–20 × ca. 2.2 mm in side view, keeled, pubescent, margins membranous, awned from apex; awn 5–7 mm. Fl. May–Jun. $2n = 28, 42, 56, 70$.

Roadsides, forest margins, moist places, adventive. Hebei [native to North America].

54. *Bromus catharticus* Vahl, Symb. Bot. 2: 22. 1791.

扁穗雀麦 bian sui que mai

Bromus unioides Kunth; *Schedonorus unioides* (Kunth) Roemer & Schultes; *Serrafalcus unioides* (Kunth) Sampaio; *Zerna unioides* (Kunth) Lindman.

Annual. Culms erect or geniculately ascending, 60–100 cm tall, ca. 5 mm in diam. Leaf sheaths pubescent; leaf blades 30–40 cm × 4–6 mm, scattered pubescent; ligule ca. 2 mm. Panicle lax, oblong in outline, 10–40 cm; branches ca. 10 cm, scabrid, each bearing 1–3 spikelets. Spikelets ovate-oblong, laterally compressed, 15–30 × 8–10 mm, florets 6–11, overlapping; rachilla internodes not visible, ca. 2 mm, scabrid; glumes

narrowly lanceolate, lower glume 10–12 mm, upper glume slightly longer than lower glume; lemmas 15–20 mm, keeled, 11-veined, veins scabrid, apex mucronate; palea narrow, ca. 1/2 as long as lemma, keels ciliate. Anthers 0.3–0.6 mm. Fl. May, fr. Sep. $2n = 28, 42, 58$.

Shady ditch sides, introduced. Guizhou, Hebei, Jiangsu, Nei Mongol, Taiwan, Yunnan [native to South America].

This species is widely introduced as a winter forage (Rescue Grass) and is now adventive in most temperate countries.

55. *Bromus carinatus* Hooker & Arnott, Bot. Beechey Voy. 403. 1840.

显脊雀麦 xian ji que mai

Ceratochloa carinata (Hooker & Arnott) Tutin.

Annual. Culms erect, 40–50 cm tall or more, glabrous. Leaf sheaths glabrous or pubescent near mouth; leaf blades flat, 20–30 cm × 5–10 mm, apex acuminate. Panicle open, 15–30 cm; branches long, spreading or drooping. Spikelets linear-lanceolate, laterally compressed, 30–40 mm, florets 5–11, lax; glumes lanceolate, 3–5-veined, apex acuminate, upper glume shorter than lower lemma, 5–7-veined; lemma 15–17 mm, compressed to keel, back scabrid, awn apical, 4(–10) mm; palea subequal to lemma; anthers ca. 0.5 mm. $2n = 56$.

Cultivated. Beijing, Taiwan [native to NW Europe and North America].

15. Tribe TRITICEAE

小麦族 xiao mai zu

Chen Shouliang (陈守良); Zhu Guanghua (朱光华)

Herbs annual or perennial, with or without rhizomes. Culms tufted or solitary. Leaf anatomy non-Kranz, without microhairs; leaf sheath usually split to base, rarely closed; ligule leathery or membranous; leaf blade usually linear to lanceolate, flat or involute. Inflorescence a solitary, bilateral spike, linear to ovate; rachis flattened, tough, or fragile and disarticulating at base of internodes, side not facing spikelets ± convex (here referred to as “back”). Spikelets 1 per node or in groups of 2 or 3 (rarely more) per node, usually sessile, rarely with a short pedicel, with 1 to many florets and apical floret smaller or sterile, laterally or dorsiventrally compressed, usually disarticulating below each floret if rachis tough. Glumes membranous to leathery, usually persistent, sometimes awnlike or reduced. Lemma 5–11-veined, apically awned or awnless. Palea with 2 keels. Lodicules 2, free, entire or 2-lobed. Stamens 3. Ovary tipped by a small, fleshy, hairy appendage. Stigmas 2. Caryopsis ellipsoid or oblong, hollowed on hilum face, free or somewhat adherent to lemma and palea. Endosperm with starch grains simple, rounded. Chromosomes large, $x = 7$.

About 20 genera and 330 species: temperate and warm-temperate regions, mainly in the N hemisphere; 13 genera (one introduced) and 175 species (99 endemic, eight introduced) in China.

In this account, “first lemma” refers to the lemma of the basal floret in a spikelet.

Chinese genera of economic value include *Hordeum* and *Triticum* (staple foods) and *Agropyron*, *Elymus*, *Elytrigia*, and *Leymus* (fine forage).

1a. Spikelets in groups of 2 or more per node of rachis.

2a. Spikelets dorsiventrally compressed; spike with rachis disarticulating, or if not then plants cultivated.

3a. Spikelets all sessile and similar in groups of 2 or 3 in regular, longitudinal rows; spike with rachis disarticulating 99. *Psathyrostachys*

3b. Spikelets in groups of 3 in regular rows: 2 lateral spikelets usually shortly pedicellate, 1 central spikelet sessile, or if 3 spikelets all sessile then spike with rachis not disarticulating 100. *Hordeum*

2b. Spikelets laterally compressed; spike with rachis not disarticulating.

4a. Glumes 1-veined, or at least distal glume 3- or more veined, usually broad, with lateral veins ± riblike 102. *Elymus*

4b. Glumes 1–3(–5)-veined, narrow with indistinct lateral vein, setiform, or reduced.

5a. Leaf blade stiff, harsh; glumes well developed, 1–3(–5)-veined, frequently keeled 98. *Leymus*

5b. Leaf blade flexible, herbaceous; glumes usually weakly developed or sometimes absent, subulate or linear-setiform, usually not keeled 101. *Hystrix*

- 1b. Spikelets 1 per node of rachis.
- 6a. Glumes 5–13-veined, veins parallel or divergent.
- 7a. Glumes 1- or 2-keeled, with 5–11 veins, lateral ones diverging into teeth, apex obtuse or bidentate 109. *Triticum*
- 7b. Glumes rounded abaxially, with 7–13 parallel or divergent veins, apex truncate, dentate or with 1–5 awns 110. *Aegilops*
- 6b. Glumes 1–9(–11)-veined, veins converging toward apex.
- 8a. Rachis fragile or falling entire; plants usually annual; lemma keeled or sharply so, keel pectinate spinulose or not.
- 9a. Spike oblong to orbicular; spikelets with 3–10 florets; lemma keeled, keel not pectinate spinulose 107. *Eremopyrum*
- 9b. Spike linear to oblong; spikelets with 2 florets; lemma sharply keeled, keel pectinate spinulose 108. *Secale*
- 8b. Rachis tough; plants perennial; lemma rounded abaxially or keeled only at apex with keel not pectinate spinulose.
- 10a. Spike broadly linear to narrowly oblong, with crowded spikelets, pectinately arranged on a tough rachis; glumes 1–5-veined, usually 1-keeled to base, or if not keeled then midvein prominent.
- 11a. Apical spikelet usually sterile; glumes 1-keeled to base 106. *Agropyron*
- 11b. Apical spikelet usually well developed; glumes not keeled or keeled only at apex, rarely keeled throughout length 105. *Kengyilia*
- 10b. Spike linear, usually with lax spikelets divergently arranged on a tough rachis; glumes 3–9(–11)-veined, veins parallel or convergent and often keeled only in distal half.
- 12a. Plants usually with long rhizomes; spikelets usually disarticulating below glumes; lemma usually without distinct callus at base 104. *Elytrigia*
- 12b. Plants tufted or with short rhizomes; spikelets usually disarticulating above glumes; lemma with distinct or obscure callus at base.
- 13a. Lemma usually with distinct callus at base 102. *Elymus*
- 13b. Lemma usually with obscure callus at base 103. *Pseudoroegneria*

98. LEYMUS Hochstetter, Flora 31: 118. 1848.

赖草属 lai cao shu

Aneurolepidium Nevski.

Herbs perennial. Plants usually with rhizomes, rarely without. Culms usually erect. Leaf sheath split almost to base; ligule leathery-membranous; auricles lanceolate or crescent-shaped; leaf blade usually glaucous, usually rolled, rarely flat, stiff, harsh. Inflorescence spike-like, linear, rarely oblong-ovate; rachis tough. Spikelets in regular rows of (1 or) 2 or 3(–6) per node, sessile, all similar, with (1–) 3–7 florets; rachilla disarticulating above glumes and between florets. Glumes opposite or side-by-side, linear to lanceolate, 1–3(–5)-veined, veins not raised (except in *L. mollis*), not keeled or keeled almost to base, apex acute to shortly awned. Lemma 3–7-veined, abaxially not keeled or keeled only at apex, apex acute to shortly awned; callus obtuse, triangular or rounded. Lodicules lanceolate to ovate, usually entire. Caryopsis adherent to lemma.

About 50 species: temperate regions of the N hemisphere; 24 species (11 endemic) in China.

The authors have seen no specimens of *Leymus pubinodis* (Keng) Á. Löve (Repert. Spec. Nov. Regni Veg. 95: 481. 1984, “*pubinodes*”; *Elymus pubinodis* Keng, Sunyatsenia 6: 85. 1941), described from Xizang.

- 1a. Spikelets (3 or) 4–6 per node.
- 2a. Spikelets with 3–5 florets; first lemma 15–20 mm 1. *L. racemosus*
- 2b. Spikelets with 5–10 florets; first lemma 8–13 mm.
- 3a. Leaf blade 5–15 × 0.5–0.8 cm; spike oblong-ovate, 5–9 cm 4. *L. ovatus*
- 3b. Leaf blade 15–42 cm; spike linear, 12–25 cm.
- 4a. Glumes 3-veined, unequal, proximal one 10–12 mm, distal one 13–16 mm; spikelets 3–5 per node 2. *L. pseudoracemosus*
- 4b. Glumes 1-veined, subequal, 10–13 mm; spikelets 4–6(–11) per node 3. *L. crassiusculus*
- 1b. Spikelets 1–3(or 4) per node.
- 5a. Spikelets usually 1 per node, rarely 2 or 3 per node below middle of spike.
- 6a. Glumes lanceolate or linear-lanceolate, 3-veined.
- 7a. Palea much shorter than lemma, apex emarginate; spikelets with 2 or 3 florets 18. *L. pishanicus*
- 7b. Palea slightly shorter than or equaling lemma; spikelets with 4–8 florets.
- 8a. Glumes 10–15 mm, margin membranous and ciliate 19. *L. altus*
- 8b. Glumes 6–7.5 mm, margin membranous but not ciliate 20. *L. obvipodus*

- 6b. Glumes subulate-linear or narrowly lanceolate, veinless or 1-veined.
- 9a. Lemma puberulent, or if smooth and glabrous then margin ciliate; leaf blade 0.1–0.3 cm wide 21. *L. ruoqiangensis*
- 9b. Lemma smooth, glabrous; leaf blade 0.2–2.5 cm wide.
- 10a. Leaf blade to 2.5 cm wide; glumes subulate-linear 23. *L. aemulans*
- 10b. Leaf blade 0.2–0.6 cm wide, glumes linear-lanceolate.
- 11a. Spikelets with 3 or 4 florets 22. *L. arjinshanicus*
- 11b. Spikelets with 4–7 florets 24. *L. ramosus*
- 5b. Spikelets 1–3(or 4) per node.
- 12a. Glumes equaling or slightly longer than spikelet.
- 13a. Glumes wholly covering lemma or covering only base of first lemma.
- 14a. Spikelets 2 per node; glumes wholly covering lemma 10. *L. karelinii*
- 14b. Spikelets (1 or) 2 or 3 per node; glumes covering only base of first lemma 11. *L. mollis*
- 13b. Glumes not covering lemma.
- 15a. Ligule ca. 0.5 mm; rachis internodes 3–6 mm 12. *L. paboanus*
- 15b. Ligule 2–3 mm; rachis internodes 6–20 mm 13. *L. tianschanicus*
- 12b. Glumes shorter than spikelet.
- 16a. Glumes oblong-lanceolate, apex with awn 4–5 mm 5. *L. aristiglumis*
- 16b. Glumes not as above.
- 17a. Glumes covering base of first lemma.
- 18a. First lemma 7–9 mm including apical point.
- 19a. Culms 14–35 cm tall; glumes narrowly lanceolate, 5–9 mm, margin not ciliate ... 7. *L. yiunensis*
- 19b. Culms 60–150 cm tall; glumes linear-lanceolate, 9–11 mm, distal margin sparsely ciliate 8. *L. pendulus*
- 18b. First lemma 10–14 mm.
- 20a. Spikelets with 2 or 3 florets 6. *L. angustus*
- 20b. Spikelets with 5–9 florets 9. *L. shanxiensis*
- 17b. Glumes not covering base of first lemma.
- 21a. Glumes 3-veined; palea equaling lemma.
- 22a. Callus of lemma villous; glumes linear-lanceolate 15. *L. secalinus*
- 22b. Callus of lemma smooth; glumes subulate 16. *L. chinensis*
- 21b. Glumes 1-veined or nearly veinless; palea shorter than or subequaling lemma.
- 23a. Callus of lemma puberulent; palea shorter than lemma; first lemma 5–8 mm 14. *L. multicaulis*
- 23b. Callus of lemma villous; palea subequaling lemma; first lemma 9–10 mm 17. *L. flexus*

1. *Leymus racemosus* (Lamarck) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 429. 1960.

大赖草 da lai cao

Elymus racemosus Lamarck, Tabl. Encycl. 1: 207. 1792; *E. giganteus* Vahl; *Leymus giganteus* (Vahl) Pilger.

Culms to 100 cm tall, ca. 10 mm in diam., stout, scabrous pubescent below raceme. Leaf sheath membranous at margin; ligule ca. 2 mm, membranous, apex truncate; leaf blade glaucous green, 20–40 × ca. 1.5 cm, abaxial surface smooth, adaxial surface and margin scabrous. Spike 15–30 × 1–2 cm; rachis stout, glabrous. Spikelets 4–6 per node, pale glaucous green, 1.5–2.2 cm, with 3–5 florets. Glumes linear-lanceolate, 12–20 mm, with robust midvein and 2 faint lateral veins, apex long acuminate. Lemma lanceolate, 7-veined, softly hairy proximally, awnless; first lemma 15–20 mm. Palea slightly shorter than lemma. Fl. and fr. Jun–Sep. $2n = 28$.

Sandy places. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

This species is used for forage.

2. *Leymus pseudoracemosus* C. Yen & J. L. Yang, Acta Bot. Yunnan. 5: 275. 1983.

柴达木赖草 chai da mu lai cao

Culms 60–90 cm tall, 2- or 3-noded, glabrous, but pubescent below inflorescence. Leaf sheath usually longer than internode, glabrous, margin membranous; ligule membranous, ca. 3 mm; leaf blade glaucous, flat or rolled, 15–34(–40) × (0.4–)0.5–0.7 cm, abaxial surface glabrous or scabrous, adaxial surface puberulent or villous. Inflorescence erect, linear, sometimes with short branches proximally, 12–25 × 2–3 cm; rachis densely pubescent, margin villous with internodes 1–3 cm. Spikelets 3–5 per node, 1.7–2.1 cm, with 5–10 florets; rachilla internodes 1–1.8 mm, pubescent. Glumes lanceolate or narrowly so, obscurely 3-veined, margin membranous, ciliate, apex with awn 1–1.7 mm; proximal glume 10–12 mm; distal glume 13–16 mm. Lemma lanceolate, 5–7(–10)-veined, densely villous, margin membranous, ciliate; first lemma 9.5–13 mm; callus villous; awn 0.2–1.5 mm. Palea slightly shorter than or equaling lemma, ciliate along keels, apex 2-cleft. Anthers yellowish, 3–5 mm. Caryopsis blackish brown, narrowly elliptic, 4.5–5 × ca. 2 mm, apex with white hairs. Fl. and fr. Jul–Aug.

• Sandy places. Qinghai.

3. *Leymus crassiusculus* L. B. Cai, Acta Phytotax. Sin. 33: 494. 1995.

粗穗赖草 cu sui lai cao

Culms erect, 70–110 cm tall, ca. 4 mm in diam., 2- or 3-noded. Leaf sheath glabrous or margin ciliate; ligule 1.5–2 mm, membranous, apex truncate; leaf blade usually rolled, 20–42 × 0.5–0.7 cm, both surfaces smooth, glabrous, or adaxial surface scabrous. Spike yellowish brown, dense, 16–22 × 1.5–2 cm, densely long soft hairy; rachis internodes 4–10 mm. Spikelets 4–6(–11) per node, 1.2–1.8 cm, with 4–7 florets; rachilla internodes 1–1.5 mm, densely pubescent. Glumes linear-lanceolate, subequal, 10–13 mm, shorter than spikelet, 1-veined, margin membranous, ciliate. Lemma lanceolate, obscurely 5-veined, densely pubescent; first lemma 8–10 mm, apex with awn less than 2 mm. Palea equaling lemma, laxly setose along keels, apex emarginate. Anthers yellow, ca. 5 mm. Fl. and fr. summer.

• Field margins; ca. 3000 m. Qinghai (Xinghai), Shanxi (Pian-guan, Taiyuan).

4. *Leymus ovatus* (Trinius) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 430. 1960.

宽穗赖草 kuan sui lai cao

Elymus ovatus Trinius in Ledebour, Fl. Altaic. 1: 121. 1829; *Aneurolepidium ovatum* (Trinius) Nevski; *Leymus secalinus* (Georgi) Tzvelev subsp. *ovatus* (Trinius) Tzvelev.

Culms usually solitary, 70–100 cm tall, 3- or 4-noded, smooth, glabrous, but densely puberulent below spike. Leaf sheath smooth, glabrous; ligule ca. 1 mm, membranous, puberulent, apex truncate; leaf blade flat or rolled, 5–15 × 0.5–0.8 cm, abaxial surface densely pubescent, adaxial surface densely villous. Spike erect, oblong-ovate, 5–9 × 1.5–2.5 cm; rachis densely pubescent, internodes 2–6(–10) mm. Spikelets 4 per node, sessile or very shortly pedicellate, 1–2 cm, with 5–7 florets. Glumes linear-lanceolate, subequal, 10–13 mm, obscurely 3-veined, apex mucronate to acuminate. Lemma lanceolate, obscurely 5–7-veined, abaxially hirsutulous, margin ciliate, apex acuminate or with awn 1–3 mm; first lemma 8–10 mm; callus hirsute. Palea slightly shorter than or equaling lemma. Anthers 3.5–4 mm. Fl. and fr. Jul–Aug.

Grassy places, river banks, roadsides. Nei Mongol, Qinghai, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

5. *Leymus aristiglumis* L. B. Cai, Bull. Bot. Res., Harbin 17: 28. 1997 [*“aristiglumis”*].

芒颖赖草 mang ying lai cao

Culms erect, 30–50 cm tall, 1.5–2 mm in diam., ca. 3-noded. Leaf sheath usually fibrous at base, margin ciliate; ligule 1.2–2 mm, membranous; leaf blade conduplicate or involute at margin, 7–16 × 2.5–4 cm, both surfaces scabrous. Spike erect, green, dense, 7–10 × 0.6–0.9 cm; rachis puberulent. Spikelets 2 or 3 per node, 0.8–1.1 cm, with 3 or 4 florets; rachilla densely puberulent. Glumes oblong-lanceolate, subequal, 3.5–4.5 × ca. 2 mm, 1-veined, margin membranous, apex with awn 4–5 mm. Lemma lanceolate, 5-veined, abaxially glabrous, margin laxly

pubescent; first lemma 6–7 mm, apex with point ca. 1 mm. Palea equaling lemma, with lax, short, stiff hairs along keels, apex emarginate. Anthers yellow, ca. 4 mm. Fl. and fr. summer.

• Mountain slopes; ca. 2600 m. Qinghai (Xining).

See the comment under *Leymus shanxiensis* (species no. 9) concerning the spelling of the specific epithet.

6. *Leymus angustus* (Trinius) Pilger, Bot. Jahrb. Syst. 74: 6. 1947.

窄颖赖草 zhai ying lai cao

Elymus angustus Trinius in Ledebour, Fl. Altaic. 1: 119. 1829; *Aneurolepidium angustum* (Trinius) Nevski; *Leymus angustus* subsp. *macroantherus* D. F. Cui; *Triticum angustum* (Trinius) F. Hermann.

Culms solitary or tufted, 60–100 cm tall, 3- or 4-noded, glabrous, or pubescent below nodes and spike. Leaf sheath grayish green, usually shorter than internodes, smooth or slightly scabrous; ligule 0.5–1 mm, membranous, apex obtuse; leaf blade glaucous, rolled, 15–25 × 0.5–0.7 cm, stiff, abaxial surface subsmooth, adaxial surface smooth, apex acute. Spike erect, 15–20 × 0.7–1 cm; rachis pubescent. Spikelets 2(or 3) per node, 1–1.4 cm, with 2 or 3 florets; rachilla puberulent. Glumes covering base of first lemma, subequal or proximal glume slightly shorter, 10–13 mm, linear-lanceolate, 1-veined. Lemma lanceolate, obscurely 5–7-veined, densely puberulent, apex mucronate or acuminate; first lemma 10–14 mm including awn; callus pubescent. Palea slightly shorter than lemma, ciliate along keels. Anthers 2.5–3 mm. Fl. and fr. Jun–Aug.

Grassy places, meadows; 2000–2100 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

This species is used for forage.

7. *Leymus yiuensis* N. R. Cui & D. F. Cui in N. R. Cui, Fl. Xinjiang. 6: 603. 1996.

伊吾赖草 yi wu lai cao

Leymus yiwuensis N. R. Cui ex L. B. Cai, nom. illeg. superfl.

Culms erect or geniculate, 14–35 cm tall, usually 1-noded, smooth, glabrous. Leaf sheath smooth, glabrous or margin ciliate; ligule 0.5–1 mm, membranous; leaf blade involute, 4–9 cm × 0.1–2.5 mm, abaxial surface glabrous, adaxial surface and margin scabrous. Spike erect, green, dense, (3–)5–11 × (0.35–)0.5–1 cm; rachis pubescent, usually with white, long, soft hairs on nodes. Spikelets 2 per node, 0.7–1.1 cm, with 3–5(–8) florets; rachilla densely pubescent. Glumes usually covering base of first lemma, narrowly lanceolate, subequal, 5–9 mm, 1-veined, proximally pubescent, distally scabrous, apex narrowed, awnlike. Lemma lanceolate, distinctly 5-veined, abaxially with dense, white, soft hairs, margin ciliate; first lemma 7–9 mm including point 1–1.5 mm; callus with soft hairs 0.5–1 mm. Palea subequaling lemma, ciliate along keels distally. Anthers yellow, 2–3 mm. Ovary elliptic, apex puberulent. Fl. and fr. Jun–Aug.

- Meadows; ca. 2400 m. Xinjiang (Burqin, Yecheng, Yiwu).

Leymus yiwuensis was described as a new species by Cai (Bull. Bot. Res., Harbin 17: 29. 1997) based on the same holotype specimen (N. R. Cui 820064, XJA) as *L. yiumensis*.

8. *Leymus pendulus* L. B. Cai, Novon 10: 7. 2000.

垂穗赖草 *chui sui lai cao*

Plants with extended rhizomes. Culms erect or slightly geniculate below, 60–150 cm tall, 2–3 mm in diam., 4–6-noded, smooth. Leaf sheath glabrous or scabrous, basal ones persistent, usually disintegrating into fibers; ligule 2–3.5 mm, membranous, apex obtuse; leaf blade green, flat or involute, 5–22(–53) × 0.2–0.7 cm, both surfaces scabrous, margin sparsely spinulose or ciliate. Spikes pendent, brownish, very lax, 23–32 cm; rachis internodes 15–30 mm below middle, 6–12 mm distally, densely pubescent. Spikelets 2 or 3 per node, 1.1–1.5 cm, with 5–9 florets; rachilla internodes 1–1.5 mm, densely puberulent. Glumes linear-lanceolate, subequal, 9–11 mm, herbaceous, 1-veined, scabrous abaxially, margin sparsely ciliate above middle. Lemma lanceolate, obscurely 5-veined, sparsely spinulose abaxially, pubescent along or near margin; first lemma 6–9 mm, with slender awn 2–3 mm. Palea equaling or slightly longer than lemma, sparsely spinulose along keels, scabrous between keels, apex pointed or bifid. Anthers yellow or purplish, 2.5–3.5 mm. Caryopsis brown, apex pubescent.

- Woodland margins, mountain valleys, bases of walls; 2300–2400 m. Qinghai (Xining).

9. *Leymus shanxiensis* G. Zhu & S. L. Chen, *nom. nov.*

阔颖赖草 *kuo ying lai cao*

Replaced synonym: *Leymus latiglumis* L. B. Cai, Acta Phytotax. Sin. 33: 493. 1995 [*“latiglumis”*], not *Leymus latiglumis* Tzvelev, Novosti Sist. Vyssh. Rast. 9: 62. 1972.

Culms erect, 70–110 cm tall, 2–3 mm in diam., 3- or 4-noded. Leaf sheath scabrous; ligule membranous, ca. 0.8 mm; leaf blade flat or rolled, 10–25 × 0.3–0.5 cm, abaxial surface smooth, glabrous, adaxial surface scabrous or densely pubescent. Spike erect, greenish, 8–15 × 1–1.3 cm; rachis internodes 6–11(–20) mm, densely puberulent. Spikelets usually 2 per node, 1.8–2.5 cm, with 5–9 florets; rachilla internodes 0.5–1.5 mm, densely puberulent. Glumes covering only base of lemma, lanceolate, subequal, 11–16 mm, 3–5(–7)-veined, margin membranous, ciliate, apex narrowed into awn. Lemma oblong-lanceolate, 5–7-veined, with dense, long, soft hairs; first lemma 10–12 mm; awn less than 2 mm. Palea slightly shorter than or equaling lemma, laxly setose along keels, apex emarginate. Anthers yellow, ca. 5 mm. Fl. and fr. summer.

- Grasslands; 1300–3700 m. Shanxi (Pinglu, Youyu).

Leymus latiglumis is the correct spelling of Cai's name. The original spelling *“latiglumis”* implies the second part of this compound epithet was intended as an adjective (agreeing with the masculine gender of *Leymus*), rather than a noun in apposition (which would be *“latigluma”*).

10. *Leymus karelinii* (Turczaninow) Tzvelev, Novosti Sist. Vyssh. Rast. 9: 59. 1972.

大药赖草 *da yao lai cao*

Elymus karelinii Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 29(1): 64. 1856 [*“karelinii”*].

Culms tufted, 50–110 cm tall, 2–5 mm in diam. Leaf blade linear, 10–14(–23) × 0.2–0.7 cm, stiff. Spike rather dense, 6–20 cm. Spikelets 2 per node, 1.1–1.5(–1.8) cm, with 3 or 4 florets. Glumes equaling spikelet, wholly covering lemma, margin broadly membranous. Lemma 10–15 mm including awn. Anthers yellow, 4–5 mm. Fl. and fr. Jul–Aug. *2n* = 56.

Grassy places on mountains; 1600–2100 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

This species is used for forage.

11. *Leymus mollis* (Trinius) Pilger, Bot. Jahrb. Syst. 74: 6. 1947.

滨草 *bin cao*

Elymus mollis Trinius in Sprengel, Neue Entdeck. Pflanzenz. 2: 72. 1821; *E. arenarius* Linnaeus var. *coreensis* Hackel; *E. arenarius* subsp. *mollis* (Trinius) Hultén; *E. arenarius* var. *mollis* (Trinius) Koidzumi; *E. mollis* var. *coreensis* (Hackel) Honda; *Leymus arenarius* (Linnaeus) Hochstetter subsp. *mollis* (Trinius) Tzvelev; *Triticum molle* (Trinius) F. Hermann.

Culms solitary or tufted, 30–80 cm tall, smooth, glabrous, but puberulent below spike. Leaf sheath longer or shorter than internode, glabrous; ligule 1–2 mm; leaf blade usually rolled, 10–15 × 0.4–0.7 cm, stiff, abaxial surface smooth, adaxial surface slightly scabrous. Spike 9–15 × 1–1.5 cm; rachis robust, puberulent; internodes 6–10 mm. Spikelets (1 or) 2 or 3 per node, 1.5–2 cm, with 2–5 florets; rachilla puberulent. Glumes covering only base of lemma, oblong-lanceolate, 12–20 × 2–2.5 mm, 3–5-veined with keel-like midvein, puberulent, margin membranous. Lemma lanceolate, 5-veined, puberulent, apex mucronate; first lemma 12–14 mm. Palea slightly shorter than lemma, ciliate along keels. Anthers 5–6 mm. Fl. and fr. May–Aug. *2n* = 28.

Coastal pebbles and sands. Hebei, Liaoning, Shandong [Japan, Korea, Mongolia, Russia; N North America].

12. *Leymus paboanus* (Claus) Pilger, Bot. Jahrb. Syst. 74: 6. 1947.

毛穗赖草 *mao sui lai cao*

Culms solitary or tufted, 45–90 cm tall, 3- or 4-noded, smooth, glabrous. Leaf sheath dull yellow at base, smooth, glabrous; ligule ca. 0.5 mm; leaf blade flat or rolled, 10–30 × 0.4–0.7 cm, abaxial surface smooth, adaxial surface scabrous. Spike erect, 6–18 × 0.3–1.3 cm; rachis slender, puberulent or basally smooth, margin ciliate; internodes 3–6 mm. Spikelets 2 or 3 per node, 0.8–1.3 cm, with 3–5 florets, viviparous or not; rachilla ca. 1.5 mm, densely pubescent. Glumes not covering base of first lemma, subulate, 6–12 mm, equaling spikelet, slightly hirsutulous. Lemma lanceolate, obscurely 3–5-veined, puberulent, apex mucronate or acuminate; first lemma 6–10 mm. Palea equaling or slightly longer than lemma. Anthers ca. 0.3 mm. Fl. and fr. Jun–Jul.

Forest understories, grassy places, river banks; ca. 2900 m. Gansu, Ningxia, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

- 1a. Spike 10–18 cm; spikelets
never viviparous 12a. var. *paboanus*
1b. Spike 6–9 cm; spikelets usually
viviparous 12b. var. *viviparus*

12a. *Leymus paboanus* var. *paboanus*

毛穗赖草(原变种) mao sui lai cao (yuan bian zhong)

Elymus paboanus Claus, Beitr. Pflanzen. Russ. Reich. 8: 170. 1851; *Aneurolepidium paboanum* (Claus) Nevski; *E. saluginosus* (Grisebach) Steudel var. *paboanus* (Claus) Roshevitz.

Spike 10–18 cm. Spikelets never viviparous.

Grassy places, river banks. Gansu, Ningxia, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

This variety is used for forage.

12b. *Leymus paboanus* var. *viviparus* L. B. Cai, Acta Phytotax. Sin. 39: 77. 2001.

胎生赖草 tai sheng lai cao

Spike 6–9 cm. Spikelets usually viviparous.

- Forest understories; ca. 2900 m. Qinghai.

13. *Leymus tianschanicus* (Drobow) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 429. 1960.

天山赖草 tian shan lai cao

Elymus tianschanicus Drobow in Vvedensky et al., Key Fl. Tashkent 1: 44. 1923, not (Drobow) Nevski (1934); *Aneurolepidium tianschanicum* (Drobow) Nevski.

Culms solitary or tufted, 70–120 cm tall, 3–6 mm in diam., 3- or 4-noded, smooth, glabrous, or slightly scabrous only below raceme. Leaf sheath smooth, glabrous; ligule 2–3 mm, membranous, apex rounded; leaf blade flat or rolled, 20–40 × 0.5–0.9 cm, stiff, glabrous or margin scabrous. Spike erect, 20–35 × ca. 1 cm; rachis densely pubescent, margin ciliate; internodes 0.6–2 cm. Spikelets 2 or 3 per node, 1.5–1.9 cm, with 3–5 florets; rachilla densely puberulent; internodes ca. 3 mm. Glumes not covering base of lemma, linear-lanceolate, equaling or slightly longer than spikelet, margin narrowly membranous at base, apex mucronate to acuminate. Lemma oblong-lanceolate, 5-veined, pubescent, margin ciliate, apex mucronate; first lemma 10–12 mm; callus villous; awn 1–3 mm. Palea shorter than or equaling lemma, margin ciliate. Anthers ca. 5 mm. Ovary white puberulent at apex. Fl. and fr. Jun–Oct.

Mountain slopes. Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

This species is used for forage.

14. *Leymus multicaulis* (Karelin & Kirilov) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 430. 1960.

多枝赖草 duo zhi lai cao

Elymus multicaulis Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 868. 1841; *Aneurolepidium multicaule* (Karelin & Kirilov) Nevski; *E. aralensis* Regel; *E. aralensis* var. *aristatus* Regel; *E. aralensis* var. *enervius* Regel; *E. aralensis* var. *glaucus* Regel; *Triticum aralense* (Regel) F. Hermann.

Culms solitary or tufted, erect, 50–80 cm tall, 1.5–3 mm in diam., 1–5-noded, glabrous, but scabrous or pubescent below spike. Leaf sheath usually brown or purplish at base, smooth to densely pubescent; ligule 1–2 mm, membranous; leaf blade glaucous, flat or involute, 10–30 × 0.3–0.8 cm, abaxial surface smooth to puberulent, adaxial surface scabrous, puberulent, or sometimes pilose. Spike 5–14 × 0.6–1 cm; rachis scabrous or pubescent, margin ciliate. Spikelets 2 or 3 per node, 0.8–1.5 cm, with 2–6 florets. Glumes not covering base of first lemma, subulate, 5–11 mm, 1-veined, hirsutulous. Lemma lanceolate or broadly so, obscurely 5-veined, smooth, glabrous, but callus puberulent; first lemma 5–9 mm. Palea shorter than lemma, ciliate along keels. Anthers 3–4 mm. Fl. and fr. May–Aug. $2n = 42$.

Alkaline meadows, fields, saline soils or pebbles, roadsides. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

Plants of this species with a pubescent leaf blade were described as “*Leymus bruneostachyus*” (N. R. Cui & D. F. Cui in N. R. Cui, Fl. Xinjiang. 6: 603. 1996), but that name was not validly published because no type was indicated (Saint Louis Code, Art. 37.1).

15. *Leymus secalinus* (Georgi) Tzvelev, Rast. Tsentr. Azii 4: 209. 1968.

赖草 lai cao

Culms solitary or tufted, 18–100 cm tall, 2–5-noded, smooth, glabrous, but densely puberulent below spike. Leaf sheath smooth, glabrous but margin ciliate when young; ligule 1–1.5 mm, membranous, apex truncate; leaf blade flat or rolled, 8–30 × 0.4–0.7 cm, abaxial surface scabrous or smooth, adaxial surface scabrous or pubescent, or both surfaces densely pubescent. Spike erect, grayish green, brown, or brownish, (6–)10–15(–24) × 0.1–1.7 cm; rachis pubescent; internodes 3–7(–20) mm. Spikelets (1 or)2 or 3(or 4) per node, 1–2.2 cm, with 2–7(–10) florets; rachilla pubescent; internodes 1–1.5 mm. Glumes not covering base of first lemma, narrowly lanceolate to nearly subulate, shorter than spikelet, obscurely 1–3-veined, scabrous, apex mucronate to acuminate. Lemma lanceolate, 5-veined, pubescent, or glabrous above middle, margin membranous, apex acuminate or with awn 1–3 mm; first lemma 8–10(–14) mm; callus villous. Palea shorter than or equaling lemma, apex slightly bifid. Anthers 2–4 mm. Fl. and fr. Jun–Oct.

Mountain slopes, stony and aleurite slopes, grassy places, lake banks, alkaline swales and pebbles; 2900–4200 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [India, Japan, Korea, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

This species is used for forage.

- 1a. Leaf blade abaxial surface scabrous or smooth; palea equaling lemma.
 2a. Spikelets 2 or 3(or 4) per node, with 4–7(–10) florets; anthers 3.5–4 mm 15a. var. *secalinus*
 2b. Spikelets 1 or 2 per node, with 2 or 3 florets; anthers 2–3 mm 15b. var. *tenuis*
 1b. Leaf blade abaxial surface densely pubescent and then palea equaling lemma, or scabrous or smooth and then palea shorter than lemma.
 3a. Culms 40–100 cm tall, 3–5-noded; spike grayish green, usually 10–15 cm; glumes 3-veined; palea equaling lemma 15c. var. *pubescens*
 3b. Culms 18–45 cm tall, 2- or 3-noded; spike brown or brownish, 6–10 cm; glumes usually 1-veined; palea shorter than lemma 15d. var. *qinghaicus*

15a. *Leymus secalinus* var. *secalinus*

赖草(原变种) lai cao (yuan bian zhong)

Triticum secalinum Georgi, Bemerk. Reise Russ. Reich. 1: 198. 1775; *Agropyron chinorossicum* Ohwi; *Aneurolepidium dasystachys* (Trinius) Nevski; *A. secalinum* (Georgi) Kitagawa; *Elymus dasystachys* Trinius; *E. dasystachys* var. *ligulatus* Keng; *E. secalinus* (Georgi) Bobrov; *E. thomsonii* J. D. Hooker; *Leymus dasystachys* (Trinius) Pilger; *L. ligulatus* (Keng) Tzvelev; *L. secalinus* var. *laxinodis* L. B. Cai.

Culms 40–100 cm tall, 3–5-noded. Leaf blade abaxial surface scabrous or smooth, adaxial surface scabrous or pubescent. Spikelets 2 or 3(or 4) per node, with 4–7(–10) florets. Glumes linear-lanceolate. Anthers 3.5–4 mm. Fl. and fr. Jun–Oct. $2n = 28$.

Grassy places, mountain slopes. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang [India, Japan, Korea, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

15b. *Leymus secalinus* var. *tenuis* L. B. Cai, Acta Phytotax. Sin. 33: 496. 1995.

纤细赖草 xian xi lai cao

Culms 40–100 cm tall, 3–5-noded. Leaf blade adaxial surface scabrous or smooth. Spikelets 1 or 2 per node, with 2 or 3 florets. Glumes nearly subulate. Palea equaling lemma. Anthers 2–3 mm.

• Lake banks; ca. 4200 m. Xizang (Gyirong, Rutog, Zanda, Zhongba).

15c. *Leymus secalinus* var. *pubescens* (O. Fedtschenko) Tzvelev, Rast. Tsent. Azii 4: 209. 1968.

短毛叶赖草 duan mao ye lai cao

Elymus dasystachys var. *pubescens* O. Fedtschenko, Trudy Imp. S.-Peterburgsk. Bot. Sada 21: 435. 1903; *Leymus secalinus* subsp. *pubescens* (O. Fedtschenko) Tzvelev.

Culms 40–100 cm tall, 3–5-noded. Leaf blade abaxial surface densely pubescent. Spike erect, grayish green, (6–)10–15 (–24) × 0.1–1.7 cm. Glumes 3-veined. Palea equaling lemma.

Stony and aleurite slopes, alkaline swales and pebbles. Xinjiang, Xizang [Russia].

15d. *Leymus secalinus* var. *qinghaicus* (L. B. Cai) G. Zhu & S. L. Chen, comb. et stat. nov.

青海赖草 qing hai lai cao

Basionym: *Leymus qinghaicus* L. B. Cai, Acta Phytotax. Sin. 39: 75. 2001.

Culms 18–45 cm tall, 2- or 3-noded. Leaf blade abaxial surface scabrous or smooth, adaxial surface scabrous or pubescent. Spike brown or brownish, 6–10 cm. Glumes narrowly lanceolate, usually 1-veined. Palea shorter than lemma.

• Mountain slopes; 2900–3100 m. Qinghai.

16. *Leymus chinensis* (Trinius ex Bunge) Tzvelev, Rast. Tsent. Azii 4: 205. 1968.

羊草 yang cao

Triticum chinense Trinius ex Bunge, Enum. Pl. China Bor. 72. 1833; *Agropyron chinense* (Trinius ex Bunge) Ohwi; *A. uninerve* P. Candargy, nom. illeg. superfl.; *Aneurolepidium chinense* (Trinius ex Bunge) Kitagawa; *Elymus auritus* Keng; *E. chinensis* (Trinius ex Bunge) Keng; *Leymus auritus* (Keng) Å. Löve.

Culms laxly tufted, 40–90 cm tall, 4- or 5-noded. Leaf sheath dull yellow, smooth; ligule 0.5–1 mm, papery, apex truncate, dentate; leaf blade flat or rolled, 7–18 × 0.3–0.6 cm, abaxial surface smooth, adaxial surface scabrous. Spike erect, 7–15 × 1–1.5 cm; rachis ciliolate at margin; internodes 6–10(–16) mm. Spikelets usually 2 per node at middle of spike, 1 per node elsewhere, glaucous when young, 1–2.2 cm, with 5–10 florets; rachilla smooth; internodes 1–1.5 mm. Glumes not covering base of first lemma, subulate, shorter than or equaling first lemma, obscurely 3-veined, smooth below middle, adaxially glabrous, but margin ciliolate, apex scabrous. Lemma lanceolate or broadly so, obscurely 5-veined, margin narrowly membranous, apex gradually narrowed, acute or mucronate; first lemma 8–9 mm; callus smooth. Palea equaling lemma, apex slightly bifid. Anthers 3–4 mm. Fl. and fr. Jun–Aug. $2n = 28^*$.

Grassy places. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [Korea, Mongolia, Russia].

This species is used for forage.

The C Asian, somewhat similar *Leymus divaricatus* (Drobov) Tzvelev (Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 430. 1960; *Elymus divaricatus* Drobov, Repert. Spec. Nov. Regni Veg. 21: 45. 1925; *E. regelii* Roshevitz; *L. regelii* (Roshevitz) Tzvelev) has been recorded from Xinjiang (the type of *E. regelii*). It differs from *L. chinensis* in having spikelets 3(or 4) per node more or less throughout the spike; glumes adaxially very shortly hairy or bristly; and lemmas usually ovate-lanceolate, abruptly narrowed at the apex, and awnless or with awn to 3(–4) mm.

17. *Leymus flexus* L. B. Cai, Acta Phytotax. Sin. 33: 491. 1995.

弯曲赖草 wan qu lai cao

Culms erect, 60–100 cm tall, 2–3 mm in diam., 3–5-noded. Leaf sheath glabrous, or pubescent proximally; ligule ca.

1.5 mm, membranous; leaf blade usually rolled, 15–27 × 0.4–0.5 cm, abaxial surface glabrous, adaxial surface scabrous. Spike brownish, 15–25 × ca. 1 cm; rachis densely white puberulent; internodes 8–15 mm. Spikelets usually 3 per node, 1.3–1.7 cm, with 3–7 florets; rachilla internodes 0.5–1.5 mm. Glumes not covering base of first lemma, linear-lanceolate, subequal, 11–14 mm, 1- or 2-veined, margin membranous, ciliate, apex narrowed into awn. Lemma lanceolate, 5-veined, pilose or glabrous; first lemma 9–10 mm; callus villous; awn 2–3 mm. Palea equaling lemma, ciliate along keels distally. Anthers yellow, 3–4 mm. Fl. and fr. summer.

• Mountain slopes; ca. 3200 m. Gansu, Qinghai (Xinghai, Xining), Shanxi.

18. *Leymus pishanicus* S. L. Lu & Y. H. Wu, Bull. Bot. Res., Harbin 12: 344. 1992.

皮山赖草 *pi shan lai cao*

Plants with long rhizomes. Culms laxly tufted, 50–80 cm tall, 3–5-noded, glabrous. Leaf sheath glabrous; ligule very short; leaf blade flat or margin rolled, abaxial surface glabrous, adaxial surface and margin scabrous. Spike lax, slender, 8–13 cm; rachis margin scabrous or ciliate; internodes 8–12 mm. Spikelets usually 1 per node, with 2 or 3 florets. Glumes lanceolate, equal, 9–11 mm, 3-veined, smooth, glabrous, margin membranous, ciliate, apex acuminate. Lemma oblong-lanceolate, 5-veined, smooth, glabrous; first lemma 12–14 mm, awnless. Palea much shorter than lemma, puberulent, ciliate along keels, apex emarginate. Fl. summer.

• Alpine meadows; ca. 2600 m. Xinjiang.

19. *Leymus altus* D. F. Cui in N. R. Cui, Fl. Xinjiang, 6: 604. 1996.

分株赖草 *fen zhu lai cao*

Culms solitary or laxly tufted, erect, glaucous, 80–150 cm tall, ca. 2-noded, smooth, glabrous. Leaf sheath smooth, glabrous; ligule ca. 2 mm, membranous; leaf blade flat or involute, 0.4–0.5 cm wide, abaxial surface glabrous, adaxial surface scabrous. Spike erect, 8–15 × 0.7–0.9 cm, with long, soft hairs at nodes; rachis margin ciliate; internodes 5–7(–30) mm. Spikelets 2 or 3 per node below middle of spike, 1 per node above middle, glaucous, 1.5–1.8 cm, with 4–6 florets; rachilla puberulent; internodes 1.5–2 mm. Glumes linear-lanceolate, 10–15 mm with proximal one shorter than distal, 3-veined, margin membranous, ciliate, apex acuminate or awned; lateral veins obscure. Lemma lanceolate, 5-veined, puberulent, margin ciliate, apex with awn 1–3 mm; first lemma 10–14 mm; callus with soft hairs ca. 1 mm. Palea equaling lemma, ciliate along keels distally, apex slightly 2-lobed. Anthers yellow, 3–4 mm. Fl. and fr. Jul–Aug.

• Field margins, gardens; ca. 2200 m. Xinjiang (Yecheng).

20. *Leymus obvipodus* L. B. Cai, Novon 10: 9. 2000.

柄穗赖草 *bing sui lai cao*

Plants with extended rhizomes. Culms erect or slightly geniculate below, 40–75 cm tall, 2–3 mm in diam., 2- or 3-noded, densely pubescent just below spike. Leaf sheath per-

sistent at base and becoming fibrous, usually puberulent; ligule 1–2 mm, membranous, apex obtuse; leaf blade involute, 6–18 × 0.2–0.4 cm, both surfaces densely puberulent. Spike erect, lax, greenish, 8–18 × 0.6–0.8 cm; rachis densely pubescent; internodes 0.5–2(–5) cm. Spikelets 1 or 2 per node, all pedicellate, 1.1–1.8 cm, with 4–8 florets; pedicel 0.1–1.4 cm, densely pubescent; rachilla densely puberulent; internodes 0.5–2 mm. Glumes lanceolate or linear-lanceolate, 1–3-veined, glabrous or scabrous abaxially, margin membranous, apex with awn 2–4 mm; proximal glume 5–6.5 mm; distal glume 6–7.5 mm. Lemma lustrous, lanceolate, obscurely 5-veined, glabrous or scabrous abaxially, pubescent along or near margin; first lemma 7–10 mm with short awn 1–3 mm. Palea slightly shorter than lemma, sparsely spinulose along keels, glabrous between keels, apex bifid. Anthers yellow, ca. 4 mm. Caryopsis brown, ca. 4.9 × 1.1 mm, apex pubescent.

• Woodland margins, wastelands; ca. 2900 m. Qinghai.

21. *Leymus ruoqianguensis* S. L. Lu & Y. H. Wu, Bull. Bot. Res., Harbin 12: 343. 1992.

若羌赖草 *ruo qiang lai cao*

Leymus arjinshanicus D. F. Cui subsp. *ruoqianguensis* (S. L. Lu & Y. H. Wu) D. F. Cui.

Culms tufted, 30–70 cm tall, 3- or 4-noded, glabrous. Leaf sheath brown at base, glabrous, margin membranous, sometimes ciliate; ligule ca. 0.5 mm; leaf blade usually rolled, 6–15 × 0.1–0.3 cm, abaxial surface glabrous, adaxial surface scabrous or puberulent. Spike erect, 4.5–14 mm; rachis hairy at nodes, margin ciliate; internodes 6–15 mm. Spikelets purplish or glaucous, usually 1 per node, with 3–5 florets. Glumes subulate or narrowly lanceolate, subequal, 7–10 mm, veinless or 1-veined, glabrous or pilose, margin scabrous, apex acuminate. Lemma oblong-lanceolate, 5-veined, awnless or mucronate. Palea subequaling lemma, ciliate along keels or glabrous. Anthers purplish or yellowish, 3–4 mm. Fl. and fr. summer.

• Alkaline soils in high mountains; 3600–4100 m. Qinghai, Xinjiang.

22. *Leymus arjinshanicus* D. F. Cui in N. R. Cui, Fl. Xinjiang, 6: 602. 1996.

阿尔金山赖草 *a er jin shan lai cao*

Plants with extended rhizomes. Culms tufted, erect, 30–70 cm tall, 2- or 3(or 4)-noded. Leaf sheath brown at base, glabrous, margin membranous, sometimes ciliate; ligule ca. 0.5 mm, apex truncate; leaf blade 10–20 × ca. 0.3 cm, abaxial surface glabrous, adaxial surface puberulent. Spike erect or slightly curved, 4–10 × 0.6–0.8 cm; rachis internodes 5–7(–15) mm. Spikelets 1 per node; rachilla densely puberulent; internodes ca. 0.2 mm. Glumes linear-lanceolate, 1-veined, proximally glabrous or distally scabrous abaxially, margin shortly prickly, apex acuminate with point ca. 1 mm. Lemma broadly lanceolate, obscurely 5-veined, glabrous or margin ciliate; first lemma 10–12 mm, apex acuminate. Palea equaling lemma, distal half ciliate abaxially, apex slightly bifid. Anthers yellow, ca. 4 mm. Fl. and fr. Jul–Sep.

• Saline meadows; ca. 3100 m. Xinjiang (Altun Shan).

In the Chinese text of the protologue (p. 216) and in the illustration caption (p. 217), the specific epithet was spelled “*aerginshanicus*,” whereas in the Latin text (p. 602) it was spelled “*arjinshanicus*.” Under Art. 61.3 of the Saint Louis Code, we here explicitly adopt “*arjinshanicus*” and reject “*aerginshanicus*.”

23. *Leymus aemulans* (Nevski) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 430. 1960.

阿英赖草 a ying lai cao

Aneurolepidium aemulans Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 1: 17. 1933; *Elymus aemulans* (Nevski) Nikiforova.

Culms densely tufted, slender, smooth, glabrous. Leaf blade glaucous green, linear, flat or subinvolute, to 2.5 cm wide, abaxial surface smooth, adaxial surface scabrous. Spike erect, lax, 5–10 cm. Spikelets 1 at each node, pale green, 1.5–2 cm, with 3–5 florets. Glumes subulate-linear, somewhat lanceolate and broadened at base, gradually tapering toward apex, 0.5–0.75 mm wide, veinless, glabrous; proximal glume 0.3–0.6 cm, apex acute or shortly aristate; distal glume 0.6–1.2 cm, apex with awn. Lemma broadly lanceolate, (0.9–)1–1.2 cm, obscurely 5-veined, smooth, glabrous; awn 2–5 mm, scabrous. Fl. and fr. May–Jun. $2n = 28$.

Stony slopes. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

24. *Leymus ramosus* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 430. 1960.

单穗赖草 dan sui lai cao

Triticum ramosum Trinius in Ledebour, Fl. Altaic. 1: 114. 1829, not Weigel (1782); *Agropyron ramosum* K. Richter; *Aneurolepidium ramosum* Nevski; *Elymus trinii* Melderis.

Culms 30–50 cm tall, smooth, glabrous. Leaf sheath glabrous or puberulent proximally; ligule very short; leaf blade glaucous, flat, 0.2–0.6 cm wide, abaxial surface glabrous, adaxial surface and margin scabrous or puberulent. Spike erect, 4–8 × 0.6–1 cm; rachis margin hispid. Spikelets 1 at each node, glaucous or purplish glaucous, 1.1–1.7 cm, with 4–7 florets. Glumes linear-lanceolate, 5–9 mm, stiff, veinless or midvein obscure. Lemma broadly lanceolate, 6–8 mm, 5–9-veined, smooth, glabrous, awnless or with awn ca. 2 mm. Fl. and fr. Jun–Aug.

Valley grasslands. Xinjiang [Mongolia, Russia (W Siberia); Europe].

99. *PSATHYROSTACHYS* Nevski in Komarov, Fl. URSS 2: 712. 1934.

新麦草属 xin mai cao shu

Plants perennial, densely tufted, or laxly tufted with underground rhizomes. Culms usually erect. Leaf blade flat or rolled. Spike linear, oblong, or ovate; rachis fragile, readily disarticulating between spikelets. Spikelets in groups of 2 or 3, sessile, compressed, with 1 or 2 (or 3) florets, usually with rudimentary florets. Glumes subulate-setiform, awnlike, inconspicuously 1-veined, not keeled, margin entire. Lemma lanceolate, broadly rounded abaxially, not keeled, 5–7-veined, apex acuminate to awned. Palea equaling or slightly longer than lemma, 2-keeled. Caryopsis tightly enclosed in lemma and palea at maturity, oblong, apex hairy. $x = 7$.

Nine species: steppes and semidesert regions from W Russia and Turkey eastward to Afghanistan and Siberia; cultivated in North America; five species (two endemic) in China.

All species of this genus are good fodder plants.

1a. Plants laxly tufted, with underground rhizomes.

2a. Glumes scabrous; lemma glabrous to sparsely scabrous 1. *P. huashanica*

2b. Glumes pilose in proximal half, scabrous in distal half; lemma sparsely pilose 2. *P. stoloniformis*

1b. Plants usually densely tufted, without underground rhizomes.

3a. Anthers violet, 5–5.6 mm 4. *P. kronenburgii*

3b. Anthers usually yellow, 3–5 mm.

4a. Glumes densely hirsute, hairs 0.5–1.3 mm 3. *P. lamuginosa*

4b. Glumes scabrous or puberulent only proximally and distally 5. *P. juncea*

1. *Psathyrostachys huashanica* Keng, Fl. Tsinling. 1(1): 440. 1976 [“*huachanica*”].

华山新麦草 hua shan xin mai cao

Plants laxly tufted, with long, underground rhizomes. Culms glabrous, 30–60 cm tall, 2–4-noded. Leaf sheath brown at base, longer than internode, glabrous; ligule ca. 0.5 mm, margin ciliate; leaf blade usually flat, 3–20 × 0.2–0.4 cm, abaxial surface and margin scabrous, adaxial surface puberulent and pilose. Spike greenish, 4–9 × 1–1.5 cm; rachis densely pubescent, margin hirsute. Spikelets 2 or 3 per node, with 1 or 2 (or 3) florets; rachilla internodes 2.1–3.5 mm. Glumes (9–)10–13 mm, scabrous. Lemma glabrous to sparsely scabrous; first lemma 8–

10 mm; awn (5–)7–9(–14) mm. Palea equaling lemma, ciliate along keels. Anthers yellow, 4.5–6 mm. Caryopsis 4.5–6 mm. Fl. and fr. May–Aug. $2n = 14^*$.

• Stony and rocky slopes; 500–700 m. Henan, Shaanxi (Hua Shan).

In the protologue, the specific epithet was misspelled “*huachanica*” on p. 440, presumably as a typographical error. On pp. 98, 99, and 473 it was correctly spelled “*huashanica*.”

2. *Psathyrostachys stoloniformis* C. Baden, Nordic J. Bot. 9: 449. 1990.

匍茎新麦草 pu jing xin mai cao

Plants laxly tufted, with underground rhizomes. Culms 40–60 cm tall, 2- or 3-noded, glabrous, but pubescent below spike. Leaf sheath brown at base, usually shorter than internode; ligule 0.4–0.6 mm; leaf blade involute at margin, (2–)8–17 × (0.2–)0.3–0.5 cm, both surfaces scabrous. Spike oblong, 7–9 × 0.8–1.2 cm; rachis margin hirsute. Spikelets usually 3 per node, narrowly elliptic, with 1 or 2 florets. Glumes (8–)10–12(–14) mm, pilose proximally, scabrous distally. Lemma (8–)9–12(–14) mm including awn, usually sparsely pilose. Palea (6.5–)7–10 mm, apex bifid. Lodicules 1.4–1.8 mm. Anthers yellow, 3.5–4.5(–5) mm. Caryopsis 4.5–4.6 × 1.2–1.4 mm. Fl. and fr. Jun–Jul. $2n = 14^*$.

• Dry steppes; 1600–2500 m. Gansu, Qinghai.

3. *Psathyrostachys lanuginosa* (Trinius) Nevski in Komarov, Fl. URSS 2: 714. 1934.

毛穗新麦草 mao sui xin mai cao

Elymus lanuginosus Trinius in Ledebour, Fl. Altaic. 1: 121. 1829; *Hordeum lanuginosum* (Trinius) Schenck.

Culms densely tufted, 15–40(–60) cm tall, 2- or 3-noded, glabrous, rarely hairy just below spike. Leaf sheath grayish brown at base when older, glabrous; ligule 0.2–0.6 mm; leaf blade flat to subinvolute, 1–13 × 0.1–0.3 cm, abaxial surface glabrous to scabrous, adaxial surface scabrous to pubescent. Spike ovate, 1–2 × 1–1.3 cm, villous; rachis brittle. Spikelets usually (2 or) 3 per node, whitish green or grayish green, with 1(or 2) florets. Glumes setiform, (5–)6–8 mm, with dense, strongly patent, long hairs. Lemma densely patent villous, 7–9 mm including awn 1–2.5 mm. Palea 6–8(–9) mm, sparsely pilose, densely ciliate along keels, apex acute. Anthers yellowish, 3–4 mm. Caryopsis 3.5–4 mm. Fl. and fr. summer. $2n = 28$.

Stony or rocky slopes, screes; ca. 200 m. Gansu, Xinjiang [Russia (W Siberia); C Asia].

4. *Psathyrostachys kronenburgii* (Hackel) Nevski in Komarov, Fl. URSS 2: 713. 1934.

单花新麦草 dan hua xin mai cao

Hordeum kronenburgii Hackel, Allg. Bot. Z. Syst. 11: 133. 1905; *Elymus kronenburgii* (Hackel) Nikiforova.

Culms usually densely tufted, (50–)70–90 cm tall, 3–5-noded, glabrous, but pubescent just below spike. Leaf sheath grayish brown at base when older, ± separating into individual fibers; ligule 0.4–2 mm; leaf blade green or glaucous green, flat, 3–13 × 0.2–5 cm. Spike greenish, 5–7 × 0.9–1.2 cm; rachis pubescent, margin hirsute. Spikelets usually 3 per node, narrowly ovate, 0.8–1 cm, with 1(or 2) florets. Glumes violet tinged, (6.5–)8–10 mm, pilose. Lemma 6–12 mm, prominently 5-veined, pilose, tapering into a short awn (1.8–)2–3.5 mm. Palea equaling lemma, ciliate along keels. Lodicules 0.6–1.3 mm. Anthers violet, 5–6 mm. Caryopsis 4–4.5 mm. Fl. and fr. Jun–Aug. $2n = 14$.

Grassy places on mountain slopes or river banks. Gansu, Qinghai, Xinjiang [Russia; C Asia].

5. *Psathyrostachys juncea* (Fischer) Nevski in Komarov, Fl. URSS 2: 714. 1934.

新麦草 xin mai cao

Culms densely tufted, 50–80(–100) cm tall, 2–4-noded, smooth and glabrous, scabrous, or with dense, short, soft hairs below spike. Leaf sheath smooth, glabrous; ligule 0.3–1 mm; leaf blade glaucous to grayish green, flat or involute, 4–18 × 0.2–8 cm, glabrous to scabrous, margin scabrous. Spike (5–)9–12 × (0.5–)0.7–1.2 cm; rachis very brittle, puberulent, margin hirsute. Spikelets 2 or 3 per node, greenish, yellowish brown at maturity, narrowly elliptic, 0.8–1.1 cm, with 1 or 2(or 3) florets. Glumes (4–)5–8 mm, obscurely 1-veined, scabrous or puberulent only proximally and distally. Lemma lanceolate, (7–)8–11 mm including awn 1–2(–3) mm, usually with short, stiff hairs or long, soft hairs. Palea slightly shorter than lemma. Lodicules 1.3–1.5 mm. Anthers yellow or purple, 3.8–4.8 mm. Caryopsis 4.3–5 mm. Fl. and fr. May–Sep.

Grasslands on mountain slopes, stony or pebbly calcareous or schistose mountain slopes, steppes, roadsides, or as a field weed; 1500–2000(–5500) m. Gansu, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Russia; cultivated in North America].

- 1a. Culms below spike smooth and glabrous, or scabrous; anthers yellow 5a. var. *juncea*
- 1b. Culms with dense, short, soft hairs below spike; anthers purple 5b. var. *hyalanth*

5a. *Psathyrostachys juncea* var. *juncea*

新麦草(原变种) xin mai cao (yuan bian zhong)

Elymus junceus Fischer, Mém. Soc. Imp. Naturalistes Moscou 1: 25. 1811; *E. junceus* var. *villosus* Drobov.

Culms below spike smooth and glabrous, or scabrous. Anthers yellow. Fl. and fr. May–Sep. $2n = 14$.

Stony or pebbly calcareous or schistose mountain slopes, steppes, roadsides, or as a field weed; below 5500 m. Gansu, Nei Mongol, Xinjiang [Kazakhstan, Russia (Siberia); cultivated in North America].

5b. *Psathyrostachys juncea* var. *hyalanth* (Ruprecht) S. L. Chen, Novon 7: 229. 1997.

紫药新麦草 zi yao xin mai cao

Elymus hyalanthus Ruprecht, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 14: 36. 1869; *Psathyrostachys hyalanth* (Ruprecht) Tzvelev; *P. juncea* subsp. *hyalanth* (Ruprecht) Tzvelev.

Culms with dense, short, soft hairs below spike. Anthers purple, 3–4 mm. Fl. and fr. late summer to autumn.

Grasslands on mountain slopes, steppes; 1500–2000 m. Xinjiang [Kyrgyzstan, Russia].

100. *HORDEUM* Linnaeus, Sp. Pl. 1: 84. 1753.

大麦属 da mai shu

Critesion Rafinesque.

Plants annual or perennial. Culms usually erect. Leaf sheath of cauline leaves split almost to base; ligule membranous or leathery-membranous; auricles present or absent; leaf blade usually flat. Spike dense, usually without a terminal spikelet; rachis short, brittle, rarely flexible. Spikelets usually 3 per node, in regular rows, with 1 (or 2) florets; lateral spikelets usually pedicellate, rarely sessile, often reduced and much smaller than central spikelet; central spikelet usually sessile, rarely pedicellate, perfect. Glumes narrow, subulate-setaceous, sometimes lanceolate dilated at base, inconspicuously 1–3-veined, not keeled. Lemma subrounded abaxially, leathery, rarely leathery-membranous, 5-veined, not keeled, awned or awnless. Palea almost equaling lemma, glabrous, scabrous, or ciliate along keels. Lodicules broadly lanceolate or lanceolate-ovate. Caryopsis usually adnate to lemma and palea, rarely free, oblong, concave furrowed on inner side, apex hairy. $x = 7$.

Between 30 and 40 species: temperate regions, also on subtropical mountains; ten species (one endemic, two introduced) in China.

In addition to the species treated below, *Hordeum bulbosum* Linnaeus has been recorded as cultivated in China (FRPS 9(3): 30. 1987).

All species when young are used for forage.

- 1a. Plants perennial; glumes subulate-setaceous, not lanceolate dilated at base.
 - 2a. Glumes much (usually more than 10 ×) longer than floret 5. *H. jubatum*
 - 2b. Glumes shorter to slightly longer than floret.
 - 3a. Nodes of culms glabrous.
 - 4a. Central spikelet with 2 florets, distal floret usually sterile; anthers 2–2.3 mm 1. *H. innermongolicum*
 - 4b. Central spikelet usually with 1 floret; anthers 1–1.7 mm 3. *H. roshevitzii*
 - 3b. Nodes of culms pubescent.
 - 5a. Central spikelet lemma apex acute, acuminate, or with short awn usually shorter than lemma body; anthers 2–4 mm 2. *H. brevisubulatum*
 - 5b. Central spikelet lemma apex with awn 5–10 mm and usually longer than lemma body; anthers 1.1–2 mm 4. *H. bogdanii*
- 1b. Plants annual; glumes lanceolate dilated at base.
 - 6a. Spike distichous.
 - 7a. Rachis of spike brittle 6. *H. spontaneum*
 - 7b. Rachis of spike flexible 7. *H. distichon*
 - 6b. Spike hexastichous.
 - 8a. Rachis of spike flexible 10. *H. vulgare*
 - 8b. Rachis of spike brittle.
 - 9a. Lateral spikelets shortly pedicellate 8. *H. lagunculiforme*
 - 9b. Lateral spikelets sessile 9. *H. agriocrithon*

1. *Hordeum innermongolicum* P. C. Kuo & L. B. Cai, Acta Biol. Plateau Sin. 6: 223. 1987.

内蒙古大麦 *nei meng gu da mai*

Plants perennial, laxly tufted. Culms 80–140 cm tall, 3–5-noded, glabrous throughout. Leaf sheath glabrous; ligule 0.5–1 mm, membranous; leaf blade 6–15 × 0.4–0.6 cm, abaxial surface subglabrous, adaxial surface pubescent. Spike reddish brown, 7–16 × 0.5–0.7 cm; rachis slightly brittle. Lateral spikelets: pedicellate, usually sterile; pedicel 0.5–1 mm; glumes setaceous, 6–8 mm; lemma lanceolate, 5–7 mm, awn 3–4 mm. Central spikelet: sessile, usually with 2 florets; proximal floret fertile, distal one sterile; glumes lanceolate-setaceous, 6–9 mm, obscurely 2- or 3-veined; lemma lanceolate, 7–10 mm, pubescent, awn 6–8 mm. Anthers yellow, 2–2.3 mm. Caryopsis 2.5–3.5 × ca. 2 mm. Fl. and fr. Jul–Aug.

• Mountain slopes; ca. 1200 m. Nei Mongol, Qinghai.

2. *Hordeum brevisubulatum* (Trinius) Link, Linnaea 17: 391. 1844.

短芒大麦 *duan mang da mai*

Plants perennial, tufted or with short rhizomes. Culms usually erect, glabrous or densely pubescent at nodes. Leaf sheath

usually fibrous at base, sometimes membranous, ± pubescent; ligule 0.2–0.7 mm; auricles present or absent; leaf blade flat or sometimes involute, (3–)5–150(–175) × (0.2–)0.6–5(–7.1) cm, abaxial surface glabrous to scabrous or densely pilose, epidermis with straight or sinuous long cells, with or without silica cells, adaxial surface scabrous or densely pubescent or pilose. Spike pale glaucous to greenish or grayish violet, (2.3–)3–8.5(–9.6) × 0.4–0.8 cm; rachis brittle. Lateral spikelets: usually developed, sometimes rudimentary, pedicellate; pedicel 0.9–2.3 mm. Central spikelet: sessile or subsessile, lanceolate; glumes setaceous, equal, 5.5–6.5(–7) mm; lemma glabrous, subglabrous, pubescent, or densely pinkish violet pilose or long spinulose, apex acute-acuminate to shortly awned, awn usually shorter than lemma body; palea apex ± acute. Lodicules (0.6–)0.8–1.4(–1.6) mm, ± pubescent distally and at margin, apex acute to acuminate. Anthers yellow to violet, (2–)2.5–4 mm. Caryopsis yellow-brown to dark violet. Fl. and fr. summer.

Steppe valleys at timberline, wet meadows, saline meadows, stream banks, salt steppes, dry valleys, dry stony slopes and other dry habitats, rarely as a weed; 1400–5000 m. Gansu, Hebei, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang, Xizang [C and N Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Turkmenistan, Uzbekistan].

- 1a. Lemma of central spikelet glabrous or subglabrous; culms glabrous throughout;

- leaf blade abaxial epidermis without silica cells 2a. subsp. *brevisubulatum*
- 1b. Lemma of central spikelet pubescent, pilose or long spinulose; culms usually densely pubescent at nodes; leaf blade abaxial epidermis with or without silica cells.
- 2a. Lemma of central spikelet densely pinkish violet pilose or long spinulose; leaf blade abaxial epidermis without silica cells 2c. subsp. *turkestanicum*
- 2b. Lemma of central spikelet pubescent, but hairs usually sparser and shorter; leaf blade abaxial epidermis with very dense silica cells 2b. subsp. *nevskianum*

2a. *Hordeum brevisubulatum* subsp. *brevisubulatum*

短芒大麦(原亚种) duan mang da mai (yuan ya zhong)

Hordeum secalinum Schreber var. *brevisubulatum* Trinius, Sp. Gram. 1: pl. 4. 1828; *Critesion brevisubulatum* (Trinius) Á. Löve; *H. macilentum* Steudel; *H. secalinum* subsp. *brevisubulatum* (Trinius) Krylov.

Culms glabrous throughout. Leaf blade abaxial epidermis with straight long cells, without silica cells. Lemma of central spikelet glabrous or subglabrous; awn less than 3 mm. Fl. and fr. summer. $2n = 14^*$, 28^* .

Steppe valleys at timberline, saline meadows, stream banks; 1400–3000 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang, Xizang [Mongolia, Pakistan, Russia (SE Siberia); C Asia].

2b. *Hordeum brevisubulatum* subsp. *nevskianum* (Bowden) Tzvelev, Novosti Sist. Vyssh. Rast. 8: 66. 1971.

拟短芒大麦草 ni duan mang da mai cao

Hordeum nevskianum Bowden, Canad. J. Genet. Cytol. 7: 396. 1965; *Critesion brevisubulatum* subsp. *nevskianum* (Bowden) Á. Löve; *C. nevskianum* (Bowden) Tzvelev; *H. brevisubulatum* var. *nevskianum* (Bowden) Tzvelev.

Culms densely pubescent at nodes. Leaf blade abaxial epidermis with sinuous long cells, silica cells very dense. Lemma of central spikelet pubescent, but hairs usually sparser and shorter than in subsp. *turkestanicum*. Fl. and fr. summer. $2n = 14$, 28^* .

Saline meadows, salt steppes, dry valleys, rarely as a weed; 1500–5000 m. Qinghai, Shaanxi, Xinjiang [N Afghanistan, Kashmir, Nepal, Russia (W Siberia)].

2c. *Hordeum brevisubulatum* subsp. *turkestanicum* Tzvelev, Novosti Sist. Vyssh. Rast. 8: 66. 1971.

糙稃大麦草 cao fu da mai cao

Hordeum turkestanicum Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 45. 1934, not R. E. Regel (1914); *Critesion brevisubulatum* subsp. *turkestanicum* Á. Löve; *C. turkestanicum* Tzvelev; *H. brevisubulatum* var. *turkestanicum* P. C. Kuo.

Culms to 50 cm tall, usually densely pubescent at nodes. Leaf blade $5-8 \times 0.2-0.4$ cm, both surfaces densely pilose or scabrous, abaxial epidermis with straight long cells, without silica cells. Spike dense, usually grayish violet. Lemma densely pinkish violet pilose or long spinulose, apex acuminate in lateral spikelets, awned in central spikelet. Fl. and fr. summer. $2n = 28$, 42 .

Mainly dry stony slopes and other dry habitats, but also wet meadows and stream banks; 2000–4600 m. Xinjiang, Xizang [C and NE Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Nepal, Russia, Turkmenistan, Uzbekistan].

3. *Hordeum roshevitzii* Bowden, Canad. J. Genet. Cytol. 7: 395. 1965.

紫大麦草 zi da mai cao

Hordeum sibiricum Roshevitz, Izv. Glavn. Bot. Sada SSSR 28: 385. 1929, not Link ex Steudel (1840), nor (Linnæus) Schenck (1907); *Critesion californicum* (Covás & Stebbins) Á. Löve subsp. *sibiricum* Á. Löve; *C. roshevitzii* (Bowden) Tzvelev.

Plants perennial, usually laxly tufted. Culms erect, 40–70 cm tall, 3- or 4(–6)-noded, smooth, glabrous. Ligule membranous; auricles usually absent; leaf blade flat, $3.5-15 \times 0.3-0.4$ cm, both surfaces glabrous but scabrous, epidermis without silica cells. Spike green or purplish green to blackish purple, $5-8 \times 0.3-0.6$ cm; rachis slightly brittle near base, very brittle distally, margin scabrous to ciliate. Lateral spikelets rudimentary, rarely male; glumes setaceous, 0.5–0.9(–1) cm, scabrous; lemma and palea ca. 4.2 mm; lemma awn ca. 2.3 mm. Central spikelet usually with 1 floret; glumes setaceous, 6–8 mm; lemma lanceolate, 5–7 mm, glabrous, awn (2–)4–8 mm; palea slightly shorter than or equaling lemma. Anthers yellow, 1–1.7 mm. Fl. and fr. Jun–Aug. $2n = 14^*$, 28 .

Alkaline or saline meadows, lake shores, river banks, streamsides, pebbles; 500–3500 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang [Japan, Korea, Mongolia, Russia].

The record in FRPS (9(3): 28. 1987) of *Hordeum violaceum* Boissier & Hohenacker, native to SW Asia, is referable to *H. roshevitzii*.

4. *Hordeum bogdanii* Wilensky, Trudy Glavn. Bot. Sada 40: 248. 1928 [“*bogdani*”].

布顿大麦草 bu dun da mai cao

Critesion bogdanii (Wilensky) Á. Löve.

Plants perennial, tufted. Culms 40–80(–100) cm tall, ca. 2 mm in diam., (2 or)3–5(or 6)-noded, densely appressed hairy at nodes. Leaf sheath membranous or fibrous, smooth, but those of lower leaves sometimes hairy; ligule 0.2–0.6 mm, membranous; auricles usually absent; leaf blade glaucous green, flat, $6-15 \times 0.3-0.8$ (–1) cm, stiff, both surfaces scabrous or adaxial surface pilose. Spike pale whitish glaucous or greenish violet to somewhat dark violet, $4-10 \times (0.3-0.5)0.5-0.7$ cm; rachis usually tough except apically, margin scabrous hairy. Lateral spikelets: pedicellate, male or perfect and setting seeds; glumes setaceous, rarely somewhat flattened at base, equal or proximal one slightly shorter (6–10 mm); lemma 5–7 mm, pubescent, awn 4–9 mm; palea usually equaling lemma. Central spikelet: sessile,

lanceolate; glumes setaceous, 5–10 mm; lemma 5–7 mm, densely shortly hairy, awn 5–10 mm; palea subequalling lemma, apex truncate or acute. Anthers usually yellow, 1.1–2 mm. Fl. and fr. Jun–Sep. $2n = 14$.

Alkaline or saline moist meadows, riverside sands, pebbles; 1000–3800 m. Gansu, Qinghai, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia (W Siberia), Turkmenistan, Uzbekistan].

5. *Hordeum jubatum* Linnaeus, Sp. Pl. 1: 85. 1753.

芒颖大麦 mang ying da mai

Critesion geniculatum Rafinesque, nom. illeg. superfl.; *C. jubatum* (Linnaeus) Nevski; *Elymus jubatus* (Linnaeus) Link.

Plants perennial, tufted, smooth and glabrous. Culms erect or decumbent at base, 30–60 cm tall, ca. 2 mm in diam., 3–5-noded. Leaf blade flat, 6–12 × 0.15–0.4 cm. Spike green or purplish green, nodding, 5–10 cm including awns, soft; rachis brittle. Lateral spikelets: reduced to 1–3 spreading awns, rarely male. Central spikelet: perfect; glumes spreading, awnlike, 2.5–6.5 cm, much longer than floret; lemma lanceolate 5–6(–8) mm, awn to 7 cm; palea equaling lemma. Fl. and fr. May–Aug. $2n = 28^*$.

Meadows, moist land. Heilongjiang, Liaoning [temperate regions of the world].

6. *Hordeum spontaneum* K. Koch, Linnaea 21: 430. 1848.

钝稃野大麦 dun fu ye da mai

Plants annual. Culms 40–50 cm tall, 5- or 6-noded, glabrous. Leaf sheath glabrous; ligule yellowish brown, ca. 1 mm, apex truncate; auricles present, 2–3 mm; leaf blade 5–10 × 0.4–0.6 cm. Spike distichous, greenish to dark brown, slightly compressed, 4–6 × ca. 1 cm; rachis ca. 3 mm, brittle, densely pubescent. Lateral spikelets: pedicellate, sterile; pedicel ca. 2 mm; lemma apex rounded-obtuse, cuspidate, very shortly awned, or with awn 6–10 mm. Central spikelets: sessile, 1–1.4 cm; glumes linear-lanceolate, densely hairy, apex tapering into slender, scabrous awn; lemma broadly elliptic, glabrous, apex prolonged into flat, very scabrous awn 5–17 cm. Fl. and fr. Apr–Jun.

Thickets, stony screes, pebbles, roadsides, waste places, often as a weed in cultivated fields of *Hordeum* and other crops; 3500–4000 m. Sichuan, Xizang, Yunnan [Afghanistan, India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; NE Africa, SW Asia].

- 1a. Apex of lemma of lateral spikelets
rounded-obtuse 6a. var. *spontaneum*
- 1b. Apex of lemma of lateral spikelets
cuspidate or awned.
 - 2a. Apex of lemma of lateral spikelets
cuspidate or with very short awn
..... 6b. var. *proskowetzii*
 - 2b. Apex of lemma of lateral spikelets
with awn 6–10 mm 6c. var. *ischnatherum*

6a. *Hordeum spontaneum* var. *spontaneum*

钝稃野大麦(原变种) dun fu ye da mai (yuan bian zhong)

Hordeum ithaburense Boissier; *H. vulgare* Linnaeus subsp. *spontaneum* (K. Koch) Ascherson & Graebner.

Lateral spikelets: lemma apex rounded-obtuse. Fl. and fr. Apr–Jun. $2n = 14$.

Thickets, stony screes, pebbles, roadsides, waste places, often as a weed in cultivated fields of *Hordeum* and other crops; 3500–4000 m. Sichuan, Xizang [Afghanistan, India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; NE Africa, SW Asia].

6b. *Hordeum spontaneum* var. *proskowetzii* Nábělek, Spisy Přír. Fak. Masarykovy Univ. 111: 32. 1929.

芒稃野大麦 mang fu ye da mai

Lateral spikelets: lemma apex cuspidate or with very short awn. Fl. and fr. Apr–Jun.

Roadsides, waste places, as a weed in cultivated fields of *Hordeum*. Sichuan, Xizang [C and SW Asia].

6c. *Hordeum spontaneum* var. *ischnatherum* (Cosson) Thellung, Fl. Adv. Montpellier, 161. 1912.

尖稃野大麦 jian fu ye da mai

Hordeum ithaburense var. *ischnatherum* Cosson, Bull. Soc. Bot. France 11: 163. 1864; *H. ischnatherum* (Cosson) Schweinfurth.

Lateral spikelets: lemma apex with awn 6–10 mm. Fl. and fr. Apr–Jun.

Roadsides, as a weed in cultivated fields of *Hordeum*. Sichuan, Xizang [C and SW Asia].

7. *Hordeum distichon* Linnaeus, Sp. Pl. 1: 85. 1753.

二棱大麦 er leng da mai

Plants annual. Culms erect, 60–80 cm tall, 5- or 6-noded, smooth, glabrous. Leaf sheath usually shorter than internode; ligule membranous; auricles present, surrounding culm; leaf blade 15–20 × 0.6–0.7 cm. Spike erect, distichous, 10–20 × 0.7–0.8 cm; rachis flexible, margin pubescent. Lateral spikelets: pedicellate, sterile; pedicel ca. 2 mm; glumes ca. 5 × 0.5 mm, awn slender, ca. 5 mm; lemma ca. 8 mm. Central spikelet: fertile; glumes ca. 5 mm, awn slender, ca. 5 mm; lemma ca. 10 mm, awn to 15 cm; caryopsis adherent to or free from lemma and palea. Fl. and fr. Jul–Aug.

Cultivated as a fodder plant, or a weed in fields of *Hordeum vulgare*. Anhui, Fujian, Hebei, Henan, Qinghai, Xizang; perhaps other provinces [widely cultivated in temperate regions].

- 1a. Caryopsis of central spikelet adherent to
lemma and palea 7a. var. *distichon*
- 1b. Caryopsis of central spikelet free from
lemma and palea 7b. var. *nudum*

7a. *Hordeum distichon* var. *distichon*

二棱大麦(原变种) er leng da mai (yuan bian zhong)

Hordeum vulgare Linnaeus convar. *distichon* (Linnaeus) Alefeld; *H. vulgare* subsp. *distichon* (Linnaeus) Koernicke; *H. vulgare* var. *distichon* (Linnaeus) J. D. Hooker.

Central spikelet: caryopsis adherent to lemma and palea. Fl. and fr. Jul–Aug. $2n = 14$.

Cultivated as a fodder plant, or a weed in fields of *Hordeum vulgare*. Hebei, Qinghai, Xizang [widely cultivated in temperate regions].

7b. *Hordeum distichon* var. *nudum* Linnaeus, Sp. Pl. 1: 85. 1753.

裸麦 luo mai

Hordeum distichon convar. *nudum* (Linnaeus) Tzvelev; *H. distichon* subsp. *nudum* (Linnaeus) Rothmaler; *H. nudum* (Linnaeus) Arduino; *H. sativum* Jessen var. *nudum* (Linnaeus) Vil-morin; *H. vulgare* var. *nudum* (Linnaeus) J. D. Hooker.

Central spikelet: caryopsis free from lemma and palea. Fl. and fr. Jul–Aug. $2n = 14$.

Cultivated as a fodder plant, or a weed in fields of *Hordeum vulgare*. NW and SW China [widely cultivated in temperate regions].

8. *Hordeum lagunculiforme* Bachtcev, Kungl. Lantbrukshögskolans Ann. 23: 309. 1957.

瓶大麦 ping da mai

Hordeum spontaneum K. Koch var. *lagunculiforme* (Bachtcev) Bachtcev.

Plants annual. Culms erect, smooth, glabrous. Leaf sheath usually glabrous; ligule membranous; auricles present; leaf blade flat. Spike hexastichous; rachis brittle. Lateral spikelets: pedicellate, fertile; pedicel 1.5–2 mm. Central spikelet: sessile, fertile. Fl. and fr. Jun–Sep. $2n = 14$.

Field margins, roadsides. Qinghai, Sichuan, Xizang [Kashmir, Russia, Turkmenistan].

9. *Hordeum agriocrithon* A. E. Åberg, Lantbrukshögskolans Ann. 6: 160. 1938.

六棱大麦 liu leng da mai

Hordeum vulgare Linnaeus subsp. *agriocrithon* (A. E. Åberg) Å. Löve.

Plants annual. Culms erect, 60–90 cm, smooth, glabrous. Leaf sheath usually glabrous; ligule 1–2 mm, membranous; auricles present, lanceolate; leaf blade flat, 10–15(–20) × 1–1.5 cm. Spike hexastichous, dense; rachis brittle. Spikelets all sessile, fertile, and similar. Glumes 5–6 × ca. 1 mm, densely puberulent; awn slender, ca. 10 mm. Lemma to 14 mm; awn ca. 15 mm. Caryopsis oblong, ca. 12 mm. Fl. and fr. Jun–Sep. $2n = 14$.

Usually a weed in fields of *Hordeum vulgare*. Qinghai, Sichuan, Xizang [C and SW Asia, E Mediterranean region].

10. *Hordeum vulgare* Linnaeus, Sp. Pl. 1: 84. 1753.

大麦 da mai

Plants annual. Culms erect, 50–100 cm tall, smooth, glabrous. Leaf sheath usually glabrous; auricles present; ligule 1–2 mm, membranous; leaf blade 9–25 × 0.6–2 cm. Spike hexastichous, dense; rachis flexible. Spikelets all sessile, fertile, and

similar. Glumes linear-lanceolate at base, puberulent; awn 8–14 mm. Lemma apex with long awn 8–15 cm or 3-forked appendage. Palea equaling lemma. Caryopsis adherent to or free from lemma and palea. Fl. and fr. Jun–Aug.

Commonly cultivated as a food and fodder plant. Anhui, Fujian, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [cultivated worldwide in all non-tropical countries and in montane areas of tropics].

1a. Caryopsis adherent to lemma and palea ... 10a. var. *vulgare*

1b. Caryopsis free from lemma and palea.

2a. Apex of lemma with long awn

8–15 cm 10b. var. *coeleste*

2b. Apex of lemma with 3-forked

appendage 10c. var. *trifurcatum*

10a. *Hordeum vulgare* var. *vulgare*

大麦(原变种) da mai (yuan bian zhong)

Hordeum sativum Jessen, nom. illeg. superfl.; *H. sativum* var. *vulgare* (Linnaeus) K. Richter; *Triticum vulgare* (Linnaeus) Salisbury (1796), not Villars (1787).

Lemma apex with long awn 8–15 cm. Caryopsis adherent to lemma and palea. Fl. and fr. Jun–Aug. $2n = 14$.

Commonly cultivated as a food and fodder plant in China [cultivated worldwide in all non-tropical countries and in montane areas of tropics].

10b. *Hordeum vulgare* var. *coeleste* Linnaeus, Sp. Pl. 1: 85. 1753.

青稞 qing ke

Hordeum coeleste (Linnaeus) P. Beauvois; *H. sativum* var. *coeleste* (Linnaeus) Vilmorin.

Lemma with long awn 8–15 cm. Caryopsis free from lemma and palea. Fl. and fr. Jun–Sep. $2n = 14$.

Sometimes cultivated in NW and SW China [cultivated in other non-tropical countries].

10c. *Hordeum vulgare* var. *trifurcatum* (Schlechtendal) Alefeld, Landw. Fl. 341. 1866.

藏青稞 zang qing ke

Hordeum coeleste var. *trifurcatum* Schlechtendal, Linnaea 11: 543. 1837; *H. aegiceras* Nees ex Royle; *H. sativum* var. *trifurcatum* Schlechtendal ex Orlov & A. E. Åberg; *H. trifurcatum* (Schlechtendal) Wender; *H. vulgare* subsp. *aegiceras* (Nees ex Royle) Å. Löve; *H. vulgare* var. *aegiceras* (Nees ex Royle) Aitchison.

Lemma apex with 3-forked appendage. Caryopsis free from lemma and palea. Fl. and fr. Jun–Jul. $2n = 14$.

Sometimes cultivated. Gansu, Qinghai, Sichuan, Xizang [cultivated in other non-tropical countries].

101. HYSTRIX Moench, Methodus, 294. 1794.

猓草属 wei cao shu

Asprella Humboldt (1790), not *Asprella* Schreber (1789).

Plants perennial, with short or creeping rhizomes. Culms usually erect. Leaf sheath of cauline leaves split almost to base; auricles crescent-shaped; ligule leathery-membranous. Spike erect or nodding, slender; rachis not disarticulating at nodes. Spikelets (1 or) 2 per node, with 1–3 (4 in *H. coreana*) florets, distal floret usually sterile; rachilla disarticulating above glumes. Glumes usually weakly developed or sometimes absent (9–10 mm in *H. coreana*), subulate or linear-setiform, not keeled (keeled in *H. coreana*), scabrous. Lemma lanceolate, subleathery, 5–7-veined, without distinct keel, usually awned; callus subobtusate. Palea 2-keeled, \pm ciliate along keels. Lodicules broadly lanceolate, margin ciliate. Caryopsis narrow, slightly furrowed, apex hairy. $x = 7$.

About ten species: mainly in warm-temperate regions of Asia and North America; four species (one endemic) in China.

- 1a. Glumes well developed, 9–10 mm including awns, keeled 4. *H. coreana*
 1b. Glumes absent or weakly developed, to 6 mm, not keeled.
 2a. Culms 40–60 cm tall, 3- or 4-noded 3. *H. kunlunensis*
 2b. Culms 80–130 cm tall, 4–6-noded.
 3a. Spikelets with 2 or 3 florets; glumes subulate, 3–6 mm 1. *H. komarovii*
 3b. Spikelets with 1 floret; glumes usually absent, especially in proximal spikelets 2. *H. duthiei*

1. *Hystrix komarovii* (Roshevitz) Ohwi, Acta Phytotax. Geobot. 2: 31. 1933.

东北猬草 dong bei wei cao

Asperella komarovii Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada SSSR 5: 152. 1924.

Culms 100–130 cm tall, 4–6-noded, glabrous or pubescent below spike. Leaf sheath glabrous or pubescent; ligule ca. 1.5 mm; leaf blade flat, 10–20 \times 1–2 cm, abaxial surface scabrous, adaxial surface pubescent. Spike \pm nodding, green, slender, 10–20 \times 1–1.5 cm; rachis pubescent on back, margin ciliate. Spikelets 2 per node, or 1 per node proximally in spike, with 2 or 3 florets. Glumes subulate, 3–6 mm, pubescent. First lemma ca. 12 mm; callus densely pubescent; awn 1–1.5 cm. Palea linear-lanceolate, shorter than lemma, ciliate along keels, apex 2-lobed. Caryopsis linear, slightly concave on inner side. Fl. and fr. Jun–Jul.

Usually in forests; 1000–2000 m. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Shaanxi [Japan, Korea, Mongolia, Russia].

2. *Hystrix duthiei* (Stapf ex J. D. Hooker) Bor, Indian Forester 66: 544. 1940.

猬草 wei cao

Asperella duthiei Stapf ex J. D. Hooker, Fl. Brit. India 7: 375. 1896 [“1897”].

Culms 80–100 cm tall, 4- or 5-noded. Leaf sheath glabrous or puberulent proximally; ligule ca. 1 mm, apex truncate; leaf blade 10–15 cm, glabrous or adaxial surface pilose; rachis pale puberulent. Spikelets 2 per node, 3–4 mm, with 1 floret. Glumes usually absent, especially in proximal spikelets. Lemma lanceolate, 9–11 mm, 5-veined, with prickly hairs abaxially; callus obtuse, pubescent; awn 1.5–2.5 cm. Palea slightly shorter than lemma, laxly ciliate along keels. Anthers yellow, ca. 5 mm. Fl. and fr. May–Aug.

Forest margins, thickets; ca. 2000 m. Anhui, Henan, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [N India, Nepal].

3. *Hystrix kunlunensis* K. S. Hao, Bot. Jahrb. Syst. 68: 580. 1938.

昆伦猬草 kun lun wei cao

Culms 40–60 cm tall, 3- or 4-noded, smooth, glabrous at nodes. Leaf sheath shorter than internode, glabrous; ligule very short to absent; leaf blade green, linear-lanceolate, 5–7 \times 0.2–0.5 cm, abaxially glabrous to scabrous, adaxially glabrous, base subauriculate, apex acuminate; leaf blade of innovation shoot narrower, narrowly linear. Spike dense, to 5 cm; rachis glabrous. Spikelets 2 per node, distichous, fragile, with 2(or 3) florets; proximal florets bisexual, distal ones unisexual. Glumes subulate, unequal, 2–5 mm, scaberulose to minutely pubescent. Lemma separated from glume by a short internode, linear-lanceolate, 6–9 mm, eventually deciduous; awn subflexuose, 1–1.2 cm, scabrous, inconspicuously veined. Palea linear-oblong, 2-keeled, glabrous, ciliate along keels. Caryopsis elliptic-oblong, ca. 5 mm.

• Near lakes; ca. 4500 m. Qinghai (Qinghai Hu).

4. *Hystrix coreana* (Honda) Ohwi, J. Jap. Bot. 12: 653. 1936.

高丽猬草 gao li wei cao

Elymus coreanus Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3(1): 17. 1930; *Asperella coreana* (Honda) Nevski; *Clinelymus coreanus* (Honda) Honda; *E. dasystachys* Trinius var. *maximoviczii* Komarov.

Culms tufted, geniculate at base, 50–65 cm tall, 3- or 4-noded, villous below spike. Leaf sheath shorter than internode, villous; ligule ca. 0.3 mm, membranous; leaf blade flat, 0.5–0.9 cm wide, both surfaces pilose. Spike somewhat nodding, 8–10 cm; rachis villous. Spikelets with 3 or 4 florets. Glumes subulate, unequal, keeled, 3-veined, scabrous along veins, apex tapering into scabrous awn; proximal glume ca. 9 mm including awn; distal glume ca. 10 mm including awn. Lemma ca. 15 mm including awn, 5-veined, glabrous except near apex. Palea ca. 9 mm, ciliate along keels distally. Lodicules ca. 1.6 mm. Anthers ca. 5.5 mm.

Sandy places on river banks. Heilongjiang, Jilin, Liaoning [N Korea, Russia (Far East)].

102. *ELYMUS* Linnaeus, Sp. Pl. 1: 83. 1753.

披碱草属 pi jian cao shu

Campeiostrachys Drobow; *Clinelymus* (Grisebach) Nevski, nom. superfl.; *Elymus* sect. *Clinelymus* Grisebach; *Goulardia* Husnot; *Roegneria* K. Koch; *Semeiostrachys* Drobow; *Terrellia* Lunell, nom. illeg. superfl.

Plants perennial, usually tufted, usually without, rarely with, rhizomes. Culms usually erect. Leaf sheath of cauline leaves split almost to base; auricles present or absent; leaf blade flat or rolled. Spike erect to nodding. Spikelets 1 or 2(–4) per node, sessile, rarely very shortly pedicellate, appressed to rachis, clearly laterally compressed, usually all similar, with 2–10 or more florets; rachis tough. Glumes opposite or side-by-side, linear-lanceolate to lanceolate-ovate, firmly membranous to leathery, 1–9(–11)-veined, not keeled, apex obtuse to shortly awned; veins \pm raised. Lemma lanceolate-oblong, rounded abaxially, 5-veined, \pm pubescent, apex obtuse or acute to awned, rarely toothed; veins connivent at apex; awn erect or reflexed. Palea shorter than or equaling lemma, apex retuse, subrounded, or acute. Caryopsis usually adherent to lemma and palea. $x = 7$.

About 170 species: temperate regions of both hemispheres, mainly in Asia; 88 species (62 endemic) in China.

The genus *Roegneria* should be referred to *Elymus* because of their many common characters, e.g., plants usually tufted; spikelets usually all similar, 1 per node; lemma lanceolate-oblong, rounded abaxially, 5-veined, veins connivent at apex.

In addition, two North American species have been recorded as cultivated in China (FRPS 9(3): 10, 66. 1987): *Elymus canadensis* Linnaeus and *E. trachycaulis* (Link) Gould ex Shinnars (as *R. pauciflora* (Schweinitz) Hylander).

Löve (Feddes Repert. 95: 447–473. 1984) published several new combinations and *nomina nova* in *Elymus* based on names previously validly published in *Roegneria* by Keng and Chen (Acta Univ. Nankin. Sci. Nat. [J. Nanjing Univ. (Biol.)] 1963(1): 1–92. 1963). However, in all cases, Löve cited the place of publication of the basionym from a later publication by Keng (Fl. Ill. Pl. Prim. Sin. Gram., ed. 2, 1965). Under Art. 33.3 of the Saint Louis Code, Löve's combinations were not validly published. These errors in citation are not correctable under Art. 33.4 because they are omissions, nor are they correctable under Art. 33.6(a) because conditions for valid publication were not again fulfilled in the 1965 work.

All species of this genus are good forage plants.

- 1a. Spikelets 2 per node (at least at middle nodes), rarely 3 or 4 per node.
 - 2a. Glumes much shorter than lemma.
 - 3a. Lemma awn more than 10 mm.
 - 4a. Leaf blade flat, 10–15 \times 0.5–1 cm 7. *E. sibiricus*
 - 4b. Leaf blade flat or \pm rolled, 3–10 \times 0.2–0.5 cm.
 - 5a. Leaf blade flat, 3–5 mm wide; glume apex with awn 1–4 mm 8. *E. nutans*
 - 5b. Leaf blade \pm rolled, ca. 2 mm wide; glume apex mucronate or acuminate 9. *E. atratus*
 - 3b. Lemma awn less than 7 mm.
 - 6a. Leaf blade 1.5–3 mm wide; glumes oblong, 2–3 mm, 3-veined 12. *E. sinosubmuticus*
 - 6b. Leaf blade 3–5 mm wide; glumes ovate-lanceolate, oblong-lanceolate, or narrowly lanceolate, 3–4 mm, 1–3-veined.
 - 7a. Spikelets 13–15 mm, with 4–6 florets; glumes oblong-lanceolate or ovate-lanceolate 10. *E. brevistaratus*
 - 7b. Spikelets 10–12 mm, with 3 or 4 florets; glumes narrowly lanceolate 11. *E. alpinus*
 - 2b. Glumes slightly shorter than or equaling lemma.
 - 8a. Rachis densely hirsute, nodes swollen 6. *E. villifer*
 - 8b. Rachis not densely hirsute, nodes not swollen.
 - 9a. Culms, leaf blade, and spike all farinaceous; glumes and lemma \pm purplish punctate; awn purple, pubescent 5. *E. purpuraristatus*
 - 9b. Culms, leaf blade, and spike not farinaceous; glumes and lemma not purplish punctate; awn green, glabrous but scabrous.
 - 10a. Glumes hirsutulous along veins.
 - 11a. Leaf sheath glabrous; spike purplish; glume apex acuminate or with point ca. 1.5 mm 2. *E. barystachyus*
 - 11b. Leaf sheath villous at base; spike green; glume apex usually with awn to 5 mm 4. *E. dahuricus*
 - 10b. Glumes scabrous along veins.
 - 12a. Glume apex acuminate or with awn 1–4 mm; lemma with usually erect awn (3–)5–13 mm.
 - 13a. Culms to 120 cm tall, 4- or 5-noded; leaf blade 10–20 \times 0.6–1.4 cm; lemma glabrous, or hirsutulous in distal half 1. *E. tangutorum*
 - 13b. Culms 40–80 cm tall, 2- or 3-noded; leaf blade 5–12 \times ca. 0.5 cm; lemma puberulent throughout ... 4. *E. dahuricus*
 - 12b. Glume apex with awn 5–7 mm; lemma with usually reflexed awn 8–20(–40) mm.
 - 14a. Leaf blade 1–1.6 cm wide; spikelets 2 or 3(or 4) per node 3. *E. excelsus*
 - 14b. Leaf blade 0.5–0.9(–1.2) cm wide; spikelets 2 per node, or 1 per node in proximal and distal parts of spike 4. *E. dahuricus*
 - 1b. Spikelets 1 per node.
 - 15a. Lemma with long, strongly recurved awn at seed maturity; if lemma awn short or nearly absent, or only slightly curved, then palea shorter than lemma, ciliate along keels, and apex rounded or emarginate.
 - 16a. Glumes usually slightly shorter than or equaling first lemma, 5–7-veined.
 - 17a. Palea oblong-obovate, much shorter than lemma 14. *E. ciliaris*

- 17b. Palea oblong, slightly shorter than or equaling lemma.
- 18a. Lemma glabrous throughout 20. *E. tibeticus*
- 18b. Lemma scabrous, pubescent, or hispidulous throughout.
- 19a. Glumes with thin margin 15. *E. canaliculatus*
- 19b. Glumes not with thin margin.
- 20a. Lemma abaxially hispidulous or laxly spinulose.
- 21a. Lemma abaxially laxly spinulose, awn 2–2.5 cm; culms 30–50 tall 16. *E. sinoflexuosus*
- 21b. Lemma abaxially hispidulous, awn 2.5–4.5 cm, culms 60–100 cm tall 17. *E. gmelinii*
- 20b. Lemma abaxially smooth and glabrous (at middle), scabrous, puberulent, or pubescent, sometimes spinulose along veins.
- 22a. Lemma abaxially scabrous, puberulent, or pubescent.
- 23a. Lemma abaxially puberulent; culms 25–30 cm tall 18. *E. zhui*
- 23b. Lemma abaxially scabrous or pubescent, margin ciliolate; culms 30–90 cm tall 19. *E. formosanus*
- 22b. Lemma abaxially smooth and glabrous at middle, otherwise spinulose along veins or \pm puberulent.
- 24a. Leaf blade usually flat, thin; glume apex acuminate 21. *E. nakaii*
- 24b. Leaf blade involute, stiff; glume apex acute or with point 1–5 mm 22. *E. strictus*
- 16b. Glumes much shorter than first lemma, (1–)3–5-veined; if glumes only slightly shorter than first lemma then margin thin, scarious, membranous, or very narrowly hyaline.
- 25a. Glumes slightly shorter than first lemma, margin thin, scarious, membranous, or very narrowly hyaline.
- 26a. Glume margin scarious.
- 27a. Culms 80–150 cm tall 23. *E. caninus*
- 27b. Culms 30–60 cm tall 24. *E. caesifolius*
- 26b. Glume margin thin, membranous, or very narrowly hyaline.
- 28a. Glume margin thin; spikelets pedicellate, pedicel 0.8–9 mm.
- 29a. Spikelet pedicel 0.8–1.5(–2) mm 25. *E. durus*
- 29a. Spikelet pedicel 5–9 mm 13. *E. cacuminis*
- 28b. Glume margin membranous or very narrowly hyaline; spikelets sessile or subsessile.
- 30a. Glume margin very narrowly hyaline.
- 31a. Culms 50–100 cm tall, 3–5-noded; leaf blade flat, 2.5–8 mm wide 26. *E. antiquus*
- 31b. Culms 10–60 cm tall, 2- or 3-noded; leaf blade tightly involute, 1–4 mm wide 27. *E. burchan-buddae*
- 30b. Glume margin membranous.
- 32a. Lemma glabrous throughout.
- 33a. Glume apex with short awn; leaf blade adaxial surface villous 28. *E. serpentinus*
- 33b. Glume apex awnless, usually acute; leaf blade adaxial surface usually scabrous 29. *E. glaberrimus*
- 32b. Lemma puberulent or \pm hispidulous.
- 34a. Spikelets with 3 or 4 florets; lemma puberulent 30. *E. pseudocaninus*
- 34b. Spikelets with 4 or 5(or 6) florets; lemma hispidulous distally and near margin 31. *E. sinkiangensis*
- 25b. Glumes much shorter than first lemma, margin herbaceous.
- 35a. Glume apex usually tapering into awn 2–7 mm; palea equaling lemma.
- 36a. Lemma glabrous throughout.
- 37a. Culms 15–20 cm tall; first lemma 7–9 mm; anthers yellow or purple, 1.2–2.5 mm 32. *E. jacquemontii*
- 37b. Culms (15–)40–50 cm tall; first lemma 10–12 mm; anthers black or brown, 2–5 mm.
- 38a. First lemma ca. 10 mm; anthers black, ca. 2 mm 33. *E. aristiglumis*
- 38b. First lemma 11–12 mm; anthers brown, 4–5 mm 34. *E. shouliangiae*
- 36b. Lemma hirsute or hirsutulous throughout, pubescent only at base and margin, or puberulent proximally and hispidulous distally.
- 39a. Lemma pubescent only at base and margin 37. *E. altissimus*
- 39b. Lemma hirsute or hirsutulous throughout, or puberulent proximally and hispidulous distally.
- 40a. Lemma hirsutulous throughout.
- 41a. Culms 1- or 2-noded; spikelets with 2 or 3 florets 33. *E. aristiglumis*
- 41b. Culms 3-noded; spikelets with 4 or 5 florets 35. *E. confusus*
- 40b. Lemma hirsute throughout, or puberulent proximally and hispidulous distally.
- 42a. Lemma hirsute throughout; culms 60–75 cm tall; palea ciliolate along keels distally 36. *E. anthosachnoides*
- 42b. Lemma puberulent proximally, hispidulous distally; culms 20–45 cm tall; palea puberulent between keels distally 39. *E. serotinus*
- 35b. Glume apex acute, mucronate, or with awn less than 2 mm; palea slightly shorter to slightly longer than lemma.

- 43a. Palea equaling or slightly longer than lemma; anthers 2.5–3 mm; lemma awn (2.5–)3.5–5.5 cm.
 44a. Leaf blade 1–2 mm wide; palea ciliate along keels 40. *E. retroflexus*
 44b. Leaf blade 2–4 mm wide; palea glabrous along keels 41. *E. leiotropis*
- 43b. Palea slightly shorter than lemma; anthers 1–2 mm; lemma awn 1–3 cm.
 45a. Spike somewhat nitid; lemma glabrous or sparsely puberulent abaxially 42. *E. brevipes*
 45b. Spike not nitid; lemma pubescent, hirsutulous, or scabrous abaxially.
 46a. Spikelets sessile or very shortly pedicellate, with 1–4(or 5) florets.
 47a. Spikelets usually very shortly pedicellate, with 3 or 4(or 5) florets 43. *E. schrenkianus*
 47b. Spikelets sessile; with 1–3(–5) florets.
 48a. Spikelets with 1–3 florets; culms 70–150 cm tall, 5–7-noded 37. *E. altissimus*
 48b. Spikelets with 2–5 florets; culms 40–80 cm tall, 3- or 4-noded 38. *E. laxinodis*
- 46b. Spikelets usually sessile, with 4–9 florets.
 49a. Lemma hirsute throughout, especially distally and near margin, first lemma
 13–14 mm 36. *E. anthosachnoides*
 49b. Lemma ± hirsutulous or scabrous abaxially, first lemma 9–11 mm.
 50a. Lemma ± hirsutulous abaxially, first lemma ca. 11 mm, awn 3–4 cm; spikelets with
 7–9 florets 44. *E. pulanensis*
 50b. Lemma scabrous abaxially, rarely hirsutulous, first lemma 9–11 mm, awn 1.8–3 cm;
 spikelets with 4–7 florets.
 51a. Spike ± purplish, nodding, 13–15 cm; glumes oblong-lanceolate, apex acute; lemma
 scabrous or hirsutulous abaxially 45. *E. purpurascens*
 51b. Spike usually glaucous green, slender and flexuose, 7–9 cm; glumes linear-lanceolate,
 apex usually acuminate; lemma scabrous abaxially 46. *E. tschimganicus*
- 15b. Lemma with straight awn or awnless; palea slightly shorter to slightly longer than lemma.
 52a. Lemma awn shorter than 7 mm or absent.
 53a. Lemma apex truncate, with 3 teeth 51. *E. tridentatus*
 53b. Lemma ± narrowed toward apex, without teeth.
 54a. Palea equaling or slightly longer than lemma, apex narrowly truncate.
 55a. Lemma ± pilose 47. *E. mutabilis*
 55b. Lemma smooth, glabrous.
 56a. Plants without rhizomes 48. *E. magnicaespes*
 56b. Plants ± with rhizomes.
 57a. First lemma ca. 10 mm, callus smooth, glabrous; anthers ca. 3 mm 49. *E. alashanicus*
 57b. First lemma 7.8–9 mm, callus puberulent; anthers 4.5–5 mm 52. *E. elytrigoides*
- 54b. Palea slightly shorter to longer than lemma, apex emarginate, rounded, or subrounded.
 58a. Glumes densely pubescent adaxially 50. *E. jufinshanicus*
 58b. Glumes not as above.
 59a. Palea 2/3–3/4 as long as lemma, subsmooth along keels 53. *E. grandis*
 59b. Palea equaling, subequaling, or longer than lemma, ± ciliate along keels.
 60a. Glumes 4–9-veined; palea slightly shorter to slightly longer than lemma.
 61a. Culms 30–80 cm tall; leaf blade 2–4 mm wide.
 62a. Spikelets 1.4–1.8 cm, with 5 or 6 florets; lemma margin broadly membranous 59. *E. viridulus*
 62b. Spikelets 1–1.4 cm, with 2–4 florets; lemma margin not membranous 60. *E. cheniae*
 61b. Culms usually more than 100 cm tall; leaf blade 5–11 mm wide.
 63a. Spikelets with 3–5 florets; glumes 5–7-veined; culms 100–160 cm tall 61. *E. intramongolicus*
 63b. Spikelets with 5–9 florets; glumes 7–9-veined; culms 50–120 cm tall 62. *E. nevskii*
- 60b. Glumes 3–5-veined; palea equaling lemma.
 64a. Spikelets with 2 or 3 florets 55. *E. kronokensis*
 64b. Spikelets with 3–6 florets.
 65a. Culms ca. 100 cm tall, 4- or 5-noded 54. *E. sylvaticus*
 65b. Culms 20–60 cm tall, 2–4-noded.
 66a. Culms 45–60 cm tall, 2- or 3-noded 56. *E. yushuensis*
 66b. Culms 20–45 cm tall, 2–4-noded.
 67a. Culms ca. 45 cm tall, usually 4-noded, palea keels wingless and ciliate 57. *E. leianthus*
 67b. Culms 20–25 cm tall, usually 2-noded; palea keels winged and ciliate 58. *E. humilis*
- 52b. Lemma awn more than 7 mm (but 1–35 mm *E. abolinii*).
 68a. Glumes 5–7(–9)-veined, slightly shorter or longer than lemma.
 69a. Glumes (especially distal one) longer than lemma.

- 70a. Spike somewhat lax; palea shorter than lemma; anthers 3–7 mm 81. *E. abolinii*
 70b. Spike dense, secund; palea subequalling lemma; anthers 2.5–3 mm.
 71a. Glume margin membranous; lemma scabrous or appressed setose 82. *E. fedtschenkoi*
 71b. Glume margin not membranous; lemma pubescent 83. *E. platyphyllus*
 69b. Glumes (especially proximal one) slightly shorter than lemma.
 72a. Spikelets pedicellate, pedicel 1–2.5 mm 85. *E. magnipodus*
 72b. Spikelets sessile.
 73a. Lemma ± glabrous abaxially, margin narrowly membranous 84. *E. shandongensis*
 73b. Lemma puberulent, pilose, or ± hirsutulous abaxially, margin not membranous.
 74a. Lemma margin ciliate 86. *E. pendulinus*
 74b. Lemma margin not ciliate.
 75a. Glume margin scarious; leaf blade abaxial surface glabrous or scabrous, adaxial surface
 scabrous or pubescent 87. *E. komarovii*
 75b. Glume margin not scarious; leaf blade both surfaces pilose or scabrous 88. *E. tianschanigenus*
 68b. Glumes (2 or) 3–5-veined, at least proximal glume 3-veined, usually much shorter than lemma,
 or if subequalling lemma then apex shortly awned.
 76a. Glumes always and lemma sometimes with membranous or scarious margin.
 77a. Glumes and lemma with membranous or scarious margin.
 78a. Lemma glabrous to hispidulous, margin membranous 63. *E. kamoji*
 78b. Lemma hirsutulous proximally and distally, subglabrous at middle, long ciliate near margin,
 margin broadly scarious 64. *E. hybridus*
 77b. Glumes with membranous margin; lemma without such margin.
 79a. Culms 50–60 cm tall, 2- or 3-noded.
 80a. Glumes 5–6 mm; lemma awn 5–10 mm; anthers black 65. *E. curtiaaristatus*
 80b. Glumes 9–12 mm; lemma awn 12–15 mm; anthers yellow 66. *E. scabridulus*
 79b. Culms 60–100 cm tall, 4–7-noded.
 81a. Spikelets 3.5–4.5 cm, with 5–10 florets 67. *E. yangiae*
 81b. Spikelets to 2 cm, with 3–9 florets.
 82a. Spikelets ± pedicellate; glumes oblong-lanceolate; palea scabrous along keels distally 68. *E. dolichatherus*
 82b. Spikelets sessile; glumes narrowly lanceolate; palea ± ciliate along keels.
 83a. Glumes and lemma usually smooth, glabrous, rarely scabrous along veins 70. *E. calcicola*
 83b. Glumes and lemma hirsute or villous.
 84a. Glumes lanceolate, subequal, 5–6 mm, 2-veined, hispidulous along veins; lemma
 densely villous abaxially 71. *E. trichospiculus*
 84b. Glumes oblong-lanceolate, hirsute, proximal one 5–6.5 mm, 3- or 4-veined, distal
 one 6.5–7.5 mm, 4- or 5-veined; lemma usually densely pubescent proximally,
 scabrous-ciliate distally 69. *E. tenuispicus*
 76b. Glumes and lemma without membranous or scarious margin.
 85a. Lemma ± puberulent abaxially.
 86a. Spikelets 12–16 mm, with 3–5 florets.
 87a. Glumes oblong-lanceolate, 7–10 mm; lemma awn 10–18 mm 72. *E. sinicus*
 87b. Glumes lanceolate, 2–5 mm; lemma awn 6–8 mm 74. *E. caianus*
 86b. Spikelets 9–12 mm, with 2 or 3 florets.
 88a. Culms usually 2-noded; glume apex acuminate 76. *E. hongyuanensis*
 88b. Culms 5–7-noded; glume apex with awn 1.5–3 mm 75. *E. debilis*
 85b. Lemma smooth or scabrous abaxially.
 89a. Lemma callus glabrous or subglabrous 78. *E. angustispiculatus*
 89b. Lemma callus distinctly hirsute.
 90a. Spikelets with 2 or 3 florets; lemma callus hairs 1–3 mm 73. *E. puberulus*
 90b. Spikelets with 4–8 florets; lemma callus hairs 4–10 mm.
 91a. Lemma callus hairs 6–10 mm 77. *E. barbicallus*
 91b. Lemma callus hairs 4–6 mm.
 92a. Leaf blade adaxial surface scabrous; lemma scabrous abaxially 79. *E. hondae*
 92b. Leaf blade adaxial surface pubescent; lemma smooth and glabrous abaxially 80. *E. alienus*

1. *Elymus tangutorum* (Nevski) Handel-Mazzetti, Symb. Sin.
 7: 1292. 1936.

Clinelymus tangutorum Nevski, Bull. Jard. Bot. Acad. Sci.
 URSS 30: 647. 1932; *Elymus molliusculus* L. B. Cai.

麦宾草 mai bin cao

Culms erect or geniculate at base, to 120 cm tall, 4- or 5-
 noded. Leaf sheath smooth; leaf blade flat, 10–20 × 0.6–1.4 cm,

both surfaces scabrous or abaxial surface smooth and adaxial surface pilose. Spike erect, usually dense, 8–15 × 0.8–1 cm; rachis margin ciliate. Spikelets usually 2 per node, green or slightly purplish, 9–15 mm, with 3 or 4 florets. Glumes lanceolate or linear-lanceolate, 7–10 mm, obscurely 5-veined, scabrous or hirsutulous along veins, apex acuminate or with awn 1–3 mm. Lemma lanceolate, glabrous, or hirsutulous distally; first lemma 8–12 mm; awn erect, (3–)5–11 mm. Palea equaling lemma, ciliate along keels, apex narrowly obtuse. Fl. and fr. late summer. $2n = 42$.

Mountain slopes, steppes. Gansu, Guizhou, Hubei, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, ?Nepal].

Elymus molliusculus is very similar to *E. tangutorum* in culm height and features of leaf blade, spike, spikelets, and lemma. It is therefore treated here in synonymy.

2. *Elymus barystachyus* L. B. Cai, Acta Bot. Boreal.-Occid. Sin. 13: 70. 1993.

硬穗披碱草 ying sui pi jian cao

Culms laxly tufted or solitary, usually geniculate at base, 50–80 cm tall, 2.5–4.5 mm in diam., 3–5-noded. Leaf sheath glabrous; ligule ca. 1 mm, membranous; leaf blade 7–22 × 0.4–0.8 cm, both surfaces glabrous. Spike 8–18 × 0.5–0.9 cm; rachis margin ciliate. Spikelets usually 2 per node, or 1 per node proximally and distally in spike, purplish, 10–18 mm, with 4–6 florets. Glumes linear-lanceolate, 7–10 mm, 4–7-veined, hirsutulous along veins, apex acuminate or with point ca. 1.5 mm. Lemma oblong-lanceolate, scabrous proximally, densely pubescent distally and at margin, apex acute or with short awn 1–2 mm; first lemma 7–8 mm. Palea equaling lemma, ciliate along keels, otherwise glabrous. Anthers black or tinged yellowish, ca. 2 mm. Fl. and fr. Jun–Aug.

• Forests; 2700–3200 m. Qinghai, Sichuan, Xizang.

3. *Elymus excelsus* Turczaninow ex Grisebach in Ledebour, Fl. Ross. 4: 331. 1852.

肥披碱草 fei pi jian cao

Clinelymus excelsus (Turczaninow ex Grisebach) Nevski; *Elymus dahuricus* Turczaninow ex Grisebach subsp. *excelsus* (Turczaninow ex Grisebach) Tzvelev; *E. dahuricus* var. *excelsus* (Turczaninow ex Grisebach) Roshevitz.

Culms robust, ca. 140 cm tall, ca. 6 mm in diam. Leaf sheath glabrous or pubescent at base; leaf blade usually glaucous, flat, 20–30 × 1–1.6 cm, both surfaces scabrous or abaxial surface smooth. Spike erect, robust, 15–22 cm; rachis margin ciliate. Spikelets 2 or 3 (or 4) per node, 2–15 (–25) mm excluding awns, with 4 or 5 florets. Glumes narrowly lanceolate, 10–13 mm, 5–7-veined, scabrous along veins, apex with awn ca. 7 mm. Lemma scabrous, glabrous or pubescent distally and at margin; first lemma 8–12 mm; awn reflexed, 15–20 (–40) mm, scabrous. Palea slightly shorter than lemma, ciliate along keels, slightly pubescent between keels. Fl. and fr. Jul–Aug. $2n = 42^*$.

Scrub, meadows, riverside sands, pebbles and rocks up to lower mountain slopes. Gansu, Hebei, Heilongjiang, Henan, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan [Japan, Korea, Mongolia, Russia].

4. *Elymus dahuricus* Turczaninow ex Grisebach in Ledebour, Fl. Ross. 4: 331. 1852.

披碱草 pi jian cao

Culms erect or geniculate at base, 40–140 cm tall, 2–4-noded. Leaf sheath glabrous, or densely pilose at base; leaf blade ± glaucous, flat, rarely rolled, 5–25 × 0.5–1 (–1.2) cm, abaxial surface smooth, adaxial surface smooth or scabrous. Spike erect, somewhat dense, 14–18 × 0.5–1 cm; rachis margin ciliate. Spikelets green or purplish green, usually stramineous at maturity, (1 or) 2 per node, 9–15 mm, with 2–5 florets. Glumes lanceolate or linear-lanceolate, 7–10 mm, 3–5-veined, scabrous or scabrous-hirsutulous along veins, apex acuminate or with awn to 5 mm. Lemma lanceolate, puberulent, pubescent, or densely hirsutulous throughout; first lemma 7–9 mm; awn straight or recurved, 2–20 mm. Palea equaling lemma, ciliate along keels, ± pubescent between keels, apex narrowly truncate. Fl. and fr. Jun–Aug.

Forest glades, scrub, mountain slopes, valleys, meadows, pebbles, sometimes roadsides and field margins; ca. 2600 m. Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Turkmenistan, Uzbekistan; SW Asia].

Four varieties occur in China. In addition, *Elymus dahuricus* var. *brevisetus* Ohwi (J. Jap. Bot. 19: 168. 1943) was described from N Shanxi (Ningwu), but no specimens have been seen by the authors.

- 1a. Culms slender, 40–80 cm tall; first lemma 7–8 mm 4c. var. *cylindricus*
- 1b. Culms more robust, 80–140 cm tall; first lemma 8–9 mm.
 - 2a. Lemma awn 2–5 mm 4d. var. *xiningensis*
 - 2b. Lemma awn 10–20 mm.
 - 3a. Leaf sheath glabrous; glumes scabrous along veins 4a. var. *dahuricus*
 - 3b. Leaf sheath densely pilose at base; glumes usually scabrous-hirsutulous along veins 4b. var. *violeus*

4a. *Elymus dahuricus* var. *dahuricus*

披碱草(原变种) pi jian cao (yuan bian zhong)

Clinelymus dahuricus (Turczaninow ex Grisebach) Nevski.

Culms more robust, 80–140 cm tall. Leaf sheath glabrous. Glumes scabrous along veins. First lemma ca. 9 mm; awn 10–20 mm. Fl. and fr. Jun–Aug. $2n = 28, 42^*$.

Forest glades, scrub, meadows, pebbles, sometimes roadsides and field margins. Hebei, Henan, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [Bhutan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Turkmenistan, Uzbekistan; SW Asia].

4b. *Elymus dahuricus* var. *violeus* C. P. Wang & H. L. Yang, Bull. Bot. Res., Harbin 4(4): 86. 1984.

青紫披碱草 qing zi pi jian cao

Culms more robust, 80–140 cm tall. Leaf sheath densely

pilose at base. Glumes usually scabrous-hirsutulous along veins. First lemma 8–9 mm; awn 10–18 mm.

- Mountain slopes, valleys. Nei Mongol, Qinghai.

4c. *Elymus dahuricus* var. *cylindricus* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 152. 1884.

圆柱披碱草 *yuan zhu pi jian cao*

Clinelymus cylindricus (Franchet) Honda; *Elymus beijingensis* B. S. Sun, nom. illeg. superfl.; *E. cylindricus* (Franchet) Honda (1930), not Pohl (1809); *E. dahuricus* subsp. *cylindricus* (Franchet) N. R. Cui; *E. franchetii* Kitagawa.

Culms slender, 40–80 cm tall. Leaf sheath glabrous. Glumes scabrous along veins. First lemma 7–8 mm; awn 6–13 mm. Fl. and fr. later summer. $2n = 42^*$.

- Mountain slopes, roadsides. Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Yunnan.

4d. *Elymus dahuricus* var. *xiningensis* (L. B. Cai) S. L. Chen, Novon 7: 228. 1997.

西宁披碱草 *xi ning pi jian cao*

Elymus xiningensis L. B. Cai, Acta Bot. Boreal.-Occid. Sin. 13: 71. 1993.

Culms more robust, 80–110 cm tall. Leaf sheath glabrous. Glumes scabrous along veins. First lemma ca. 8 mm; awn 2–5 mm. Fl. and fr. late summer.

- Mountain slopes; ca. 2600 m. Qinghai.

5. *Elymus purpuraristatus* C. P. Wang & H. L. Yang, Bull. Bot. Res., Harbin 4(4): 83. 1984.

紫芒披碱草 *zi mang pi jian cao*

Culms robust, to 160 cm tall, together with leaf blade and spike usually farinaceous throughout. Leaf sheath glabrous; leaf blade usually rolled, $15\text{--}25 \times 0.25\text{--}0.4$ cm, abaxial surface smooth, adaxial surface scabrous. Spike erect or slightly curved, slender, usually dense, 8–15 cm; rachis margin ciliate. Spikelets 2 per node, purplish green, 10–12 mm, with 2 or 3 florets. Glumes lanceolate or linear-lanceolate, 7–10 mm, 3-veined, \pm purplish punctate, scabrous, hispidulous along veins, apex mucronate. Lemma oblong-lanceolate, purplish punctate throughout, pubescent; first lemma 6–9 mm; awn purple, 7–15 mm, pubescent. Palea equaling or subequaling lemma, ciliate along keels. Fl. and fr. late summer.

- Mountain slopes, valleys. Nei Mongol.

In the protologue, the specific epithet was misspelled “*purpuraristus*” on p. 83, presumably as a typographical error. In the illustration caption on p. 90 it was correctly spelled “*purpuraristatus*.”

6. *Elymus villifer* C. P. Wang & H. L. Yang, Bull. Bot. Res., Harbin 4(4): 84. 1984.

毛披碱草 *mao pi jian cao*

Culms erect, 60–75 cm tall. Leaf sheath densely villous; leaf blade flat or slightly rolled, $9\text{--}15 \times 0.3\text{--}0.6$ cm, villous

throughout. Spike slightly curved, 9–12 cm; rachis with swollen nodes, densely hirsute throughout, margin narrowly winged. Spikelets usually 2 per node, or 1 per node at apex and base of spike, 6–10 mm, with 2 or 3 florets. Glumes narrowly lanceolate, 4.5–7.5 mm, 3- or 4-veined, hirsutulous along veins, margin narrowly membranous, apex acuminate or with awn 1.5–2.5 mm. Lemma oblong-lanceolate, scabrous or hispidulous distally; first lemma 7–11 mm. Palea equaling lemma, ciliate along keels, pubescent between keels. Fl. and fr. late summer.

- Swales of mountain valleys. Nei Mongol.

7. *Elymus sibiricus* Linnaeus, Sp. Pl. 1: 83. 1753.

老芒麦 *lao mang mai*

Clinelymus sibiricus (Linnaeus) Nevski; *C. yubaridakensis* Honda; *Elymus sibiricus* var. *brachystachys* Keng; *E. sibiricus* var. *gracilis* L. B. Cai; *E. sibiricus* var. *erectiusculus* L. B. Cai; *E. yubaridakensis* (Honda) Ohwi; *Hordeum sibiricum* (Linnaeus) Schenck (1907), not Link ex Steudel (1840), nor Roshevitz (1929); *Triticum arktasianum* F. Hermann.

Culms usually erect, sometimes slightly decumbent at base, 60–90 cm tall. Leaf sheath glabrous; leaf blade flat, $10\text{--}15 \times 0.5\text{--}1$ cm, glabrous or adaxial surface slightly pubescent. Spike pendulous, lax, 15–20 cm; rachis margin scabrous, ciliate. Spikelets glaucous or purplish glaucous, usually 2 per node, with (3 or) 4 or 5 florets. Glumes narrowly lanceolate, 4–5 mm, 3–5-veined, glabrous, scabrous along veins, apex acuminate or with awn ca. 4 mm. Lemma lanceolate, 5-veined, obscurely so at base, scabrous or puberulent; first lemma 8–11 mm; awn 15–20 mm. Palea equaling lemma, ciliate along keels, puberulent between keels. Fl. and fr. Jun–Aug. $2n = 28^*$, 42^* .

Forest glades, scrub, swales, sands and pebbles in river valleys; 1500–4900 m. Gansu, Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Japan, Korea, Mongolia, Nepal, Russia].

8. *Elymus nutans* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 72. 1868.

重穗披碱草 *chong sui pi jian cao*

Culms erect or geniculate at base, (13–)50–70 cm tall. Leaf sheath puberulent at base; leaf blade flat, $6\text{--}8 \times 0.3\text{--}0.5$ cm, abaxial surface scabrous or smooth, adaxial surface pilose. Spike pendulous, flexuose, somewhat dense, 5–12 cm; rachis margin scabrous, ciliate. Spikelets usually 2 per node (at least at middle nodes), subsessile or very shortly pedicellate, green, purplish when mature, 9–15 mm, with 2(or 3) glumes and 2–4 florets. Glumes oblong, subequal, 4–5 mm, 3- or 4(or 5)-veined, scabrous along veins, apex with awn 1–4 mm. Lemma narrowly lanceolate, puberulent; first lemma (6–)10 mm; awn (3–)12–20 mm, divergently scabrous. Palea equaling lemma, ciliate along keels, puberulent between keels. Fl. and fr. Jul–Aug.

Mountain slopes, grasslands, riverside sands and pebbles; 2800–3400 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Mongolia, Nepal; C and SW Asia].

- 1a. Culms 50–70 cm tall; spikelets with 2 glumes; glumes 3- or 4-veined; first lemma awn 12–20 mm 8a. var. *nutans*
 1b. Culms 13–20 cm tall; spikelets often with 3 glumes; glumes 5-veined; first lemma awn 3–9 mm 8b. var. *triglumis*

8a. *Elymus nutans* var. *nutans*

重穗披碱草(原变种) chong sui pi jian cao (yuan bian zhong)

Clinelymus nutans (Grisebach) Nevski.

Culms 50–70 cm tall. Spikelets with 2 glumes. Glumes 3- or 4-veined. First lemma ca. 10 mm; awn 12–20 mm. Fl. and fr. Jul–Aug. $2n = 42^*$.

Mountain slopes, grasslands, riverside sands and pebbles. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Mongolia, Nepal; C and SW Asia].

This variety is a good forage grass.

8b. *Elymus nutans* var. *triglumis* (Q. B. Zhang) G. Zhu & S. L. Chen, *comb. et stat. nov.*

三颖披碱草 san ying pi jian cao

Basionym: *Elymus triglumis* Q. B. Zhang, Acta Bot. Yunnan. 13: 21. 1991.

Culms 13–20 cm tall. Spikelets often with 3 glumes. Glumes 5-veined. First lemma 6–9 mm; awn 3–9 mm. Fl. Jul–Aug.

• Mountain grasslands; 2800–3400 m. Xinjiang (Tian Shan).

9. *Elymus atratus* (Nevski) Handel-Mazzetti, Symb. Sin. 7: 1922. 1936.

黑紫披碱草 hei zi pi jian cao

Clinelymus atratus Nevski, Bull. Jard. Bot. Acad. Sci. URSS 30: 644. 1932.

Culms erect or geniculate at base, somewhat slender, 40–60 cm tall. Leaf sheath smooth, glabrous; leaf blade \pm rolled, 3–10(–19) \times ca. 0.2 cm, both surfaces glabrous, or pubescent at base. Spikelets usually 2 per node, purplish black when mature, 8–10 mm, with 2 or 3 florets, usually 1 or 2 florets fertile. Glumes narrowly oblong or lanceolate, subequal, 2–4 mm, 1–3-veined, scabrous along midvein, apex mucronate or acuminate; lateral veins obscure. Lemma lanceolate, hirsutulous throughout; first lemma 7–8 mm; awn usually reflexed, 10–17 mm, scabrous. Palea equaling lemma, ciliolate along keels. Fl. and fr. late summer. $2n = 42^*$.

• Steppes. Gansu, Qinghai, Sichuan, Xinjiang, Xizang.

10. *Elymus breviaristatus* Keng ex P. C. Keng, Bull. Bot. Res., Harbin 4(3): 191. 1984.

短芒披碱草 duan mang pi jian cao

Elymus yilianus S. L. Chen, nom. illeg. superfl.

Culms laxly tufted, erect or geniculate at base, ca. 70 cm tall. Leaf sheath smooth; leaf blade flat, 4–12 \times 0.3–0.5 cm,

scabrous or abaxial surface smooth. Spike pendulous, lax, slender, 10–15 cm; rachis margin scabrous or ciliolate. Spikelets 2 per node, glaucous or purplish glaucous, 13–15 mm, with 4–6 florets. Glumes oblong-lanceolate or ovate-lanceolate, 3–4 mm, 1–3-veined, scabrous along veins, apex usually pointed. Lemma lanceolate, puberulent throughout or glabrous at middle part; first lemma 8–9 mm, apex with awn (1–)2–5 mm. Palea equaling lemma, ciliolate along keels, puberulent between keels, apex narrowed. Fl. and fr. summer. $2n = 42^*$.

• Mountain slopes. Ningxia, Qinghai, Sichuan, Xinjiang.

“*Elymus brachyaristatus*” (Löve, Feddes Repert. 95: 449. 1984) was not validly published because it was given as a *nomen novum* based on “*Clinelymus breviaristatus*” (Keng, Fl. Ill. Pl. Prim. Sin. Gram. 423. 1959), which was itself not validly published because no Latin description was provided (Saint Louis Code, Art. 36.1). Moreover, Löve’s supposed blocking name, *E. breviaristatus* (Hitchcock) Á. Löve (loc. cit. 471. Oct 1984), is in fact an illegitimate later homonym (Art. 53.1) because *E. breviaristatus* Keng ex P. C. Keng had already been validly published in July 1984.

11. *Elymus alpinus* L. B. Cai, Acta Biol. Plateau Sin. 14: 8. 1999.

高原披碱草 gao yuan pi jian cao

Culms erect, 25–35 cm tall, usually 5-noded. Leaf sheath usually longer than internode, glabrous; ligule ca. 0.3 mm, apex usually truncate; leaf blade flat or slightly involute, 6–10 \times 0.3–0.5 cm, both surfaces glabrous, margin ciliate. Spike erect or slightly flexuose, 4–6 \times ca. 0.9 cm; rachis glabrous, but margin ciliolate; internodes 2–3 mm. Spikelets (1 or)2 per node, green, 10–12 mm, with 3 or 4 florets; rachilla densely puberulent. Glumes narrowly lanceolate, subequal, 3–4 mm, 1–3-veined, scabrous along midvein, apex acuminate. Lemma lanceolate, abaxially pubescent; first lemma 7–8 mm; awn slender, 3–7 mm. Palea slightly longer than lemma, ciliolate along keels distally, puberulent between keels. Anthers blackish, ca. 1.5 mm. Ovary pubescent at apex. Fl. Jul.

• Meadows; ca. 3200 m. Qinghai (Gonghe, Ulan).

12. *Elymus sinosubmuticus* S. L. Chen, *nom. nov.*

无芒披碱草 wu mang pi jian cao

Replaced synonym: *Elymus submuticus* Keng ex P. C. Keng, Bull. Bot. Res., Harbin 4(3): 192. 1984, not *Elymus submuticus* (Hooker) Smyth, Trans. Kansas Acad. Sci. 25: 99. 1913.

Culms erect or geniculate at base, slender, 25–45 cm tall, 2-noded, smooth. Leaf sheath shorter than internode, smooth; ligule very short; leaf blade flat or rolled, 3–6 \times 0.15–0.3 cm, abaxial surface smooth, adaxial surface scabrous. Spike lax, curved, 3.5–7.5 cm. Spikelets 2 per node, or 1 per node distally in spike, subsessile or with pedicel ca. 1 mm, purplish, (7–)9–13 mm, with (1 or)2 or 3(or 4) florets, densely puberulent. Glumes oblong, subequal, 2–3 mm, 3-veined, scabrous along raised midvein, apex acute or acuminate. Lemma lanceolate, \pm puberulent; first lemma 7–8 mm; awn less than 2 mm. Palea equaling lemma, ciliolate along keels, apex narrowly obtuse. Anthers ca. 1.7 mm. Fl. and fr. late summer. $2n = 42^*$.

- Mountain slopes. Sichuan.

13. *Elymus cacuminis* B. Rong Lu & B. Salomon, Nordic J. Bot. 13: 355. 1993 [*"cacuminus"*].

峰峦披碱草 feng luan pi jian cao

Roegneria cacuminis (B. Rong Lu & B. Salomon) L. B. Cai.

Culms tufted at base, erect or geniculately ascending, 25–57 cm tall, (2 or)3(or 4)-noded, glabrous, or sparsely scabrous below spike. Leaf sheath grayish or purplish, usually hairy at base, smooth distally; ligule to 0.5 mm; auricles pale green, brown, or purple; leaf blade light green to purplish, linear, tightly involute or with involute margin, rarely flat, 2–15 × 0.1–0.6 cm, abaxial surface scabrous, adaxial surface ± pubescent. Spike strongly nodding at flowering, secund or distichous, dense or lax, 4–13 × 0.8–1.2 cm; rachis scabrous on back and margin. Spikelets 1 per node, green or purple, 25–40 × 2.5–4.5 mm, with 3–6 florets; pedicel 5–9 mm. Glumes ovate or narrowly lanceolate, glabrous abaxially, scabrous along veins, margin thin, apex mucronate; proximal glume 2–6 × 0.5–1.4 mm, (1 or)2–5-veined; distal glume (2.5–)3–9 × 0.8–1.5 mm, 3–5(–7)-veined. Lemma narrowly lanceolate-elliptic, 8–11 × 1.2–2 mm, scabrous to sparsely pubescent abaxially; callus narrow ± setulose; awn strongly curved at maturity, 1.5–3 cm. Palea slightly shorter than lemma, glabrous to sparsely pubescent adaxially, ciliate along keels. Anthers yellow or purple, 1.3–2 mm. Fl. and fr. Jul–Sep. $2n = 28^*$.

Dry scrub, stony mountain slopes, rocky river banks, streams in valleys; 4300–5000 m. Sichuan, Xizang [India (Sikkim), Nepal].

14. *Elymus ciliaris* (Trinius ex Bunge) Tzvelev, Novosti Sist. Vyssh. Rast. 9: 61. 1972.

纤毛披碱草 xian mao pi jian cao

Culms solitary or tufted, usually geniculate at base, sometimes erect, 40–130 cm tall, 1–5 mm in diam. Leaf sheath glabrous, or pilose at base; leaf blade flat, 9–25 × 0.3–1 cm, glabrous to scabrous, pilose or pubescent, or densely so. Spike erect or nodding, 10–22 cm; rachis scabrous, margin hispid. Spikelets 1(or 2) per node, green, 10–22 mm excluding awns, with 5–12 florets. Glumes oblong-lanceolate or elliptic-lanceolate, proximal one 6–11 mm, distal one 7–13 mm, 5–7-veined, scabrous, ciliate, or white hirsute along veins and margin, apex acute, acuminate, or pointed. Lemma oblong-lanceolate or oblong, scabrous to hispid or both, margin shortly ciliate to long ciliate, apex pointed or awned; first lemma 7–12 mm; awn often reflexed, 1–30 mm. Palea oblong-ovate, much shorter than lemma, scabrous or ciliate along keels distally, apex truncate. Fl. and fr. May–Jul.

Mountain slopes, moist meadows, roadsides; 1200–1600 m. Anhui, Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia].

1a. Leaf blade glabrous to scabrous.

2a. Lemma scabrous abaxially, margin ciliate; palea scabrous along

keels distally 14c. var. *hackelianus*

2b. Lemma hispid abaxially, margin long ciliate; palea ciliate along keels distally.

3a. Lemma apex with awn 10–30 mm 14a. var. *ciliaris*

3b. Lemma apex pointed or with awn 1–3(–7) mm 14b. var. *submuticus*

1b. Leaf blade pubescent or pilose to densely so.

4a. Glumes elliptic-lanceolate, ciliate along veins and margin, apex pointed; leaf blade densely pilose on both surfaces 14f. var. *lasiophyllus*

4b. Glumes oblong-lanceolate, scabrous or white hirsute along veins and margin, apex acute or acuminate; leaf blade densely pubescent on both surfaces and margin, or pubescent on both surfaces and white pilose along veins and margin.

5a. Glumes scabrous along veins and margin; lemma scabrous or hispidulous abaxially, margin shortly ciliate, first lemma 9–12 mm; culms 4–5 mm in diam.; leaf blade densely pubescent on both surfaces and margin 14d. var. *amurensis*

5b. Glumes white hirsute along veins and margin; lemma punctate-scabrous and densely hispid throughout, first lemma 7–9.5 mm; culms 1–2 mm in diam.; leaf blade pubescent on both surfaces, white pilose along veins and margin 14e. var. *hirtiflorus*

14a. *Elymus ciliaris* var. *ciliaris*

纤毛披碱草(原变种) xian mao pi jian cao (yuan bian zhong)

Triticum ciliare Trinius ex Bunge, Enum. Pl. China Bor. 72. 1833; *Agropyron ciliare* (Trinius ex Bunge) Franchet; *A. ciliare* var. *integrum* Keng; *A. integrum* (Keng) Keng; *A. semicostatum* (Nees ex Steudel) Nees ex Boissier var. *ciliare* (Trinius ex Bunge) Hackel; *Brachypodium ciliare* (Trinius ex Bunge) Maximowicz; *Roegneria ciliaris* (Trinius ex Bunge) Nevski; *R. ciliaris* f. *eriocaulis* Kitagawa.

Leaf blade glabrous but margin scabrous. Glumes elliptic-lanceolate, apex pointed, usually with teeth below point. Lemma hispid abaxially, margin long ciliate; first lemma 8–9 mm; awn 10–30 mm. Palea ciliate along keels distally. Fl. and fr. May–Jul. $2n = 28^*$.

Mountain slopes, moist meadows, roadsides. Almost throughout China [Japan, Korea, Mongolia, Russia].

14b. *Elymus ciliaris* var. *submuticus* (Honda) S. L. Chen, Novon 7: 228. 1997.

短芒纤毛草 duan mang xian mao cao

Agropyron ciliare var. *submuticum* Honda, J. Fac. Sci.

Univ. Tokyo, Sect. 3, Bot. 3(1): 27. 1930; *A. ciliare* f. *submuticum* (Honda) Ohwi; *Roegneria ciliaris* var. *submutica* (Honda) Keng.

Leaf blade usually glabrous. Lemma hispid abaxially, margin long ciliate, apex pointed or with awn 1–3(–7) mm. Palea ciliate along keels distally. Fl. and fr. May–Jul. $2n = 28$.

Mountain slopes, moist meadows, roadsides. Anhui, Hebei, Shaanxi, Shandong, Zhejiang [Japan].

14c. *Elymus ciliaris* var. *hackelianus* (Honda) G. Zhu & S. L. Chen, **comb. nov.**

日本纤毛草 ri ben xian mao cao

Basionym: *Agropyron japonicum* Honda var. *hackelianum* Honda, Bot. Mag. (Tokyo) 41: 385. 1927; *A. ciliare* var. *hackelianum* (Honda) Ohwi; *A. ciliare* f. *japonense* (Honda) Ohwi; *A. ciliare* var. *hondae* Keng, nom. illeg. superfl.; *A. ciliare* var. *pauperum* Keng; *A. hackelianum* (Honda) Beetle; *A. hackelianum* var. *japonicum* Beetle, nom. illeg. superfl.; *A. japonense* Honda; *A. japonense* var. *hackelianum* (Honda) Honda; *A. japonicum* Honda (1927), not (Miquel) P. Candargy (1901); *Elymus ciliaris* var. *japonensis* (Honda) S. L. Chen; *E. ciliaris* subsp. *japonicus* Á. Löve; *E. racemifer* var. *japonensis* (Honda) Osada; *Roegneria ciliaris* var. *hackeliana* (Honda) L. B. Cai; *R. ciliaris* var. *japonensis* (Honda) C. Yen et al.; *R. hackeliana* (Honda) Nakai; *R. japonensis* (Honda) Keng; *R. japonensis* var. *hackeliana* (Honda) Keng; *R. japonica* B. S. Sun, nom. illeg. superfl.

Leaf blade abaxial surface glabrous, adaxial surface and margin scabrous. Glumes elliptic-lanceolate, apex acute or pointed. Lemma scabrous abaxially, margin ciliate; first lemma 8–8.5 mm; awn 5–25 mm. Palea scabrous along keels distally. Fl. and fr. May–Jul. $2n = 28^*$.

Mountain slopes, roadsides. Anhui, Beijing, Fujian, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

When *Agropyron japonicum* and *A. japonicum* var. *hackelianum* are regarded as taxonomic synonyms and treated at varietal rank under *Elymus ciliaris*, the correct name under Art. 11.4 of the Saint Louis Code is the new combination *E. ciliaris* var. *hackelianus*. The earliest legitimate name at varietal rank is *A. japonicum* var. *hackelianum*, not the autonym, “*A. japonicum* var. *japonicum*,” which was not validly published under Art. 27.2. Even though *A. japonicum* Honda is a later homonym and therefore illegitimate, *A. japonicum* var. *hackelianum* is legitimate under Art. 55.2.

14d. *Elymus ciliaris* var. *amurensis* (Drobow) S. L. Chen, Novon 7: 228. 1997.

阿麦纤毛草 a mai xian mao cao

Agropyron amurense Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 12: 50. 1914; *A. ciliare* subsp. *amurense* (Drobow) T. Koyama; *A. ciliare* var. *pilosum* (Korshinsky) Honda; *Elymus ciliaris* subsp. *amurensis* (Drobow) Tzvelev; *Roegneria amurensis* (Drobow) Nevski; *R. ciliaris* var. *pilosa* (Korshinsky) Ohwi; *Triticum ciliare* f. *pilosum* Korshinsky.

Culms 4–5 mm in diam. Leaf blade both surfaces and margin densely pubescent. Glumes oblong-lanceolate, scabrous

along veins and margin, apex acute or acuminate. Lemma scabrous or hispidulous abaxially, margin shortly ciliate; first lemma 9–12 mm; awn 20–25 mm. Fl. and fr. Jun–Jul.

Mountain slopes. Heilongjiang, Nei Mongol [Japan, Korea, Mongolia, Russia].

14e. *Elymus ciliaris* var. *hirtiflorus* (C. P. Wang & H. L. Yang) S. L. Chen, Novon 7: 228. 1997.

毛花纤毛草 mao hua xian mao cao

Roegneria hirtiflora C. P. Wang & H. L. Yang, Bull. Bot. Res., Harbin 4(4): 86. 1984; *Elymus sinohirtiflorus* S. L. Chen; *R. amurensis* var. *hirtiflora* (C. P. Wang & H. L. Yang) L. B. Cai.

Culms 1–2 mm in diam. Leaf blade both surfaces pubescent, white pilose along veins and margin. Glumes oblong-lanceolate, white hirsute along veins and margin, apex acuminate. Lemma punctate-scabrous and densely hispid throughout; first lemma 7–9.5 mm; awn 16–25 mm. Palea laxly ciliate along keels. Fl. and fr. Jun–Jul.

• Mountain slopes; ca. 1200 m. Nei Mongol.

14f. *Elymus ciliaris* var. *lasiophyllus* (Kitagawa) S. L. Chen, **comb. nov.**

毛叶纤毛草 mao ye xian mao cao

Basionym: *Agropyron ciliare* var. *lasiophyllum* Kitagawa in Nakai et al., Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 60, 98. 1936; *Roegneria ciliaris* var. *lasiophylla* (Kitagawa) Kitagawa.

Leaf blade both surfaces densely pilose. Glumes elliptic-lanceolate, ciliate along veins and margin, apex pointed. Lemma hispid abaxially, margin long ciliate; awn 10–25 mm. Fl. and fr. May–Jul.

• Mountain slopes, moist meadows, roadsides; 1500–1600 m. Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi.

15. *Elymus canaliculatus* (Nevski) Tzvelev, Rast. Tsentr. Azii 4: 220. 1968.

沟槽披碱草 gou cao pi jian cao

Agropyron canaliculatum Nevski, Izv. Bot. Sada Akad. Nauk SSSR 30: 509. 1932; *Elymus longearistatus* (Boissier) Tzvelev subsp. *canaliculatus* (Nevski) Tzvelev; *Roegneria canaliculata* (Nevski) Ohwi; *R. longearistata* (Boissier) Drobow var. *canaliculata* (Nevski) L. B. Cai.

Culms erect or geniculate ascending, slender to stout, 30–70 cm tall, 3- or 4(or 5)-noded, glabrous. Leaf sheath glabrous, or sparsely scabrous or grayish purplish hairy at base; ligule 0.2–0.6 mm; auricles pale green or purple, 0.4–0.7 mm; leaf blade green to dark green, involute, 6–20 × 0.1–0.4 cm, abaxial surface glabrous but margin scabrous, adaxial surface scabrous to pilose. Spike strongly nodding at flowering, distichous, lax, 6–20 × 0.6–1.5 cm; rachis scabrous. Spikelets 1 per node, light green to purple, 40–70 × 4–7 mm, with 4–7(–9) developed florets. Glumes narrowly lanceolate-elliptic, proximal one 3–9 × 0.7–1.8 mm excluding awn, distal one 4–10 × 1–

2 mm excluding awn, 5–7-veined, scabrous abaxially, margin thin or hyaline, apex mucronate or tapering into a short awn to 5 mm. Lemma narrowly lanceolate-elliptic, 8–12 × 1–2 mm, pubescent abaxially; callus narrow, pointed, setulose or densely so; awn strongly curved, stout, 2.5–5 cm at maturity. Palea narrowly lanceolate-elliptic, slightly shorter than or equaling body of lemma, glabrous adaxially, ciliate along keels. Anthers yellow or purple, 4–5 mm. Fl. and fr. summer. $2n = 28^*$.

Mountain slopes, rocks, valleys; middle to upper mountain belts. Xizang [Pakistan, Russia (Alai, Pamirs), Tajikistan].

16. *Elymus sinoflexuosus* (L. B. Cai) S. L. Chen & G. Zhu, *Novon* 12: 428. 2002.

弯曲披碱草 *wan qu pi jian cao*

Roegneria flexuosa L. B. Cai, *Acta Phytotax. Sin.* 34: 330. 1996, not *Elymus flexuosus* Tausch (1837).

Plants with short rhizomes. Culms erect, 30–50 cm tall, 1.5–2.5 mm in diam., 3- or 4-noded, glabrous. Leaf sheath glabrous; ligule ca. 1 mm, membranous, apex truncate; leaf blade involute, 4–14 × 0.2–0.3 cm, adaxial surface scabrous or pubescent. Spike slightly nodding, lax, 10–16 cm; rachis flexuose, margin spinose; internodes 12–16 mm. Spikelets 1 per node, 15–20 mm excluding awns, with 6 or 7 florets; rachilla usually puberulent. Glumes oblong-lanceolate, proximal one 5–6 mm, distal one 7–8 mm, 5–7-veined, glabrous, apex acute or pungent. Lemma lanceolate, abaxially laxly spinulose; first lemma 9–10 mm; awn curved, 20–25 mm, scabrous. Palea slightly shorter than or equaling lemma, spinose along keels, glabrous between keels, apex truncate. Anthers yellow, 1.5–2 mm. Fl. and fr. Jul–Aug.

• Mountain slopes; 1700–3500 m. Gansu (Zhangye), Xinjiang (Taxkorgan).

17. *Elymus gmelinii* (Ledebour) Tzvelev, *Rast. Tsent. Azii* 4: 216. 1968.

真穗披碱草 *zhen sui pi jian cao*

Culms laxly tufted, slender, 60–100 cm tall, 1.5–3 mm in diam. at base. Leaf sheath smooth, glabrous, but retrorsely pubescent at base; leaf blade flat or involute, 9–20(–26) × 0.2–0.8 cm, abaxial surface glabrous, adaxial surface scabrous or puberulent. Spike erect or nodding, usually secund, 9–15 cm. Spikelets 1 per node, yellowish green or tinged purplish, 15–25 mm, with (3–)5–7 florets. Glumes oblong-lanceolate or lanceolate, subequal and 10–15 mm or proximal one 6–11 mm and distal one 9–12 mm, 5–7-veined, scabrous along veins, apex acute or acuminate. Lemma lanceolate, hispidulous throughout; first lemma 10–12 mm; awn divaricate, 2.5–4.5 cm. Palea equaling or subequaling lemma, hispid along keels, apex subobtuse or emarginate. Anthers 2.5–3.5 mm. Fl. and fr. Jun–Aug.

Forest margins, mountain slopes, roadsides; 600–2600 m. Gansu, Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang, Yunnan [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

1a. Culms 60–80 cm tall, 1.5–2 mm in diam. at base; glumes unequal: proximal one 6–11 mm, distal one 9–12 mm 17a. var. *gmelinii*

1b. Culms 75–100 cm tall, up to 3 mm in diam. at base; glumes subequal, 10–15 mm 17b. var. *macrathorus*

17a. *Elymus gmelinii* var. *gmelinii*

真穗披碱草(原变种) *zhen sui pi jian cao* (yuan bian zhong)

Triticum caninum Linnaeus var. *gmelinii* Ledebour, *Fl. Altaic*. 1: 118. 1829 [“*gmelinii*”]; *Agropyron caninum* (Linnaeus) P. Beauvois var. *gmelinii* (Ledebour) Pease & A. H. Moore; *A. gmelinii* (Ledebour) Scribner & J. G. Smith (1897), not (Trinius) P. Candargy (1901); *A. turczaninowii* Drobaw; *A. turczaninowii* var. *tenuisetum* Ohwi; *Elymus gmelinii* subsp. *tenuisetum* (Ohwi) Á. Löve; *Roegneria gmelinii* (Ledebour) Kitagawa; *R. turczaninowii* (Drobaw) Nevski; *R. turczaninowii* var. *pohuashanensis* Keng; *R. turczaninowii* var. *tenuiseta* (Ohwi) H. L. Yang & C. P. Wang; *Semeiostachys turczaninowii* (Drobaw) Drobaw.

Culms 60–80 cm tall, 1.5–2 mm in diam. at base. Glumes unequal: proximal one 6–11 mm, distal one 9–12 mm. Lemma awn 2–4 cm. Fl. and fr. Jun–Jul. $2n = 28$.

Forest margins, mountain slopes, roadsides; 1300–2300 m. Gansu, Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

17b. *Elymus gmelinii* var. *macrathorus* (Ohwi) S. L. Chen & G. Zhu, *Novon* 12: 426. 2002.

大芒披碱草 *da mang pi jian cao*

Agropyron turczaninowii var. *macrathorus* Ohwi, *Acta Phytotax. Geobot.* 10: 98. 1941; *Roegneria gmelinii* var. *macrathera* (Ohwi) Kitagawa; *R. macrathera* (Ohwi) L. B. Cai; *R. turczaninowii* var. *macrathera* (Ohwi) H. L. Yang & C. P. Wang.

Culms 75–100 cm tall, ca. 3 mm in diam. at base. Glumes subequal, 10–15 mm. Lemma awn 3–4.5 cm. Fl. and fr. Jul–Aug.

• Mountain slopes, roadsides; 600–2600 m. Nei Mongol, Xinjiang.

18. *Elymus zhui* S. L. Chen, nom. nov.

小株披碱草 *xiao zhu pi jian cao*

Replaced synonym: *Roegneria minor* Keng, *Acta Univ. Nankin. Sci. Nat.* 1963(1): 71. 1963, not *Elymus minor* (J. G. Smith) M. E. Jones, *Contr. W. Bot.* 14: 20. 1912.

Culms erect or slightly procumbent at base, 25–30 cm tall, ca. 4-noded. Leaf sheath glabrous, or pubescent at base; ligule ca. 0.5 mm or obsolete; leaf blade green, involute or flat, 8–10(–15) × 0.2–0.4 cm, abaxial surface pilose, adaxial surface densely pilose. Spike erect, 8–9 cm. Spikelets 1 per node, green, with (2 or) 3–5 florets. Glumes oblong-lanceolate, proximal one 5–7 mm, distal one 6–8 mm, 5- or 6-veined, scabrous along veins, apex acute, sometimes with a tooth just below apex. Lemma lanceolate, puberulent throughout; first lemma ca. 8.5 mm; awn reflexed, ca. 1.2 cm. Palea subequaling lemma, rigidly ciliolate along keels, puberulent between keels distally, apex subrounded. Fl. and fr. Jul–Aug.

• Mountain slopes; ca. 1600 m. Guizhou, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi.

The epithet of this *nomen novum* honors the late Dr. Guanghua Zhu, co-author of the present account of *Triticeae*.

Löve (Feddes Repert. 95: 458. 1984) did not validly publish the combination "*Elymus minor*," which would have been a later homonym; see the note following the genus description above.

19. *Elymus formosanus* (Honda) Á. Löve, Feddes Repert. 95: 449. 1984.

台湾披碱草 tai wan pi jian cao

Culms erect, 30–90 cm tall. Leaf sheath glabrous, or pubescent at base; leaf blade ca. 20×0.2 – 0.6 cm, both surfaces glabrous or scabrous. Spike slightly nodding, 10–20 cm. Spikelets 1 per node, lax, ca. 20 mm, with 5–7 florets. Glumes lanceolate, proximal one ca. 5 mm, distal one 7–9 mm, 5–7-veined, apex acute; veins robust, scabrous. Lemma oblong-lanceolate, ca. 8 mm, abaxially rounded and scabrous or pubescent, margin ciliate; callus broad, rounded; awn recurved, 1–3.5 cm, rigid. Palea subequaling lemma, ciliate along keels, apex subrounded or slightly emarginate. Caryopsis ca. 3 mm. Fl. and fr. Jun–Jul. $2n = 28^*$.

• Mountain slopes. Taiwan.

- 1a. Culms 60–90 cm tall; leaf sheath glabrous, leaf blade 0.4–0.6 cm wide; spike 15–20 cm; lemma awn 2–3.5 cm 19a. var. *formosanus*
 1b. Culms 30–50 cm tall; leaf sheath usually pubescent at base; leaf blade 0.2–0.4 cm wide; spike 10–12 cm; lemma awn 1–2 cm 19b. var. *pubigerus*

19a. *Elymus formosanus* var. *formosanus*

台湾披碱草(原变种) tai wan pi jian cao (yuan bian zhong)

Agropyron formosanum Honda, Bot. Mag. (Tokyo) 41: 385. 1927; *Roegneria formosana* (Honda) Ohwi; *R. formosana* var. *longearistata* Keng.

Culms 60–90 cm tall. Leaf sheath glabrous; leaf blade 0.4–0.6 cm. Spike 15–20 cm. Lemma awn 2–3.5 cm. Fl. and fr. Jun–Jul.

• Mountain slopes. Taiwan.

19b. *Elymus formosanus* var. *pubigerus* (Keng) S. L. Chen, Novon 7: 228. 1997.

毛鞘台湾草 mao qiao tai wan cao

Roegneria formosana var. *pubigera* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 60. 1963.

Culms 30–50 cm tall. Leaf sheath usually pubescent at base; leaf blade 0.2–0.4 cm wide. Spike 10–12 cm. Lemma with awn 1–2 cm. Fl. and fr. Jun–Jul.

• Mountain slopes. Taiwan.

20. *Elymus tibeticus* (Melderis) G. Singh, Taxon 32: 640. 1983.

西藏披碱草 xi zang pi jian cao

Agropyron tibeticum Melderis in Bor, Grasses Burma,

Ceylon, India, Pakistan, 696. 1960; *Roegneria tibetica* (Melderis) H. L. Yang.

Culms laxly tufted, 70–100 cm tall, 3- or 4-noded, smooth and glabrous, or nodes pubescent. Leaf sheath densely hispidulous proximally, glabrous distally; leaf blade green, flat, 12 – 16×0.3 – 0.6 cm, abaxial surface and near margin scabrous, adaxial surface pilose. Spike suberect or \pm nodding, usually dense, or lax proximally, 10–16 cm. Spikelets 1 per node, green, 10–16 mm excluding awns, with (3 or) 4 or 5 florets. Glumes oblong-lanceolate, proximal one 7–8.5 mm, distal one 8.5–10 mm, 5–7-veined, scabrous along veins, margin narrowly hyaline-membranous, apex acuminate or with awn to 6 mm. Lemma narrowly lanceolate, 8–10 mm, glabrous abaxially, apex hispidulous; awn straight or slightly curved, 1–1.7 cm. Palea narrowly lanceolate, subequaling lemma, hispidulous distally abaxially, ciliate along keels, apex emarginate or truncate-obtuse. Anthers yellow, 2–2.3 mm. Fl. and fr. Jul–Aug. $2n = 28^*$.

Forests, mountain slopes, valleys, roadsides; ca. 2500 m. Xizang, Yunnan [Bhutan].

21. *Elymus nakaii* (Kitagawa) S. L. Chen, **comb. nov.**

吉林披碱草 ji lin pi jian cao

Basionym: *Roegneria nakaii* Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 5(5): 151. 1941.

Culms erect, slightly decumbent at base, ca. 100 cm tall, \pm puberulent at nodes. Leaf sheath glabrous, or retrorsely pubescent proximally; leaf blade flat, 11 – 20×0.4 – 0.7 cm, thin, abaxial surface glabrous, adaxial surface pilose. Spike erect, 10–13 cm. Spikelets 1 per node, \pm secund, dense, with ca. 5 florets. Glumes lanceolate, proximal one 9–10 mm including point, distal one 9.5–11.5 mm including point, (3)5(–7)-veined, scabrous along veins, margin glabrous, apex acuminate. Lemma hirsutulous near base and margin and along veins, otherwise glabrous; first lemma ca. 10 mm; awn reflexed, 18–22 mm. Palea subequaling lemma, rigidly ciliate along keels, between keels glabrous proximally and puberulent distally, apex emarginate, truncate, or subrounded. Fl. and fr. Jul–Aug. $2n = 28^*$.

Meadows, mountain slopes. Hebei, Jilin, Nei Mongol, Ningxia [N Korea].

Löve (Feddes Repert. 95: 454. 1984) did not previously validly publish the combination *Elymus nakaii* because the place of valid publication of the basionym was not cited (Saint Louis Code, Art. 33.3). Instead, *Roegneria nakaii* was cited from Kitagawa (J. Jap. Bot. 17: 236. 1941), where the name was not validly published because no Latin description was provided (Art. 36.1).

22. *Elymus strictus* (Keng) S. L. Chen, **comb. nov.**

肃草 su cao

Basionym: *Roegneria stricta* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 68. 1963.

Culms erect or slightly geniculate at base, 50–100 cm tall, glabrous throughout. Leaf sheath glabrous; leaf blade glaucous or farinose, involute, (3.5) 8– $16 \times (0.1)$ 0.4–0.8 cm, stiff, abaxial surface glabrous, adaxial surface pubescent. Spike erect, (3.5) 10–18(–26) cm. Spikelets 1 per node, glaucous, or pur-

plish at maturity, (8–)15–20 mm, with (3–)5–8(–14) florets. Glumes: proximal one 5–8(–11) mm, distal one 6–13 mm, (3–)5–7-veined, apex acute or with mucro 1–5 mm; veins usually robust, scabrous. Lemma smooth and glabrous abaxially, or only so at middle and then otherwise \pm puberulent, or hirsute along veins and on callus; first lemma (7–)9–10 mm; awn sub-erect, slightly recurved, (7–)14–22 mm, scabrous. Palea equaling lemma, ciliolate along keels distally, between keels puberulent distally or glabrous, apex emarginate or truncate. Anthers usually yellow, 1–2 mm. Fl. and fr. Jul–Oct. $2n = 28^*$.

• Mountain slopes, valleys, meadows, roadsides; 1300–4000 m. Gansu, Guizhou, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

Löve (Feddes Repert. 95: 458. 1984) did not previously validly publish the combination *Elymus strictus*; see the note following the genus description above. Because of this, Chen and Zhu (Novon 12: 428. 2002) did not previously validly publish *E. strictus* var. *crassus* (Saint Louis Code, Art. 43.1).

- 1a. Palea between keels puberulent distally 22a. var. *strictus*
 1b. Palea between keels glabrous 22b. var. *crassus*

22a. *Elymus strictus* var. *strictus*

肃草(原变种) su cao (yuan bian zhong)

Elymus gmelinii (Ledebour) Tzvelev subsp. *strictus* (Keng) K. B. Jensen; *Roegneria stricta* Keng; *R. stricta* f. *major* Keng; *R. varia* Keng.

Lemma glabrous at middle abaxially, otherwise \pm puberulent. Palea between keels puberulent distally.

• Mountain slopes, valleys, meadows, roadsides; 1300–2200 m. Gansu, Guizhou, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.

22b. *Elymus strictus* var. *crassus* (L. B. Cai) S. L. Chen, **comb. et stat. nov.**

粗壮肃草 cu zhuang su cao

Basionym: *Roegneria crassa* L. B. Cai, Acta Phytotax. Sin. 34: 332. 1996.

Lemma glabrous abaxially or hirsute along veins and on callus. Palea between keels glabrous. Fl. and fr. Jul–Aug.

• Mountain slopes; 1800–4000 m. Ningxia, Qinghai.

23. *Elymus caninus* (Linnaeus) Linnaeus, Fl. Suec., ed. 2, 39. 1755.

犬草 quan cao

Triticum caninum Linnaeus, Sp. Pl. 1: 86. 1753; *Agrropyron caninum* (Linnaeus) P. Beauvois; *Braconotia canina* (Linnaeus) Fourreau; *B. elymoides* Godron, nom. illeg. superfl.; *Elytrigia canina* (Linnaeus) Drobow; *Gouldardia canina* (Linnaeus) Husnot; *Roegneria canina* (Linnaeus) Nevski; *Zeia canina* (Linnaeus) Lunell.

Culms laxly tufted, 80–150 cm tall, smooth. Leaf sheath glabrous; leaf blade green or glaucous green, broadly linear, flat, 12–20 \times 0.5–1.1 cm, thin, glabrous or adaxial surface scabrous to scattered pilose. Spike nodding, somewhat dense, 10–20

cm. Spikelets 1 per node, green, rarely greenish purple, 10–15 mm excluding awns, with 2–5 florets. Glumes lanceolate, abruptly narrowed distally, 3–5-veined with broad secondary veins, scabrous, margin scarious; proximal glume 0.6–1 cm, awn ca. 2 mm; distal glume 0.7–1.1 cm, awn 2–4 mm. Lemma smooth, 0.9–1.1 cm; awn divergent, 1.5–1.8 cm. Palea apex truncate. Anthers 2.5–2.8 cm. Fl. and fr. Jun–Aug. $2n = 28$.

Forests, forest glades, scrub, mountain slopes; 1300–2000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

24. *Elymus caesifolius* Á. Löve ex S. L. Chen, **nom. nov.**

马格草 ma ge cao

Replaced synonym: *Roegneria glaucifolia* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 57. 1963, not *Elymus glaucifolius* Willdenow, Enum. Pl. 131. 1809.

Culms tufted, erect, 30–60 cm tall, 2- or 3-noded, glabrous. Leaf sheath glabrous or pilose at base; leaf blade glaucous, involute, (2–)6–16 \times (0.1–)0.3–0.5 cm, stiff, abaxial surface smooth, glabrous, adaxial surface and margin scabrous. Spike erect, 6–15 cm. Spikelets 1 per node, 13–15 mm excluding awns, with 3–5 florets. Glumes oblong-lanceolate, proximal one 4–7 mm, distal one 6–8 mm, both 3-veined or distal one 5-veined, margin scarious, apex acute or acuminate. Lemma oblong-lanceolate, scabrous abaxially, scabrous or hirsutulous along veins; first lemma 9–11 mm; awn reflexed, 15–30 mm, scabrous. Palea slightly shorter than or subequaling lemma, abaxially hirsutulous in distal half, ciliolate along keels, apex truncate. Fl. and fr. late summer. $2n = 42^*$.

• Mountain slopes. Xizang.

Löve (Feddes Repert. 95: 448. 1984) did not previously validly publish the name *Elymus caesifolius*; see the note following the genus description above.

25. *Elymus durus* (Keng) S. L. Chen, **comb. nov.**

岷山披碱草 min shan pi jian cao

Basionym: *Brachypodium durum* Keng, Sunyatsenia 6: 54. 1941; *Elymus sclerus* Á. Löve, nom. illeg. superfl.; *Roegneria dura* (Keng) Keng; *R. dura* var. *variiglumis* Keng; *R. tschimganica* (Drobow) Nevski var. *variiglumis* (Keng) L. B. Cai.

Culms solitary or tufted, usually geniculate or with swollen nodes at base, 55–80 cm tall; nodes glaucous or purplish green, glabrous. Leaf sheath sometimes retrorsely pubescent; leaf blade flat or involute, 6–20(–25) \times 0.1–0.45 cm, stiff, abaxial surface smooth or puberulent, adaxial surface scabrous or laxly puberulent. Spike nodding, 5–11 cm. Spikelets 1 per node, green or purplish green, 1.6–2.2 cm, with (3 or)4–7 florets; pedicel 0.8–1.5(–2) mm, glabrous or puberulent. Glumes lanceolate, scabrous along veins, margin thin, apex acute, acuminate, or pointed; proximal glume 3–4(–7) mm, 1–5-veined; distal glume 5–9 mm, 3–5-veined. Lemma lanceolate, hispidulous or scabrous; first lemma ca. 11 mm; awn reflexed, 1.5–2.8 cm, scabrous. Palea subequaling lemma, ciliate along keels, puberulent between keels. Anthers black, ca. 1.5 mm. Fl. and fr. late summer. $2n = 28^*$.

• Mountain meadows; 3700–4200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan.

Löve (Feddes Rept. 95: 448. 1984) published *Elymus sclerus* as a *nomen novum* for *Brachypodium durum*, but the supposed blocking name, “*Elymus durus* Hedw. ex Steud., 1854” (Steudel, Nomencl. Bot., ed. 2, 1: 550, 551. 1840), was merely cited as a synonym by Steudel and was therefore not validly published under Art. 34.1(c) of the Saint Louis Code. Under Art. 11.4, the correct name in *Elymus* at specific rank is *E. durus*. Löve’s name was therefore nomenclaturally superfluous when published and is illegitimate under Art. 52.1.

26. *Elymus antiquus* (Nevski) Tzvelev, Rast. Tsentr. Azii 4: 220. 1968.

小颖披碱草 xiao ying pi jian cao

Agropyron antiquum Nevski, Izv. Bot. Sada Akad. Nauk SSSR 30: 515. 1932; *A. microlepis* Melderis; *Elymus microlepis* (Melderis) Melderis; *Roegneria antiqua* (Nevski) B. S. Sun; *R. parvigluma* Keng.

Culms tufted at base, slender, 50–100 cm tall, 3–5-noded, glabrous or scabrous below spike. Leaf sheath smooth or scabrous to sparsely hairy, margin sometimes ciliate; ligule 0.2–0.5 mm; leaf blade flat, 6–15 × 0.25–0.8 cm, both surfaces scabrous or pubescent. Spike ± nodding at flowering, distichous, 7.5–21 cm; rachis glabrous or ± scabrous on back and margin. Spikelets 1 per node, subsessile, green or purplish, 20–40 × 2–6 mm, with 3–7(–9) developed florets. Glumes oblong, lanceolate, or subovate, scabrous abaxially or only along veins, margin narrowly hyaline, apex mucronate; proximal glume 1.5–3 × 0.5–1.2 mm, 2- or 3-veined; distal glume 3–5.5 × 0.6–1.5 mm, 3–5-veined. Lemma lanceolate, 8–11.5 × 1.2–1.8 mm, glabrous, pubescent, or densely so abaxially; awn straight or slightly curved, 1–2 mm at maturity; callus setulose to densely so. Palea slightly shorter than lemma, scabrous-pubescent to pubescent adaxially, ciliate along keels distally, apex obtuse. Anthers yellow or purple, 2–3 mm. Fl. and fr. Jun–Jul. $2n = 28^*$.

Mountain slopes and valleys, river banks; 2300–3800 m. Qinghai, Sichuan, Xizang, Yunnan [Nepal].

27. *Elymus burchan-buddae* (Nevski) Tzvelev, Rast. Tsentr. Azii 4: 220. 1968.

短颖披碱草 duan ying pi jian cao

Agropyron burchan-buddae Nevski, Izv. Bot. Sada Akad. Nauk SSSR 30: 514. 1932; *A. nutans* Keng; *Elymus breviglumis* (Keng) Á. Löve ex D. F. Cui; *E. pseudonutans* Á. Löve; *Roegneria breviglumis* Keng; *R. burchan-buddae* (Nevski) B. S. Sun; *R. nutans* (Keng) Keng.

Culms tufted at base, erect or geniculately ascending, 10–60 cm tall, 2- or 3-noded, glabrous or sparsely scabrous below spike. Leaf sheath smooth or sparsely scabrous; ligule 0.2–0.3 (–0.5) mm; leaf blade light green to green, sometimes glaucous, tightly involute or with involute margin, 2–10(–18) × 0.1–0.4 cm, both surfaces glabrous, scabrous, or nearly hairy. Spike slightly distichous, rarely secund, 4–11 × 1–1.5 cm; rachis scabrous on back and margin. Spikelets 1 per node, sessile or subsessile, glaucous, (10–)14–35 × 3–6 mm, with 2–5(–7) florets. Glumes lanceolate or lanceolate-ovate, scabrous along veins and sometimes abaxially, margin sometimes very nar-

rowly hyaline, apex acute or mucronate; proximal glume 1.5–5 × 0.5–2 mm, (2 or)3(or 4)-veined; distal glume 3–5(–7.5) × 0.6–2 mm, 3–5-veined. Lemma narrowly lanceolate-elliptic, 7–10 × 1.3–2 mm, scabrous to pubescent abaxially; callus narrow, pointed, setulose or densely so; awn strongly curved at maturity, 1–3 cm. Palea shorter than or equaling body of lemma, glabrous to scabrous adaxially, ciliate along keels distally, apex rounded or obtuse. Anthers yellow to dark purple or black, 1–2 mm. Fl. and fr. Jul–Aug. $2n = 28^*$.

Forest margins, mountain slopes, lands along rivers, river banks; 3000–5500 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [N India, ?Nepal].

28. *Elymus serpentinus* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 427. 2002.

蜿蜒披碱草 wan zhou pi jian cao

Roegneria serpentina L. B. Cai, Acta Phytotax. Sin. 35: 167. 1997.

Culms erect, 40–60 cm tall, 1–2 mm in diam., usually 4-noded, glabrous. Leaf sheath shorter than internode, glabrous; ligule ca. 0.4 mm, membranous, apex truncate; leaf blade flat, 4–15 × 0.3–0.4 cm, abaxial surface glabrous, adaxial surface villous. Spike pendulous, lax, 7–11 cm; rachis flexuose, slender, scabrous on back, margin ciliolate; internodes 7–12 mm. Spikelets 1 per node, green, 13–16 mm excluding awns, with 4–6 florets; rachilla puberulent. Glumes oblong-lanceolate, 4- or 5-veined, scabrous along veins, margin narrowly membranous, apex dentate on one or both sides; proximal glume 5–6 mm, awn 3–4 mm; distal glume 6–7 mm, awn 4–6 mm. Lemma lanceolate, smooth and glabrous abaxially, scabrous along veins; first lemma 9–10 mm; awn distinctly recurved, 14–18 mm. Palea distinctly shorter than lemma, softly ciliolate along keels, puberulent between keels, apex emarginate. Anthers yellow, ca. 3 mm. Ovary puberulent at apex. Fl. and fr. Jul.

• River banks; ca. 2000 m. Hebei (Yuxian).

29. *Elymus glaberrimus* (Keng & S. L. Chen) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

光穗披碱草 guang sui pi jian cao

Plants without rhizome, when culms tufted, or with short rhizome. Culms erect, glaucous, ca. 80 cm tall. Leaf sheath smooth and glabrous, or puberulent at base; leaf blade glaucous, flat, or involute when dry, 8–15 × (0.1–)0.3–0.4 cm, stiff, abaxial surface smooth, glabrous, adaxial surface scabrous. Spike erect, 5–12 cm, with 6–11 spikelets. Spikelets 1 per node, greenish, stramineous when old; rachilla smooth and glabrous, or puberulent. Glumes lucid, oblong-lanceolate, glabrous, margin membranous, apex acute with a tooth on one side; proximal glume 4–6 mm, 3-veined; distal glume 5.5–7.5 mm, 3–5-veined. Lemma oblong-lanceolate, smooth and glabrous throughout; first lemma ca. 9 mm; awn recurved, 3–20 mm, scabrous. Palea equaling lemma, smooth and glabrous abaxially distally or scabrous proximally, ciliolate along keels, apex emarginate or truncate. Fl. and fr. Aug–Sep. $2n = 28^*$.

• Meadows, mountain steppes, rocky slopes; 1400–2300 m. Qinghai, Xinjiang.

- 1a. Lemma awn 10–20 mm; plants without rhizome 29a. var. *glaberrimus*
 1b. Lemma awn 3–5 mm; plants usually with short rhizome 29b. var. *breviaristus*

29a. *Elymus glaberrimus* var. *glaberrimus*

光穗披碱草(原变种) *guang sui pi jian cao* (yuan bian zhong)

Roegneria glaberrima Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 72. 1963.

Plants without rhizome. Lemma awn 10–20 mm. Fl. and fr. Aug–Sep.

- Rocky slopes; 1400–2300 m. Qinghai, Xinjiang.

29b. *Elymus glaberrimus* var. *breviaristus* S. L. Chen ex D. F. Cui, Bull. Bot. Res., Harbin 10(3): 29. 1990.

短芒光穗披碱草 *duan mang guang sui pi jian cao*

Roegneria breviarista (S. L. Chen ex D. F. Cui) L. B. Cai; *R. glaberrima* var. *breviarista* (S. L. Chen ex D. F. Cui) L. B. Cai.

Plants usually with short rhizome. Lemma awn 3–5 mm. Fl. and fr. late summer.

- Meadows, mountain steppes; 1600–1700 m. Xinjiang.

30. *Elymus pseudocanicus* G. Zhu & S. L. Chen, nom. nov.

阿尔泰披碱草 *a er tai pi jian cao*

Replaced synonym: *Elymus altaicus* D. F. Cui, Bull. Bot. Res., Harbin 10(3): 28. 1990, not *Elymus altaicus* A. Sprengel, Tent. Suppl. 5. 1828; *Roegneria altaica* L. B. Cai.

Culms erect, 50–75 cm tall, 3-noded, glabrous; nodes ± purplish. Leaf sheath purplish when young, yellowish brown when older, smooth, glabrous; ligule ca. 1 mm, membranous; leaf blade usually involute, 10–18 × 0.2–0.35 cm, abaxial surface smooth, adaxial surface scabrous. Spike dense, 8–9 cm; rachis smooth, margin ciliate; internodes 7–9 mm. Spikelets 1 per node, purplish, subunilateral, 13–15 mm, with 3 or 4 florets; rachilla puberulent; internodes 2–3 mm. Glumes broadly lanceolate, subequal, 9–11 mm, 5-veined, margin broadly membranous, apex awnless. Lemma purplish, lanceolate, puberulent; first lemma 10–12 mm; callus puberulent; awn purplish, recurved, robust, 14–18 mm. Palea slightly shorter than or subequaling lemma, ciliate along keels distally. Anthers yellow, ca. 2.5 mm. Fl. and fr. Jun–Aug.

- Forest understories along river valleys, mountain slopes. Xinjiang.

31. *Elymus sinkiangensis* D. F. Cui, Bull. Bot. Res., Harbin 10(3): 26. 1990.

新疆披碱草 *xin jiang pi jian cao*

Roegneria sinkiangensis (D. F. Cui) L. B. Cai.

Culms 60–80 cm tall, 2- or 3-noded. Leaf sheath smooth, glabrous, but retrorsely pubescent at base; ligule ca. 0.3 mm; leaf blade flat, 5–30 × 0.3–0.5 cm, abaxial surface smooth, glabrous, adaxial surface long pilose, margin ciliate. Spike erect,

dense, 7–10 cm; rachis subglabrous, margin ciliate; internodes 4–7 mm. Spikelets 1 per node, 13–15(–18) mm, with 4 or 5(or 6) florets. Glumes lanceolate, 3–5-veined, hispidulous along veins, margin membranous, apex acuminate or with awn ca. 2 mm; proximal glume 9–10 mm including awn; distal glume 10–12 mm including awn. Lemma lanceolate, hispidulous distally and near margin; first lemma 10–12 mm; awn recurved, 20–35 mm, scabrous. Palea equaling lemma, ciliate along keels. Anthers yellow, 1.5–2 mm. Fl. and fr. Jul–Sep.

- Forest margins, mountain steppes; 1800–2100 m. Xinjiang.

32. *Elymus jacquemontii* (J. D. Hooker) Tzvelev, Rast. Tsent. Azii 4: 221. 1968.

低株披碱草 *di zhu pi jian cao*

Agropyron jacquemontii J. D. Hooker, Fl. Brit. India 7: 369. 1896 [“1897”]; *Anthosachne jacquemontii* (J. D. Hooker) Nevski; *Roegneria jacquemontii* (J. D. Hooker) Nevski.

Culms slender, 15–20 cm tall, 2- or 3(or 4)-noded. Leaf blade green or light green, glaucous, involute, 2–4(–7) × 0.1–0.2 cm, abaxial surface glabrous, adaxial surface scabrous or ± pubescent. Spike 4–11 × 0.8–2 cm, with 4 or 5 spikelets; rachis slender, 8–15 mm, glabrous. Spikelets 1 per node, sessile, 12–18 mm, with 4–7 florets. Glumes 4.5–7 mm, 5-veined, glabrous, margin hyaline, apex with short awn 1–3(–5) mm. Lemma lanceolate, glabrous throughout; first lemma 7–9 mm; awn strongly curved, 20–50(–60) mm. Palea equaling lemma, ciliate along keels, apex obtuse. Anthers yellow or purple, 1.2–2.5 mm. Fl. and fr. late summer. $2n = 28^*$.

- Stony mountain slopes, alluvial soils, between rocks, usually growing together with *Elymus burchan-buddae* and *E. nutans*; ca. 3900 m. Xinjiang, Xizang.

33. *Elymus aristiglumis* (Keng & S. L. Chen) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

芒颖披碱草 *mang ying pi jian cao*

Culms solitary or tufted, erect, (15–)40–50 cm tall, 1- or 2-noded, glabrous. Leaf sheath glabrous; leaf blade flat, ± so, or involute, 6–8(–11) × to 0.5 cm, glabrous, scabrous, or densely hispidulous. Spike nodding, 6–8 cm excluding awns; rachis margin scabrous; internodes 3–10 mm. Spikelets 1 per node, purple, 12–15 mm excluding awns, with 2 or 3 florets; pedicel 0.5–1 mm, scabrous. Glumes narrowly lanceolate, subsymmetric, 1–3-veined, scabrous or smooth, apex with awn 3–7 mm; proximal glume 3–4 mm; distal glume 3–5 mm. Lemma oblong, smooth and glabrous or hirsutulous; first lemma ca. 10 mm; awn reflexed, 20–40 mm. Palea equaling lemma, hirsutulous throughout, ciliate along keels. Anthers black, ca. 2 mm. Fl. and fr. late summer. $2n = 28^*, 42^*$.

- Mountain slopes, river banks; 1500–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang.

- 1a. Leaf blade involute, less than 0.2 cm wide, both surfaces densely hispidulous 33b. var. *hirsutus*
 1b. Leaf blade flat or ± so, 0.4–0.5 cm wide, glabrous or scabrous.
 2a. Lemma ± hirsutulous throughout

except callus glabrous, awn

20–30 mm 33a. var. *aristiglumis*

2b. Lemma smooth, glabrous, awn

to 40 mm 33c. var. *leianthus*

33a. *Elymus aristiglumis* var. *aristiglumis*

芒颖披碱草(原变种) mang ying pi jian cao (yuan bian zhong)

Roegneria aristiglumis Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 55. 1963.

Leaf blade flat, 0.4–0.5 cm wide, glabrous or scabrous. Lemma \pm hirsutulous throughout except callus glabrous; awn 20–30 mm. Fl. and fr. late summer.

• Mountain slopes; 1500–3000 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang.

33b. *Elymus aristiglumis* var. *hirsutus* (H. L. Yang) S. L. Chen, Novon 7: 227. 1997.

毛芒颖草 mao mang ying cao

Roegneria aristiglumis var. *hirsuta* H. L. Yang, Acta Phytotax. Sin. 18: 253. 1980.

Leaf blade involute, less than 0.2 cm wide, both surfaces densely hispidulous. Lemma hirsutulous throughout; awn 20–30 mm. Fl. and fr. late summer.

• Mountain slopes; 4400–4500 m. Xizang.

33c. *Elymus aristiglumis* var. *leianthus* (H. L. Yang) S. L. Chen, Novon 7: 227. 1997.

平滑披碱草 ping hua pi jian cao

Roegneria aristiglumis var. *leiantha* H. L. Yang, Acta Phytotax. Sin. 18: 253. 1980.

Leaf blade \pm flat, 0.4–0.5 cm wide, glabrous or scabrous. Lemma smooth, glabrous; awn to 40 mm. Fl. and fr. late summer.

• Mountain slopes, river banks; 4900–5200 m. Xizang.

34. *Elymus shouliangiae* (L. B. Cai) G. Zhu, Novon 12: 427. 2002.

守良披碱草 shou liang pi jian cao

Roegneria shouliangiae L. B. Cai, Acta Phytotax. Sin. 35: 161. 1997.

Culms erect, 60–70 cm tall, 2–3 mm in diam., ca. 4-noded. Leaf sheath glabrous; ligule ca. 0.3 mm, apex truncate; leaf blade flat, 9–17 \times 0.3–0.6 cm, rigid, both surfaces glabrous or adaxial surface scabrous. Spike lax, 16–19 cm; rachis glabrous, but margin scabrous; internodes 15–23 mm. Spikelets 1 per node, 2.6–3.2 cm excluding awns, with 8–10 florets; rachilla internodes puberulent. Glumes lanceolate, glabrous; proximal glume 7–8 mm, 3- or 4-veined, apex acuminate; distal glume 8–9 mm, 5–7-veined, apex with awn 2–5 mm. Lemma lanceolate, smooth, glabrous; first lemma 11–12 mm; awn recurved, robust, 3.5–4 cm. Palea subequaling lemma, scabrous or spinescent along keels, glabrous between keels, apex truncate. An-

thers brown, 4–5 mm. Ovary obovate, apex pubescent. Fl. and fr. Jul.

• River banks; ca. 2800 m. Xizang (Gyirong)

35. *Elymus confusus* (Roshevitz) Tzvelev var. *breviaristatus* (Keng) S. L. Chen, Novon 7: 228. 1997.

紊草 wen cao

Roegneria confusa (Roshevitz) Nevski var. *breviaristata* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 52. 1963; *R. confusa* subsp. *breviaristata* (Keng) N. R. Cui.

Culms 30–70 cm tall, 3-noded. Leaf sheath glabrous, but retrorsely pilose at base; leaf blade green, usually involute, 3–7.4 \times ca. 0.4 cm, abaxial surface glabrous, adaxial surface scabrous. Spike erect, ca. 10 cm. Spikelets yellowish, green, or purplish green, 10–15 mm excluding awns, with 4 or 5 florets. Glumes narrowly lanceolate, 3-veined or distal glume 5-veined, scabrous along veins, apex long acuminate or distal glume with short awn; proximal glume 4–6 mm; distal glume 6–8 mm. Lemma laxly hirsutulous abaxially; first lemma 9–11 mm; awn reflexed, 13–15 mm, scabrous. Palea equaling lemma, ciliolate along keels distally, apex usually truncate. Fl. and fr. Jul–Aug. $2n = 42^*$.

• Meadows. Ningxia, Xinjiang.

Elymus confusus var. *confusus* is distributed in Mongolia and Russia, but has not yet been recorded from China. It differs from var. *breviaristatus* in having the awn of the first lemma about twice as long as the lemma body and in its chromosome number of $2n = 28$.

36. *Elymus anthosachnoides* (Keng) Á. Löve ex B. Rong Lu, Nordic J. Bot. 15: 24. 1995.

假花鳞草 jia hua lin cao

Culms solitary or tufted, 60–75 cm tall, 1.5–2.5 mm in diam., 4–6-noded. Leaf sheath glabrous; leaf blade flat, 11–25 \times 0.35–0.7 cm, both surfaces villous or adaxial surface pilose or glabrous. Spike pendulous, 8–16 cm. Spikelets 1 per node, yellowish green or tinged purplish, 24–30 mm excluding awns, with 5–7 florets; rachilla villous; internodes ca. 3 mm. Glumes lanceolate, 3–5(–7)-veined, scabrous along veins, apex acute; proximal glume 5–7.5 mm; distal glume 7–9 mm. Lemma lanceolate, hirsute throughout, especially distally and near margin, or glabrous or scabrous; first lemma 13–14 mm; awn reflexed, robust, 20–35 mm. Palea slightly shorter than or equaling lemma, ciliolate along keels distally. Anthers reddish brown, 1–2 mm. Fl. and fr. Jul–Aug.

• Mountain slopes; 2700–4000 m. Qinghai, Sichuan, Xizang, Yunnan.

Löve (Feddes Repert. 95: 459. 1984) did not previously validly publish the combination *Elymus anthosachnoides*; see the note following the genus description above.

- 1a. Spike 8–9 cm; lemma hirsute throughout 36a. var. *anthosachnoides*
- 1b. Spike 10–16 cm; lemma glabrous or scabrous 36b. var. *scabrilemmatus*

36a. *Elymus anthosachnoides* var. *anthosachnoides*

假花鳞草(原变种) jia hua lin cao (yuan bian zhong)

Roegneria anthosachnoides Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 65. 1963.Spike 8–9 cm. Lemma hirsute throughout. Fl. and fr. Jul–Aug. $2n = 28^*$.

- Mountain slopes; ca. 4000 m. Sichuan, Yunnan.

36b. *Elymus anthosachnoides* var. *scabrilemmatus* (L. B. Cai) S. L. Chen, *comb. nov.*

糙稃花鳞草 cao fu hua lin cao

Basionym: *Roegneria anthosachnoides* var. *scabrilemmata* L. B. Cai, Acta Phytotax. Sin. 35: 165. 1997.

Spike 10–16 cm. Lemma glabrous or scabrous. Fl. and fr. Jul–Aug.

- Mountain slopes; 2700–3600 m. Qinghai, Sichuan.

37. *Elymus altissimus* (Keng) Á. Löve ex B. Rong Lu, Nordic J. Bot. 15: 24. 1995.

高株披碱草 gao zhu pi jian cao

Roegneria altissima Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 53. 1963.

Culms tufted, erect, slightly geniculate, 70–150 cm, rigid, 5–7-noded. Leaf blade glaucous green, 7–25(–40) × 0.6–1 cm, abaxial surface glabrous, adaxial surface laxly puberulent, margin scabrous. Spike erect or slightly curved, 15–18 cm. Spikelets 1 per node, ca. 11 mm, with 1–3 florets. Glumes greenish or slightly purplish, oblong, 5–6 mm, thick, 5–7-veined or proximal glume 3-veined, apex acuminate. Lemma yellowish green or slightly purplish, oblong-lanceolate, pubescent only at base and at margin; first lemma ca. 10 mm; awn slightly reflexed, robust, 10–20 mm. Palea slightly shorter than lemma, apex emarginate or subrounded. Fl. and fr. Jun–Sep. $2n = 28^*$.

- Forests, meadows; 1700–3400 m. Qinghai, Sichuan, Xinjiang, Yunnan.

Löve (Feddes Repert. 95: 448. 1984) did not previously validly publish the combination *Elymus altissimus*; see the note following the genus description above.

38. *Elymus laxinodis* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 427. 2002.

稀节披碱草 xi jie pi jian cao

Roegneria laxinodis L. B. Cai, Guihaia 16: 199. 1996.

Culms erect or geniculate at base, 40–80 cm tall, 1–1.5 mm in diam., 3- or 4-noded, pubescent below spike and at nodes. Leaf sheath puberulent or scabrous; ligule ca. 0.5 mm, membranous, apex truncate; leaf blade flat, 10–16 × 0.4–0.6 cm, abaxial surface scabrous or ciliate along veins, adaxial surface villous. Spike erect or slightly curved, lax, 8–11 cm; rachis slender, puberulent; internodes 13–20(–28) mm. Spikelets narrow, 15–18 mm, with 2–5 florets. Glumes lanceolate, 3–5-

veined, sparsely spinose along veins and at margin, apex pungent; proximal glume 3–4 mm; distal glume 4–5 mm. Lemma narrowly lanceolate, abaxially puberulent; first lemma 9–10 mm; awn curved, 1.2–1.6 cm. Palea slightly shorter than lemma, scabrous along keels, puberulent between keels, apex truncate or obtuse. Anthers yellow, 2–2.5 mm. Caryopsis lanceolate, 6–7 mm. Fl. and fr. Aug–Sep.

- Mountain slopes; 3500–4000 m. Qinghai (Yushu), Sichuan (Kangding).

39. *Elymus serotinus* (Keng) Á. Löve ex B. Rong Lu, Nordic J. Bot. 15: 21. 1995.

秋披碱草 qiu pi jian cao

Roegneria serotina Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 50. 1963.

Culms laxly tufted, erect, or decumbent or geniculate at base, 20–45 cm tall. Leaf sheath puberulent or margin ciliate at base; leaf blade involute, 9–11(–20) × 0.1–0.2 cm, both surfaces smooth and glabrous or adaxial surface scabrous. Spike curved and nodding, 6–10 cm, with 5–11 spikelets. Spikelets 1 per node, yellowish brown or purplish green, 12–13(–22) mm excluding awns, with 3–6(or 7) florets. Glumes oblong-lanceolate, 3–5-veined, laxly puberulent, scabrous along veins, apex acute or acuminate; proximal glume 5–6 mm; distal glume 7–8 mm; awn usually 2–5 mm. Lemma oblong-lanceolate, puberulent proximally, hispidulous distally; first lemma ca. 10 mm; awn reflexed, 2.5–3 cm, scabrous. Palea equaling lemma, puberulent between keels distally. Fl. and fr. late summer. $2n = 28^*$.

- Mountain slopes. Henan, Qinghai, Shaanxi.

Löve (Feddes Repert. 95: 467. 1984) did not previously validly publish the combination *Elymus serotinus*; see the note following the genus description above.

40. *Elymus retroflexus* B. Rong Lu & B. Salomon, Nordic J. Bot. 13: 355. 1993.

反折披碱草 fan zhe pi jian cao

Roegneria retroflexa (B. Rong Lu & B. Salomon) L. B. Cai.

Culms 55–75 cm tall, 3- or 4-noded, glabrous. Leaf sheath smooth; ligule 0.4–0.5 mm, apex lacerate; auricles 1–1.2 × 0.1–0.2 mm; leaf blade narrowly linear, 4–10 × 0.1–0.2 cm, scabrous. Spike nodding, lax, 6.5–12 × 0.5–1 cm; rachis smooth. Spikelets 1 per node, 4–6.5 × 2–5 mm, with 3–5 florets; rachilla pilose, 2.5–3 mm. Glumes narrowly elliptic, subequal, small, scabrous along veins, margin membranous, apex acute or mucronate; proximal glume (1.5–)2–5 × 0.5–1 mm, (2 or)3-veined; distal glume (3–)5–7.5 × 0.8–1.3 mm, 3–5-veined. Lemma narrowly lanceolate, 9–12 × 1–1.5 mm excluding awn; awn bent when mature, 3.5–5.5 cm. Palea narrowly lanceolate, 8–9 × 0.9–1.2 mm, ciliate along keels, apex truncate, hairy. Anthers yellow, 2.5–3 mm. Fl. and fr. Jul–Sep. $2n = 28^*$.

- Dry to moist mountain slopes and meadows usually with shrubs and *Betula* trees; 3900–4300 m. Xizang.

41. *Elymus leiotropis* (Keng) S. L. Chen, *comb. nov.*光脊披碱草 *guang ji pi jian cao*

Basionym: *Roegneria leiotropis* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 58. 1963.

Culms tufted, erect but geniculate at base, 60–90 cm tall, 3-noded. Leaf sheath glabrous; ligule ca. 0.2 mm, apex truncate; leaf blade flat or slightly involute, 7–17 × 0.2–0.4 cm, abaxial surface smooth, adaxial surface scabrous. Spike curved or nodding, 10–15 cm. Spikelets 1 per node, purplish green, 15–20 mm, with 4 or 5 florets. Glumes oblong-lanceolate, 3–5-veined, apex acute or acuminate; proximal glume 5–7 mm; distal glume 6–8 mm. Lemma lanceolate, hirsutulous throughout; first lemma 10–13 mm; awn reflexed, robust, 25–40 mm. Palea slightly shorter than lemma, distally scabrous, smooth along keels, apex truncate or emarginate. Fl. and fr. late summer.

- Mountain slopes. Yunnan.

Löve (Feddes Repert. 95: 449. 1984) did not previously validly publish the combination *Elymus leiotropis*; see the note following the genus description above.

42. *Elymus brevipes* (Keng) S. L. Chen, *comb. nov.*短柄披碱草 *duan bing pi jian cao*

Basionym: *Roegneria brevipes* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 49. 1963; *R. breviglumis* Keng var. *brevipes* (Keng) L. B. Cai.

Culms solitary or tufted, erect, 30–60 cm tall. Leaf blade involute when dry, rigid, abaxial surface smooth, adaxial surface scabrous. Spike curved or nodding, branched at base, 7–11 cm excluding awns; rachis slender. Spikelets 1 per node, purplish green, ± nitid, 14–22 × 4–7 mm; pedicel 0.5–2 mm. Glumes lanceolate, distinctly 3-veined or distal glume 4-veined, scabrous, apex acute or acuminate; proximal glume 1.5–3 mm; distal glume 3–4.5 mm. Lemma lanceolate, scabrous or subglabrous; first lemma 9–10 mm; awn reflexed, 2.5–3 cm, scabrous. Palea 8–9 mm, puberulent abaxially, ciliate along distal 1/3 of keels, apex truncate. Anthers yellow, 1.5–2.5 mm. Fl. and fr. late summer. $2n = 28^*$.

- Open rocky mountains. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, ?Yunnan.

Löve (Feddes Repert. 95: 467. 1984) did not previously validly publish the combination *Elymus brevipes*; see the note following the genus description above.

A record of the C Asian and W Himalayan *Elymus schugnanicus* (Nevski) Tzvelev (Novosti Sist. Vyssh. Rast. 9: 62. 1972; *Agropyron schugnanicum* Nevski, Bull. Jard. Bot. Acad. Sci. URSS 30: 512. 1932) from Yunnan (Fl. Yunnan. 9: 419–420. 2003, as *Roegneria schugnanica* (Nevski) Nevski) may be referable to *E. brevipes*. Lu (Nordic J. Bot. 15: 13–15. 1995) treated the two taxa as conspecific. Alternatively, it may be referable to *E. tschinganicus*.

43. *Elymus schrenkianus* (Fischer & C. A. Meyer) Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 428. 1960.扭轴披碱草 *niu zhou pi jian cao*

Triticum schrenkianum Fischer & C. A. Meyer, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 3: 305. 1845; *Agropyron schrenkianum* (Fischer & C. A. Meyer) P. Candargy; *Campeiostrachys schrenkiana* (Fischer & C. A. Meyer) Drobaw; *Roegneria schrenkiana* (Fischer & C. A. Meyer) Nevski.

Culms robust, 30–90 cm tall. Sheath of lower leaves retrorsely pubescent; leaf blade flat, 5–8 × 0.3–0.6 cm, scabrous or sometimes pubescent. Spike nodding, ± secund, dense, 5–11 cm; internodes 3–8 mm. Spikelets 1 per node, usually very shortly pedicellate, purplish green, with 3 or 4 (or 5) florets. Glumes linear-lanceolate, 3-veined; proximal glume 4–4.5 mm, awn 2–3.5 mm; distal glume 4.5–5.5 mm, awn ca. 5 mm. Lemma lanceolate, very scabrous; first lemma ca. 11 mm; awn divaricate, 15–22 mm. Palea subequaling or equaling lemma, hispid along keels, apex subobtus. Anthers 1.5–1.8 mm. Fl. and fr. Jun–Jul. $2n = 42^*$.

Glades, mountain slopes, dry river meadows. Qinghai, Xinjiang, Xizang [Bhutan, India (Sikkim), Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Russia, Turkmenistan, Uzbekistan].

44. *Elymus pulanensis* (H. L. Yang) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988 [“*pulancensis*”].普兰披碱草 *pu lan pi jian cao*

Roegneria pulanensis H. L. Yang, Acta Phytotax. Sin. 18: 253. 1980; *R. jacquemontii* (J. D. Hooker) Nevski var. *pulanensis* (H. L. Yang) L. B. Cai.

Culms laxly tufted, 30–50 cm tall, 3- or 4-noded. Leaf blade flat or involute, 7–10 × 0.15–0.3 cm, both surfaces glabrous or laxly villous. Spike curved, 8–10 cm, with 5–8 spikelets; rachis smooth, glabrous; internodes 14–20 mm. Spikelets 1 per node, 22–26 mm, with 7–9 florets. Glumes oblong-lanceolate, 3–5-veined, smooth, glabrous, margin membranous; proximal glume 4.5–5 mm, awn (1–)1.5–5 mm; distal glume 5–7 mm, awn to 7 mm. Lemma lanceolate, ± laxly hirsutulous abaxially; first lemma ca. 11 mm; awn reflexed, 30–40 mm. Palea equaling lemma, shortly ciliate along keels distally. Fl. and fr. late summer.

- River banks; ca. 3600 m. Xizang, Yunnan.

45. *Elymus purpurascens* (Keng) S. L. Chen, *comb. nov.*紫穗披碱草 *zi sui pi jian cao*

Basionym: *Roegneria purpurascens* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 56. 1963.

Culms laxly tufted, erect or slightly decumbent at base, 60–90 cm tall, rigid. Leaf sheath smooth, glabrous; leaf blade involute, 11–22 × 0.3–0.6 cm, stiff, abaxial surface glabrous, adaxial surface scabrous or pubescent, margin scabrous. Spike nodding, 13–15 cm, with 8–13 spikelets. Spikelets 1 per node, purplish in part, 1.5–2.3 cm excluding awns, with 4–7 florets. Glumes oblong-lanceolate, 5–8 mm, 5-veined, scabrous, apex acute; proximal glume sometimes shorter and 3-veined. Lemma lanceolate, scabrous or hirsutulous abaxially; first lemma 9–11 mm; awn reflexed, purplish, robust, 18–28 mm, scabrous. Palea

subequaling lemma, shortly ciliate along keels distally, puberulent between keels. Fl. and fr. Jun–Jul. $2n = 28^*$, 42^* .

• Mountain slopes. Gansu, Nei Mongol, Ningxia, Qinghai, Yunnan.

Löve (Feddes Repert. 95: 448. 1984) did not previously validly publish the combination *Elymus purpurascens*; see the note following the genus description above.

46. *Elymus tschimganicus* (Drobow) Tzvelev, Rast. Tsentr. Azii 4: 221. 1968 [*czimganicus*].

云山披碱草 yun shan pi jian cao

Culms erect, usually geniculate at base, 25–60 cm tall, smooth, glabrous. Leaf sheath glabrous throughout, or pubescent proximally; leaf blade glaucous green, subinvolute, 0.15–0.3 cm wide, both surfaces glabrous or adaxial surface slightly hairy. Spike flexuose, slender, 7–9 cm. Spikelets 1 per node, pale glaucous green, rarely very slightly tinged purple, with 5–7 florets. Glumes linear-lanceolate, 4–8 mm, $1/4$ – $1/2$ as long as basal florets in spikelet, (3–)5-veined, scabrous along veins, apex usually acuminate, occasionally shortly awned. Lemma lanceolate, 9–10 mm, scabrous; callus shortly setose on sides, or smooth and glabrous; awn reflexed, 20–30 mm. Palea subequaling lemma, apex slightly emarginate or obtuse. Anthers 2–2.5 mm. Fl. and fr. Jun–Jul.

Mountain slopes, high mountain meadows; ca. 3500 m. Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

See the comment under *Elymus brevipes* (species no. 42).

- 1a. Lemma callus shortly setose on sides; leaf sheath glabrous, or pubescent proximally 46a. var. *tschimganicus*
- 1b. Lemma callus smooth, glabrous; leaf sheath glabrous throughout 46b. var. *glabrispiculus*

46a. *Elymus tschimganicus* var. *tschimganicus*

云山披碱草(原变种) yun shan pi jian cao (yuan bian zhong)

Agropyron tschimganicum Drobow in Vvedensky et al., Key Fl. Tashkent 1: 40. 1923; *Roegneria tschimganica* (Drobow) Nevski.

Leaf sheath glabrous, or pubescent proximally. Lemma callus shortly setose on sides. Fl. and fr. Jun–Jul. $2n = 42^*$.

High mountain meadows. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

“*Agropyron czimganicum*,” “*Elymus czimganicus*,” and “*Roegneria czimganica*” are merely orthographical variants.

46b. *Elymus tschimganicus* var. *glabrispiculus* D. F. Cui, Bull. Bot. Res., Harbin 10(3): 30. 1990.

光稃披碱草 guang fu pi jian cao

Roegneria glabrispicula (D. F. Cui) L. B. Cai; *R. tschimganica* var. *glabrispicula* (D. F. Cui) L. B. Cai.

Leaf sheath glabrous throughout. Lemma callus smooth, glabrous. Fl. and fr. summer.

• Mountain slopes; ca. 3500 m. Xinjiang.

47. *Elymus mutabilis* (Drobow) Tzvelev, Rast. Tsentr. Azii 4: 217. 1968.

狭颖披碱草 xia ying pi jian cao

Plants \pm with rhizome, or if without rhizome then culms tufted. Culms erect, 60–120 cm tall. Leaf blade flat, 10–20 \times 0.4–0.7 cm, glabrous. Spike usually dense, 6–20 \times 0.4–0.7 cm; rachis margin ciliate; internodes 9–15 mm. Spikelets 1 per node, green, purple, glaucous, or purplish glaucous, 10–20 mm, with 2–5 florets; very shortly pedicellate. Glumes lanceolate or broadly so, 7–13 \times 1.5–2 mm, 5-veined, scabrous or hispid, margin sometimes broadly membranous, apex acuminate to awned; awn (when present) 1–2 mm. Lemma narrowly elliptic, 8–9 mm, scabrous, \pm pilose, or pubescent throughout; awn 1–7 mm. Palea equaling or subequaling lemma, margin ciliate, apex emarginate, truncate, or obtuse. Anthers 2–3 mm. Fl. and fr. Jun–Sep. $2n = 28^*$.

Sparse forests, forest margins and glades, among shrubs, mountain slopes, meadows, pebbles; 1200–2400 m. Xinjiang [Mongolia, Russia; C and SW Asia, Europe].

This species is a good forage grass.

- 1a. Plants without rhizome (culms tufted); spikelets usually glaucous or purplish glaucous 47c. var. *praecaespitosus*
- 1b. Plants \pm with rhizome; spikelets purple or green.
 - 2a. Spikelets usually purple; glumes lanceolate; lemma \pm pilose, awn 2–5 mm 47a. var. *mutabilis*
 - 2b. Spikelets usually green; glumes broadly lanceolate; lemma pubescent throughout, awn 1–2 mm 47b. var. *nemoralis*

47a. *Elymus mutabilis* var. *mutabilis*

狭颖披碱草(原变种) xia ying pi jian cao (yuan bian zhong)

Agropyron mutabile Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 88. 1916; *A. angustiglume* Nevski; *Gouardia mutabilis* (Drobow) Ikonnikov; *Roegneria angustiglumis* (Nevski) Nevski; *R. mutabilis* (Drobow) Hylander.

Plants \pm with rhizome. Spikelets usually purple. Glumes lanceolate. Lemma \pm pilose; awn 2–5 mm. Fl. and fr. Jul–Aug.

Sparse forests, forest glades, among shrubs, mountain slopes, meadows, pebbles; 1300–2400 m. Xinjiang [Mongolia, Russia; SW Asia, Europe].

47b. *Elymus mutabilis* var. *nemoralis* S. L. Chen ex D. F. Cui, Bull. Bot. Res., Harbin 10(3): 29. 1990.

林缘披碱草 lin yuan pi jian cao

Roegneria mutabilis var. *nemoralis* (D. F. Cui) L. B. Cai.

Plants with rhizome. Spikelets usually green. Glumes broadly lanceolate. Lemma pubescent throughout; awn 1–2 mm.

• Forest glades, mountain slopes; 1800–1900 m. Xinjiang.

47c. *Elymus mutabilis* var. *praecaespitosus* (Nevski) S. L. Chen, Novon 7: 229. 1997.

密丛披碱草 *mi cong pi jian cao*

Agropyron praecaespitosum Nevski, Izv. Glavn. Bot. Sada SSSR 29: 541. 1930; *Elymus praecaespitosus* (Nevski) Tzvelev; *E. mutabilis* subsp. *praecaespitosus* (Nevski) Tzvelev; *Gouldardia praecaespitosa* (Nevski) Ikonnikov; *Roegneria praecaespitosa* (Nevski) Nevski.

Plants without rhizome. Culms tufted. Spikelets usually glaucous or purplish glaucous. Fl. and fr. Jun–Sep.

Forest margins, mountain slopes; 1200–2400 m. Xinjiang [Mongolia, Russia].

48. *Elymus magnicaespes* D. F. Cui, Bull. Bot. Res., Harbin 10(3): 25. 1990.

大丛披碱草 *da cong pi jian cao*

Roegneria magnicaespes (D. F. Cui) L. B. Cai.

Plants without rhizome. Culms tufted, erect, 50–70 cm tall, 2-noded. Leaf sheath glabrous, usually fibrous and broken at base; ligule ca. 5 mm, membranous, apex truncate; leaf blade setaceous, involute, 6–15 × 0.15–0.25 cm, stiff, abaxial surface glabrous, adaxial surface scabrous. Spike erect, slender, 8–12 cm; rachis scabrous, margin ciliate; internodes ca. 10 mm. Spikelets 1 per node, 11–18 × 2–3 mm, with 4–6 florets; rachilla densely puberulent; internodes ca. 1.5 mm. Glumes oblong-lanceolate, 4- or 5-veined, margin membranous, apex acuminate or pointed; proximal glume 3–6 mm, distal glume 6–9 mm. Lemma oblong-lanceolate, smooth, glabrous, apex acuminate; first lemma ca. 10 mm. Palea equaling lemma, narrowed toward subtruncate apex, ciliate along keels. Anthers ca. 3 mm. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Steppes; ca. 2100 m. Xinjiang.

49. *Elymus alashanicus* (Keng) S. L. Chen, Bull. Bot. Res., Harbin 14: 142. 1994.

阿拉善披碱草 *a la shan pi jian cao*

Roegneria alashanica Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 73. 1963.

Plants ± with rhizome. Culms laxly tufted, 40–60 cm tall, rigid, 3-noded. Leaf sheath usually fibrous and broken at base; leaf blade setaceous, involute, 5–8(–12) × 0.2–0.3 cm, stiff, both surfaces pubescent or abaxial surface smooth and glabrous. Spike erect, slender, 5–10 cm. Spikelets 1 per node, yellowish, 12–15 × 2–3 mm, with 3–6 florets, glabrous; rachilla glabrous. Glumes oblong-lanceolate, 3-veined, margin membranous, apex acute, rarely obtuse; proximal glume 5–6 mm; distal glume 7–9 mm. Lemma lanceolate, smooth, obscurely 5-veined, margin narrowly membranous, apex acute to pointed; callus smooth, glabrous; first lemma ca. 10 mm. Palea subequaling or slightly longer than lemma, apex truncate. Anthers ca. 3 mm. Fl. and fr. late summer.

• Mountain slopes; ca. 1800 m. Gansu, Nei Mongol, Ningxia, Xinjiang.

50. *Elymus jufinshanicus* (C. P. Wang & H. L. Yang) S. L. Chen, Novon 7: 228. 1997.

九峰山披碱草 *jiu feng shan pi jian cao*

Roegneria alashanica Keng var. *jufinshanica* C. P. Wang & H. L. Yang, Bull. Bot. Res., Harbin 4(4): 87. 1984; *R. jufinshanica* (C. P. Wang & H. L. Yang) L. B. Cai.

Culms laxly tufted, usually geniculate at base, 70–90 cm tall. Leaf sheath usually longer than internode, glabrous; ligule 0.5–1 mm, apex truncate; leaf blade linear, usually involute, 8–18 × 0.1–0.15 cm, abaxial surface usually glabrous, adaxial surface usually villous. Spike erect, 12–15 cm; rachis subglabrous on back, margin ciliate. Spikelets 1 per node, yellowish, 13–18 × 2–3 mm, with 3 or 4 florets; rachilla densely pubescent. Glumes oblong-lanceolate, 3–5-veined, densely pubescent adaxially, apex acuminate; proximal glume 9–11 mm; distal glume 11–12 mm. Lemma lanceolate, subglabrous; first lemma ca. 11 mm; awn ca. 5 mm. Palea shorter than lemma. Anthers yellow, 1.5–2 mm. Fl. and fr. late summer.

• Mountain slopes; ca. 2200 m. Nei Mongol.

51. *Elymus tridentatus* (C. Yen & J. L. Yang) S. L. Chen, Novon 7: 229. 1997.

三齿披碱草 *san chi pi jian cao*

Roegneria tridentata C. Yen & J. L. Yang, Novon 4: 310. 1994.

Culms tufted, erect or slightly procumbent geniculate at base, 40–65 cm tall, 1.5–2 mm in diam., 2- or 3-noded, smooth, glabrous. Leaf sheath glabrous; ligule ca. 0.5 mm, scarious, apex truncate; leaf blade involute or subinvolute, 5–7 × ca. 0.2 cm, abaxial surface glabrous, adaxial surface pubescent. Spike erect, 5–11.5 × ca. 0.5 cm, with 6–14 spikelets; rachis usually glabrous. Spikelets 1 per node, purple or greenish purple, 10–13 × ca. 2 mm, with 4 or 5 florets; rachilla internodes 1.5–2 mm, appressed puberulent. Glumes oblong or oblong-elliptic, slightly oblique, unequal, prominently 3(–5)-veined, glabrous, sometimes sparsely shortly spinulose along veins, apex rounded-obtuse, rarely acute; proximal glume 4–5 mm; distal glume 5–6.5 mm. Lemma oblong-lanceolate, (7–)8–9 mm, appressed white pubescent proximally and laterally, apex truncate and 3-toothed, teeth 0.5–1 mm; callus obtuse, puberulent along sides. Palea shorter to longer than lemma, scabrous between keels, setulose-ciliate on distal 1/3–1/2 of keels, apex truncate. Anthers black, ca. 2 mm. $2n = 42^*$.

• Rocky slopes, roadsides; ca. 3700–3800 m. Qinghai.

52. *Elymus elytrigoides* (C. Yen & J. L. Yang) S. L. Chen, **comb. nov.**

昌都披碱草 *chang du pi jian cao*

Basionym: *Roegneria elytrigoides* C. Yen & J. L. Yang, Acta Bot. Yunnan. 6: 75. 1984; *Pseudoroegneria elytrigoides* (C. Yen & J. L. Yang) B. Rong Lu; *R. alashanica* Keng var. *elytrigoides* (C. Yen & J. L. Yang) L. B. Cai.

Plants with rhizome. Culms laxly tufted, erect, 60–75 cm tall, 1–1.2 mm in diam., 2–4(–6)-noded, glabrous. Leaf sheath

shorter than internode, glabrous, fibrous and broken at base; ligule ca. 0.5 mm, membranous, apex truncate; leaf blade green, flat or involute, (7–)10–15 × 0.15–0.33 cm, stiff. Spike linear, straight, (5–)8–16 cm, with 5–12 spikelets; rachis glabrous; internodes 8–15 mm, or to 20 mm at base of spike. Spikelets 1 per node, 12–15 mm, with 5 or 6 florets; rachilla glabrous or puberulent; internodes 1.5–1.8 mm. Glumes oblong-lanceolate, herbaceous, glabrous, margin membranous, apex obtuse or acute, unilaterally dentate; proximal glume 3.5–6.5 mm, 3- or 4-veined; distal glume 5–8.5 mm, 4- or 5-veined. Lemma oblong-lanceolate, 5-veined, glabrous, apex obtuse or with point ca. 0.5 mm; first lemma 7.8–9 mm; callus obtuse, puberulent. Palea equaling or slightly longer than lemma, abaxially glabrous, ciliolate along keels distally, apex truncate. Anthers yellow or pale brown, 4.5–5 mm. Caryopsis dark purple, oblong, ca. 5.5 × 1.5 mm, apex densely white hispidulous. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Mountain rocks among *Caragana*, river banks; ca. 3200 m. Xizang (Qamdo).

53. *Elymus grandis* (Keng) S. L. Chen, *comb. nov.*

大披碱草 *da pi jian cao*

Basionym: *Roegneria grandis* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 45. 1963.

Plants with short, underground rhizomes. Culms solitary or tufted, 80–100 cm tall, stiff, 5- or 6-noded. Leaf blade 20–30 × ca. 1 cm, subleathery, both surfaces smooth or adaxial surface scabrous. Spike erect, slender, lax, 20–25 cm; rachis scabrous. Spikelets 1 per node, 20–30 mm, with ca. 12 florets. Glumes oblong-lanceolate, 10–15 mm, 5–7-veined, smooth or scabrous, margin ± membranous. Lemma white pilose, apex pointed; first lemma ca. 15 mm including apical point ca. 1 mm. Palea 2/3–3/4 as long as lemma, subsmooth along keels, apex truncate or subrounded. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Mountain slopes. Henan, Shaanxi.

Löve (Feddes Repert. 95: 458. 1984) did not previously validly publish the combination *Elymus grandis*; see the note following the genus description above.

54. *Elymus sylvaticus* (Keng & S. L. Chen) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

林地披碱草 *lin di pi jian cao*

Roegneria sylvatica Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 36. 1963.

Culms laxly tufted, erect or slightly decumbent at base, ca. 100 cm tall. 4- or 5-noded. Leaf sheath smooth, glabrous; leaf blade flat, 13–25 × 0.6–0.9 cm, soft, glabrous. Spike rather dense, 7.5–8.5 cm. Spikelets 1 per node, 12–14 mm, with 3 florets. Glumes lanceolate, 8–10 mm, 3–5-veined, scabrous, margin narrowly membranous, apex acute, pointed, or with awn 1–2 mm. Lemma hirsutulous, margin narrowly membranous, apex narrowed with short awn 1–3 mm, sometimes with a tooth below apex; first lemma 9–11 mm. Palea subequaling lemma, densely ciliolate along keels distally, puberulent between keels, apex emarginate. Fl. and fr. summer.

• Forests; 1800–3300 m. Qinghai, Xinjiang.

55. *Elymus kronokensis* (Komarov) Tzvelev, Rast. Tsent. Azii 4: 216. 1968.

少花披碱草 *shao hua pi jian cao*

Agropyron kronokense Komarov, Repert. Spec. Nov. Regni Veg. 13: 87. 1914; *A. boreale* (Turczaninow) Drobow; *Elymus borealis* (Turczaninow) D. F. Cui (1996, “*borealis*”), not Scribner (1900); *E. kronokensis* subsp. *borealis* (Turczaninow) Tzvelev; *Roegneria borealis* (Turczaninow) Nevski; *R. kronokensis* (Komarov) Tzvelev; *Triticum boreale* Turczaninow.

Culms erect, slender, (20–)30–60 cm tall, smooth, glabrous. Leaf blade flat, 5–9 × 0.15–0.25 cm, abaxial surface glabrous but scabrous, adaxial surface pilose. Spike erect, dense, 4–12 cm; rachis densely hirsute; Spikelets 1 per node, purple or purplish green, 9–10 mm, with 2(or 3) florets. Glumes lanceolate or broadly so, 4–6(–7) × 1.5–2.5 mm, 3–5-veined, glabrous, or scabrous along veins, margin purple or purplish membranous, apex obtusely dentate or with awn 1(–3) mm. Lemma lanceolate, 7–8(–9) mm, smooth, glabrous; awn 2–4 (–5) mm. Palea equaling lemma, ciliate along keels, apex emarginate. Fl. and fr. Jun–Aug. $2n = 28$.

Meadows in alpine zones and river valleys; 1600–1800 m. Xinjiang [Mongolia, Russia].

56. *Elymus yushuensis* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 428. 2002.

玉树披碱草 *yu shu pi jian cao*

Roegneria yushuensis L. B. Cai, Bull. Bot. Res., Harbin 14: 338. 1994.

Culms erect, 45–60 cm tall, 1–2 mm in diam., 2- or 3-noded, glabrous. Leaf sheath glabrous; ligule very short, apex truncate; leaf blade usually involute, 5–9 cm, abaxial surface glabrous, adaxial surface and margin pilose. Spike lax, 6–11 cm; rachis slender, glabrous; internodes 7–18 mm, or to 30 mm at base of spike. Spikelets 1 per node, usually purplish, 12–20 mm, with 4–6 florets; rachilla pubescent. Glumes lanceolate, 3–5-veined, glabrous, apex pungent; proximal glume 4–5 mm; distal glume 6–7 mm. Lemma oblong-lanceolate, abaxially spinescent; first lemma 8–9 mm; awn 2–4 mm. Palea slightly shorter than or equaling lemma, ciliolate along keels distally, apex truncate. Caryopsis yellowish, apex pubescent. Fl. and fr. Aug–Sep.

• Roadsides; 3500–4000 m. S Qinghai.

57. *Elymus leianthus* (Keng) S. L. Chen, Novon 7: 229. 1997.

光花披碱草 *guang hua pi jian cao*

Roegneria leiantha Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 42. 1963; *Kengyilia leiantha* (Keng) L. B. Cai.

Culms usually geniculate at base, ca. 45 cm tall, usually 4-noded. Leaf sheath smooth, glabrous; leaf blade flat or inflexed, 6–11 × 0.2–0.4 cm, smooth and glabrous or adaxial surface scabrous. Spike ± curved, ca. 12 cm; rachis margin ciliolate. Spikelets 1 per node, 12–14 mm excluding awns, with 3 or 4

florets. Glumes narrowly oblong, subequal, 5–8 mm including awn, 3–5-veined, scabrous along veins, apex acuminate or with awn 1–2 mm. Lemma oblong-lanceolate, 5-veined, glabrous but scabrous along veins, margin membranous; first lemma 9–10 mm; callus subglabrous; awn 4–5 mm. Palea equaling lemma, wingless and ciliate along keels, apex obtuse or emarginate. Anthers yellow, 2–3 mm. Fl. and fr. late summer.

- Mountain slopes; 2300–2400 m. Qinghai, Yunnan.

58. *Elymus humilis* (Keng & S. L. Chen) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

矮披碱草 ai pi jian cao

Roegneria humilis Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 40. 1963.

Culms laxly tufted, 20–25 cm tall, usually 2-noded, smooth, glabrous. Leaf sheath smooth, glabrous, brown and fibrous at base when old; leaf blade usually involute, 2.5–5.5 (–10.5) × 0.1–0.4 cm, abaxial surface puberulent, adaxial surface pubescent. Spike slightly secund, 4.5–7 cm; rachis glabrous or puberulent, margin ciliate. Spikelets 1(or 2) per node, 8–13 mm excluding awns, with 3–5 florets; rachilla densely strigose. Glumes lanceolate, asymmetric, 2–5-veined, margin purplish membranous, apex acuminate to purplish pointed; proximal glume 7–10 mm including awn 1–3 mm; distal glume 8–11 mm including awn ca. 3 mm. Lemma lanceolate, distally scabrous, especially along veins, margin purplish membranous; first lemma 8–9 mm; callus with hairs 0.2–0.5 mm; awn erect, purplish, 2–5 mm. Palea equaling lemma, winged along keels, ciliate along wings, puberulent between keels, apex emarginate. Anthers purplish when young, ca. 2 mm. Fl. and fr. late summer.

- Roadsides. Qinghai, Xinjiang.

59. *Elymus viridulus* (Keng & S. L. Chen) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

绿穗披碱草 lǜ suǐ pi jian cao

Roegneria viridula Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 39. 1963.

Culms erect, ca. 80 cm tall, rigid, 4-noded, smooth, glabrous. Leaf sheath retrorsely pubescent proximally, glabrous distally; leaf blade linear, flat or involute, 10–15 × 0.2–0.4 cm, abaxial surface smooth, glabrous, adaxial surface scabrous and pilose at base. Spike ± nodding, 7.5–9.5 cm; rachis glabrous but margin ciliate. Spikelets 1 per node, 14–18 mm, with 5 or 6 florets. Glumes green, lucid, broadly lanceolate, suboblique, subequal, 8–12 mm including awn 1–2 mm, 4–6(–7)-veined, nearly keeled along midvein, glabrous, margin broadly membranous. Lemma greenish, oblong-lanceolate, glabrous but scabrous distally and near margin, margin broadly membranous; first lemma ca. 10 mm; awn 2–6 mm. Palea slightly shorter than or subequaling lemma, both surfaces puberulent, hispid-ciliate along keels distally, apex slightly emarginate or truncate. Anthers yellow, ca. 4 mm. Fl. and fr. late summer. $2n = 28^*$.

- Mountain slopes. Xinjiang.

60. *Elymus cheniae* (L. B. Cai) G. Zhu, Novon 12: 426. 2002.

陈氏披碱草 chen shi pi jian cao

Roegneria cheniae L. B. Cai, Acta Phytotax. Sin. 34: 333. 1996.

Culms erect or geniculate at base, 30–60 cm tall, 1.5–2.5 mm in diam., 3- or 4-noded, glabrous. Leaf sheath glabrous; ligule ca. 0.5 mm, membranous, apex truncate; leaf blade flat or involute at margin, 3–10 × 0.2–0.4 cm, both surfaces usually glabrous. Spike erect, 5–13 × ca. 0.4 cm; rachis glabrous, but margin ciliate; internodes 5–7 mm. Spikelets green or purplish green, 10–14 mm, with 2–4 florets; rachilla puberulent. Glumes lanceolate or oblong-lanceolate, usually subequal, 7–11 mm, 4–6-veined, glabrous, margin membranous, apex pungent or mucronate. Lemma lanceolate, abaxially spinose; first lemma 8–10 mm; awn 1–3 mm. Palea slightly shorter or longer than lemma, ciliate along keels, glabrous between keels. Anthers yellow, 1.5–2 mm. Caryopsis oblong, ca. 6 mm. Fl. and fr. Aug.

- Thickets; 2300–2600 m. Xinjiang (Xinyuan, Zhaosu).

61. *Elymus intramongolicus* (Shan Chen & W. Gao) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

内蒙披碱草 nei meng pi jian cao

Roegneria intramongolica Shan Chen & W. Gao, Acta Phytotax. Sin. 17(4): 93. 1979.

Culms laxly tufted, erect, 100–160 cm tall, ca. 5 mm in diam., 4- or 5-noded, smooth, glabrous. Leaf sheath glabrous; ligule lacerate, apex obtuse; leaf blade flat, 15–25 × 0.5–1 cm, abaxial surface hirsutulous along veins, adaxial surface pubescent. Spike erect, 9–15 cm; rachis margin shortly ciliate; internodes 5–10 mm. Spikelets 1 per node, green or purplish green, 11–13.5(–18.5) mm, with 3–5 florets. Glumes linear-lanceolate, 5–7-veined, densely hirsutulous abaxially, margin submembranous, apex acuminate or with awn 1–1.5 mm; proximal glume 9–10 mm; distal glume 10–11 mm. Lemma lanceolate, puberulent abaxially, apex unequally 1-toothed on each side; first lemma 11–12.5 mm; awn 1–2.5 mm. Palea shorter than lemma, puberulent abaxially, ciliate along keels. Fl. and fr. Jul–Aug.

- Forest margins, meadows. Nei Mongol.

62. *Elymus nevskii* Tzvelev, Spisok Rast. Gerb. Fl. SSSR Bot. Inst. Vsesoyuzn. Akad. Nauk 18: 29. 1970.

齿披碱草 chi pi jian cao

Agropyron ugamicum Drobow in Vvedensky et al., Key Fl. Tashkent 1: 40. 1923, not *Elymus ugamicus* Drobow (loc. cit. 44. 1923); *E. dentatus* (J. D. Hooker) Tzvelev subsp. *ugamicus* (Drobow) Tzvelev; *E. gmelinii* (Ledebour) Tzvelev subsp. *ugamicus* (Drobow) Á. Löve; *Gouardia ugamica* (Drobow) Ikonnikov; *Roegneria ugamica* (Drobow) Nevski; *Semeiostachys ugamica* (Drobow) Drobow.

Culms geniculate at base, robust, 50–120 cm tall. Leaf sheath glabrous or proximally pilose; leaf blade flat, 0.7–1.1 cm wide, both surfaces pilose and scabrous or abaxial surface glabrous. Spike erect, secund, dense; rachis margin scabrous.

Spikelets 1 per node, greenish or tinged purplish, 20–30 mm, with 5–9 florets. Glumes broadly lanceolate, subequal, 12–15 × 2.5–4 mm, prominently (5–)7–9-veined, scabrous, margin hyaline, apex acuminate, often 1-toothed. Lemma lanceolate, 11–13 mm, hirsute, scabrous; awn moderately stout, 1–5(–7) mm. Palea subequaling lemma, 10–12 mm, hispid along keels, apex rounded-obtuse. Anthers 2.5–3 mm. Fl. and fr. Jul–Aug. $2n = 28$.

Mountain slopes, valleys. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

This species has been treated as conspecific with *Elymus dentatus* (J. D. Hooker) Tzvelev (Spisok Rast. Gerb. Fl. SSSR Bot. Inst. Vsesoyuzn. Akad. Nauk 18: 29. 1970; *Agropyron dentatum* J. D. Hooker, Fl. Brit. India 7: 370. 1896 [“1897”]; *Roegneria dentata* (J. D. Hooker) Nevski; *Semeiostachys dentata* (J. D. Hooker) Drobow), which is regarded here as endemic to Kashmir and Pakistan. If the two species are united then the name *E. dentatus* has priority.

63. *Elymus kamoji* (Ohwi) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988.

柯孟披碱草 ke meng pi jian cao

Culms laxly tufted, erect or geniculate at base, (30–)50–100 cm tall. Leaf sheath usually glabrous but margin usually ciliate; ligule ca. 0.5 mm, apex truncate; leaf blade flat or involute, 5–40 × (0.1–)0.3–13 cm, glabrous, scabrous. Spike nodding, rarely erect, (2.5–)7–20 cm; rachis internodes 8–16(–25) mm. Spikelets 1 per node, green or purplish green, (10–)13–25 mm excluding awns, with (3–)5–8 florets; rachilla puberulent; internodes (1.5–)2–2.5 mm. Glumes ovate-lanceolate to oblong-lanceolate, 3–5(–7)-veined, margin broadly scarious, apex with awn 2–7 mm, more rarely acute and awnless; proximal glume 4–8 mm; distal glume 5–9 mm. Lemma lanceolate, glabrous to hispidulous, margin membranous; first lemma 8–11 mm; callus puberulent to hispidulous; awn erect or slightly reflexed, 18–40 mm. Palea slightly shorter than or equaling lemma, margin distinctly winged, apex subrounded or obtuse. Fl. and fr. May–Jul.

Forest margins, mountain slopes, roadsides; 100–2300 m. Anhui, Fujian, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Qinghai, Shaanxi, Shandong, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Korea, Russia (Far East)].

Some authors consider *Elymus tsukushiensis* Honda (Bot. Mag. (Tokyo) 1: 391. 1936), described from Japan, to be conspecific with *E. kamoji*, described from China, in which case the name *E. tsukushiensis* would have priority.

Two varieties occur in China. In addition, *Elymus kamoji* var. *intermedius* S. L. Chen & Y. X. Jin (Bull. Nanjing Bot. Gard. 1987: 10. 1988) perhaps also merits recognition. It is characterized by having different leaf epidermis, glumes with an awn ca. 4 mm, and lemmas with a robust, straight, rough awn.

- 1a. Culms 50–100 cm tall; spikelets 13–25 mm, with 5–8 florets; glume apex usually awned 63a. var. *kamoji*
- 1b. Culms 30–45 cm tall; spikelets 10–13 mm, with 3–5 florets; glume apex usually acute 63b. var. *macerrimus*

63a. *Elymus kamoji* var. *kamoji*

柯孟披碱草(原变种) ke meng pi jian cao (yuan bian zhong)

Agropyron kamoji Ohwi, Acta Phytotax. Geobot. 11: 179. 1942; *A. semicostatum* (Nees ex Steudel) Nees ex Boissier var. *transiens* Hackel; *A. tsukushiense* (Honda) Ohwi var. *transiens* (Hackel) Ohwi; *Elymus tsukushiensis* Honda var. *transiens* (Hackel) Osada; *Roegneria kamoji* (Ohwi) Keng & S. L. Chen; *R. tsukushiensis* (Honda) B. Rong Lu et al. var. *transiens* (Hackel) B. Rong Lu et al.

Culms 50–100 cm tall. Spikelets 13–25 mm, with 5–8 florets. Glume apex usually awned. Fl. and fr. May–Jul. $2n = 42$.

Forest margins, mountain slopes, roadsides; 100–2300 m. Anhui, Fujian, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Qinghai, Shaanxi, Shandong, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Korea, Russia (Far East)].

63b. *Elymus kamoji* var. *macerrimus* (Keng) G. Zhu, Novon 12: 426. 2002.

细瘦披碱草 xi shou pi jian cao

Roegneria kamoji var. *macerrima* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 17. 1963; *R. kamoji* subsp. *macerrima* (Keng) N. R. Cui; *R. macerrima* (Keng) L. B. Cai.

Culms 30–45 cm tall. Spikelets 10–13 mm, with 3–5 florets. Glume apex usually acute. Fl. and fr. May–Jul.

- Roadsides. Guangxi, Sichuan.

64. *Elymus hybridus* (Keng) S. L. Chen, *comb. nov.*

杂交披碱草 za jiao pi jian cao

Basionym: *Roegneria hybrida* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 18. 1963; *R. tsukushiensis* (Honda) B. Rong Lu et al. var. *hybrida* (Keng) L. B. Cai.

Culms erect or decumbent at base, ca. 90 cm tall. Leaf sheath brown or purplish; leaf blade flat, 15–25 × (0.25–)0.5–0.8 cm. Spike nodding, ca. 27 cm. Spikelets 1 per node, green, 17–20 mm excluding awns, with 6–8 florets. Glumes oblong-lanceolate, scabrous along veins, margin membranous, apex acuminate or with awn 1–2.5 mm; proximal glume 6–8 mm, 3–5-veined; distal glume 8–9 mm, 5–7-veined. Lemma oblong-lanceolate, proximal and distal parts hirsutulous but middle part subsmooth, long ciliate near margin, margin broadly scarious; awn erect or reflexed, 20–30 mm, scabrous. Palea slightly shorter than or equaling lemma, winged along keels, ciliolate along distal 3/4 of wings, apex obtuse. Ovary apex with yellowish, hard hairs. Fl. and fr. May–Jul.

- Mountain slopes. Jiangsu (Nanjing).

Chen (Bull. Nanjing Bot. Gard. 1987: 9. 1988) did not previously validly publish the combination *Elymus hybridus* because the place of valid publication of the basionym was not cited (Saint Louis Code, Art. 33.3). Instead, *Roegneria hybrida* was cited from Keng (Fl. Ill. Pl. Prim. Sin. Gram. 352. 1959), where the name was not validly published because no Latin description was provided (Art. 36.1).

65. *Elymus curtisistatus* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 426. 2002.

缩芒披碱草 suo mang pi jian cao

Roegneria curtisristata L. B. Cai, Guihaia 16: 200. 1996.

Culms erect, 40–65 cm tall, 1–2 mm in diam., usually 3-noded, scabrous. Leaf sheath usually glabrous but retrorsely villous on basal leaves; ligule very short, apex truncate; leaf blade involute, 4–10 × 0.2–0.3 cm, both surfaces glabrous or adaxial surface sparsely villous. Spike erect or slightly curved, 9–12 cm; rachis glabrous, but margin spinose; internodes 7–12 mm. Spikelets purplish, narrow, 13–19 mm excluding awns, with 5–7 florets; rachilla puberulent. Glumes lanceolate or oblong-lanceolate, subequal, 5–6 mm, 3–5-veined, scabrous along veins, margin narrowly membranous. Lemma lanceolate, abaxially glabrous but scabrous distally and at margin; first lemma 9–10 mm; callus pubescent; awn straight, 5–10 mm. Palea slightly longer than lemma, ciliate along keels distally, scabrous between keels, apex truncate or obtuse. Anthers black, 2.3–3.2 mm. Fl. and fr. Aug.

- Mountain slopes; ca. 3400 m. Xizang (Qamdo).

66. *Elymus scabridulus* (Ohwi) Tzvelev, Rast. Tsent. Azii 4: 218. 1968.

粗糙披碱草 cu cao pi jian cao

Agropyron scabridulum Ohwi, J. Jap. Bot. 19: 166. 1943; *Elymus semicostatus* (Nees ex Steudel) Melderis subsp. *scabridulus* (Ohwi) Å. Löve; *Roegneria scabridula* (Ohwi) Melderis.

Culms 50–60 cm tall, 2- or 3-noded, pubescent at nodes. Leaf sheath glabrous or retrorsely puberulent in innovation shoot; leaf blade involute, 7–15(–20) × ca. 0.3 cm, both surfaces ± scabrous. Spike erect, 8–10 cm; rachis compressed, margin with setiform hairs. Spikelets 1 per node, usually secund, dense, ca. 12 mm, with 5 or 6 florets. Glumes lanceolate, 3–5-veined, scabrous along veins, margin membranous, apex acuminate or pointed, usually with a tooth on one side; proximal glume 9–10 mm; distal glume 11–12 mm. Lemma lanceolate, scabrous; first lemma 7–8 mm; awn erect or slightly reflexed, purplish, slender, 12–15 mm. Palea linear-oblong, equaling lemma, setiform ciliate along keels, apex obtuse. Anthers yellow, oblong, ca. 1.5 mm. Fl. and fr. late summer.

- Forest margins, mountain slopes. Nei Mongol.

67. *Elymus yangiae* B. Rong Lu, Willdenowia 22: 129. 1992 [“*yangii*”].

杨氏披碱草 yang shi pi jian cao

Roegneria yangiae (B. Rong Lu) L. B. Cai, Acta Phytotax. Sin. 35: 158. 1997.

Culms erect or nodding at apex, 60–100(–110) cm tall, 4–7-noded, uppermost internode 23–35 cm. Leaf sheath scabrous; ligule 0.3–0.6 mm, apex lacerate; auricles 1.2–2 × 0.5–0.8 mm; leaf blade narrowly linear, 5–25 × 0.3–0.4 cm, both surfaces scabrous, margin ciliate. Spike nodding, 10–15 × 0.5–0.8 cm; rachis margin scabrous. Spikelets 1 per node, 35–45 mm including awns, with 5–10 florets; rachilla pilose, 1.7–2.1 mm. Glumes lanceolate, scabrous along veins, margin membranous, apex mucronate or acute; proximal glume 2–4.5 × 0.2–0.7 mm, (1 or) 2- or 3-veined; distal glume 3–3.5 × 0.4–0.9 mm, 2- or 3(–5)-veined. Lemma narrowly lanceolate, 7–10 mm, sparsely

pubescent to densely pilose; awn usually straight, 12–32 mm. Palea narrowly lanceolate, 8–10 mm, pubescent, ciliate along keels, apex pointed, 2-cleft. Anthers yellow, 3.5–4.2 mm. Fl. and fr. summer. $2n = 28^*$.

- Among bushes, stony mountain slopes; 3000–4200 m. Xizang.

68. *Elymus dolichatherus* (Keng) S. L. Chen, **comb. nov.**

长芒披碱草 chang mang pi jian cao

Basionym: *Roegneria dolichathera* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 19. 1963; *R. dolichathera* var. *glabrifolia* Keng.

Culms erect, usually glaucous, 60–90 cm tall, 4- or 5-noded. Leaf blade flat or involute, 10–20 × 0.3–0.7 cm, abaxial surface smooth, glabrous, adaxial surface scabrous or densely pubescent. Spike erect, ± curved, or nodding, 10–15 (–17) cm; rachis ± puberulent. Spikelets 1 per node, ± pedicellate, green or purplish green, 12–20 mm excluding awns, with 3–6 florets. Glumes oblong-lanceolate, subequal, 6–8 mm excluding awn, 3–5-veined, scabrous along veins, margin membranous, apex acuminate or awned. Lemma with teeth just below apex; awn erect or slightly reflexed, slender, (10–)15–30 mm. Palea slightly shorter than lemma, scabrous along keels distally. Fl. and fr. Jun–Jul. $2n = 28^*$.

- Forests, mountain slopes; 2300–3700 m. Ningxia, Qinghai, Sichuan, Yunnan.

Löve (Feddes Repert. 95: 453. 1984) did not previously validly publish the combination *Elymus dolichatherus*; see the note following the genus description above.

69. *Elymus tenuispicus* (J. L. Yang & Y. H. Zhou) S. L. Chen, Novon 7: 229. 1997.

柔穗披碱草 rou sui pi jian cao

Roegneria tenuispica J. L. Yang & Y. H. Zhou, Novon 4: 307. 1994.

Culms laxly tufted, erect, 35–75 cm tall, 0.5–1 mm in diam., 4- or 5-noded, glabrous but puberulent at nodes. Leaf sheath equaling or longer than internode, villous, persistent basal part often lacerate, fibrous; ligule ca. 0.5 mm, hyaline-membranous, apex truncate; leaf blade green, flat or involute, 15–20 × 0.3–0.4 cm, abaxial surface scabrous, adaxial surface villous. Spike erect or slightly nodding, 9.2–10.5 cm excluding awns; rachis glabrous, but margin hispid-ciliate; nodes densely pubescent. Spikelets 1 per node, 13–16 mm, with 4–9 florets; rachilla puberulent. Glumes oblong-lanceolate, herbaceous, hirsute, margin membranous, apex acuminate with mucro 0.5–1 mm; proximal glume 5–6.5 mm, 3- or 4-veined; distal glume 6.5–7.5 mm, 4- or 5-veined. Lemma oblong-lanceolate, proximally densely pubescent, distally scabrous-ciliate; first lemma 7.5–8 mm; callus obtuse, densely puberulent, laterally with hairs 0.6–0.8 mm; awn erect, 10–20 mm. Palea shorter than or subequaling lemma, ciliate along distal 1/2–3/4 of keels, pubescent between keels, apex rounded-obtuse. Anthers yellow, 2–2.5 mm. Caryopsis brown, oblong, ca. 5.5 × 1.5 mm, densely white hispidulous. Fl. and fr. Jul–Aug. $2n = 28^*$.

- Roadsides; ca. 3600 m. Xizang.

70. *Elymus calcicola* (Keng) S. L. Chen, *comb. nov.*

钙生披碱草 *gai sheng pi jian cao*

Basionym: *Roegneria calcicola* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 21. 1963.

Culms slender, ca. 100 cm tall, ca. 5-noded. Leaf blade glaucous green, flat, 10–20 × 0.4–0.5 cm, thick, abaxial surface glabrous, or puberulent along veins, adaxial surface pubescent. Spike ± curved, 12–20 cm. Spikelets 1 per node, 12–17 mm excluding awns, with 3–6 florets. Glumes narrowly lanceolate, usually asymmetric, smooth, or scabrous along veins, margin membranous, apex acuminate; proximal glume 5–8 mm; distal glume 6–10 mm. Lemma glabrous, scabrous, or hirsutulous; first lemma 9–11 mm; awn erect, slender, 15–25 mm, scabrous. Palea equaling or slightly longer than lemma, abaxially puberulent, ciliate throughout length of keels, apex narrowed, obtuse, usually slightly 2-lobed. Fl. and fr. Jun–Jul.

• Steep slopes by rivers, moist and calcareous soils; 1600–2000 m. Guizhou, Sichuan, Yunnan.

Löve (Feddes Repert. 95: 453. 1984) did not previously validly publish the combination *Elymus calcicola*; see the note following the genus description above.

71. *Elymus trichospiculus* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 428. 2002 [*“trichospicula”*].

毛穗披碱草 *mao sui pi jian cao*

Roegneria trichospicula L. B. Cai, Bull. Bot. Res., Harbin 14: 340. 1994.

Culms erect or slightly geniculate at base, 90–110 cm tall, 1.5–2.5 mm in diam., 4- or 5-noded, usually glabrous but puberulent below spike. Leaf sheath usually villous proximally; ligule ca. 0.5 mm; leaf blade 6–16 × 0.2–0.45 cm, both (especially adaxial) surfaces pilose. Spike lax, 8–12 cm; rachis puberulent on back, margin spinescent. Spikelets 1 per node, 12–18 mm, with 3–5 florets; rachilla hispidulous; internodes 1.5–2.5 mm. Glumes lanceolate, subequal, 5–6 mm, 3-veined, hispidulous along veins, apex acuminate or pointed; point less than 2 mm. Lemma oblong-lanceolate, 5-veined, abaxially densely villous, apex with straight awn 6–12 mm; first lemma 9–10 mm. Palea equaling lemma, ciliolate along keels distally, glabrous between keels, apex truncate. Anthers yellow, ca. 2 mm. Fl. and fr. Aug.

• Forest margins; 3500–4400 m. S Qinghai.

72. *Elymus sinicus* (Keng) S. L. Chen, Novon 7: 229. 1997.

中华披碱草 *zhong hua pi jian cao*

Plants laxly tufted or with very short rhizome. Culms erect or geniculate at base, 60–90 cm tall, glabrous throughout. Leaf sheath glabrous; leaf blade involute, 6–22 × (0.1–)0.3–0.7 cm, stiff, abaxial surface glabrous, adaxial surface pilose. Spike erect, 8–13 cm. Spikelets 1 per node, 13–15 mm, with 4 or 5 florets. Glumes oblong-lanceolate, usually oblique, 3–5-veined, apex acute or with awn 1–3 mm; proximal glume 7–8 mm; distal glume 8–10 mm. Lemma oblong-lanceolate, laxly puberulent abaxially; first lemma ca. 9 mm; callus with hairs 0.1–0.4 mm; awn erect or slightly recurved, 10–18 mm. Palea equaling lemma, apex emarginate or truncate, setiform ciliate along keels

distally, puberulent between keels distally. Fl. and fr. Jul–Aug.

• Forest margins, mountain slopes, valleys, roadsides; 800–3800 m. Gansu, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Yunnan.

- 1a. Leaf blade (0.1–)0.3–0.4 cm wide; spike 8–10 cm; glume apex acute, awnless 72a. var. *sinicus*
 1b. Leaf blade ca. 0.7 cm wide; spike 12–13 cm; glume apex with awn 1–3 mm 72b. var. *medius*

72a. *Elymus sinicus* var. *sinicus*

中华披碱草(原变种) *zhong hua pi jian cao (yuan bian zhong)*

Roegneria sinica Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 33. 1963; *R. sinica* var. *angustifolia* C. P. Wang & H. L. Yang.

Leaf blade 6–12 × (0.1–)0.3–0.4 cm. Spike 8–10 cm. Spikelets 13–14 mm, with 4 or 5 florets. Glume apex acute, awnless. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Forest margins, mountain slopes, valleys, roadsides; 2100–3000 m. Gansu, Nei Mongol, Qinghai, Shanxi, Sichuan.

72b. *Elymus sinicus* var. *medius* (Keng) S. L. Chen & G. Zhu, Novon 12: 427. 2002.

中间披碱草 *zhong jian pi jian cao*

Roegneria sinica var. *media* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 35. 1963; *R. media* (Keng) L. B. Cai.

Leaf blade 7–22 × ca. 0.7 cm. Spike 12–13 cm. Spikelets ca. 15 mm, with 5 florets. Glume apex with awn 1–3 mm. Fl. Jul.

• Mountain slopes, roadsides; 800–3800 m. Gansu, Henan, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang.

73. *Elymus puberulus* (Keng) S. L. Chen, *comb. nov.*

微毛披碱草 *wei mao pi jian cao*

Basionym: *Roegneria puberula* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 20. 1963.

Culms laxly tufted, erect or geniculate at base, ca. 60 cm tall. Leaf sheath glabrous but pilose or pubescent at base; leaf blade flat, dark green abaxially, glaucous adaxially, 15–22 × 0.5–0.7 cm, abaxial surface glabrous, adaxial surface pubescent. Spike nodding or curved, 8–11 cm. Spikelets 1 per node, green, ca. 12 mm excluding awns, with 2 or 3 florets; pedicel absent or 0.5–0.7 mm, puberulent. Glumes oblong-lanceolate, 3–5-veined, apex acute or acuminate; proximal glume 4.5–6 mm; distal glume 5.5–7 mm. Lemma lanceolate, scabrous or smooth and glabrous; first lemma 8.5–9 mm; callus with hairs 1–3 mm; awn erect, slender, 17–23 mm. Palea slightly shorter than lemma, along keels subsmooth or ciliolate only near apex, apex emarginate or subrounded. Anthers yellowish brown, ca. 1.4 mm. Ovary apex hirsute. Fl. and fr. summer.

• Mountain slopes. Chongqing (Nanchuan).

Löve (Feddes Repert. 95: 453. 1984) did not previously validly publish the combination *Elymus puberulus*; see the note following the genus description above.

74. *Elymus caianus* S. L. Chen & G. Zhu, *Novon* 12: 425. 2002.

纤瘦披碱草 xian shou pi jian cao

Roegneria gracilis L. B. Cai, *Acta Phytotax. Sin.* 34: 328. 1996, not *Elymus gracilis* Philippi (1864).

Plants with short rhizome. Culms erect, ca. 70 cm tall, 1.2–2 mm in diam., 3- or 4-noded. Leaf sheath usually shorter than internode, glabrous; ligule very short, apex truncate; leaf blade flat or margin involute, 2–6 × 0.2–0.3 cm, abaxial surface often glabrous, adaxial surface scabrous or also sparsely pubescent. Spike slightly nodding, lax, 10–12 cm; rachis slender, margin spinose; internodes 5–12 mm. Spikelets purplish, 12–16 mm excluding awns, with 3 or 4 florets; rachilla puberulent; internodes 2–2.5 mm. Glumes lanceolate, 3-veined, scabrous along veins, apex acuminate; proximal glume 2–3 mm; distal glume 4–5 mm. Lemma narrowly lanceolate, usually spinose above middle and near margin; first lemma 8–10 mm; awn 6–8 mm. Palea slightly shorter than or equaling lemma, spinose along keels, glabrous between keels, apex truncate or obtuse. Anthers yellow, ca. 1 mm. Ovary obovate, apex pubescent. Fl. and fr. autumn. $2n = 28^*$.

• Stream banks; ca. 4000 m. Xizang (Gongbo'gyamda).

75. *Elymus debilis* (L. B. Cai) S. L. Chen & G. Zhu, *Novon* 12: 426. 2002.

柔弱披碱草 rou ruo pi jian cao

Roegneria debilis L. B. Cai, *Acta Phytotax. Sin.* 34: 327. 1996.

Culms slender, 50–60 cm tall, 1–2 mm in diam., 5–7-noded, scabrous; nodes with short, soft hairs. Leaf sheath glabrous; ligule ca. 0.3 mm, apex truncate; leaf blade flat, 7–15 × 0.3–0.5 cm, abaxial surface usually glabrous, adaxial surface scabrous or laxly villous. Spike usually nodding, 6–11 × 0.5–0.7 cm; rachis margin spinose; internodes 4–5 mm. Spikelets green, ca. 9 mm excluding awns, with 2 or 3 florets. Glumes narrowly lanceolate, 2.5–4 mm, subequal or proximal one shorter, 2- or 3-veined, scabrous, or spinose along veins, apex awned; awn 1.5–3 mm. Lemma lanceolate, 5-veined, abaxially scabrous or spinose, apex awned; first lemma 7–8 mm; awn flexuose, slender, 7–10 mm. Palea slightly longer than lemma, spinose along keels, scabrous between keels, apex truncate. Anthers yellow, ca. 1 mm. Caryopsis oblong. Fl. and fr. Jul–Aug.

• Forests; 2300–3400 m. Gansu (Sunan), Qinghai (Tongde).

76. *Elymus hongyuanensis* (L. B. Cai) S. L. Chen & G. Zhu, *Novon* 12: 426. 2002.

红原披碱草 hong yuan pi jian cao

Roegneria hongyuanensis L. B. Cai, *Acta Phytotax. Sin.* 35: 157. 1997.

Culms erect or geniculate below, 50–70 cm tall, 1.3–2.5 mm in diam., usually 2-noded. Leaf sheath glabrous; ligule very short, apex truncate; leaf blade flat or margin involute, 7–10 × 0.15–0.3 cm, abaxial surface subglabrous, adaxial surface laxly

villous. Spike pendulous, lax, 7–10 cm; rachis glabrous but margin scabrous; internodes 5–12 mm. Spikelets 1 per node, green, 10–12 mm excluding awns, with 2 or 3 florets. Glumes lanceolate, ca. 3-veined, glabrous or scabrous along veins, apex acute; proximal glume 3–4 mm; distal glume 4–6 mm. Lemma lanceolate, abaxially sparsely setose; first lemma 8–9 mm; awn straight, 6–11 mm. Palea subequaling lemma, ciliolate along keels, sparsely setose between keels, apex subtruncate to subrounded. Anthers black, ca. 2 mm. Caryopsis oblong, 4–5 mm, apex pubescent. Fl. and fr. summer.

• Meadows; ca. 3400 m. Sichuan (Hongyuan).

77. *Elymus barbicallus* (Ohwi) S. L. Chen, *Bull. Nanjing Bot. Gard.* 1987: 9. 1988.

毛盘草 mao pan cao

Culms laxly tufted, 40–100 cm tall, 4- or 5-noded, glabrous, or puberulent below nodes; nodes glabrous or white pilose. Leaf sheath glabrous or outer margin ciliate; leaf blade 15–30 × 0.3–0.8 cm, both surfaces glabrous or scabrous, or abaxial surface scabrous and adaxial surface pilose. Spike erect or slightly nodding, 18–22 cm. Spikelets 1 per node, green, 15–25 mm excluding awns, with 5–8 florets. Glumes lanceolate or oblong-lanceolate, apex acute or acuminate; proximal glume 7–14 mm, 3–5-veined; distal glume 8–14.5 mm, 5–7-veined. Lemma 8–13 mm, glabrous only abaxially, but scabrous near base, margin, and along veins; callus with hairs 6–10 mm; awn straight, 20–30 mm. Palea slightly shorter than to equaling lemma, ciliolate along keels distally, hispidulous between keels distally, apex emarginate or rounded. Anthers yellowish. Ovary hirsute. Fl. and fr. May–Jul. $2n = 28^*$.

• Forest margins, mountain slopes, valleys, river banks; 1300–1700 m. Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi.

- 1a. Culms puberulent below nodes, nodes white pilose; leaf sheath outer margin ciliate; glumes 10–14.5 mm; lemma 12–13 mm 77c. var. *pubinodis*
- 1b. Culms, nodes, and leaf sheaths glabrous; glumes 7–12 mm; lemma 8–10 mm.
 - 2a. Leaf blade 0.6–0.8 cm wide, both surfaces glabrous or scabrous; palea equaling lemma 77a. var. *barbicallus*
 - 2b. Leaf blade 0.3–0.7 cm wide, abaxial surface scabrous, adaxial surface pilose; palea slightly shorter than lemma 77b. var. *pubifolius*

77a. *Elymus barbicallus* var. *barbicallus*

毛盘草(原变种) mao pan cao (yuan bian zhong)

Agropyron barbicalum Ohwi, *Acta Phytotax. Geobot.* 11: 257. 1942; *Roegneria barbicala* (Ohwi) Keng & S. L. Chen; *R. barbicala* var. *brevisetia* Keng.

Culms 70–100 cm tall, glabrous; nodes glabrous. Leaf sheath glabrous; leaf blade 15–20 × 0.6–0.8 cm, both surfaces glabrous or scabrous. Proximal glume 7–8 mm; distal glume 8–9 mm. Lemma 8–10 mm. Palea equaling lemma. Fl. and fr. Jun–Jul.

• Forest margins, mountain slopes, river banks. Hebei, Nei Mongol.

77b. *Elymus barbicallus* var. *pubifolius* (Keng) S. L. Chen, Novon 7: 227. 1997.

毛叶毛盘草 mao ye mao pan cao

Roegneria barbicalla var. *pubifolia* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 25. 1963.

Culms ca. 50 cm tall, glabrous; nodes glabrous. Leaf sheath glabrous; leaf blade 15–20 × 0.3–0.7 cm, abaxial surface scabrous, adaxial surface pilose. Glumes 7–12 mm. Lemma ca. 10 mm. Palea slightly shorter than lemma. Fl. and fr. May–Jul.

• Mountain slopes; 1300–1700 m. Hebei, Shanxi.

77c. *Elymus barbicallus* var. *pubinodis* (Keng) S. L. Chen, Novon 7: 227. 1997.

毛节毛盘草 mao jie mao pan cao

Roegneria barbicalla var. *pubinodis* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 24. 1963.

Culms 40–50 cm tall, puberulent below nodes; nodes white pilose. Leaf sheath outer margin ciliate; leaf blade 16–30 × 0.4–0.7 cm, both surfaces glabrous or adaxial surface scabrous. Proximal glume 10–14 mm; distal glume 12–14.5 mm. Lemma 12–13 mm. Fl. and fr. May–Jul.

• Mountain slopes, valleys. Hebei, Nei Mongol.

78. *Elymus angustispiculatus* S. L. Chen & G. Zhu, Novon 12: 425. 2002.

狭穗披碱草 xia sui pi jian cao

Roegneria angusta L. B. Cai, Acta Phytotax. Sin. 34: 332. 1996, not *Elymus angustus* Trinius (1829).

Culms erect or slightly geniculate at base, 80–100 cm tall, 2–2.5 mm in diam., ca. 4-noded. Leaf sheath margin ciliate; ligule ca. 0.6 mm, papery, apex truncate; leaf blade flat, 8–15 × 0.4–0.6 cm, both surfaces glabrous or adaxial surface scabrous. Spike erect or slightly curved, 16–20 × ca. 0.6 cm; rachis scabrous on back, margin ciliate. Spikelets 1 per node, narrow, 16–26 mm, with 4–6 florets. Glumes lanceolate, subequal, 8–10 mm, 3-veined, scabrous along veins, apex with mucro 1–2 mm. Lemma narrowly lanceolate, abaxially glabrous; first lemma 10–12 mm; callus glabrous or slightly pilose; awn straight, 20–25 mm, scabrous. Palea subequaling lemma, ciliate along keels distally, glabrous between keels. Anthers yellow, 2–2.7 mm. Fl. and fr. Jul–Aug.

• Mountain slopes; ca. 2500 m. Qinghai (Xunhua).

79. *Elymus hondae* (Kitagawa) S. L. Chen, Bull. Nanjing Bot. Gard. 1987: 9. 1988 [“*hondai*”].

本田披碱草 ben tian pi jian cao

Roegneria hondae Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 6(4): 118. 1942 [“*hondai*”]; *R. hondae* var. *fascinata* Keng.

Culms 70–100 cm tall, glabrous. Leaf sheath glabrous, or

retroscarsely pilose at base of innovation shoot; leaf blade 13–20 × 0.3–0.9 cm, abaxial surface smooth, subglabrous, adaxial surface scabrous, hispid along veins. Spike lax, 15–20 cm. Spikelets 1 per node, purplish green, ca. 16 mm excluding awns, with ca. 5 florets. Glumes lanceolate, scabrous along veins, apex acuminate or pointed; proximal glume 7–10 mm, 3–5-veined; distal glume 8.5–11 mm, 4–6-veined. Lemma scabrous, with a tooth below apex on one or both sides; first lemma ca. 10 mm; callus with hairs ca. 5 mm; awn straight, 15–25 mm. Palea slightly shorter than lemma, ciliate along keels distally, puberulent between keels distally, apex obtuse or emarginate. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Mountain slopes. Hebei, Henan, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi.

80. *Elymus alienus* (Keng) S. L. Chen, Novon 7: 227. 1997 [“*aliena*”].

洮源披碱草 lai yuan pi jian cao

Roegneria aliena Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 31. 1963; *R. barbicalla* (Ohwi) Keng & S. L. Chen var. *foliosa* (Keng) L. B. Cai; *R. foliosa* Keng.

Plants usually with short, underground rhizomes. Culms laxly tufted, (30–)60–90 cm tall, 3- or 4(–6)-noded. Leaf sheath glabrous or retroscarsely pubescent; leaf blade flat, 12–20 × 0.4–0.9 cm, abaxial surface glabrous, adaxial surface pubescent. Spike erect or slightly curved, 7–15 cm. Spikelets 1 per node, green or purplish green, 14–17 mm excluding awns, with 4–6 florets; rachilla puberulent; internodes 1–2.5 mm. Glumes oblong-lanceolate, 3–5(or 6)-veined, smooth or scabrous along veins, apex acute or acuminate; proximal glume 7–8 mm; distal glume 8–10 mm. Lemma lanceolate, smooth and glabrous abaxially, but scabrous or puberulent along veins and near margin; first lemma 9–10 mm; callus with hairs 0.4–0.6 mm; awn straight or slightly reflexed, 10–25 mm. Palea slightly shorter than lemma, ciliate along keels distally, apex obtuse. Anthers ca. 2.5 mm. Fl. and fr. Jun–Aug.

• Moist valleys, roadsides; ca. 1100 m. Hebei, Henan, Nei Mongol, Shanxi.

The names *Roegneria aliena* and *R. foliosa* have equal priority, but in *Elymus* only *E. alienus* is validly published. Chen (Bull. Nanjing Bot. Gard. 1987: 9. 1988) did not validly publish the combination “*E. foliosus*” because the place of valid publication of the basionym was not cited (Saint Louis Code, Art. 33.3). Instead, *R. foliosa* was cited from Keng (Fl. Ill. Pl. Prim. Sin. Gram. 366. 1959), where the name was not validly published because no Latin description was provided (Art. 36.1).

81. *Elymus abolinii* (Drobow) Tzvelev, Rast. Tsentr. Azii 4: 214. 1968.

异芒披碱草 yi mang pi jian cao

Culms erect, 80–115 cm tall. Leaf blade flat, 0.4–0.7 cm wide, glabrous, scabrous, or adaxial surface pilose along veins. Spike erect or nodding, 10–20 cm; rachis with short bristles. Spikelets 1 per node, somewhat remote, green or slightly tinged, 15–30 mm, with 4–11 florets; rachilla appressed pilose. Glumes lustrous green, lanceolate or linear-lanceolate, subequal, 11–16 × 2–3 mm, 5–9-veined, very scabrous,

margin scarious, apex acuminate, often asymmetric and 1-toothed. Lemma lanceolate, 9–13 mm, scabrous-hairy, apex 1-toothed; awn sometimes recurved, 3–35 mm or reduced to a cusp ca. 1 mm. Palea shorter than lemma, apex truncate or subobtusate. Anthers 3–7 mm. Fl. and fr. Jun–Sep. $2n = 28$.

Mountain slopes, river banks; ca. 1300–2700 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

- 1a. Lemma awn 3–8 mm or reduced to a cusp ca. 1 mm.
 - 2a. Spikelets with 5–7 florets; glumes lanceolate, 5–7-veined; palea apex subobtusate 81a. var. *abolinii*
 - 2b. Spikelets with 4 or 5 florets; glumes linear-lanceolate, 6–9-veined; palea apex truncate 81b. var. *nudiusculus*
- 1b. Lemma awn 15–35 mm.
 - 3a. Spikelets 15–25 mm, with 5–7 florets 81c. var. *divaricans*
 - 3b. Spikelets 25–30 mm, with 7–11 florets 81d. var. *pluriflorus*

81a. *Elymus abolinii* var. *abolinii*

异芒披碱草(原变种) yi mang pi jian cao (yuan bian zhong)

Agropyron abolinii Drobow, Repert. Spec. Nov. Regni Veg. 21: 42. 1925 [“*abolini*”]; *Gouldardia abolinii* (Drobow) Ikonnikov; *Roegneria abolinii* (Drobow) Nevski.

Spikelets 15–25 mm, with 5–7 florets. Glumes lanceolate, 5–7-veined. Lemma awn 3–5 mm or reduced to a cusp ca. 1 mm. Palea apex subobtusate.

Mountain slopes; ca. 2700 m. Xinjiang [Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan].

81b. *Elymus abolinii* var. *nudiusculus* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 425. 2002.

裸穗异芒草 luo sui yi mang cao

Roegneria nudiuscula L. B. Cai, Acta Phytotax. Sin. 35: 171. 1997.

Spikelets 15–20 mm, with 4 or 5 florets. Glumes linear-lanceolate, 6–9-veined. Lemma awn 3–8 mm. Palea apex truncate.

• River banks; 1500–2000 m. Xinjiang.

81c. *Elymus abolinii* var. *divaricans* (Nevski) Tzvelev, Rast. Tsent. Azii 4: 214. 1968.

曲芒异芒草 qu mang yi mang cao

Roegneria abolinii var. *divaricans* Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 68. 1934.

Spikelets 15–25 mm, with 5–7 florets. Lemma awn 15–35 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes; 1300–1900 m. Xinjiang [Mongolia, Russia].

81d. *Elymus abolinii* var. *pluriflorus* D. F. Cui, Bull. Bot. Res., Harbin 10(3): 30. 1990.

多花异芒草 duo hua yi mang cao

Roegneria abolinii var. *pluriflora* (D. F. Cui) L. B. Cai.

Spikelets 25–30 mm, with 7–11 florets. Lemma awn 15–22 mm. Fl. and fr. Jun–Sep.

• Grassy mountain slopes. Xinjiang.

82. *Elymus fedtschenkoi* Tzvelev, Novosti Sist. Vyssh. Rast. 10: 21. 1973.

光鞘披碱草 guang qiao pi jian cao

Agropyron curvatum Nevski, Izv. Bot. Sada Akad. Nauk SSSR 30: 629. 1932; *Elymus curvatus* (Nevski) D. F. Cui (1996), not Piper (1903); *Roegneria curvata* (Nevski) Nevski; *R. fedtschenkoi* (Tzvelev) N. R. Cui, nom. superfl.

Culms erect or slightly geniculate at base, robust, 50–100 cm tall. Leaf sheath smooth, glabrous, rarely pilose at base; leaf blade 0.5–1.2 cm wide, glabrous, scabrous, or adaxial surface laxly pilose. Spike erect or slightly curved, often somewhat secund, dense, 7–16 cm. Spikelets 1 per node, subsessile, green or greenish tawny-purple, 15.5–25 mm excluding awns, with 5 or 6 florets. Glumes broadly lanceolate, 11–18 × 2.3–3.5 mm, 5–7-veined, margin membranous, apex acuminate, pointed, sometimes with a tooth. Lemma lanceolate, 10–14 mm, scabrous or appressed setose; awn reflexed, 25–37 mm. Palea lanceolate, 9–13 mm, hispid along keels, apex subobtusate. Anthers 2.5–3 mm. Fl. and fr. Jun–Jul. $2n = 28^*$.

Mountain meadows. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan].

83. *Elymus platyphyllus* (Keng) Á. Löve ex D. F. Cui in N. R. Cui, Fl. Xinjiang. 6: 192. 1996.

宽叶披碱草 kuan ye pi jian cao

Roegneria platyphylla Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 35. 1963.

Culms erect, 60–100 cm tall. Leaf sheath smooth, glabrous; leaf blade flat, 5–18 × 0.5–1.2 cm, rigid, abaxial surface glabrous, but scabrous along veins, adaxial surface pilose. Spike erect, usually secund, dense, 8–13 cm. Spikelets 1 per node, greenish, 18–24 mm excluding awns, with 6 or 7 florets. Glumes lanceolate, 5–7(–9)-veined, scabrous or hispidulous along veins, apex pointed; proximal glume 10–12 mm; distal glume 11–15 mm. Lemma lanceolate, pubescent throughout; first lemma 10–12 mm; awn erect, 7–14 mm. Palea subequaling lemma, puberulent abaxially, setiform ciliate along keels distally, apex emarginate or truncate. Anthers ca. 3 mm. Ovary hirsute. Fl. and fr. late summer.

• Meadows. Xinjiang.

Löve (Feddes Repert. 95: 456. 1984) did not previously validly publish the combination *Elymus platyphyllus*; see the note following the genus description above.

84. *Elymus shandongensis* B. Salomon, Willdenowia 19: 449. 1990.

山东披碱草 shan dong pi jian cao

Roegneria shandongensis (B. Salomon) J. L. Yang et al.

Culms laxly tufted, erect or slightly decumbent at base, 60–90 cm tall. Leaf sheath usually glabrous; ligule ca. 6.5 mm; leaf blade flat or involute at margin, 10–25 × 0.4–0.8 cm, both surfaces scabrous or adaxial surface smooth. Spike erect or slightly curved, 8–20 cm. Spikelets 1 per node, 13–19 mm excluding awns, with 5–8 florets. Glumes oblong-lanceolate, 5–7-veined, apex acute or pointed; veins robust, scabrous; proximal glume 5–7 mm; distal glume 7–9 mm. Lemma oblong-lanceolate, subglabrous abaxially, margin membranous; first lemma 9–10 mm; callus pubescent along lateral side; awn erect, (12–) 20–30 mm, scabrous. Palea subequaling lemma, wingless and shortly setiform ciliate along keels. Fl. and fr. Jul–Aug. $2n = 28^*$.

• Mountain slopes, roadsides. Anhui, Guizhou, Henan, Hubei, Jiangsu, Shaanxi, Shandong, Taiwan, Zhejiang.

This species has long been misclassified by some taxonomists in China as *Elymus × mayebaranus* (Honda) S. L. Chen (*Agropyron × mayebarunum* Honda; *Roegneria × mayebarana* (Honda) Ohwi ex Keng & S. L. Chen). The true *E. × mayebaranus* is found only in Japan; it is a highly sterile natural hybrid between the hexaploid ($2n = 42$) parents *E. humidus* (Ohwi & Sakamoto) Á. Löve (*A. humidum* Ohwi & Sakamoto) and *E. tsukushiensis* Honda.

85. *Elymus magnipodus* (L. B. Cai) S. L. Chen & G. Zhu, Novon 12: 427. 2002.

大柄披碱草 da bing pi jian cao

Roegneria magnipoda L. B. Cai, Acta Phytotax. Sin. 35: 164. 1997.

Culms erect, 20–35 cm tall, 1–2.5 mm in diam., 2-noded, smooth, glabrous. Leaf sheath usually longer than internode except on upper leaves, glabrous; ligule very short, papery; leaf blade involute, 4–7 × 0.15–0.25 cm, both surfaces glabrous or adaxial surface scabrous. Spike erect, lax, 6–9 cm; rachis glabrous; internodes 10–20(–28) mm. Spikelets 1 per node, yellowish green, 15–25 mm excluding awns, with 6–8 florets; pedicel 1–2.5 mm. Glumes subequal, 4.5–7 mm, 4–7-veined, abaxially glabrous, apex acute. Lemma lanceolate, abaxially smooth, glabrous; first lemma 9–10 mm; awn erect or slightly recurved, 9–15 mm. Palea slightly shorter than or equaling lemma, ciliate along keels, apex truncate or subrounded. Anthers black, 2–3 mm. Ovary obovate, apex pubescent. Fl. and fr. Jun–Jul.

• River banks; ca. 3100 m. Qinghai (Golmud).

86. *Elymus pendulinus* (Nevski) Tzvelev, Rast. Tsent. Azii 4: 218. 1968.

缘毛披碱草 yuan mao pi jian cao

Culms 60–110 cm tall, glabrous throughout, or puberulent or pubescent at nodes, sometimes also densely retrorsely pubescent in upper part (exserted from leaf sheath). Leaf sheath glabrous, or retrorsely pubescent at least at base; leaf blade flat, 10–25 × 0.3–0.9 cm, glabrous, scabrous, or adaxial surface pilose. Spike slightly nodding, 12–25 cm. Spikelets 1 per node, green or purplish at base, 15–25 mm excluding awns, with 4–9 florets. Glumes lanceolate or oblong-lanceolate, 3–7-veined, sometimes scabrous along veins, margin sometimes laxly cilio-

late, apex acute or pointed; proximal glume 7–9 mm; distal glume 7–10 mm. Lemma lanceolate or oblong-lanceolate, scabrous abaxially, pilose distally, laxly hirsutulous near apex, or hirsutulous throughout, margin ciliate distally; first lemma 8–11 mm; awn erect or slightly reflexed, slender, 15–30 mm. Palea slightly shorter than or subequaling lemma, ciliate along keels distally, pubescent between keels. Anthers ca. 2 mm. Fl. and fr. May–Jul. $2n = 28^*$.

Forests, mountain slopes, valleys, meadows, along rivers; 100–2400 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan [Japan, Korea, Mongolia, Russia].

- 1a. Culms glabrous throughout (rarely pubescent at nodes) 86a. subsp. *pendulinus*
- 1b. Culms puberulent or densely pubescent, at least at nodes.
 - 2a. Culms puberulent at nodes; leaf sheath glabrous; spikelets with 6–9 florets 86b. subsp. *multiculmis*
 - 2b. Culms densely retrorsely pubescent in upper part (exserted from leaf sheath) and at nodes; leaf sheath retrorsely pubescent, especially proximally; spikelets with 4 or 5 florets 86c. subsp. *pubicaulis*

86a. *Elymus pendulinus* subsp. *pendulinus*

缘毛披碱草(原亚种) yuan mao pi jian cao (yuan ya zhong)

Roegneria pendulina Nevski in Komarov, Fl. URSS 2: 616. 1934; *Agropyron caninum* (Linnaeus) P. Beauvois var. *amurense* (Korshinsky) Korshinsky; *Triticum caninum* Linnæus f. *amurense* Korshinsky.

Culms glabrous throughout, rarely pubescent at nodes. Leaf sheath usually retrorsely pubescent at base. Spikelets with 4–8 florets. Fl. and fr. May–Jul. $2n = 28^*$.

Forests, mountain slopes, valleys, along rivers. Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan [Japan, Korea, Mongolia, Russia].

86b. *Elymus pendulinus* subsp. *multiculmis* (Kitagawa) Á. Löve, Feddes Repert. 95: 459. 1984.

多秆缘毛草 duo gan yuan mao cao

Roegneria multiculmis Kitagawa, J. Jap. Bot. 17: 235. 1941; *R. multiculmis* var. *pubiflora* Keng.

Culms puberulent at nodes. Leaf sheath glabrous. Spikelets with 6–9 florets. Fl. and fr. Jun–Jul. $2n = 28^*$.

• Mountain slopes; 1100–1200 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi.

86c. *Elymus pendulinus* subsp. *pubicaulis* (Keng) S. L. Chen, comb. et stat. nov.

毛秆披碱草 mao gan pi jian cao

Basionym: *Roegneria pubicaulis* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 30. 1963; *R. pendulina* f. *pubinodis* (Keng) Kitagawa; *R. pendulina* var. *pubinodis* Keng.

Culms densely retrorsely pubescent in upper part (exserted from leaf sheath) and at nodes. Leaf sheath retrorsely pubescent, especially proximally. Spikelets with 4 or 5 florets. Fl. and fr. Jun–Jul. $2n = 28^*$.

• Meadows, damp places; 100–2400 m. Gansu, Liaoning, Nei Mongol, Shaanxi, Yunnan.

Löve (Feddes Repert. 95: 459. 1984) did not previously validly publish the combination *Elymus pendulinus* subsp. *pubicaulis*; see the note following the genus description above.

87. *Elymus komarovii* (Nevski) Tzvelev, Rast. Tsent. Azii 4: 216. 1968.

偏穗披碱草 pian sui pi jian cao

Agropyron komarovii Nevski, Izv. Bot. Sada Akad. Nauk SSSR 30: 620. 1932 [“*komarovi*”]; *Elymus uralensis* (Nevski) Tzvelev subsp. *komarovii* (Nevski) Tzvelev; *Roegneria komarovii* (Nevski) Nevski.

Culms erect or geniculate at base, 50–75 cm tall. Leaf sheath smooth and glabrous, or pubescent at base; leaf blade flat, 8–21 × 0.4–0.8 cm, abaxial surface glabrous but scabrous, adaxial surface scabrous or pubescent. Spike erect, usually secund, dense, 8.5–15 cm; rachis margin scabrous. Spikelets 1 per node, green or purplish green, 13–25 mm excluding awns, with 3–5 florets. Glumes lanceolate, subequal, 8–10 mm, 5–7-veined, margin scarious, apex asymmetric, awned; awn 2–7 mm, scabrous. Lemma lanceolate, 10–12 mm, puberulent; awn erect, 8–15 mm, scabrous. Palea subequaling lemma,

ciliate along keels, apex emarginate or obtuse. Anthers ca. 2 mm. Fl. and fr. summer. $2n = 28^*$.

Steppes, near villages; 1800–2900 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

88. *Elymus tianschanigenus* Czerepanov, Sosud. Rast. SSSR, 351. 1981.

天山披碱草 tian shan pi jian cao

Agropyron tianschanicum Drobow in Vvedensky et al., Key Fl. Tashkent 1: 40. 1923; *Elymus tianschanicus* (Drobow) Nevski (1934), not Drobow (1923); *E. uralensis* (Nevski) Tzvelev subsp. *tianschanicus* (Drobow) Tzvelev; *Roegneria tianschanica* (Drobow) Nevski; *Semeiostachys tianschanica* (Drobow) Drobow.

Culms erect, 50–100 cm tall, smooth, glabrous. Leaf sheath smooth, glabrous; leaf blade flat, 10–18 × 0.5–1 cm, both surfaces scabrous and pilose or abaxial surface scattered pilose. Spike erect or slightly nodding, subsecund, dense, 7–17.5 cm. Spikelets 1 per node, purplish green, 2–3 mm excluding awns, with 3–5(–7) florets. Glumes broadly lanceolate, slightly asymmetric, subequal, 9–12 mm, 5–7-veined, scabrous, apex acute or mucronate, sometimes with a tooth. Lemma lanceolate, 9–12 mm, pilose; awn straight, (4–)7–16 mm. Palea equaling or slightly longer than lemma, ciliate along keels, apex slightly emarginate or subobtusate. Anthers ca. 2.5 mm. Fl. and fr. summer. $2n = 28$.

Slopes in river valleys, meadows; 2700–3000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan].

103. PSEUDOROEGNERIA (Nevski) Á. Löve, Taxon 29: 168. 1980.

假鹅观草属 jia e guan cao shu

Elytrigia sect. *Pseudoroegneria* Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 60. 1934.

Plants perennial, densely tufted. Culms usually erect. Leaf blade flat or involute. Spike rather lax; rachis tough, glabrous or margin scaberulous. Spikelets 1 per node, with 3–6 florets; rachilla glabrous. Glumes lanceolate, 5–7-veined, glabrous or only midvein sometimes with a few spinules toward apex, apex truncate or obtuse to pointed. Lemma linear-lanceolate, usually 5-veined, glabrous but scabrous, awned or awnless; callus usually obscure; awn divergent at nearly 90° at maturity. Palea usually equaling lemma. $x = 7$.

About 15 species: N hemisphere; one species in China.

1. *Pseudoroegneria cognata* (Hackel) Á. Löve, Feddes Repert. 95: 446. 1984.

假鹅观草 jia e guan cao

Agropyron cognatum Hackel, Allg. Bot. Z. Syst. 11: 22. 1905; *A. dschungaricum* (Nevski) Nevski; *A. ferganense* Drobow; *Elymus cognatus* (Hackel) T. A. Cope; *Elytrigia cognata* (Hackel) O. Anders & D. Podlech; *E. dschungarica* Nevski; *E. ferganensis* (Drobow) Nevski; *E. geniculata* (Trinius) Nevski subsp. *ferganensis* (Drobow) Tzvelev.

Culms erect, 60–100 cm tall, smooth, glabrous. Leaf

sheath smooth, glabrous; leaf blade glaucous green, 12–18 × (0.1–)0.2–0.7 cm, abaxial surface smooth, glabrous, adaxial surface pubescent. Spike erect, 7–19 cm; rachis smooth. Spikelets usually glaucous green, 10–18 × 3–6 mm, with (3 or)4–6 florets. Glumes 5-veined, apex acute to acuminate; proximal glume 5–10 mm; distal glume 6–12 mm. Lemma 8–11 mm, 5-veined, apex obtuse or subacute; intermediate veins connivent with midvein slightly lower than marginal veins. Palea equaling lemma, shortly ciliate along keels distally, apex subobtusate. Anthers ca. 3.5 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Stony slopes. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan].

104. ELYTRIGIA Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 190. 1810.

偃麦草属 yan mai cao shu

Braconotia Godron, nom. illeg. superfl.

Plants perennial, with or without rhizomes. Leaf sheath of cauline leaves split almost to base. Spike erect or nodding, linear; rachis usually not disarticulating. Spikelets 1 per node, sessile, clearly laterally compressed, with 3–10 florets; rachilla disarticulating below glumes. Glumes oblong, ovate, or lanceolate, unequal, usually asymmetric, distinctly (3–)5–7-veined, with transverse scar at base. Lemma lanceolate, 5–7-veined, rounded abaxially or keeled only at apex; callus usually glabrous. Palea slightly shorter than lemma, ciliate along keels. Caryopsis usually adherent to lemma and palea, oblong, with longitudinal groove adaxially. $x = 7$.

About 40 species: subtropical and warm-temperate regions; two species in China.

In addition, the following five species have been recorded as cultivated in China (FRPS 9(3): 105–109. 1987): the mainly European *Elytrigia elongata* (Host) Nevski, *E. intermedia* (Host) Nevski, *E. juncea* (Linnaeus) Nevski, and *E. trichophora* (Link) Nevski, and the North American *E. smithii* (Rydberg) Nevski.

These species are very valuable hay and pasture plants.

- 1a. Plants with long rhizomes; culms not tufted; leaf blade 0.5–1 cm wide; spike 10–18 cm; lemma apex acuminate or with awn to 8 mm 1. *E. repens*
 1b. Plants with short rhizomes; culms usually densely tufted; leaf blade to 0.3 cm wide; spike 7–11 cm; lemma apex with awn 15–23 mm 2. *E. gmelinii*

1. *Elytrigia repens* (Linnaeus) Desvaux ex B. D. Jackson, Index Kew. 1: 836. 1893.

偃麦草 *yan mai cao*

Plants with long rhizomes. Culms not tufted, green, glaucous, or purplish green, 40–80 cm tall, 3–5-noded, smooth. Leaf sheath smooth, glabrous but pilose at base; ligule ca. 0.5 mm; leaf blade flat, 10–20 × 0.5–1 cm, abaxial surface smooth, adaxial surface scabrous or pilose. Spike erect, 10–18 × 0.8–1.5 cm; rachis smooth but margin hispidulous; internodes 10–15 (–30) mm. Spikelets 10–18 × 6–10 mm, with 5–7 (–10) florets, glabrous. Glumes subequal, 4–15 mm, 5–7-veined, smooth, glabrous, margin membranous, apex with point 1–2 mm or awn 4–8 mm. Lemma oblong-lanceolate, 6–12 mm, apex acuminate or with awn to 2 mm or 4–8 mm. Palea slightly shorter than lemma, ciliate along keels. Anthers yellow, ca. 5 mm. Fl. and fr. Jun–Sep.

Valleys, grasslands, pastures, meadows, field margins, waste places; 500–1900 m. Gansu, Hebei, Heilongjiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan [India, Japan, Korea, Mongolia, Russia; C and SW Asia, Europe; introduced in North America].

This species is one of the world's most valuable range grasses.

- 1a. Glumes 4–8 mm; lemma 6–10 mm 1c. subsp. *elongatiformis*
 1b. Glumes 10–15 mm; lemma ca. 12 mm.
 2a. Glume and lemma apex both with awn 4–8 mm 1b. subsp. *longearistata*
 2b. Glume apex usually with point 1–2 mm; lemma apex acuminate or with awn to 2 mm 1a. subsp. *repens*

1a. *Elytrigia repens* subsp. *repens*

偃麦草(原亚种) *yan mai cao* (*yuan ya zhong*)

Triticum repens Linnaeus, Sp. Pl. 1: 86. 1753; *Agropyron junceum* (Linnaeus) P. Beauvois var. *repens* (Linnaeus) M. Marsson; *A. repens* (Linnaeus) P. Beauvois; *Braconotia officinarum* Godron, nom. illeg. superfl.; *Elymus repens* (Linnaeus) Gould; *T. infestum* Salisbury, nom. illeg. superfl.; *Zeia repens* (Linnaeus) Lunell.

Glumes 10–15 mm, apex usually with point 1–2 mm. Lemma ca. 12 mm, apex acuminate or with awn to 2 mm. Fl. and fr. Jul–Aug. $2n = 42^*$.

Pastures, meadows, waste places. Gansu, Hebei, Heilongjiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan [India, Japan, Korea, Mongolia, Russia; C and SW Asia, Europe; introduced in North America].

1b. *Elytrigia repens* subsp. *longearistata* N. R. Cui, Fl. Xinjiang. 6: 602. 1996.

芒偃麦草 *mang yan mai cao*

Glumes 10–15 mm, apex with awn 4–8 mm. Lemma ca. 12 mm, apex with awn 4–8 mm. Fl. and fr. Jun–Aug.

• Valleys, field margins; 500–1900 m. Xinjiang.

1c. *Elytrigia repens* subsp. *elongatiformis* (Drobow) Tzvelev, Novosti Sist. Vyssh. Rast. 10: 31. 1973.

多花偃麦草 *duo hua yan mai cao*

Agropyron elongatiforme Drobow in Vvedensky et al., Key Fl. Tashkent 1: 40. 1923; *A. repens* subsp. *elongatiforme* (Drobow) D. R. Dewey; *Elymus elongatiformis* (Drobow) As-sadi; *E. repens* subsp. *elongatiformis* (Drobow) Melderis; *Elytrigia elongatiformis* (Drobow) Nevski.

Glumes 4–8 mm. Lemma 6–10 mm. Fl. and fr. Jun–Sep.

Valleys, grasslands. Xinjiang [Mongolia, Russia].

2. *Elytrigia gmelinii* (Trinius) Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 78. 1936.

曲芒偃麦草 *qu mang yan mai cao*

Triticum gmelinii Trinius, Linnaea 12: 467. 1838 [*"gmelinii"*]; *Agropyron aegilopoides* Drobow; *A. gmelinii* (Trinius) P. Candargy (1901), not (Ledebour) Scribner & J. G. Smith (1897); *A. strigosum* (M. Bieberstein) Boissier subsp. *aegilopoides* (Drobow) Tzvelev; *A. propinquum* Nevski; *Elymus aegilopoides* (Drobow) Voroschilov; *Elytrigia aegilopoides* (Drobow) Peshkova; *E. propinqua* (Nevski) Nevski; *E. strigosa* (M. Bieberstein) Nevski subsp. *aegilopoides* (Drobow) Tzvelev; *Pseudoroegneria strigosa* (M. Bieberstein) Á. Löve subsp. *aegilopoides* (Drobow) Á. Löve.

Plants with short rhizomes. Culms usually densely tufted, geniculate at base, 35–65 cm tall, smooth, glabrous. Leaf sheath smooth, glabrous; ligule short; leaf blade glaucous, flat or margin involute, to 0.3 cm wide, abaxial surface smooth, glabrous, adaxial surface puberulent. Spike erect, secund, 7–11 cm; rachis margin scabrous. Spikelets glaucous or purplish, 13–18 mm excluding awns, with 5–7 florets. Glumes narrowly lanceolate, 5-

or 6-veined, glabrous, apex acuminate or with awn to 4 mm; proximal glume 6–9 mm; distal glume 7–10 mm. Lemma narrowly lanceolate, 10–11 mm, hispid; awn curved, 15–23 mm. Fl. and fr. Jun–Aug. $2n = 14$.

Forest grasslands; ca. 2000 m. Xinjiang [Mongolia, Russia (Siberia)].

105. KENGYILIA C. Yen & J. L. Yang, Canad. J. Bot. 68: 1897. 1990.

以礼草属 *yi li cao shu*

Plants perennial, with creeping, underground rhizomes. Culms densely tufted, rarely laxly so. Leaf blade flat, rolled. Spike dense, rarely lax, usually with terminal spikelet. Spikelets 1(or 2) per node, sessile, with (5–)7 or 8 florets; rachilla disarticulating above glumes. Glumes rounded abaxially or keeled only at apex, rarely keeled throughout length. Lemma rounded abaxially, rarely keeled, usually 5-veined, densely pilose or hirsute, awnless or shortly awned. Palea apex retuse, obtuse, or 2-lobed. Caryopsis oblong, apex usually hairy. $x = 7$.

About 30 species; mountains of C Asia and the Xizang-Qinghai Plateau; 24 species (21 endemic) in China.

- 1a. Plants laxly tufted.
 - 2a. Spikelets usually 2 per node in proximal part of spike, 1 per node in distal part 1. *K. geminata*
 - 2b. Spikelets 1 per node throughout spike.
 - 3a. Glumes slightly asymmetric, midvein raised, forming keel from base to apex, often ciliate 6. *K. habahenensis*
 - 3b. Glumes ovate, ovate-lanceolate, or oblong-lanceolate, midvein slightly raised, not forming keel.
 - 4a. Glumes equaling first lemma or distal glume slightly longer 2. *K. grandiglumis*
 - 4b. Glumes shorter than first lemma.
 - 5a. Glumes oblong-lanceolate; lemma densely pubescent 5. *K. melanthera*
 - 5b. Glumes ovate or ovate-lanceolate; lemma laxly puberulent or densely hirsute.
 - 6a. Palea equaling or slightly longer than lemma; lemma laxly puberulent 3. *K. rigidula*
 - 6b. Palea shorter than lemma; lemma densely hirsute 4. *K. eremopyroides*
 - 1b. Plants ± densely tufted.
 - 7a. Spike lax, rachis internodes (4–)5–10(–15) mm.
 - 8a. Spike rachis densely pubescent.
 - 9a. Glumes oblong, subequal, 6.7–7.5 mm, hirsute along veins 7. *K. gobicola*
 - 9b. Glumes lanceolate, unequal, proximal one 4.5–6 mm, distal one 5.5–7 mm, both scabrous along veins 8. *K. pendula*
 - 8b. Spike rachis glabrous, scabrous, or sparsely puberulent.
 - 10a. Rachis puberulent throughout, pilosulose only distally, or puberulent.
 - 11a. Rachis puberulent throughout; glumes white pilose; lemma awn 10–15 mm 11. *K. tahelacana*
 - 11b. Rachis pilosulose only distally or puberulent; glumes glabrous; lemma awn 1–3 mm.
 - 12a. Spikelets 16–22 mm, with 6–9 florets 9. *K. laxiflora*
 - 12b. Spikelets 10–12 mm, with 3–5 florets 10. *K. laxistachya*
 - 10b. Rachis glabrous or margin ciliate.
 - 13a. Glumes oblong-lanceolate, 1–3(–5)-veined, anthers yellow or nearly black.
 - 14a. Lemma laxly or distally densely hirsute; anthers nearly black 14. *K. stenachyra*
 - 14b. Lemma densely pubescent; anthers yellow 15. *K. shawanensis*
 - 13b. Glumes oblong or ovate-lanceolate, 4–6-veined, anthers yellow.
 - 15a. Lemma densely villous; anthers 3.5–4 mm 12. *K. zhaosuensis*
 - 15b. Lemma scabrous or sparsely spinose; anthers 1.4–1.8 mm 13. *K. hejingensis*
 - 7b. Spike dense, rachis internodes 1–5(–7) mm.
 - 16a. Glumes glabrous, puberulent, or only scabrous or ciliate along midvein.
 - 17a. Lemma awnless; palea usually slightly longer than lemma 16. *K. mutica*
 - 17b. Lemma awn 2–11 mm; palea usually shorter than lemma.
 - 18a. Lemma awn usually recurved, 7–11 mm 19. *K. kaschgarica*
 - 18b. Lemma awn usually straight or slightly reflexed, 2–6 mm.
 - 19a. Glumes ovate-oblong, 3- or 4-veined 17. *K. hirsuta*
 - 19b. Glumes lanceolate, 5-veined 18. *K. alata*
 - 16b. Glumes densely hirsute, villous, or hirsutulous, rarely scabrous and then lemma awn 5–7 mm.
 - 20a. Spike rachis glabrous, if puberulent or villous then culms less than 50 cm tall.
 - 21a. Anthers black; lemma awn 1–7 mm; glumes oblong-lanceolate 20. *K. thoroldiana*

- 21b. Anthers yellow or purple; lemma awn 10–13 mm; glumes oblong-ovate or ovate-lanceolate 21. *K. batalinii*
 20b. Spike rachis densely hairy.
 22a. Culms 60–70 cm tall; spike slightly secund 24. *K. pamirica*
 22b. Culms 12–50 cm tall; spike clearly distichous.
 23a. Lemma densely white hairy (hairs ca. 1 mm), awn 1.5–4 mm; anthers yellow, ca. 3 mm 22. *K. guidenensis*
 23b. Lemma densely hirsute, awn 4–6 mm; anthers yellowish black, 2–2.2 mm 23. *K. kokonorica*

1. *Kengyilia geminata* (Keng & S. L. Chen) S. L. Chen, Bull. Bot. Res., Harbin 14: 141. 1994.

孪生以礼草 luan sheng yi li cao

Roegneria geminata Keng & S. L. Chen, Acta Univ. Nankin. Sci. Nat. 1963(1): 80. 1963; *Elymus geminatus* (Keng & S. L. Chen) S. L. Chen.

Plants usually with short rhizomes. Culms laxly tufted, 75–100 cm tall, glabrous or puberulent below spike. Leaf sheath glabrous; leaf blade flat, 7.5–27 × 0.3–0.5 cm, abaxial surface glabrous, adaxial surface puberulent or scabrous, margin ciliate. Spike usually curved, 8–15 cm. Spikelets usually 2 per node in proximal part of spike or with short branch at basal node, 1 per node in distal part of spike, greenish or tinged purplish, 16–20 mm, with 5–7 florets. Glumes lanceolate, laxly villos, apex acuminate or pointed; proximal glume 5–8 mm; distal glume 6–8 mm. Lemma oblong-lanceolate, densely villos; first lemma 9.5–10.5 mm; awn purple, 5–11 mm. Palea equaling lemma, abaxially laxly puberulent, margin ciliate (hairs hyaline, 0.6–1.2 mm), apex narrowly truncate. Fl. and fr. late summer.

• River banks; ca. 3000 m. Qinghai.

2. *Kengyilia grandiglumis* (Keng) J. L. Yang et al., Hereditas (Lund) 116: 28. 1992.

大颖以礼草 da ying yi li cao

Roegneria grandiglumis Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 82. 1963.

Culms laxly tufted, geniculate at base, 40–70 cm tall, smooth, glabrous. Leaf sheath smooth, glabrous; leaf blade glaucescent green, involute or plicate, 6.5–17(–25) × 0.1–0.4 cm, abaxial surface smooth, glabrous, adaxial surface scabrous, apex acuminate. Spike 7–8 cm; rachis glabrous. Spikelets 10–13 mm, with 3–5 florets. Glumes pale green, tinged purplish, oblong-lanceolate, oblique distally, equal, 8–10 mm, or proximal glume slightly shorter, usually 3-veined, or 4- or 5-veined in distal glume, glabrous or pilose, margin submembranous, apex acuminate or shortly pointed. Lemma glabrous in proximal and middle parts, smooth but densely hispid in distal and lateral parts; first lemma ca. 9 mm, apex with point 1–3 mm. Palea slightly shorter than lemma, puberulent proximally, ciliate along keels distally, apex emarginate. Anthers black or dark green. Fl. and fr. late summer. $2n = 42^*$.

• Sandy river banks. Qinghai.

This species is used for forage.

3. *Kengyilia rigidula* (Keng) J. L. Yang et al., Hereditas (Lund) 116: 27. 1992.

硬秆以礼草 ying gan yi li cao

Roegneria rigidula Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 77. 1963; *Kengyilia rigidula* var. *intermedia* (Keng) S. L. Chen; *K. rigidula* var. *trichocolea* L. B. Cai; *R. rigidula* var. *intermedia* Keng.

Culms laxly tufted, erect or geniculate at base, (40–)50–75 cm tall, rigid, 3- or 4-noded, glabrous. Leaf sheath glabrous or retrorsely puberulent; leaf blade involute, 3–10(–25) × (0.1–)0.2–0.4 cm, both surfaces puberulent, margin ciliate. Spike curved, 7.5–8 cm. Spikelets 10–15 mm, with 4–6 florets. Glumes ovate-lanceolate, 3- or 4-veined, glabrous but scabrous along midvein distally, apex acute; proximal glume 2–4 mm, sometimes 1- or 2-veined; distal glume 3–5 mm. Lemma oblong-lanceolate, 5-veined, laxly puberulent; first lemma 7–8 mm; awn 1–3 mm. Palea equaling or slightly longer than lemma, pubescent abaxially, ciliate along keels distally. Anthers yellow or nearly black. Fl. and fr. late summer. $2n = 42^*$.

• Dry mountain slopes; ca. 3300 m. Gansu, Qinghai, Xizang.

4. *Kengyilia eremopyroides* Nevski ex C. Yen et al., Novon 8: 96. 1998.

卵颖以礼草 luan ying yi li cao

Plants with short rhizomes. Culms densely tufted, erect, 31–37 cm tall, 1.5–2 mm in diam., 2-noded, glabrous but upper internodes pubescent. Leaf sheath glabrous; ligule ca. 0.5 mm, scarious-membranous, apex truncate; leaf blade flat, (1.5–)2–5.5 × 0.25–0.3 cm, abaxial surface densely pilose, adaxial surface pilose. Spikes erect, slightly secund, (3.5–)4–4.5 × 0.8–1 cm; rachis densely pilose; proximal internodes 5–7 mm, distal ones 1.5–2 mm. Spikelets stramineous or purple, ovate, 10–11 mm, with 4–6 florets; rachilla densely puberulent; internodes 0.8–1.2 mm. Glumes ovate, 3–5-veined, glabrous, apex acute or mucronate; proximal glume 4–4.5 mm; distal glume 4.5–5 mm. Lemma ovate-oblong, 7–8 mm, densely hirsute; awn 3–4 mm, scabrous. Palea shorter than lemma, sparsely ciliolate along keels distally, apex emarginate. Anthers black, ca. 2 mm. Fl. Jul.

• Clayey-sandy ground; ca. 4000 m. Qinghai (Ngoring Hu).

This species is known only from the type, *N. M. Przewalski* 339 (LE), collected in July 1884 at “Lacus Orin-Nor” (Ngoring Hu, located W of Madoi in Qinghai).

5. *Kengyilia melanthera* (Keng) J. L. Yang et al., Hereditas (Lund) 116: 28. 1992.

黑药以礼草 hei yao yi li cao

Plants with underground rhizome. Culms laxly tufted, erect, lucid, 15–60 cm tall, 2- or 3-noded. Leaf blade 2.5–8

(–12) × 0.2–0.4 cm. Spike erect or curved, 4–7 × 1–1.5 cm. Spikelets crowded, 10–14 mm, with 3–5 florets. Glumes oblong-lanceolate, 3–5-veined, glabrous, puberulent, or densely pubescent; proximal glume 4–6 mm; distal glume 5–7 mm. Lemma densely pubescent, apex awnless, pointed, or with awn 2–4 mm; first lemma ca. 8 mm. Palea slightly shorter than or equaling lemma, puberulent abaxially, ciliate along keels, apex retuse or truncate. Anthers black. Fl. and fr. late summer. $2n = 42^*$.

• Mountain slopes, sandy grassy slopes, lake and river banks. Qinghai.

- 1a. Culms 15–25 cm tall; glumes glabrous or puberulent; lemma apex with awn 2–4 mm 5a. var. *melanthera*
 1b. Culms 40–60 cm tall; glumes densely pubescent; lemma apex awnless or pointed 5b. var. *tahopaica*

5a. *Kengyilia melanthera* var. *melanthera*

黑药以礼草(原变种) *hei yao yi li cao* (yuan bian zhong)

Agropyron melantherum Keng, Sunyatsenia 6: 62. 1941;
Elymus melantherus (Keng) Á. Löve; *Kengyilia thoroldiana* (Oliver) J. L. Yang et al. var. *melanthera* (Keng) L. B. Cai;
Roegneria melanthera (Keng) Keng.

Culms 15–25 cm tall. Glumes glabrous or puberulent. Lemma apex with awn 2–4 mm. Fl. and fr. late summer.

• Mountain slopes, sandy grassy slopes, lake banks. Qinghai.

5b. *Kengyilia melanthera* var. *tahopaica* (Keng) S. L. Chen, Bull. Bot. Res., Harbin 14: 141. 1994.

大黑药以礼草 *da hei yao yi li cao*

Roegneria melanthera var. *tahopaica* Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 78. 1963; *Kengyilia hirsuta* (Keng) J. L. Yang et al. var. *tahopaica* (Keng) L. B. Cai.

Culms 40–60 cm tall. Glumes densely pubescent. Lemma apex awnless or pointed. Fl. and fr. late summer.

• River banks. Qinghai.

6. *Kengyilia habahenensis* B. R. Baum et al., Pl. Syst. Evol. 174: 103, 106. 1991.

哈巴河以礼草 *ha ba he yi li cao*

Plants with short rhizomes. Culms laxly tufted, 80–120 cm tall. Leaf sheath long pilose proximally, glabrous or sparsely pilose distally; ligule fringed; leaf blade linear, flat or margin involute, margin ciliate. Spike dense with pectinate appearance, (3–)4–7(–8) × 0.5–1 cm; rachis sparsely hirsutulous. Spikelets linear-oblong, ca. 15 × 2 mm, with 3–11 florets. Glumes slightly asymmetric, 3–5(–7) mm, connately 3–5-veined, apex acute or mucronate to pointed; midvein raised, forming keel from base to apex, often ciliate; proximal glume slightly shorter than distal one. Lemma connately veined, softly hairy, apex pointed or with awn ca. 3 mm; first lemma ca. 7 mm. Palea equaling lemma. Lodicules ciliate at margin. Anthers ca. 2 mm. Fl. and fr. late summer. $2n = 42^*$.

• Slopes in sparse *Larix* forests, scrub, dense vegetation; ca. 1100 m. Xinjiang.

7. *Kengyilia gobicola* C. Yen & J. L. Yang, Canad. J. Bot. 68: 1897. 1990.

戈壁以礼草 *ge bi yi li cao*

Culms densely tufted, ca. 60 cm tall, 1.5–2 mm in diam., 2- or 3-noded, glabrous but pubescent below spike. Leaf sheath lacerate-fibrous at base, glabrous; ligule ca. 0.5 mm, scarious-membranous; leaf blade flat or rolled, (6–)7–8 × ca. 0.3 cm, abaxial surface glabrous, adaxial surface villous. Spike erect, 8–12 × 0.4–0.6 cm; rachis densely pubescent; internodes 5–10 mm. Spikelets ovate, 15–20 mm, with (5–)7 or 8 florets; rachis pubescent; internodes 1–1.8 mm. Glumes oblong, sometimes oblique, subequal, 6.7–7.5 mm, herbaceous, 3–5-veined, glabrous but hirsute along veins, apex pointed or with a tooth on one side. Lemma 7–9 mm, villous; awn 1–4 mm. Palea slightly shorter than or equaling lemma, pubescent, ciliolate along keels, apex truncate. Anthers yellow or purple, 2–3 mm. Caryopsis dark brown, ca. 7 mm. Fl. and fr. late summer. $2n = 42^*$.

• Stony mountain deserts, roadsides; 2700–3700 m. Xinjiang.

8. *Kengyilia pendula* L. B. Cai, Acta Phytotax. Sin. 37: 460. 1999.

弯垂以礼草 *wan chui yi li cao*

Culms erect, 20–85 cm tall, 1.8–2.5 mm in diam., 3- or 4-noded, puberulent below spike. Leaf sheath usually shorter than internode, glabrous, or hispidulous at base; ligule ca. 0.5 mm, apex truncate; leaf blade flat or margin involute, 5–10 × 0.3–0.5 cm, abaxial surface glabrous, adaxial surface villous. Spike nodding, purple, 9–13 × 0.9–1.5 cm; rachis densely pubescent; internodes 4–6 mm, or to 24 mm at base of spike. Spikelets 14–18 mm excluding awns, with 5–8 florets; rachilla puberulent. Glumes lanceolate, 3–5-veined, scabrous along veins, apex usually mucronate; proximal glume 4.5–6 mm; distal glume 5.5–7 mm. Lemma lanceolate, distinctly 5-veined distally, abaxially pilose, margin densely villous; first lemma 8–9 mm; awn 5–6 mm. Palea slightly longer than lemma, spinose along keels, glabrous between keels, apex truncate. Anthers blackened, ca. 2.5 mm. Caryopsis apex puberulent. Fl. and fr. Aug.

• Sunny hillsides; ca. 3600 m. Qinghai (Baima).

9. *Kengyilia laxiflora* (Keng) J. L. Yang et al., Hereditas (Lund) 116: 27. 1992.

疏花以礼草 *shu hua yi li cao*

Roegneria laxiflora Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 75. 1963.

Culms densely tufted, erect or geniculate at base, 50–70 cm tall. Leaf blade usually involute, ca. 10 × 0.3 cm. Spike curved, slender, rather lax, 10–15(–20) cm; rachis pilosulose only distally. Spikelets 16–22 mm, with 6–9 florets. Glumes soft, herbaceous, glabrous, margin membranous; proximal glume ca. 4 mm, 3-veined; distal glume 6–7 mm, 5-veined. Lemma lanceolate, 5-veined, hirsutulous, apex acute, acuminate, or with awn 1–2 mm; first lemma to 11 mm including awn. Palea slightly longer than lemma, ciliolate along keels. Fl. and fr. late summer. $2n = 42^*$.

- Mountain slopes. Gansu, Qinghai, W Sichuan.

10. *Kengyilia laxistachya* L. B. Cai & D. F. Cui, Bull. Bot. Res., Harbin 15: 424. 1995.

稀穗以礼草 *xi sui yi li cao*

Culms densely tufted, 25–55 cm tall, 2- or 3-noded. Leaf sheath glabrous; ligule ca. 0.3 mm, apex truncate; leaf blade usually involute, 5–8 cm, glabrous or adaxial surface puberulent. Spike erect or slightly curved, 5–7 × ca. 0.5 cm; rachis slender, puberulent on back; internodes 6–9 mm. Spikelets 10–12 mm, with 3–5 florets. Glumes broadly lanceolate or oblong, 2–4-veined, glabrous, margin membranous, apex pungent or mucronate; proximal glume 5–7 mm; distal glume 6–8 mm. Lemma oblong-lanceolate, abaxially densely villous; first lemma 7–8 mm; awn 2–3 mm. Palea slightly shorter than lemma, spinescent along keels distally, glabrous between keels, apex truncate. Anthers 2–2.5 mm. Fl. and fr. autumn.

- River banks; 2100–2700 m. Xinjiang (Heshuo, Shache).

11. *Kengyilia tahelacana* J. L. Yang et al., Canad. J. Bot. 71: 339. 1993.

黄药以礼草 *huang yao yi li cao*

Culms densely tufted, sometimes geniculate at base, 90–110 cm tall, 4- or 5-noded, glabrous but pubescent below spike. Leaf sheath glabrous; ligule ca. 0.4 mm, scarious-membranous, apex truncate; leaf blade flat, 15–32 × 0.5–0.8 cm, abaxial surface glabrous, adaxial surface scabrous. Spike slightly curved, 8–10 × ca. 1.5 cm; rachis puberulent throughout; internodes 4–9 mm. Spikelets green, lanceolate, 15–16 mm excluding awns, with ca. 7 florets; rachilla puberulent; internodes 1.5–2 mm. Glumes oblong, slightly oblique, subequal, 7–8 mm, herbaceous, (3–)5(or 6)-veined, white pilose, margin membranous, apex acuminate, mucronate, or with awn 1–2 mm. Lemma oblong-lanceolate, 6–9 mm, pubescent and hairy distally; callus glabrous but hairy on both sides; awn straight, 10–15 mm. Palea equaling or slightly longer than lemma, ciliolate along keels distally, puberulent between keels, apex emarginate. Anthers yellow, 2.5–3 mm. Caryopsis brown, ca. 6 mm. Fl. and fr. late summer. $2n = 42^*$.

- Rocky mountains; 2400–2500 m. Xinjiang.

12. *Kengyilia zhaosuensis* J. L. Yang et al., Canad. J. Bot. 71: 341. 1993.

昭苏以礼草 *zhao su yi li cao*

Culms densely tufted, 60–90 cm tall, ca. 2 mm in diam., 3- or 4-noded, glabrous but nodes pubescent. Leaf sheath glabrous; ligule ca. 0.5 mm, scarious-membranous, apex truncate; leaf blade flat or slightly involute, 18–20 × 0.5–0.7 cm, abaxial surface glabrous, adaxial surface scabrous. Spike erect or slightly curved, 14–20 × ca. 1 cm; rachis scabrous or hirsute; internodes 7–10 mm. Spikelets green, lanceolate, 15–17 mm excluding awns, with 6 or 7 florets; rachilla pubescent; internodes 1.5–2 mm. Glumes oblong, nearly oblique, 5-veined, glabrous, margin broadly membranous, apex acuminate, mucronate, or with awn 1–2 mm; proximal glume 9–11 mm; distal glume 10–12 mm. Lemma narrowly lanceolate, 8–10 mm excluding awn,

herbaceous, densely villous, margin membranous; callus hairy; awn 2–6 mm. Palea shorter than lemma, ciliate along keels distally, apex truncate. Anthers yellowish, 3.5–4 mm. Caryopsis brown. Fl. and fr. late summer. $2n = 42^*$.

- Rocky mountain ravines; ca. 1800 m. Xinjiang.

13. *Kengyilia hejingensis* L. B. Cai & D. F. Cui, Bull. Bot. Res., Harbin 15: 426. 1995 [*“hejingensi”*].

和静以礼草 *he jing yi li cao*

Culms erect or slightly geniculate, 60–80 cm tall, 2.5–3.5 mm in diam., 3- or 4-noded. Leaf sheath glabrous; ligule ca. 5 mm, membranous, apex truncate; leaf blade flat, 7–14 × 0.4–0.8 cm, abaxial surface glabrous or scabrous, adaxial surface white villous. Spike erect, green, dense, 8–11 × 0.6–0.8 cm; rachis margin ciliate; internodes ca. 5 mm. Spikelets 15–18 mm, with 4–6 florets. Glumes ovate-lanceolate, subequal, 8–9 mm, 4–6-veined, glabrous, margin membranous; awn 2–5 mm. Lemma lanceolate, 5–7-veined, abaxially scabrous or sparsely spinescent; first lemma 10–11 mm; awn 7–12 mm. Palea slightly shorter than lemma, ciliolate along keels, scabrous between keels. Anthers yellow, 1.4–1.8 mm. Ovary apex hirsute. Fl. and fr. autumn.

- Sloping meadows; 2200–2600 m. Xinjiang (Hejing).

14. *Kengyilia stenachyra* (Keng) J. L. Yang et al., Hereditas (Lund) 116: 27. 1992.

窄颖以礼草 *zhai ying yi li cao*

Roegneria stenachyra Keng, Acta Univ. Nankin. Sci. Nat. 1963(1): 79. 1963.

Culms erect, 60–90 cm tall, 3-noded, glabrous. Leaf sheath glabrous; leaf blade flat when fresh, soon involute on drying, 5–15 × 0.3–0.5 cm, stiff, abaxial surface glabrous, adaxial surface puberulent. Spike ca. 10 × 1 cm. Spikelets purplish stramineous, 12–15 mm excluding awns, with 4 or 5 florets. Glumes lanceolate-oblong, 4–5 mm or distal glume slightly longer, 1–3-veined, hirsutulous along veins, apex acute. Lemma laxly or distally densely hirsute; first lemma ca. 10 mm; awn 5–10 mm, scabrous. Palea shorter than lemma, ciliate along keels distally, apex emarginate or truncate. Anthers nearly black. Fl. and fr. late summer. $2n = 42^*$.

- Mountain slopes; ca. 3200 m. Gansu, Qinghai.

15. *Kengyilia shawanensis* L. B. Cai, Guihaia 16: 202. 1996.

沙湾以礼草 *sha wan yi li cao*

Culms laxly tufted, erect or slightly geniculate at base, 20–30 cm tall, 1.5–2.5 mm in diam., 3- or 4-noded. Leaf sheath glabrous; ligule very short, papery, apex truncate; leaf blade flat, 5–10 × 0.25–0.5 cm, both surfaces glabrous or adaxial surface sparsely villous, margin ciliate. Spike erect, 5–10 × 0.3–0.5 cm; rachis scabrous on back, margin spinose; internodes 6–9 mm. Spikelets green, 10–16 mm excluding awns, with 3–5 florets; rachilla puberulent. Glumes broadly lanceolate or oblong, 3–5-veined, glabrous, margin broadly membranous, apex acute or pungent; proximal glume 5.5–7.5 mm; distal glume 7–8.5 mm. Lemma lanceolate, abaxially densely pubescent; first lem-

ma 8–9 mm; awn straight, 2–7 mm. Palea subequaling lemma, spinose along keels distally, glabrous between keels. Anthers yellow, ca. 3 mm. Fl. and fr. Jun–Jul.

- Arid mountain slopes; ca. 3000 m. Xinjiang (Shawan).

16. *Kengyilia mutica* (Keng) J. L. Yang et al., *Hereditas* (Lund) 116: 28. 1992.

无芒以礼草 *wu mang yi li cao*

Roegneria mutica Keng, *Acta Univ. Nankin. Sci. Nat.* 1963(1): 87. 1963.

Culms usually geniculate at base, 60–70 cm tall, 3-noded, puberulent below spike. Leaf sheath glabrous; leaf blade 12–19 × 0.4–0.6 cm, stiff, glabrous. Spike erect, 5–7 × ca. 0.8 cm. Spikelets greenish, ca. 12 mm, with 4 or 5 florets. Glumes oblong-ovate, 5–6 mm, 3-veined, glabrous or puberulent, apex acute; midvein prominent. Lemma densely villous, apex acute or pointed; first lemma ca. 9.5 mm. Palea equaling or slightly longer than lemma, ciliate along keels distally, apex emarginate or obtuse. Fl. and fr. late summer. $2n = 42^*$.

- Grasslands. Qinghai.

17. *Kengyilia hirsuta* (Keng) J. L. Yang et al., *Hereditas* (Lund) 116: 28. 1992.

糙毛以礼草 *cao mao yi li cao*

Roegneria hirsuta Keng, *Acta Univ. Nankin. Sci. Nat.* 1963(1): 84. 1963; *Agropyron kengii* Tzvelev; *Elymus kengii* (Tzvelev) Á. Löve; *Kengyilia hirsuta* var. *obviaristata* L. B. Cai; *K. hirsuta* var. *variabilis* (Keng) L. B. Cai; *K. obviaristata* (L. B. Cai) L. B. Cai; *R. hirsuta* var. *leiophylla* Keng & S. L. Chen; *R. hirsuta* var. *variabilis* Keng.

Culms densely tufted, erect or decumbent, 40–70(–150) cm tall, rigid, 2- or 3-noded, pubescent only below spike. Leaf sheath glabrous or villous at base; leaf blade flat or margin involute, stiff, usually both surfaces glabrous or adaxial surface pilose or abaxial surface densely puberulent, margin ciliate. Spike (3–)6–8 × 0.7–1 cm. Spikelets densely imbricate, greenish or purplish, 10–15 mm excluding awns, with 3–7 florets. Glumes greenish, ovate-oblong, 3- or 4-veined, glabrous, or scabrous along midvein distally, apex acuminate or pointed; proximal glume 4.5–6 mm; distal glume 5–7 mm. Lemma yellowish brown, hirsute; first lemma 8–10 mm; awn erect or slightly reflexed, (1–)2–6 mm. Palea slightly shorter than or equaling lemma, hirsute-ciliate along keels, apex emarginate or 2-lobed. Anthers dark green. Fl. and fr. Aug–Sep. $2n = 42^*$.

- Mountain steppes, river banks. Gansu, Qinghai, Xinjiang.

18. *Kengyilia alata* (Drobow) J. L. Yang et al., *Canad. J. Bot.* 71: 343. 1993.

毛稃以礼草 *mao fu yi li cao*

Culms densely tufted, erect or geniculate at base, 25–70 cm tall, smooth and glabrous, puberulent at nodes, or densely retrorsely hairy throughout. Leaf sheath smooth and glabrous or densely pubescent; leaf blade glaucous, 5–10 × 0.3–0.5 cm, abaxial surface smooth and glabrous or pubescent, adaxial surface scabrous (together with margin) or puberulent. Spike erect,

dense, 5–8 × 0.8–1.1 cm; rachis puberulent to densely pubescent, margin scabrous or hispidulous. Spikelets green or purplish green, 10–16 × 5–7 mm, with 3–6 florets. Glumes lanceolate, 7–11 × ca. 2.5 mm, 5-veined, glabrous, or scabrous distally, margin broadly membranous. Lemma lanceolate, 8–9 mm, densely hispidulous or pubescent; awn 2–5 mm. Palea equaling or slightly longer than lemma, ciliate along keels distally. Lodicules shortly broadly triangular or long narrowly triangular. Anthers yellow, 2–3 mm. Fl. and fr. Jun–Sep.

Meadows on mountain slopes, dry steppes; 1500–3000 m. Gansu, Xinjiang, Xizang [Mongolia, Russia].

- 1a. Culms smooth and glabrous or nodes puberulent; leaf sheath smooth, glabrous, leaf blade abaxial surface smooth, glabrous; lodicules shortly broadly triangular 18a. var. *alata*
- 1b. Culms densely retrorsely hairy throughout; leaf sheath densely pubescent, leaf blade abaxial surface pubescent; lodicules long narrowly triangular 18b. var. *longiglumis*

18a. *Kengyilia alata* var. *alata*

毛稃以礼草(原变种) *mao fu yi li cao* (yuan bian zhong)

Agropyron alata (Drobow), *Repert. Spec. Nov. Regni Veg.* 21: 43. 1925; *Elymus alata* (Drobow) Á. Löve; *Elytrigia alata* (Drobow) Nevski.

Culms smooth and glabrous or nodes puberulent. Leaf sheath smooth, glabrous; leaf blade abaxial surface smooth, glabrous, adaxial surface and margin scabrous. Lodicules shortly broadly triangular.

Meadows on mountain slopes; 1500–3000 m. Xinjiang, Xizang [Mongolia, Russia].

18b. *Kengyilia alata* var. *longiglumis* (Keng) C. Yen et al., *Novon* 8: 94. 1998.

长颖以礼草 *chang ying yi li cao*

Roegneria longiglumis Keng, *Acta Univ. Nankin. Sci. Nat.* 1963(1): 83. 1963; *Kengyilia longiglumis* (Keng) J. L. Yang et al.

Culms densely retrorsely hairy throughout. Leaf sheath densely pubescent; leaf blade abaxial surface pubescent, adaxial surface puberulent. Lodicules long narrowly triangular. $2n = 42^*$.

- Dry steppes; ca. 2500 m. Gansu.

19. *Kengyilia kaschgarica* (D. F. Cui) L. B. Cai, *Novon* 6: 142. 1996.

喀什以礼草 *ka shi yi li cao*

Elymus kaschgaricus D. F. Cui, *Bull. Bot. Res.*, Harbin 10(3): 27. 1990; *Roegneria kaschgarica* (D. F. Cui) Y. H. Wu.

Culms densely tufted, 25–35 cm tall, ca. 2 mm in diam., 2- or 3-noded, glabrous but puberulent below spike. Leaf sheath of lower leaves usually densely retrorsely pubescent, of upper

leaves glabrous; leaf blade usually involute, 6–15 × 0.15–0.2 cm, abaxial surface glabrous, smooth or scabrous, adaxial surface villous and scabrous; ligule ca. 0.5 mm, membranous, apex truncate. Spike erect, dense, 3–8 × 0.5–0.7 cm; rachis densely pubescent; internodes 4–5 mm or ca. 8 mm at base of spike. Spikelets 9–11 mm, with 3–5 florets; rachilla densely pubescent; internodes 1–1.5 mm. Glumes ovate-oblong, 3–5-veined, strongly ciliate along veins, margin broadly membranous; proximal glume 5–7 mm excluding awn; distal glume 6–8 mm excluding awn. Lemma oblong, densely pubescent; first lemma 7–9 mm; callus pilose on both sides; awn recurved, 7–11 mm. Palea slightly shorter than lemma, ciliate along keels. Anthers ca. 1.5 mm. Fl. and fr. Jul–Sep.

- Cold alpine meadows; 2800–3800 m. Xinjiang.

20. *Kengyilia thoroldiana* (Oliver) J. L. Yang et al., *Hereditas* (Lund) 116: 27. 1992.

梭罗以礼草 suo luo yi li cao

Culms densely tufted, 12–15 cm tall, 1- or 2-noded, glabrous. Leaf sheath glabrous; leaf blade involute, 2–5(–8) × 0.2–0.35 cm, abaxial surface glabrous, adaxial surface and margin scabrous. Spike ovate or oblong-ovate, dense or moderately lax, 3–7.5 × 1–1.5 cm excluding awns; rachis glabrous. Spikelets 10–13 mm, with 4–6 florets. Glumes oblong-lanceolate, villous or only scabrous along midvein, apex acute, acuminate, or pointed; proximal glume 5–6 mm, 3(or 4)-veined; distal glume 6–7 mm, 5-veined. Lemma 5-veined, densely pubescent; first lemma 7–8 mm; awn 1–7 mm. Palea slightly shorter than lemma, long ciliate along keels distally, apex emarginate or 2-lobed. Anthers black. Fl. and fr. late summer.

Mountain slopes, valleys, river and lake banks; 4700–5100 m. Gansu, Qinghai, Xinjiang, Xizang [India (Sikkim)].

- 1a. Glumes villous; lemma awn 1–2.5 mm; spike dense, 3–4 cm excluding awns 20a. var. *thoroldiana*
- 1b. Glumes only scabrous along midvein; lemma awn 5–7 mm; spike moderately lax, 5–7.5 cm excluding awns 20b. var. *laxiuscula*

20a. *Kengyilia thoroldiana* var. *thoroldiana*

梭罗以礼草(原变种) suo luo yi li cao (yuan bian zhong)

Agropyron thoroldianum Oliver in Hooker's Icon. Pl. 23: t. 2262. 1893; *Elymus thoroldianus* (Oliver) G. Singh; *Roegneria thoroldiana* (Oliver) Keng.

Spike 3–4 cm excluding awns. Glumes villous. Lemma awn 1–2.5 mm. Fl. and fr. late summer.

Mountain slopes, valleys, river banks; 4700–5100 m. Gansu, Qinghai, Xizang [India (Sikkim)].

20b. *Kengyilia thoroldiana* var. *laxiuscula* (Melderis) S. L. Chen, *Novon* 7: 229. 1997.

疏穗梭罗以礼草 shu sui suo luo yi li cao

Agropyron thoroldianum var. *laxiusculum* Melderis in Bor, Grasses Burma, Ceylon, India, Pakistan, 696. 1960; *Ely-*

mus thoroldianus subsp. *laxiusculus* (Melderis) Á. Löve; *E. thoroldianus* var. *laxiusculus* (Melderis) G. Singh; *Kengyilia grandiglumis* (Keng) J. L. Yang et al. var. *laxiuscula* (Melderis) L. B. Cai; *K. laxiuscula* (Melderis) Tzvelev; *Roegneria thoroldiana* var. *laxiuscula* (Melderis) H. L. Yang.

Spike 5–7.5 cm excluding awns. Glumes only scabrous along midvein. Lemma awn 5–7 mm. Fl. and fr. late summer.

- Lake banks; ca. 4700 m. Xizang.

21. *Kengyilia batalinii* (Krasnov) J. L. Yang et al., *Canad. J. Bot.* 71: 343. 1993.

巴塔以礼草 ba ta yi li cao

Culms densely tufted, erect or geniculate at base, 12–40 cm tall, glabrous or puberulent below spike. Leaf sheath glabrous, pubescent or densely so, or ciliate at margin; ligule short; leaf blade flat or involute, ca. 0.4 cm wide, abaxial surface glabrous or pubescent, adaxial surface softly hairy. Spike dense, 2.5–7 × 0.6–1 cm; rachis glabrous, puberulent, or densely villous; internodes 2–5 mm. Spikelets green or purplish green, 8–14 mm, with 3–6 florets, softly pale hairy. Glumes oblong-ovate or ovate-lanceolate, 4–7 mm, herbaceous, 3–5-veined, white hirsute or softly hairy, ciliate along veins, margin broadly membranous, apex acute or with awn 2–4 mm. Lemma ovate or broadly lanceolate, 6–8 mm, densely hirsute or softly long hairy; awn slightly curved, 8.5–13 mm. Palea lanceolate, subequaling lemma, ciliate along keels distally, apex truncate or emarginate. Anthers yellow or purple, 2.5–4 mm. Fl. and fr. Jun–Sep.

Mountain slope grasslands, alpine steppes; 2100–4200 m. Xinjiang, Xizang [Mongolia, Russia].

- 1a. Culms 20–40 cm tall; leaf sheath glabrous, rarely pubescent or margin ciliate; spike rachis glabrous or puberulent; anthers yellow, ca. 4 mm 21a. var. *batalinii*
- 1b. Culms 12–25(–35) cm tall; leaf sheath densely pubescent; spike rachis densely villous; anthers purple, 2.5–2.7 mm 21b. var. *nana*

21a. *Kengyilia batalinii* var. *batalinii*

巴塔以礼草(原变种) ba ta yi li cao (yuan bian zhong)

Triticum batalinii Krasnov, *Bot. Zap.* 2: 21. 1887–1888 [“*batalini*”]; *Agropyron argenteum* (Nevski) Pavlov; *A. batalinii* (Krasnov) Roshevitz; *Elymus batalinii* (Krasnov) Á. Löve; *Elytrigia argentea* Nevski; *E. batalinii* (Krasnov) Nevski.

Culms 20–40 cm tall. Leaf sheath glabrous, rarely pubescent or margin ciliate. Spike rachis glabrous or puberulent. Anthers yellow, ca. 4 mm. Fl. and fr. Jun–Sep. *2n* = 42.

Mountain slope grasslands; 2100–3500 m. Xinjiang (Kunlun Shan, Tian Shan), Xizang [Mongolia, Russia].

21b. *Kengyilia batalinii* var. *nana* (J. L. Yang et al.) C. Yen et al., *Novon* 8: 95. 1998.

矮生以礼草 ai sheng yi li cao

Kengyilia nana J. L. Yang et al., *Canad. J. Bot.* 71: 341. 1993.

Culms 12–25(–35) cm tall. Leaf sheath densely pubescent. Spike rachis densely villous. Anthers purple, 2.5–2.7 mm. Fl. and fr. late summer. $2n = 42^*$.

- Alpine steppes; ca. 4200 m. Xinjiang.

22. *Kengyilia guidenensis* C. Yen et al., *Novon* 5: 395. 1995.

贵德以礼草 *gui de yi li cao*

Culms densely tufted, erect, 35–50 cm tall, ca. 1.5 mm in diam., 2- or 3-noded, pubescent just below spike. Leaf sheath glabrous, rarely pubescent on lowermost leaves; ligule ca. 0.5 mm, scarious-membranous, apex truncate; leaf blade narrowly lanceolate, flat or slightly involute, 8.5–9 × ca. 0.3 cm, abaxial surface glabrous, adaxial surface densely white hairy, hairs ca. 1 mm. Spike erect, ovate, 3–3.5 × ca. 0.5 cm; rachis densely white pilose; internodes 1.5–2 mm. Spikelets greenish purple, oblong-ovate, ca. 7 mm excluding awns, with 5–7 florets; rachilla densely hirsutulous; internodes 1–1.2 mm. Glumes broadly lanceolate, unequal, 1(–3)-veined, densely white hirsute, margin herbaceous-membranous, apex acuminate or mucronate; proximal glume 3–5 mm; distal glume 4–7 mm. Lemma ovate, 7–9 mm excluding awn, densely white hairy, hairs ca. 1 mm; first lemma ca. 7 mm; callus with hairs ca. 0.8 mm; awn 1.5–4 mm. Palea equaling lemma, ciliate along keels, densely hirsute between keels, apex emarginate. Lodicules triangular. Anthers yellow, ca. 3 mm. Caryopsis brown, ca. 5 mm. Fl. and fr. autumn.

- Stony slopes, between broken granite rocks; ca. 3100 m. Qinghai (Guide).

23. *Kengyilia kokonorica* (Keng) J. L. Yang et al., *Hereditas* (Lund) 116: 27. 1992.

青海以礼草 *qing hai yi li cao*

Roegneria kokonorica Keng, *Acta Univ. Nankin. Sci. Nat.*

1963(1): 88. 1963; *Elymus kokonoricus* (Keng) Á. Löve ex D. F. Cui.

Culms solitary or tufted, 30–50 cm tall, 2- or 3-noded, puberulent below spike. Leaf sheath glabrous; leaf blade rolled, 2–15(–18) × 0.2–0.5 cm, glabrous. Spike dense, 3–6 × 0.7–0.8 cm. Spikelets green or tinged purplish, 8–10 mm, with 3 or 4(–6) florets. Glumes green abaxially, lanceolate-ovate, 3–4 mm excluding awn, 1–3-veined, densely hirsute, margin membranous; midvein somewhat prominent; awn 2–3 mm. Lemma densely hirsute; first lemma ca. 6 mm; awn 4–6 mm, scabrous. Palea equaling lemma, ciliate along keels. Anthers yellowish black, 2–2.2 mm. Ovary apex puberulent. Fl. and fr. late summer. $2n = 42^*$.

- Dry steppes. Gansu, Ningxia, Qinghai, Xinjiang, Xizang.

24. *Kengyilia pamirica* J. L. Yang & C. Yen, *J. Sichuan Agric. Univ.* 10: 566. 1992.

帕米尔以礼草 *pa mi er yi li cao*

Culms densely tufted, 60–70 cm tall, 1.2–2 mm in diam., 2- or 3-noded, glabrous but pubescent just below spike. Leaf sheath glabrous; ligule ca. 0.5 mm, hyaline-membranous, apex truncate; leaf blade involute, 9–10(–15) × 0.2–0.7 cm, abaxial surface glabrous, adaxial surface densely villous along lateral veins, or both surfaces villous on surculose leaves. Spike lanceolate to obovate, 8–10 × 0.8–1.2 cm; rachis densely villous; internodes 2–7 mm. Spikelets purple, 12–16 mm excluding awns, with 5–8 florets; rachilla densely pubescent; internodes 0.5–2 mm. Glumes oblong, equal or subequal, 6–7(–9) mm, 3–5-veined, densely hirsute, apex acute, mucronate, or with awn 1–2 mm. Lemma ovate, 7–9 mm, densely villous; callus with hairs ca. 0.8 mm laterally, 0.2–0.5 mm elsewhere; awn erect, 10–15 mm, scabrous. Palea subequaling lemma, sparsely ciliate along keels distally, puberulent or scabrous between keels, apex emarginate or truncate. Anthers yellow to purple, ca. 3 mm. Caryopsis brown, ca. 6 mm. Fl. and fr. late summer. $2n = 42^*$.

- Steppes; ca. 2800 m. Xinjiang.

106. AGROPYRON Gaertner, *Novi Comment. Acad. Sci. Imp. Petrop.* 14: 539. 1770.

冰草属 *bing cao shu*

Costia Willkomm (1858), nom. illeg. superfl., not Willkomm (1860).

Plants perennial, with creeping rhizomes or culms tufted. Culms erect or geniculate at base. Sheaths of vegetative shoots often closed almost throughout their length, usually with lanceolate auricles; leaf blade flat or involute. Spike linear-oblong or ovoid; rachis tough, pubescent. Spikelets 1 per node, divergently or pectinately arranged, sessile, laterally compressed, with 3–10 florets; rachilla disarticulating above glumes and between florets. Glumes linear to narrowly ovate, hardened, 1–5-veined, 1-keeled to base, tapering to an acuminate or shortly awned tip in which veins converge. Lemma lanceolate-oblong, leathery, 5–7-veined, glabrous or pilose, apex acute or with straight awn; midvein slightly keeled; callus very short. Palea ± equaling lemma, pilose along keels, rarely smooth and glabrous, apex usually 2-toothed. Lodicules ciliate at margin. Caryopsis somewhat adherent to lemma and palea. $x = 7$.

About 15 species; mainly in Asia and Europe; introduced and widely cultivated in North America; five species (one endemic) in China.

The authors have seen no specimens of *Agropyron kanashiroi* Ohwi (J. Jap. Bot. 19: 167. 1943; *Elytrigia kanashiroi* (Ohwi) Melderis; *Pseudo-roegneria strigosa* (M. Bieberstein) Á. Löve subsp. *kanashiroi* (Ohwi) Á. Löve; *Roegneria kanashiroi* (Ohwi) K. L. Chang), described from “*Mongholia interior*” and also recorded from Ningxia (in Fl. Ningxia. 2: 359. 1988).

- 1a. Plants with long-creeping, branching rhizomes; culms not tufted 1. *A. michnoi*
- 1b. Plants without such rhizomes; culms tufted.
 - 2a. Spike rather lax, rachis internodes 3–5(–10) mm.

- 3a. Spike 1–1.5(–2) cm wide; spikelets 15–20 mm, with 9–11 florets 2. *A. sibiricum*
 3b. Spike 0.4–0.6 cm wide; spikelets 8–14(–19) mm, with (2 or) 3–8 florets 3. *A. mongolicum*
 2b. Spike dense, rachis internodes 1–2 mm.
 4a. Culms densely tufted; spikelets imbricate, not pectinately arranged 4. *A. desertorum*
 4b. Culms laxly tufted; spikelets pectinately arranged, diverging at wide angle from rachis 5. *A. cristatum*

1. *Agropyron michnoi* Roshevitz, Izv. Glavn. Bot. Sada SSSR 28: 384. 1929.

根茎冰草 gen jing bing cao

Agropyron cristatum (Linnaeus) Gaertner subsp. *michnoi* (Roshevitz) Á. Löve.

Plants with long-creeping, branching rhizomes. Culms not tufted, erect, 42–68 cm tall, glabrous. Leaf sheath glabrous; ligule ca. 1 mm, scarious, apex truncate; leaf blade flat or margin inrolled, 3–9 × 0.2–0.4 cm, abaxial surface glabrous, adaxial surface puberulent and laxly villous together. Spike elliptic or elliptic-lanceolate, dense, 5–10 × 0.9–1.4 cm; rachis pubescent. Spikelets pale glaucous green, 5–10 mm, with 5–7(–10) florets. Glumes boat-shaped, glabrous but ciliate along keel; awn 1–3 mm; proximal glume 2.5–3.5 mm; distal glume 3–4 mm. Lemma lanceolate, ± woolly and bristly together; first lemma 5–8 mm; awn ca. 2 mm. Palea equaling lemma, ciliate along keels, apex acuminate. Fl. and fr. Jul–Sep.

Sandy banks. Nei Mongol [Mongolia, Russia].

This species is used for forage.

2. *Agropyron sibiricum* (Willdenow) P. Beauvois, Ess. Agrostogr. 102, 142, 146, 181. 1812.

西伯利亚冰草 xi bo li ya bing cao

Triticum sibiricum Willdenow, Enum. Pl. 1: 135. 1809; *Agropyron cristatum* (Linnaeus) Gaertner subsp. *sibiricum* (Willdenow) Á. Löve; *A. fragile* (Roth) P. Candargy subsp. *sibiricum* (Willdenow) Melderis; *A. fragile* var. *sibiricum* (Willdenow) Tzvelev; *Eremopyrum sibiricum* (Willdenow) P. Candargy.

Roots coated with grains of sand affixed by secretions of root hairs. Culms tufted, erect or geniculate at base, 50–80 cm tall, glabrous, or scabrous below spike. Leaf sheath glabrous, smooth or scabrous; leaf blade flat or involute, 10–20 × 0.4–0.6 cm, abaxial surface smooth, adaxial surface scabrous or puberulent. Spike slightly curved, 7–12 × 1–1.5(–2) cm; rachis internodes 4–5(–7) mm. Spikelets pale green, 15–20 × 4–6 mm, with 9–11 florets. Glumes ovate-lanceolate, oblique, glabrous, smooth or scabrous along keel, apex pointed; proximal glume 5–6.5 mm, 3–5-veined; distal glume 6–7 mm, 5-veined. Lemma glabrous or scabrous, apex pointed; first lemma ca. 8 mm. Palea slightly shorter than or equaling lemma, ciliate along keels. Anthers 3.5–4 mm. Fl. and fr. Jun–Jul. $2n = 14, 28$.

Sandy steppes, semideserts, sands. Hebei, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; Europe; introduced in North America].

Plants with villous lemmas have been named *Agropyron sibiricum* f. *pubiflorum* Roshevitz (in B. Fedtschenko, Fl. Iugo-Vostoka Evropejskoi Chasti SSSR 2: 156. 1928). In China they are usually found in the steppes of Nei Mongol.

3. *Agropyron mongolicum* Keng, J. Wash. Acad. Sci. 28: 305. 1938.

沙芦草 sha lu cao

Culms tufted, erect or geniculate at base, 20–60 cm tall, 2- or 3(–6)-noded. Leaf sheath glabrous; ligule apex truncate; leaf blade involute, 5–15 × 0.2–0.3 cm, glabrous or prickly hairy along veins. Spike linear, moderately lax, 3–9(–12) × 0.4–0.6 cm; rachis glabrous or puberulent; internodes 3–5(–10) mm. Spikelets 8–14(–19) × 3–5 mm, with (2 or) 3–8 florets; rachilla glabrous or puberulent; internodes 3–5(–10) mm. Glumes oblique, 3–5-veined, apex with point ca. 1 mm or awn ca. 2 mm; proximal glume 3–6 mm; distal glume 4–6 mm. Lemma 5-veined, glabrous, laxly puberulent, or densely villous, apex pointed; first lemma 5–8 mm. Palea shorter than or equaling lemma, shortly ciliate along keels. Fl. and fr. Jul–Sep.

• Dry steppes, sandy places. Gansu, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang.

- 1a. Glume apex with point ca. 1 mm;
lemma glabrous or laxly puberulent 3a. var. *mongolicum*
 1b. Glume apex with awn ca. 2 mm;
lemma densely villous 3b. var. *villosum*

3a. *Agropyron mongolicum* var. *mongolicum*

沙芦草(原变种) sha lu cao (yuan bian zhong)

Agropyron cristatum (Linnaeus) Gaertner subsp. *mongolicum* (Keng) Á. Löve.

Glume apex with point ca. 1 mm. Lemma glabrous or laxly puberulent.

• Dry steppes, sandy places. Gansu, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang.

This variety provides good forage.

3b. *Agropyron mongolicum* var. *villosum* H. L. Yang, Bull. Bot. Res., Harbin 4(4): 89. 1984.

毛沙芦草 mao sha lu cao

Glume apex with awn ca. 2 mm. Lemma densely villous.

• Sandy places. Nei Mongol.

4. *Agropyron desertorum* (Fischer ex Link) Schultes, Mant. 2: 412. 1824.

沙生冰草 sha sheng bing cao

Culms densely tufted, erect or geniculate at base, 20–70 cm tall, glabrous, or pubescent just below spike. Leaf sheath glabrous or pubescent; leaf blade glaucous green, involute, 5–10 × 0.1–0.3 cm, stiff, abaxial surface smooth, glabrous, adaxial surface scabrous. Spike erect, 4–8 × 0.5–1 cm; rachis pubes-

cent; internodes 1–2 mm. Spikelets imbricate, 5–10 × 3–5 mm, with 4–7 florets. Glumes ovate-lanceolate, glabrous, smooth but scabrous on keel; awn 1–2 mm; proximal glume (2–)3–4 mm; distal glume 4–5 mm. Lemma lanceolate, glabrous to densely pilose; awn 1–3 mm. Palea ciliate along keels, apex 2-dentate. Anthers ca. 4 mm. Fl. and fr. Jun–Aug. $2n = 28^*$.

Mountain slopes, frigid high pastures, dry steppes, sandy places; ca. 2700 m. Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang [Mongolia, Russia; introduced in North America].

- 1a. Lemma glabrous, or ± bristly hairy
abaxially and at margin 4a. var. *desertorum*
1b. Lemma densely pilose throughout
..... 4b. var. *pilosiusculum*

4a. *Agropyron desertorum* var. *desertorum*

沙生冰草(原变种) sha sheng bing cao (yuan bian zhong)

Triticum desertorum Fischer ex Link, Enum. Hort. Berol. Alt. 1: 97. 1821; *Agropyron cristatum* (Linnaeus) Gaertner subsp. *desertorum* (Fischer ex Link) Á. Löve; *A. cristatum* var. *desertorum* (Fischer ex Link) R. D. Dorn; *A. sibiricum* (Willdenow) P. Beauvois var. *desertorum* (Fischer ex Link) Boissier; *Eremopyrum sibiricum* (Willdenow) P. Candargy var. *desertorum* (Fischer ex Link) P. Candargy.

Lemma glabrous, or ± bristly hairy abaxially and at margin.

Mountain slopes, dry steppes. Nei Mongol, Shanxi [Mongolia, Russia].

4b. *Agropyron desertorum* var. *pilosiusculum* (Melderis) H. L. Yang in P. C. Kuo, Fl. Reipubl. Popularis Sin. 9(3): 113. 1987.

毛沙生冰草 mao sha sheng bing cao

Agropyron desertorum f. *pilosiusculum* Melderis in Norlindh, Fl. Mongol. Steppe 1: 121. 1949; *A. sinkiangense* D. F. Cui.

Lemma densely pilose throughout.

Frigid high pastures, sandy places; ca. 2700 m. Nei Mongol, Qinghai, Xinjiang [Mongolia].

5. *Agropyron cristatum* (Linnaeus) Gaertner, Novi Comment. Acad. Sci. Imp. Petrop. 14: 540. 1770.

冰草 bing cao

Culms laxly tufted, 20–60(–80) cm tall, usually puberulent, rarely glabrous. Leaf sheath hairy or glabrous; leaf blade involute or flat, 5–15(–20) × 0.2–0.5(–0.9) cm, abaxial surface glabrous, adaxial surface moderately pubescent. Spike oblong-ovoid or ovoid-lanceolate, very dense, 2–6 × 0.8–2.5 cm; rachis internodes ca. 1 mm. Spikelets pectinately arranged, diverging at wide angle from rachis, 6–18 mm, with (3–)5–11 florets. Glumes lanceolate or ovate-lanceolate, pilose or glabrous, rarely laxly spinescent hairy, usually awned; awn ± equaling glume body; proximal glume 2–3 mm; distal glume 3–4 mm. Lemma pilose, densely so, or glabrous, rarely laxly spinescent hairy, usually awned; awn 2–4 mm. Palea ciliate along keels, apex 2-

toothed. Anthers ca. 4 mm. Fl. and fr. Jun–Sep. $2n = 28^*$.

Dry mountain slopes, dry meadows, steppes, stony steppe slopes. Gansu, Hebei, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Xinjiang [Japan, Korea, Mongolia, Pakistan, Russia; SW Asia, Europe; introduced in North America].

This species provides good forage.

- 1a. Glumes and lemma glabrous, rarely
laxly spinescent hairy 5c. var. *pectinatum*
1b. Glumes and lemma pilose or densely so.
2a. Spike oblong-ovoid, 0.8–1.5 cm
wide; spikelets 6–9(–12) mm, with
(3–)5–7 florets 5a. var. *cristatum*
2b. Spike ovoid-lanceolate, 2–2.5 cm
wide; spikelets 8–18 mm, with
9–11 florets 5b. var. *pluriflorum*

5a. *Agropyron cristatum* var. *cristatum*

冰草(原变种) bing cao (yuan bian zhong)

Bromus cristatus Linnaeus, Sp. Pl. 1: 78. 1753; *Costia cristata* (Linnaeus) Willkomm; *Eremopyrum cristatum* (Linnaeus) Willkomm & Lange; *Triticum cristatum* (Linnaeus) Schreber; *Zeia cristata* (Linnaeus) Lunell.

Spike oblong-ovoid, 0.8–1.5 cm wide. Spikelets 6–9(–12) mm, with (3–)5–7 florets. Glumes pilose. Lemma densely pilose. Fl. and fr. Jun–Jul.

Dry meadows, stony steppe slopes. Gansu, Nei Mongol, Qinghai, Xinjiang [Japan, Korea, Mongolia, Pakistan, Russia; SW Asia].

5b. *Agropyron cristatum* var. *pluriflorum* H. L. Yang, Bull. Bot. Res., Harbin 4(4): 88. 1984.

多花冰草 duo hua bing cao

Spike ovoid-lanceolate, 2–2.5 cm wide. Spikelets 8–18 mm, with 9–11 florets. Glumes and lemma pilose. Fl. and fr. Jul–Sep.

• Steppes. Nei Mongol.

5c. *Agropyron cristatum* var. *pectinatum* (M. Bieberstein) Roshevitz ex B. Fedtschenko, Izv. Imp. Bot. Sada Petra Velikago 14(Suppl. 2): 97. 1915.

光穗冰草 guang sui bing cao

Triticum pectinatum M. Bieberstein, Fl. Taur.-Caucas. 1: 87. 1808; *Agropyron cristatum* subsp. *pectinatum* (M. Bieberstein) Tzvelev; *A. cristatum* f. *pectiniforme* (Roemer & Schultes) A. V. Bukhteeva; *A. cristatum* var. *pectiniforme* (Roemer & Schultes) H. L. Yang, nom. superfl.; *A. pectiniforme* Roemer & Schultes; *Eremopyrum cristatum* var. *pectinatum* (M. Bieberstein) P. Candargy; *Triticum pectiniforme* (Roemer & Schultes) Steudel, nom. superfl.

Glumes and lemma glabrous, rarely laxly spinescent hairy.

Dry mountain slopes. Hebei, Nei Mongol, Qinghai, Xinjiang [Mongolia, Russia; Europe].

107. EREMOPYRUM (Ledebour) Jaubert & Spach, Ann. Sci. Nat., Bot., sér. 3, 14: 360. 1851.

旱麦草属 han mai cao shu

Triticum [unranked] *Eremopyrum* Ledebour, Fl. Altaic. 1: 112. 1829.

Plants annual. Culms erect or geniculate-ascending. Leaf sheath split to base; leaf blade usually flat. Spike ellipsoid-ovoid or cylindric-ovoid, very dense; rachis short, disarticulating at nodes. Spikelets 1 per node, held at nearly 90° to rachis, sessile, laterally compressed, with 3–6 florets; rachilla somewhat scabrous or shortly pilose, with or without joints below each floret. Glumes boat-shaped, leathery, with prominent keel, margin somewhat thickened, ultimately subhorny. Lemma leathery, 5-veined, 1-keeled, apex pointed or shortly awned; callus very short. Palea usually almost 2/3 as long as lemma, scabrous or pilose along keels. Lodicules ciliate at margin. Caryopsis somewhat adherent to lemma and palea. $x = 7$.

About eight species: from N Africa and the Mediterranean region to the W Himalayas; four species in China.

All species are valuable fodder plants for ephemeral spring pastures.

1a. Spikelets villous or hairy.

2a. Spikelets 12–15 mm; leaf sheath not inflated on upper leaves, or slightly dilated on uppermost leaf 3. *E. bonaepartis*

2b. Spikelets 6–10 mm; leaf sheath inflated on upper leaves 4. *E. triticeum*

1b. Spikelets glabrous or scabrous.

3a. Spikelets 9–14 mm; glumes linear-lanceolate; lemma pubescent; palea keels prolonged into 2 short, blunt teeth; leaf sheath slightly inflated on upper leaves 1. *E. orientale*

3b. Spikelets 13–17 mm; glumes linear; lemma long villous; palea keels prolonged into 2 awned teeth 0.5–1.5 mm; leaf sheath slightly dilated but not inflated on uppermost leaf 2. *E. distans*

1. *Eremopyrum orientale* (Linnaeus) Jaubert & Spach, Ann. Sci. Nat., Bot., sér. 3, 14: 361. 1851.

东方旱麦草 dong fang han mai cao

Secale orientale Linnaeus, Sp. Pl. 1: 84. 1753; *Agropyron orientale* (Linnaeus) Roemer & Schultes; *Costia orientalis* (Linnaeus) Willkomm; *Triticum orientale* (Linnaeus) M. Bieberstein (1808), not Percival (1921).

Culms geniculate at nodes, 8–25 cm tall, usually 3-noded, pubescent below spike. Leaf sheath scabrous and puberulent on lower leaves, glabrous and slightly inflated on upper leaves; leaf blade green, flat, 2–5 × 0.2–0.4 cm, both surfaces pubescent, adaxial surface also shortly pilose along veins. Spike ellipsoid-ovoid, 1.5–3 × 0.8–1.6(–1.8) cm. Spikelets green, 9–14 mm, with 3–5 florets, villous. Glumes linear-lanceolate, laterally strongly compressed, asymmetric, contorted, nearly as long as spikelet including awns, keeled, with 2 or 3 distinct lateral veins, apex long acuminate with awn 4–6 mm. Lemma lanceolate, pubescent, apex gradually tapering to scabrous awn 4–5 mm; first lemma 6–7 mm excluding awn. Palea slightly shorter than or equaling lemma, sparsely shortly ciliate along keels; keels prolonged into 2 short, blunt teeth. Fl. and fr. Apr–May.

Wooded steppes, dry barren slopes, sands; 500–1600 m. Nei Mongol, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; Mediterranean region].

This is an excellent spring pasture grass for all kinds of animals.

2. *Eremopyrum distans* (K. Koch) Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 52. 1934.

毛穗旱麦草 mao sui han mai cao

Agropyron distans K. Koch, Linnaea 21: 426. 1848; *A. lasianthum* Boissier; *A. orientale* (Linnaeus) Roemer & Schultes subsp. *distans* (K. Koch) Maire; *A. orientale* var. *lasian-*

thum (Boissier) Boissier; *Eremopyrum orientale* (Linnaeus) Jaubert & Spach var. *lasianthum* (Boissier) Maire; *Triticum lasianthum* (Boissier) Steudel.

Culms usually geniculate at base, 14–20 cm tall, hairy below spike. Leaf sheath slightly dilated but not inflated on uppermost leaf; leaf blade green, flat, 3–5 × 0.2–0.3 cm, scabrous, abaxial surface pubescent, adaxial surface shortly pilose. Spike oblong lobed or oblong-ovoid, 2–5.5 × 1.5–2.5 cm. Spikelets green or slightly purple tinged, 13–17 mm, with 3–5 florets, villous. Glumes linear, laterally strongly compressed, slightly contorted, equaling spikelet including awn, keeled, apex gradually tapering to slender, scabrous awn 6–8 mm. Lemma long villous, apex gradually tapering to slender, scabrous awn 5–7 mm. Palea apex acuminate; keels prolonged into 2 awned teeth 0.5–1.5 mm. Anthers yellow, ca. 1.5 mm. Fl. and fr. May–Jun. $2n = 14$.

Wooded steppes, arid areas; ca. 800 m. Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; Europe].

3. *Eremopyrum bonaepartis* (Sprengel) Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 52. 1934 [“*Buona-partis*”].

光穗旱麦草 guang sui han mai cao

Triticum bonaepartis Sprengel, Erster Nachtr. Bot. Gart. Halle, 40. 1801; *Agropyron bonaepartis* (Sprengel) T. Durand & Schinz; *A. patulum* Trinius, nom. illeg. superfl.; *A. turkestanicum* Gandoger; *Eremopyrum bonaepartis* var. *turkestanicum* (Gandoger) Tzvelev; *Triticum patulum* Willdenow, nom. illeg. superfl.

Culms geniculate and somewhat purple tinged near base, 5–30 cm tall, pubescent below spike. Leaf sheath not inflated on upper leaves, or slightly dilated on uppermost leaf, glabrous

or rarely puberulent, scabrous; leaf blade green, 0.2–0.5 cm wide, scabrous. Spike green or faintly colored, ovoid lobed, $2-4.5 \times 1.5-2.5(-2.8)$ cm. Spikelets divergent, pectinately arranged, closely pressed to each other, lax at maturity, 12–15 mm, with 3–5 florets, glabrous. Glumes linear, laterally strongly compressed, 9–14 mm, shorter than spikelet, apex gradually tapering to subulate tip. Lemma linear-lanceolate, 12–14 mm, glabrous, apex gradually tapering to awn 1.5–3 mm. Palea shorter and narrower than lemma, shortly thickly ciliate along keels, apex 2-dentate. Fl. and fr. Apr–May.

A weed in desert and semi-desert zones. Xinjiang [Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; E Mediterranean region].

4. *Eremopyrum triticeum* (Gaertner) Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 52. 1934.

旱麦草 han mai cao

Agropyron triticeum Gaertner, Novi Comment. Acad. Sci.

Imp. Petrop. 14: 539. 1770; *A. prostratum* (Pallas) P. Beauvois; *Eremopyrum prostratum* (Pallas) P. Candargy; *Secale prostratum* Pallas; *Triticum prostratum* (Pallas) Linnaeus f.

Culms geniculate at base, 10–30 cm tall, 3- or 4-noded, puberulent below spike. Leaf sheath inflated on upper leaves, glabrous or puberulent at base; ligule 0.5–1 mm, membranous, apex truncate; leaf blade thin, flat, $1.5-8 \times 0.2-0.3$ cm, both surfaces scabrous or sparsely puberulent. Spike ellipsoid-ovoid or subglobose, contracted, dense, $1-1.7(-2) \times 0.6-1.6$ cm. Spikelets closely imbricate, green, 6–10 mm, with 3–6 florets, glabrous. Glumes lanceolate, 4–6 mm, thickly keeled, glabrous, apex subulate. Lemma scabrous but first lemma \pm puberulent, 5–6 mm, apex acuminate or with short awn 1–1.5 mm; callus ca. 0.4 mm. Palea shorter than lemma, apex 2-dentate. Fl. and fr. Apr–May.

Wooded and grassy steppes, dry slopes, semideserts, sands, pebbles, alkaline and saline soils; 800–1400 m. Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; Europe].

108. SECALE Linnaeus, Sp. Pl. 1: 84. 1753.

黑麦属 hei mai shu

Plants annual [rarely perennial]. Culms usually erect. Spike distichous, very dense; rachis usually very brittle, pubescent. Spikelets 1 per node, sessile, with 2 florets, occasionally with rudimentary 3rd floret. Glumes linear-subulate, keeled, hispid along keel, margin membranous, apex acuminate or awned. Lemma lanceolate, asymmetric, 5-veined with 2 marginal veins forming keels, hispid along keels, apex acuminate or tapering into long, straight, scabrous awn. Palea equaling lemma, smooth or scabrous along keels or ciliate distally, apex 2-dentate. Lodicules ciliate distally. Caryopsis oblong, somewhat laterally compressed, deeply furrowed, apex pubescent. $x = 7$.

About five species: mainly in temperate Europe and Asia; three species (two introduced) in China.

- 1a. Glume apex long awned, awn $2-3 \times$ as long as glume body 3. *S. sylvestre*
- 1b. Glume apex acuminate or shortly awned, awn very much shorter than lemma body.
 - 2a. Spike rachis tough 1. *S. cereale*
 - 2b. Spike rachis fragile, or sometimes tough proximally 2. *S. segetale*

1. *Secale cereale* Linnaeus, Sp. Pl. 1: 84. 1753.

黑麦 hei mai

Triticum cereale (Linnaeus) Salisbury (1796), not Schrank (1789); *T. secale* Link.

Culms erect, 80–180 cm tall, scabrous or villous below spike. Leaf blade glaucous, $10-20 \times (0.2-0.5-1)$ cm, glabrous or abaxial surface sparsely pilose. Spike erect, $5-15 \times 1-1.5$ cm excluding awns; rachis tough. Spikelets ca. 15 mm excluding awns, with 2(or 3) florets. Glumes linear or linear-lanceolate, 10–12 mm, scabrous along keels, margin membranous, apex usually acuminate. Lemma strongly compressed, 12–15 mm, pectinately spinose-ciliate along keels; awn 30–50 mm. Palea equaling lemma. Fl. and fr. Jul–Aug. $2n = 14$.

Cultivated. Anhui, Fujian, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Shaanxi, Taiwan, Xinjiang, Yunnan [widely cultivated elsewhere].

2. *Secale segetale* (Zhukovsky) Roshevitz, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 6: 143. 1947.

脆轴黑麦 cui zhou hei mai

Secale cereale Linnaeus subsp. *segetale* Zhukovsky, Trudy

Prikl. Bot. 19(2): 56. 1928; *S. afghanicum* (Vavilov) Roshevitz; *S. cereale* subsp. *afghanicum* (Vavilov) K. Hammer; *S. cereale* var. *afghanicum* Vavilov; *S. segetale* subsp. *afghanicum* (Vavilov) Bondar ex Korovina; *S. segetale* var. *afghanicum* (Vavilov) Tzvelev.

Culms tufted, erect or geniculate at base, glaucous, to 100 cm tall, glabrous, or pilose below spike. Leaf blade flat or involute, $10-40 \times 0.3-0.8$ cm, scabrous or adaxial surface pubescent. Spike $4-13 \times$ ca. 1 cm excluding awns; rachis fragile, or sometimes tough proximally, margin ciliate. Spikelets lanceolate, 12–15(–17) mm, with 2(or 3) florets. Glumes 9–12 mm, glabrous or sparsely puberulent, shortly scabrous-ciliate along keels, apex acuminate or with awn to 5 mm. Lemma long lanceolate, 8–12 mm, glabrous, smooth, rarely scabrous; awn 20–70 mm. Palea equaling lemma. Fl. and fr. (May–)Jul–Aug. $2n = 14^*$.

A weed in fields of *Triticum*. Xinjiang [Kazakhstan, Kyrgyzstan, Pakistan, Turkmenistan, Uzbekistan; SW Asia].

3. *Secale sylvestre* Host, Icon. Descr. Gram. Austriac. 4: 7. 1809.

小黑麦 xiao hei mai

Secale fragile M. Bieberstein.

Culms densely tufted, rarely solitary, erect but usually geniculate at base, ca. 40 cm tall, glabrous but pilose below spike. Leaf blade flat or involute, 5–10 × 0.2–0.3 cm, both surfaces glabrous or adaxial surface pubescent. Spike erect, 3–8 × 0.8–1 cm excluding awns; rachis fragile, margin ciliate; inter-

nodes 3–4 mm. Spikelets with 2 or 3 florets. Glumes linear-subulate, 7–9 mm; awn ca. 20 mm. Lemma spinose-ciliate along keels. Caryopsis black-brown, ca. 5 mm, apex white hairy. Fl. and fr. Jun–Aug. $2n = 14$.

Cultivated in N China [native to Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

109. TRITICUM Linnaeus, Sp. Pl. 1: 85. 1753.

小麦属 xiao mai shu

Deina Alefeld; *Nivieria* Seringe; *Zeia* Lunell, nom. illeg. superfl.

Plants annual. Culms usually erect, rarely decumbent at base. Leaf sheath split almost to base; ligule membranous; auricles lanceolate; leaf blade usually flat. Spike linear, oblong, or ovate, distichous; rachis disarticulating or not. Spikelets 1 per node, sessile, with (2 or) 3–9(–11) florets; apical floret usually sterile; rachilla without joints. Glumes ovate, oblong, or elliptic, ± leathery, 3–11(–13)-veined with 1 or 2 veins raised as keels, glabrous or hairy, smooth or very scabrous along keels, apex obliquely truncate, 1- or 2-toothed, larger tooth sometimes extending into longish awn. Lemma 7–11(–15)-veined, ± keeled, apex awned or awnless; callus very short, obtuse. Palea usually slightly shorter than lemma. Lodicules ciliate at margin. Caryopsis ovate or oblong, ± plump, deeply furrowed, apex ± hairy. $x = 7$.

About 25 species: distributed as cultivated plants almost throughout temperate regions of both hemispheres, also on tropical mountains; four species (all introduced) in China.

The generic name “*Gigachilon*” (Seidl in Berchtold et al., Oekon.-Techn. Fl. Böhm. 1: 425. 1836) was merely cited in synonymy (of *Triticum polonicum*) and was therefore not validly published (Saint Louis Code, Art. 34.1(c)). Under Art. 43.1, combinations in “*Gigachilon*” published by Löve (Feddes Repert. 95: 496–498. 1984) were not validly published either.

An artificial hybrid between *Aegilops tauschii* (*Triticum tauschii*) (♀) and *T. urartu* Thumanjan ex Gandilyan (♂) was described as *T. ×teres* H. R. Jiang & X. X. Kong (Acta Bot. Boreal.-Occid. Sin. 6: 206. 1986); it is not treated in this account.

In addition, the following three species have been recorded as cultivated in China (FRPS 9(3): 48–51. 1987): *Triticum carthlicum* Nevski (as *T. turgidum* Linnaeus var. *carthlicum* (Nevski) Yan ex P. C. Kuo), *T. dicoccoides* (Körnicker) Schweinfurth (as *T. turgidum* var. *dicoccoides* (Körnicker) Bowden), and *T. timopheevii* (Zhukovsky) Zhukovsky.

- 1a. Spike linear; spikelets usually with 1 fertile floret 1. *T. monococcum*
- 1b. Spike cylindric, oblong or branched at base; spikelets with 2 or more fertile florets.
 - 2a. Glumes ovate or broadly so; lemma awnless to long awned 4. *T. aestivum*
 - 2b. Glumes narrow, ± lanceolate; lemma long awned.
 - 3a. Spike dense, or relatively lax and then glumes 25–30 mm, herbaceous or submembranous 2. *T. turgidum*
 - 3b. Spike lax; glumes 12–15 mm, papery 3. *T. turanicum*

1. *Triticum monococcum* Linnaeus, Sp. Pl. 1: 86. 1753.

一粒小麦 yi li xiao mai

Crithodium monococcum (Linnaeus) Á. Löve; *Nivieria monococcum* (Linnaeus) Seringe; *Triticum aestivum* Linnaeus var. *monococcum* (Linnaeus) L. H. Bailey; *T. sativum* Lamarck var. *monococcum* (Linnaeus) Vilmorin; *T. vulgare* Villars var. *bidens* Alefeld.

Culms tufted, erect, 70–120 cm tall, 3- or 4-noded, pale pubescent at nodes. Leaf sheath margin ciliate; leaf blade broadly linear, to 1 cm wide, scabrous, glabrous or adaxial surface shortly pubescent. Spike laterally compressed, 3–7 cm excluding awns, glabrous, rarely pubescent, apex with sterile spikelets; rachis compressed, easily disarticulating. Spikelets with 2 or 3 florets, usually basal floret fertile. Glumes lanceolate or subobovate, 6–8(–9) mm, slightly shorter than proximal florets, obscurely 7-veined, usually glabrous and lustrous, 2-keeled; 1 keel prominent, scabrous distally, prolonged at apex into triangular, acute tooth 0.75–1.5 mm; other keel less prominent, prolonged at apex into much smaller, subacute tooth.

Lemma obscurely 9-veined; awn 5–10 cm. Palea usually longitudinally breaking at maturity. Caryopsis ca. 7 × 3 mm. Fl. and fr. Jun–Jul. $2n = 14$.

Possibly cultivated in N China as a food plant, in experimental fields, or in fields mixed with other *Triticum* [cultivated or wild in N Africa, SW Asia, and C and SE Europe].

It is not impossible that relict cultivation of *Triticum monococcum* occurs in China, but it is most unlikely and confirming records are needed.

2. *Triticum turgidum* Linnaeus, Sp. Pl. 1: 86. 1753.

圆锥小麦 yuan zhui xiao mai

Culms erect, 60–180 cm tall, 4- or 5-noded, smooth, glabrous. Leaf blade erect or nodding, green or greenish, broadly linear, pubescent or glabrous. Spike simple or branched at base, dense or relatively lax, pubescent or glabrous; rachis tough, margin very slightly ciliate. Spikelets with 2–7 florets (perfect florets 3–5), sometimes densely pubescent at base. Glumes broadly lanceolate or oblong-lanceolate, 10–30 mm, shorter to longer than lemma, herbaceous, submembranous, leathery, or

papery, very prominently keeled, rough or prickly along keel, apex usually long awned, rarely awnless; keel crested, prolonged at apex into triangular, acute tooth. First lemma awn 12–19 cm or longer, stiff to relatively slender; more distal lemmas sometimes with apical point or awnless. Palea shorter than or equaling lemma. Caryopsis usually free from lemma and palea, plump or hard and vitreous. Fl. and fr. Jun–Aug.

Frequently cultivated for food. Beijing, Gansu, Henan, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [cultivated in E and N Africa, C and SW Asia, S Europe, the Mediterranean region, and South America (Argentina)].

- 1a. Glumes 25–30 mm, longer than lemma, herbaceous or submembranous, keeled; spike relatively lax 2c. subsp. *polonicum*
- 1b. Glumes 10–12 mm, shorter than or equaling lemma, papery or leathery, keeled or winged; spike dense, simple or branched at base.
 - 2a. Spike usually branched at base; glumes obviously shorter than lemma, papery, keeled 2a. subsp. *turgidum*
 - 2b. Spike simple, never branched at base; glumes slightly shorter than or equaling lemma, leathery, winged 2b. subsp. *durum*

2a. *Triticum turgidum* subsp. *turgidum*

圆锥小麦(原亚种) yuan zhui xiao mai (yuan ya zhong)

Triticum aestivum Linnaeus subsp. *turgidum* (Linnaeus) Domin; *T. aestivum* var. *turgidum* (Linnaeus) Fiori; *T. compositum* Linnaeus; *T. sativum* Lamarck var. *compositum* (Linnaeus) Alph. Wood; *T. sativum* Lamarck var. *turgidum* (Linnaeus) Hackel; *T. turgidum* var. *compositum* (Linnaeus) Gaudin; *T. vulgare* Villars var. *turgidum* (Linnaeus) Alefeld.

Spike usually branched at base, dense. Glumes obviously shorter than lemma, papery, keeled. Fl. and fr. Jun–Jul. $2n = 28$.

Frequently cultivated for food. Beijing, Gansu, Henan, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan; probably other provinces [cultivated in C and SW Asia and S Europe].

2b. *Triticum turgidum* subsp. *durum* (Desfontaines) Husnot, Graminées, 80. 1899.

硬粒小麦 ying li xiao mai

Triticum durum Desfontaines, Fl. Atlant. 1: 114. 1798; *T. aestivum* subsp. *durum* (Desfontaines) Thellung; *T. aestivum* var. *durum* (Desfontaines) Fiori; *T. pyramidale* Percival; *T. sativum* subsp. *durum* (Desfontaines) K. Richter; *T. turgidum* convar. *durum* (Desfontaines) Bowden; *T. vulgare* var. *durum* (Desfontaines) Alefeld.

Spike simple, never branched at base, dense. Glumes 10–12 mm, slightly shorter than or equaling lemma, leathery, winged. Fl. and fr. Jun–Jul. $2n = 28$.

Frequently cultivated for food in China [cultivated in E Africa, C and SW Asia, S Europe, and the Mediterranean region].

2c. *Triticum turgidum* subsp. *polonicum* (Linnaeus) Thellung, Naturwiss. Wochenschr., n.s., 17: 470. 1918.

波兰小麦 bo lan xiao mai

Triticum polonicum Linnaeus, Sp. Pl., ed. 2, 1: 127. 1762; *Deina polonica* (Linnaeus) Alefeld; *T. aestivum* var. *polonicum* (Linnaeus) L. H. Bailey; *T. petropavlovskiyi* Udachin & Migushova; *T. polonicum* var. *tibeticum* Udachin; *T. turgidum* convar. *polonicum* (Linnaeus) Mackey; *T. turgidum* var. *polonicum* (Linnaeus) Yan ex P. C. Kuo.

Spike relatively lax. Glumes 25–30 mm, longer than lemma, herbaceous or submembranous, keeled. Fl. and fr. Jun–Aug. $2n = 28$.

Frequently cultivated for food in China [cultivated in E and N Africa, C and SW Asia, S Europe, and South America (Argentina)].

3. *Triticum turanicum* Jakubziner, Selektiv. Semenov. (Moscow) 14(5): 46. 1947.

杂生小麦 za sheng xiao mai

Triticum orientale Percival, Wheat Pl. Monogr. 155, 204. 1921, not M. Bieberstein (1808); *T. durum* Desfontaines subsp. *turanicum* (Jakubziner) L. B. Cai; *T. percivalianum* Parodi, nom. illeg. superfl.; *T. turgidum* Linnaeus convar. *turanicum* (Jakubziner) Mackey; *T. turgidum* subsp. *turanicum* (Jakubziner) A. Löve & D. Löve.

Culms 120–130 cm tall; upper internodes solid. Leaf blade nodding, long, puberulent. Spike lax, 9–15 × ca. 1 cm; rachis tough, margin ciliate; internodes 5–6.5 mm. Spikelets 16–20 mm, with 3–5 florets (perfect florets 3 or 4). Glumes narrow, 12–15 × ca. 4 mm, keel distinct, puberulent, apex acute, tooth very short. Lemma awn nearly black, 14–16 mm, scabrous. Palea equaling lemma. Caryopsis usually free from lemma and palea, 10–12 × ca. 3 mm, vitreous. Fl. and fr. Jun–Jul. $2n = 28$.

Usually in fields mixed with other *Triticum*, rarely cultivated for food in China. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia (Iran)].

4. *Triticum aestivum* Linnaeus, Sp. Pl. 1: 85. 1753, nom. cons.

小麦 xiao mai

Culms hollow, 60–130(–150) cm tall, ca. 5-noded; nodes glabrous. Leaf blade flat, 10–24 × 0.4–1.5 cm, usually glabrous. Spike lax or dense, usually narrowed distally, square or sub-square in cross section, 5–18 cm, with up to 29 spikelets; rachis disarticulating or tough and not disarticulating, margin ciliate; internodes 3–4 mm. Spikelets with 4–9 florets (distal florets sterile). Glumes laxly appressed or adnate to floret, ovate or elliptic, sometimes very hard, distinctly or indistinctly to obscurely keeled, pubescent or glabrous; keel sometimes prolonged at apex into shortish tooth; tooth apex subobtusely, acute, or tapering into short awn. Lemma oblong-lanceolate, pubescent or glabrous, awnless to long awned; awn usually divergent. Palea subequaling lemma. Anthers yellow or purplish. Caryopsis usually free from lemma and palea. Fl. and fr. Apr–Aug.

Commonly cultivated, e.g., in fields of *Hordeum* and *Triticum*; below 3500 m. Throughout China [cultivated worldwide].

- 1a. Glumes obscurely keeled proximally, indistinctly so distally; spike rachis usually tough and not disarticulating 4a. subsp. *aestivum*
 1b. Glumes distinctly keeled; spike rachis disarticulating.
 2a. Glumes adnate to floret, very hard 4b. subsp. *yunnanense*
 2b. Glumes laxly appressed to floret 4c. subsp. *tibeticum*

4a. *Triticum aestivum* subsp. *aestivum*

小麦(原亚种) xiao mai (yuan ya zhong)

Triticum aestivum var. *hybernum* (Linnaeus) Fiori, nom. rej.; *T. compactum* Host; *T. hybernum* Linnaeus, nom. rej.; *T. sativum* Lamarck, nom. illeg. superfl.; *T. sativum* var. *aestivum* (Linnaeus) Alph. Wood; *T. sativum* var. *vulgare* Hackel, nom. illeg. superfl.; *T. segetale* Salisbury, nom. illeg. superfl.; *T. vulgare* Villars (1787), nom. illeg. superfl., not (Linnaeus) Salisbury (1796); *T. vulgare* var. *aestivum* (Linnaeus) Spenner; *Zeia vulgaris* Lunell, nom. illeg. superfl.; *Z. vulgaris* var. *aestiva* (Linnaeus) Lunell.

Spike rachis usually tough and not disarticulating. Glumes obscurely keeled proximally, indistinctly so distally; keel prolonged at apex into shortish tooth; tooth apex subobtusely, acute, or tapering into short awn. Fl. and fr. Jun–Aug. $2n = 42^*$.

Commonly cultivated throughout China [cultivated worldwide].

4b. *Triticum aestivum* subsp. *yunnanense* King ex S. L. Chen, Novon 7: 230. 1997.

云南小麦 yun nan xiao mai

Spike rachis easily disarticulating. Glumes adnate to floret, very hard, distinctly keeled. Fl. and fr. Apr–Aug. $2n = 42^*$.

• Cultivated for food in SW Yunnan; 1500–3000 m.

4c. *Triticum aestivum* subsp. *tibeticum* J. Z. Shao, Acta Genet. Sin. 7(2): 155. 1980.

西藏小麦 xi zang xiao mai

Spike rachis disarticulating. Glumes laxly appressed to floret, distinctly keeled. $2n = 42^*$.

• Fields of *Hordeum* and *Triticum*; 1700–3500 m. Xizang.

110. AEGILOPS Linnaeus, Sp. Pl. 2: 1050. 1753.

山羊草属 shan yang cao shu

Aegilops subg. *Gastropyrum* Jaubert & Spach; *Gastropyrum* (Jaubert & Spach) Á. Löve; *Patropyrum* Á. Löve.

Plants annual. Culms usually erect. Leaf sheath split almost to base; auricles crescent-shaped; leaf blade usually flat. Spike cylindric, lanceolate, or ovoid, dense; rachis disarticulating below each spikelet into segments. Spikelets 1 per node, sessile and fitting into rachis, cylindric or turgid, with 2–8 florets; rachilla not jointed, shortly pilose. Glumes rounded abaxially, leathery or cartilaginous, many veined, not keeled, apex truncate or toothed; teeth usually prolonged into longish awns. Lemma oblong or lanceolate, rounded abaxially, leathery-membranous to leathery, 5–7-veined, not keeled, apex usually 1–3-toothed or -awned; callus very short, obtuse. Palea equaling or subequaling lemma, ciliate along keels. Caryopsis free or adherent to lemma and palea, oblong-ovate, furrowed, apex hairy. $x = 7$.

About 21 species; mainly in the Mediterranean region, extending into N Africa and eastward to C Asia; one species in China.

In addition, the following mainly Mediterranean species have been recorded as cultivated in China (FRPS 9(3): 39–43. 1987): *Aegilops biuncialis* Visiani, *A. cylindrica* Host, *Aegilops ovata* Linnaeus, *A. triaristata* Willdenow, *A. triuncialis* Linnaeus, *A. umbellulata* Zhukovsky, and *A. ventricosa* Tausch. It is not clear in which sense the ambiguous name *A. ovata* was used: that of *A. geniculata* Roth, which has been its traditional application, or that of *A. neglecta* Reuquen ex Bertoloni, where its lectotype illustration is said to belong.

1. *Aegilops tauschii* Cosson, Notes Pl. Crit. 69. 1850.

山羊草 shan yang cao

Patropyrum tauschii (Cosson) Á. Löve; *Triticum tauschii* (Cosson) Schmalhausen.

Culms 20–40 cm tall. Leaf sheath glabrous but margin ciliate; ligule 0.5–1 mm, membranous; leaf blade 4–6 × ca. 0.3 cm, scabrous, adaxial surface pilose. Spike cylindric, with (5–) 7–10(–13) spikelets. Spikelets cylindric, ca. 9 mm, with 3 or

4(or 5) florets. Glumes 4–6 mm, leathery, 7–9(–10)-veined, apex truncate or slightly toothed. Lemma lanceolate, 5-veined; first lemma ca. 7 mm; awn 1–4 cm. Palea equaling lemma. Fl. and fr. May–Jun. $2n = 14$.

Stony slopes, fields of *Triticum*, weedy places. Henan, Shaanxi, Xinjiang [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; SW Asia].

The name *Aegilops squarrosa* Linnaeus has been misapplied to this species by some authors.

16. Tribe CENTOTHECEAE

假淡竹叶族 jia dan zhu ye zu

Liu Liang (刘亮); Sylvia M. Phillips

Annuals or perennials. Leaf blades broad with cross veins and sometimes a pseudopetiole; ligule a short scarious rim, sometimes ciliate. Inflorescence a panicle or composed of racemes. Spikelets all alike, laterally compressed, florets 1 to many, upper

florets \pm reduced, disarticulating below each floret or falling entire; glumes herbaceous, shorter than lemmas, 3–7-veined, apex usually entire; lemmas herbaceous, similar to glumes, 5–9-veined, awnless or shortly awned from apex. Caryopsis ellipsoid or trigonous. $x = 12$.

Ten genera and ca. 30 species: mainly in the tropics, in shady places; two genera and three species in China.

- 1a. Lemmas awnless; spikelets breaking up above glumes 111. *Centotheca*
 1b. Lemmas awned; spikelets falling entire 112. *Lophatherum*

111. CENTOTHECA Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 189. 1810 [“*Centosteca*”], nom. et orth. cons.

假淡竹叶属 *jia dan zhu ye shu*

Annual or perennial. Leaf blades broadly linear to lanceolate, narrowed at base. Inflorescence a panicle or the primary branches reduced to racemes. Spikelets breaking up above glumes, florets 1–4, rachilla extension usually bearing a rudimentary floret, upper florets decreasing in size and often with reflexed bristles; glumes unequal, separated by a short internode, 3–5-veined, dorsally keeled, apex acute or acuminate; lemmas dorsally rounded, 5–7-veined, apex acute or apiculate; palea narrower, equal to or shorter than its lemma, keels ciliate or glabrous. Stamens 2 or 3.

Three or four species: W Africa, tropical Asia, Australia (Queensland), Pacific islands; one species in China.

1. *Centotheca lappacea* (Linnaeus) Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 189. 1810.

假淡竹叶 *jia dan zhu ye*

Cenchrus lappaceus Linnaeus, Sp. Pl., ed. 2, 2: 1488. 1763; *Centotheca lappacea* subsp. *inermis* (Rendle) T. Koyama; *C. lappacea* var. *inermis* Rendle; *C. lappacea* var. *longilamina* (Ohwi) Bor; *C. latifolia* Trinius, nom. illeg. superfl.; *C. longilamina* Ohwi; *Festuca latifolia* Roth (1821), not Candolle (1813); *Holcus latifolius* Osbeck; *Melica lappacea* (Linnaeus) Raspail; *Poa latifolia* G. Forster; *Uniola lappacea* (Linnaeus) Trinius.

Perennial from a knotty base. Culms solitary or loosely tufted, erect, smooth, 40–100 cm tall, 4–7-noded. Leaf sheaths smooth or ciliate along one margin; leaf blades broadly lanceolate, 5–15 \times 1–2.5 cm, abaxial surface glabrous with cross veins, adaxial surface glabrous or loosely hispidulous, apex long-attenuate; ligule 1–1.5 mm. Panicle open, 12–25 cm, primary branches up to 15 cm, the spikelets clustered around them; pedicels 2.5–3 mm, slender, pubescent. Spikelets ca. 5 mm, florets 2–3; glumes 3–5-veined; lower glume 2–2.5 mm, acute; upper glume 3–3.5 mm, mucronate; lowest lemma ca. 4 mm, 7-

veined, glabrous, apex apiculate; second and third lemmas 3–3.5 mm, coarsely setose with tubercle-based, reflexing bristles near upper margins; paleas firm, ciliate along keels. Caryopsis ellipsoid, 1–1.2 mm. Fl. and fr. Jun–Oct. $2n = 24$.

Forest margins, shady roadsides and other moist shady places. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; W tropical Africa, Australia (Queensland), Pacific Islands (Polynesia)].

This is an excellent fodder grass. The stiff bristles on the spikelets, which reflex at maturity, aid dispersal by catching in the fur of passing animals.

In 1820 Trinius published the name *Centotheca latifolia*, but not as a new combination based on *Holcus latifolius* Osbeck (1757), which should have been the basionym as the earliest legitimate name for the species, but as a replacement name for *Cenchrus lappaceus* Linnaeus (1763). The well-known combination *Centotheca latifolia* is therefore illegitimate, because it was nomenclaturally superfluous when published, and the epithet of *H. latifolius* cannot be transferred to *Centotheca* without creating a later homonym, which would be illegitimate. The earliest legitimate name with an epithet available in *Centotheca* is *Cenchrus lappaceus*, and hence Desvaux's combination is the correct name for this species.

112. LOPHATHERUM Brongniart in Duperrey, Voy. Monde 2: 49. 1831.

淡竹叶属 *dan zhu ye shu*

Perennials with spindle-shaped root tubers. Culms unbranched. Leaf blades all cauline, narrowly lanceolate, strongly many-veined with obvious cross veinlets, pseudopetiolate. Inflorescence of loose or dense unilateral racemes spaced on a central axis. Spikelets falling entire, floret 1, rachilla extension bearing a bunch of up to 9 smaller sterile lemmas, cross veinlets evident on glumes and lemmas; glumes unequal, 5–7-veined, apex obtuse; fertile lemma 7-veined, all lemmas with a retrorsely scaberulous awn, those of the sterile lemmas developing into a fan of recurved hooks at maturity. Stamens 2 or 3.

Two species: warm-temperate and tropical Asia: two species in China.

- 1a. Spikelets narrowly lanceolate, subterete, 1.5–2.5 mm broad, patent at maturity; lowest lemma with straight back 1. *L. gracile*
 1b. Spikelets ovate, lightly flattened, 3–4 mm broad, imbricate at maturity; lowest lemma with gibbous back 2. *L. sinense*

1. *Lophatherum gracile* Brongniart in Duperrey, Voy. Monde 2: 50. 1831.

淡竹叶 *dan zhu ye*

Acroelytrum japonicum Steudel; *Lophatherum annulatum* Franchet & Savatier; *L. elatum* Zollinger & Moritzi; *L. gracile* var. *elatum* (Zollinger & Moritzi) Hackel; *L. gracile* var. *pilosulum* (Steudel) Hackel; *L. humile* Miquel; *L. japonicum* (Steu-

del) Steudel; *L. lehmannii* Nees ex Steudel; *L. multiflorum* Steudel; *L. pilosulum* Steudel; *L. zeylanicum* J. D. Hooker.

Culms tufted from a knotty rootstock, slender, stiffly erect, 60–150 cm tall. Leaf sheaths glabrous or pilose; leaf blades lanceolate, 5–30 × 2–5 cm, glabrous or with long hairs on both surfaces, base rounded to a 8–12 mm pseudopetiole; ligule brown, hispid on backside. Inflorescence 10–25 cm; racemes few, 5–10 cm, loosely spiculate, erect at first with appressed spikelets, later obliquely spreading and spikelets patent; pedicels short, thick. Spikelets narrowly lanceolate, subterete, 7–12 mm, base glabrous or hairy; glumes ovate, rounded on back, subleathery with membranous margins; lower glume 3–4.5 mm, 5-veined, glabrous or stiffly hairy near margins and apex; upper glume ca. 5 mm, 5–7-veined, glabrous; lemma of fertile floret oblong with straight back, not keeled, 6–7 mm; palea lanceolate, hyaline; awn of fertile and sterile lemmas 1.5–2 mm. Fl. and fr. Jun–Sep. $2n = 48^*$.

Shady slopes, roadsides and in moist forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, S Korea, Malaysia, Myanmar, Nepal, New Guinea, Philippines,

Sri Lanka, Thailand, Vietnam; Australia (Queensland), Pacific Islands (Polynesia)].

This species is used for medicinal purposes. The leaves are reminiscent of those of bamboos. The barbed awns catch in the fur of passing animals, effecting dispersal of the spikelet.

2. *Lophatherum sinense* Rendle, J. Linn. Soc., Bot. 36: 421. 1904.

中华淡竹叶 zhong hua dan zhu ye

Culms tufted, stiffly erect, up to 110 cm tall. Leaf sheaths usually glabrous; leaf blades lanceolate, 15–20 × 3–5 cm, base rounded to a pseudopetiole; ligule very small. Inflorescence 15–25 cm, racemes few, distant, up to 5 cm, closely spiculate with subsessile imbricate spikelets. Spikelets obliquely ovate, flattened, 7–10 mm; glumes broadly ovate, weakly keeled, 5(–7)-veined; lower glume ca. 4 mm; upper glume ca. 5 mm; lemma of fertile floret broadly ovate with gibbous back, keeled, ca. 6 mm, palea shorter than lemma; awn of fertile and sterile lemmas ca. 1 mm. Fl. and fr. Aug–Oct. $2n = 48^*$.

Shady hillsides by streams. Hunan, Jiangsu, Jiangxi, Zhejiang [Japan, S Korea].

This species is very similar to *Lophatherum gracile* vegetatively, but has different spikelets.

17. Tribe THYSANOLAENEAE

粽叶芦族 zong ye lu zu

Liu Liang (刘亮); Sylvia M. Phillips

Perennials. Culms tufted, tall, bamboolike, solid. Leaf blades broad, flat, many-veined, cross veinlets present, base rounded, contracted to sheath, apex acuminate; ligule scarious. Inflorescence a large panicle, the numerous tiny spikelets on branchlets contracted around the primary branches, immature at emergence. Spikelets with 2 florets and a rachilla extension, a 3rd reduced floret sometimes present, laterally compressed, falling entire with pedicel attached, subsequently disarticulating between florets; rachilla glabrous, internode very short; glumes much shorter than spikelet, hyaline, 0–1-veined, rounded on back, obtuse; lower lemma barren without palea, oblong-lanceolate, membranous, rounded on back, 1–3-veined, glabrous, narrowly acuminate; upper floret bisexual, becoming firm, its lemma lanceolate, finely 3-veined, ciliate on margins, apex acuminate-rostrate; palea small, hyaline. Stamens 2–3. Caryopsis subglobose, hilum punctiform. $x = 12$.

One species: tropical Asia, including China, Indian Ocean Islands.

113. *THYSANOLAENA* Nees, Edinburgh New Philos. J. 18: 180. 1835.

粽叶芦属 zong ye lu shu

Description and distribution as for tribe.

1. *Thysanolaena latifolia* (Roxburgh ex Hornemann) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 312. 1930.

粽叶芦 zong ye lu

Melica latifolia Roxburgh ex Hornemann, Suppl. Hort. Bot. Hafn. 117. 1819; *Agrostis maxima* Roxburgh; *Thysanolaena maxima* (Roxburgh) O. Kuntze.

Culms 1–3 m tall, hard, unbranched, often arching. Leaf sheaths smooth; leaf blades broadly lanceolate-oblong, leathery, up to 40 × 3–7 cm; ligule truncate, 1–2 mm. Panicle up to 60 cm, open or contracted; main branches 1–3 per node, pilose in axils, bare of spikelets in lower part, lowest branch up to 30 cm; pedicels ca. 2 mm. Spikelets 1.5–1.8 mm; glumes 1/5–1/4 spikelet length, ovate-lanceolate; lower lemma as long as spikelet;

upper lemma slightly shorter than lower lemma, marginal hairs rigid, to 1 mm, spreading at maturity, apex slightly recurved. Anthers brown, 0.5–1 mm. Caryopsis oblong, ca. 0.5 mm. Fl. and fr. summer to autumn. $2n = 24$.

Hillsides and valleys, among rocks, in thickets, forest margins, open grasslands, river banks. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Indian Ocean Islands].

This tall, broad-leaved grass is easily recognized by its large, purplish brown panicle of tiny spikelets, which fall entire with the pedicel attached. It provides a source of fiber, the heads can be used as brooms, and it is also planted as an ornamental.

18. Tribe ARUNDINEAE

芦竹族 lu zhu zu

Liu Liang (刘亮); Sylvia M. Phillips

Perennials, mostly tall reeds, culms hollow. Leaf blades linear or broadly linear; ligule a line of hairs or membranous. Inflorescence an open or contracted panicle, often large and plumose with numerous spikelets. Spikelets laterally compressed, florets 2 to several, fertile with uppermost reduced, or lowest sterile, disarticulating above glumes and between florets, lowest persistent when sterile; floret callus truncate to linear, glabrous, laterally pilose or long-plumose; glumes persistent, variable in length, shorter than lemmas or as long as spikelet, membranous, 1–5-veined, apex acute to acuminate; lemmas narrow, rounded on back, hyaline to chartaceous, 1–7-veined, glabrous or plumose, apex acute or 2-toothed, awnless or a short straight awn arising from apex; palea short or subequaling lemma. Stamens 2 or 3. Caryopsis with hilum short or long-linear. Leaf anatomy non-Kranz; microhairs slender with long, narrow terminal cell. $x = 9$ or 12.

Four genera and ten species: one genus cosmopolitan, otherwise temperate Old World, but widely introduced elsewhere; three genera and six species in China.

The circumscription of this tribe is not yet settled. It is recognized here in the narrow sense, to include the tall, reedlike grasses with unspecialized spikelets, and their near relatives.

- 1a. Plants tufted; leaf blades articulated; culms up to 1 m tall; lemmas glabrous 114. *Molinia*
- 1b. Plants reedlike; leaf blades cauline, persistent; culms up to 6 m tall (if less than 1 m, lemmas plumose).
- 2a. Spikelet hairs arising from lemma back; ligule membranous 115. *Arundo*
- 2b. Spikelet hairs arising from floret callus; ligule ciliate 116. *Phragmites*

114. MOLINIA Schrank, Baier. Fl. 1: 100, 334. 1789.

麦氏草属 mai shi cao shu

Moliniopsis Hayata.

Perennial. Culms tufted, internodes unequal, the lowest short, clavately swollen and persisting for several years. Leaves all in lower part of culm, leaf sheaths longer than internodes; leaf blades linear, articulated with sheath; ligule a line of hairs. Inflorescence an open or contracted panicle. Spikelets weakly laterally compressed, florets 2 to several, disarticulating above glumes and between florets; rachilla internodes slender, usually 1/3–1/2 length of lemma; glumes shorter than lowest lemma, 1–3-veined; floret callus truncate, glabrous or bearded; lemmas papery, 3(–5)-veined, glabrous, apex acute; palea almost as long as lemma, keels ciliate or glabrous.

Two species: one from W Europe to W Siberia, the other in E Asia; one species in China.

The second species in the genus, *Molinia caerulea* (Linnaeus) Moench, differs in its 1-veined glumes, shorter, glabrous callus, and more prominently veined lemmas. Both species are very variable in habit.

1. *Molinia japonica* Hackel, Bull. Herb. Boissier 7: 704. 1899.

拟麦氏草 ni mai shi cao

Molinia hui Pilger; *Moliniopsis hui* (Pilger) Keng; *M. japonica* (Hackel) Hayata.

Shortly rhizomatous perennial. Culms stiffly erect, 60–100 cm tall, 2–5 mm in diam., unbranched. Leaf sheaths usually thinly pilose, a ring of short hairs externally at junction with blade; leaf blades tough, 30–60 cm, 3–14 mm wide, midvein convex on abaxial surface, adaxial surface paler, glabrous or thinly pilose, apex acuminate; ligule 0.5–1 mm. Panicle 15–40 cm, open; primary branches ascending, branched from base,

spikelets loosely appressed to secondary branches. Spikelets 6.5–10 mm, with 3–5 spaced florets, uppermost floret reduced, smooth, glossy; rachilla internodes 1.5–2 mm, puberulous, often with longer hair-tuft at apex; glumes much shorter than lowest lemma, 3-veined; lower glume ovate, 2–4 mm, acute; upper glume elliptic-ovate, 3–5 mm, subacute; callus hairs 1–2 mm; lemmas ovate-oblong, 4–7 mm, inconspicuously 3-veined, subacute; palea ciliate along upper keels. Anthers 2–3 mm. Fl. and fr. Jul–Aug. $2n = 50$.

Moist upland grasslands and moorlands, in the open or in shade; ca. 1500 m. Anhui, Zhejiang [Japan, S Korea, Russia (S Kuril Islands, S Sakhalin)].

115. ARUNDO Linnaeus, Sp. Pl. 1: 81. 1753.

芦竹属 lu zhu shu

Perennials, usually tall reeds, rhizomatous. Culms usually robust, rarely rather slender, hollow. Leaf blades cauline, broadly linear, tough, flat, base rounded or cordate; ligule membranous with minutely ciliate margin. Inflorescence a large, copiously branched, plumose panicle of numerous spikelets. Spikelets wedge-shaped, laterally compressed, florets 2–5, disarticulating above

glumes and between florets; rachilla internodes glabrous; glumes subequal, narrow, as long as spikelet, membranous, 3–5-veined; floret callus laterally pilose; lemmas narrow, membranous, rounded on back, 3–7-veined, plumose below middle with spreading silky-white hairs, tapering to an entire or bidentate apex tipped by a straight awnlet; palea 1/2–2/3 length of lemma body, keels glabrous or shortly ciliate. $x = 12$.

Three species: Mediterranean region to China; two species in China.

- 1a. Culms 2–6 m tall; lemmas 8–11 mm, hairs 5–6 mm 1. *A. donax*
 1b. Culms 0.6–1.2 m tall; lemmas 3.5–6 mm, hairs 1.5–3 mm 2. *A. formosana*

1. *Arundo donax* Linnaeus, Sp. Pl. 1: 81. 1753.

芦竹 lu zhu

Aira bengalensis (Retzius) J. F. Gmelin; *Amphidonax bengalensis* (Retzius) Nees ex Steudel (1854), not Roxburgh ex Nees (1836); *Arundo bengalensis* Retzius; *A. coleotricha* (Hackel) Honda; *A. donax* var. *coleotricha* Hackel; *Donax arundinaceus* P. Beauvois; *D. bengalensis* (Retzius) P. Beauvois; *Scolochloa donax* (Linnaeus) Gaudin.

Robust reed from a thick knotty rhizome. Culms very stout, erect, 2–6 m tall, 1–1.5 cm in diam., unbranched or with bamboolike clusters of slender branches from nodes. Leaf sheaths longer than internodes, usually glabrous except long pilose at mouth; leaf blades 30–60 × 2–5 cm, margins scabrous, tapering to a slender filiform apex; ligule 0.7–1.5 mm. Panicle 30–60 cm, dense, usually purplish; branches 10–25 cm, ascending. Spikelets 10–15 mm, florets 2–5; glumes narrowly lanceolate, 8–12 mm, 3–5-veined, lower glume acute, upper glume sharply acuminate; lemmas linear-lanceolate, 8–11 mm, 3–7-veined, dorsal hairs 5–6 mm, apex minutely bidentate with 1–2 mm awnlet from sinus, lateral veins also shortly extended; palea 1/2 length of lemma body. Fl. and fr. Oct–Dec.

River banks and other damp places, but it will also grow when planted in dryish habitats. Fujian, Guangdong, Guizhou, Hainan, Hunan, Jiangsu, Sichuan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, Cambodia, India, Indonesia, Japan, Kazakhstan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam; N Africa, C and SW Asia, S Europe; widely introduced elsewhere].

Forms with variegated leaf blades are sometimes cultivated in gar-

dens, e.g., var. *versicolor* (Miller) Stokes (*Arundo versicolor* Miller), with longitudinally green- and white-striped leaf blades. *Arundo donax* var. *coleotricha* refers to a wild variant with pubescent leaf sheaths.

The culms have many uses, including light construction, basket making, matting, musical pipes, and ornaments.

2. *Arundo formosana* Hackel, Bull. Herb. Boissier 7: 724. 1899.

台湾芦竹 tai wan lu zhu

Arundo formosana var. *gracilis* Hackel; *A. formosana* var. *robusta* Conert; *A. parviflora* Ohwi.

Tufted perennial from a short rhizome. Culms relatively slender, suberect to pendant, 0.6–1.2 m tall, 2–6 mm in diam., with slender clusters of branches from nodes. Leaf sheaths longer than internodes, glabrous; leaf blades 10–25 × 0.5–1.5 cm, margins scabrous, basal part with long silky hairs, apex acuminate; ligule 0.5–1 mm. Panicle 10–30 cm, loosely contracted, light brownish; branches 5–8 cm, ascending. Spikelets 6–10 mm, florets 2–5, uppermost floret much reduced; glumes 3–4 mm, 3-veined, lower glume lanceolate-elliptic, acuminate, upper glume lanceolate, acuminate; lemmas narrowly lanceolate, 3.5–6 mm, 5-veined, dorsal hairs 1.5–3 mm, apex subentire to minutely bidentate with 1.5–3 mm awn from sinus, lateral veins shortly extended or not; palea 2/3 length of lemma body. Fl. and fr. Jun–Dec.

Dry coastal grassland and sea cliffs. Taiwan [Japan (Iriomote Island in S Ryukyu Islands), Philippines].

The culms are used for basket making.

116. PHRAGMITES Adanson, Fam. Pl. 2: 34, 559. 1763.

芦苇属 lu wei shu

Perennial reeds, rhizomatous. Culms tall, erect, leafy, hollow. Leaf blades all cauline, broadly linear, base rounded, deciduous; ligule membranous with ciliate margin. Inflorescence a large, plumose, copiously branched panicle with numerous, crowded, silky-hairy spikelets. Spikelets laterally compressed, with several loosely arranged florets, lowest floret masculine or empty, resembling glumes but longer, persistent, succeeding florets bisexual, rachilla disarticulating between bisexual florets; glumes shorter than lemmas, unequal, papery, 3–5-veined; floret callus linear, silky-plumose with long spreading hairs; lemmas of bisexual florets very narrow, hyaline, 1–3-veined, glabrous, entire, long caudate; palea short, hyaline. Stamens 2 or 3.

Four or five species: cosmopolitan; three species in China.

This is a genus of tall, aquatic or semiaquatic reeds found in nearly all parts of the world. The species are very variable, closely related, and distinctly separated. Liu (*Phragmites* Resources, 1989) recognized five varieties in *Phragmites japonicus*, five varieties in *P. karka*, and 74 varieties in *P. australis*!

Arundo and *Neyraudia* have a similarly tall, reedy habit and plumose panicle, but both differ from *Phragmites* in the spikelet hairs arising on the lemmas and not on the floret callus. *Neyraudia* is further distinguished by its solid culms. *Arundo* generally has broader leaves cordate at the junction with the sheath.

Phragmites reeds provide a source of fiber, the rhizomes have medicinal uses, and the plants also aid soil retention. Reed beds can also be used for the purification of water.

- 1a. Lower glume 1/2–3/5 length of lowest lemma; stolons bent zigzag, nodes hirsute 1. *P. japonicus*
 1b. Lower glume up to 1/2 length of lowest lemma; stolons if present straight, nodes glabrous.
 2a. Spikelets 10–18 mm; upper glume 6–9 mm; panicle branches usually spiculate to base; culms up to 2 m tall ... 2. *P. australis*
 2b. Spikelets 8–10 mm; upper glume 3.5–5 mm; panicle branches often bare around lowermost node; culms
 4–6 m tall 3. *P. karka*

1. *Phragmites japonicus* Steudel, Syn. Pl. Glumac. 1: 196. 1854.

日本苇 *ri ben wei*

Phragmites japonicus var. *prostratus* (Makino) L. Liu; *P. prostratus* Makino; *P. serotinus* Komarov.

Perennial with underground rhizomes and long overground stolons; stolons bent zigzag, nodes hirsute. Culms up to 2 m tall, 4–5 mm in diam., nodes pubescent. Leaf sheaths tinged purple upward; leaf blades 10–30 × 2–3 cm, margins scabrous, apex acuminate; ligule 0.2–0.6 mm, ciliolate, hairs ca. 0.1 mm. Panicle 20–30 × 5–8 cm; axis puberulous; pedicels 6–7 mm, pilose, hairs soft, up to 2 mm. Spikelets purplish, 8–12 mm, florets 3–4; glumes acute, lower glume 1/2–3/5 length of lowest lemma, ca. 5 mm, upper glume ca. 5.5 mm; lowest lemma linear-lanceolate, 6–10 mm; floret callus bare in lower 1/3, upper 2/3 with silky hairs 3/4 length of lemma; bisexual lemmas very narrowly lanceolate, 6–9 mm, apex acuminate. $2n = 48$.

Swamps and lakesides; 200–1000 m. Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia (Far East, Kuril Islands)].

2. *Phragmites australis* (Cavanilles) Trinius ex Steudel, Nomencl. Bot., ed. 2, 1: 143. 1840.

芦苇 *lu wei*

Arundo australis Cavanilles, Anales Hist. Nat. 1: 100. 1799; *A. phragmites* Linnaeus; *Phragmites communis* Trinius.

Robust perennial from an extensive creeping rhizome; overground stolons sometimes present, straight, nodes glabrous. Culms up to 2 m or more tall, ca. 6 mm in diam., usually farinose below nodes, nodes glabrous or pubescent. Leaf sheaths light green, glabrous or thinly hairy; leaf blades usually drooping, up to 50 × 1–3 cm, smooth or margins scabrous, tapering to a filiform apex; ligule a minute membranous rim, ciliate, hairs 0.2–0.6 mm. Panicle 20–50 × ca. 10 cm, branches of lowermost whorl usually spiculate to base, densely hirsute at insertion; pedicels 2–4 mm, glabrous or pilose only at base. Spikelets 10–18 mm, florets 2–5; glumes acute, lower glume up to 1/2 length of lowest lemma, 3–5 mm, upper glume 6–9 mm; lowest lemma linear-lanceolate, 8–15 mm; floret callus with hairs equal to lemma; bisexual lemmas very narrowly lanceolate, 9–16 mm,

apex long attenuate. Fl. and fr. Jul–Nov. $2n = 36, 44, 46, 48, 49, 50, 51, 52, 54, 84, 96, 120$.

Moist places along river banks and lake margins, forming large colonies. Throughout China [cosmopolitan].

This is an extremely polymorphic, cosmopolitan reed with numerous chromosomal variants and ecotypes. Plants from the high Himalayas sometimes form short, leafy tufts with strongly distichous, short, pungent leaf blades. Similar variants occur elsewhere in the world in extreme conditions.

3. *Phragmites karka* (Retzius) Trinius ex Steudel, Nomencl. Bot., ed. 2, 1: 144. 1840.

卡开芦 *ka kai lu*

Arundo karka Retzius, Observ. Bot. 4: 21. 1786; *A. roxburghii* Kunth; *Phragmites cinctus* (J. D. Hooker) B. S. Sun; *P. roxburghii* (Kunth) Steudel; *Trichoon roxburghii* (Kunth) Wight.

Robust perennial from an extensive creeping rhizome. Culms very stout, often woody, 4–6 m tall, 1.5–2.5 cm in diam. Leaf sheaths greenish, glabrous; leaf blades erect-ascending, up to 80 × 2–3 cm, abaxial surface scabrous, apex stiff, long acuminate; ligule 0.5–1 mm, ciliolate. Panicle 30–50 × 10–20 cm; branches of lowermost whorl bare of spikelets toward base, ± glabrous at insertion. Spikelets 10–12 mm, florets 4–6; glumes lanceolate-elliptic, obtuse to acuminate, lower glume up to 1/2 length of lowest lemma, 2.5–4 mm, upper glume 3.5–5 mm; lowest lemma narrowly elliptic, 7–12 mm; floret callus with hairs 4–8 mm; bisexual lemmas linear-lanceolate, 8.5–10 mm, apex long attenuate. Fl. and fr. autumn. $2n = 24, 36, 38, 48$.

Warm swampy valleys and river banks; under 1000 m. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, N Australia, Pacific Islands].

This is a very robust species found in warm parts of the Old World. It has stiffer, more scabrous leaf blades and smaller spikelets with shorter callus hairs than *Phragmites australis*.

The name "*Arundo vallatoria* Linnaeus" (Herb. Amboin. 15. 1754) belongs here, but was not validly published (see Art. 34 Ex. 2 of the Saint Louis Code), and hence neither was the combination "*Phragmites vallatoria* (Linnaeus) Veldkamp" (Blumea 37: 233. 1992).

19. Tribe DANTHONIEAE

扁芒草族 *bian mang cao zu*

Wu Zhenlan (吴珍兰), Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial or rarely annual, occasionally forming tall tussocks, culms usually solid. Leaf blades linear to setaceous; ligule a line of hairs (*Elytrophorus* membranous). Inflorescence an open or contracted panicle, sometimes spikelike or scanty and racemelike. Spikelets alike (except *Cortaderia*, *Elytrophorus*), laterally compressed, fertile florets several, uppermost florets reduced, disarticulating between florets; floret callus usually bearded, short and obtuse or elongate; glumes persistent (except *Schimus*), variable in length, shorter than lemmas to as long as spikelet, usually membranous, 1–9-veined, apex acute to acuminate; lemmas rounded on back, hyaline to leathery, glabrous, pilose or villous, hairs sometimes in tufts, (1–)3–11-veined, apex entire or 2-lobed, awnless or a

straight or geniculate awn with flat twisted column arising from apex or sinus, lobes often extended into bristles; palea well developed. Stamens (1–)3. Caryopsis usually ellipsoid, hilum short or long-linear. Leaf anatomy non-Kranz; microhairs slender, the apical cell \pm as long as basal cell (replaced by long slender papillae in *Cortaderia*). $x = 9$ or 12 .

Between 18 and 25 genera and ca. 300 species: tropical and temperate regions, mainly in S hemisphere, especially South Africa and Australia; four genera (one introduced) and six species (one introduced) in China.

- 1a. Tussock grass up to 3 m; leaf blade margins sharply serrulate; plants gynodioecious 117. *Cortaderia*
 1b. Tufted grasses up to 50 cm; leaf blade margins smooth or scabrous; plants bisexual.
 2a. Spikelets in dense globose clusters along a long unbranched axis; lemmas 1–3-veined 118. *Elytrophorus*
 2b. Spikelets in a loose or contracted panicle; lemmas 5- or more-veined.
 3a. Perennial; lemmas with conspicuous geniculate awn 119. *Danthonia*
 3b. Annual; lemmas awnless or mucronate 120. *Schismus*

117. CORTADERIA Stapf, Gard. Chron., ser. 3, 22: 378. 1897, nom. cons.

蒲苇属 pu wei shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Moorea Lemaire, nom. rej.

Perennial, tussock-forming, gynodioecious (bisexual and female plants). Culms often tall. Leaf blades mainly basal, linear, flat or convolute; ligule a line of hairs. Inflorescence a large plumose panicle. Spikelets laterally compressed, with 2 to several florets, disarticulating above glumes and between florets; rachilla villous; glumes longer than lowest lemma, sometimes as long as spikelet, narrow, membranous, 1-veined; floret callus linear, hairy; lemmas lanceolate to ovate, hyaline, 3–7-veined, villous on back, entire or 2-dentate, awnless or with a terminal awn; palea glabrous or sometimes pilose; female plants with sterile anthers present. Lodicules hairy.

Twenty-seven species: mainly South America, also New Zealand and New Guinea; one species (introduced) in China.

1. *Cortaderia selloana* (Schultes & J. H. Schultes) Ascherson & Graebner, Syn. Mitteleur. Fl. 2: 325. 1900.

蒲苇 pu wei

Arundo selloana Schultes & J. H. Schultes, Mant. 3: 605. 1827.

Perennial forming large tussocks. Culms robust, 2–3 m tall. Leaf blades stiff, 50–200 cm, 4–10 mm wide, glaucous, margins sharply serrulate, apex acuminate; ligule 2–4 mm. Panicle 30–100 cm, silvery or sometimes pinkish; branches erecto-

patent in bisexual, patent in female plants. Spikelets dimorphic, florets 2–5; glumes linear or lanceolate, acuminate; lemmas 3-veined, gradually tapering to an entire apex continuing into a slender awn. Female spikelets: glumes 8–9 mm; lemmas 8–14 mm, densely silky villous; palea 2.5–3 mm; minute staminodes present. Male spikelets: glumes 9–18 mm; lemmas 11–17 mm, sparsely pilose; palea 4–6 mm.

Cultivated. Jiangsu, Taiwan, Zhejiang [native to South America].

This species is widely cultivated as an ornamental (Pampas Grass). The sharply serrulate leaf margins cut skin very easily.

118. ELYTROPHORUS P. Beauvois, Ess. Agrostogr. 67. 1812.

总苞草属 zong bao cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual. Leaf blades linear, flat; ligule membranous. Inflorescence composed of dense globular spikelet clusters, spaced or confluent along an elongate central axis, outer spikelets of each cluster with an enlarged lower glume and the lower or all lemmas empty, forming a chaffy involucre of linear-acuminate scales. Spikelets ovate, strongly laterally compressed, florets several, usually disarticulating above glumes and between florets; glumes slightly shorter than lemmas, subequal, membranous, narrow, 1-veined, acuminate to a short awn-point; lemmas 3-veined, keeled, membranous, shortly ciliate on keel and margins, keel acuminately extended into an awn-point; palea winged on keels. Lodicules 1–2. Stamens 1–3. Caryopsis with embryo 1/2 its length and free pericarp.

Two species: tropical Africa, Australia, India; one species in China.

The relationships of this odd little genus are still unclear. Molecular studies show it is probably more closely related to a group known as the crinipoid *Danthonieae*, from Africa and India, than to *Danthonia* and *Schismus*.

1. *Elytrophorus spicatus* (Willdenow) A. Camus in Lecomte, Fl. Indo-Chine 7: 547. 1923.

总苞草 zong bao cao

Dactylis spicata Willdenow, Ges. Naturf. Freunde Berlin

Neue Schriften 3: 416. 1801; *Elytrophorus articulatus* P. Beauvois; *Sesleria spicata* (Willdenow) Sprengel.

Culms tufted, erect, 10–50 cm tall. Leaf sheaths loose, glabrous; leaf blades up to 25 cm, 2–4 mm wide, often as long as the inflorescence, abaxial surface scabrous, adaxial surface his-

pidulous on veins, pilose near ligule; ligule 0.5–1 mm. Inflorescence 2–30 cm, globular spikelet clusters 3–7 mm in diam., discrete or confluent into a narrow cylinder. Spikelets broadly ovate, ca. 4 mm, florets 3–7; lower glume 1.5–2 mm; upper glume 1.5–2.5 mm; lemmas 2.5–3.5 mm (including awn), extended into an awn of variable length but commonly about as

long as lemma body; palea wings very variable in size and shape, often conspicuous, apex dentate. Anthers 1–3, 0.3–0.5 mm. Fl. and fr. May–Nov.

Wet places, often in rice fields. Hainan, Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; tropical Africa, Australia].

119. DANTHONIA Candolle in Lamarck & Candolle, Fl. Franç., ed. 3, 3: 32. 1805, nom. cons.

扁芒草属 bian mang cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Sieglingia Bernhardt, nom. rej.

Perennial. Culms tufted, erect, cleistogenes often present in culm sheaths. Leaf blades narrow, flat or rolled; ligule a line of hairs. Inflorescence an open or contracted panicle, sometimes reduced to a raceme. Spikelets large, wedge-shaped, laterally compressed, florets several, rachilla disarticulating above glumes and between florets; glumes subequal, as long as spikelet, membranous or papery, (1–)3–9-veined; floret callus short, obtuse; lemmas herbaceous or papery, 7–9-veined, pilose on margins or all over, apex 2-lobed, lobes acute or extended into slender awns; central awn arising from sinus, flat, column short, strongly twisted, bristle straight or sparsely twisted; palea equal to or shorter than its lemma. Lodicules 2, glabrous. Caryopsis with linear hilum up to 2/3 its length.

About 20 species: Asia, Europe, North and South America; two species in China.

Danthonia had a much broader circumscription in the past, including many species now placed in *Rytidosperma*. Species of *Rytidosperma* lack cleistogenes, and also differ from the above description in having lemma hairs in tufts, ciliate lodicules, and a punctiform hilum. Modern molecular studies have shown these two genera belong to different evolutionary lines. It is likely that the Himalayan species will be shown to be members of *Rytidosperma*, but some morphological characters are intermediate and the species have not yet been included in any molecular analysis. Further research is required to clarify their position.

1a. Glumes 10–12 mm, entire; lemma bifid to middle or below, tufts of hair at base of lobes; anthers 1.2–1.5 mm

..... 1. *D. cachemyriana*

1b. Glumes (10–)13–25 mm, denticulate or mucronate; lemma bifid above middle, variably hairy on upper back

and margins, hairs not or indistinctly tufted; anthers 3–5.5 mm 2. *D. cumminsii*

1. *Danthonia cachemyriana* Jaubert & Spach, Ill. Pl. Orient. 4: 46. 1851.

喀什米尔扁芒草 ka shi mi er bian mang cao

Danthonia exilis J. D. Hooker.

Small densely tufted perennial, roots fibrous, basal sheaths soft, gray-brown. Culms up to 25 cm tall, cleistogenes absent. Leaf blades filiform, up to 6 cm, ca. 1 mm wide, glabrous, adaxial surface scabrous. Inflorescence a short contracted panicle or raceme, 2–4 cm; branches and pedicels scaberulous-puberulous. Spikelets with 3–5 florets; glumes 10–12 mm, pale green or purple-tinged, narrowly lanceolate, glabrous, acuminate; callus villous; lemma elliptic, deeply bifid to middle or below, 2.2–2.5 mm (to awn base), 5–7-veined, sparsely to densely pilose on back and tufts of hairs between veins across base of lobes, ciliate on margins, lobes long-acuminate into slender awns; central awn up to 1.5 cm with brown column, awns of lobes 4–5.5 mm. Anthers 1.2–1.5 mm. Lodicules ciliate, hairs ca. 0.5 mm. Caryopsis narrowly obovoid, ca. 1.5 mm; hilum linear-oblong, 2/5 caryopsis length. Fl and fr. Jul–Sep.

Rock crevices; 3800 m. Xizang [E Afghanistan, Kashmir, N Pakistan].

This is a grass of the NW Himalayas from the Hindu Kush to Kashmir.

2. *Danthonia cumminsii* J. D. Hooker, Fl. Brit. India 7: 282. 1896 [“1897”].

扁芒草 bian mang cao

Danthonia cachemyriana Jaubert & Spach var. *minor* J. D. Hooker; *D. schneideri* Pilger; *D. schneideri* var. *minor* (J. D. Hooker) Karthikeyan.

Tussocky perennial from a woody rootstock, basal sheaths leathery, yellowish. Culms 15–60 cm tall, cleistogenes absent. Leaf blades filiform, stiff, up to 35 cm, 1–2 mm wide, glabrous or abaxial surface pubescent. Inflorescence variable, 3–15 cm, a dense, narrow, many-spiculate panicle ranging to a few-spiculate raceme; branches and pedicels puberulous, sometimes a ring of hairs below spikelet. Spikelets with 4(–6) florets spaced on a filiform rachilla; glumes (10–)13–20 mm, gray-green or purple-tinged, elliptic-lanceolate, sometimes thinly hairy, denticulate or mucronate; callus villous; lemma elliptic, bifid above middle, often in upper 1/3, 4.2–8 mm (to awn base), 7–9-veined, thinly hairy on upper margins and across upper back or fringed on margins, hairs sometimes weakly tufted, infrequently short hairs also on lower back or marginal tufts toward base, lobes acuminate into slender awns; central awn 1.5–2.5 cm with dark brown column, awns of lobes 4.5–8 mm. Anthers 2.8–4.5 mm. Lodicules ciliate, hairs ca. 1 mm. Caryopsis narrowly elliptic-oblong, ca. 3 mm; hilum linear, 7/8 caryopsis length. Fl. and fr. May–Oct.

Alpine steppe-meadows, upland forests and stony ground near

streams; 3000–4500 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Nepal, Pakistan].

This is a very variable species, especially in spikelet size and lemma indumentum, but it is not easily divided into infraspecific taxa.

Small-spiculate forms with purple glumes and larger, pallid forms sometimes grow together.

This is an important component of alpine pasture, providing good forage for yaks.

120. *SCHISMUS* P. Beauvois, Ess. Agrostogr. 73. 1812.

齿稃草属 *chi fu cao shu*

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals or short-lived perennials, dwarf, densely tufted. Leaf blades linear, flat or involute; ligule a line of hairs. Inflorescence a contracted or spike-like panicle. Spikelets with several florets, laterally compressed, falling entire, or upper florets disarticulating separately and then lower florets, glumes, and pedicel falling tardily together; glumes as long as spikelet or almost so, subequal, membranous with hyaline margins, lanceolate, prominently 5–7-veined, acute to acuminate; lemmas ovate, rounded on back, membranous, 7–9-veined, pilose on back or margins, emarginate to 2-lobed, mucronate or not; palea equaling or subequaling lemma, hyaline. Lodicules 2, ciliate.

Five species: S Africa, C and SW Asia, Mediterranean region; introduced in America and Australia; two species in China.

- 1a. Apical lobes of lowest lemma narrowly triangular, clearly longer than wide; palea reaching slightly beyond base of lemma sinus, never exceeding middle of lobes 1. *S. arabicus*
 1b. Apical lobes of lowest lemma broadly triangular, not longer than wide; palea reaching at least middle of lobes, often as long as or longer than lemma 2. *S. barbatus*

1. *Schismus arabicus* Nees, Fl. Afr. Austral. Ill. 422. 1841.

齿稃草 *chi fu cao*

Schismus barbatus (Linnaeus) Thellung subsp. *arabicus* (Nees) Maire & Weiller.

Annual. Culms tufted, 5–15 cm tall. Leaf sheaths glabrous; leaf blades up to 10 cm, glabrous or pilose on adaxial surface; ligule 0.5–1 mm. Inflorescence subspicate, 1–4 cm, 5–10 mm wide. Spikelets 5–7 mm, florets 5–8; glumes about as long as spikelet, lanceolate, acuminate, lower glume 4.5–6.5 mm, 5–7-veined, upper glume 5–7 mm, 3–5-veined; lemmas elliptic-ovate, 2.5–4 mm, 7–9-veined, pilose below middle with pointed hairs, deeply 2-lobed, lobes (of lowest lemma) 1–2 mm, narrowly triangular, clearly longer than wide, apex acuminate, with or without mucro from sinus; palea reaching only slightly beyond base of lemma sinus, never exceeding middle of apical lobes. Anthers 0.2–0.4 mm. Fl. and fr. Mar–Jul. $2n = 12$.

Arid open places. Xinjiang, W Xizang [Afghanistan, NW India, Mongolia, Pakistan, Russia (Altai); N Africa, C and SW Asia, SE Europe; introduced in America and Australia].

2. *Schismus barbatus* (Linnaeus) Thellung, Bull. Herb. Boissier, sér. 2, 7: 391. 1907.

髯毛齿稃草 *ran mao chi fu cao*

Festuca barbata Linnaeus, Demonstr. Pl. 3. 1753; *F. minuta* Hoffmann; *Schismus marginatus* J. D. Hooker; *S. minutus* (Hoffmann) Roemer & Schultes.

Annual. Culms tufted, 5–25 cm tall. Leaf sheaths loosely pilose toward ligule; leaf blades 1–5 cm, often pilose on adaxial surface near base; ligule ca. 0.5 mm. Inflorescence subspicate, 1–4 cm, 5–10 mm wide. Spikelets 5–6 mm, florets 5–10; glumes slightly shorter than spikelet, lanceolate, acute, lower glume 4–5 mm, 5–7-veined, upper glume 4–6 mm, 5-veined; lemmas broadly ovate, 1.8–2.5 mm, 9-veined, pilose below middle often with minutely clavate hairs, 2-lobed, lobes (of lowest lemma) 0.2–0.4 mm, broadly triangular, not longer than wide, apex acute, with or without mucro from sinus; palea reaching at least middle of apical lobes, often as long as or longer than lemma. Anthers 0.2–0.4 mm. $2n = 12$.

Dry open places. Xizang [Afghanistan, NW India, Turkmenistan; N and S Africa, C and SW Asia, S Europe; introduced in America and Australia].

20. Tribe ARISTIDEAE

三芒草族 *san mang cao zu*

Chen Shouliang (陈守良), Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials, or occasionally annuals. Leaf blades narrow, often convolute; ligule a line of hairs. Inflorescence a contracted or open panicle. Spikelets all alike, with 1 floret, bisexual without rachilla extension, laterally compressed or terete, disarticulating above glumes; glumes usually longer than floret, persistent, membranous to scarious, 1–5-veined, apex acute to acuminate or mucronate; floret callus pungent to obtuse, bearded; lemma usually terete, cartilaginous becoming indurated at maturity, margins tightly convolute and enclosing the palea, 1–3-veined, veins converging at apex, extending directly into 3 awns, or more often combining into a single 3-branched awn raised upon a twisted column, laterals sometimes reduced or rarely suppressed, awn branches scabrid or all or only the central branch plumose; palea less than 1/2 length of lemma, often obscure, hyaline or membranous. Stamens 3, rarely 1. Caryopsis terete or fusiform, tightly enclosed within toughened lemma, embryo 1/3 its length; hilum linear. Leaf anatomy: either Kranz PS (*Stipagrostis*) or a form of Kranz unique to *Aristida*; microhairs absent or 1-celled, rarely 2-celled. $x = 11, 12$.

Three genera and ca. 350 species: tropical and subtropical regions of the world; two genera and 12 species (six endemic) in China.

This tribe is usually instantly recognizable on account of the 3-branched awn. *Stipagrostis* has sometimes been included in *Aristida*, but besides the obvious awn difference, separation of the two genera is supported by differences in leaf anatomy. In *Stipagrostis* the cells of the outer bundle sheath are larger than the inner, and only the inner contain chloroplasts, whereas in *Aristida* the cells of the outer bundle sheath are smaller, and both sheaths contain chloroplasts. There is also usually a difference in chromosome number: $2n = 22$ in *Aristida* and $2n = 44$ in *Stipagrostis*.

Species of *Aristideae* are mainly found on the poor, stony soils of dry plains and deserts.

- 1a. Branches of the awn scabrid 121. *Aristida*
 1b. Branches of the awn (or at least the central branch) plumose 122. *Stipagrostis*

121. ARISTIDA Linnaeus, Sp. Pl. 1: 82. 1753.

三芒草属 san mang cao shu

Lu Shenglian (卢生莲), Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, less often annuals or suffrutescent. Culms tufted. Leaf blades usually basal, rolled or rarely flat. Inflorescence a narrow or open panicle. Spikelets with 1 floret; glumes scarious, narrow, unequal with the upper usually longer, 1(–3)-veined; floret callus bearded, obtuse to pungent or 2-toothed; lemma narrowly cylindrical or laterally compressed, convolute, glabrous or sparsely hairy; awn 3-branched, branches arising directly from lemma apex or seated on a straight or twisted column, persistent or disarticulating either at base or apex of column (always persistent in China), scabrid. Stamens 3.

About 300 species: widely distributed in tropical and warm-temperate regions of the world; ten species (six endemic) in China.

This genus is found on poor, dry soils in areas of low rainfall, but does not usually penetrate into true desert.

- 1a. Annuals; culms usually branched.
 2a. Lemma 1.7–2 mm; central awn 0.5–0.8 cm 1. *A. cumingiana*
 2b. Lemma 5–11 mm; central awn 1–2.5 cm.
 3a. Glumes subequal or lower glume slightly shorter; lemma distinctly longer than upper glume 2. *A. adscensionis*
 3b. Glumes unequal, lower glume 1/2–2/3 length of upper glume; lemma \pm equal to upper glume 3. *A. depressa*
 1b. Perennials; culms usually unbranched.
 4a. Lower glume longer than upper glume; panicle open, branches divaricate, bearded in axils 4. *A. chinensis*
 4b. Lower glume shorter than upper glume or glumes subequal; panicle narrow, branches erect or ascending, glabrous in axils.
 5a. Column of awn 1–3 mm, twisted; lateral awns 5–10 mm.
 6a. Leaf sheaths and blades glabrous; glumes and lemma smooth (rarely scabrid); anthers 3.5–4 mm 5. *A. tsangpoensis*
 6b. Leaf sheaths and blades with silky hairs; glumes and lemma scabrid or lemma with long soft hairs; anthers 4–4.5 mm 6. *A. scabrescens*
 5b. Column of awn absent or very short and straight; lateral awns reduced, 0.1–3 mm, or up to 6 mm.
 7a. Lateral awns 0.1–0.4 mm 7. *A. brevissima*
 7b. Lateral awns 1.1–6 mm.
 8a. Glumes 7–10 mm, lemma 6.5–8 mm, central awn 4–8 mm.
 9a. Lateral awns 1.1–3 mm; apex of glumes acute, upper mucronate; leaf sheaths smooth 8. *A. trisetata*
 9b. Lateral awns 5–6 mm; apex of glumes obtuse or emarginate; leaf sheaths scaberulous 9. *A. batangensis*
 8b. Glumes 12–13 mm; lemma ca. 9 mm, central awn 8–9 mm 10. *A. alpina*

1. *Aristida cumingiana* Trinius & Ruprecht, Sp. Gram. Stipac. 141. 1842.

黄草毛 huang cao mao

Delicate annual. Culms solitary or tufted, capillary, erect or geniculate at base, 6–20 cm tall, branched. Leaf sheaths smooth, loose, shorter than internodes; leaf blades narrow, involute, 2.5–10 cm, abaxial surface glabrous, adaxial surface hairy, smooth; ligule ca. 0.2 mm. Panicle oblong to ovate in outline, loose, open, 5–10 cm; branches capillary, ascending, inserted 2–3 together along main axis. Spikelets green or purple; glumes unequal, 1-veined, scabrid on vein, apex acuminate-mucronate, lower glume lanceolate, 2–2.5 mm, upper

glume narrowly lanceolate-oblong, 2.8–3.5 mm; callus small, broadly obtuse; lemma 1.7–2 mm, upper part scabrid; awn arising directly from lemma apex, stiffly spreading, central branch 5–8 mm, laterals about half as long. Anthers 0.5–0.6 mm. Fl. and fr. summer and autumn.

Hill slopes, dry grasslands; 200–800 m. Fujian, Guangdong, Hunan, Jiangsu, Yunnan, Zhejiang [India, Indonesia (Celebes), Laos, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam; Africa, N Australia].

This is much the smallest species in China, easily recognized by its delicate habit and very small, often purplish spikelets. It is one of the most widespread species in the genus.

2. *Aristida adscensionis* Linnaeus, Sp. Pl. 1: 82. 1753.

三芒草 san mang cao

Aristida adscensionis var. *vulpioides* (Hance) Hackel ex Henrard; *A. heymannii* Regel; *A. vulgaris* Trinius & Ruprecht; *A. vulpioides* Hance; *Chaetaria adscensionis* (Linnaeus) P. Beauvois.

Annual. Culms tufted, erect or geniculate at base, 15–55 cm tall, branched. Leaf sheaths smooth, glabrous, shorter than internodes, laxly overlapping; leaf blades involute, 3–20 cm, finely pointed; ligule ca. 0.5 mm. Panicle usually narrow, loosely contracted, 4–20 cm; branches short, ascending, inserted singly on main axis. Spikelets gray-green or purplish green; glumes subequal or unequal with upper longer, 1-veined, scabrid on vein, lower glume lanceolate-oblong, 4–6.8 mm, acute, upper glume linear, 5–8 mm, obtuse to emarginate or apiculate; callus ca. 0.5 mm, narrowly obtuse; lemma linear, distinctly longer than upper glume, 7–11 mm, laterally compressed, smooth or rarely scabrid in upper half, keel scabrid upward; awn branches arising directly from lemma apex, central branch 1–2.5 cm, laterals slightly shorter. Anthers 1.8–2 mm. Fl. and fr. Jun–Oct.

Dry mountain slopes, rocky fissures, and along river banks; 200–1800 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan [tropical and warm-temperate regions of the world].

Aristida adscensionis is a widely distributed, variable, annual pioneer of dry, open places, recognized by its long, parallel-sided, flattened lemma often exerted from the glumes. It is used for forage.

3. *Aristida depressa* Retzius, Observ. Bot. 4: 22. 1786.

仪英三芒草 yi ying san mang cao

Aristida vulgaris var. *depressa* (Retzius) Trinius & Ruprecht; *Chaetaria depressa* (Retzius) P. Beauvois.

Annual. Culms slender, erect or geniculate at base, 30–50 cm tall, branched. Leaf sheaths glabrous, shorter than internodes, loose; leaf blades involute, 4–15 cm, abaxial surface smooth, adaxial surface pubescent, apex finely pointed; ligule ca. 0.5 mm. Panicle lax and open or loosely contracted, 7–18 cm; branches filiform, 2–5 cm, ascending or slightly flexuously spreading, inserted singly or in small groups along main axis. Spikelets greenish or stramineous; glumes clearly unequal with upper longer, narrowly lanceolate, 1-veined, lower glume 4–4.7 mm, scabrid on vein and back, acuminate, upper glume 7–8 mm, smooth, emarginate to acute; callus 0.3–0.5 mm, obtuse; lemma linear, about as long as upper glume, 6.5–8 mm, laterally compressed, smooth or punctately scabrid, keel spinulose; awn arising directly from lemma apex, branches subequal, central branch 1.2–1.5 cm, laterals ca. 1 cm. Anthers 1.5–2 mm. Fl. Jul–Sep.

Grassy mountain slopes, river banks and roadsides; 700–1600 m. Sichuan, Yunnan [India, Myanmar, Sri Lanka, Thailand].

This is a variant from the *Aristida adscensionis* gene pool, in which species it is often included.

4. *Aristida chinensis* Munro, Proc. Amer. Acad. Arts 4: 363. 1860.

华三芒草 hua san mang cao

Aristida formosana Honda.

Perennial. Culms densely tufted, erect, wiry, 30–60 cm tall, unbranched. Leaf sheaths smooth, longer than internodes, bearded at mouth; leaf blades involute, filiform, curling when dry, 10–20 cm, abaxial surface smooth, adaxial surface pubescent; ligule ca. 0.2 mm. Panicle ovate in outline, open, 1/2 length of plant or more, 20–30 cm; branches 3–15 cm, divaricate, solitary or in small widely spaced groups along central axis, bearded in axils, strongly scabrid, lower part naked, spikelets clustered distally. Spikelets gray-green or purple; glumes unequal with lower longer, linear-lanceolate, 1–3-veined, acuminate-mucronate, lower glume 8–14 mm, scabrid on vein, upper glume 1/2–2/3 length of lower, smooth; callus ca. 0.5 mm; lemma 5–8 mm, terete, smooth; awn branches arising directly from lemma apex, central branch 1–1.5 cm, laterals slightly shorter or subequal to central branch. Anthers 1–2 mm. Fl. and fr. Apr–Dec.

Grassy hill slopes. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Cambodia, Indonesia (Celebes), Philippines, Thailand, Vietnam].

This is a species of local distribution, easily distinguished by its large, open, scabrid panicle and spikelets with inverted glumes (lower glume longer).

5. *Aristida tsangpoensis* L. Liu, Fl. Xizang. 5: 82. 1987.

藏布三芒草 zang bu san mang cao

Perennial forming tough tussocks; roots sometimes coated in sand. Culms erect or slightly geniculate, 15–40 cm tall, unbranched. Leaf sheaths glabrous, rarely collar with short hairs or sometimes silky hairs at mouth; leaf blades flat or involute, 5–10 cm, abaxial surface smooth, adaxial surface scabrid. Panicle narrow, 5–11 cm; branches 1.5–4 cm, paired, appressed to axis; pedicels often villous below spikelet. Spikelets yellowish green or gray-purple; glumes slightly unequal with upper longer, 1-veined, lower glume narrowly lanceolate-oblong, (7–)9–11 mm, scabrid on vein, subacute, mucronate, upper glume linear-oblong, (9–)11–12 mm, smooth on vein, acute, mucronate; callus ca. 0.5 mm, obtuse; lemma 6–9 mm, streaked gray-purple, smooth or punctately scabrid; awn with 1–2 mm slightly twisted column, central branch 1–1.4 cm, laterals 7–9.7 mm. Anthers 3.5–4 mm. Fl. and fr. Jul–Sep.

● Mountain slope forests, under montane scrub, sandy riversides; 3000–3900 m. Xizang, Yunnan.

6. *Aristida scabrescens* L. Liu, Fl. Xizang. 5: 84. 1987.

糙三芒草 cao san mang cao

Perennial. Culms densely tufted, erect, 15–60 cm tall, unbranched. Leaf sheaths usually shorter than internodes, sparsely silky hairy along margins, sheath-collar ciliate, villous at mouth; leaf blades gray-green, involute, 5–20 cm, abaxial surface smooth, adaxial surface densely pilose with short hairs. Panicle narrowly contracted or lax, 4–16 cm; branches 1–7 cm, capillary, paired, appressed to axis or loosely ascending. Spikelets yellowish green to purplish green; glumes subequal with upper slightly longer, lanceolate, scabrid, apiculate, lower glume 10–

12 mm, upper glume 12–14 mm; callus obtuse; lemma 8–9 mm, punctately scabrid, also with some long soft hairs; awn with 2–3 mm twisted column, central branch ca. 1.5 cm, laterals ca. 1.2 cm. Anthers 4–4.5 mm. Fl. and fr. Jul–Sep.

• Grassy places on mountain slopes, river banks; 3100–4100 m. Xizang.

7. *Aristida brevissima* L. Liu, Fl. Xizang. 5: 80. 1987.

短三芒草 duan san mang cao

Perennial forming small tough tussocks. Culms erect, 15–30 cm tall, unbranched. Leaves mainly basal; leaf sheaths glabrous except for ca. 2 mm hairs at mouth, shorter than internodes, tightly overlapping; leaf blades involute, needle-like, 4–8 cm, abaxial surface smooth, adaxial surface scabrid. Panicle narrow, 7–13 cm; branches short, few-spiculate, paired. Spikelets yellowish green; glumes equal or upper slightly longer, 10–11 mm, narrowly lanceolate, smooth, glabrous, 1-veined; callus ca. 0.6 mm, obtuse; lemma 8–9 mm, streaked blackish, punctately scabrid, awns arising directly from lemma apex, very reduced; central awn ca. 2 mm, lateral awns vestigial, 0.1–0.4 mm. Anthers 3–4 mm. Fl. Aug.

• Mountain slopes; 3000–3100 m. Xizang, Yunnan.

8. *Aristida trisetata* Keng, Sunyatsenia 6: 102. 1941.

三刺草 san ci cao

Perennial forming small tough tussocks, base clothed in old leaf sheaths. Culms erect, 10–40 cm tall, unbranched. Leaves mainly basal; leaf sheaths glabrous, shorter than internodes, laxly overlapping in clusters; leaf blades usually involute, curved, 3.5–15 cm, acute; ligule ca. 2 mm. Panicle linear, 3.5–9 cm; branches short, stiff, few-spiculate, inserted singly, appressed to main axis. Spikelets purple or brown; glumes subequal or slightly unequal with upper longer, 7–10 mm, 1-veined, scabrid on vein, lower glume narrowly lanceolate, subacute, upper glume linear-oblong, acute and mucronate; callus 0.5–0.8 mm, obtuse; lemma 6.5–8 mm, streaked purple-brown, smooth or upper part scabrid, narrowly tapering into apex; awns arising directly from lemma apex; central awn 4–8 mm, lateral awns much reduced, 1.1–3 mm. Anthers 3–4 mm. Fl. and fr. Jul–Sep.

• Forests, under montane scrub, grasslands on steep dry mountainsides; 2400–4700 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

9. *Aristida batangensis* Z. X. Tang & H. X. Liu, J. Sichuan Univ., Nat. Sci. Ed. 29: 423. 1992.

巴塘三芒草 ba tang san mang cao

Perennial forming tough tussocks, old sheaths persistent. Culms erect or base geniculate, 50–70 cm tall, unbranched. Leaf sheaths scaberulous, lower purplish; leaf blades involute, often curved, tough, 3–15 cm, adaxial surface hispidulous; ligule 1–1.5 mm. Panicle linear, sparsely branched; branches short, appressed to main axis. Spikelets hoary green; glumes slightly unequal with upper longer, narrowly lanceolate, lower glume ca. 7 mm, upper glume 8.5–9 mm, 1-veined, smooth, obtuse or emarginate; callus ca. 0.5 mm, obtuse, bearded with 0.2–0.8 mm hairs; lemma cylindrical, awns arising directly from lemma apex; central awn 7–8 mm, lateral awns 5–6 mm. Anthers ca. 3 mm.

• Habitat unknown; 2600–2700 m. W Sichuan (Batang).

10. *Aristida alpina* L. Liu, Fl. Xizang. 5: 82. 1987.

高原三芒草 gao yuan san mang cao

Perennial forming small tough tussocks. Culms erect, 15–25 cm tall, unbranched, upper part dark-gray, terminal node usually included in uppermost leaf sheath. Leaf sheaths glabrous, pilose at mouth (hairs ca. 2 mm), tightly overlapping; leaf blades gray-green, involute or rarely flat, 4–18 cm, abaxial surface smooth, adaxial surface scabrid. Panicle narrow, 4–10 cm; branches 2–5 cm, appressed to main axis. Spikelets dark-purple or brown; glumes subequal with upper slightly longer, 1.2–1.3 cm, lanceolate, 1-veined, scabrid on upper part and vein, apiculate; callus ca. 0.5 mm, bearded with ca. 0.8 mm hairs, obtuse; lemma ca. 9 mm, dark purple, scabrid in upper part, awns arising directly from lemma apex; central awn 8–9 mm, lateral awns 4–6 mm. Anthers ca. 3 mm. Fl. and fr. summer and autumn.

• Dry mountain slopes; ca. 4500 m. Xizang.

This species is very similar to *Aristida trisetata*, but with somewhat larger spikelet parts.

122. *STIPAGROSTIS* Nees, Linnaea 7: 290. 1832.

针禾属 zhen he shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Aristida sect. *Stipagrostis* (Nees) Benth & J. D. Hooker.

Perennial, sometimes suffrutescent, or rarely annual. Culms tufted. Leaf blades mostly rolled, tough, sometimes deciduous from the sheaths. Inflorescence a narrow or open panicle. Spikelets with 1 floret; glumes scarious, unequal or subequal, 1–11-veined; floret callus laterally bearded, pungent; lemma narrowly cylindrical, indurated, glabrous or sparsely hairy; awn 3-branched, articulated at the lemma apex, a twisted column present or not, at least the central awn branch plumose, lateral branches shorter, often capillary. Stamens 3.

About 50 species: Africa to C Asia; two species in China.

This is a genus of grasses adapted to true desert conditions.

- 1a. Spikelets 1.3–1.7 cm; glumes subequal, lower slightly longer; lemma 5–7 mm, apex truncate, ciliolate 1. *S. pennata*
 1b. Spikelets 2.5–3 cm; glumes unequal, lower clearly longer; lemma 8–9 mm, apex slightly 2-lobed, glabrous 2. *S. grandiglumis*

1. *Stipagrostis pennata* (Trinius) De Winter, *Kirkia* 3: 135. 1963.

羽毛针禾 *yu mao zhen he*

Aristida pennata Trinius, *Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad.* 6: 488. 1815; *Aristida pungens* var. *pennata* (Trinius) Trautvetter; *Arthratherum pennatum* (Trinius) Tzvelev.

Perennial with slender rhizomes, roots tomentose. Culms tussocky, 20–60 cm tall, much branched at base. Leaf sheaths smooth or scabrid, longer than internodes; leaf blades involute, 10–30 cm, glaucous, abaxial surface scabrid, adaxial surface puberulent; ligule short, margin with 0.5–1 mm hairs. Panicle lax, open, base usually included in uppermost leaf sheath, 5–20 cm; branches paired, rarely solitary. Spikelets 1.3–1.7 cm, stramineous; glumes narrowly lanceolate, smooth or scabrid, pubescent within, subequal, lower slightly longer than upper, lower glume 3–5-veined, upper glume 3-veined, apex acuminate; callus ca. 1 mm; lemma 5–7 mm, smooth on back, apex truncate, ciliolate; awn with short 0.3–1 mm column, all 3 branches densely plumose throughout, hairs 2–4 mm, central branch 1–1.5 cm, lateral branches a little shorter. Fl. and fr. Jul–Sep.

Fixed dunes; 300–500 m. Xinjiang, Yunnan [Afghanistan, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia (Caucasus, Iran)].

This species provides good fodder when young and is also good for binding sand.

2. *Stipagrostis grandiglumis* (Roshevitz) Tzvelev, *Zlaki SSSR*, 618. 1976.

大颖针禾 *da ying zhen he*

Aristida grandiglumis Roshevitz, *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* 11: 18. 1949.

Perennial, roots tomentose. Culms densely tufted, 30–65 cm tall, branched at base. Leaf sheaths smooth or scabrid, longer than internodes; leaf blades involute, 10–35 cm, abaxial surface smooth, adaxial surface pubescent; ligule short, ciliate. Panicle lax with few spikelets, 15–30 cm; branches capillary, solitary, 3–10 cm. Spikelets 2.5–3 cm, stramineous or yellowish white; glumes narrowly lanceolate, smooth or scabrid, densely pubescent within upward, unequal, lower glume 2.5–3 cm, 5–7-veined, marginal veins obscure, upper glume 2–2.3 cm, 3-veined, apex acuminate; callus 1–1.5 mm; lemma 8–9 mm, apex slightly 2-lobed, glabrous; awn with short ca. 1 mm column, all 3 branches densely plumose throughout, hairs 4–5 mm, central branch ca. 2.5 cm, lateral branches 2–2.2 cm. Fl. and fr. Jun–Sep.

Desert sands, banks of watercourses; 1100–1500 m. Gansu (Dunhuang), S Xinjiang [Mongolia].

21. Tribe PAPPOPHOREAE

冠芒草族 *guan mang cao zu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, often convolute; ligule a line of hairs. Inflorescence a contracted, rather narrow panicle. Spikelets all alike, slightly laterally compressed, with (1 or) 2 to several florets, lower florets bisexual, the upper progressively reduced, disarticulating above glumes but not usually between florets; glumes persistent, membranous, usually enclosing the florets, obviously 1- to many-veined, entire; lemmas broad, rounded on back, 9–11-veined, veins extended into 5–19 awns, sometimes alternating with hyaline lobes; palea broad, subequaling lemma body, keels ciliate. Caryopsis with large embryo and punctiform hilum. Leaf anatomy: Kranz PS type; microhairs slender, bulbous-tipped. $x = 9$ or 10.

Five genera and 41 species: tropics and subtropics extending to temperate E Asia, usually in dry places; one genus and two species in China.

Pappophoreae can be easily recognized by the many-veined, many-awned lemmas on a tough rachilla, with the florets all falling together from the glumes. Anatomically it is related to *Eragrostideae*, but its stalked microhairs, with bulbous glandular tips, are unique.

123. ENNEAPOGON Desvaux ex P. Beauvois, Ess. Agrostogr. 81. 1812.

九顶草属 *jiu ding cao shu*

Perennial or sometimes annual. Culms tufted. Leaf blades usually narrow, often convolute. Panicle contracted, sometimes spikelike or capitate. Spikelets with 2–3(–6) florets, lowermost floret bisexual, second floret smaller, usually staminate, remaining florets reduced to barren lemmas forming a brushlike apical clump; glumes lanceolate, unequal with the upper longer, 1- to several-veined; lemmas papery to leathery, smooth or ribbed, villous below middle, veins extended into 7–9 awns forming a circlet around top of lemma; awns stout and ciliate for much of their length, slender and scaberulous toward tips.

Twenty-eight species: tropics and subtropics, especially Africa and Australia, extending to temperate E Asia; two species in China.

- 1a. Third lemma vestigial, 0.5–3 mm including awns; basal sheaths enclosing cleistogamous spikelets 1. *E. desvauxii*
1b. Third lemma sterile but well developed, 4–10 mm including awns; basal sheaths lacking cleistogamous spikelets .. 2. *E. persicus*

1. *Enneapogon desvauxii* P. Beauvois, Ess. Agrostogr. 82. 1812.

九顶草 *jiu ding cao*

Enneapogon borealis (Grisebach) Honda; *E. brachysta-*

chyus (Jaubert & Spach) Stapf; *E. desvauxii* subsp. *borealis* (Grisebach) Tzvelev; *E. jinjiangensis* B. S. Sun & S. Wang; *Pappophorum boreale* Grisebach; *P. brachystachyum* Jaubert & Spach.

Perennial. Culms densely tufted, wiry, usually geniculate

at base, 5–35 cm tall, pubescent. Basal leaf sheaths tough, whitish, enclosing cleistogamous spikelets, finally becoming fibrous; leaf blades usually involute, filiform, 2–12 cm, 1–3 mm wide, densely pubescent or the abaxial surface with longer white soft hairs, finely acuminate. Panicle gray, dense, spike-like, linear to ovate, 1.5–5 × 0.6–1 cm. Spikelets with 3 florets, 5.5–7 mm; glumes pubescent, 3–9-veined, lower glume 3–3.5 mm, upper glume 4–5 mm; lowest lemma 1.5–2 mm, densely villous; awns 2–4 mm, subequal, ciliate in lower 2/3 of their length; third lemma 0.5–3 mm, reduced to a small tuft of awns. Anthers 0.3–0.6 mm. Fl. and fr. Aug–Nov. $2n = 36$.

Dry hill slopes; 1000–1900 m. Anhui, Hebei, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Yunnan [India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, E Russia; Africa, America, SW Asia].

This species is one of the most widespread in the genus and is the only one to develop cleistogamous spikelets within the basal leaf sheaths. Mature grains can often be found at the base of the plant.

2. *Enneapogon persicus* Boissier, Diagn. Pl. Orient., ser. 1, 5: 71. 1844.

波斯九顶草 *bo si jiu ding cao*

Enneapogon schimperianus (A. Richard) Renvoize; *Pappophorum aucheri* Jaubert & Spach; *P. persicum* (Boissier) Steudel; *P. schimperianum* Hochstetter ex A. Richard; *P. turcomanicum* Trautvetter.

Perennial. Culms compactly tufted, wiry, erect or geniculate, 15–45 cm tall, pubescent especially below nodes. Basal leaf sheaths tough, lacking cleistogamous spikelets, not becoming fibrous; leaf blades usually involute, rarely flat, often diverging at a wide angle from the culm, 3–17 cm, 3–4 mm wide, pubescent, acuminate. Panicle olive-gray or tinged purplish, contracted to spike-like, narrowly oblong, 4–18 × 1–2 cm. Spikelets with 3 or 4 florets, 8–14 mm; glumes puberulous, (5–) 7–9-veined, lower glume 5–10 mm, upper glume 7–11 mm; lowest lemma 2–3.2 mm, shortly villous; awns 4.5–7 mm, unequal with 4 shorter, ciliate in lower 2/3–3/4 of their length; third lemma sterile but well developed, 3–5 mm (including awns); fourth lemma vestigial or absent. Anthers 0.5–1.3 mm. Fl. May. $2n = 20$.

Dry, stony or sandy soils. Xinjiang [Afghanistan, NW India, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; NE Africa, SW Asia].

22. Tribe ERAGROSTIDEAE

画眉草族 *hua mei cao zu*

Chen Shouliang (陈守良), Wu Zhenlan (吴珍兰), Lu Shenglian (卢生莲), Sun Bixing (孙必兴 Sun Bi-sin);
Sylvia M. Phillips, Paul M. Peterson

Annual or perennial. Leaf blades linear to filiform; ligule a line of hairs, infrequently membranous. Inflorescence a panicle or composed of tough unilateral racemes of biseriate spikelets (bottlebrush in *Harpachne*); racemes digitate or scattered along an axis or rarely single, persistent or deciduous. Spikelets usually laterally compressed, with one floret or more usually several to many, the uppermost ± reduced, disarticulating below each floret or sometimes by other abscission modes; glumes mostly persistent, usually 1-veined, membranous and shorter than lowest lemma, rarely longer; floret callus sometimes bearded; lemmas membranous to leathery, 1–3-veined (7–11 in *Aeluropus*), glabrous or hairy, apex entire or 2–3-toothed occasionally with small subsidiary lobes between teeth, mucronate or awned from apex or sinus; palea keels sometimes winged. Stamens 1–3. Fruit sometimes with free pericarp. Leaf anatomy: Kranz PS type; microhairs usually short and stout. $x = 10$, less often 9, 12.

About 80 genera and 1000 species; tropics and subtropics; 17 genera and 92 species (30 endemic, three introduced) in China.

This tribe is characterized by unspecialized spikelets usually with several florets, 3-veined lemmas, and a rather cartilaginous texture, and also by a ciliate ligule, although there are exceptions to all these characters. This contrasts with the 5-veined lemmas and membranous ligule of most *Poeae*, which are often superficially similar, especially when the inflorescence is a panicle. Anatomically the two tribes are quite different.

- 1a. Spikelets with 1 floret.
 - 2a. Ligule membranous; lemma 3-veined, awned; fruit a caryopsis 140. *Muhlenbergia*
 - 2b. Ligule a line of hairs; lemma 1-veined, awnless; fruit with free pericarp.
 - 3a. Inflorescence an open or spike-like panicle, exerted from uppermost leaf sheath 138. *Sporobolus*
 - 3b. Inflorescence a short dense head, subtended by an inflated leaf sheath with rudimentary blade 139. *Crypsis*
- 1b. Spikelets with 2 or more florets.
 - 4a. Lemmas 7–11-veined 124. *Aeluropus*
 - 4b. Lemmas 3-veined (subsidiary veins in keel in *Eleusine*).
 - 5a. Lemmas emarginate or 2-toothed at apex, or if entire marginal veins or flanks hairy.
 - 6a. Cleistogamous spikelets concealed within the upper leaf sheaths 126. *Cleistogenes*
 - 6b. Cleistogamous spikelets absent.
 - 7a. Plants tall, reedlike; inflorescence a large plumose panicle 125. *Neyraudia*
 - 7b. Plants smaller; inflorescence composed of racemes.
 - 8a. Plants with long scaly rhizomes 127. *Orinus*
 - 8b. Plants lacking long scaly rhizomes.
 - 9a. Inflorescence a single terminal raceme 128. *Tripogon*
 - 9b. Inflorescence of 2 to many racemes along a central axis.
 - 10a. Racemes persistent; glumes shorter than lowermost lemma 129. *Leptochloa*

- 10b. Racemes deciduous; glumes as long as the spikelet 130. *Dinebra*
- 5b. Lemmas usually entire at apex, glabrous.
- 11a. Inflorescence a panicle 131. *Eragrostis*
- 11b. Inflorescence of one or more racemes.
- 12a. Inflorescence a single terminal raceme.
- 13a. Spikelets erect; lemmas disarticulating leaving the persistent paleas 132. *Eragrostiella*
- 13b. Spikelets deflexed, falling entire with pedicel attached 133. *Harpachne*
- 12b. Inflorescence of 2 or more racemes.
- 14a. Racemes inserted singly, crowded along an elongate central axis; grain smooth 134. *Desmostachya*
- 14b. Racemes digitate or ± whorled; grain ornamented with a free pericarp.
- 15a. Racemes terminating in a sharp point 135. *Dactyloctenium*
- 15b. Racemes terminating in a fertile or abortive spikelet.
- 16a. Racemes terminating in an abortive spikelet; paleas persistent 136. *Acrachne*
- 16b. Racemes terminating in a fertile spikelet; paleas falling with lemmas 137. *Eleusine*

124. AELUROPUS Trinius, Fund. Agrost. 143. 1820.

獐毛属 zhang mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, tough, stoloniferous or rhizomatous. Leaf blades stiff, rolled, often markedly distichous, pungent; ligule a narrow ciliate membrane. Inflorescence spike-like or capitate, composed of short, erect racemes of sessile, tightly imbricate spikelets appressed to a central axis. Spikelets ovate-lanceolate, laterally compressed, florets several to many, rachilla disarticulating above glumes and between florets; glumes shorter than lemmas, papery with broad scarious margins, lower glume 1–3-veined, upper glume 5–7-veined; lemmas ovate, resembling glumes in texture, strongly 7–11-veined, glabrous or hairy on margins, rounded on back, acute or mucronate; palea keels ciliate or scabrid, apex truncate.

About ten species: Mediterranean region to N China, also in NE tropical Africa, S India, and Sri Lanka; four species (two endemic) in China.

This is a genus of grasses adapted to saline soils in desert regions, where they provide valuable fodder where little else will grow. The tough, widely spreading rhizomes and stolons make them effective soil stabilizers.

All the species listed here are offshoots from the widespread and highly variable species *Aeluropus littoralis* (Gouan) Parlatores, which occurs from Europe to temperate Asia. The most appropriate status for the taxa within this species complex is still uncertain.

- 1a. Racemes congested on inflorescence axis, often not strictly distichous; lemmas usually glabrous.
- 2a. Leaf blades 3–6 mm broad; spikelets 4–6 mm 1. *A. sinensis*
- 2b. Leaf blades 1–2 mm broad; spikelets 2–3 mm 2. *A. micrantherus*
- 1b. Racemes rather spaced on inflorescence axis, strictly distichous; lemmas usually pubescent.
- 3a. Glumes and lemmas ciliate only along middle vein and margins, or glumes glabrous 3. *A. pungens*
- 3b. Glumes and lemmas pubescent or hispidulous throughout 4. *A. pilosus*

1. *Aeluropus sinensis* (Debeaux) Tzvelev, Rast. Tsentr. Azii 4: 128. 1968.

獐毛 zhang mao

Aeluropus littoralis (Gouan) Parlatores var. *sinensis* Debeaux, Actes Soc. Linn. Bordeaux 33: 73. 1879; *A. littoralis* subsp. *sinensis* (Debeaux) Tzvelev.

Culms 15–35 cm tall, 1.5–2 mm in diam., many-noded, nodes ± pubescent. Leaf sheaths glabrous but pilose at mouth and base; leaf blades flat, glabrous, 3–6 × 0.3–0.6 cm; ligule truncate, ca. 0.5 mm. Inflorescence spike-like, 2–5 × 0.5–1.5 cm; racemes congested. Spikelets 4–6 mm, florets 4–6; glumes and lemmas glabrous or scabrid along midvein; lower glume ca. 2 mm; upper glume ca. 3 mm; lowest lemma ca. 3.5 mm. Fl. and fr. summer.

• Maritime or alkaline sand; near sea level to 3000 m. Gansu, Hebei, Henan, Jiangsu, Liaoning, Nei Mongol, Ningxia, Shandong, Shanxi, Xinjiang.

Aeluropus sinensis is rather more robust than typical *A. littoralis* and has a more compact inflorescence.

2. *Aeluropus micrantherus* Tzvelev, Rast. Tsentr. Azii 4: 128. 1968.

微药獐毛 wei yao zhang mao

Aeluropus littoralis (Gouan) Parlatores subsp. *micrantherus* (Tzvelev) Tzvelev; *A. littoralis* var. *micrantherus* (Tzvelev) K. L. Chang.

Culms procumbent or ascending, usually branched at base, 6–30 cm tall. Leaf sheaths glabrous or puberulous, pilose along mouth and margin; leaf blades flat or involute toward apex, 1.5–4.5 × 0.1–0.3 cm, hirtellous on both surfaces; ligule ca. 0.2 mm, usually pilose. Inflorescence spike-like, 2–7 × ca. 0.3 cm; racemes congested. Spikelets ovate, 2–3 mm, florets 2–6; glumes ovate, scabrid along middle vein; lower glume 1–1.2 mm; upper glume 1.5–1.8 mm; lemmas ovate or broadly ovate, lowest 2.5–3.2 mm, 5–9-veined, glabrous throughout or ciliate near lower margins, apex acute or mucronate; palea subequal to lemma. Anthers 0.6–0.8 mm. Fl. and fr. summer.

Water courses, sandy places, desert slopes. Xinjiang [Mongolia].

This species is distinguished from *Aeluropus littoralis* by its smaller anthers (0.6–0.8 mm vs. 1.2–1.6 mm).

3. *Aeluropus pungens* (M. Bieberstein) K. Koch, *Linnaea* 21: 408. 1848.

小獐毛 xiao zhang mao

Culms erect or decumbent, usually branched at base, 5–25 cm tall, scabrid or puberulous below inflorescence. Leaf sheaths glabrous; leaf blades flat or involute, 0.5–6 × ca. 0.15 cm, glabrous or adaxial surface hirsute, abaxial surface pilose; ligule very short, margin ciliate. Inflorescence spike-like, 2–7 × 0.3–0.5 cm; racemes solitary, rather spaced, strictly distichous, spikelets also distichous on the raceme rachis. Spikelets 2–4 mm, florets (2–)4–8; glumes ovate, laxly ciliate or nearly glabrous; lower glume 1–2 mm; upper glume 1.5–2.5 mm; lemmas ovate, lowest 1.5–3 mm, 5–9-veined, margins membranous and ciliate, apex cuspidate; palea equal to lemma, keels ciliate, apex truncate or emarginate. Anthers ca. 1.5 mm. Fl. and fr. May–Aug.

Sandy places on alkaline soils, desert sands. Gansu, Xinjiang [India, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

Aeluropus pungens differs from typical *A. littoralis* by its somewhat shorter lemmas with membranous, ciliate margins.

- 1a. Leaf blades glabrous 3a. var. *pungens*
 1b. Leaf blades densely hirsute on adaxial surface, pilose on abaxial surface 3b. var. *hirtulus*

3a. *Aeluropus pungens* var. *pungens*

小獐毛(原变种) xiao zhang mao (yuan bian zhong)

Poa pungens M. Bieberstein, *Tabl. Prov. Mer. Casp.* 130. 1800; *Aeluropus littoralis* (Gouan) Parlatores subsp. *pungens* (M. Bieberstein) Tzvelev.

Leaf blades glabrous on both surfaces. Fl. and fr. May–Aug.

Sandy places on alkaline soils. Gansu, Xinjiang [India, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; SW Asia, Europe].

3b. *Aeluropus pungens* var. *hirtulus* S. L. Chen & X. Y. Yang, *Bull. Bot. Res.*, Harbin 4: 123. 1984.

刺叶獐毛 ci ye zhang mao

Leaf blades densely hirsute on adaxial surface, pilose on abaxial surface.

• Desert sands. Xinjiang.

4. *Aeluropus pilosus* (H. L. Yang) S. L. Chen & H. L. Yang, *Fl. Reipubl. Popularis Sin.* 10(1): 8. 1990.

毛叶獐毛 mao ye zhang mao

Aeluropus littoralis (Gouan) Parlatores var. *pilosus* H. L. Yang, *Acta Bot. Yunnan.* 5: 74. 1983.

Plants with both long rhizomes and stolons. Culms erect or decumbent, 12–20 cm tall, densely pubescent. Leaf sheaths densely pubescent, longer than internodes; leaf blades flat or involute, 1.5–3.5 × 0.15–0.25 cm, adaxial surface hispid along veins, abaxial surface densely pubescent; ligule ca. 1 mm, margin ciliate. Inflorescence spike-like, 3–4 × 0.25–0.4 cm; racemes solitary, remote, 5–12 mm, spikelets distichous along rachis, rachis hirtellous along edges. Spikelets ovate, 3–4 mm, florets 3–4(–6); glumes ovate or ovate-lanceolate, pubescent, hispid along middle vein, margins ciliate; lower glume 1.2–1.5 mm; upper glume ca. 2 mm; lemmas ovate-oblong to ovate, lowest ca. 2.5 mm, (7–)9-veined, hispidulous throughout, apex cuspidate; palea equal to or slightly longer than lemma, keels hispidulous, apex lacerate. Anthers 1.1–1.5 mm. Fl. Jul.

• Desert sands. Xinjiang.

125. NEYRAUDIA J. D. Hooker, *Fl. Brit. India* 7: 305. 1896 [“1897”].

类芦属 lei lu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, stout. Culms tall, reedlike, solid. Leaf blades cauline, linear, flat, finally deciduous from sheaths; ligule a line of long hairs. Inflorescence a large plumose panicle, primary branches in clusters or solitary on central axis. Spikelets laterally compressed, florets several, all bisexual or lowest sterile and without a palea; rachilla glabrous, disarticulating above glumes and sterile floret (when present) and between fertile florets; glumes lanceolate, shorter than lemmas, subequal or unequal, scarious-membranous, 1–3-veined, obtuse to acuminate or aristulate; lemmas ovate-lanceolate, scarious-membranous, 3-veined, long-ciliate on lateral veins, keeled, apex setaceously bidentate with a short, often recurved awn from the sinus; palea shorter than lemma, hyaline, keels very shortly ciliate. Callus oblong, bearded. Caryopsis narrow, subterete.

Five species: Old World tropics; four species (two endemic) in China.

Although *Neyraudia* has slender, arundinoid microhairs, its other features, including the embryo, are typically eragrostoid.

- 1a. Lowest floret sterile, its lemma glabrous, palea absent.
 2a. Culms 1–3 m tall; florets 4–10; lemmas ca. 4 mm 1. *N. reynaudiana*
 2b. Culms ca. 1 m tall; florets 2–3; lemmas 2–3 mm 2. *N. fanjingshanensis*
 1b. Lowest floret fertile, its lemma ciliate, palea present.
 3a. Basal leaf sheaths glabrous; glumes 2–3 mm 3. *N. arundinacea*
 3b. Basal leaf sheaths densely hairy with brown hairs; glumes 4–5 mm 4. *N. montana*

1. *Neyraudia reynaudiana* (Kunth) Keng ex Hitchcock, Amer. J. Bot. 21: 131. 1934.

类芦 lei lu

Arundo reynaudiana Kunth, Révis. Gramin. 1: 275. 1830; *A. henslowiana* Nees; *A. zollingeri* Buse; *Neyraudia arundinacea* var. *zollingeri* (Buse) Henrard; *N. madagascariensis* (Kunth) J. D. Hooker var. *zollingeri* (Buse) J. D. Hooker; *N. mezii* (Janowsky) Veldkamp; *Thysanolaena mezii* Janowski.

Perennial, robust, caespitose from a short woody scaly rhizome. Culms erect, 1–3 m tall, 3–10 mm in diam., usually fasciculately branched, many-noded, internodes somewhat glaucous, nodes purple. Leaf sheaths glabrous but pilose at mouth; leaf blades flat or involute, 20–70 × 0.4–1 cm, glabrous or adaxial surface pilose, apex long acuminate; ligule 1–2 mm. Panicle ample, loose to dense, glistening, 30–70 cm, branches slender, nodding; pedicels 1–4 mm. Spikelets 6–9 mm, florets 4–10, lowest sterile, resembling glumes but somewhat longer; glumes golden-brown or purplish, glabrous, subequal, 2–3 mm, acute; lemmas purplish, ca. 4 mm, lateral veins ciliate with white, soft, ca. 2 mm hairs, awn recurved, 1–2 mm. Fl. and fr. Aug–Dec.

Stream-sides, hill slopes, rocky places, old walls. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, NE India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

The lower glume lies tight against the lowest sterile lemma and is easily overlooked.

This is an ornamental and soil-retaining grass.

2. *Neyraudia fanjingshanensis* L. Liu, Fl. Reipubl. Popularis Sin. 9(2): 388. 2002.

梵净山类芦 fan jing shan lei lu

Perennial, caespitose from a short woody rhizome. Culms erect, hard, bamboolike, 0.8–1.2 m tall, 2–3 mm in diam., branched, 5–6-noded, internodes floury-white below nodes. Leaf sheaths pilose with long soft hairs at mouth; leaf blades stiff, 10–20 × 0.2–0.4 cm, apex long acuminate. Panicle large, ca. 30 cm; branches slender, up to 20 cm. Spikelets ca. 4 mm, florets 2 or 3, lowest sterile, resembling glumes; lower glume ca. 1.5 mm, upper glume ca. 2 mm; floret callus bearded; lowest lemma ca. 2 mm, glabrous; second lemma ca. 3 mm, lateral veins ciliate with soft, 1–2 mm hairs, margin shortly ciliate; awn recurved, 1–2 mm. Fl. and fr. Aug–Sep.

• Mountain slopes, streams; ca. 900 m. Guizhou (Fanjing Shan).

This species is apparently known only from the type gathering, which has not been seen.

3. *Neyraudia arundinacea* (Linnaeus) Henrard, Meded. Rijks-Herb. 58: 8. 1929.

大类芦 da lei lu

Aristida arundinacea Linnaeus, Mant. 2: 186. 1771.

Perennial, robust, caespitose from a short woody scaly rhizome. Culms erect, 2–4 m tall, up to 10 mm in diam., often fasciculately branched, many-noded, somewhat glaucous. Leaf sheaths glabrous; leaf blades mostly involute, 20–60 × 0.4–1 cm, glabrous, apex filiform; ligule 1–2 mm. Panicle ample, dense, glistening, 30–80 cm, branches slender, nodding; pedicels 1–4 mm. Spikelets 6–9 mm, florets 5–7, all fertile; glumes light brown, glabrous, subequal, 2–3 mm, acute; lemmas pallid or purplish, 3.5–4.5 mm, lateral veins ciliate with white, soft, ca. 2 mm hairs; awn recurved, 1.5–2.5 mm.

Hainan [NW India, Pakistan, Thailand; Africa, Mascarenes].

This species is very similar to *Neyraudia reynaudiana*, but is slightly more robust and with all the florets fertile.

4. *Neyraudia montana* Keng, Sinensia 6: 151. 1935.

山类芦 shan lei lu

Perennial, caespitose from a short woody rhizome clothed in tomentose sheath remnants. Culms erect, up to 1 m tall, 2–3 mm in diam., 4–5-noded. Basal leaf sheaths tomentose with golden brown hairs, upper leaf sheaths glabrous; leaf blades firm, involute, up to 60 × 0.5–0.7 cm, glabrous or adaxial surface pilose, apex long acuminate; ligule ca. 2 mm. Panicle 30–45 cm, open, branches to 15 cm, distant, inserted singly, stiffly divaricate, branchlets and pedicels appressed. Spikelets 7–10 mm, florets 3–6, all fertile; glumes 1-veined, ca. 5 mm, or lower glume ca. 4 mm, apex acuminate or subulate; lemmas 5–6 mm, lateral veins ciliate, awn straight, 0.8–2 mm. Callus hairs ca. 2 mm. Fl. and fr. Aug.

• Mountain slopes, roadsides. Anhui, Fujian, Hubei, Jiangxi, Zhejiang.

Neyraudia montana is distinctive on account of its basal sheaths with brown, velvety hairs and much more open panicle with stiffer branches than in the other species.

126. CLEISTOGENES Keng, Sinensia 5: 147. 1934.

隐子草属 yin zi cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Kengia Packer, nom. illeg. superfl.

Perennial. Culms usually tufted, many-noded. Leaf blades linear or linear-lanceolate, often inrolled when dry, lower blades usually disarticulating from the sheaths; ligule a line of hairs, sometimes on a very short membranous base. Inflorescence of often few-spicate lax racemes spaced along a central axis, or a sparsely branched panicle, spikelets distant or loosely imbricate, shortly pedicellate; axillary cleistogamous spikelets also present concealed within the upper leaf sheaths. Spikelets laterally compressed, florets 1 to several, loosely spaced, rachilla slender, disarticulating above glumes and between florets, rachilla internodes pubescent at apex;

glumes membranous, very unequal with the lower shorter, 1–5(–7)-veined; lemmas narrowly lanceolate to ovate, 3–5(–7)-veined, keeled, usually pubescent near margins, apex narrow, bidenticulate or rarely entire, acute, mucronate or shortly awned; palea keels glabrous or ciliolate. Floret callus shortly bearded. Anthers 3, linear.

About 13 species: S Europe and Turkey eastward through C Asia, Pakistan, and NW India to Japan, concentrated in NE China; ten species (five endemic) in China.

A large proportion of the species comprises plants of semi-arid regions, where they provide useful fodder. The genus is remarkable for the regular formation of cleistogamous spikelets in the axils of the upper leaf sheaths that ensure the production of seed even under unfavorable climatic conditions. These cleistogamous spikelets generally have fewer florets, smaller, hyaline glumes, and narrower lemmas with longer awns than the chasmogamous spikelets.

The glumes are very variable even in the terminal, exserted inflorescences. Those of the lower spikelets, near the inflorescence base, tend to be smaller and fewer nerved than those above. Spikelets near the top of the inflorescence should be inspected. Awn measurements should be taken on the lowest floret of a spikelet near the top.

- 1a. Culms forming dense tussocks, fasciculately branched; uppermost internode elongate, serpentine when dry 1. *C. squarrosa*
- 1b. Culms solitary or tufted, unbranched or simply branched; uppermost internode not obviously longer than the rest, straight.
 - 2a. Lemmas awnless or shortly mucronate; mucro less than 0.5 mm.
 - 3a. Lemmas ovate, 3–4.5 mm; panicle branches spreading; culm bases slightly swollen with whitish old sheaths 2. *C. songorica*
 - 3b. Lemmas lanceolate, 4–6 mm; panicle branches laxly ascending; culm bases slender, old sheath remnants in dense clusters.
 - 4a. Lowest lemma 5–7 mm; leaf blades ascending, uppermost not noticeably shorter 3. *C. ramiflora*
 - 4b. Lowest lemma 4–5.5 mm; leaf blades patent, uppermost much shorter than blades at culm center 4. *C. mucronata*
 - 2b. Lemmas awned; awn 0.5–9 mm.
 - 5a. Leaf blades narrowly linear, 1–2(–2.7) mm wide; culms 0.5–1.5 mm in diam.
 - 6a. Glumes acuminate, lower glume 1.4–4.3 mm, 1(–3)-veined; awn 0.8–2.5 mm 5. *C. festuacea*
 - 6b. Glumes obtuse to acute, lower glume 0.8–2 mm, 0–1-veined; awn 0.5–1 mm 6. *C. caespitosa*
 - 5b. Leaf blades linear to narrowly lanceolate, 2–9 mm wide; culms 1–2.5 mm in diam.
 - 7a. Panicle contracted, base included in uppermost leaf sheath; glumes 3–7-veined.
 - 8a. Leaf sheaths glabrous; basal scaly buds present 7. *C. kitagawae*
 - 8b. Leaf sheaths tuberculate-hispid; basal scaly buds absent 8. *C. polyphylla*
 - 7b. Panicle open, exserted from uppermost leaf sheath (if shortly included, glumes not 3–7-veined).
 - 9a. Lower glume 0–1-veined, often obtuse; awn 2–9 mm; lowest branch of panicle up to 4 cm, simple 9. *C. hackelii*
 - 9b. Lower glume 1–3-veined, acuminate; awn 1–2 mm; lowest branch of panicle up to 8 cm, often with branchlets 10. *C. hancei*

1. *Cleistogenes squarrosa* (Trinius) Keng, Sinensia 5: 156. 1934.

糙隐子草 *cao yin zi cao*

Molinia squarrosa Trinius in Ledebour, Fl. Altaic. 1: 105. 1829; *Cleistogenes andropogonoides* Honda; *C. squarrosa* var. *longearistata* (Rendle) Keng; *Diplachne squarrosa* (Trinius) Maximowicz; *D. squarrosa* var. *longearistata* Rendle; *Kengia andropogonoides* (Honda) Packer; *K. squarrosa* (Trinius) Packer.

Culms densely tufted, forming low tussocks, lacking basal scaly buds, 10–30 cm tall, 0.5–0.8 mm in diam. at base, lower internodes much shorter than their leaf sheaths, upper internodes elongate, serpentine when dry. Leaf sheaths glabrous, the lower imbricate in fascicles; leaf blades narrowly linear, erect, flat or involute, 3–6 × 0.1–0.2 cm, scabrid, apex filiform; ligule ca. 0.2 mm. Panicle depauperate, 4–7 cm, scarcely exceeding leaves, composed of few spikelets borne directly on the central axis or lowermost on patent 2–3-spiculate branchlets. Spikelets 5–10 mm, green or purplish green, florets 2–4; glumes narrowly lanceolate, subacute to acuminate-aristulate; lower glume 1–2.4 mm, 1-veined; upper glume 3–5 mm, 1(–3)-veined; lemmas lanceolate, lowest 5–6 mm, pilose near margins, minutely 2-

toothed; awn 2.5–7 mm; palea keels scabrid, extended into 2 mucros to 0.7 mm. Anthers ca. 2.5 mm. Fl. and fr. Jul–Sep.

Grasslands, mountain slopes, dry sandy and stony places. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [Kazakhstan, Mongolia, Russia; SW Asia (Caucasus)].

This distinctive species of arid places is recognized by its low mounds of dense foliage, few-flowered panicles of awned spikelets, and the curling, elongate upper internodes of the dried culm.

This is an excellent forage grass.

2. *Cleistogenes songorica* (Roshevitz) Ohwi, J. Jap. Bot. 18: 540. 1942.

无芒隐子草 *wu mang yin zi cao*

Diplachne songorica Roshevitz, Fl. URSS. 2: 752. 1934; *Cleistogenes mutica* Keng; *Kengia mutica* (Keng) Packer; *K. songorica* (Roshevitz) Packer.

Culms compactly tufted with tomentose roots, bases slightly swollen and clothed in pale papery old sheaths, lacking basal scaly buds, erect or ascending, 15–35(–50) cm tall, ca. 1

mm in diam., unbranched, leafy to base. Leaf sheaths longer than internodes, glabrous but pilose at mouth; leaf blades linear, grayish green, tough, flat or slightly involute, stiffly patent, 2–6 × 0.15–0.25 cm, glabrous, acute; ligule ca. 0.5 mm. Panicle open, 2–5 cm, exserted or not from uppermost leaf sheath; branches pilose in the axils, usually widely spreading, racemose, lowest branch 2–3.5 cm. Spikelets 4–8 mm, green or purple, florets 3–6; glumes lanceolate, 1-veined, acute; lower glume 2–3 mm; upper glume 3–4 mm; lemmas ovate, lowest 3–4.5 mm, pilose on lower flanks and back, apex entire, acute or with mucro less than 0.5 mm; palea keels ciliate. Anthers 1–2 mm. Fl. and fr. Jul–Sep.

Dry, sandy, or stony open grasslands, deserts. Gansu, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan].

This species of desert steppe is recognized by its dense tufts of gray-green leaves, and awnless, often purple spikelets with broader lemmas than the other species of the genus. The name *Cleistogenes thordii* (*Orinus thordii* in this account) has been misapplied to *C. songorica* in C Asian literature.

This is an excellent forage grass.

3. *Cleistogenes ramiflora* Keng & C. P. Wang, Bull. Bot. Res., Harbin 6(1): 175. 1986.

枝花隐子草 zhi hua yin zi cao

Kengia ramiflora (Keng & C. P. Wang) H. Yu & N. X. Zhao.

Culms tufted, erect or slightly decumbent at base, 25–35 cm tall. Leaf sheaths glabrous but pilose at mouth; leaf blades narrowly linear, flat or involute, ascending, 3–10 × ca. 0.2 cm; ligule short. Panicle narrow, 5–9 cm, lowest branch 2–4 cm. Spikelets 7–9 mm, florets 3–4; glumes lanceolate, 1-veined; lower glume 2–4 mm; upper glume 4–5 mm; lemmas lanceolate, purplish at margin and apex, lowest 5–6(–7) mm, acute or with a mucro to 0.5 mm; palea slightly shorter than lemma. Anthers ca. 3 mm. Fl. and fr. Jul–Sep.

• Mountain meadows, thickets. Nei Mongol.

No material of this species has been seen. The description is taken from the protologue. The spikelets are very similar to those of *Cleistogenes mucronata*, but the habit is different, as shown in the illustration accompanying the protologue, with softly ascending leaf blades of more or less equal length throughout.

4. *Cleistogenes mucronata* Keng ex P. C. Keng & L. Liu, Acta Bot. Sin. 9: 70. 1960.

小尖隐子草 xiao jian yin zi cao

Cleistogenes gracilis Keng ex P. C. Keng & L. Liu; *Kengia gracilis* (Keng ex P. C. Keng & L. Liu) Packer; *K. mucronata* (Keng ex P. C. Keng & L. Liu) Packer.

Culms densely tufted, clothed at base in old sheath remnants, lacking basal scaly buds, erect, wiry, 30–60 cm tall, 0.5–0.8 mm in diam., unbranched. Leaf sheaths longer than internodes, glabrous but pilose at mouth; leaf blades stiff, patent, longest at culm center, here 3–7 × 0.1–0.2 cm, uppermost 1–2 cm, glabrous, adaxial surface and margins scabrid, abaxial sur-

face smooth, lower blades disarticulating; ligule 0.2–0.3 mm. Panicle open, 5–12 cm, exserted from uppermost leaf sheath; branches laxly ascending or spreading, racemose or lower branches with branchlets, lowest branch 4–8 cm. Spikelets oblong, (6–)8–14 mm, yellowish brown or purplish green, florets 3–8; glumes lanceolate, acute; lower glume 1.6–3.5 mm, 1(–3)-veined; upper glume 3.5–4.5 mm, 1–3-veined; lemmas lanceolate, lowest 4–5 mm, loosely pilose near margins; mucro 0.1–0.2 mm; palea keels ciliate. Anthers 2–3 mm. Fl. and fr. Jul–Sep.

• Rocky hills, mountain slopes. Gansu, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi.

This is a densely tufted, wiry species with clumps of old sheaths at the base, numerous stiff, patent, narrow leaf blades, the uppermost very short, and exserted, flexuose panicles of spikelets with relatively short, inconspicuously mucronate lemmas. It is close to *Cleistogenes festuacea* and perhaps intergrades with that species through forms with slightly longer lemmas and awnlets.

5. *Cleistogenes festuacea* Honda, Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 98. 1936.

薄鞘隐子草 bao qiao yin zi cao

Cleistogenes foliosa Keng; *C. kitagawae* Honda var. *foliosa* (Keng) S. L. Chen & C. P. Wang; *C. striata* Honda; *Kengia festuacea* (Honda) Packer; *K. foliosa* (Keng) Packer; *K. kitagawae* (Honda) Packer var. *foliosa* (Keng) H. Yu & N. X. Zhao; *C. longiflora* Keng ex P. C. Keng & L. Liu.

Culms densely tufted, base with old sheath remnants, lacking basal scaly buds, erect, wiry, 30–45 cm tall, 0.5–0.8 mm in diam., unbranched. Leaf sheaths longer than internodes, glabrous but pilose at mouth; leaf blades flat or involute when dry, ascending to stiffly spreading, 4.5–7 × 0.12–0.2(–0.27) cm, scaberrulous especially toward the subulate-involute apex, lower blades disarticulating; ligule ca. 0.5 mm. Panicle lax, slightly flexuose, 7–10 cm, usually shortly exserted from uppermost leaf sheath; branches mostly narrowly ascending, few-spiculate, simple, lowest branch 3–5 cm. Spikelets 6–9 mm, pale green or purple-tinged, florets 2–5; glumes narrowly lanceolate, 1–3(–5)-veined, acuminate; lower glume 1.4–4.3 mm; upper glume (2.5–)3.5–5.7 mm; lemmas narrowly lanceolate, lowest (4.5–)5–6.5 mm, thinly pilose near margins; awn (0.2–)1–2(–2.5) mm; palea keels ciliate. Anthers 2.2–2.5 mm. Fl. and fr. Aug–Oct.

• Gansu, Hebei, Nei Mongol, Ningxia, Shandong, Shanxi.

This species has a characteristic, densely tufted habit with very slender, wiry culms, narrow, spreading leaf blades and a loose, rather flexuose panicle. However, the spikelet parts are variable, which has led to the application of several different species names. The glumes are usually acuminate and 1-veined or faintly 2- or 3-veined. The name *Cleistogenes striata* was given to an unusually strongly veined variant with up to 5 prominent veins in the glumes and 7 veins in the lemmas. The length of the lemmas and awns is also variable, sometimes even within a single panicle.

6. *Cleistogenes caespitosa* Keng, Sinensia 5: 154. 1934.

丛生隐子草 cong sheng yin zi cao

Kengia caespitosa (Keng) Packer.

Culms densely tufted, base thickened by clustered old leaf sheaths, lacking basal scaly buds, 30–40 cm tall, 0.8–0.9 mm in diam., unbranched. Leaf sheaths longer than the internodes, glabrous but pilose at mouth; leaf blades flat or involute toward apex, stiffly spreading, $3-7.5 \times 0.2-0.4$ cm; ligule ca. 0.5 mm. Panicle open, lax, 4–6 cm; branches spreading at maturity, simple or lowest with branchlets, lowest branch 1–3 cm. Spikelets 5–12 mm, florets (1–)3–6; glumes ovate-lanceolate, obtuse; lower glume 0.8–2 mm, 0–1-veined; upper glume 1.5–3.5 mm, 1–3-veined; lemmas lanceolate, lowest 4–5.5 mm, pilose near margins; awn 0.4–1 mm; palea keels scabrid. Anthers ca. 3 mm. Fl. and fr. Jul–Oct.

• Dry hill slopes, forest margins. Gansu, Hebei, Henan, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi.

This is a variant from the *Cleistogenes festucea* gene pool with unusually short, obtuse glumes.

7. *Cleistogenes kitagawae* Honda, Rep. First Sci. Exped. Manchoukuo, Sect. IV, 4: 99. 1936.

凌源隐子草 *ling yuan yin zi cao*

Kengia kitagawae (Honda) Packer.

Culms densely tufted with small scaly buds at base, erect, ca. 50 cm tall, 1–1.5 mm in diam. Leaf sheaths longer than internodes, lower clustered, glabrous but pilose at mouth; leaf blades linear or linear-lanceolate, usually involute, stiffly spreading, $5-7(-9) \times 0.2-0.4$ cm; ligule 0.2–0.3 mm. Panicle contracted, 5–8 cm, base included in uppermost sheath; branches narrowly ascending, simple, compactly spiculate, lowest branch (2–)3–4.5 cm. Spikelets 7–9 mm, florets 2–5; glumes narrowly lanceolate-oblong, acuminate; lower glume 2.8–4 mm, 3-veined; upper glume 4.2–5.5 mm, 3–5-veined; lemmas lanceolate-oblong, lowest 5–5.3 mm, glabrous or sparsely pilose near margins and toward base; awn 0.5–1 mm; palea keels scabrid.

Mountain slopes, forest margins. Hebei, Liaoning [Mongolia, Russia (Far East)].

Cleistogenes hackelii (Honda) Honda var. *brachyphylla* Ohwi (J. Jap. Bot. 18: 540. 1942; *Kengia hackelii* (Honda) Packer var. *brachyphylla* (Ohwi) H. Yu & N. X. Zhao), described from Hebei, may belong here. The type has not been seen.

8. *Cleistogenes polyphylla* Keng ex P. C. Keng & L. Liu, Acta Bot. Sin. 9: 69. 1960.

多叶隐子草 *duo ye yin zi cao*

Cleistogenes hancei Keng var. *jeholensis* (Honda) Kitagawa; *C. serotina* (Linnaeus) Keng var. *jeholensis* Honda; *Kengia hancei* (Keng) Packer var. *jeholensis* (Kitagawa) H. Yu & N. X. Zhao; *K. polyphylla* (Keng ex P. C. Keng & L. Liu) Packer.

Culms loosely tufted from a knotty base with old sheath remnants, lacking basal scaly buds, erect, slender to moderately stout, 25–90 cm tall, 0.8–1.5 mm in diam., many-noded, sometimes branching. Leaf sheaths longer than internodes, tuberculate-hispid (especially the lower), older lower sheaths with disarticulated blades, glabrescent and spotted with tubercles; leaf blades lanceolate or linear-lanceolate, stiffly erect or becoming divaricate, flat with involute apex, $2-10 \times (0.2-0.3-0.6$

cm; ligule ca. 0.5 mm. Panicle contracted, 4–8.5 cm, base included in uppermost sheath; branches glabrous in the axils, simple, lowest branch 2–2.5 cm. Spikelets 8–13 mm, green or purple, florets 4–9; glumes lanceolate or oblong; lower glume 1.5–3.5(–4) mm, 1–3(–5)-veined; upper glume 3–5 mm, 3–5-veined; lemmas lanceolate, lowest 4–5.5 mm, loosely pilose near margins and base, emarginate; awn 0.5–1.8 mm; palea keels scabrid. Anthers ca. 2 mm. Fl. and fr. Jul–Oct.

• Dry mountain slopes, along banks of streams. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi.

The habit is distinctive, with many nodes obscured by the overlapping leaf sheaths, broad, often erect leaf blades, and a contracted inflorescence with the base included in the uppermost sheath. The tubercles on the lower leaf sheaths are often purple colored and obvious. Robust specimens are similar to *Cleistogenes hackelii* var. *nakaii*, but that taxon has scaly basal buds, longer internodes with the nodes often exposed, and glabrous leaf sheaths.

This is a good mountain forage grass.

9. *Cleistogenes hackelii* (Honda) Honda, Bot. Mag. (Tokyo) 50: 437. 1936.

朝阳隐子草 *chao yang yin zi cao*

Culms loosely tufted from a knotty base with scaly buds, erect, very slender to moderately stout, 30–90 cm tall, 0.5–1.5 mm in diam., often branched above base, internodes often purple. Leaf sheaths mostly shorter than internodes, pilose above middle with tubercle-based hairs or glabrous; leaf blades linear-lanceolate, thin, flat, patent, $3-15 \times 0.3-1$ cm, glabrous or thinly pilose, acute; ligule 0.3–0.5 mm. Panicle open, exserted, 4–10 cm; branches few, laxly spreading, lowest branch 2–5 cm. Spikelets 5–9 mm, florets 2–5; glumes lanceolate or lanceolate-ovate; lower glume 0.5–3 mm, 0–1-veined, obtuse to acute; upper glume wide, 1–4.7 mm, 1–3-veined (or terminal spikelet 3–5-veined), narrowly obtuse to acute; lemmas lanceolate, lowest 4–6 mm, usually with dark transverse blotches, pilose along lower margins and keel, emarginate; awn 2–9 mm; palea keels scabrid. Fl. and fr. Jul–Nov. $2n = 40$.

Hill slopes in forests, along forest margins. Anhui, Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea].

This is a rather tall species with a sparse panicle, found in shady places. The spikelets are distinguished by the small, hyaline glumes and relatively long awns, although awn length is very variable. The scaly basal buds are an obvious feature. Japanese specimens (var. *hackelii*) are relatively uniform, but in China the species is much more variable and often slightly more robust with thicker culms and larger leaf blades (var. *nakaii*). It forms part of an intergrading complex with *Cleistogenes hancei*, which has a larger, open panicle, often with secondary branching, and spikelets with longer, acuminate glumes and shorter awns.

- 1a. Leaf blades $3.5-9 \times 0.3-0.6$ mm; leaf sheaths often tuberculate-hispid; lowest lemma 4–5.4 mm; upper glume 2.2–3.5 mm, 1-veined 9a. var. *hackelii*
- 1b. Leaf blades $6.5-12 \times 0.4-0.8$ mm; leaf sheaths usually glabrous; lowest lemma

5.4–6 mm; upper glume 3–4.7 mm,
1–3-veined 9b. var. *nakaii*

9a. *Cleistogenes hackelii* var. *hackelii*

朝阳隐子草(原变种) *chao yang yin zi cao* (yuan bian zhong)

Diplachne hackelii Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 112. 1930; *Cleistogenes caespitosa* Keng var. *ramosa* F. Z. Li & C. K. Ni; *C. chinensis* (Maximowicz) Keng; *C. hackelii* var. *chinensis* (Maximowicz) Ohwi; *C. serotina* (Linnaeus) Keng var. *aristata* (Hackel) Keng; *C. serotina* var. *chinensis* (Maximowicz) Handel-Mazzetti; *Diplachne serotina* (Linnaeus) Link var. *aristata* Hackel; *D. serotina* var. *chinensis* Maximowicz; *Kengia caespitosa* (Keng) Packer var. *ramosa* (F. Z. Li & C. K. Ni) H. Yu & N. X. Zhao; *K. chinensis* (Maximowicz) Packer; *K. hackelii* (Honda) Packer.

Leaf sheaths often tuberculate-hispid; leaf blades 3.5–9 × 0.3–0.6 mm. Culms 0.6–1.2 mm in diam. Lower glume 1–2 mm, 0–1-veined; upper glume 2.2–3.5 mm, 1-veined; lowest lemma 4–5.4 mm. Fl. and fr. Jul–Nov. $2n = 40$.

Hill slopes in forests, along forest margins. Anhui, Fujian, Gansu, Guizhou, Hebei, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan [Japan, Korea].

In Japan the leaf sheaths are always conspicuously tuberculate-hispid; the older, lower sheaths with disarticulated blades are glabrescent and spotted with tubercles.

9b. *Cleistogenes hackelii* var. *nakaii* (Keng) Ohwi, Bot. Mag. (Tokyo) 55: 309. 1941.

宽叶隐子草 *kuan ye yin zi cao*

Cleistogenes serotina var. *nakaii* Keng, Sinensia 5: 151. 1934, based on *Diplachne latifolia* Nakai, Bot. Mag. (Tokyo) 35: 139. 1921, not (Grisebach) Hackel (1902); *C. nakaii* (Keng) Honda; *Kengia hackelii* subsp. *nakaii* (Keng) T. Koyama; *K. hackelii* var. *nakaii* (Keng) H. Yu & N. X. Zhao; *Kengia nakaii* (Keng) Packer.

Leaf sheaths usually glabrous; leaf blades 6.5–12 × 0.4–0.8 mm. Culms 0.9–1.5 mm in diam. Lower glume 2–3.6 mm, 1(–3)-veined; upper glume 3–4.7 mm, 1–3-veined; lowest lemma 5.4–6 mm. Fl. and fr. Jul–Oct.

Hill slopes in forests, along forest margins. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Zhejiang [Korea].

This is a good forage and sand-binding grass.

Cleistogenes ramiflora Keng & C. P. Wang var. *tianmushanensis*

F. Z. Li & C. K. Ni (Bull. Bot. Res., Harbin 15: 436. 1995; *Kengia ramiflora* (Keng & C. P. Wang) H. Yu & N. X. Zhao var. *tianmushanensis* (F. Z. Li & C. K. Ni) H. Yu & N. X. Zhao) is based on a specimen from Zhejiang (Tianmu Shan). It appears to match *C. hackelii* var. *nakaii*, the only *Cleistogenes* species known from Zhejiang, except for its awnless lemmas. The type has not been seen.

10. *Cleistogenes hancei* Keng, Sinensia 11: 408. 1940.

北京隐子草 *bei jing yin zi cao*

Diplachne sinensis Hance, J. Bot. 8: 76. 1870, not *Cleistogenes chinensis* (Maximowicz) Keng (1934); *C. hancei* var. *jeholensis* (Honda) Kitagawa; *C. nakaii* (Keng) Honda var. *purpurascens* Honda; *C. serotina* (Linnaeus) Keng var. *jeholensis* Honda; *C. serotina* var. *sinensis* (Hance) Keng; *C. serotina* var. *vivipara* Honda; *Kengia hancei* (Keng) Packer; *K. serotina* (Linnaeus) Packer var. *vivipara* (Honda) H. Yu & N. X. Zhao.

Culms loosely tufted from a knotty base with scaly buds, erect, 50–100 cm tall, 1–2 mm in diam., usually unbranched, internodes often purple. Leaf sheaths longer or slightly shorter than internodes, usually glabrous, rarely sparsely pilose with tubercle-based hairs, older lower sheaths with disarticulated blades; leaf blades linear, flat, stiffly divaricate to patent, 6–15 × 0.4–0.9 cm, scabrid on both surfaces, sharply acuminate; ligule ca. 0.5 mm. Panicle open, exserted, (6–)10–15 cm; branches widely spreading, clothed in loosely imbricate spikelets, lower branches often with branchlets, lowest 3–8 cm. Spikelets 8–14 mm, green or purplish, florets (3–)5–10; glumes lanceolate, acuminate; lower glume 2–4.2 mm, 1–3-veined; upper glume 3.5–5.7 mm, (1–)3–7-veined; lemmas lanceolate, lowest 5.5–6.5 mm, usually with dark transverse blotches, thinly pilose along lower margins or subglabrous, emarginate; awn (0.6–)1–2(–3) mm; palea keels scabrid. Fl. and fr. Jul–Nov.

Mountain slopes, roadsides, forest margins. Anhui, Fujian, Hebei, Henan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi [Russia (Far East)].

This species is one of the largest in the genus, with relatively robust culms, long, broad leaf blades, and an open inflorescence, often with secondary branching. The spikelets typically have multiveined, acuminate glumes, long lemmas, and short awns, but there is much variation and the species is difficult to separate from *Cleistogenes hackelii* var. *nakaii*.

The epithet of *Diplachne sinensis* cannot be used in *Cleistogenes* because the heterotypic name *C. chinensis* already exists. The epithets “*sinensis*” and “*chinensis*” form homonyms when combined under the same generic name (Saint Louis Code, Art. 53.3 and Ex. 9).

This is a good forage and sand-binding grass.

127. ORINUS Hitchcock, J. Wash. Acad. Sci. 23: 136. 1933.

固沙草属 *gu sha cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, with long scaly rhizomes. Leaf blades linear to involute, with setiform slightly pungent apex; ligule membranous. Inflorescence a sparse panicle of few to several ascending racemose branches along a central axis. Spikelets shortly pedicelled, laterally compressed, florets (1 or)2 to several, rachilla disarticulating above glumes and between florets; glumes thin, lower 1-veined,

upper 3-veined, acute to obtuse; lemmas lanceolate-oblong, 3-veined, pilose, lightly keeled, entire, acute or mucronate; palea equal to or slightly shorter than lemma, \pm ciliolate along keels, \pm hairy between keels. Caryopsis cylindrical.

Four species: Himalayas from Kashmir to Nepal and W China, at high altitudes; four species (three endemic) in China.

The widely spreading, scaly rhizomes are well adapted to survival in shifting sands, and the species are good stabilizers of dunes.

1a. Lemmas pilose all over; leaf sheaths usually pilose.

2a. Spikelets 5–6.5(–11) mm; florets 2–5 1. *O. thoroldii*

2b. Spikelets 8–11 mm; florets 5–8 2. *O. tibetica*

1b. Lemmas pilose only along margins and lower keel; leaf sheaths usually glabrous.

3a. Spikelets 7–8.5 mm; florets 3–5; lemmas obviously pilose 3. *O. kokonorica*

3b. Spikelets 5–6 mm; florets 1–2; lemmas inconspicuously pilose 4. *O. anomala*

1. *Orinus thoroldii* (Stapf ex Hemsley) Bor, Kew Bull. [6] 1951: 454. 1952.

固沙草 gu sha cao

Diplachne thoroldii Stapf ex Hemsley, J. Linn. Soc., Bot. 30: 121. 1894; *Cleistogenes thoroldii* (Stapf ex Hemsley) Roshevitz; *Kengia thoroldii* (Stapf ex Hemsley) H. Yu & N. X. Zhao; *Orinus arenicola* Hitchcock.

Rhizomes clothed in hard imbricate scales, roots woolly. Culms erect, slender, 12–20(–50) cm tall, smooth and glabrous or rarely loosely pilose. Leaf sheaths hirsute, densely so at mouth; leaf blades flat, finally involute, pale green, 2–9 \times 0.2–0.5 cm, hirsute to subglabrous, base rounded, apex pungent; ligule lacerate, 1–1.5 mm. Panicle up to 15 cm, racemes 4–8, inserted singly, (1–)3–5(–7) cm, ascending or eventually spreading. Spikelets cuneate, 5–6.5(–11) mm, florets 2–5; rachilla glabrous, internodes 1–2.5 mm; glumes lanceolate, dorsally often purplish, margins hyaline, glabrous or loosely pilose; lower glume 3–5 mm; upper glume 4–6 mm; lemmas purplish brown to brown-black or blotched with purple, lowest 4.5–5(–7) mm, pilose all over, acute or mucronate; palea pilose along keels, between upper keels and on outer flaps, apex 2-lobed. Callus glabrous. Anthers (1–)3–3.5 mm. Caryopsis narrowly oblong. Fl. Aug.

High arid sandy or gravelly steppe, sometimes with *Artemisia*, fixed sand dunes; 3300–4300 m. Qinghai, Xinjiang, Xizang [Kashmir, Nepal].

The name *Cleistogenes thoroldii* has been misapplied to *C. songorica* in C Asian literature.

2. *Orinus tibetica* N. X. Zhao, Acta Bot. Yunnan. 16: 228. 1994.

西藏固沙草 xi zang gu sha cao

Culms erect, 15–35 cm tall, densely long-pilose. Leaf sheaths pilose, especially along margins and at mouth; leaf blades linear-lanceolate, usually flat, 2–8 \times 0.2–0.4 cm, villous on both surfaces, rarely tuberculate-hairy at the base; ligule lacerate, ca. 1 mm. Panicle (3.5–)5–9 cm; racemes inserted singly, the lowest 3–5 cm. Spikelets purplish brown, 8–11 mm, florets 5–8; glumes lanceolate, dorsally purplish brown, membranous with hyaline margins, glabrous or laxly pilose; lower glume 4.5–5.5 mm; upper glume 5–6 mm; lemmas pilose all over, lowest 5–6 mm, apex acute or lowest mucronate; palea keels pilose, apex narrow or emarginate. Anthers ca. 3 mm. Caryopsis oblong. Fl. Jul–Aug.

• Mountain slopes; ca. 4400 m. Xizang (Dingjie).

3. *Orinus kokonorica* (K. S. Hao) Keng ex X. L. Yang, Fl. Reipubl. Popularis Sin. 10(1): 40. 1990.

青海固沙草 qing hai gu sha cao

Cleistogenes kokonorica K. S. Hao, Bot. Jahrb. Syst. 68: 582. 1938; *Diplachne kokonorica* (K. S. Hao) Conert; *Kengia kokonorica* (K. S. Hao) Packer.

Culms erect, (20–)30–50 cm tall, smooth or scabrid. Leaf sheaths glabrous, scabrid or rarely hirtellous; leaf blades stiff, usually involute, 4–9 \times 0.2–0.3 cm, scabrid or hirtellous on both surfaces, apex long acuminate; ligule lacerate, 0.5–1 mm. Panicle 4–7(–19) cm, very narrow; racemes inserted singly, erect, bearing (3–)4–6(–11) spikelets. Spikelets 7–8.5 mm, florets (2–)3–5, rachilla puberulous, internodes 1–1.5 mm; glumes lanceolate, dorsally black-purple, margins membranous, yellowish brown, glabrous; lower glume 3.5–5 mm, acute; upper glume 4.5–6 mm, acute or obtuse; lemmas thin, dorsally black-brown but yellow-brown at base and apex, lowest 5–5.5 mm, margins and lower keel loosely pilose, apex denticulate, middle vein exerted into a short mucro; palea keels ciliolate, loosely puberulous on outer flaps, apex acute or emarginate. Callus laterally puberulous. Anthers ca. 3 mm. Caryopsis narrowly oblong. Fl. Aug.

• Dry mountain slopes, steppe; 3000–3500 m. Gansu, Qinghai.

This is an excellent sand-binding grass.

4. *Orinus anomala* Keng ex P. C. Keng & L. Liu, Acta Bot. Sin. 9: 68. 1960.

鸡爪草 ji zhua cao

Culms loosely tufted, erect, 35–50 cm tall, puberulous below nodes. Leaf sheaths glabrous or pilose at the mouth; leaf blades stiff, erect, involute, 7–12 \times 0.2–0.35 cm, glabrous or adaxial surface scabrid or loosely pilose at base, apex long acuminate; ligule erose, ca. 0.5 mm. Panicle ca. 10 cm, linear; racemes solitary or rarely paired, erect, 3.5–4 cm, with 7–9 spikelets. Spikelets yellowish or purplish green, 5–6 mm, florets 1–2, rachilla minutely puberulous, internodes ca. 1.5 mm; glumes glabrous, scabrid along upper keel, acuminate; lower glume 3–3.5 mm; upper glume 4–4.5 mm; lemmas oblong-lanceolate, lower 4.5–5 mm, margins and keel shortly and inconspicuously pilose in lower 1/3, apex acute; palea scabrid on upper keels, apex emarginate. Anthers yellow, ca. 2 mm. Fl. Aug.

• Mountain slopes. Qinghai, Sichuan.

128. **TRIPOGON** Roemer & Schultes, Syst. Veg. 2: 34. 1817.

草沙蚕属 *cao sha can shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, often small. Culms densely tufted, slender, unbranched. Leaf blades mainly basal, filiform to setaceous, usually involute; ligule a narrow membrane fringed with hairs. Inflorescence a solitary unilateral terminal raceme. Spikelets sessile, biserial, broadside to rachis, linear to elliptic, laterally compressed, florets 2 to several, rachilla disarticulating above glumes and between florets; glumes narrow, shorter than lemmas or upper glume exceeding lowest lemma, unequal, membranous, 1-veined or upper glume sometimes 3-veined, keeled, acute to emarginate and mucronate, lower glume often with a lobe or tooth on one side; lemmas lanceolate to ovate, membranous, 3-veined, glabrous, lightly keeled or rounded, 2-dentate, midvein produced into an awn, teeth usually also mucronate or awned; palea keels scabrid or ciliate, often winged. Floret callus bearded. Stamens 1–3. Caryopsis narrow, trigonous to subterete.

About 30 species: Old World tropics, one species in tropical America; 11 species (five endemic) in China.

- 1a. Central awn much shorter than lemma; anthers 3.
 - 2a. Lemma midvein extended into 0.2–0.5 mm mucro; lateral veins not extended 1. *T. purpurascens*
 - 2b. Lemma midvein extended into 0.5–2 mm awn; lateral veins extended into 0.2–0.7 mm mucros.
 - 3a. Culms 5–8 cm; racemes 2–4 cm, purple-brown 2. *T. humilis*
 - 3b. Culms 10–30 cm; racemes 6–15 cm, gray-green 3. *T. chinensis*
- 1b. Central awn slightly shorter to distinctly longer than lemma; anthers 1–3.
 - 4a. Anthers 3 (rarely 2).
 - 5a. Central awn 1.8–3.3 mm; lower glume without lateral lobe.
 - 6a. Racemes erect or slightly curved; upper glume 3.5–4.3 mm, apex subacute, mucronate; awn 1.8–3.3 mm 4. *T. sichuanicus*
 - 6b. Racemes drooping; upper glume 4–5 mm, apex 2-denticulate; awn 3–4 mm 5. *T. debilis*
 - 5b. Central awn 5–11 mm; lower glume lobed on one side.
 - 7a. Plant robust, up to 50 cm; lemmas with lateral awns arising from tips of teeth; anthers 1.4–1.7 mm 6. *T. trifidus*
 - 7b. Plant slender, up to 35 cm; lemmas with apical teeth between awns; anthers 0.5–0.9 mm 7. *T. rupestris*
 - 4b. Anther 1.
 - 8a. Central awn distinctly longer than its lemma, flexuose or reflexed; lateral awns 1–2 mm.
 - 9a. Raceme with closely imbricate spikelets; central awn flexuose, at most gently reflexed 8. *T. filiformis*
 - 9b. Raceme with spaced spikelets; central awns all strongly and stiffly reflexed 9. *T. longearistatus*
 - 8b. Central awn slightly shorter to slightly longer than its lemma; lateral awns 0–1 mm.
 - 10a. Spikelets their own length apart or slightly imbricate; lemmas 3.3–4.5 mm; central awn 2.5–4 mm 10. *T. yunnanensis*
 - 10b. Spikelets closely imbricate; lemmas 2.2–2.6 mm; central awn 1.8–2.8 mm 11. *T. liouae*

1. *Tripogon purpurascens* Duthie, Ann. Roy. Bot. Gard. Calcutta 9: 74. 1901.

玫瑰紫草沙蚕 *mei gui zi cao sha can*

Tripogon jacquemontii Stapf var. *submuticus* J. D. Hooker.

Culms 5–35 cm tall. Basal leaf sheaths finally splitting into dense clumps of fibers; leaf blades 1–10 × 0.1–0.3 cm, adaxial surface densely scabrid-hispidulous, loosely pilose with long scattered hairs, abaxial surface glabrous. Racemes 2–10 (–17) cm, stiff, straight or slightly curved, spikelets tightly appressed to concavities in rachis, imbricate by 1/4–1/3 their length. Spikelets 4–7 mm, usually purplish; florets 2–4 (–6), imbricate, rachilla mostly hidden; lower glume narrowly triangular, symmetrical, 1.5–2.5 mm, acuminate; upper glume narrowly oblong, 2.5–4.5 mm, thickened along midvein, margins broad, scarious, apex scabrid-apiculate; lemmas oblong-lanceolate, 2–3.4 mm to sinus, 2-dentate, midvein produced into a 0.2–0.5 mm mucro, teeth rounded, lateral veins not extended; palea keels wingless, scabrid. Anthers 3, 1.2–2 mm. Fl. and fr. Jul–Sep.

Arid places, especially open stony mountainsides, sometimes forming a sward; 700–2400 m. Xinjiang [Afghanistan, Bhutan, NW India, Nepal, Pakistan; SW Asia (Saudi Arabia, Yemen)].

This is the only species in China with a short mucro from the lemma tip not exceeding 0.5 mm, lateral veins not at all extended from the apical teeth, and wingless, scabrid palea keels. It was misidentified as *Tripogon abyssinicus* Nees ex Steudel in Fl. Brit. India (7: 287. 1896, “1897”).

The name “*Tripogon hookerianus* Bor” (Grasses Burma, Ceylon, India, Pakistan, 522. 1960) belongs here, but was not validly published because no type was indicated.

2. *Tripogon humilis* H. L. Yang, Acta Bot. Yunnan. 5: 72. 1983.

矮草沙蚕 *ai cao sha can*

Culms 5–8 cm tall. Basal leaf sheaths persistent in tight bunches; leaf blades setaceous, 1.5–6 × ca. 0.1 cm, adaxial surface densely hirtellous and thinly pilose, abaxial surface glabrous, sometimes scabrid. Racemes 2–4 cm, slender, rachis slightly laterally compressed, margins hirtellous, spikelets appressed to rachis, not or only slightly imbricate. Spikelets 3.5–

5.5 mm, purplish brown; florets 2–4, imbricate; lower glume lanceolate, symmetrical, 2–3 mm, acuminate; upper glume lanceolate, 3–4 mm, apex acute-apiculate; lemmas oblong-ovate, 3–3.5 mm, 2-dentate, central awn 1.75–2.5 mm, erect, teeth broad, acute to truncate, lateral veins extended into 0.2–0.7 mm awns; palea keels ciliate. Anthers 3, 0.5–0.8(–1.2) mm. Fl. Jul.

- Mountain slopes; ca. 2800 m. Xizang.

In the protologue, this small species was distinguished from *Tripogon chinensis* by its low stature and short racemes; it also has a rather longer central awn and short anthers. The type has not been seen. The awn length, anther length, and ciliate palea keels of *T. humilis* exclude it from *T. purpurascens*.

3. *Tripogon chinensis* (Franchet) Hackel, Bull. Herb. Boissier, sér. 2, 3: 503. 1903.

中华草沙蚕 zhong hua cao sha can

Nardurus filiformis (Salzmann ex Willkomm & Lange) C. Vicioso var. *chinensis* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 149. 1884; *Tripogon chinensis* subsp. *coreensis* (Hackel) T. Koyama; *T. chinensis* var. *coreensis* Hackel; *T. coreensis* (Hackel) Ohwi.

Culms 10–30 cm tall. Basal leaf sheaths papery, tardily fibrous; leaf blades 5–15 × ca. 0.1 cm, adaxial surface scabrid, sometimes loosely pilose with long scattered hairs, abaxial surface glabrous. Racemes 6–15 cm, slender, spikelets appressed to rachis, slightly imbricate by up to 1/3 their length. Spikelets 4.5–8 mm, gray-green; florets 3–5, loosely imbricate, rachilla usually partially visible; lower glume lanceolate, nearly symmetrical, 1.2–3 mm, acuminate-mucronate; upper glume elliptic-oblong, 2.5–4.5 mm, thickened along midvein, margins broad, scarious, apex sharply acute or subacute and mucronate; lemmas oblong-ovate, 2–3.3 mm to sinus, 2-dentate, central awn clearly shorter than its lemma, 1–2 mm, erect, teeth broad, obliquely truncate to acute, lateral veins extended into 0.2–0.5 mm awns; palea keels very narrowly winged, ciliate. Anthers 3, 1–1.5 mm. Fl. and fr. Jul–Sep.

Dry stony slopes, among rocks; 200–2200 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Mongolia, Philippines, E Russia].

4. *Tripogon sichuanicus* S. M. Phillips & S. L. Chen, Kew Bull. 57: 916. 2002.

四川草沙蚕 si chuan cao sha can

Culms 15–30 cm tall. Basal leaf sheaths papery; leaf blades inrolled or flat, 1–10 × 0.1–0.2 cm, adaxial surface scabrid, sometimes pilose with long scattered hairs, abaxial surface glabrous. Racemes 5–13 cm, spikelets imbricate by 1/3–1/2 their length. Spikelets 5–13 mm, olive green; florets 5–10, approximate, rachilla partially visible; lower glume lanceolate, nearly symmetrical, 2.1–2.7 mm, acuminate-mucronate; upper glume lanceolate-oblong, 3.5–4.3 mm, 1–3-veined and thickened along midline, margins broad, scarious, apex subacute, mucronate; lemmas oblong-ovate, 2.8–3 mm to sinus, 2-dentate, central awn slightly shorter to slightly longer than its lem-

ma, 1.8–3.3 mm, erect, teeth rounded to truncate, lateral veins extended into 0.1–0.5 mm mucros; palea keels wingless, ciliate. Anthers 3, 1.2–1.3 mm. Fl. and fr. Jun–Aug.

- Mountain slopes, dry valleys; 1600–3200 m. Sichuan.

Tripogon sichuanicus has been misidentified as either *T. filiformis* or the Indian species *T. bromoides* Roth ex Roemer & Schultes. It is clearly separated from *T. filiformis* by its short, blunt lemma teeth and by the presence of 3 anthers. *Tripogon bromoides* differs in having a much broader raceme, 0.8–1.5 cm wide, with spikelets diverging at an angle from the rachis, a lower glume with a lateral lobe, prominent, acute lemma teeth, and longer lateral awns. *Tripogon sichuanicus* is actually much closer to *T. chinensis*, although that species has shorter awns and a more easterly distribution.

5. *Tripogon debilis* L. B. Cai, Novon 15: 390. 2005.

柔弱草沙蚕 rou ruo cao sha can

Culms 25–34 cm tall. Leaf sheaths white-villous below blade; leaf blades inrolled, 4–11 cm, adaxial surface scabrid or sometimes pubescent toward base, abaxial surface glabrous. Racemes 8–15 cm, drooping, spikelets their own length apart or slightly imbricate. Spikelets 6–8 mm, brownish green; florets 6–8, imbricate; lower glume lanceolate, nearly symmetrical, 2.5–3.5 mm, apex entire, sharply acuminate; upper glume lanceolate, 4–5 mm, margins narrowly membranous, apex 2-denticulate; lemmas lanceolate, 3.5–4.5 mm, 2-dentate, central awn 3–4 mm, erect, teeth acute, lateral veins extended into 0.3–0.5 mm mucros from outer edge of teeth; palea ca. 1 mm shorter than lemma, keels wingless, ciliate. Anthers 3, 1.3–1.5 mm.

- Stony slopes, roadsides, wasteland; 3100–3800 m. Sichuan (Hengduan Shan).

This species is close to *Tripogon sichuanicus*, which also occurs in similar habitats in W Sichuan. The protologue states that there is usually only 1 anther, but the accompanying illustration shows 3. The presence of a single anther is not otherwise recorded among the species related to *T. chinensis*.

6. *Tripogon trifidus* Munro ex J. D. Hooker, Fl. Brit. India 7: 286. 1896 [“1897”].

三裂草沙蚕 san lie cao sha can

Culms up to 50 cm tall, relatively robust. Basal leaf sheaths papery, finally fibrous; leaf blades flat or inrolled, 24–30 × ca. 0.2 cm, adaxial surface scaberulous, pilose with long hairs toward ligule, abaxial surface glabrous. Racemes 10–20 cm, flexuose, fairly dense, spikelets loosely erect to slightly diverging from rachis, imbricate by 1/2–2/3 their length. Spikelets 7–14 mm, pallid to dark gray; florets 5–13, loosely to densely imbricate; lower glume lanceolate, asymmetrical, broadened on one side into a lobe or tooth, 2.4–4.2 mm, acute; upper glume narrowly oblong-elliptic, 4–6.5 mm, apex subacute and mucronate; lemmas lanceolate, 2.6–4 mm to sinus, narrowly bifid, central awn 6–11 mm, flexuose, teeth acuminate, lateral veins extended from their tips into 0.4–1.5 mm awns; palea keels winged, ciliate. Anthers 2–3, 1.4–1.7 mm. Fl. and fr. Jul.

Stony ground, among rocks, in the open or in shade; 1300–2600 m. Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

This is a relatively stout species of *Tripogon*, taller than other Chinese members of the genus, with longer, thicker leaf blades and a taller tuft of basal sheaths. Most specimens have florets with 3 anthers, but specimens from the Himalayas tend to have only 2 anthers in some or all florets.

Material of this species was misidentified in Fl. Xizang. (5: 73. 1987) as *Tripogon wardii* Bor, a little-known species from N Myanmar differing from *T. trifidus* by its much denser racemes and lemmas with a lateral tooth between the central and lateral awns. *Tripogon wardii* is similar to *T. bromoides* Roth ex Roemer & Schultes from India.

7. *Tripogon rupestris* S. M. Phillips & S. L. Chen, Kew Bull. 57: 917. 2002.

岩生草沙蚕 yan sheng cao sha can

Culms 10–35 cm tall. Basal leaf sheaths papery becoming slightly fibrous; leaf blades 4–12 × 0.08–0.12 cm, adaxial surface scabrid, sparsely pilose with long scattered hairs, abaxial surface glabrous. Racemes 5–20 cm, flexuose, spikelets loosely appressed to the slender rachis, spaced their own length apart or only slightly imbricate. Spikelets 4.3–8 mm, tinged brownish purple; florets 4–7, tightly to loosely imbricate; lower glume narrowly lanceolate, asymmetrical, broadened into a prominent lateral tooth on one side, 2.2–3 mm, acuminate; upper glume narrowly lanceolate-oblong, 3.2–5 mm, apex emarginate and mucronate; lemmas elliptic-lanceolate, 2.4–3 mm to sinus, 3-awned with 2 teeth between the awns, central awn 5–9 mm, flexuose, often recurving, teeth variable, obtuse to acuminate, lateral veins extended into (1.5–)2–3.5 mm awns; palea keels winged, shortly ciliate. Anthers 3, 0.5–0.9 mm. Fl. and fr. Aug.

Damp rocks, often among moss; 2300–3000 m. Xizang, Yunnan [N India, Nepal].

This small species, forming delicate tufts with dark, flexuose racemes, was formerly usually identified as *Tripogon filiformis*. *Tripogon rupestris* has a looser raceme of spaced spikelets with widely spreading awns. Identification can be confirmed by inspecting the number of anthers.

8. *Tripogon filiformis* Nees ex Steudel, Syn. Pl. Glumac. 1: 301. 1854.

小草沙蚕 xiao cao sha can

Tripogon filiformis var. *tenuispicus* J. D. Hooker; *T. namus* Keng ex P. C. Keng & L. Liu; *T. unidentatus* Nees ex Steudel.

Culms 8–40 cm tall. Basal leaf sheaths papery becoming slightly fibrous; leaf blades 3–15 × 0.1–0.15 cm, adaxial surface scabrid, sparsely pilose, abaxial surface glabrous. Racemes 3–20 cm, variable, straight or flexuose, spikelets loosely erect or diverging from the slender rachis, imbricate by 1/2–3/4 their length. Spikelets 5–9 mm, pale green or tinged gray or purple; florets 4–10, tightly to loosely imbricate; lower glume narrowly lanceolate, asymmetrical, broadened into a prominent lateral tooth on one side, 1.6–2.7 mm, subacute; upper glume narrowly lanceolate-oblong, 3–4.5 mm, apex acuminate or emarginate and mucronate; lemmas elliptic-lanceolate, 2–2.7 mm to sinus, 3-awned with 2 teeth between the awns, central awn 3–8 mm, flexuose, sometimes recurving, teeth variable, acute, acuminate or awnlike, lateral veins extended into 1–3 mm awns; palea keels winged, shortly ciliate. Anther 1, 0.7–1.3 mm. Fl. and fr. Jun–Oct.

Dry grassy slopes, often among rocks; 1200–4200 m. Fujian,

Guizhou, Henan, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, N India, N Myanmar, Nepal, Pakistan].

Tripogon filiformis is a Himalayan species distinguished by its slender habit with dense, feathery racemes of long-awned spikelets, lemmas with teeth between the awns, and a single anther. The racemes are variable in length and color, but are usually rather flexuose with the leaf blades extending up among them.

9. *Tripogon longearistatus* Hackel ex Honda, Bot. Mag. (Tokyo) 41: 11. 1927 [*“longe-aristatus”*].

长芒草沙蚕 chang mang cao sha can

Tripogon japonicus (Honda) Ohwi; *T. longearistatus* subsp. *japonicus* (Honda) T. Koyama; *T. longearistatus* var. *japonicus* Honda; *T. panxianensis* H. Peng.

Culms 15–30 cm tall. Basal leaf sheaths papery; leaf blades 4–13 × ca. 0.1 cm, adaxial surface glabrous or loosely pilose, abaxial surface glabrous. Racemes 8–20 cm, usually slightly flexuose, spikelets loosely erect, distant by about their own length along the slender rachis. Spikelets 4.5–9 mm, pale green to dark gray; florets 4–7(–9), loosely arranged, rachilla visible; lower glume linear-lanceolate, asymmetrical, broadened or toothed on one side, 2.5–3 mm, subacute to acuminate; upper glume narrowly lanceolate-oblong, 4–4.5 mm, apex acuminate-rostrate or emarginate and mucronate; lemmas elliptic-lanceolate, 2.5–3.3 mm to sinus, 2-dentate, central awn 3.6–8 mm, stiff, strongly reflexed, teeth acute, lateral veins extended into 0.3–2 mm awns arising free from lemma tooth or from its outer margin; palea keels very narrowly winged, ciliolate. Anther 1, 1–1.5 mm. Fl. and fr. Sep–Oct.

Rocky slopes; 300–1000 m. Fujian, Gansu, Guangdong, Guizhou, Hunan, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

Tripogon longearistatus is close to *T. filiformis*, with which it is sometimes confused. They can usually be distinguished on habit. In *T. longearistatus*, the widely spaced spikelets with stiff, strongly reflexed awns make it one of the easiest Chinese species to recognize. Moreover, there is little overlap in their geographic range: *T. filiformis* is an upland and high-altitude species, whereas *T. longearistatus* is confined to the eastern lowlands.

The name “*Tripogon corensis* var. *longearistatus* Hackel ex T. Mori” (Enum. Pl. Corea, 56. 1922) is a *nomen nudum* and was therefore not validly published; “*T. chinensis* var. *longearistatus* Hackel ex Honda” was not validly published because it was merely cited as a synonym in the protologue of *T. longearistatus*; and the same combination published by I. C. Chung (J. Wash. Acad. Sci. 45: 216. 1955) was not validly published because a full and direct reference to the basionym was not provided.

10. *Tripogon yunnanensis* J. L. Yang ex S. M. Phillips & S. L. Chen, Kew Bull. 57: 921. 2002.

云南草沙蚕 yun nan cao sha can

Culms 25–33 cm tall. Basal leaf sheaths finally forming dense fibrous clumps; leaf blades 2.5–10 × ca. 0.1 cm, adaxial surface pilose with long scattered hairs or subglabrous, abaxial surface glabrous. Racemes 9–15 cm, spikelets distant by about their own length on lower part of rachis, imbricate above. Spikelets (8.5–)10–22 mm, dark gray or gray-green; florets (4–)6–17, loosely imbricate, rachilla visible; lower glume lanceolate, asymmetrical, broadened on one side into a lateral lobe, 1.5–3.5 mm, acuminate; upper glume narrowly lanceolate-ob-

long, 4–5.5 mm, apex emarginate and mucronate; lemmas lanceolate-oblong, 3.3–4.5 mm to sinus, 2-dentate, central awn a little shorter or about equaling its lemma, 2.5–4 mm, slightly flexuose, teeth acute to truncate, lateral veins extended into 0.4–1 mm mucros; palea keels very narrowly winged, ciliate. Anther 1, 1.4–2 mm. Fl. and fr. Jul–Aug.

• Dry mountain slopes, among rocks; 2800–4500 m. Sichuan, Xizang, Yunnan.

The name *Tripogon yunnanensis* was not previously validly published by J. L. Yang (Acta Bot. Yunnan. 5: 51. 1981) because two types were indicated. Consequently the intended new combination "*T. bromoides* var. *yunnanensis* (Keng ex J. L. Yang) S. L. Chen & X. L. Yang" (FRPS 10(1): 59. 1990) was also not validly published.

11. *Tripogon liouae* S. M. Phillips & S. L. Chen, Kew Bull. 57: 922. 2002.

丽藕草沙蚕 li ou cao sha can

Culms 10–30 cm tall. Basal leaf sheaths finally splitting

into dense clumps of fibers; leaf blades 1.5–6 × ca. 0.1 cm, much shorter than the culms, adaxial surface pilose with long scattered hairs, abaxial surface glabrous. Racemes 2–8 cm, slightly flexuose, very dense, spikelets diverging from rachis, imbricate by 1/2 their length or more. Spikelets 6–15 mm, blackish; florets 7–15, loosely imbricate, rachilla visible; lower glume lanceolate, asymmetrical, broadened on one side below middle, sometimes lobed, subacute and mucronate; upper glume narrowly lanceolate-oblong, 2.7–4 mm, apex emarginate and mucronate; lemmas lanceolate-oblong, 2.2–2.6 mm to sinus, 2-dentate, central awn a little shorter or about equaling its lemma, 1.8–2.8 mm, teeth acute to truncate, lateral veins extended into 0–0.5 mm mucros; palea keels narrowly winged, ciliate. Anther 1, 1.3–1.8 mm. Fl. and fr. Jul–Sep.

• Dry open spaces, sometimes forming a turf; 3000–4600 m. Xizang.

Tripogon liouae has a distinctive habit, with a basal tuft of short leaves and dense, blackish racemes on culms that are conspicuously taller than the basal tuft.

129. *LEPTOCHLOA* P. Beauvois, Ess. Agrostogr. 71. 1812.

千金子属 qian jin zi shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Diplachne P. Beauvois.

Annuals or perennials. Leaf blades linear; ligule membranous, sometimes with a ciliate fringe. Inflorescence open, composed of several to many slender racemes of usually imbricate spikelets scattered along a central axis. Spikelets laterally compressed or subterete, florets 1 to several, rachilla disarticulating above glumes and between florets; glumes usually shorter than lemmas, unequal, membranous, 1-veined; lemmas membranous, 3-veined, generally hairy along the veins, keeled or rounded, obtuse or 2-dentate, sometimes mucronate to short-awned; palea equal to or slightly shorter than lemma. Stamens (1–)3. Caryopsis laterally or dorsally compressed. $x = 10$.

Thirty-two species: throughout the tropics and in warm-temperate parts of America and Australia; three species in China.

- 1a. Spikelets 6–10 mm, subterete, slightly imbricate or distant on indistinctly unilateral racemes; lemmas shortly awned; perennial 1. *L. fusca*
- 1b. Spikelets 1.4–4 mm, laterally compressed, imbricate on clearly unilateral racemes; lemmas not awned; annual.
 - 2a. Leaf sheaths and blades glabrous; racemes flexuose; spikelets 2–4 mm, 3–6(–7)-flowered 2. *L. chinensis*
 - 2b. Leaf sheaths and blades pilose; racemes straight; spikelets 1.4–2 mm; 2–4-flowered 3. *L. panicea*

1. *Leptochloa fusca* (Linnaeus) Kunth, Révis. Gramin. 1: 91. 1829.

双稃草 shuang fu cao

Festuca fusca Linnaeus, Syst. Nat., ed. 10, 2: 876. 1759; *Diplachne fusca* (Linnaeus) P. Beauvois ex Roemer & Schultes; *D. malabarica* (Linnaeus) Merrill, nom. rej.; *Leptochloa malabarica* (Linnaeus) Veldkamp, nom. rej.; *Poa malabarica* Linnaeus, nom. rej.

Perennial, loosely tufted to rhizomatous. Culms erect or geniculate and rooting from lower nodes, up to 100 cm or more tall. Leaf sheaths glabrous; leaf blades tough, usually involute, 5–30(–50) × 0.15–0.3(–0.6) cm, adaxial surface scabrid, abaxial surface subglabrous; ligule 3–12 mm, acute. Inflorescence 15–25 cm, scabrid; racemes 3–28, indistinctly unilateral, 4–20 cm, straight, ascending or spreading, spikelets usually distant. Spikelets glaucous-green, subterete, 6–14 mm, florets 5–12; glumes

keeled; lower glume lanceolate, 2–3 mm, acute; upper glume narrowly oblong, 3–4 mm, acute or mucronate; lemmas narrowly oblong, dorsally subrounded, lowest 4–5 mm, lower lateral veins pilose, entire or 2-dentate, midvein often produced into a short 0.3–1.6 mm awn; palea ciliate along upper keels. Callus laterally pilose. Anthers 0.5–0.75(–2.5) mm. Caryopsis elliptic-oblong, 1.5–2.5 mm, dorso-ventrally flattened. Fl. and fr. Jun–Sep. $2n = 20$.

Shallow water, marshy, sometimes brackish ground. Anhui, Fujian, Guangdong, Hainan, Hebei, Henan, Hubei, Jiangsu, Liaoning, Shandong, Taiwan, Yunnan, Zhejiang [India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand; Africa, SW Asia, Australia].

This is a widespread, polymorphic species varying in habit, height, and robustness of the culm, compactness of the inflorescence, and in the lemma tip. It is a salt-tolerant species and is known to excrete salt through glands on the leaves.

2. *Leptochloa chinensis* (Linnaeus) Nees, Syll. Pl. Nov. 1: 4. 1824.

千金子 qian jin zi

Poa chinensis Linnaeus, Sp. Pl. 1: 69. 1753.

Annual or sometimes perennial. Culms erect, geniculate or decumbent and rooting from nodes, 30–100 cm tall, smooth and glabrous. Leaf sheaths glabrous; leaf blades flat or slightly involute, 5–25 × 0.2–0.9 cm, glabrous, scabrid on both surfaces or abaxial surface smooth, apex acuminate; ligule membranous, 1–5 mm. Inflorescence 10–50 cm; racemes numerous, unilateral, to 10 cm, slender, flexuose, laxly ascending, rachis scabrid, spikelets usually imbricate. Spikelets purplish or brownish green, narrowly elliptic-oblong, laterally compressed, 2–4 mm, florets 3–7; glumes scabrid along keels and sometimes laterally; lower glume lanceolate, 1–1.5 mm, acute; upper glume elliptic-oblong, 1.2–2 mm, obtuse; lemmas elliptic-oblong, keeled, lowest ca. 1.5 mm, shortly appressed-hairy along lower margins and on either side of midvein, obtuse or minutely emarginate; palea minutely hispid on keels, appressed hairy on back and flaps. Anthers ca. 0.5 mm. Caryopsis oblong, 0.7–0.9 mm, plano-convex. Fl. and fr. Aug–Oct. $2n = 40$.

Moist places; 200–1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Africa].

This species is a forage grass.

3. *Leptochloa panicea* (Retzius) Ohwi, Bot. Mag. (Tokyo) 55: 311. 1941.

虻子草 ji zi cao

Poa panicea Retzius, Observ. Bot. 3: 11. 1783; *Cynosurus tenerrimus* Hornemann; *Eleusine tenerrima* (Hornemann) Hornemann; *Leptochloa tenerrima* (Hornemann) Roemer & Schultes.

Annual. Culms tufted, slender, ascending, 30–80 cm tall. Leaf sheaths papillate-pilose with spreading hairs; leaf blades thin, flat, 4–18 × 0.3–0.6 cm, glabrous or pilose, attenuate; ligule membranous, 1–2 mm, usually lacerate. Inflorescence 10–30(–50) cm, brushlike; racemes 5–35, unilateral, 2–11 cm, very slender, straight, ascending, rachis scabrid, spikelets imbricate. Spikelets glaucous-green or purplish green, elliptic, lightly laterally compressed, 1.4–2 mm, florets 2–4; glumes scabrid along keel; lower glume lanceolate, 0.7–1.5 mm, apex acuminate; upper glume narrowly oblong, 0.9–1.6 mm, cuspidate or obtuse and mucronate; lemmas elliptic-oblong, keeled, lowest 0.8–1.3 mm, veins puberulous, usually also a few appressed hairs between veins, obtuse; palea keels scaberulous. Anthers ca. 0.2 mm. Caryopsis broadly elliptic, 0.7–0.8 mm, obtusely trigonous, apex obtuse. Fl. and fr. Jul–Oct.

Roadsides, rice fields, damp weedy places. Anhui, Fujian, Guangdong, Guizhou, Hainan, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Africa, America].

All Old World material of this species belongs to the typical race, subsp. *panicea*. Two further subspecies occur in America.

This species is an excellent forage grass.

130. *DINEBRA* Jacquin, Fragm. Bot. 77, t. 121, fig. 1. 1809.

弯穗草属 wan sui cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annuals. Culms tufted. Leaf blades linear, flat; ligule a lacerate or ciliate membrane. Inflorescence of elongate or cuneate racemes along a central axis, these deciduous or with deciduous secondary branchlets; spikelets sessile, biseriate, closely imbricate. Spikelets cuneate, laterally compressed, florets (1 or) 2 to several, rachilla eventually disarticulating above glumes and between florets; glumes much longer than and enclosing the florets, subequal, often leathery, sometimes 3-veined, strongly keeled, acute to caudate or aristate; lemmas thinly membranous, 3-veined, pubescent on veins or glabrous, keeled, acute to emarginate, with or without a mucro; palea slightly shorter than lemma, hyaline. Caryopsis elliptic, trigonous.

Three species: native from Africa and Madagascar to India; one species (introduced) in China.

1. *Dinebra retroflexa* (Vahl) Panzer, Ideen Revis. Gras. 59–60. 1813.

弯穗草 wan sui cao

Cynosurus retroflexus Vahl, Symb. Bot. 2: 20. 1791; *Dinebra brevifolia* Steudel; *D. retroflexa* var. *brevifolia* (Steudel) T. Durand & Schinz.

Culms usually straggling from a decumbent base, much branched, rooting at lower nodes, infrequently erect, green or purplish green, up to 50 cm or more tall. Leaf sheaths glabrous or with scattered hairs; leaf blades linear, 3–25 × 0.3–0.5 cm, glabrous or thinly pilose, apex acuminate; ligule lacerate. Inflo-

rescence 6–20 cm, narrowly elliptic-oblong to pyramidal, open; racemes 0.5–4 cm, stiff, ascending when young, reflexing and finally deciduous from the axis at maturity; rachis flattened, narrowly winged. Spikelets narrowly cuneate, florets 2–3; glumes narrowly elliptic with caudate diverging tips, 6–8 mm, keel scabrid, minutely glandular; lemmas greenish, narrowly ovate, 2–3 mm, lower part of veins appressed-pilose, acute to emarginate, mucronate; palea appressed-pilose on the flaps. Callus obtuse, glabrous. Anthers purplish red, ca. 0.3 mm. Fl. and fr. Nov–Dec.

Dry open places, an introduced weed; ca. 1100 m. Fujian, Yunnan [native to India, Africa, and Madagascar].

131. ERAGROSTIS Wolf, Gen. Pl. 23. 1776.画眉草属 *hua mei cao shu*

Chen Shouliang (陈守良); Paul M. Peterson

Annual or perennial, often glandular particularly on the leaf sheaths and inflorescence. Leaf blades mostly flat, sometimes rolled, rarely pungent; ligule a line of hairs or sometimes membranous. Inflorescence an open, contracted, spiciform or glomerate panicle, very rarely of racemes on a central axis. Spikelets 2- to many-flowered, laterally compressed, orbicular to vermiform, variously disarticulating. Glumes unequal, deciduous or persistent, 1(–3)-veined. Lemmas membranous to coriaceous, keeled or rounded, glabrous to asperulous or rarely hairy, 3-veined or the veins sometimes very faint and occasionally suppressed, apex entire, obtuse to acuminate, rarely mucronate. Palea keels sometimes winged or ciliate. Stamens 2 or 3. Fruit mostly globose, ellipsoid, or rectangular-prismatic, usually a caryopsis but sometimes the pericarp free.

About 350 species: tropics and subtropics throughout the world; 32 species (11 endemic, one introduced) in China.

- 1a. Florets disarticulating from above downward, falling together with the rachilla joints.
 - 2a. Panicle contracted, spikelike or cylindrical.
 - 3a. Perennial; lemmas 1.8–2.5 mm, ciliate along the margins below 27. *E. ciliata*
 - 3b. Annual; lemmas 0.8–1.3 mm, glabrous or scabrous along the margins 28. *E. ciliaris*
 - 2b. Panicle usually open.
 - 4a. Perennial 29. *E. collina*
 - 4b. Annual.
 - 5a. Palea-keels long ciliate; branchlets and pedicels glandular 30. *E. tenella*
 - 5b. Palea-keels glabrous to ciliate; branchlets and pedicels eglandular.
 - 6a. Culms 120–150 cm tall, ca. 5 mm in diam.; panicle branches solitary or in pairs; spikelets yellowish green 31. *E. alta*
 - 6b. Culms 30–100 cm tall, 1.5–2.5 mm in diam., panicle branches clustered or verticillate; spikelets purplish at maturity 32. *E. japonica*
- 1b. Florets disarticulating from below upward, usually leaving the rachilla entire.
 - 7a. Annual.
 - 8a. Palea falling together with its lemma at maturity.
 - 9a. Spikelets oblong, 5–10 × 2–4 mm, 10–20-flowered 25. *E. unioides*
 - 9b. Spikelets filiform, 11–25 × 1–2.5 mm, 10–40-flowered.
 - 10a. Upper glumes ca. 1 mm; lower lemma ca. 1.5 mm; palea ca. 1 mm; anthers ca. 0.2 mm 20. *E. multicaulis*
 - 10b. Upper glumes 1.3–2.3 mm; lower lemma 1.8–2.2 mm; palea ca. 1.6–1.8 mm; anthers 0.7–0.9 mm 7. *E. atrovirens*
 - 8b. Palea persistent or tardily falling.
 - 11a. Plants glandular on the culms, leaf sheaths, and panicle.
 - 12a. Spikelets 2–3 mm broad, lower lemma 2.2–2.8 mm 22. *E. cilianensis*
 - 12b. Spikelets 1.5–2.5 mm broad, lower lemma 1.5–2 mm.
 - 13a. Palea subequal to its lemma; midrib of lemma glandular 23. *E. minor*
 - 13b. Palea shorter than its lemma; midrib of lemma eglandular 24. *E. suaveolens*
 - 11b. Plants eglandular.
 - 14a. Lower glume 1-veined, 1–2 mm, the upper ca. 2 mm.
 - 15a. Spikelets 5–20 × 2–2.5 mm, 8–40 florets 16. *E. cumingii*
 - 15b. Spikelets 3–5 × ca. 2 mm, 3–10 florets 21. *E. autumnalis*
 - 14b. Lower glume without a vein, less than 1 mm, the upper less than 1.4 mm.
 - 16a. Summit of sheaths pilose; panicles 3.5–14 cm wide, axils pilose; pedicels as long or longer than the spikelets 19. *E. pilosa*
 - 16b. Summit of sheaths glabrous; panicles 1.5–3 cm wide, axils glabrous; pedicels usually shorter than the spikelets 20. *E. multicaulis*
 - 7b. Perennial.
 - 17a. Lemma falling together with the palea at maturity.
 - 18a. Spikelets 2–4 mm wide; stamens 2, anthers 0.2–0.5 mm; leaf blades sub lanceolate, 3–6 mm broad 25. *E. unioides*
 - 18b. Spikelets 1.5–2.5 mm wide; stamens 3, anthers 0.7–0.9 mm; leaf blades linear, 2–4 mm broad 7. *E. atrovirens*
 - 17b. Palea persistent or tardily falling at maturity.
 - 19a. Panicle contracted and spikelike, less than 3(–5) cm wide.
 - 20a. Spikelets 1–2 mm broad; lower panicle branches (1.5–)3–8 cm 4. *E. nutans*
 - 20b. Spikelets 2–3 mm broad; lower panicle branches 0.5–2.5 cm.

- 21a. Palea apex acute, the keels ciliate but not winged; panicle 2–8 cm, pilose in axils 5. *E. cylindrica*
- 21b. Palea apex toothed, the keels winged, ciliolate along the wings; panicle 10–15 cm, glabrous in axils 6. *E. nevinii*
- 19b. Panicle open, usually more than 3 cm wide.
- 22a. Branchlets and pedicels distinctly or obscurely glandular.
- 23a. Caryopsis rectangular-prismatic with a shallow adaxial groove, laterally compressed, 0.7–1.5 mm 15. *E. ferruginea*
- 23b. Caryopsis obovoid to ellipsoid, terete, without a groove, 0.7–0.9 mm 13. *E. perennans*
- 22b. Branchlets and pedicels eglandular.
- 24a. Branches densely spiculate to base.
- 25a. Stamens 3, anthers 0.3–1.3 mm; caryopsis dark brown 1. *E. brownii*
- 25b. Stamens 2, anthers 0.2–0.3 mm; caryopsis cinnamon 2. *E. elongata*
- 24b. Branches naked at base.
- 26a. Leaf blades long pilose on both surfaces.
- 27a. Spikelets 7–14-flowered; caryopsis furrowed on one side, bluntly triangular in section 10. *E. pilosissima*
- 27b. Spikelets usually 7-flowered; caryopsis compressed, elliptical in section 11. *E. pilosiuscula*
- 26b. Leaf blades glabrous, pubescent or pilose in part.
- 28a. Spikelets livid green, black-green, purplish black, or plumbeous; leaf sheaths compressed at the base.
- 29a. Culms 80–120 cm tall; leaf blades flat or involute, up to 40 cm; panicle up to 40 cm.
- 30a. Caryopsis ellipsoid to obovoid, smooth and mostly translucent, dorsally compressed, adaxial surface sometimes with a shallow, broad groove, light brown 9. *E. curvula*
- 30b. Caryopsis rectangular-prismatic, faintly striate, laterally compressed, with a shallow, narrow groove, reddish brown ... 15. *E. ferruginea*
- 29b. Culms 30–80 cm tall; leaf blades flat or involute, 5–25 cm, panicle up to 23 cm.
- 31a. Plants with scaly buds at the base; spikelets 4–13 mm, 6–24-flowered.
- 32a. Lower glume ca. 1 mm; upper glume ca. 1.3 mm, 1–3-veined; caryopsis 0.8–1 mm 16. *E. cumingii*
- 32b. Lower glume ca. 1.2 mm; upper glume ca. 1.8 mm, 1-nerved; caryopsis 0.5–0.6 mm 17. *E. duricaulis*
- 31b. Plants without scaly buds at the base; 3–12-flowered.
- 33a. Spikelets 2–2.5 mm wide, 5–10 mm; lemmas 2–2.2 mm; caryopsis elliptical, terete 14. *E. nigra*
- 33b. Spikelets 1–1.5 mm wide, 3–6 mm; lemmas 2.4–3 mm; caryopsis rectangular-prismatic, laterally compressed ... 15. *E. ferruginea*
- 28b. Spikelets purplish, yellowish, or greenish; leaf sheaths not compressed at the base.
- 34a. Palea tardily deciduous at maturity; spikelets 7–15 mm, 10–44-flowered 18. *E. hainanensis*
- 34b. Palea persistent; spikelets 0.5–20 mm, 5–60-flowered.
- 35a. Axils of panicle and branches glabrous.
- 36a. Spikelets 5–10 × ca. 2.5 mm, 5–15-flowered; anthers ca. 0.5 mm 8. *E. fauriei*
- 36b. Spikelets 5–25 × ca. 3 mm, 6–60-flowered; anthers ca. 0.3 mm 12. *E. perlaxa*
- 35b. Axils of panicle and branches pilose.
- 37a. Culms 50–110 cm tall; panicle 20–35 cm; anthers ca. 1 mm 13. *E. perennans*
- 37b. Culms 20–60 cm tall; panicle 3–12 cm; anthers 0.2–0.4 mm.
- 38a. Leaf blades pilose on adaxial surface; lemmas with reddish or yellowish lateral veins 3. *E. rufinerva*
- 38b. Leaf blades glabrous; lemmas with inconspicuous lateral veins 26. *E. montana*

1. *Eragrostis brownii* (Kunth) Nees, Cat. Indian Pl. 105. 1834.

长画眉草 *chang hua mei cao*

Poa brownii Kunth, Révis. Gramin. 1: 112. 1829; *Eragrostis zeylanica* Nees & Meyen; *E. bellissima* B. S. Sun & S. Wang.

Perennial. Culms slender, tufted, erect or geniculate at base, 15–60 cm tall, 0.5–1 mm in diam., 2–5-noded. Leaf sheaths glabrous and smooth, pilose along summit; ligules membranous, ca. 0.2 mm; leaf blades flat or involute, 3–10 cm × 1–3 mm. Panicle 3–18 cm; branches solitary with spikelets at base. Spikelets livid green, purplish or dark brown, oblong-elliptic, 4–20 × 1.5–2.5 mm, 7- to many-flowered, subsessile or with very short pedicel, apex acute. Glumes ovate-lanceolate, 1–2 mm; lower glume 1-veined, ca. 1.2 mm; upper glume 1–3-veined, the laterals usually faint, ca. 1.8 mm. Lower lemmas 2–2.5 mm. Palea slightly shorter than lemma, 1.5–2 mm, ciliate along keels, apex emarginate. Stamens 3; anthers 0.3–1.3 mm. Caryopsis dark brown, ca. 0.5 mm. Fl. spring.

Mountain slopes, open places, roadsides; ca. 1000 m. Anhui, Fujian, Hainan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, New Guinea, Philippines, Sri Lanka; Australia, Pacific Islands].

2. *Eragrostis elongata* (Willdenow) J. Jacquin, Ecl. Gram. Rar. 3. 1813.

双药画眉草 *shuang yao hua mei cao*

Poa elongata Willdenow, Enum. Pl. 1: 108. 1809.

Perennial. Culms erect, loosely tufted, 20–90 cm tall, 0.5–1 mm in diam., 2–4-noded. Leaf sheaths usually shorter than internodes, glabrous; ligules 0.3–0.4 mm; leaf blades flat to involute, adaxial surface scabrous, sometimes hairy below, 5–21 cm × 1–3 mm. Panicle spicate to narrowly ovate, 5–30 × 1–4 cm; branches appressed or diverging up to 80° from the rachises with spikelets at base. Spikelets stramineous to greenish or light brown, 3–12(–20) × 1.5–2.5 mm, 6–25-flowered; subsessile or with a very short pedicel, rachilla fragile. Glumes linear-lanceolate to lanceolate, 1-veined, 0.8–2 mm. Lower lemmas lanceolate to ovate, 1.3–2.2 mm. Palea shorter and narrower than the lemmas, hyaline, 1.1–1.7 mm, ciliate along keel. Stamens 2; anthers 0.2–0.3 mm. Caryopsis cinnamon, ovoid-ellipsoid, 0.4–0.7 mm, smooth to finely reticulate.

• Open grasslands, moist places, roadsides; near sea level to 1000 m. Fujian, Guangdong, Hainan, Jiangxi.

3. *Eragrostis rufinerva* L. C. Chia, Fl. Hainan. 4: 539. 1977.

红脉画眉草 *hong mai hua mei cao*

Perennial. Culms loosely tufted, 20–35 cm tall, ca. 1.5 mm in diam., 3–5-noded. Leaf sheaths usually shorter than internodes, glabrous but pilose around summit; ligules membranous; leaf blades flat or involute, adaxial surface pilose, abaxial surface glabrous, 3–11 cm × 2–4 mm. Panicle open, 3–12 × 0.2–0.5 cm; branch single, sparsely pilose in axils. Spikelets glaucous-green, densely imbricate, oblong or elliptic, 3–7 × 2–2.5 mm, 16–30-flowered; rachilla persistent. Glumes membranous, ovate, 1-veined, lower glume ca. 1 mm, apex acute, the up-

per 1.2–1.4 mm. Lemma broad ovate, apex acute; margin membranous, reddish or yellow. Palea persistent, apex obtuse, along keels ciliate. Stamens 3; anthers ca. 0.3 mm. Caryopsis brown-red, ellipsoid, ca. 0.6 mm. Fl. and fr. winter.

• Open grasslands. Hainan.

4. *Eragrostis nutans* (Retzius) Nees ex Steudel, Nomencl. Bot., ed. 2, 1: 563. 1840.

细叶画眉草 *xi ye hua mei cao*

Poa nutans Retzius, Observ. Bot. 4: 19. 1786; *Eragrostis guangxiensis* S. C. Sun & H. Q. Wang.

Perennial. Culms erect, 30–60 cm. Leaf sheaths long silky hairs along summit; ligules fringed, ca. 0.3 mm; leaf blades 6–12 × 0.15–0.3 cm. Panicle contracted, spikelike, 7–14 × 1.5–3 (–5) cm; branches naked at lower part, ascending, glabrous in axils, lower branches (1.5–)3–8 cm. Spikelets 3–6 × 1–2 mm, usually (3–)5–12-flowered. Glumes chartaceous, broadly lanceolate to ovate, subequal, 1-veined. Lemmas 1.6–2 mm, ovate, chartaceous. Palea the same texture and length as lemma, 2-keeled, scabrous to ciliate along keels. Stamens 3; anthers ca. 0.8 mm. Caryopsis ellipsoid, ca. 0.7 mm; embryo 1/2 length of the caryopsis.

Open, moist places, roadsides. Guangxi, Taiwan, Yunnan [India, Japan (Ryukyu Islands), Philippines].

This species is frequently confused with *Eragrostis gangetica* (Roxburgh) Steudel, which is an annual.

5. *Eragrostis cylindrica* (Roxburgh) Nees ex Hooker & Arnott, Bot. Beechey Voy. 251. 1838.

短穗画眉草 *duan sui hua mei cao*

Poa cylindrica Roxburgh, Fl. Ind. 1: 335. 1820; *Eragrostis geniculata* Nees & Meyen.

Perennial. Culms 30–90 cm tall, 1–2.5 mm in diam., tufted, rigid, 3–4-noded. Leaf sheaths shorter than internodes, pilose and long-pilose near summit; ligules a line of hairs; leaf blades 3–15 cm × 2–5 mm, linear, usually involute, pilose. Panicle 2–8 × 1–2.5 cm, contracted, cylindrical in outline; branches ascending, long pilose in axils, lower branches 0.5–1.5 cm. Spikelets yellowish brown or purplish, oblong, subsessile or with very short pedicels, ca. 7 × 2.5–3 mm, 4–17-flowered. Glumes 1-veined, apex acute, lower glume ca. 1.5 mm, upper glume ca. 2 mm. Lemmas chartaceous, ovate-oblong, apex mucronate, lowest lemma ca. 2 mm. Palea persistent, elliptical, chartaceous, ca. 1.8 mm, apex acute, along keels without wing only ciliate, margins unrolled and ciliate. Stamens 3; anthers yellowish, ca. 0.4 mm. Caryopsis yellow, elliptical, ca. 0.5 mm. Fl. and fr. Apr–Oct.

• Mountain slopes. Anhui, Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Taiwan.

6. *Eragrostis nevinii* Hance, J. Bot. 18: 302. 1880.

华南画眉草 *hua nan hua mei cao*

Perennial. Culms rigid, tufted, erect or geniculate at base, 20–50 cm tall, 2–4 mm in diam., 5–6-noded. Leaf sheaths long

pilose throughout; ligules a line of hairs; leaf blades linear, usually involute, 4–11 × 0.3–0.4 cm, pubescent in both surfaces. Panicle contracted and spikelike, 10–15 × 1–2 cm, 1- to several-branched; branches ascending, tightly appressed glabrous or with short hairs in axils, lower branches 1.5–2.5 cm. Spikelets yellow or purplish, oblong or linear-oblong, 4–8 × 2–3 mm, 4–14 florets. Glumes lanceolate, 1-veined, lower glume ca. 1.5 mm, the upper ca. 2 mm. Lemmas ovate, apex acute, lower lemma ca. 2.5 mm. Palea persistent, apex toothed, along keels winged, along wings ciliate. Stamens 3; anthers ca. 0.5 mm. Caryopsis brown, oblong, ca. 1 mm. Fl. and fr. Apr–Oct.

• Mountain slopes, waste places. Fujian, Hainan, Shanghai, Taiwan.

7. *Eragrostis atrovirens* (Desfontaines) Trinius ex Steudel, Nomencl. Bot., ed. 2, 1: 562. 1840.

鼠妇草 shu fu cao

Poa atrovirens Desfontaines, Fl. Atlant. 1: 73. 1798; *Eragrostis chariis* (Schultes) Hitchcock; *E. elegantula* (Kunth) Nees ex Steudel (1854), not Nees (1851); *E. fracta* S. C. Sun & H. Q. Wang; *E. longispicula* S. C. Sun & H. Q. Wang; *E. multinodis* B. S. Sun & S. Wang; *Poa chariis* Schultes; *P. elegantula* Kunth.

Perennial. Culms loosely tufted, erect or geniculate at base, 15–100 cm tall, ca. 4 mm in diam., 4–8-noded. Leaf sheaths glabrous but pilose along summit; ligules a ciliate membrane, 0.2–0.3 mm; leaf blades flat or involute, 4–17 × 0.2–0.4 cm, adaxial surface scabrous, near base pilose, abaxial surface glabrous. Panicle open, 5–20(–25) × 2–15 cm; branches one to several per node. Spikelets plumbeous and purplish, narrowly oblong, 5–15(–25) × 1.5–2.5 mm, 8–40-flowered, pedicels 0.5–5(–15) mm; rachilla persistent. Glumes 1-veined, 1–2.3 mm; lower glume ovate, 1–1.3 mm, apex acute, upper glume narrowly ovate, 1.3–2.3 mm, apex acuminate. Lemmas broad ovate, 1.8–2.2 mm, apex acute, lower lemma 2–2.2 mm, deciduous with palea. Palea loosely ciliate along keel, 1.6–1.8 mm. Stamens 3; anthers 0.7–0.9 mm. Caryopsis ca. 1 mm. Fl. and fr. summer and autumn. $2n = 40$.

Roadsides, river banks. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Yunnan [tropical and subtropical regions of Africa and Asia].

8. *Eragrostis fauriei* Ohwi, Bot. Mag. (Tokyo) 55: 278. 1941.

佛欧里画眉草 fo ou li hua mei cao

Perennial. Culms densely caespitose, 30–60 cm tall, erect, glabrous. Leaf sheaths usually shorter than internodes; ligules margin ciliate; leaf blades subcoriaceous, 2–5 mm broad, margin involute. Panicle open, 10–15 cm; branches ascending, scabrous, glabrous in axils. Spikelets palely purplish, lanceolate, 5–10 × ca. 2.5 mm, 5–15-flowered, pedicellate; rachilla persistent. Glumes broadly lanceolate, 1-veined, apex acuminate, lower glume 1–1.5 mm, the upper 1.5–1.7 mm. Lemmas ovate, apex acute, minutely punctate, keel scabrous, lateral veins distinct, subparallel. Palea persistent, keels arc-shaped, ciliate-scabrous. Stamens 3; anther oblong, blackish purple, ca. 0.5 mm. Caryopsis elliptical, slightly compressed, obscurely striate.

• Waste places. Taiwan.

9. *Eragrostis curvula* (Schrader) Nees, Fl. Afr. Austral. Ill. 397. 1841.

弯叶画眉草 wan ye hua mei cao

Poa curvula Schrader, Gött. Gel. Anz. 3: 2073. 1821.

Perennial. Culms densely tufted, erect, 80–120 cm tall, 5–6-noded. Leaf sheaths scabrous with retrorse hairs at lower part, glabrous upward, shorter than internodes, long pilose along the summit; leaf blades elongate, involute, attenuate to a fine point, arcuate spreading, scabrous, (5–)10–40 cm × 1–2.5(–3) mm. Panicles open, 12–35 × 6–9 cm; branches solitary or in pairs, ascending, naked at base, at least the lower densely pilose in axils. Spikelets gray-green, (4–)6–11 × 1.5–2 mm, 5–16-flowered. Glumes lanceolate, apex acuminate, 1-veined, lower glume 1.2–1.5 mm, upper glume 1.8–2.5 mm. Lemmas broadly oblong, apex acute or obtuse, veins prominent, lower lemma 2–2.5 mm. Palea subequal to lemma, 2-keeled, persistent or tardily deciduous. Stamens 3; anthers ca. 1.2 mm. Caryopsis ellipsoid to obovoid, dorsally compressed, adaxial surface with a shallow, broad groove or ungrooved, smooth, mostly translucent, light brown, 1–1.7 mm. Fl. and fr. Apr–Sep. $2n = 20, 42, 63, 80$.

Commonly cultivated for ornament. Fujian, Guangxi, Hubei, Jiangsu, Xinjiang, Yunnan [native to Africa].

This species is used for fodder and as an ornamental grass.

10. *Eragrostis pilosissima* Link, Hort. Berol. 1: 189. 1827.

多毛知风草 duo mao zhi feng cao

Eragrostis makinoi Hackel.

Perennial. Culms tufted, erect, slender and rigid, 30–40 cm tall, less than 2 mm in diam. Leaf sheaths densely pilose, usually shorter than internodes but longer than internodes at base; ligules a line of hairs, ca. 0.3 mm; leaf blades usually involute, 5–10 × 0.1–0.2 cm, densely pilose at both surfaces. Panicle lax, 4–10 × 2–5 cm; branch usually solitary, slender, glabrous in axils. Spikelets yellow, oblong, 3–7 × ca. 2 mm, 7–14-flowered. Glumes ovate-oblong, subequal, 1–1.5 mm, apex acute. Lemmas ovate-oblong, apex obtuse, lateral veins faint. Palea slightly shorter than lemma, slightly arc-shaped, along keels ciliate, persistent or tardily deciduous. Stamens 3; anthers ca. 0.8 mm. Caryopsis furrowed on one side, bluntly triangular in section. Fl. and fr. Aug.

Mountain slopes. Fujian, Guangdong, Hainan, Jiangxi, Taiwan [SE Asia].

11. *Eragrostis pilosiuscula* Ohwi, Bot. Mag. (Tokyo) 55: 279. 1941.

有毛画眉草 you mao hua mei cao

Perennial. Culms tufted. Leaf sheaths tuberculate-pilose; ligules a line of hairs, 0.4–0.5 mm; leaf blades linear, ca. 10 × 0.15 cm, densely covered with long tuberculate hairs on both surfaces. Panicles open, 5–7 cm; branches solitary or in pairs, naked at base. Spikelets usually 7-flowered, ca. 3.5 mm. Glumes

lanceolate, or upper ovate, chartaceous, subequal, ca. 1 mm, 1-veined. Lemmas ca. 1.5 mm, chartaceous, ovate. Palea elliptical, usually equal to lemma, 2-keeled, minutely scabrous along keels. Caryopsis compressed, elliptical in section. Fl. and fr. Aug.

• Open places. Guangdong, Taiwan.

12. *Eragrostis perlaxa* Keng ex P. C. Keng & L. Liu, Acta Bot. Sin. 9: 66. 1960.

疏穗画眉草 shu sui hua mei cao

Perennial. Culms tufted, erect and slender, 40–90 cm tall, ca. 1 mm in diam., 2–3-noded. Leaf sheaths glabrous, pilose along the summit; ligules a line of hairs, ca. 0.2 mm; leaf blades involute, adaxial surface pilose, 3–8 × 0.1–0.25 cm. Panicle lax, 7–25 × 0.4–0.9 cm; branch solitary, 4–8 cm, glabrous in axils; branchlet with 2–5 spikelets. Spikelets stramineous or gray-green, filiform or oblong, 0.5–2.5 × ca. 0.3 cm, 6–60-flowered, with pedicel 0.5–1 cm. Glumes 1-veined, lower glume narrowly ovate, apex acuminate, ca. 1.2 mm, upper glume ovate, apex acute, ca. 1.5 mm. Lemmas broadly ovate, apex acute, lateral veins distinct, lower lemma ca. 2 mm. Palea ca. 1.8 mm, persistent, along keels ciliate. Anthers ca. 0.3 mm. Caryopsis ca. 0.6 mm. Fl. Aug.

• Mountain slopes, open ground. Anhui, Fujian, Guangdong, Guangxi, Taiwan.

13. *Eragrostis perennans* Keng, Sunyatsenia 3: 16. 1935.

宿根画眉草 su gen hua mei cao

Eragrostis hekouensis B. S. Sun & S. Wang; *E. lincangensis* B. S. Sun & S. Wang; *E. quinquenervis* B. S. Sun & S. Wang; *E. rubida* B. S. Sun & S. Wang.

Perennial. Culms erect and rigid, 50–110 cm tall, 1–3 mm in diam., 2–4-noded. Leaf sheaths pilose along summit; ligule membranous or a line of hairs, 0.15–0.3 mm; leaf blades flat, stiff, 10–45 × 0.3–0.5(–0.7) cm, glabrous or adaxial surface scabrous, rarely villous on both surfaces. Panicle open, 20–35 × 3–6(–13) cm; branches usually solitary, pilose, hispidulous or glabrous in axils. Spikelets purplish yellow, 4–20 × 1.8–3 mm, 5–24-flowered, with pedicel 1–5 mm. Glumes broadly lanceolate, apex acuminate, 1-veined, lower glume 1.6–2 mm, upper glume 1.8–2.3 mm. Lemmas oblong-lanceolate, apex acute; lateral veins greenish and distinct; lowest lemma 2.2–2.5 mm. Palea persistent, ca. 2 mm, along 2 keels ciliate. Anthers ca. 1 mm. Caryopsis obovoid to ellipsoid, terete, somewhat striate, brown, 0.7–0.9 mm. Fl. and fr. summer and autumn.

Mountain slopes, roadsides. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Yunnan, Zhejiang [SE Asia].

14. *Eragrostis nigra* Nees ex Steudel, Syn. Pl. Glumac. 1: 267. 1854.

黑穗画眉草 hei sui hua mei cao

Eragrostis atropurpurea Hochstetter ex Steudel; *E. denegensis* B. S. Sun & S. Wang.

Perennial. Culms tufted, erect or slightly geniculate at base, 30–90 × 0.15–0.25 cm, slightly compressed at base, 2–3-

noded. Leaf sheaths along margins long ciliate, white pilose along the summit; ligules 0.1–0.5 mm; leaf blades filiform, flat, 2–25 × 0.3–0.5 cm, glabrous. Panicle open, 10–24 × 3–16 cm; branches solitary or verticillate, slender and twisted, glabrous in axils. Spikelets black or black green, 3–6 × 1–1.5 mm, 3–8-flowered, with pedicel 2–10 mm. Glumes membranous, lanceolate, apex acuminate, lower glume 1-veined, 1.5–2.5 mm; upper glume 1–3-veined, 1.8–2.5 mm. Lemmas ovate-oblong, apex membranous, lower lemma 2–2.2 mm. Palea persistent, slightly shorter than lemma, along 2 keels ciliate, apex obtuse. Stamens 3; anthers ca. 0.6 mm. Caryopsis elliptical, 0.5–1 mm. Fl. and fr. Apr–Sep.

Mountain slopes. Gansu, Guangxi, Guizhou, Henan, Jiangxi, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Sri Lanka; SE Asia].

15. *Eragrostis ferruginea* (Thunberg) P. Beauvois, Ess. Agrostogr. 71. 1812.

知风草 zhi feng cao

Poa ferruginea Thunberg in Murray, Syst. Veg., ed. 14, 114. 1784; *Eragrostis mairei* Hackel; *E. mairei* var. *eglandis* B. S. Sun & S. Wang.

Perennial. Culms single or tufted, erect or geniculate at base, 30–110 cm tall, 2–4 mm in diam. Leaf sheaths laterally compressed, glabrous but along margins and summit densely pilose, sometimes glandular along main vein; ligules a line of hairs, ca. 1 mm; leaf blades linear-lanceolate, (4–)20–40 × 2–6 mm, glabrous or adaxial surface sparingly covered with silky hairs on basal part. Panicle large and open, 15–40 × 4–15 cm, 1–3-branched at each node, glabrous in axils; branchlet and pedicel usually glandular at middle or above middle. Spikelets oblong, purplish black, gray-green, rarely yellowish green, 5–10 × 2–2.5 mm, (4–)7–12-flowered. Glumes lanceolate, open, 1-veined, apex acuminate, lower glume 1.4–2 mm, upper glume 2–3 mm. Lemma ovate-lanceolate to oblong, 2.4–3 mm, apex obtuse, lower lemma ca. 3 mm. Palea persistent, along keels ciliate. Anthers ca. 1 mm. Caryopsis rectangular-prismatic with a shallow, narrow adaxial groove, laterally compressed, faintly striate, reddish brown, 0.7–1.5 mm. Fl. and fr. Aug–Dec. 2n = 80.

Mountain slopes, roadsides. Anhui, Beijing, Fujian, Guizhou, Henan, Hubei, Shaanxi, Shandong, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India (Sikkim), Japan, Korea, Laos, Nepal, Vietnam].

The name “*Eragrostis ferruginea* var. *yunnanensis* Keng” (Claves Gen. Sp. Gram. Prim. Sin. 178. 1957) was not validly published because no Latin description was provided.

16. *Eragrostis cumingii* Steudel, Syn. Pl. Glumac. 1: 266. 1854.

珠芽画眉草 zhu ya hua mei cao

Eragrostis bulbifera Steudel; *E. reflexa* Hackel.

Annual to perennial. Culms erect, tufted, slender, usually with scaly buds at base, glabrous, 20–70 cm tall, 1–1.5 mm in diam., 3–4-noded. Leaf sheaths compressed at base, glabrous, long pilose along summit; ligules 0.1–0.3 mm, fimbriate; leaf blades involute, 5–19 × 0.1–0.2 cm, glabrous on both surfaces, but long pilose at base of adaxial surface. Panicle open, 8–30 ×

4–8 cm; branches solitary, naked at lower part, glabrous in axils. Spikelets yellowish green or gray-green, narrowly oblong, 5–20 × 2–2.5 mm, 8–40-flowered, pedicels without glands. Glumes chartaceous, deltoid-oblong, easily falling off when mature, lower glume 1-veined, ca. 1 mm, upper glume 1–3-veined, ca. 1.3 mm. Lemmas broadly ovate, lateral veins nearly parallel, lower lemma ca. 2 mm. Palea chartaceous, oblanceolate, persistent or tardily deciduous, strongly 2-keeled, along keels ciliate. Anthers ca. 0.2 mm. Caryopsis elliptical, terete to laterally flattened, 0.8–1 mm. Fl. and fr. Sep–Oct.

Roadsides, fields. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Jiangsu, Taiwan, Yunnan, Zhejiang [Japan; SE Asia, Australia].

17. *Eragrostis duricaulis* B. S. Sun & S. Wang, J. Yunnan Univ. 20: 354. 1998.

针仓画眉草 zhen cang hua mei cao

Perennial. Culms erect, tufted, with scaly buds at base, glabrous, 60–80 cm tall, 1–1.2 mm in diam., 3–5-noded. Leaf sheaths dark brown, compressed near base, mostly glabrous and pilose at summit; ligules 0.1–0.3 mm, ciliate; leaf blades filiform, flat or folded, 5–20 × 0.1–0.3 cm, glabrous below and tuberculate pilose above. Panicle open, 12–22 × 4–10 cm; branches 1 or 2 per node, naked at lower part, ascending up to 6 cm, glabrous in axils. Spikelets plumbeous or yellowish, narrowly elliptical, 4–9 × 1.5–2 mm, 6–16-flowered, pedicels without glands, 1–3 mm. Glumes membranous, easily falling off when mature, lower glumes 1-veined, ca. 1.2 mm, upper glumes 1-veined, ca. 1.8 mm, scabrous on keel. Lemmas broadly ovate, apex acuminate, lower lemma ca. 2 mm, deciduous. Palea persistent, ca. 1.6 mm, apex obtuse. Stamens 3; anthers 0.3–0.4 mm. Caryopsis brown, elliptical to roundish (spherical), 0.5–0.6 mm. Fl. and fr. Apr–Oct.

• Reservoir dams; ca. 1100 m. Yunnan (Zhenkang).

18. *Eragrostis hainanensis* L. C. Chia, Fl. Hainan. 4: 539. 1977.

海南画眉草 hai nan hua mei cao

Perennial, usually stoloniferous. Culms rigid, erect or geniculate at base, 35–45 cm tall, ca. 2 mm in diam., 4–7-noded. Leaf sheaths glabrous and smooth, long pilose along summit; ligules scarious, ca. 0.2 mm, margin ciliate; leaf blades linear involute, stiff, 4–8 × ca. 0.3 cm, adaxial surface long pilose. Panicle open, 9–13 × 4–6 cm; branches solitary, lax, ascending, naked at base, usually glabrous in axils. Spikelets greenish or purplish green, oblong, 7–15 × ca. 2 mm, 10–44-flowered; rachilla persistent. Glumes membranous, ovate 1-veined, lower glume ca. 1 mm, upper glume ca. 1.2 mm. Lemmas broadly ovate, apex slightly obtuse, veins prominent, lower lemma ca. 1.6 mm. Palea slightly shorter than lemma, along 2 keels ciliate, tardily deciduous. Stamens 3; anthers yellow, ca. 3 mm. Fl. and fr. autumn.

• Open grasslands. Hainan.

19. *Eragrostis pilosa* (Linnaeus) P. Beauvois, Ess. Agrostogr. 71. 1812.

画眉草 hua mei cao

Poa pilosa Linnaeus, Sp. Pl. 1: 68. 1753.

Annual. Culms tufted, erect or geniculate at base, 15–60 cm tall, 1.5–2.5 mm in diam., 4-noded, smooth. Leaf sheaths pilose at summit, compressed, margin submembranous; ligules a line of hairs; leaf blades flat or involute, 6–20 × 0.2–0.3 cm, glabrous. Panicle 10–25 × 3.5–14 cm; branches solitary to verticillate, pilose in axils, usually ascending, pedicels as long or longer than spikelets. Spikelets 3–10 × 1–1.5 mm, 4–14-flowered. Glumes membranous, lanceolate, apex acuminate, lower glume without vein, 0.4–0.9 mm, upper glume 1-veined, 0.7–1.3 mm. Lemmas ovate, apex acute, lower lemma ca. 1.8 mm. Palea ca. 1.5 mm, along keels persistent or tardily deciduous ciliate. Stamens 3; anthers 0.1–0.3 mm. Caryopsis oblong, ca. 0.8 mm. Fl. and fr. Aug–Nov. $2n = 40, 60$.

Open grasslands. Anhui, Beijing, Fujian, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Shaanxi, Shandong, Taiwan, Xizang, Yunnan, Zhejiang [SE Asia; Africa, Australia, S Europe; introduced in America].

This species is very widely distributed in tropical and warm regions of the Old World. It is a forage grass with medicinal uses.

20. *Eragrostis multicaulis* Steudel, Syn. Pl. Glumac. 1: 426. 1854.

多秆画眉草 duo gan hua mei cao

Eragrostis niwahokori Honda; *E. pilosa* (Linnaeus) P. Beauvois var. *imberbis* Franchet; *E. pulchra* S. C. Sun & H. Q. Wang.

Annual. Culms tufted, erect or ascending, geniculate at base. Leaf sheaths glabrous at summit or with a few short hairs, compressed; ligules a line of hairs, 0.2–0.1 mm; leaf blades usually flat, 3–9 cm × 0.5–2.5 mm, glabrous. Panicle open, 4.5–9 × 1.5–3 cm; branches solitary or in pairs but base branches nearly whorled, glabrous in axils; pedicels usually shorter than spikelets. Spikelets dark green, 2.5–4.5 mm, 3–10-flowered. Glumes membranous, falling off at maturity, lower glume narrow, veins obscure, ca. 0.6 mm, upper glume oblong-ovate, 1-veined, ca. 1 mm. Lemmas membranous, semi-ovate in side vein, ca. 1.5 mm, middle vein keeled, falling off at maturity. Palea membranous, ca. 1 mm, apex blunt, along 2 keels ciliate, persistent or tardily falling off at maturity. Stamens 3; anthers ca. 0.2 mm. Caryopsis ca. 0.8 mm, striate. Fl. and fr. late summer. $2n = 40$.

Roadsides, waste fields, especially common in flower pots. Taiwan, Yunnan [India, Japan; SE Asia].

21. *Eragrostis autumnalis* Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 10: 178. 1936.

秋画眉草 qiu hua mei cao

Annual. Culms single or tufted, 15–45 cm tall, 1–2.5 mm in diam., 3–4-noded. Leaf sheaths compressed, glabrous, along summit with long deciduous hairs; ligules a line of hairs; leaf blades usually involute or plicate, 6–12 × 0.2–0.3 cm. Panicle 6–15 × 3–5 cm; branches solitary, clustered, or verticillate, glabrous in axils. Spikelets gray-green, 3–5 × ca. 2 mm, 3–10 florets, with pedicels 1–5 mm. Glumes 1-veined, lower glume ca. 1.5 mm, upper glume ca. 2 mm. Lemma broadly ovate, apex acute, lower lemma ca. 2 mm. Palea ca. 1.5 mm, 2-keeled, along keels ciliate, persistent or tardily deciduous. Stamens 3;

anthers ca. 0.5 mm. Caryopsis red-brown, ca. 1 mm. Fl. and fr. Jul–Nov.

• Grasslands, roadsides. Anhui, Fujian, Guizhou, Hebei, Henan, Jiangsu, Jiangxi, Shandong, Zhejiang.

Eragrostis autumnalis is very similar to *E. pilosa* and can be separated from that species by its longer, 1-veined lower glumes (ca. 1.5 mm vs. 0.4–0.9 mm), longer upper glumes (ca. 2 mm vs. 0.7–1.3 mm), and longer lemmas (ca. 2 mm vs. 1.8 mm).

22. *Eragrostis cilianensis* (Allioni) Vignolo-Lutati ex Janchen, Mitt. Naturwiss. Vereins Univ. Wien, n.s., 5: 110. 1907.

大画眉草 da hua mei cao

Poa cilianensis Allioni, Fl. Pedem. 2: 246. 1785; *Eragrostis major* Host; *E. megastachya* (Koeler) Link; *Poa megastachya* Koeler.

Annual. Culms rather robust, 30–90 cm tall, 3–5 mm in diam., erect or geniculate at base, 3–5-noded, a line of glands below each node. Leaf sheaths with glands along veins, along summit with tubercle hairs; ligules a line of hairs, ca. 0.5 mm; leaf blades flat, glabrous, 6–20 × 0.2–0.6 cm, along midvein and margin glandular. Panicle oblong or pyramidal, 5–20 cm; branch usually solitary, ascending; branchlet glandular. Spikelets dark green, gray-green or yellowish white, compressed, oblong or ovate-oblong, 5–20 × 2–3 mm, 10–40-flowered. Glumes subequal or lower glume slightly shorter, 1-veined, upper glume 1–3-veined, along middle vein glandular. Lemmas chartaceous, broadly ovate-oblong, conspicuously 3-veined, along middle vein glandular, lower lemma 2.2–2.8 mm. Palea persistent; oblanate, apex rounded, 1.2–1.6 mm, along keels ciliate. Stamens 3; anthers ca. 0.5 mm. Caryopsis oblong, ca. 0.5 mm in diam. Fl. and fr. Jul–Oct. $2n = 40$.

Waste places, fields, cultivated ground. Anhui, Beijing, Fujian, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Taiwan, Xinjiang, Yunnan, Zhejiang [tropical and subtropical regions of the world].

23. *Eragrostis minor* Host, Icon. Descr. Gram. Austriac. 4: 15. 1809.

小画眉草 xiao hua mei cao

Poa eragrostis Linnaeus, Sp. Pl. 1: 68. 1753; *Eragrostis minor* var. *minima* B. S. Sun & S. Wang; *E. poaeoides* P. Beauvois, nom illeg. superfl.

Annual. Culms slender, tufted, erect or geniculate at base, (5–)15–50(–80) cm tall, 1–2 mm in diam., 3–4-noded, below each node usually a line of glands. Leaf sheaths usually shorter than internodes, along summit and margin with long silky hairs, along veins glandular especially in middle vein or tuberculate hispidulous; ligules a line of hairs; leaf blades flat or involute, 3–15 × 0.2–0.4 cm, adaxial surface scabrous and pilose, abaxial surface glabrous, along middle vein and margins with glands in row. Panicle open, 6–15 × 3–6 cm; branch solitary, ascending or spreading. Spikelets green or dark green, oblong, 3–8 × 1.5–2 mm, 3–16-flowered, with glandular pedicels 3–6 mm. Glumes chartaceous, lanceolate, 1-veined, glandular along veins, lower glume ca. 1.6 mm, upper glume ca. 1.8 mm. Lemma ovate, apex obtuse, lateral veins nearly parallel, midrib glandular, low-

er lemma 1.5–2 mm. Palea subequal to its lemma, persistent, 2-keeled, along keels ciliate or scabrous. Stamens 2 or 3; anthers 0.2–0.3 mm. Caryopsis red-brown, oblong or globose, ca. 0.5 mm in diam. Fl. and fr. Jul–Sep. $2n = 40$.

Mountain slopes, grasslands, roadsides. Anhui, Beijing, Fujian, Guizhou, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [tropical, subtropical, and temperate regions of the world].

24. *Eragrostis suaveolens* A. K. Becker ex Claus, Beitr. Pflanzenk. Russ. Reiches 8: 266. 1851.

香画眉草 xiang hua mei cao

Annual. Culms slender, caespitose, decumbent at base, smooth and glabrous, 20–60 cm tall. Leaf sheaths glabrous, along veins with many glands, pilose along summit; ligules a ring of hairs; blades linear, flat, glabrous, with many glands. Panicle lax; branches slender, solitary or 2(–3) per node, glabrous in axils. Spikelet rather pale, 4–11 × 1.5–2(–2.5) mm, (5–)10–20-flowered. Glumes slightly shorter than florets, lower glume shorter than upper glume. Lemmas broadly ovate, eglandular along keel, lower lemma 1.5–2 mm. Palea slightly shorter than its lemma, curved, along keels ciliate, persistent. Stamens 3; anthers 0.2–0.3 mm. Fl. and fr. Jun–Sep.

Roadsides, streams, fields. Xinjiang [Kazakhstan; E Europe].

25. *Eragrostis unioides* (Retzius) Nees ex Steudel, Syn. Pl. Glumac. 1: 264. 1854.

牛虱草 niu shi cao

Poa unioides Retzius, Observ. Bot. 5: 19. 1788; *Eragrostis amabilis* (Linnaeus) Wight & Arnold ex Nees; *E. formosana* Hayata; *P. amabilis* Linnaeus.

Annual or perennial. Culms erect or geniculate at base, 20–60 cm tall, 2–3 mm in diam., 3–5-noded. Leaf sheaths glabrous and smooth, long pilose along the summit; ligules membranous, ca. 0.8 mm; leaf blades sublanolate, flat, 2–20 × 0.3–0.6 cm, adaxial surface long pilose, abaxial surface smooth, apex acuminate. Panicle open, oblong, 5–20 × 3–5 cm; branch solitary, glabrous in axils. Spikelets purplish red at maturity, oblong, 5–10 × 2–4 mm, with pedicel 0.2–1 cm, 10–20-flowered; florets closely imbricate; rachilla persistent, lower glume 1.5–2 mm, upper glume 2–2.5 mm. Lemmas broadly ovate, veins prominent, apex acute, the lower lemma ca. 2 mm. Palea slightly shorter than the lemma, 2-keeled, very narrowly winged and ciliate, falling off together with its lemma at maturity. Stamens 2; anthers purple, 0.2–0.5 mm. Caryopsis compressed, ellipsoidal, ca. 0.8 mm. Fl. and fr. Aug–Oct.

Mountain slopes, grasslands, roadsides. Fujian, Hainan, Jiangxi, Taiwan, Yunnan [W Africa, tropical Asia].

26. *Eragrostis montana* Balansa, J. Bot. (Morot) 4: 168. 1890.

山地画眉草 shan di hua mei cao

Eragrostis malayana Stapf.

Short-lived perennial. Culms erect or geniculate at base, new tufts at nodes but not rooting, up to 60 cm tall, ca. 2 mm in diam. Leaf sheaths lightly keeled, glabrous, pilose at collar; leaf blades 3.5–11.5 cm × 0.5–1.25(–3) mm, glabrous except for

sparse long hairs near ligule; ligule ca. 0.2 mm, ciliolate. Panicle lax to contracted, 4–10 × 0.5–5 cm; branches solitary, lowermost 1.2–3 cm, erect or spreading, bare in lower 1/5–1/3, scaberulous, branchlets appressed, main axils often pilose; pedicels 0.5–3 mm, shorter than spikelet. Spikelets 2.8–5(–7) × 1.5–2.3 mm, greenish yellow tinged light purple, florets 12–18, closely overlapping, disarticulating from base upward; rachilla persistent; glumes unequal, lower glume 0.5–1 mm, upper glume 0.75–1.4 mm, both acute; lemmas 1.1–1.5 mm, lateral veins faint, apex subacute. Palea persistent, keels ciliolate. Stamens 3; anthers 0.2–0.4 mm. Caryopsis slightly compressed, ellipsoidal, 0.5–0.6 mm. Fr. Nov.

About 1200 m. Yunnan [Cambodia, Indonesia, Malaysia, Myanmar, Thailand, S Vietnam].

This species is reported from Yunnan, but the authors have not seen any specimens.

27. *Eragrostis ciliata* (Roxburgh) Nees, Fl. Bras. Enum. Pl. 2: 512. 1829.

纤毛画眉草 xian mao hua mei cao

Poa ciliata Roxburgh, Fl. Ind. 1: 336. 1820; *Eragrostis alopecuroides* Balansa; *E. brevispica* Keng.

Perennial. Culms tufted, erect, rigid, 30–90 cm tall, ca. 2 mm in diam., many-noded, a line of glands below node. Leaf sheaths glabrous and smooth, long pilose along summit; ligules a line of hairs; leaf blades flat, lanceolate, 4–17 × 0.3–0.5 cm, glabrous. Panicle dense, cylindrical, 1.5–7 × 0.5–1.5 cm, densely hirsute in axils of basal branch. Spikelets compressed, 4–6 × ca. 3 mm, 7–13-flowered; rachilla slender, disarticulated between florets from top to the base at maturity. Glumes membranous lanceolate, pubescent on back, ciliate along margin, apex mucronate; lower glume ca. 1.8 mm, upper glume 1.8–2 mm. Lemmas membranous, pubescent on back, ciliolate along the margins below, apex short pointed, lower lemma 1.8–2.5 mm. Palea slightly shorter than lemma, margin ciliate, along 2 keels long ciliate, the cilia 0.8–1.6 mm. Stamens 2; anthers ca. 0.4 mm. Caryopsis red brown, ovate, ca. 0.5 mm. Fl. and fr. winter.

Thickets. Hainan [India, Myanmar, Sri Lanka, Vietnam].

28. *Eragrostis ciliaris* (Linnaeus) R. Brown in Tuckey, Narr. Exped. Zaire 478. 1818.

毛画眉草 mao hua mei cao

Poa ciliaris Linnaeus, Syst. Nat., ed. 10, 2: 875. 1759; *Cynodon ciliaris* (Linnaeus) Raspail; *Megastachya ciliaris* (Linnaeus) P. Beauvois; *Poa amboinica* Linnaeus.

Annual. Culms slender, tufted, 10–70 cm tall. Leaf sheaths with long silky hairs; ligules a line of ca. 0.4 mm hairs; leaf blades ca. 15 × 0.3 cm, adaxial surface with silky hairs. Panicle purplish, contracted, spikelike. Spikelets ca. 2 mm, many-flowered. Glumes chartaceous, deltoid-lanceolate, 1-veined, apex pointed, lower glume slightly shorter than upper glume, upper glume ca. 1 mm. Lemmas chartaceous, 0.8–1.3 mm, midrib of back with short glandular hairs, glabrous to scabrous along the margins, apex mucronate. Palea oblanceolate, chartaceous, equal to lemma, along 2 keels ciliate, cilia longer than the width

of the palea. Caryopsis ca. 0.3 mm, the embryo 1/2 the length of the caryopsis. Fl. and fr. in autumn. $2n = 20, 40$.

Dry places. Taiwan [tropical and subtropical regions of the world].

Eragrostis ciliaris is often confused with *E. ciliata*, but the latter species is a perennial with lemmas 2–2.5 mm, membranous, and pubescent abaxially and the palea slightly shorter than the lemma.

29. *Eragrostis collina* Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 413. 1831.

戈壁画眉草 ge bi hua mei cao

Aira arundinacea Linnaeus; *Eragrostis arundinacea* (Linnaeus) Roshevitz (1934), not Jedwabnick (1924).

Perennial with rhizomes. Culms glaucous, erect, caespitose, rigid, robust, glabrous, 30–100 cm tall. Leaf sheaths glabrous, with long soft hairs along summit; ligules a ring of hairs; blades linear, flat or involute, glabrous, margins scabrous, 2–6 mm broad. Panicle ca. 25 × 12 cm; branches ascending, loose, smooth, 1–2(–3) per node. Spikelets dark green, usually gathered at tip, 1.8–3.5 mm, 2–5-flowered; rachilla articulating at maturity. Glumes unequal, shorter than florets. Lemma ca. 2 mm, apex obtuse. Caryopsis nearly rounded, ca. 1 mm in diam. Fl. and fr. Jun–Sep.

Mountain slopes, streams; 500–1000 m. N Xinjiang [Kazakhstan, Russia; SW Asia (Caucasus, Iran, Turkey)].

30. *Eragrostis tenella* (Linnaeus) P. Beauvois ex Roemer & Schultes, Syst. Veg. 2: 576. 1817.

鲫鱼草 ji yu cao

Poa tenella Linnaeus, Sp. Pl. 1: 69. 1753.

Annual. Culms slender, 15–60 cm tall, erect or geniculate at base, 3–4-noded. Leaf sheaths shorter than internodes, pilose along margin and summit; ligules a line of short hairs; leaf blades flat, 2–10 × 0.3–0.5 cm, adaxial surface scabrous, abaxial surface glabrous and smooth. Panicle open; branches solitary or clustered, long pilose in axils, branchlet and pedicels glandular. Spikelets ovate or oblong-ovate, ca. 2 mm, 4–10-flowered; rachilla disarticulated between florets from above downward at maturity. Glumes membranous, 1-veined, lower glume ca. 0.8 mm, upper glume ca. 1 mm, falling off when mature. Lemmas broadly ovate, apex obtuse, lower lemma ca. 1 mm. Palea persistent or tardily deciduous, long ciliate along keels, hairs rigidly spreading at maturity. Stamens 3; anthers ca. 0.3 mm. Caryopsis red, ovoid, ca. 0.5 mm. Fl. and fr. Apr–Aug. $2n = 20$.

Moist places. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hebei, Shandong, Taiwan, Xizang, Yunnan [Old World tropics].

31. *Eragrostis alta* Keng, Lingnan Sci. J. 16: 1. 1937.

高画眉草 gao hua mei cao

Annual. Culms erect, 120–150 cm tall, ca. 5 mm in diam., striate. Leaf sheaths loose, glabrous distinctly striate; ligules ca. 1 mm, ciliolate along margin; leaf blades greenish, 20–45 × 0.3–0.5 cm, adaxial surface smooth, abaxial surface scabrous. Panicle contracted 20–40 × ca. 3 cm; branches solitary or in

pairs, ascending glabrous in axils. Spikelets yellowish green, glabrous, $2-3 \times 0.8-1$ mm, 5–9-flowered; rachilla disarticulating between florets from top downward at maturity; pedicels straight or curved, eglandular. Glumes ovate, membranous, subequal, ca. 0.7 mm, 1-veined, apex obtuse. Lemmas apex obtuse or slightly acute, lower lemma ca. 1 mm. Palea along 2 keels glabrous or slightly ciliate. Stamens 2; anthers 0.3–0.4 mm. Fl. and fr. spring and early summer.

- Forests, moist places. Hainan.

32. *Eragrostis japonica* (Thunberg) Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 1: 405. 1831.

乱草 luan cao

Poa japonica Thunberg in Murray, Syst. Veg., ed. 14, 114. 1784.

Annual. Culms erect, or geniculate at base, 30–100 cm

tall, 1.5–2.5 mm in diam., 3–4-noded. Leaf sheaths usually loose, longer than internodes, glabrous; ligules scarious, ca. 0.5 mm, fimbriate at apex, pubescent on back; leaf blades flat, $3-25 \times 0.3-0.5$ cm, smooth and glabrous. Panicle elongated, $6-34 \times 1.5-6$ cm; branches slender, clustered or verticillate, glabrous in axils. Spikelets usually purplish at maturity, ovate, 1–2 mm, 4–8-flowered; rachilla distarticulating between florets from top downward at maturity. Glumes chartaceous, ovate-lanceolate, subequal, 0.6–0.8 mm, 1-veined, apex obtuse. Lemmas chartaceous, broadly elliptical, distinctly 3-veined, apex obtuse, lower lemma ca. 1 mm. Palea subequal to lemma, along 2 keels ciliate. Stamens 2; anthers ca. 0.2 mm. Caryopsis red-brown, ovoid, 0.4–0.5 mm. Fl. and fr. Jun–Nov.

Fields, roadsides, stream banks. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Thailand, Vietnam].

132. *ERAGROSTIELLA* Bor, Indian Forester 66: 269. 1940.

细画眉草属 xi hua mei cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, compactly tufted. Culms slender, rigidly erect, unbranched. Leaf blades mainly basal, filiform; ligule membranous with ciliate fringe. Inflorescence a single subsecund spike-like raceme with sessile or subsessile, biseriate spikelets. Spikelets laterally compressed with many tightly imbricate florets, narrow, often linear-oblong, lemmas disarticulating at maturity leaving the persistent rachilla and paleas, but sometimes the upper part shed as a whole; glumes shorter than lemmas, subequal or upper slightly longer, 1–3-veined; lemmas ovate or lanceolate, cartilaginous, 3-veined, glabrous, keeled along midvein, acute or obtuse; palea keels usually narrowly winged, wing margins usually ciliate. Grain ellipsoid.

Six species: E Africa through India to SE Asia and N Australia; one species (endemic) in China.

This homogeneous and easily recognized genus of rather small grasses is split from *Eragrostis* on the basis of its single terminal raceme.

1. *Eragrostiella lolioides* (Handel-Mazzetti) P. C. Keng, Acta Bot. Sin. 9: 51. 1960.

细画眉草 xi hua mei cao

Eragrostis lolioides Handel-Mazzetti, Symb. Sin. 7: 1282. 1936.

Culms 20–50 cm tall, ca. 0.7 mm in diam., 1-noded. Leaf sheaths yellowish brown, glabrous, becoming fibrous at base; leaf blades stiff, involute, $4-11 \times 0.1-0.15$ cm, adaxial surface and margins scabrid, apex acuminate; ligule 0.5–0.8 mm. Raceme 10–27 cm, loosely spiculate and tipped with a spikelet, spikelets 5–7 mm apart. Spikelets ovate-oblong, stramineous at

maturity, $5-8 \times 3-4$ mm, florets 5–12 in middle part of raceme; glumes narrowly lanceolate, papery with membranous margins, 1-veined, acuminate; lower glume 2–2.5 mm; upper glume 2.5–3 mm; lemmas broadly ovate, lowest 2.8–3 mm, glabrous, obtuse; palea membranous, broadly ovate, ca. 2 mm, keels very narrowly winged, ciliate. Anthers 3, ca. 0.6 mm. Fl. and fr. autumn and winter.

- Hill slopes, roadsides; 1400–2000 m. Yunnan.

Eragrostiella lolioides is similar to *E. nardoides* (Trinius) Bor, from Bhutan, Nepal, and the Indian Himalayas, but the latter species has more closely set spikelets with smaller lemmas (1.6–2 mm).

133. *HARPACHNE* A. Richard, Tent. Fl. Abyss. 2: 431. 1850.

镰稈草属 lian fu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials. Culms tufted. Leaf blades linear or convolute; ligule a line of hairs. Inflorescence a single, cylindrical “bottle-brush” raceme, the spikelets on slender pedicels, reflexing, hanging from rachis. Spikelets strongly laterally compressed, florets several to many, often increasing in size up the spikelet, spikelet falling entire together with the pungent or hooked pedicel; glumes narrowly oblong, shorter than lemmas, 1-veined; lemmas lanceolate, papery with membranous margins, 3-veined, glabrous, strongly keeled, acute to setaceously acuminate; palea much shorter than lemma, gibbous, keels winged. Caryopsis laterally compressed, obliquely elliptic.

Three species: two in tropical Africa, the other endemic to SW China.

1. *Harpachne harpachnoides* (Hackel) B. S. Sun & S. Wang, Fl. Yunnan. 9: 456. 2003.

镰稈草 lian fu cao

Eragrostis harpachnoides Hackel, Oesterr. Bot. Z. 52: 306. 1902.

Culms 15–30 cm tall, ca. 1 mm in diam., 3–4-noded. Leaf sheaths pilose along margins and at mouth, otherwise glabrous; leaf blades stiff, narrowly linear or involute, $2-9 \times 0.1-0.2$ cm, glabrous, apex acute; ligule ca. 0.5 mm. Inflorescence $3-7 \times$ ca. 1.5 cm; rachis pilose; pedicels 1.5–3 mm. Spikelets narrowly oblong to elliptic-oblong, $4-8 \times 1.5-2.5$ mm, florets 4–8, imbricate, slightly decreasing in length toward spikelet apex; glumes linear-oblong, keel scabrid; lower glume 1–1.5 mm, truncate; upper glume 2–2.5 mm, obtuse; lemmas lanceolate with straight keel, lowest ca. 2.5 mm, minutely puberulous, apex abruptly acute to apiculate; palea keels winged, wing margins ciliate, apex obtuse. Anthers 0.5–1 mm. Fl. and fr. Jun–Nov.

• Open places. Sichuan, Yunnan.

The other two species of *Harpachne* occur in tropical Africa and have longer spikelets (8–20 mm). The common *H. schimperi* A. Richard is clearly distinguished from *H. harpachnoides* by its wedge-shaped spikelets, in which the lemmas increase in length upward with acuminate-aristate tips.

134. *DESMOSTACHYA* (Stapf) Stapf in Dyer, Fl. Cap. 7: 316. 1898.

羽穗草属 yu sui cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Eragrostis sect. *Desmostachya* Stapf in J. D. Hooker, Fl. Brit. India 7: 324. 1896 [“1897”].

Perennials, rhizomatous. Leaf blades linear or inrolled; ligule a line of hairs. Inflorescence a narrow spike-like panicle composed of numerous, short, 1-sided racemes of sessile, closely imbricate, biseriate spikelets on a long central axis. Spikelets falling entire, strongly laterally compressed, florets several to many; glumes shorter than lemmas, unequal, membranous, 1-veined, lightly keeled, acute; lemmas papery to leathery, 3-veined with lateral veins evanescent upward, glabrous, keeled, acute; palea equal to or slightly shorter than lemma. Caryopsis ovoid, trigonous.

One species: from N Africa through SW Asia and India to China and continental SE Asia.

This genus is closely related to *Eragrostis*, differing mainly by its inflorescence structure.

1. *Desmostachya bipinnata* (Linnaeus) Stapf in Dyer, Fl. Cap. 7: 632. 1900.

羽穗草 yu sui cao

Briza bipinnata Linnaeus, Syst. Nat., ed. 10, 2: 875. 1759; *Eragrostis cynosuroides* (Retzius) P. Beauvois; *Poa cynosuroides* Retzius.

Coarse perennial forming large leafy tussocks, also with widely spreading scaly rhizomes. Culms rigid, branched at base and covered with leathery yellowish sheaths, 80–100 cm tall, ca. 7 mm in diam. Leaf sheaths glabrous; leaf blades flat or inrolled, tough, $18-30 \times 0.4-1$ cm, adaxial surface and margins

scabrid, abaxial surface rather smooth, apex long acuminate; ligule ca. 0.3 mm. Inflorescence $20-60 \times 2-3$ cm; racemes ascending or spreading, crowded or spaced, 0.5–3.5 cm; main axis and rachis hispidulous. Spikelets elliptic or elliptic-oblong, 2–10 mm, stramineous or purplish, florets 3–10; glumes ovate-lanceolate; lower glume 0.7–1.5 mm; upper glume 1.1–2 mm; lemmas ovate-lanceolate, 1.8–2.7 mm; palea keels scabrid. Fl. and fr. summer.

Arid regions with water table near surface. Hainan [Cambodia, India, Myanmar, Pakistan, Thailand, Vietnam; N and NE Africa, SW Asia, Australia (Cocos Islands)].

This is a tough grass of arid regions, useful as a soil binder.

135. *DACTYLOCTENIUM* Willdenow, Enum. Pl. 2: 1029. 1809.

龙爪茅属 long zhao mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Culms tufted, sometimes stoloniferous, compressed. Leaf blades linear, flat or loosely folded; ligule membranous, often ciliate. Inflorescence of paired or digitate spike-like racemes; racemes linear to narrowly oblong, spikelets sessile, biseriate, closely imbricate, the uppermost abortive, rachis terminating in a bare pointed extension. Spikelets elliptic to ovate, laterally compressed, florets several, disarticulating above glumes but not usually between florets; glumes shorter than lemmas, keeled, 1-veined; lower glume smaller, sharply acute; upper glume with a stout oblique awn from just below the broadly rounded emarginate tip; lemmas membranous, 3-veined, glabrous, strongly keeled, acute to shortly awned and often recurved at the apex; palea keels sometimes winged. Grain angular, ornamented, enclosed within a free hyaline pericarp which ruptures at maturity. $x = 9, 10$.

Thirteen species: mainly from Africa to India, one species widespread; one species in China.

This genus can easily be recognized by its digitate, spike-like racemes, each terminating in a bare point.

1. *Dactyloctenium aegyptium* (Linnaeus) Willdenow, Enum. Pl. 2: 1029. 1809 [*"aegyptiacus"*].

龙爪茅 long zhao mao

Cynosurus aegyptius Linnaeus, Sp. Pl. 1: 72. 1753; *Chloris mucronata* Michaux; *Eleusine aegyptia* (Linnaeus) Desfontaines; *E. pectinata* Moench, nom. illeg. superfl.

Annual. Culms slender to moderately robust, geniculately ascending to shortly stoloniferous and mat-forming, infrequently erect, 15–60 cm tall. Leaf sheaths with ciliate margin; leaf blades flat, 5–20 × 0.2–0.6 cm, tuberculate-pilose on both surfaces, apex acute or acuminate; ligule membranous, 1–2 mm, margin ciliate. Inflorescence digitate, racemes 2–9, linear to narrowly oblong, often radiating horizontally. Spikelets broadly ovate, 3–4.5 mm, florets 3–4; lower glume narrowly lanceolate,

keel thick, hispidulous; upper glume elliptic to narrowly obovate, keel smooth, extended into a stout scabrid awn 1/2–2 times length of glume body; lemmas ovate, 2.6–4 mm, keel gibbous, hispidulous above middle, often extended into a stout cusp; palea equal to lemma, keels winged, wings ciliolate, tip 2-toothed. Grain ca. 1 mm, broadly obtriangular, transversely rugose. Fl. and fr. May–Oct. $2n = 20, 36, 40, 48$.

Disturbed weedy places, especially on sandy soils. Fujian, Guangdong, Guizhou, Hainan, Sichuan, Taiwan, Yunnan, Zhejiang [tropical and warm-temperate regions of the Old World; introduced to America and Europe].

Willdenow misspelled the specific epithet as "*aegyptiacus*," but this is simply an orthographical error, and does not affect the valid publication of the combination.

This is a widely distributed, annual weed.

136. **ACRACHNE** Wight & Arnott ex Chiovenda, Annuario Reale Ist. Bot. Roma 8: 361. 1908.

尖稈草属 jian fu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals. Culms single or tufted. Leaf blades linear, thin, flat; ligule membranous with ciliate fringe. Inflorescence composed of racemes arranged digitately or in whorls along a central axis; racemes with imbricate, subsessile spikelets on a slender flattened rachis, terminal spikelet abortive. Spikelets laterally compressed, florets 6–20, lemmas falling at maturity from below upward leaving the paleas on the persistent rachilla, but often spikelet falling wholly or in part when only a few lemmas have been shed; glumes shorter than lemmas, 1-veined, keeled; lemmas firmly membranous, 3-veined, glabrous, strongly keeled, entire or bidentate, tipped with a stout awn-point. Grain ellipsoid, ornamented, deeply sulcate on hilar side, enclosed within a free hyaline pericarp which ruptures at maturity.

Three species: Old World tropics; one species in China.

1. *Acrachne racemosa* (B. Heyne ex Roemer & Schultes) Ohwi, Bull. Tokyo Sci. Mus. 18: 1. 1947.

尖稈草 jian fu cao

Eleusine racemosa B. Heyne ex Roemer & Schultes, Syst. Veg. 2: 583. 1817; *Acrachne verticillata* (Roxburgh) Wight & Arnott ex Chiovenda; *Eleusine verticillata* Roxburgh; *Leptochloa racemosa* (B. Heyne ex Roemer & Schultes) Kunth; *Sclerodactylon micrandrum* P. C. Keng & L. Liu.

Culms tufted, erect or geniculately ascending, 8–50 cm tall. Leaf sheaths glabrous, compressed; leaf blades narrowly lanceolate, 7–20 × 0.3–1 cm, soft, adaxial surface tuberculate-pilose at base, tapering to a setaceous apex. Inflorescence subdigitate or racemes arranged along a central axis up to 15 cm; racemes mainly grouped in pseudo-whorls or pairs, 4–12 cm,

ascending. Spikelets densely imbricate, oblong with serrate outline, 6–10 mm, florets 6–20, stramineous at maturity; glumes papery-membranous; lower glume narrowly oblong, 1.2–3 mm, apex acute, mucronate; upper glume lanceolate, 1.5–3 mm, acuminate, awn-pointed; lemmas broadly ovate, 2–3 mm, keel scabrid, shallowly concave above middle and excurrent into a stout 0.5–1 mm awn-point, lateral veins also fractionally excurrent. Grain blackish, rugose, surface finely granular. Fl. and fr. autumn. $2n = 36$.

Field margins, river banks; 300–900 m. Hainan, Yunnan [Afghanistan, India, Indonesia, Myanmar, Pakistan, Sri Lanka, Thailand, Vietnam; Africa, SW Asia (S Arabia), N Australia, Pacific Islands; introduced in the West Indies].

This species is a good forage grass.

137. **ELEUSINE** Gaertner, Fruct. Sem. Pl. 1: 7. 1788.

稈草属 can shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or tussocky perennials. Culms compressed. Leaf sheaths strongly keeled; leaf blades linear, usually folded; ligule membranous, usually with a ciliate fringe. Inflorescence of digitate or subdigitate spikelike racemes clustered at the top of the culm; racemes with closely imbricate, biseriate spikelets, terminating in a fertile spikelet. Spikelets laterally compressed, florets several, disarticulating between the florets (except the cultivated species *E. coracana*); glumes shorter than lemmas, persistent, 1–3(–7)-veined, keeled, awnless; lemmas membranous, 3-veined, glabrous, strongly keeled, keel thickened with 1–3 closely spaced additional veins, obtuse or acute. Grain ellipsoid to subglobose, trigonous in section, ornamented, pericarp free. $x = 9$. Fl. and fr. Jul–Sep.

Nine species: mostly in E and NE tropical Africa, one species a pantropical weed and one cultivated as a cereal; two species (one introduced) in China.

Eleusine, *Acrachne*, and *Dactyloctenium* form a group of closely related genera, remarkable for their unusual, ornamented grains enclosed within a free pericarp, which is easily removed when soaked in a drop of water.

- 1a. Racemes slender, 3–5 mm broad, straight; spikelets disarticulating at maturity; grain oblong or ovate, not exposed when ripe 1. *E. indica*
 1b. Racemes stout, 8–15 mm broad, incurved; spikelets not disarticulating at maturity; grain globose, exposed in the gaping floret when ripe 2. *E. coracana*

1. *Eleusine indica* (Linnaeus) Gaertner, Fruct. Sem. Pl. 1: 8. 1788.

牛筋草 niu jin cao

Cynosurus indicus Linnaeus, Sp. Pl. 1: 72. 1753.

Annual. Culms tufted, erect or geniculate at base, 10–90 cm tall. Leaf sheaths glabrous or tuberculate-pilose; leaf blades flat or folded, 10–15 × 0.3–0.5 cm, glabrous or adaxial surface tuberculate-pilose; ligule ca. 1 mm, membranous, at most sparsely ciliolate. Inflorescence digitate, racemes (1–)2–7, linear, ascending, 3–10 × 0.3–0.5 cm, one raceme often set below the rest. Spikelets elliptic, 4–7 mm, florets 3–9; glumes lanceolate, scabrid along keel; lower glume 1-veined, 1.5–2 mm; upper glume with small additional veins in the thickened keel, 2–3 mm; lemmas ovate, 2–4 mm, keel with small additional veins, acute; palea keels winged. Grain blackish, oblong or ovate, obliquely striate with fine close lines running vertically between the striae. Fl. and fr. Jun–Oct. $2n = 18$.

Disturbed places, roadsides. Anhui, Beijing, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shandong, Shanghai, Sichuan, Taiwan, Tianjin, Xizang, Yunnan, Zhejiang [tropics and subtropics].

This pantropical, annual weed is a forage grass and is used for Chinese medicine.

2. *Eleusine coracana* (Linnaeus) Gaertner, Fruct. Sem. Pl. 1: 8. 1788.

穆 can

Cynosurus coracanus Linnaeus, Syst. Nat., ed. 10, 2: 875. 1759 [“*coracan*”].

Annual. Culms tufted, robust, erect or ascending, usually branched, 50–120 cm tall. Leaf sheaths glabrous; leaf blades flat, 30–60 × 0.6–1.2 cm, pilose or glabrous; ligule 1–2 mm. Inflorescence subdigitate, racemes 5–20, stout, often incurved at maturity, 5–10 × 0.8–1.5 cm, hairy at base. Spikelets very closely imbricate, ovate, 5–9 mm, florets 6–9, not disarticulating at maturity; glumes lanceolate-oblong, scabrid along the winged keel; lower glume 3-veined, 1.5–3 mm; upper glume with additional veins in keel, 1.8–5 mm; lemmas triangular-ovate, 2.2–4.7 mm, keel 3-veined, scabrid and narrowly winged, subacute; palea narrowly ovate, keels scabrid, winged. Grain yellowish brown, globose, finely striate-punctate. Fl. and fr. May–Sep. $2n = 36$.

Cultivated cereal crop. Anhui, Fujian, Guangdong, Guizhou, Hainan, Henan, Hubei, Jiangxi, Ningxia, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [widely cultivated in tropical and subtropical regions of the Old World].

This species is used for cereal, forage, papermaking, and soil-retention.

138. *SPOROBOLUS* R. Brown, Prodr. 169. 1810.

鼠尾粟属 shu wei su shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals or perennials, tufted or sometimes with creeping rhizomes or stolons. Leaf blades flat or rolled, linear to narrowly lanceolate; ligule a line of hairs. Inflorescence an open or contracted panicle, rarely spike-like. Spikelets with 1 floret, subterete, not compressed or keeled, glabrous; rachilla disarticulating above glumes; glumes usually shorter than lemma, unequal, membranous, deciduous or persistent, 1-veined or veinless, apex obtuse, acute or acuminate; lemma elliptic to narrowly ovate, thinly membranous, 1–3-veined, glabrous, rounded on back, awnless; palea equaling or shorter than lemma, depressed between veins and often splitting lengthways as grain grows. Stamens 2–3. Grain globose to ellipsoid, rounded or truncate, pericarp free, commonly swelling when wet and expelling the grain, which often adheres to spikelet apex. $x = 9, 12$.

About 160 species: tropics and subtropics, extending into warm-temperate regions; eight species (one introduced) in China.

Most species of this genus in China are fodder plants. The culms are used for weaving.

A specimen (*H. Y. Liang 64044*, US) collected from sandy soil near the seashore of Hainan appears to be *Sporobolus gloeocladus* Cope (Kew Bull. 47: 656. 1992), from SW Asia, and is presumably an introduction.

- 1a. Annual.
 2a. Panicle linear, spike-like; lower margins of leaf blades pectinate with long tubercle-based bristles 1. *S. piliferus*
 2b. Panicle ovate, open; lower margins of leaf blades not pectinate.
 3a. Panicle branches whorled; spikelets 1–1.4 mm 2. *S. coromandelianus*
 3b. Panicle branches not whorled; spikelets 0.8–1 mm 3. *S. tenuissimus*

1b. Perennial.

- 4a. Lower glume 2/3–4/5 spikelet length; upper glume as long as the spikelet; leaf blades involute to acicular, 3–11 cm.
 5a. Plant with long tough rhizomes; leaf blades stiff, pungent; panicle gray-green, dense, branches appressed 4. *S. virginicus*
 5b. Plant tufted; leaf blades linear-acicular; panicle purplish, slightly lax, branches slightly spreading 5. *S. hancei*
 4b. Lower glume less than 1/2 spikelet length; upper glume 1/2–2/3 spikelet length; leaf blades linear, 15–50 cm.
 6a. Lowermost panicle branches whorled, glandular *S. gloeoclados* (see note above)
 6b. Lowermost panicle branches not whorled.
 7a. Panicle linear, dense, branches often appressed 6. *S. fertilis*
 7b. Panicle effuse or laxly contracted, branches spreading.
 8a. Panicle contracted, up to 5 cm wide, spikelets crowded; stamens usually 2 7. *S. diandrus*
 8b. Panicle up to 20 cm wide, spikelets scattered; stamens 3 8. *S. wallichii*

1. *Sporobolus piliferus* (Trinius) Kunth, Enum. Pl. 1: 211. 1833.

毛鼠尾粟 mao shu wei su

Vilfa pilifera Trinius, Gram. Unifl. Sesquifl. 157. 1824;
Agrostis japonica Steudel; *Sporobolus japonicus* (Steudel)
 Maximowicz ex Rendle.

Annual. Culms tufted, slender, usually geniculate at base, 5–25 cm tall, branched. Leaf sheaths with long tubercle-based cilia; leaf blades narrowly lanceolate, flat or margins rolled when dry, 1.5–7 × 0.1–0.4 cm, thinly pilose on both surfaces, margins pectinate with long tubercle-based bristles especially near blade base; ligule ca. 0.5 mm. Panicle linear, spikelike, 1.5–8 × 0.3–0.7 cm; branches subverticillate, short, erect, mostly unbranched, spotted with small glands. Spikelets narrowly lanceolate-oblong, 2.4–3 mm, purplish brown; glumes acuminate; lower glume lanceolate, 1/2 spikelet length, veinless; upper glume oblong, as long as spikelet; lemma oblong, equaling upper glume, 1-veined or obscurely 3-veined, acute; palea equaling or shorter than lemma, broader, obtuse, easily splitting longitudinally. Anthers 3, ca. 0.5 mm. Grain red-brown, elliptic, 0.8–1.4 mm, slightly laterally compressed, apex rounded. Fl. and fr. Apr–Sep. $2n = 36, 40$.

Open situations on moist ground, fields. Anhui, Jiangxi, Zhejiang [Bhutan, India, Japan, Korea, Malaysia, Nepal, Philippines; Africa].

2. *Sporobolus coromandelianus* (Retzius) Kunth, Révis. Gramin. 1: 68. 1829.

卡鲁满德鼠尾粟 ka lu man de shu wei su

Agrostis coromandeliana Retzius, Observ. Bot. 4: 19. 1786.

Annual. Culms loosely tufted, slender, ascending, 10–35 cm tall, branched. Leaf blades linear, flat, 3–10 × 0.2–0.5 cm, scaberulous, often with long scattered bristles, margins thickened, scabrid, sometimes with a few bristles but not pectinate, apex acute; ligule 0.4–1 mm. Panicle ovate, 2–7 cm; lowest primary branches whorled, succeeding branches subwhorled, lower 1/3–1/2 bare, a linear glandular patch on bare portion, spikelets borne on short 2–4-spiculate branchlets or directly on primary branches. Spikelets gray, narrowly elliptic, 1–1.7 mm, usually scaberulous; lower glume ovate, 0.2–0.4 mm, veinless, obtuse; upper glume elliptic, as long as spikelet, 1-veined, acute; lemma elliptic, slightly shorter than upper glume, 1-veined,

acute. Anthers 3, 0.2–0.4 mm. Grain obovate, 0.7–0.8 mm, apex rounded. $2n = 24, 36$.

Dry meadows with scattered trees; ca. 1000 m. Yunnan [Afghanistan, India, Indonesia (Java), Myanmar, New Guinea, Pakistan, Sri Lanka, Thailand; Africa, SW Asia; introduced in Australia].

3. *Sporobolus tenuissimus* (Martius ex Schrank) Kuntze, Revis. Gen. Pl. 3: 369. 1898.

热带鼠尾粟 re dai shu wei su

Panicum tenuissimum Martius ex Schrank, Denkschr. Königl.-Baier. Bot. Ges. Regensburg 2: 26. 1822.

Annual, delicate. Culms tufted, weak, 20–100 cm tall. Leaf sheaths glabrous; leaf blades linear, flat or folded, 5–20 × 0.2–0.5 cm, glabrous; ligule 0.2–0.3 mm. Panicle narrowly oblong, open, diffuse, 10–40 × 2–6 cm; lowest primary branches single or paired, branches capillary, lower 1/2 bare, secondary branches spreading. Spikelets gray or purplish, 0.8–1 mm, gaping at maturity; lower glume oblong, 0.1–0.4 mm, truncate-erose; upper glume ovate-oblong, 0.3–0.5 mm, subacute; lemma ovate, as long as spikelet, acute to obtuse. Anthers 3, 0.1–0.3 mm. Grain obovate. 0.4–0.7 mm, truncate. $2n = 12$.

Disturbed or cultivated places at low elevations, introduced. S. Taiwan [native to tropical America; now widely adventive in warm parts of the world].

4. *Sporobolus virginicus* (Linnaeus) Kunth, Révis. Gramin. 1: 67. 1829.

盐地鼠尾粟 yan di shu wei su

Agrostis virginica Linnaeus, Sp. Pl. 1: 63. 1753; *Vilfa virginica* (Linnaeus) P. Beauvois.

Perennial with long, tough, yellowish rhizomes. Culms erect or decumbent, often fastigiate branched in upper part, 15–30 cm tall, 1–2 mm thick. Leaf sheaths tightly overlapping, loosely pubescent at mouth; leaf blades glaucous, stiff, distichous, flat at first, soon involute, 3–10 × 0.1–0.3 cm, adaxial surface scabrid, abaxial surface smooth, apex pungent; ligule ca. 0.2 mm. Panicle linear, spikelike, 3–10 × 0.4–1 cm; branches 0.5–1.5 cm, erect, appressed to rachis. Spikelets gray-green or greenish yellow, fusiform, 2.3–2.7 mm; glumes acute; lower glume lanceolate, 2/3–4/5 spikelet length, 1-veined; upper glume

narrowly ovate, as long as spikelet, 1-veined; lemma broadly lanceolate, subequal to upper glume, midvein distinct, lateral veins obscure, obtuse; palea equaling lemma. Anthers 3, 1–1.5 mm. Grain subglobose, ca. 0.7 mm. Fl. and fr. Jun–Sep. $2n = 18$.

Sandy seashores, often below high tide mark. Fujian, Guangdong, Hainan, Taiwan, Zhejiang [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; tropics and sub-tropics].

This species is a good sand binder. It is widespread on seashores and in inland, saline places in warm parts of both the Old and New Worlds.

5. *Sporobolus hancei* Rendle, J. Linn. Soc., Bot. 36: 387. 1904.

广州鼠尾粟 guang zhou shu wei su

Perennial. Culms tufted slender, erect, 10–50 cm tall, unbranched. Leaf sheaths laxly overlapping, glabrous or loosely ciliate at mouth; leaf blades narrowly linear and flat near ligule becoming involute toward apex, or acicular throughout, 3–12 cm \times 0.5–2 mm, adaxial surface puberulous, abaxial surface glabrous; ligule very shortly hairy or obscure. Panicle laxly contracted to open, 4–12 \times 0.5–1(–3) cm; branches verticillate or paired, 0.7–2 cm, suberect to spreading, spiculate to base; pedicels short, smooth or scabridulous. Spikelets glistening, thinly membranous, pale purplish, lanceolate, 2–2.5 mm; glumes slightly unequal; lower glume lanceolate, 2/3–3/4 spikelet length, veinless, apex acute or obtuse; upper glume ovate, as long as spikelet, 1-veined, acute; lemma ovate, as long as spikelet, 1-veined, acute; palea subequaling lemma. Anthers 3, 0.8–1 mm. Grain red-brown, elliptic-oblong, laterally compressed, ca. 1.5 mm. Fl. Mar–May.

Grassy hillsides, dry places on poor soil. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Taiwan [Japan (Ryukyu Islands)].

6. *Sporobolus fertilis* (Steudel) Clayton, Kew Bull. 19: 291. 1965.

鼠尾粟 shu wei su

Agrostis fertilis Steudel, Syn. Pl. Glumac. 1: 170. 1854; *Sporobolus elongatus* R. Brown var. *purpureosuffusus* Ohwi; *S. fertilis* (Steudel) Clayton var. *purpureosuffusus* (Ohwi) P. C. Keng & X. S. Shen; *S. indicus* (Linnaeus) R. Brown subsp. *purpureosuffusus* (Ohwi) T. Koyama; *S. indicus* var. *major* (Buse) Baaijens; *S. indicus* var. *purpureosuffusus* (Ohwi) T. Koyama.

Perennial. Culms densely tufted, erect, rigid, 25–100(–120) cm tall. Leaf sheaths glabrous but margin ciliate, basal sheaths papery, lightly keeled; leaf blades linear, flat or involute, 15–50(–65) \times 0.2–0.5 cm, glabrous or adaxial surface thinly pilose, tapering to a long filiform apex; ligule ca. 0.5 mm. Panicle linear, contracted to spikelike, often interrupted especially at base, 7–45 \times 0.5–1.5 cm; branches 1–2.5(–5) cm, erect and appressed to main axis, or looser and narrowly ascending, densely spiculate throughout. Spikelets grayish or yellowish green, 1.7–2 mm; lower glume oblong, ca. 0.5 mm, veinless, apex truncate-erose; upper glume oblong-elliptic, 1/2–2/3 spike-

let length, 1-veined, \pm acute; lemma ovate, as long as spikelet, indistinctly 1(–3)-veined, acute. Anthers 3, 0.8–1 mm. Grain red-brown, obovate-elliptic, 0.9–1.2 mm, distinctly shorter than its lemma and palea, these gaping widely beyond its top, apex truncate. Fl. and fr. Mar–Dec. $2n = 36, 48, 54$.

Roadsides, field margins, grassy places on hill slopes, moist ground of mountain valleys. Anhui, Fujian, Gansu, Guangdong, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; occasionally introduced elsewhere].

This common and variable, perennial weed is distinguished by its contracted panicle and short glumes. The spikelets are frequently infected by a black smut fungus.

7. *Sporobolus diandrus* (Retzius) P. Beauvois, Ess. Agrostogr. 26. 1812.

双蕊鼠尾粟 shuang rui shu wei su

Agrostis diandra Retzius, Observ. Bot. 5: 19. 1788 [“1789”]; *A. elongata* var. *flaccida* Roth ex Roemer & Schultes; *Sporobolus indicus* var. *flaccidus* (Roth ex Roemer & Schultes) Veldkamp; *Vilfa diandra* (Retzius) Trinius; *V. retzii* Steudel, nom. illeg. superfl.

Perennial. Culms tufted, erect, 30–90 cm tall. Leaf sheaths glabrous but margin ciliate; leaf blades linear, usually involute, 5–30 \times 0.2–0.3 cm, glabrous on both surfaces or adaxial surface distinctly pilose at base, tapering to a long filiform apex; ligule 0.2–0.3 mm. Panicle contracted or rather loose, 7–35 \times 1.5–3.5 cm; branches 1.5–9 cm, ascending or obliquely spreading, loosely spiculate, often lower 1/3 bare. Spikelets silvery grayish or yellowish green, 1.4–1.7 mm; lower glume oblong, ca. 0.5 mm, veinless, truncate or obtuse; upper glume oblong-ovate, 1/2–2/3 spikelet length, obscurely 1-veined, acute or obtuse-erose; lemma ovate-oblong, as long as spikelet, indistinctly 1(–3)-veined, acute to obtuse. Anthers 2(–3), 0.5–0.8 mm. Grain obovate to oblong, 0.6–0.9 mm, apex truncate. Fl. and fr. May–Aug. $2n = 24$.

Dry hill slopes, grassy fields, roadsides, beaches. Fujian, Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand; Australia].

Sporobolus diandrus and *S. fertilis* are elements of the polymorphic, pantropical species complex of *S. indicus* (Linnaeus) R. Brown. This complex includes a range of intergrading taxa encompassing chromosome numbers from $2n = 18$ to $2n = 54$. Due to the small differences between these taxa and the frequency of intermediates, they are sometimes regarded as varieties of a broadly defined *S. indicus*.

8. *Sporobolus wallichii* Munro ex Trimen, J. Bot. 27: 171. 1889.

瓦丽鼠尾粟 wa li shu wei su

Perennial. Culms tufted, erect or slightly geniculate, 90–120 cm tall. Leaf sheaths glabrous but margins ciliate upward; leaf blades linear, flat, up to 45 \times 0.8 cm, glabrous, smooth or scabridulous, especially on adaxial surface, tapering to a long filiform apex; ligule ca. 0.5 mm. Panicle effuse, up to 45 \times 20 cm; branches up to 10 cm, widely spreading with scattered spikelets. Spikelets grayish green, ca. 2 mm; lower glume ellip-

tic-oblong, 0.5–0.75 mm, veinless, emarginate; upper glume elliptic, ca. 1/2 spikelet length, veinless, subobtusate; lemma lanceolate, as long as spikelet, very indistinctly veined, acuminate. Anthers 3, 0.8–1 mm. Grain obovate, ca. 1 mm, apex truncate. $2n = 24$.

Moist meadows; 400–1200 m. Yunnan [India, Myanmar, Sri Lanka, Thailand].

This is a robust species with a large, effuse panicle and short-glumed spikelets.

139. *CRYPsis* Aiton, Hort. Kew. 1: 48. 1789, nom. cons.

隐花草属 yin hua cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Heleochoa Host ex Roemer.

Annuals, low growing. Culms ascending or prostrate, much branched. Leaf blades short, linear to lanceolate, flat or involute; ligule a line of hairs. Inflorescence a very dense panicle, spicate and cylindrical, or ovoid to capitate and then usually subtended by 1 or 2 inflated spathe-like leaf sheaths with a reduced blade. Spikelets with 1 floret, strongly laterally compressed, disarticulating below the floret or rarely falling entire; glumes narrow, slightly shorter than lemmas, unequal to subequal, membranous, 1-veined, scabrid or ciliate along keel, acute or with a short awn-point; lemma lanceolate, membranous, 1-veined, awnless; palea similar to lemma, 1–2-veined, splitting at maturity. Lodicules absent. Stamens 2–3. Grain ellipsoid, pericarp free and sometimes swelling when wet.

Nine to twelve species: centered on the Mediterranean region and SW Asia, but extending to C Africa and from Europe to China; introduced elsewhere; two species in China.

Crypsis species occur mainly on periodically wet, often saline soils in semi-arid areas.

- 1a. Inflorescence longer than wide; blade of uppermost leaf clearly demarcated from its sheath; palea 2-veined;
stamens 3 1. *C. schoenoides*
1b. Inflorescence as wide as or wider than long; blade of uppermost leaf continuous with its sheath; palea 1-veined;
stamens 2 2. *C. aculeata*

1. *Crypsis schoenoides* (Linnaeus) Lamarck, Tabl. Encycl. 1: 166. 1791.

蔺状隐花草 lin zhuang yin hua cao

Phleum schoenoides Linnaeus, Sp. Pl. 1: 60. 1753; *Heleochoa schoenoides* (Linnaeus) Host.

Culms tufted, prostrate or ascending, 5–20 cm or more tall, 3–5-noded, glabrous. Leaf sheaths loose and enlarged, smooth, glabrous, shorter than internodes; leaf blades demarcated from sheath, involute, 2–10 × 0.1–0.4 cm, adaxial surface puberulent or pilose, abaxial surface glabrous or pilose, apex acicular. Inflorescence often subtended by enlarged inflated uppermost sheath, ellipsoid or ovoid, 1–3 × 0.5–1 cm, rachis distinct. Spikelets greenish or purple, 3–4 mm; glumes unequal, slightly shorter than lemma, ciliate on keel; lower glume 2.2–2.5 mm; upper glume 2.5–2.8 mm; lemma 3–3.6 mm, keel ciliate, acute; palea slightly shorter than or equaling lemma, 2-veined. Anthers 3, 0.8–1 mm. Grain elliptic, 1–1.5 mm. Fl. and fr. Jun–Sep. $2n = 16, 18, 36$.

Sandy soils, grassy roadsides. Anhui, Hebei, Henan, Jiangsu, Nei Mongol, Ningxia, Shandong, Shanxi, Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, S Europe, Mediterranean region; introduced in North America and isolated records elsewhere].

Crypsis vaginiflora (Forsskål) Opiz is a very similar species found from Africa to India. It occurs in Kashmir and is to be expected in Xizang. It differs by its hairy leaf sheath margins and collar, subequal glumes as long as the lemma, and shorter anthers (0.6–0.7 mm).

Crypsis turkestanica Eig, from C Asia and also reported from

Xinjiang, has ovoid panicles usually clearly longer than wide and supported by 2 terminal leaf sheaths, a palea with 1 or 2 inconspicuous veins, 2 or 3 stamens, and anthers 0.6–1.3 mm long.

2. *Crypsis aculeata* (Linnaeus) Aiton, Hort. Kew. 1: 48. 1789.

隐花草 yin hua cao

Schoenus aculeatus Linnaeus, Sp. Pl. 1: 42. 1753.

Culms prostrate or ascendent, glabrous, 5–40 cm tall. Leaf sheaths loose and enlarged, shorter than internodes; leaf blades continuous with sheath, linear-lanceolate, flat or conduplicate, 2–8 × 0.1–0.5 cm, adaxial surface scabridulous, abaxial surface smooth, margins involute, apex acicular. Inflorescence subtended by enlarged inflated uppermost sheaths, capitate to ovoid, as wide or wider than long, 0.4–0.9 × 0.8–1.3 cm, rachis obsolete. Spikelets yellowish, 3.5–4.5 mm; glumes unequal, scabrid or ciliate on keel, obtuse; lower glume linear, 2.5–3 mm; upper glume lanceolate, 3–3.5 mm; lemma longer than glumes, 3.5–4.5 mm, acute; palea equaling or slightly longer than lemma, 1-veined or vein obsolete. Anthers 2, 1–1.3 mm. Grain oblong or obovoid, ca. 2 mm. Fl. and fr. May–Sep. $2n = 16, 18, 54$.

River banks, ditches, other damp places on saline and alkaline soils. Anhui, Gansu, Hebei, Henan, Jiangsu, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Xinjiang, Yunnan [Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan; SW Asia, C Europe, Mediterranean region; introduced in S Africa].

This species is an indicator of saline and alkaline soils and is a good fodder plant.

140. MUHLENBERGIA Schreber in Linnaeus, Gen. Pl., ed. 8, 1: 44. 1789.

乱子草属 luan zi cao shu

Wu Zhenlan (吴珍兰); Paul M. Peterson

Perennial, usually with creeping scaly rhizomes. Culms erect, ascending or decumbent at base. Leaf blades linear to narrowly lanceolate; ligule membranous, sometimes minutely ciliate. Inflorescence an open or contracted panicle. Spikelets with 1 floret, lanceolate, slightly laterally compressed, rachilla disarticulating above glumes; glumes shorter than or equal to lemma, subequal or the upper shorter, thin, usually 1-veined or the lower veinless, persistent; callus small, obtuse; lemma 3-veined, membranous, dark green mottled with dark gray, laxly pilose toward base on abaxial surface, awned from acute apex or from between two minute teeth; awn straight or flexuose; palea equal to the lemma, membranous. Caryopsis usually fusiform, rarely ellipsoid. $x = 10$.

About 155 species: mainly SW North America and Mexico, also Central and South America and SE Asia; six species in China.

Muhlenbergia duthieana Hackel (Oesterr. Bot. Z. 52: 11. 1902) has recently been reported from Yunnan (Fl. Yunnan. 9: 467. 2003). It is a loosely tufted species lacking rhizomes, with a dense, narrow panicle, and spikelets distinguished by their long glumes, at least 4/5 as long as the spikelet. Outside China it is known from montane forests in the Himalayas, from Pakistan to Nepal.

Many species of this genus are good fodder plants.

- 1a. Culms decumbent or ascending at base; plants usually without creeping rhizomes, rarely with short rhizomes.
 - 2a. Glumes 1.5–2.2 mm; culms decumbent at base 1. *M. japonica*
 - 2b. Glumes 3–4 mm; culms ascending at base 2. *M. himalayensis*
- 1b. Culms erect or ascending; plants with long, creeping, scaly rhizomes.
 - 3a. Glumes 0.5–1.2 mm, 1/4–1/3 length of lemma, apex obtuse 3. *M. huegelii*
 - 3b. Glumes 1.5–4 mm, 1/2–4/5 length of lemma, apex acute or acuminate.
 - 4a. Culms with many branches in the upper part; spikelets ca. 3 mm; glumes 1/2–2/3 length of spikelet; anthers ca. 0.5 mm 4. *M. ramosa*
 - 4b. Culms without branches in the upper part; spikelets 3–5 mm; glumes 2/3–4/5 length of spikelet; anthers 1–2 mm.
 - 5a. Anthers 1.5–2 mm; spikelets 4–5 mm; inflorescence branches appressed with few spikelets; leaf blades 2–4 mm wide 5. *M. hakonensis*
 - 5b. Anthers ca. 1 mm; spikelets 3–4 mm; inflorescence branches loosely ascending with many spikelets; leaf blades 3–6 mm wide 6. *M. curvيارistata*

1. *Muhlenbergia japonica* Steudel, Syn. Pl. Glumac. 1: 422. 1854.

日本乱子草 ri ben luan zi cao

Plants usually without rhizomes or rarely with short rhizomes. Culms usually decumbent at base and rooting at nodes, 15–50 cm tall, ca. 1 mm thick. Leaf sheaths glabrous, usually shorter than internodes; leaf blades narrowly lanceolate, flat, 2–9.5 × 0.15–0.4 cm, scabrid on both surfaces and margins, apex acuminate; ligule 0.2–0.4 mm, ciliate. Panicle 4–12 cm, narrow; branches one per node, scabrid, with many spikelets near base. Spikelets lanceolate, 2.5–3 mm, purplish gray-green, mottled dark gray; glumes 1.5–2.2 mm, membranous, scabrid, 1-veined, apex acute; lower glume 1.5–2 mm, upper glume 2–2.2 mm; lemma 2.5–3 mm, lower 1/4 of back pubescent, otherwise glabrous or scaberulous; awn 5–9 mm, slender, purplish, scabrid. Anthers ca. 0.6 mm. Fl. and fr. Jun–Nov. $2n = 40$.

Moist ground of river banks, around margins of shrubs; 1400–3000 m. Anhui, Beijing, Fujian, Guizhou, Heilongjiang, Henan, Hubei, Shaanxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan].

2. *Muhlenbergia himalayensis* Hackel ex J. D. Hooker, Fl. Brit. India 7: 259. 1896 [“1897”].

喜马拉雅乱子草 xi ma la ya luan zi cao

Plants with short rhizomes. Culms tufted, usually ascending at base, 30–50 cm tall, 0.5–1 mm thick, many-noded, sub-inflated at nodes, branches glabrous. Leaf sheaths loose, longer

than internodes; leaf blades 1–9 × 0.1–0.3 cm, flat, flaccid, scabrid on both surfaces; ligule ca. 0.5 mm, lacerate, glabrous. Panicle 5–15 cm, narrow, lax; branches slender, flexuose, usually naked below the middle. Spikelets narrowly lanceolate, 3–4 mm, purplish gray-green; glumes 3–4 mm, subequal or lower glume shorter than the upper, lanceolate, membranous, 1-veined, apex acuminate or acute; lemma 3–4 mm, equal to or slightly longer than glumes, lower 1/3 of back pilose; awn 9–14 mm, usually purple, slender, erect or slightly flexuose, scabrid. Anthers ca. 1.5 mm. Fl. and fr. Jul–Oct.

Moist ground of mountain slopes, valleys, ditches, under thickets; 2000–2900 m. Sichuan, Xizang, Yunnan [Afghanistan, Bhutan, Kashmir, Nepal].

3. *Muhlenbergia huegelii* Trinius, Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3–4): 293. 1841.

乱子草 luan zi cao

Muhlenbergia arisanensis Hayata; *M. geniculata* Nees ex Steudel; *M. longistolon* Ohwi; *M. viridissima* Nees ex Steudel.

Plants usually with long, scaly rhizomes. Culms erect, 70–90 cm tall, rigid, puberulent below nodes. Leaf sheaths loose, glabrous, usually shorter than internodes; leaf blades 4–14 × 0.4–1 cm, flat, scabrid on both surfaces and margins, apex acuminate; ligule ca. 1 mm, glabrous or ciliate. Panicle 8–27 cm, rather open, sometimes nodding; branches few to many at each node, branches and pedicels all slender, scabrid. Spikelets lan-

ceolate, 2–3 mm, gray-green or purplish; glumes 0.5–1.2 mm with lower glume slightly shorter than the upper, hyaline, veinless or upper glume 1-veined, apex obtuse; lemma 2–3 mm, gray-green or purple, scaberulous, lower 1/4 of back pilose; awn 8–16 mm. Anthers ca. 0.8 mm. Fl. and fr. Jul–Oct. $2n = 40, 42$.

Moist places in mountain valleys, riversides, forests; 900–3000 m. Anhui, Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Japan, Korea, Nepal, Pakistan, Philippines, Russia].

4. *Muhlenbergia ramosa* (Hackel ex Matsumura) Makino, J. Jap. Bot. 1(4): 13. 1917.

多枝乱子草 duo zhi luan zi cao

Muhlenbergia japonica Steudel var. *ramosa* Hackel ex Matsumura, Bot. Mag. (Tokyo) 11: 444. 1897; *M. frondosa* (Poirot) Fernald subsp. *ramosa* (Hackel ex Matsumura) T. Koyama & Kawano.

Plants with creeping scaly rhizomes; rhizomes 11–30 × ca. 0.2 cm. Culms usually erect, 30–120 cm tall, 1–2.5 mm thick, with many branches in upper part. Leaf sheaths loosely overlapping, glabrous; leaf blades 5–12 × 0.3–0.6 cm, flat, thinner, scabrid on both surfaces and margins; ligule ca. 0.5 mm, truncate. Panicle 10–18 cm, narrow; branches one or two per node, usually with spikelets to the base. Spikelets narrowly lanceolate, ca. 3 mm, purplish gray-green; glumes 1.5–2.2 mm with lower glume usually shorter than the upper, broadly lanceolate, 1-veined, apex acute to acuminate; lemma 2.5–3.1 mm, lower 1/4 of back pilose; awn 5–10 mm, gray-green or purple, scabrid. Anthers ca. 0.5 mm. Caryopsis ca. 0.5 mm, brown, narrowly oblong. Fl. and fr. Jul–Oct.

Open forest of mountain valleys, moist places on mountain slopes; 100–1300 m. Anhui, Fujian, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan].

5. *Muhlenbergia hakonensis* (Hackel ex Matsumura) Makino, J. Jap. Bot. 1(4): 13. 1917.

箱根乱子草 xiang gen luan zi cao

Muhlenbergia japonica Steudel var. *hakonensis* Hackel ex Matsumura, Bot. Mag. (Tokyo) 11: 444. 1897.

Plants with creeping scaly rhizomes; rhizomes 3–5 cm, ca. 2 mm thick. Culms erect, 40–80 cm tall, ca. 1 mm thick at base, slender, not branching in upper part. Leaf sheaths loose, glabrous; leaf blades 5.5–12 × 0.2–0.4 cm, flat, scabrid on both surfaces and margins or abaxial surface smooth; ligule 0.5–1 mm, truncate, lacerate. Panicle 15–23 × ca. 0.5 cm, narrow, branches one or two per node, sparse, appressed. Spikelets narrowly lanceolate, 4–5 mm, gray-green; glumes 3–4 mm, papery, subequal or lower glume slightly shorter than the upper, 1-veined, scaberulous along veins, apex acuminate; lemma 4–5 mm, pale with gray-green variegation, equal to spikelet, lower 1/4 of back pubescent; awn 5–9 mm, straight. Anthers 1.5–2 mm. Caryopsis ca. 3 mm, red-brown, terete, hilum narrowly ovate, 1/3 length of the caryopsis. Fl. and fr. Jul–Oct. $2n = 40$.

Wet places on mountain slopes, roadsides. Anhui, Sichuan [Japan, Korea].

6. *Muhlenbergia curvيارistata* (Ohwi) Ohwi, Bot. Mag. (Tokyo) 55: 397. 1941.

弯芒乱子草 wan mang luan zi cao

Muhlenbergia ramosa var. *curvيارistata* Ohwi, Acta Phytotax. Geobot. 6: 292. 1937; *M. curvيارistata* var. *nipponica* Ohwi; *M. tenuiflora* (Willdenow) Britton, et al. subsp. *curvيارistata* (Ohwi) T. Koyama & Kawano.

Plants with creeping scaly rhizomes; rhizomes up to 10 cm, 2–3 mm thick. Culms erect, 60–100 cm tall, ca. 2 mm thick, not branching in upper part, smooth or puberulent below nodes. Leaf sheaths loose, glabrous or scaberulous; leaf blades 8–19 cm × 3–6 mm, flat, scabrid on both surfaces and margins; ligule 0.5–1 mm, apex truncate, lacerate. Panicle 15–35 × 0.5–1.5 cm, effuse or contracted; branches usually two per node, ascending, scabrid. Spikelets lanceolate, 3–3.5 mm, pale purplish; glumes membranous, 1-veined, scabrid on veins, apex acute; lower glume 1.5–2 mm, upper glume 2–2.5 mm; lemma equal to spikelet, 3–3.5 mm, glaucous and variegated with dark gray, lower 1/4 of back pilose; awn 5–10 mm, flexuose or erect, pale or sometimes purplish, scabrid. Anthers ca. 1 mm. Fl. and fr. Jul–Sep. $2n = 40$.

Grassy places on mountain slopes, forests, moist ground along roadsides; 900–1400 m. Hebei, Jilin, Liaoning [Japan].

23. Tribe CYNODONTEAE

虎尾草族 hu wei cao zu

Sun Bixing (孙必兴 Sun Bi-sin), Chen Shouliang (陈守良), Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annual or perennial herbs. Leaf blades linear to ovate; ligule a short membrane with ciliate or ciliolate margin. Inflorescence composed of racemes; racemes solitary, digitate or scattered along an axis, tough, unilateral (bilateral and axis fragile in *Lepturus*), persistent, or sometimes racemes very short, contracted into a cylindrical spikelike inflorescence and falling entire from main axis, or spikelets borne directly on main axis. Spikelets with 1 fertile floret, with or without additional sterile florets, disarticulating above glumes but not between florets or falling entire; glumes herbaceous, 1–3-veined (5–12-veined in *Lepturus*), shorter than floret or exceeding and enclosing it, sometimes lower glume absent; lemma membranous to leathery, keeled or rounded, 1–3-veined, lateral veins near margins and often ciliate, apex entire or 2–3(–5)-lobed, awned or awnless. Caryopsis sometimes with free pericarp. Leaf anatomy: Kranz PS type; microhairs short and stout. $x = 9, 10$.

About 60 genera: throughout the tropics and subtropics, extending into North America; 12 genera (three introduced) and 27 species (six introduced) in China.

- 1a. Spikelets sunk in cavities of rachis; rachis fragile; inflorescence a single bilateral raceme 141. *Lepturus*
- 1b. Spikelets not in cavities; rachis tough; inflorescence not a single bilateral raceme.
 - 2a. Inflorescences unisexual, plant monoecious or dioecious; female inflorescence a tough globular burr in inflated upper leaf sheaths 149. *Buchloë*
 - 2b. Inflorescences bisexual, all alike.
 - 3a. Inflorescence cylindrical; racemes very short, borne along central axis, deciduous, or deciduous spikelets borne singly.
 - 4a. Spikelets with long flexuous awns 152. *Perotis*
 - 4b. Spikelets awnless or mucronate.
 - 5a. Spikelets 2 or more on short racemelets; glume with rows of hooked spines 150. *Tragus*
 - 5b. Spikelets borne singly on the central axis; glume smooth, glossy 151. *Zoysia*
 - 3b. Inflorescence not cylindrical; racemes digitate, scattered or solitary, persistent or rarely deciduous.
 - 6a. Racemes borne along an axis.
 - 7a. Lemma 3-awned; sterile floret and rachilla extension present 148. *Bouteloua*
 - 7b. Lemma acute; sterile floret and rachilla extension absent 147. *Spartina*
 - 6b. Racemes digitate, subdigitate or solitary.
 - 8a. Fertile floret solitary.
 - 9a. Raceme solitary; glumes longer than and enclosing floret 145. *Microchloa*
 - 9b. Racemes digitate; glumes shorter than the exposed floret 146. *Cynodon*
 - 8b. Fertile floret accompanied by male or sterile florets.
 - 10a. Spikelets dark brown; upper glume with stout subapical awn 144. *Eustachys*
 - 10b. Spikelets pallid or purplish; upper glume at most with fine mucro.
 - 11a. Lemma keeled, caryopsis subterete 142. *Chloris*
 - 11b. Lemma back flat, caryopsis dorsally compressed 143. *Enteropogon*

141. LEPTURUS R. Brown, Prodr. 207. 1810.

细穗草属 xi sui cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennial, rarely annual. Culms stoloniferous or decumbent. Leaf blades linear or linear-lanceolate; ligule membranous, margin ciliate. Inflorescence a single cylindrical bilateral raceme; spikelets alternate, sessile, borne edgewise and sunken in hollows on opposite sides of articulated rachis, falling with adjacent rachis internode; rachis terminating in a spikelet. Spikelets dorsally compressed, florets 1 or 2, disarticulating above glumes and between florets, rachilla extension with apical rudimentary floret present; lower glume minute or suppressed; upper glume leathery, appressed to rachis, exceeding and covering the sunken florets, closely 5–12-veined, apex acute to caudately awned; lemma much shorter than upper glume, rounded on back, cartilaginous to hyaline, 3-veined, apex obtuse to acute; palea membranous, usually equal to lemma. Caryopsis ellipsoid, pericarp free. $x = 9$. Leaf anatomy: Kranz PS type, with short stout microhairs.

Eight to fifteen species: shores of Indian and W Pacific Oceans; one species in China.

Lepturus has characteristic, sunken spikelets within a fragile rachis, unique in the tribe, but the leaf anatomy is typically chloridoid. Its precise affinities are uncertain, and it is sometimes placed in its own tribe, *Leptureae*.

1. *Lepturus repens* (G. Forster) R. Brown, Prodr. 207. 1810.

细穗草 xi sui cao

Rottboellia repens G. Forster, Fl. Ins. Austr. 9. 1786; *Monerma repens* (G. Forster) P. Beauvois.

Perennial, stoloniferous, often very widely spreading. Culms tough, 20–50 cm tall, much branched. Leaf sheaths usually keeled, glabrous; leaf blades stiff, flat or involute, glaucous, 3–20 cm, 2.5–5 mm wide, glabrous or adaxially pilose near ligule, margins scabrous, apex acuminate; ligule 0.3–0.8 mm. Raceme erect, 5–15 cm; spikelets sometimes paired on each internode toward raceme base; rachis scabrous-hispidulous, in-

ternodes 3–5 mm. Spikelets 10–12 mm, florets often 2; lower glume membranous, triangular, up to 0.8 mm or absent; upper glume narrowly lanceolate, as long as spikelet, leathery, scabrous, apex caudate-aristate; lower lemma broadly lanceolate, 3.7–4.5 mm, puberulous near base, cartilaginous in lower two-thirds, thinner and scabrous above, apex acute. Anthers 1.5–2 mm. Caryopsis strongly dorsally compressed, plano-convex, 1.6–2 mm. $2n = 54$.

Rocky and sandy seashores, especially coral sand. Taiwan [Japan (Ryukyu Islands), Indonesia, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, N Australia, Indian Ocean Islands, Pacific Islands (Polynesia)].

142. CHLORIS Swartz, Prodr. 25. 1788.

虎尾草属 hu wei cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annuals or perennials, with rhizomes or stolons. Basal leaf sheaths rounded or keeled; leaf blades linear, flat or folded; ligule a short ciliate membrane. Inflorescence of racemes, digitate or occasionally in 2 or more whorls; spikelets shortly pedicelled or subsessile, closely imbricate, biseriate. Spikelets laterally compressed, florets 2–4, lowermost fertile, successive florets male or sterile and progressively reduced, disarticulating above glumes; glumes unequal, usually shorter than florets, lanceolate, membranous, 1-veined, acuminate to an awn-point; callus bearded; lemma of fertile floret keeled, lanceolate to obovate, cartilaginous to leathery, usually ciliate on margins and keel, apex entire or emarginate, subapically mucronate or awned; palea as long as lemma; subsequent florets similar to fertile floret or of different shape or vestigial. Caryopsis ellipsoid to subterete, pericarp free though sometimes reluctantly so. $x = 10$.

About 55 species: tropical and warm-temperate regions throughout the world; five species (one introduced) in China.

- 1a. Leaf blades obtuse; lowest lemma glabrous 1. *C. pycnothrix*
- 1b. Leaf blades acute to tapering; lowest lemma hairy on margins.
 - 2a. Lowest lemma with spreading 2.5–4 mm hairs on upper margins 3. *C. virgata*
 - 2b. Lowest lemma with 0.5–1.5 mm hairs on upper margins.
 - 3a. Culms 1–3 m, stoloniferous perennial; spikelets 2-awned 2. *C. gayana*
 - 3b. Culms up to 1 m, tufted annuals (or weakly perennial); spikelets 3-awned.
 - 4a. Sterile lemmas inflated; the lower 1–1.5 mm, nearly as long as wide 4. *C. barbata*
 - 4b. Sterile lemmas ± flattened; the lower 1.6–2 mm, longer than wide 5. *C. formosana*

1. *Chloris pycnothrix* Trinius, Gramin. Unifl. Sesquifl. 234. 1824.

异序虎尾草 yi xu hu wei cao

Chloris anomala B. S. Sun & Z. H. Hu.

Annual or short-lived perennial, stoloniferous. Culms erect or geniculately ascending and rooting at lower nodes, 35–60 cm tall. Leaf sheaths keeled, glabrous; leaf blades flat or folded, 3–16 cm, 3–5 mm wide, glabrous, apex obtuse, often mucronulate; ligule 3–4 mm, white ciliate. Racemes digitate or in two close whorls, 7–13, ascending when young, spreading at maturity, 5–9 cm, feathery, purplish; rachis puberulous. Spikelets with 2 florets, 1- or 2-awned; glumes linear-lanceolate, acuminate-mucronate; lower glume 1–1.6 mm; upper glume 2–3.2 mm; lemma of fertile floret narrowly elliptic in side view, 2–3 mm, glabrous, scabrous in upper half, awn 9–25 mm; second floret reduced to a narrow 0.3–0.8 mm rudiment on a filiform rachilla, awn absent or erect, 3–7 mm. Fl. and fr. May–Nov.

Sunny open places, roadsides and hillsides; 400–1500 m. Yunnan [India, Myanmar, Sri Lanka; Africa, America, SW Asia].

This is a weedy annual, long present in Africa and America, but spreading in recent times in Asia.

The widely spreading, long-awned, feathery racemes and blunt leaf blades easily distinguish this from the other *Chloris* species in China.

2. *Chloris gayana* Kunth, Révis. Gramin. 1: 293. 1830.

非洲虎尾草 fei zhou hu wei cao

Perennial, stoloniferous. Culms erect or ascending, usually rooting at lower nodes, ± flattened, hard, 1–1.5(–2) m tall. Leaf sheaths glabrous except mouth; leaf blades flat, 15–35 cm, 2–10 mm wide, scabrous, apex acuminate; ligule ca. 0.5 mm, with

long hairs behind. Racemes digitate, 5–20, ascending to spreading, 4–11 cm, greenish brown; rachis scabrous. Spikelets with 3 or 4 florets, 2-awned; lower glume 1.5–2.5 mm; upper glume 2.5–4 mm including awn-point; lemma of fertile floret elliptic to oblanceolate in side view, 2.5–3.5 mm, shortly appressed-sericeous on lower margins, usually a tuft of hairs 0.5–1.5 mm on upper margins, keel glabrous or sparsely to densely sericeous; awn 2–6 mm; second floret usually male, narrowly lanceolate or cuneate, lemma ciliate on margins, body and awn a little shorter than fertile floret; third (and fourth) florets reduced to oblong or clavate awnless scales, less than 1 mm. $2n = 20, 30, 40$.

Open grassland and savanna; widely cultivated in warmer parts of China [native to Africa].

This is a forage grass, native to Africa, but now introduced and naturalized throughout the tropics and subtropics (Rhodes Grass). There are many different strains differing in habit, plant height, lemma pubescence, and awn length. It is usually a robust, strongly stoloniferous grass, but tufted forms also occur occasionally.

3. *Chloris virgata* Swartz, Fl. Ind. Occid. 1: 203. 1797.

虎尾草 hu wei cao

Chloris caudata Trinius ex Bunge.

Annual. Culms tufted, erect or geniculately ascending, slightly flattened, 15–100 cm tall. Basal leaf sheaths strongly keeled, glabrous; leaf blades flat or folded, 5–30 cm, 2–7 mm wide, glabrous, adaxial surface scabrous, apex acuminate; ligule 0.5–1 mm, glabrous or ciliate. Racemes digitate, 5–12, erect or slightly slanting, 2–10 cm, silky, pale brown or tinged pink or purple; rachis scabrous or hispid. Spikelets with 2 or 3 florets, 2-awned; lower glume 1.8–2.2 mm; upper glume 3–4 mm, acuminate; lemma of fertile floret obovate-lanceolate in side view, 2.8–3.5 mm, keel gibbous, conspicuously bearded on

upper margins with a spreading tuft of 2.5–3.5 mm silky hairs, margins, keel and flanks silky-ciliate or glabrous; awn 5–15 mm; second floret sterile, oblong, glabrous, awn 4–10 mm; third floret occasionally present, reduced to a small clavate scale, awnless. Fl. and fr. Jun–Oct. $2n = 14, 20, 26, 30, 40$.

Common on stony slopes, steppe, sandy riversides, roadsides, fields, plantations, frequent on walls and roofs; sea level to 3700 m. Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India, Myanmar, Nepal, Pakistan; Africa, America, SW Asia, Australia, Pacific Islands].

This is a widespread and very variable, weedy annual, recognized by the conspicuous tufts of spreading, silky hairs on the upper lemma margins, together with a digitate inflorescence of erect racemes. It extends from the tropics well into temperate regions where the summers are hot.

4. *Chloris barbata* Swartz, Fl. Ind. Occid. 1: 200. 1797.

孟仁草 meng ren cao

Andropogon barbatus Linnaeus, Mant. Pl. 2: 302. 1771, not Linnaeus (1759); *Chloris inflata* Link.

Annual or short-lived perennial. Culms loosely tufted, ascending or decumbent at base and rooting at lower nodes, 0.2–1 m tall. Leaf sheaths keeled, glabrous; leaf blades flat or folded, 10–40 cm, 4–8 mm wide, glabrous, apex acute; ligule short, ciliate. Racemes digitate, 5–15, erect or ascending, 3–8 cm, often somewhat flexuous and purplish; rachis scabrous. Spikelets with 3 or 4 florets, 3(–4)-awned; lower glume 1.2–1.5 mm; upper glume 1.7–2.5 mm, shortly mucronate; lemma of fertile floret elliptic in side view, 1.7–2.5 mm, pilose on keel, ciliate on upper margins with 1–1.5 mm hairs; awn 4.5–7 mm; upper florets sterile, lemmas empty, inflated, overlapping to form a knob at side of fertile floret; second lemma turbinate, truncate, 1–1.5 mm, glabrous or sparsely appressed-pilose on back, awn

subequaling awn of fertile floret; third (and fourth) lemmas orbicular, awn somewhat shorter. Fl. and fr. Apr–May. $2n = 20, 40$.

Sea coasts, offshore islands. Guangdong, Taiwan [India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Africa, America, Australia, Pacific Islands].

This is a widespread species from tropical to warm-temperate regions of the world, found in weedy or disturbed places. It is tolerant of high salt concentrations. When young this grass is favored by cattle.

5. *Chloris formosana* (Honda) Keng ex B. S. Sun & Z. H. Hu, Fl. Reipubl. Popularis Sin. 10(1): 78. 1990.

台湾虎尾草 tai wan hu wei cao

Chloris barbata var. *formosana* Honda, Bot. Mag. (Tokyo) 40: 437. 1926.

Annual or short-lived perennial. Culms erect to decumbent and rooting at lower nodes, 20–70 cm tall. Leaf sheaths keeled, glabrous; leaf blades usually folded, 4–40 cm, 2–3 mm wide, glabrous, apex acute; ligule 0.5–1 mm, ciliate. Racemes digitate, 4–11, erect or somewhat lax, 3–8 cm, pallid or purplish; rachis puberulous. Spikelets with 3 florets, 3-awned; lower glume 1–2 mm; upper glume 2–3 mm, obtuse, mucronate; lemma of fertile floret elliptic in side view, 2.3–3 mm, with a lateral groove, this occasionally appressed-pilose, glabrous on keel, densely ciliate on upper margins with ca. 1 mm hairs; awn (2–) 4–6 mm; upper florets sterile, lemmas empty, flattened or only slightly inflated, overlapping to form a knob at side of fertile floret; second lemma oblanceolate, truncate, 1.6–2 mm, glabrous, awn 2.5–5 mm; third lemma similar to second but slightly smaller, awn 2–3 mm. Fl. and fr. Jul–Oct.

Sandy or gravelly soils near the sea. Fujian, Guangdong, Hainan, Taiwan [Vietnam].

143. ENTEROPOGON Nees in Lindley, Intr. Nat. Syst. Bot., ed. 2: 448. 1836.

肠须草属 chang xu cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennials, rarely annuals. Culms slender or stout, \pm compressed. Leaf blades linear to filiform, apex tapering; ligule ciliate. Inflorescence a single raceme or sometimes digitate; racemes unilateral, slender; spikelets sessile, imbricate, biserial, awned. Spikelets dorsally compressed, narrow, not gaping, florets 2(or 3), lowermost floret fertile, 2nd male or neuter floret sometimes present, uppermost floret reduced to a rudimentary awned lemma at rachilla apex, disarticulating above glumes; callus bearded; glumes shorter or upper as long as florets, lanceolate to subulate, membranous, 1-veined, acute to shortly awned; lemma of fertile floret broadly rounded to almost flat on back, subleathery, 3-veined, midvein prominent, raised, scabrous, apex 2-toothed, awned. Caryopsis narrowly elliptic, dorsally compressed, pericarp free. $x = 10$.

Nineteen species: throughout the tropics; two species in China.

Enteropogon is closely related to *Chloris*. The flattened fertile floret and caryopsis are the most reliable distinguishing features.

- 1a. Racemes 3–10; plant stout, 100–150 cm tall 1. *E. dolichostachyus*
1b. Raceme usually 1 (occasionally 2 or 3); plant slender, 30–60 cm tall 2. *E. unispiceus*

1. *Enteropogon dolichostachyus* (Lagasca) Keng ex Lazarides, Austral. J. Bot., Suppl. Ser., 5: 31. 1972.

肠须草 chang xu cao

Chloris dolichostachya Lagasca, Gen. Sp. Pl. 5. 1816.

Perennial. Culms erect or geniculately ascending, some-

times rooting at lower nodes, (0.5–)1–1.5(–2) m tall. Leaf sheaths glabrous or tuberculate-hispid, especially on margin, pilose at mouth; leaf blades linear, flat or rolled, 15–45 cm, 4–15 mm wide, scabrous, often tuberculate-hispid near ligule, apex setaceous; ligule ca. 0.4 mm. Racemes digitate, 3–10, ascending at first, later divaricate or drooping, 10–20 cm; rachis

triquetrous, scabrous. Spikelets with 2 florets, 5–7 mm; lower glume linear-lanceolate, 2–3 mm; upper glume lanceolate, 3–5 mm, awn-pointed; lemma of fertile floret oblong-lanceolate, 3.5–5 mm, glabrous, scabrous along either side of midvein and toward apex; awn 8–16 mm; palea linear-lanceolate, narrower than lemma, keels scabrous; upper floret reduced to an oblong 0.8–1.8 mm lemma with 2–5 mm awn, appressed to fertile floret. Fl. and fr. Mar–Nov.

River valleys, fields, banks, roadsides, and thicket on hills; 200–1000 m. Hainan, S Taiwan, S Yunnan [Afghanistan, Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand; N and NE Australia].

Enteropogon has traditionally been separated from *Chloris* on the basis of inflorescence form. *Enteropogon* has a single raceme, whereas *Chloris* has several digitate racemes. Thus this species has frequently been placed in *Chloris*. However, this inflorescence character is unreliable for separating the two genera, and a better separation is achieved on the basis of lemma and caryopsis compression, in which case this species falls within *Enteropogon*.

2. *Enteropogon unispiceus* (F. Mueller) W. D. Clayton, Kew Bull. 21: 108. 1967.

细穗肠须草 *xi sui chang xu cao*

Chloris unispicea F. Mueller, Fragm. 7: 118. 1870; *C. cheesemanii* Hackel ex Cheeseman; *Enteropogon gracilior* Rendle.

Perennial. Culms tufted, delicate, wiry, rooting at lower nodes, densely branched above base, 30–60 cm tall. Leaf sheaths glabrous or tuberculate-pilose, pilose at mouth; leaf blades linear, inrolled or flat, glaucous, 10–15 cm, 1–2 mm wide, scabrous, sometimes tuberculate-pilose on adaxial surface, apex finely acuminate; ligule ca. 0.3 mm. Raceme 1(–4), 4.5–11 cm; rachis triquetrous, scaberulous. Spikelets with 2 florets; lower glume lanceolate, 1.5–3.5 mm, acute; upper glume elliptic-oblong, 3.5–5.5 mm, mucronate; lemma of fertile floret oblong-lanceolate, ca. 3.5 mm, smooth or scabrous above middle; awn 5–10 mm; palea narrowly lanceolate, scabrous on upper part; upper floret reduced to a rudimentary ca. 0.5 mm lemma with 1.3–1.5 mm awn, loosely appressed to fertile floret. Fl. and fr. Sep. $2n = 20$.

Dry open slopes. S Taiwan [Australia (Queensland), Cook Island].

144. *EUSTACHYS* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810.

真穗草属 *zhen sui cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annuals or perennials. Leaf sheaths strongly keeled; leaf blades linear, flat or folded, apex often obtuse; ligule a ciliate rim. Inflorescence digitate; racemes unilateral, slender; spikelets sessile, tightly pectinate-imbricate, biseriate. Spikelets laterally compressed, florets 2, lower floret fertile, upper floret reduced to a small empty lemma, disarticulating above glumes; glumes about as long as florets, broad, membranous, 1-veined; lower glume awnless; upper glume with an oblique, stout, subapical awn; callus pubescent; lemma of fertile floret dark brown, keeled, broad, cartilaginous to leathery, 3-veined, hairy on veins, apex acute to emarginate, awnless or with a fine, subapical awn-point; palea nearly as long as lemma, keels scabrous or ciliolate; upper floret cuneate or obovate, glabrous. Caryopsis ellipsoid, trigonous, pericarp reluctantly free.

Eleven species: tropics and subtropics, mainly in the New World; one species in China.

Eustachys is closely related to *Chloris*. The chief difference is the broad, subapically awned upper glume. The racemes of brown, very tightly packed spikelets, lacking conspicuous awns, impart a distinctive appearance different from *Chloris*.

1. *Eustachys tenera* (J. Presl) A. Camus, Rev. Bot. Appl. Agric. Colon. 5: 208. 1925 [*"tener"*].

真穗草 *zhen sui cao*

Cynodon tener J. Presl in C. Presl, Reliq. Haenk. 1: 291. 1830; *Chloris tenera* (J. Presl) Scribn.; *Eustachys obtusifolia* A. Camus.

Plant stoloniferous. Culms slender, in flabellate tufts along the rooting stolons, laterally compressed, 15–30 cm tall. Leaf sheaths strongly keeled, keel scabrous, overlapping at base; leaf blades broadly linear, flat or folded, 1.5–7 cm, 3–5 mm wide, midvein on abaxial surface and margins scabrous, apex obtuse; ligule ca. 1 mm. Racemes 3–6, 4–7 cm; rachis triquetrous, scab-

rous on angles. Spikelets 1–1.2 mm, florets 2; glumes boat-shaped, keeled, scabrous on vein, ca. 1 mm; lower glume subacute; upper glume truncate, awn 0.3–0.5 mm; lemma of fertile floret broadly boat-shaped, ca. 1.2 mm, leathery, pilose along keel and incurving margins; palea obovate, narrower than lemma, keels scabrous; upper lemma much reduced, cuneate, lying within concave back of palea of fertile floret. Caryopsis brownish, plump, ca. 0.7 mm. Fl. and fr. Jun–Nov.

Grasslands, thickets, open weedy places, at low altitudes. Guangdong, Hainan, Taiwan [Indonesia, Malaysia, New Guinea, Philippines, Thailand, Vietnam].

This species is used as a lawn grass.

145. *MICROCHLOA* R. Brown, Prodr. 208. 1810.

小草属 *xiao cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, or sometimes annual. Culms tufted, slender. Leaves mostly basal; leaf blades narrow, often convolute; ligule short, ciliate from a membranous base. Inflorescence a single raceme; raceme unilateral, very slender, scarcely wider than culm, falcate

when dry; spikelets sessile, biseriate, closely imbricate; rachis crescentic in section. Spikelets small, lightly dorsally compressed, narrowly subterete, floret 1 without prolonged rachilla or sterile florets, disarticulating above glumes; glumes subequal, as long as spikelet and enclosing floret, firmly membranous, 1-veined, margins infolding, apex acute, both or only upper deciduous; lower glume keeled; upper glume rounded; lemma shorter than glumes, ovate, keeled, thinly membranous, 3-veined, ciliate on veins, apex acute or minutely emarginate and mucronulate; palea subequal to lemma, keels ciliate. Caryopsis ellipsoid. $x = 10$.

Six species: throughout the tropics; one species in China.

1. *Microchloa indica* (Linnaeus f.) P. Beauvois, Ess. Agrostogr., Expl. Pl., 13. 1812.

小草 xiao cao

Perennial, or sometimes annual. Culms tufted, usually densely, very slender, wiry, up to 60 cm tall. Basal leaf sheaths disintegrating into fibers; leaf blades very narrowly linear, 1–6 cm, ca. 1 mm wide, adaxial surface usually with long scattered hairs, margins scabrous, midrib and submarginal veins thickened, apex obtuse; ligule 0.1–0.3 mm. Raceme (3–)5–20 (–25) cm, falcate when dry; rachis shortly ciliate on margins or glabrous. Spikelets light green, lanceolate, 1.6–4 mm, acute; lower glume slightly asymmetrical; lemma 1.5–3 mm, mucronate. Caryopsis ca. 1 mm. Fl. and fr. Jul–Oct.

Dry open places, on very stony soils, rock crevices; sea level to 2500 m. Guangdong, Hainan, Yunnan [throughout the tropics].

- 1a. Plants up to 25 cm tall; raceme 0.8–1 mm wide; spikelets 1.6–3 mm 1a. var. *indica*
 1b. Plants 25–60 cm tall; raceme 1–1.5 mm wide; spikelets 2.5–4 mm 1b. var. *kunthii*

1a. *Microchloa indica* var. *indica*

小草(原变种) xiao cao (yuan bian zhong)

Nardus indica Linnaeus f., Suppl. Pl., 105. 1782 [“1781”].

Plants sometimes annual, delicate, up to 25 cm tall. Raceme (3–)5–8(–10) cm, 0.8–1 mm wide. Spikelets 1.6–3 mm.

Dry open places inland, sandy places near the sea; sea level to 2500 m. Fujian, Guangdong, Hainan, Yunnan [throughout the tropics; probably introduced in America, rare in Australia].

1b. *Microchloa indica* var. *kunthii* (Desvaux) B. S. Sun & Z. H. Hu, Fl. Reipubl. Popularis Sin. 10(1): 88. 1990.

长穗小草 chang sui xiao cao

Microchloa kunthii Desvaux, Mém. Soc. Agric. Angers 1: 179. 1831.

Plants perennial, slightly stouter, base often fibrous, 22–60 cm tall. Raceme (7–)15–20(–25) cm, 1–1.5 mm wide. Spikelets 2.5–4 mm.

Dry open places, especially in rock fissures. Yunnan [throughout the tropics, except Australia].

146. *CYNODON* Richard in Persoon, Syn. Pl. 1: 85. 1805, nom. cons.

狗牙根属 gou ya gen shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Capriola Adanson, nom. rej.; *Dactilon* Villars, nom. rej.

Perennials, rhizomatous or stoloniferous, sometimes sward forming. Culms slender to robust, leafy, internodes short. Leaf blades broadly linear to filiform, flat; ligule membranous or ciliate. Inflorescence digitate or sometimes 2 or more closely spaced whorls; racemes unilateral, slender; spikelets sessile, imbricate, biseriate; rachis flat or semiterete. Spikelets strongly laterally compressed, floret 1, with or without rachilla extension (very rarely 2nd floret present), narrowly ovate, awnless, disarticulating above glumes; glumes subequal, shorter or as long as floret, narrow, herbaceous, 1-veined or upper glume 3-veined, apex acuminate, both or only lower glume persistent; lemma keeled, boat-shaped, cartilaginous, 3-veined, usually pubescent on keel, apex entire, awnless. Caryopsis ellipsoid, laterally compressed. $x = 9, 10$.

Ten species: tropics of the Old World, especially Africa, one species pantropical extending into warm-temperate regions; two species in China.

- 1a. Rhizomes absent; racemes 5–10 cm; leaf sheath mouth glabrous or pilose; anthers ca. 0.5 mm 1. *C. radiatus*
 1b. Rhizomes present; racemes 2–6 cm; leaf sheath mouth bearded; anthers more than 1 mm 2. *C. dactylon*

1. *Cynodon radiatus* Roth ex Roemer & Schultes, Syst. Veg. 2: 411. 1817.

弯穗狗牙根 wan sui gou ya gen

Cynodon arcuatus J. Presl in C. Presl; *C. dactylon* var. *intermedius* (Rangachari & Tadulingham) C. E. C. Fischer; *C. intermedius* Rangachari & Tadulingham.

Perennial, stoloniferous, widely spreading, without rhizomes. Culms slender, 20–50(–80) cm tall. Leaf sheaths glabrous or pilose at mouth; leaf blades broadly linear, 2.5–10(–15) cm, 3–6 mm wide, glaucous, glabrous, apex acute; ligule

ca. 3 mm, membranous, ciliate on upper edge. Racemes digitate, usually 4–8, 5–10 cm, flexuous, slightly drooping; spikelets overlapping by 1/3–1/2 their length. Spikelets 1.8–2.5 mm; rachilla extension ca. 1 mm, without reduced floret at apex; glumes lanceolate, about half as long as floret, 1-veined, keel scabrous, thickened; lower glume ca. 1 mm; upper glume 1–1.4 mm; lemma as long as spikelet, pilose along keel and lateral veins, hairs sometimes clavate, apex subacute; palea glabrous, keels smooth or rarely scaberulous. Anthers 0.5–0.7 mm. Caryopsis trigonous, laterally compressed. Fl. and fr. Jul–Nov. $2n = 36$.

Sunny open places, roadsides. Guangdong (offshore islands), Hainan, Taiwan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; N Australia; Madagascar].

The club-shaped tips to the lemma hairs can be seen only under a microscope. This species is easily confused with *Cynodon dactylon*, from which it differs mainly in the absence of rhizomes. It is genetically isolated from all other species of *Cynodon*.

2. *Cynodon dactylon* (Linnaeus) Persoon, Syn. Pl. 1: 85. 1805.

狗牙根 *gou ya gen*

Perennial, stoloniferous, also with slender scaly rhizomes, sward forming. Culms slender, 10–40 cm tall. Leaf sheaths bearded at mouth, otherwise glabrous or thinly pilose; leaf blades linear, short and narrow, 1–12 cm, 1–4 mm wide, usually glabrous, apex subacute; ligule a line of hairs. Racemes digitate, (2–)3–6, 2–6 cm, straight or gently curved, rather stiff, spreading; spikelets overlapping by 1/2–2/3 their length. Spikelets 2–2.7 mm; rachilla extension ca. 1 mm, sometimes with minute rudimentary floret at apex; glumes linear-lanceolate, often purplish, usually more than half as long as floret, 1.5–2 mm, 1-veined, keel scabrous, thickened; lemma as long as spikelet, silky villous along keel, hairs straight, otherwise glabrous or lateral veins thinly villous, apex subacute; palea glabrous, keels scaberulous. Anthers more than 1 mm. Caryopsis subterete, scarcely laterally compressed. Fl. and fr. nearly all the year. $2n = 18, 36$.

Open disturbed situations, roadsides, field margins, cultivated as a lawn grass; sea level to 2500 m. Fujian, Gansu, Guangdong, Hainan, Hubei, Jiangsu, Shaanxi, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [tropical and warm-temperate regions of the world].

This is the most widely used lawn grass in warm parts of the

world, and it is also an important pasture grass (Bermuda Grass). It is extremely variable and it will readily hybridize with some other *Cynodon* species.

- 1a. Spikelet with 1 bisexual floret 2a. var. *dactylon*
1b. Spikelet with 2 bisexual florets 2b. var. *biflorus*

2a. *Cynodon dactylon* var. *dactylon*

狗牙根(原变种) *gou ya gen* (yuan bian zhong)

Panicum dactylon Linnaeus, Sp. Pl. 1: 58. 1753.

Spikelets 2–2.5 mm, with 1 bisexual floret. Fl. and fr. most of the year. $2n = 18, 36$.

Open disturbed situations, roadsides, field margins, and cultivated as a lawn grass; sea level to 2500 m. Fujian, Guangdong, Hainan, Hubei, Jiangsu, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [tropical and warm-temperate regions of the world].

2b. *Cynodon dactylon* var. *biflorus* Merino, Fl. Galicia 3: 310. 1909.

双花狗牙根 *shuang hua gou ya gen*

Fibichia umbellata Koeler var. *biflora* Beck.

Spikelets 2.5–2.7 mm, with 2 bisexual florets; rachilla between florets ca. 1 mm. Fl. and fr. May–Oct.

Fujian, Jiangsu, Taiwan, Zhejiang [described from Europe].

Specimens occur sporadically throughout the range of the species in which the rudimentary second floret at the end of the rachilla extension is better developed. In rare cases it may even enclose anthers or be bisexual and only a little smaller than the lower floret. Such spikelets often occur on plants with mainly normal inflorescences and are of negligible taxonomic significance.

147. SPARTINA Schreber, Gen. Pl. 43. 1789.

米草属 *mi cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennials, usually with wide spreading scaly rhizomes. Culms erect, robust. Leaf blades long, tough; ligule a line of hairs. Inflorescence of racemes, these subdigitate or disposed along an axis, few to many; spikelets appressed or pectinate; rachis triquetrous, terminating in a naked point. Spikelets strongly laterally compressed, lanceolate or narrowly oblong, floret 1, without rachilla extension, disarticulating below glumes and falling entire; glumes unequal, keeled; lower glume shorter than floret; upper glume longer than floret, papery, 1–3-veined, sometimes additional veins present, apex narrowly acute to shortly awned; lemma keeled, firm with wide membranous margins, lateral veins obscure, apex subacute; palea equaling or exceeding lemma. Lodicules often absent. Caryopsis fusiform, embryo nearly as long as caryopsis. $x = 10$.

Seventeen species: both coasts of the Americas, Atlantic coasts of Europe and Africa, especially in temperate and subtropical regions; two species (both introduced) in China.

This genus is adapted to the saline environment of the coast. Species with spreading rhizomes form colonies in tidal saltmarshes and are particularly suitable for stabilizing coastal mud flats.

- 1a. Spikelets glabrous, rarely short hairs on keels; culms (0.5–)1–2(–3) m tall; leaf blades 10–90 × 1–2 cm 1. *S. alterniflora*
1b. Spikelets pubescent; culms 0.1–0.5(–1.2) m tall; leaf blades 11–22 × 0.7–1 cm 2. *S. anglica*

1. *Spartina alterniflora* Loiseleur, Fl. Gall. 719. 1807.

互花米草 *hu hua mi cao*

Spartina glabra Muhlenberg ex Elliott var. *alterniflora*

(Loiseleur) Merrill; *S. maritima* (Curtis) Fernald var. *alterniflora* (Loiseleur) St.-Yves; *S. stricta* Roth var. *alterniflora* (Loiseleur) A. Gray; *Trachynotia alterniflora* (Loiseleur) Candolle.

Perennial with soft fleshy rhizomes. Culms stout, forming large clumps, erect, (0.5–)1–2(–3) m tall, ca. 1 cm in diam. Leaf sheaths mostly longer than internodes, smooth; leaf blades linear-lanceolate, flat, 10–90 × 1–2 cm, smooth or margins minutely scabrous, tapering to long hard involute apex; ligule ca. 1 mm. Racemes racemously arranged, (5–)10–20, 5–20 cm, slender, erect or slightly spreading; spikelets scarcely overlapping; rachis smooth, terminating in a bristle up to 3 cm. Spikelets ca. 10 mm, glabrous or nearly so; lower glume linear, 1/2–2/3 as long as spikelet, acute; upper glume ovate-lanceolate, as long as spikelet, glabrous or with very short hairs on keel, subacute; lemma lanceolate-oblong to narrowly ovate, glabrous; palea slightly longer than lemma. Anthers 5–6 mm. $2n = 62$.

Tidal mudflats of coast, introduced. Fujian, Guangdong, Guangxi, Hebei, Jiangsu, Shandong, Zhejiang [native to Atlantic coast of North America].

Spartina alterniflora was first introduced to China from North America in 1979. From eight initial plantings in 1985 it has spread rapidly in suitable habitats along the whole Chinese coast. It is used to protect coastal dykes from tidal erosion and to promote sediment build-up for polder formation. Plantations are also used for pasture and cut for green manure and forage.

2. *Spartina anglica* C. E. Hubbard, Bot. J. Linn. Soc. 76: 364. 1978.

大米草 da mi cao

Spartina townsendii H. Groves & J. Groves var. *anglica* (C. E. Hubbard) Lambinon & Maquet.

Perennial with soft fleshy rhizomes, deeply rooted. Culms forming large clumps, erect, 10–50(–120) cm tall, 3–35 mm in diam. Leaf sheaths mostly longer than internodes, smooth; leaf blades linear, flat or inrolled upward, 10–45 × 0.7–1.5 cm, smooth, apex fine, hard, upper blades usually patent; ligule 2–3 mm. Racemes racemously arranged, 2–6(–12), 7–23 cm, stiff, erect or slightly spreading; spikelets closely overlapping; rachis terminating in a hard bristle up to 5 cm. Spikelets 12–21 mm, pubescent; lower glume 2/3–4/5 as long as spikelet, acute; upper glume lanceolate-oblong, as long as spikelet, acute; lemma lanceolate-oblong, ca. 1 cm, keel scabrous, pubescent, entirely or in upper half; palea slightly longer than lemma. Anthers 7–13 mm. $2n = 124$.

Tidal mudflats of coast, introduced. Jiangsu, Zhejiang [native to England].

Spartina anglica is an extremely vigorous species, which arose in England at the end of the 19th century by the natural hybridization of *S. alterniflora* and *S. maritima* (Curtis) Fernald, followed by a doubling of chromosomes in the resulting sterile hybrid to form a fertile amphidiploid. It was introduced from England to China in 1963 and was planted in coastal areas. At first it spread rapidly, occurring in all coastal provinces by 1985. In recent years it has died back, leaving only small residual colonies. The reasons for the dieback are not fully understood.

148. *BOUTELOUA* Lagasca, Varied. Ci. 2: 134. 1805 [*Botelua*], nom. et orth. cons.

格兰马草属 ge lan ma cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annuals or perennials. Culms mostly tufted. Leaf blades narrow; ligule a line of hairs. Inflorescence of racemes inserted singly along an axis; racemes unilateral, 1–80, short, deciduous or persistent; spikelets sessile, few to numerous, biseriate, sometimes pectinate; rachis narrow, flat, ending in a straight or forked point. Spikelets subterete or laterally compressed, fertile floret 1, usually 2nd sterile floret present, rarely this reduced to a rachilla extension; glumes unequal, narrow, membranous, 1-veined, keeled, acuminate to awn-pointed; lemma of fertile floret ± as long as upper glume, rounded or keeled on back, thinly leathery, 3-veined, veins excurrent into 3 short awns, central awn sometimes flanked by 2 teeth, less often apex simply acute; palea veins sometimes excurrent; sterile floret variable within a species or even an individual specimen, usually lemma body reduced and prominently awned. Caryopsis ellipsoid. $x = 7, 10$.

About 40 species: Canada to Argentina, centered on Mexico; two species (both introduced) in China.

- 1a. Racemes 10–50, falling entire at maturity 1. *B. curtipendula*
1b. Racemes 1–3(–4); racemes persistent, spikelets disarticulating above glumes 2. *B. gracilis*

1. *Bouteloua curtipendula* (Michaux) Torrey, Explor. Red River Louisiana, 300. 1853.

垂穗草 chui sui cao

Chloris curtipendula Michaux, Fl. Bor.-Amer. 1: 59. 1803; *Atheropogon curtipendulus* (Michaux) E. Fournier; *Cynodon curtipendulus* (Michaux) Raspail; *Dinebra curtipendula* (Michaux) P. Beauvois; *Eutriana curtipendula* (Michaux) Trinius.

Perennial with short, slender, scaly rhizomes. Culms tufted, erect, 30–100 cm tall. Leaf sheaths glabrous or nearly so; leaf blades flat or slightly involute, 20–30 cm, 1–5 mm wide, both surfaces and margins scabrous, base pubescent; li-

gule ca. 1 mm. Inflorescence axis 15–25 cm; racemes 10–50, 1–2 cm, purplish, secund along axis, usually nodding, with 3–6 (–10) appressed or ascending spikelets, falling entire. Spikelets 4.5–10 mm; lower glume linear-lanceolate, 2.5–4 mm; upper glume lanceolate, 4(–7) mm; lemma of fertile floret usually somewhat exceeding glumes, acuminate, lateral veins extended into ca. 1 mm mucros; palea slightly longer than lemma; 2nd floret rudimentary, with long central awn and 2 shorter laterals, or greatly reduced, or lacking. Fl. and fr. summer to autumn. $2n = 28, 35, 40, 42, 56, 70$.

Cultivated in China [native to America].

This is an American pasture grass (Side-oats Grama) reported to be excellent in China for grazing and also for hay.

2. *Bouteloua gracilis* (Kunth) Lagasca ex Griffiths, Contr. U. S. Natl. Herb. 14: 375. 1912, nom. cons., not Vasey (1878).

格兰马草 ge lan ma cao

Chondrosum gracile Kunth, Nov. Gen. Sp. 1: 176. 1815 ["1816"]; *Actinochloa gracilis* (Kunth) Willdenow ex Roemer & Schultes; *Atheropogon gracilis* (Kunth) Sprengel; *Eutriana gracilis* (Kunth) Trinius.

Perennial. Culms densely tufted, erect, 15–60 cm tall. Leaf sheaths glabrous, in tight bundles at culm base; leaf blades flat or involute, 3–10 cm, 1–2 mm wide, usually glabrous. Inflorescence of (1 or) 2(–4) distant racemes; racemes 2.5–5 cm, falcate at maturity, persistent, spikelets numerous, densely crowded,

pectinate; rachis not extended beyond uppermost spikelet. Spikelets 5–6 mm; glumes lanceolate, persistent; lower glume linear-lanceolate, ca. 3.5 mm; upper glume lanceolate, 3.5–6 mm, sparsely villous on keel; lemma of fertile floret 5–5.5 mm, dorsally villous, lateral veins extended into 3 short awns at apex, intermediate lobes acute; 2nd floret ca. 2 mm, densely long-villous at rachilla apex, cleft to the base, lobes rounded, awns 3, scabrous, ca. 5 mm; 1 or 2 additional broad awnless rudiments sometimes present. Fl. and fr. summer to autumn. $2n = 28, 35, 42, 61, 77$.

Cultivated in China [native to North America (including Mexico)].

This is a valuable forage grass native to the North American prairie (Blue Grama).

149. **BUCHLOË** Engelm., Trans. Acad. Sci. St. Louis 1: 432. 1859, nom. cons.

野牛草属 ye niu cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, stoloniferous; monoecious or dioecious. Leaf blades linear; ligule a line of hairs. Male inflorescence long exserted, racemes 1–4, distant, short; spikelets biseriate, pectinate; rachis slender. Female inflorescence composed of usually 2 modified racemes in axils of inflated upper leaf sheaths; spikelets 3–5; rachis shortened and with the spikelets forming a globular deciduous burr. Male spikelets with 2 florets; glumes unequal, 1-veined; lemmas longer than glumes, 3-veined, entire. Female spikelets dorsally compressed, floret 1; lower (inner) glume reduced or suppressed, thin; upper glume strongly indurated, forming an involucre on the outside of the burr, back rounded, margins inflexed and enclosing floret, apex contracted with 3–5 rigid acuminate lobes; lemma ovate-lanceolate, subleathery, 3-veined, apex shortly 3-lobed. Caryopsis ellipsoid.

One species: native to Mexico and the United States; introduced in China.

1. *Buchloë dactyloides* (Nuttall) Engelm., Trans. Acad. Sci. St. Louis 1: 432. 1859.

野牛草 ye niu cao

Sesleria dactyloides Nuttall, Gen. N. Amer. Pl. 1: 65. 1818; *Bulbilis dactyloides* (Nuttall) Rafinesque ex Kuntze; *Calanthera dactyloides* (Nuttall) Kunth ex Hooker; *Casiostega dactyloides* (Nuttall) E. Fournier.

Perennial, sward forming. Culms slender, erect, 5–25 cm tall. Leaf sheaths sparsely pilose; leaf blades 3–10(–20) cm, 1–2 mm wide, curling, pilose on both surfaces, apex filiform; ligule

ca. 0.5 mm. Male racemes 1–4, stramineous, 5–15 × ca. 5 mm, scattered toward culm apex. Female inflorescence capitate, 6–9 × 3–4 mm; indurated upper (outer) glume whitish with green apical lobes; lemma ovate below, contracted toward green apical lobes, middle lobe much longer than laterals; palea broad, as long as lemma body. Fl. and fr. summer to autumn. $2n = 56, 60$.

Cultivated in China [native to Mexico and the United States].

This species (Buffalo Grass), from the western prairies of the United States, is a low, creeping grass that has been introduced into China for forage and as a lawn grass.

150. **TRAGUS** Haller, Hist. Stirp. Helv. 2: 203. 1768, nom. cons.

锋芒草属 feng mang cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Nazia Adanson, nom. rej.

Annuals or perennials. Leaf blades narrow, flat; ligule a line of hairs, sometimes from a membranous base. Inflorescence linear, cylindrical, spikelike, dense, axis bearing numerous very short racemes; racemes sessile or shortly pedunculate, falling entire as spiny burrs; spikelets 2–5, contiguous or on a short rachis, sometimes the upper reduced. Spikelets elliptic to lanceolate, floret 1; lower glume a tiny scale or suppressed; upper glume as long as spikelet, rounded, prominently 5–7-veined, veins forming ribs armed with conspicuous, stout, hooked spines, thin between ribs, apex acute to acuminate; lemma ovate, almost as long as glume, flattened, membranous, 3-veined, pubescent around midvein, apex entire; palea slightly shorter than lemma. Caryopsis ellipsoid to oblong, slightly dorsally compressed.

Seven species: tropical and warm-temperate regions of the Old World; introduced in America; two species in China.

Both species occurring in China have been confused with the Mediterranean, African, and SW Asian *Tragus racemosus* (Linnaeus) Allioni, which differs in having 7 veins (vs. 5) in the upper glume.

- 1a. Lower spikelet 3.5–4 mm, upper spikelet subequal, 3.2–3.7 mm; apex of upper glume extended beyond spines as long point 1. *T. mongolorum*
 1b. Lower spikelet 2–3 mm, upper spikelet clearly smaller, 1.5–2.2 mm; apex of upper glume scarcely extended beyond spines 2. *T. berteronianus*

1. *Tragus mongolorum* Ohwi, Acta Phytotax. Geobot. 10: 268. 1941.

锋芒草 feng mang cao

Tragus roxburghii Panigrahi.

Annual, mat-forming. Culms tufted, ascending from prostrate base, rooting at nodes, up to 25 cm tall. Leaf sheaths usually shorter than internodes, uppermost longer, inflated, often clasping base of inflorescence; leaf blades broadly linear, tough, flat, glaucous, 3–8 cm, 2–4 mm wide, margins thick, pectinate-spinose, apex acute. Inflorescence 3–6 × ca. 0.8 cm; racemes of 2 subequal contiguous spikelets, rachis internode ca. 0.2 mm; rachis extension absent or up to 1.5 mm beyond upper spikelet, sometimes bearing rudimentary 3rd spikelet, this often reduced to a row of spines; basal peduncle 0.3–0.5 mm. Lower spikelet fertile, elliptic, 3.5–4 mm; lower glume very small, membranous; upper glume 5-ribbed, ribs bearing hooked, thick-based spines, apex acuminate-attenuate; lemma ovate-lanceolate, ca. 3 mm, puberulous, apex sharply acute. Upper spikelet similar to lower but slightly smaller, 3.2–3.7 mm, fertile. Fl. and fr. Jul–Sep.

Hill slopes, roadsides, a weed of cultivation. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi, Sichuan, Xizang, Yunnan [India, Malaysia, Myanmar, Pakistan, Thailand; Indian Ocean Islands (Mascarenes)].

This species has been widely known under the name *Tragus biflorus* Schultes, which is illegitimate because it was nomenclaturally

superfluous when published. Panigrahi replaced *T. biflorus* with *T. roxburghii*, but overlooked Ohwi's earlier name, *T. mongolorum*, which was validly published, is legitimate, and is therefore the correct name for the species.

The spiny burrs cling easily to skin and clothing.

2. *Tragus berteronianus* Schultes, Mant. 2: 205. 1824.

虱子草 shi zi cao

Tragus racemosus (Linnaeus) Allioni var. *berteronianus* (Schultes) Hackel; *T. tcheliensis* Debeaux.

Annual, mat-forming. Culms tufted, usually decumbent at base and rooting at lower nodes, 15–30 cm tall. Leaf sheaths shorter than or subequal to internodes; leaf blades broadly linear, tough, flat, glaucous, 3–7 cm, 3–4 mm wide, margins thick, pectinate-spinose, apex acute. Inflorescence 4–11 × ca. 0.5 cm; racemes of 2 unequal spikelets separated by a 0.4–0.6 mm rachis internode; rachis not extended beyond upper spikelet; basal peduncle 0.2–0.4 mm. Lower spikelet fertile, elliptic, 2–3 mm; lower glume suppressed; upper glume 5-ribbed, ribs bearing hooked, swollen-based spines, apex acute; lemma ovate-lanceolate, 1.8–2.1 mm, puberulous, apex sharply acute. Upper spikelet sterile, narrowly elliptic, 1.5–2.2 mm, often reduced to the upper glume. Fl. and fr. summer to autumn. $2n = 20$.

Roadsides, other weedy places. Anhui, Gansu, Hebei, Jiangsu, Nei Mongol, Shaanxi, Sichuan [Afghanistan, Pakistan; Africa, America, SW Asia].

151. **ZOYSIA** Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 3: 440. 1801, nom. cons.

结缕草属 jie lü cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Osterdamia Necker ex Kuntze, nom. illeg. superfl.

Perennials, rhizomatous and/or stoloniferous, sward forming. Culms arising from nodes along stolons, often densely branched at ground level. Leaf blades conspicuously distichous, stiff, flat or involute; ligule short, ciliolate. Inflorescence a cylindrical, dense, spike-like raceme; spikelets appressed to axis, falling entire; pedicels persistent, flattened, sometimes widened upward. Spikelets laterally compressed, floret 1; lower glume usually absent; upper glume as long as spikelet, enclosing floret, laterally compressed, leathery, rounded on back, smooth, glossy, apex acute or midvein excurrent into mucro; lemma membranous, 1–3-veined, apex acute or emarginate; palea reduced or absent. Lodicules absent. Styles connate at base, stigmas apically exerted. Caryopsis ovoid. $x = 9, 10$.

Nine species: tropical and subtropical coasts of the Indian Ocean, W Pacific, and Australasia; several species widely introduced elsewhere as tropical lawn grasses; five species in China.

The spikelets often consist of only two scales: a leathery, glossy glume (technically the upper glume) enclosing a much thinner lemma.

The species are good sand-binding and lawn grasses.

- 1a. Spikelets usually ca. 2 mm wide; uppermost leaf sheaths inflated, enclosing base of inflorescence 1. *Z. macrostachya*
 1b. Spikelets less than 1.5 mm wide; uppermost leaf sheaths not inflated.
 2a. Spikelets ovate, 2–2.5 times as long as wide; pedicels flexuous, usually longer than spikelet 2. *Z. japonica*
 2b. Spikelets lanceolate to oblong, 3–4 times as long as wide; pedicels straight, usually shorter than spikelet.
 3a. Spikelets 4–8 mm 3. *Z. sinica*
 3b. Spikelets 2–3 mm.

- 4a. Leaf blades 1.5–2.5 mm wide (when flattened); inflorescence 2–4 cm; spikelets 10–30 4. *Z. matrella*
 4b. Leaf blades ca. 1 mm wide, setaceous; inflorescence up to 1.5 cm; spikelets 6–12 5. *Z. pacifica*

1. *Zoysia macrostachya* Franchet & Savatier, Enum. Pl. Jap. 2: 608. 1879.

大穗结缕草 da sui jie lü cao

Perennial, loosely spreading from extensive, deep, slender rhizomes. Culms erect or ascending, 10–20 cm tall, much branched at ground level, many-noded. Leaf sheaths overlapping over whole culm length, glabrous, bearded at mouth with 2–3 mm hairs; leaf blades linear-lanceolate, stiff, patent, margins involute, 1.5–8 cm, 2–4 mm wide, abaxial surface glabrous or puberulous, adaxial surface glaucous, glabrous, apex pungent. Inflorescence lanceolate-oblong, 3–5 × 0.5–1 cm, base enclosed in inflated uppermost leaf sheaths; spikelets many, closely overlapping; pedicels stout, 1–2 mm, apex slightly oblique. Spikelets 6–8 × ca. 2 mm, yellowish, brown or purplish brown; lower glume absent; upper glume elliptic-oblong, obscurely 7-veined, minutely puberulent along margins and near apex, apex acute or with subapical awn to 1.2 mm; lemma lanceolate, ca. 4 mm, 1-veined; palea absent. Anthers 2–2.5 mm. Caryopsis 1.8–2 mm. Fl. and fr. Jun–Sep. $2n = 40$.

Coastal sands extending to grazed or trodden places inland. Anhui, Fujian, Jiangsu, Shandong, Zhejiang [Japan, Korea].

This species is used as a lawn grass.

2. *Zoysia japonica* Steudel, Syn. Pl. Glumac. 1: 414. 1854.

结缕草 jie lü cao

Zoysia koreana Mez; *Z. matrella* (Linnaeus) Merrill subsp. *japonica* (Steudel) Masamune & Yanagita; *Z. matrella* var. *japonica* (Steudel) Sasaki; *Z. pungens* Willdenow var. *japonica* (Steudel) Hackel.

Perennial, with long slender stolons, forming large mats. Culms erect, up to 20 cm tall, sometimes branched at base. Leaf sheaths glabrous, pilose at mouth with 1–2 mm hairs, basal sheaths persistent; leaf blades aggregated toward culm base, linear-lanceolate, flat or margins involute, tough, patent, 2.5–6 cm, 2–4 mm wide, abaxial surface subglabrous, adaxial surface thinly pilose, apex pungent. Inflorescence linear-elliptic, 2–4 × 0.3–0.5 cm, long exserted above leaves; spikelets many, loosely overlapping; pedicels slender, slightly flexuous, longer than spikelet, up to 5 mm. Spikelets 2.5–3.5 × 1–1.5 mm, yellowish green becoming purplish brown; lower glume absent; upper glume obliquely ovate, obscurely 5–7-veined, upper margins broad, papery, apex obtuse, sometimes mucronate; lemma boat-shaped, slightly shorter than glume, 1-veined; palea absent. Anthers ca. 1.5 mm. Caryopsis 1.5–2 mm. Fl. and fr. May–Aug. $2n = 40$.

Coastal areas, grassy hillsides, open places. Hebei, Hong Kong, Jiangsu, Jiangxi, Liaoning, Shandong, Taiwan, Zhejiang [Japan, Korea].

This species can be distinguished by its relatively short, broad leaf blades, broadly linear inflorescence well exserted above the leaves, and many short, plump spikelets on long, slender pedicels.

This species is a good lawn grass.

3. *Zoysia sinica* Hance, J. Bot. 7: 168. 1869.

中华结缕草 zhong hua jie lü cao

Zoysia matrella (Linnaeus) Merrill var. *macrantha* Nakai ex Honda; *Z. sinica* var. *macrantha* (Nakai ex Honda) Ohwi; *Z. sinica* subsp. *nipponica* (Ohwi) T. Koyama; *Z. sinica* var. *nipponica* Ohwi.

Perennial, forming dense spreading mats from slender underground rhizomes. Culms erect from nodes of rhizome, stiff, 10–30 cm tall, branched at base. Leaf sheaths glabrous, usually persistent at base, pilose at mouth; leaf blades broadly linear, flat or margins involute, stiff, suberect to patent, 2–10 cm, 2–3 mm wide, green or gray-green, glabrous, apex pungent. Inflorescence linear-elliptic, 2–4(–8) × 0.4–0.5 cm, usually shortly exserted from uppermost leaf sheath; spikelets many, closely overlapping; pedicels shorter than spikelet, ca. 3 mm, widened at apex. Spikelets 4–8 × 1–1.5 mm, yellowish brown or purplish brown; lower glume absent; upper glume lanceolate-oblong to narrowly oblong with slightly falcate apex, obscurely 7–11-veined, midvein usually shortly excurrent; lemma lanceolate-oblong, 3–4 mm, 1-veined; palea absent. Anthers 1.5–2.5 mm. Fl. and fr. May–Oct.

Coastal sands, extending to grazed and trodden places inland. Anhui, Fujian, Guangdong, Guangxi, Hebei, Jiangsu, Liaoning, Shandong, Taiwan, Zhejiang [Japan, Korea].

This species can be recognized by its long, straight-sided spikelets with falcate tips. Specimens with spikelets at the upper end of the size range (5–8 mm) have been separated as var. *nipponica*, but variation is continuous and spikelet size can be variable even on a single specimen.

This species is a good lawn grass.

4. *Zoysia matrella* (Linnaeus) Merrill, Philipp. J. Sci. 7: 230. 1912.

沟叶结缕草 gou ye jie lü cao

Agrostis matrella Linnaeus, Mant. Pl. 2: 185. 1771; *Zoysia pungens* Willdenow; *Z. serrulata* Mez; *Z. tenuifolia* Thiele.

Perennial, stoloniferous, mat-forming, also with shallow underground rhizomes. Culms up to 20 cm tall. Leaf sheaths glabrous, bearded at mouth with 4–5 mm hairs; leaf blades flat or involute, tough, suberect to spreading, 3–8 cm, 1.5–2.5 mm wide, glabrous or adaxial surface thinly pilose, apex acute. Inflorescence linear, 2–4 × 0.2–0.3 cm, exserted above leaves; spikelets 10–30, loosely overlapping; rachis somewhat wavy; pedicels shorter than spikelet, 1–3 mm, widened at apex. Spikelets 2–3 × ca. 1 mm, yellowish brown or purplish brown; lower glume usually absent; upper glume lanceolate, 5-veined, midrib prominent, sometimes scabrous toward apex, lateral veins obscure, apex obtuse; lemma oblong-ovate, 2–2.5 mm, obscurely 3-veined, midvein sometimes shortly excurrent; palea lanceolate, 1/2 as long as lemma. Anthers 1–1.5 mm. Caryopsis ca. 1.5 mm. Fl. and fr. Jul–Oct. $2n = 20, 40$.

Coastal sands. Guangdong, Hainan, Taiwan [India, Indonesia, Japan (S Kyushu and Ryukyu Islands), Malaysia, Philippines, Sri Lanka, Thailand, Vietnam].

This species forms natural hybrids with *Zoysia sinica*.

Zoysia matrella is a good sand-binding and lawn grass.

5. *Zoysia pacifica* (Goudswaard) M. Hotta & S. Kuroki, Acta Phytotax. Geobot. 45: 71. 1994.

细叶结缕草 xi ye jie lü cao

Zoysia matrella (Linnaeus) Merrill var. *pacifica* Goudswaard, Blumea 26: 172. 1980.

Perennial, stoloniferous, forming a low dense sward. Culms 5–10 cm tall, much branched. Leaf sheaths glabrous, bearded at mouth with 2–5 mm hairs; leaf blades setaceous, soft, 4–6 cm, ca. 1 mm wide. Inflorescence linear, up to 1.5 cm; spikelets 6–12, loosely overlapping; rachis somewhat wavy;

pedicels shorter than spikelet, up to 1.6 mm, scabrous, slightly widened at apex. Spikelets 2–3 × ca. 0.6 mm, straw colored tinged purplish; lower glume absent; upper glume lanceolate, shiny, obscurely 5-veined, apex subacute, sometimes with subapical awn-point; lemma slightly shorter than upper glume, 1-veined; palea absent. Anthers 0.6–0.8 mm. Fl. and fr. Aug–Dec. $2n = 40^*$.

Rocky and coral beaches. Taiwan [Japan (S Kyushu and Ryukyu Islands), Philippines, Thailand; Pacific Islands].

This grass has been widely known as *Zoysia tenuifolia* Thiele, but the type specimens of that name belong taxonomically to *Z. matrella*.

This fine-leaved, densely growing, low grass forms excellent lawns and is grown in gardens in S and SE China.

152. *PEROTIS* Aiton, Hort. Kew. 1: 85. 1789.

茅根属 mao gen shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Diplachyrium Nees.

Annuals or sometimes perennials. Leaf blades short, broad, base slightly cordate, margins often pectinate-ciliate; ligule a membranous rim. Inflorescence a cylindrical raceme of long-awned, solitary spikelets borne directly on main axis; rachis clothed in short pegs after spikelets have fallen. Spikelets linear-elliptic, terete or slightly laterally compressed, with 1 floret, falling entire, sessile or borne on a pedicel-like callus which falls with spikelet; glumes subequal, as long as spikelet and enclosing floret, papery, 1-veined, rounded, scabrous, apex with a long slender awn far exceeding glume body, lower glume tightly embraced by upper glume, its awn usually longer than upper glume awn; lemma lanceolate, shorter than glumes, hyaline, 1-veined, glabrous, acute; palea hyaline, slightly shorter than lemma, flattened. Caryopsis terete or flattened, apex acute.

Thirteen species: Old World tropics; three species in China.

This is an easily recognizable genus on account of the delicate, elongate, violet-tinged, “bottlebrush” inflorescence of small, long-awned spikelets, which fall entire from the central axis.

1a. Spikelets 3.5–4.5 mm; glume apex tapering into awn 1. *P. rara*

1b. Spikelets 1.5–2.5 mm; glume apex abruptly distinct from awn.

2a. Spikelet callus 0.2–0.5 mm; glumes scabrid on keel, evenly hirtellous on back; leaf blades 2–5 mm wide; inflorescence up to 12 cm 2. *P. indica*

2b. Spikelet callus 0.1–0.2 mm; glumes pectinate-ciliate on keel, scaberulous-hirtellous in rows on lower back; leaf blades 4–7 mm wide; inflorescence up to 20 cm 3. *P. hordeiformis*

1. *Perotis rara* R. Brown, Prodr. 172. 1810.

大花茅根 da hua mao gen

Diplachyrium rarum (R. Brown) Nees; *Perotis longiflora* Nees; *P. macrantha* Honda; *P. patula* Nees; *Saccharum rarum* (R. Brown) Poiret.

Annual or short-lived perennial. Culms loosely tufted, decumbent at base, 15–40 cm tall. Leaf sheaths glabrous; leaf blades lanceolate to narrowly ovate, flat or margins involute, tough, 1.5–5 cm, 2–5 mm wide, glaucous, glabrous, margins spiny-scabrous, pectinate at base, apex acute. Inflorescence up to 20 cm; spikelets laxly arranged, horizontally spreading, lightly reflexed at maturity; rachis scaberulous-hirtellous. Spikelets 3.5–4.5 mm (excluding awns); basal callus 0.5–1.5 mm, narrowly obconical, flattened, sometimes laterally pubescent; glumes linear-lanceolate, back evenly scaberulous-hirtellous with short white hairs, midvein scabrous with longer prickles toward awn, apex gradually tapering into awn; awn 1–2.5 mm; lemma 1.2–1.5 mm. Anthers ca. 0.6 mm. Caryopsis terete, subulate, ca. 2.5 mm. Fl. and fr. Jun–Nov.

Sandy seashores. Fujian, Guangdong, Guangxi, Hainan, Taiwan [New Guinea, Philippines, Thailand, Vietnam; Australia].

This species is at the northern limit of its range in S China, and can be distinguished by its much more loosely arranged inflorescence of very narrow spikelets, with the tips drawn out into longer awns.

2. *Perotis indica* (Linnaeus) O. Kuntze, Revis. Gen. Pl. 2: 787. 1891.

茅根 mao gen

Anthoxanthum indicum Linnaeus, Sp. Pl. 1: 28. 1753; *Saccharum spicatum* Linnaeus.

Annual. Culms loosely tufted, erect or decumbent at base, 20–30 cm tall. Leaf sheaths usually glabrous; leaf blades lanceolate to narrowly ovate, flat or margins involute, tough, 2–4 cm, 2–5 mm wide, glaucous, glabrous, margins spiny-scabrous especially near base, apex acute; ligule ca. 0.5 mm. Inflorescence up to 12 cm; spikelets usually densely arranged, ascending or horizontally spreading; rachis scabrous. Spikelets 1.5–2.5 mm (excluding awns); basal callus 0.2–0.5 mm, subacute; glumes narrowly lanceolate, back uniformly hirtellous with short white

hairs, midvein scabrous, apex obtuse, clearly demarcated from awn; awn 1–1.5 cm; lemma 0.5–1 mm. Anthers ca. 0.3 mm. Caryopsis terete, narrowly ellipsoid, 1–1.8 mm.

Stream banks, roadsides, other weedy places, on sandy soil. Guangdong, Hainan, Shandong, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa (probably introduced), Australia (Queensland)].

3. *Perotis hordeiformis* Nees in Hooker & Arnott, Bot. Beechey Voy. 248. 1838.

麦穗茅根 mai sui mao gen

Perotis chinensis Gandoger.

Annual or short-lived perennial. Culms loosely tufted, erect or decumbent at base, 25–40 cm tall. Leaf sheaths glabrous; leaf blades lanceolate to narrowly ovate, 2–4 cm, 4–

mm wide, glabrous, margins spiny-scabrous or loosely ciliate near base; ligule ca. 0.5 mm. Inflorescence up to 20 cm; spikelets usually densely arranged, ascending or horizontally spreading; rachis scabrous. Spikelets 1.5–2.5 mm (excluding awns); basal callus 0.1–0.2 mm, obtuse; glumes narrowly lanceolate, back scaberulous-hirtellous in rather indistinct close rows (most obvious toward lemma base), midvein pectinate-ciliolate, apex abruptly acute, clearly demarcated from awn; awn 0.5–1.5 cm. Anthers ca. 0.3 mm. Caryopsis terete, narrowly ellipsoid, ca. 1.5 mm. Fl. and fr. summer and autumn. $2n = 40$.

Sandy places, along seashores. Guangdong, Hebei, Jiangsu, Yunnan [India, Indonesia, Malaysia, Nepal, Myanmar, Pakistan, Sri Lanka, Thailand].

This species is very close to *Perotis indica* and is sometimes included within it. No single character by itself is reliable for separating the two, but the combination of characters given in the key will usually suffice.

24. Tribe PANICEAE

黍族 shu zu

Chen Shouliang (陈守良); Sylvia M. Phillips, Stephen A. Renvoize

Perennial or annual. Leaf blades usually linear or lanceolate; ligule membranous, a line of hairs, or a short membrane with ciliate fringe (rarely absent in some *Echinochloa*). Inflorescence variable, an open to spike-like panicle or composed of unilateral racemes, these digitate or spread along a central axis; spikelets single, paired or clustered, sometimes supported by spines or bristles. Spikelets all alike (sexes separate in *Spinifex* and *Thuarea*), florets 2, without a rachilla extension, lower floret staminate or barren, upper floret bisexual, spikelets dorsally or infrequently lightly laterally compressed, falling entire, usually awnless; glumes membranous or herbaceous, lower glume usually shorter than the spikelet and sometimes very small or rudimentary, upper glume often as long as the spikelet; lower lemma usually as long as the spikelet and resembling the upper glume, with or without a palea; upper floret commonly indurated, tightly enclosing the caryopsis, lemma margins narrow and inrolled or broad and hyaline. Caryopsis with a large embryo 1/3–1/2 its length, hilum punctiform (rarely linear in *Acroceras*, *Oplismenus*, and some *Panicum*). Leaf anatomy: mixed, including non-Kranz, Kranz MS, and Kranz PS types. $x = 9$, occasionally 10 (rarely other numbers reported).

About 100 genera and ca. 2000 species: tropical and subtropical regions of the world, extending into temperate regions especially in North America; 27 genera (one endemic, two introduced) and 145 species (16 endemic, 12 introduced) in China.

The *Paniceae* are a distinctive tribe on account of the uniform pattern of deciduous, 2-flowered spikelets with a staminate or barren lower floret and an indurated, fertile upper floret enclosing the caryopsis.

- 1a. Plants dioecious; female inflorescence a large globose spiny head 179. *Spinifex*
- 1b. Plants bisexual; inflorescence not as above.
 - 2a. Spikelets of 2 kinds, the upper staminate portion of the raceme folding over 1–2 bisexual spikelets 168. *Thuarea*
 - 2b. Spikelets all alike.
 - 3a. Spikelets (at least some of them) subtended by bristles or a spiny involucre; or raceme rachis prolonged into a bristle or short point beyond the uppermost spikelet.
 - 4a. Inflorescence of racemes, only the uppermost spikelet of each raceme subtended by a bristle or short (often inconspicuous) point.
 - 5a. Racemes ending in a long bristle; upper glume acuminate-aristate 176. *Pseudoraphis*
 - 5b. Racemes ending in an inconspicuous point; upper glume not awned.
 - 6a. Racemes very short, sunk in pockets on the broad or thick inflorescence axis; upper lemma smooth 173. *Stenotaphrum*
 - 6b. Racemes not sunk in pockets, inflorescence axis slender; upper lemma rugose or granulate 172. *Paspalidium*
 - 4b. Inflorescence paniculate, often spike-like, all or many of the spikelets subtended by bristles or a spiny involucre.
 - 7a. Bristles persisting on the axis after the spikelets have fallen 171. *Setaria*
 - 7b. Bristles or spines falling as involucre around the spikelets.
 - 8a. Involucral bristles slender, free to the base 177. *Pennisetum*
 - 8b. Involucral bristles and spines flattened and connate below, forming a cup 178. *Cenchrus*
 - 3b. Spikelets not subtended by bristles; or raceme rachis terminating in a spikelet.
 - 9a. Inflorescence an open, contracted or spike-like panicle; pedicels usually all slender and distinct.

- 10a. Spikelets laterally compressed.
- 11a. Glumes keeled; upper floret with wings or scars at the base 155. *Ichnanthus*
- 11b. Glumes not keeled; upper floret without basal wings or scars.
- 12a. Lower lemma entire, awnless; upper lemma gibbously semiorbicular with a little greenish crest near the apex 160. *Cyrtococcum*
- 12b. Lower lemma bilobed or shortly awned; upper lemma elliptic, not crested 174. *Melinis*
- 10b. Spikelets dorsally compressed.
- 13a. Panicle spikelike.
- 14a. Upper glume gibbous; culms hollow 158. *Sacciolepis*
- 14b. Upper glume not gibbous; culms filled with aerenchyma 157. *Hymenachne*
- 13b. Panicle open, the spikelets evenly spaced or appressed along the primary branches.
- 15a. Upper glume as long as or only slightly shorter than the spikelet.
- 16a. Margins of upper palea free toward apex; trailing semi-aquatic perennial 157. *Hymenachne*
- 16b. Margins of upper palea clasped by upper lemma along whole length 156. *Panicum*
- 15b. Upper glume 2/3 spikelet length or less.
- 17a. Upper glume 1/2–2/3 spikelet length, 3–5-veined; spikelets on short appressed secondary racemelets 159. *Ottochloa*
- 17b. Upper glume very small, usually veinless; spikelets on long capillary pedicels 175. *Digitaria*
- 9b. Inflorescence of unilateral racemes; spikelets usually single or paired; pedicels often very short, at least for one spikelet of a pair.
- 18a. Apex of upper lemma awned, crested or with a tuft of setae.
- 19a. Upper lemma awned; upper glume ciliate on the margins 164. *Alloteropsis*
- 19b. Upper lemma apex crested or with a tuft of setae; upper glume glabrous.
- 20a. Apex of upper lemma with a tuft of short setae 161. *Setiopsis*
- 20b. Apex of upper lemma with a little green crest 162. *Acroceras*
- 18b. Apex of upper lemma not as above.
- 21a. Spikelets laterally compressed or glumes awned; leaf blades lanceolate to ovate; trailing forest grasses.
- 22a. Glumes not awned, upper glume armed with hooked bristles at maturity 153. *Pseudechinolaena*
- 22b. Glumes awned, the awns often sticky 154. *Oplismenus*
- 21b. Spikelets dorsally compressed; lower glume awnless.
- 23a. Spikelets densely packed in 4 rows or congested into clusters; apex of upper palea reflexed 163. *Echinochloa*
- 23b. Spikelets mostly in 1 or 2 rows; apex of upper palea tucked in.
- 24a. Spikelets supported on a basal globular beadlike swelling; lower glume vestigial 167. *Eriochloa*
- 24b. Spikelets without a basal beadlike swelling (rarely with a barrel-shaped basal stipe, but then lower glume well developed).
- 25a. Upper lemma cartilaginous to papery, the margins broad, flat and hyaline, covering much of the palea 175. *Digitaria*
- 25b. Upper lemma coriaceous to bony with inrolled or flat margins exposing much of the palea (if texture thinner than margins inrolled).
- 26a. Lower glume present.
- 27a. Upper lemma acute, obtuse or briefly mucronulate, subequaling spikelet; spikelets plumply elliptic, acute or obtuse; back of upper lemma facing away from rachis 165. *Brachiaria*
- 27b. Upper glume clearly mucronate, shorter than spikelet; spikelets plano-convex, acuminate; back of upper lemma lying against rachis 166. *Urochloa*
- 26b. Lower glume absent.
- 28a. Back of upper lemma lying against rachis; spikelets strongly plano-convex, often orbicular 169. *Paspalum*
- 28b. Back of upper lemma facing away from rachis; spikelets thinly biconvex, oblong-elliptic 170. *Axonopus*

153. PSEUDECHINOLAENA Stapf, Prain, Fl. Trop. Africa 9: 494. 1919.

钩毛草属 gou mao cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals. Culms trailing. Leaf blades lanceolate; ligule membranous. Inflorescence composed of several slender, loosely spiculate racemes spaced along a central axis, spikelets paired but the sessile spikelet often reduced. Spikelets laterally compressed, florets 2; glumes equaling the spikelet or slightly shorter, lower glume acute to awned, upper glume gibbous, armed at maturity with coarse, tubercle-based hooklike bristles, apex acute or rarely awned; lower lemma equaling the spikelet, papery to subcoriaceous but membranous on the margins and with a median hyaline patch at the base; upper lemma laterally compressed, obliquely ellipsoid, cartilaginous to coriaceous, margins flat or inrolled.

Six species: one species throughout the tropics (including China), five endemic to Madagascar, in forest shade.

1. *Pseudechinolaena polystachya* (Kunth) Stapf in Prain, Fl. Trop. Africa 9: 495. 1919.

钩毛草 *gou mao cao*

Echinolaena polystachya Kunth, Nov. Gen. Sp. 1: 119. 1816; *Panicum heteranthum* Link; *P. uncinatum* Raddi.

Culms slender, stoloniferous, rooting and forming a loose mat, up to 50 cm tall. Leaf sheaths usually shorter than the internodes; leaf blades lanceolate, thin, 2–8 × 0.6–1.2 cm, glabrous or hispidulous, apex acute to acuminate; ligule 1–2 mm.

Inflorescence narrow, 5–15 cm, bearing 3–5 loosely ascending racemes with distant spikelet pairs, lowest raceme 1–4 cm; pedicels 1–2 mm. Spikelets 4–5 mm; glumes papery, the lower lanceolate, 3-veined, acuminate, the upper thicker, navicular, 7-veined, with tubercle-based hooks between the veins; lower lemma 7-veined; upper lemma subcoriaceous, ca. 3 mm, pale, glossy. Caryopsis fusiform, ca. 2.5 mm, acute. Fl. and fr. Sep–Oct. $2n = 36$.

Forest shade. Fujian, Guangdong, Guangxi, Hainan, Xizang, Yunnan [throughout the tropics].

154. OPLISMENUS P. Beauvois, Fl. Oware 2: 14. 1810 [“1807”], nom. cons.

求米草属 *qiu mi cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Orthopogon R. Brown, nom. rej.

Perennials or annuals. Culms trailing, ascending from a decumbent base, the internodes mostly with a villous line adaxial to the subtending leaf. Leaf blades ovate, lanceolate or linear-lanceolate, often with cross veins; ligule a ciliate membrane. Inflorescence composed of several unilateral racemes spaced along a central axis; racemes elongate or reduced to fascicles of a few spikelets, spikelets usually paired on short pedicels, the lowermost often reduced. Spikelets lanceolate to oblong, weakly dorsally or laterally compressed, florets 2; glumes subequal, 1/2–3/4 spikelet length, often pilose, the lower or both tipped by a viscid awn; lower lemma equaling the spikelet, acute to shortly awned, its palea absent or much reduced; upper lemma papery or subcoriaceous, smooth and shiny, acute, indistinctly crested. $x = 9$.

Five to nine species: throughout the tropics and subtropics; four species (one endemic) in China.

This is a genus of closely related, intergrading species where the number of taxa meriting recognition is still open to doubt.

- 1a. Racemes reduced to dense cuneate fascicles less than 2 cm long 1. *O. undulatifolius*
- 1b. Racemes elongate, 2–10 cm long.
 - 2a. Spikelets single; fertile lemma mucronate at apex 4. *O. patens*
 - 2b. Spikelets paired or 3 at the base; fertile lemma acute at apex.
 - 3a. Awn of lower glume 2–3 times longer than glume body 2. *O. compositus*
 - 3b. Awn of lower glume equaling or slightly longer than glume body 3. *O. fujianensis*

1. *Oplismenus undulatifolius* (Arduino) Roemer & Schultes, Syst. Veg. 2: 482. 1817.

求米草 *qiu mi cao*

Perennial. Culms slender, straggling, ascending from a prostrate base, 20–50 cm tall. Leaf sheaths usually densely tuberculate-hairy, less often glabrous; leaf blades lanceolate to narrowly ovate, 1–15 × 0.3–3 cm, glabrous or variously hairy, base subrounded and usually suboblique, apex acute; ligule ca. 1 mm. Inflorescence axis 9–15 cm, glabrous or hispidulous; racemes 4–9, reduced to dense cuneate fascicles less than 2 cm long, the rachis often setose. Spikelets in 3–5 clustered pairs, lanceolate, hispidulous; glumes herbaceous, awned, the awns stout, purple, viscid; lower glume 3–5-veined, awn 5–10(–15) mm; upper glume 5-veined, awn 2–5 mm; lower lemma herbaceous, 5–9-veined, apex with a stout 1–2 mm mucro, palea ab-

sent; upper lemma subcoriaceous, smooth. Fl. and fr. Jul–Nov. $2n = 54$.

Light shade in forests, moist places. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [warm-temperate and subtropical regions of the N hemisphere, uplands of India and Africa].

Oplismenus undulatifolius is sometimes considered synonymous with *O. hirtellus* (Linnaeus) P. Beauvois. Although the two taxa intergrade, *O. hirtellus* (*O. aemulus* (R. Brown) Roemer & Schultes) generally has longer racemes (to 3 cm) of contiguous spikelets, at least in the lower part of the inflorescence. It has a more tropical distribution than *O. undulatifolius* and has recently been reported from Taiwan and Yunnan.

- 1a. Inflorescence with short branches.
- 2a. Leaves and inflorescence axis

- hispidulous, or leaf blades densely tuberculate-hairy 1a. var. *undulatifolius*
- 2b. Leaves and inflorescence axis glabrous or scabrous, or rarely leaf blades puberulous.
- 3a. Leaf blades broadly lanceolate to narrowly ovate-elliptic, 5–15 × 1.2–3 cm, glabrous or scabrous 1b. var. *japonicus*
- 3b. Leaf blades linear-lanceolate to narrowly lanceolate, 4–9 × 0.5–1 cm, glabrous or puberulous ... 1c. var. *imbecillis*
- 1b. Inflorescence with spikelets practically sessile on main axis.
- 4a. Leaves and inflorescence axis hispidulous or with tubercle-based hairs 1d. var. *binatus*
- 4b. Leaves and inflorescence axis glabrous or scabrous.
- 5a. Leaf blades 1–3 × 0.3–0.5 cm 1e. var. *microphyllus*
- 5b. Leaf blades 5–10 × 1–2 cm 1f. var. *glaber*

1a. *Oplismenus undulatifolius* var. *undulatifolius*

求米草(原变种) qiu mi cao (yuan bian zhong)

Panicum undulatifolium Arduino, Animadv. Bot. Spec. Alt. 14, t. 4. 1764; *Orthopogon undulatifolius* (Arduino) Sprengel.

Leaf blades densely hairy with tubercle-based hairs. Inflorescence with short branches, the axis hispidulous. Fl. and fr. Jul–Nov. $2n = 54$.

Light shade in forests, moist places, common. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [warm-temperate and subtropical regions of the N hemisphere, uplands of India and Africa].

1b. *Oplismenus undulatifolius* var. *japonicus* (Steudel) G. Koidzumi, Bot. Mag. (Tokyo) 39: 302. 1925.

日本求米草 ri ben qiu mi cao

Panicum japonicum Steudel, Flora 29: 18. 1846; *Oplismenus japonicus* (Steudel) Honda.

Leaf sheaths glabrous; leaf blades broadly lanceolate or narrowly ovate-elliptic, 5–15 × 1.2–3 cm, glabrous or scabrous. Inflorescence axis up to 15 cm, glabrous. Fl. and fr. Aug–Nov.

Roadsides, moist grasslands. Anhui, Fujian, Guangdong, Guangxi, Hebei, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan].

1c. *Oplismenus undulatifolius* var. *imbecillis* (R. Brown) Hackel, Publ. Bur. Sci. Gov. Lab. 25: 82. 1906 [“1905”].

狭叶求米草 xia ye qiu mi cao

Orthopogon imbecillis R. Brown, Prodr. 194. 1810; *Oplismenus imbecillis* (R. Brown) Roemer & Schultes; *O. imbecillis* var. *morrisonensis* Honda; *Panicum imbecille* (R. Brown) Trin.

Leaf sheaths glabrous and smooth, or ciliate along the margins; leaf blades narrowly lanceolate or linear-lanceolate, 4–

9 × 0.5–1 cm, glabrous or puberulous. Inflorescence axis glabrous. Spikelets usually pilose. Fl. and fr. Aug–Nov.

Hill slopes, moist grasslands. Anhui, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Taiwan, Yunnan, Zhejiang [Japan].

1d. *Oplismenus undulatifolius* var. *binatus* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 471. 1984.

双穗求米草 shuang sui qiu mi cao

Leaf blades and inflorescence axis hispidulous or with tubercle-based hairs. Spikelets 2 per node.

• Moist places in forests. Anhui, Hebei, Jiangsu, Zhejiang.

1e. *Oplismenus undulatifolius* var. *microphyllus* (Honda) Ohwi, Bot. Mag. (Tokyo) 55: 546. 1941.

小叶求米草 xiao ye qiu mi cao

Oplismenus microphyllus Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 274. 1930; *O. hirtellus* (Linnaeus) P. Beauvois var. *microphyllus* (Honda) Fosberg & Sachet; *O. hirtellus* subsp. *microphyllus* (Honda) U. Scholz.

Leaf blades 1–3 × 0.3–0.5 cm, glabrous or scabrous. Spikelets 2 per node, or 3 per node at base, one spikelet usually sterile.

Moist grassy places in forests. Taiwan [Philippines].

1f. *Oplismenus undulatifolius* var. *glaber* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 471. 1984.

光叶求米草 guang ye qiu mi cao

Plant glabrous except for ciliate margins of leaf sheaths; leaf blades 5–10 × 1–2 cm, glabrous. Spikelets 2 per node.

• Moist places in forests. Anhui, Hunan, Shanxi, Sichuan, Zhejiang.

2. *Oplismenus compositus* (Linnaeus) P. Beauvois, Ess. Agrostogr. 54. 1812.

竹叶草 zhu ye cao

Perennial. Culms stoloniferous, straggling, ascending to 20–80 cm. Leaf sheaths glabrous, pilose or tuberculate-hairy; leaf blades lanceolate to ovate-lanceolate, 3–20 × 0.5–3 cm, subglabrous to tuberculate-hairy, base usually oblique. Inflorescence axis 5–15 cm, glabrous to tuberculate-hairy; racemes 3–6, 2–6 cm, ascending to erect. Spikelets in 7–14 widely spaced, sometimes patent pairs, lanceolate, glabrous to thinly pilose; glumes herbaceous, awned, the awns stout, green or purple, viscid; lower glume awn 5–10 mm; upper glume awn to 3 mm or occasionally absent; lower lemma subcoriaceous, 7–9-veined, acute or with a stout 0.3–1 mm mucro; upper lemma subcoriaceous, ca. 2.5 mm, smooth. Fl. and fr. Sep–Nov. $2n = 54, 72^*$.

Moist places in forests and along forest margins, hill slopes. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Philippines, Thailand, and elsewhere in tropical Asia extending westward through India to E Africa; Australia, Pacific Islands (Polynesia)].

1a. Panicle axis, rachis, leaf sheaths, and leaf

blades pilose, hispid or tuberculate-hairy;
upper glume awned.

2a. Leaf blades $5-10 \times 0.5-1.8$ cm

..... 2d. var. *intermedius*

2b. Leaf blades $10-20 \times 2-3$ cm 2e. var. *owatarii*

1b. Panicle axis, rachis, leaf sheaths, and leaf
blades glabrous, or puberulous or only ciliate
at the mouth of the leaf sheath; or if panicle
axis pilose, then upper glume awnless.

3a. Leaf blades $9-13 \times 1.2-2.5$ cm;

spikelets $3.5-4$ mm 2c. var. *formosanus*

3b. Leaf blades $3-8 \times 0.8-1.4$ cm;
spikelets $2.5-3.5$ mm.

4a. Upper glume with $1-2$ mm

awn 2a. var. *compositus*

4b. Upper glume awnless 2b. var. *submuticus*

2a. *Oplismenus compositus* var. *compositus*

竹叶草(原变种) zhu ye cao (yuan bian zhong)

Panicum compositum Linnaeus, Sp. Pl. 1: 57. 1753; *P. aristatum* Retzius.

Leaf sheaths subglabrous or puberulous; leaf blades $3-8 \times 0.8-1.4$ cm, glabrous or margins ciliate. Inflorescence axis glabrous or puberulous. Spikelets ca. 3 mm; lower glume awn $7-20$ mm, upper glume awn $1-2$ mm. Fl. and fr. Sep–Nov. $2n = 54, 72^*$.

Moist places in forests. Guangdong, Guizhou, Jiangxi, Sichuan, Taiwan, Yunnan [tropical Asia extending westward through India to E Africa; Australia, Pacific Islands (Polynesia)].

2b. *Oplismenus compositus* var. *submuticus* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 470. 1984.

无芒竹叶草 wu mang zhu ye cao

Leaf sheaths glabrous except for ciliate margins; leaf blades $3-8 \times 0.8-1.4$ cm. Inflorescence axis scabrous or pilose. Spikelets ca. 3 mm; lower glume awn $5-10$ mm; upper glume without awn. Fl. and fr. autumn.

• Moist places along forest margins. Sichuan, Yunnan.

2c. *Oplismenus compositus* var. *formosanus* (Honda) S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 470. 1984.

台湾竹叶草 tai wan zhu ye cao

Oplismenus formosanus Honda, Repert. Spec. Nov. Regni Veg. 20: 361. 1924.

Leaf blades lanceolate, $9-13 \times 1.2-2.5$ cm, usually glabrous. Inflorescence axis usually glabrous. Spikelets $3.5-4$ mm; upper glume awn to 3 mm. Fl. and fr. autumn.

• Moist places in forests. Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Yunnan.

2d. *Oplismenus compositus* var. *intermedius* (Honda) Ohwi, Acta Phytotax. Geobot. 11: 35. 1942.

中间型竹叶草 zhong jian xing zhu ye cao

Oplismenus burmannii var. *intermedius* Honda, Bot. Mag. (Tokyo) 38: 191. 1924.

Leaf sheaths densely tuberculate-hairy, margins ciliate; leaf blades $5-10 \times 0.5-1.8$ cm, base cordate. Inflorescence axis pilose or hispid. Spikelets $3-3.5$ mm; lower glume awn $5-10$ mm; upper glume awn shorter. Fl. and fr. autumn.

Moist places in forests, hill slopes. Guangdong, Guangxi, Sichuan, Taiwan, Yunnan, S Zhejiang [Japan, Philippines].

2e. *Oplismenus compositus* var. *owatarii* (Honda) J. Ohwi, Acta Phytotax. Geobot. 11: 35. 1942.

大叶竹叶草 da ye zhu ye cao

Oplismenus owatarii Honda, Repert. Spec. Nov. Regni Veg. 20: 316. 1924.

Leaf sheaths, leaf blades, and inflorescence axis densely hairy with long, soft or tubercle-based hairs; leaf blades $10-20 \times 2-3$ cm. Spikelets ca. 4 mm; lower glume awn ca. 8 mm; upper glume awn ca. 1 mm. Fl. and fr. autumn.

Undergrowth in moist forests on hill slopes. Guangdong, Guizhou, Taiwan, Yunnan [Japan, Thailand].

3. *Oplismenus fujianensis* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 469. 1984.

福建竹叶草 fu jian zhu ye cao

Culms decumbent at the base, $40-80$ cm tall. Leaf sheaths densely hairy with tubercle-based hairs; leaf blades lanceolate or ovate-lanceolate, $5-10 \times 1.5-2.5$ cm, densely pubescent on both surfaces, base oblique, apex acute. Ligule a ciliate membrane. Inflorescence axis $10-15$ cm, densely tuberculate-hairy; racemes $2-5$ cm. Spikelets secund, paired or 3 at the base of raceme, closely spaced, ovate-lanceolate, $2.5-3$ mm, pilose; glumes herbaceous, lower glume $3-5$ -veined, awn $2-4$ mm, equaling or only slightly longer than the glume body; upper glume acute or with a ca. 0.5 mm mucro; lower lemma $7-9$ -veined, lower palea membranous, short and narrow; upper lemma smooth. Fl. and fr. Jul–Oct.

• Moist places in thickets. Fujian.

4. *Oplismenus patens* Honda, Repert. Spec. Nov. Regni Veg. 20: 360. 1924.

疏穗竹叶草 shu sui zhu ye cao

Culms slender, $30-60$ cm tall, glabrous. Leaf sheaths glabrous except for ciliate margins; leaf blades linear-lanceolate to ovate-lanceolate, $5-15 \times 0.4-3.5$ cm, glabrous on both surfaces; ligule membranous, ciliate. Inflorescence axis $20-25$ cm, glabrous or puberulous; racemes $5-8$, $6-10$ cm. Spikelets borne singly, ovate-lanceolate; glumes both awned; lower glume awn ca. 10 mm, upper glume awn $1/5-1/2$ length of awn of lower glume; lower lemma equaling spikelet, $7-9$ -veined, dorsally puberulous, margins ciliate, awn $1-2.5$ mm, lower palea absent; upper lemma papery or coriaceous, smooth, mucro $0.5-1$ mm. Fl. and fr. Sep–Nov.

Undergrowth in moist forests on hillsides, moist places in open forests. Fujian, Guangdong, Hainan, Taiwan, Yunnan [Japan].

This species is sometimes regarded as a variant of *Oplismenus compositus*.

- 1a. Awn of upper glume 1/5 length of awn of lower glume; leaf blades linear-lanceolate to lanceolate, 0.4–0.7 cm wide 4c. var. *angustifolius*
- 1b. Awn of upper glume 1/3–1/2 length of awn of lower glume; leaf blades lanceolate to lanceolate-ovate, 0.7–3.5 cm wide.
- 2a. Leaf blades 10–15 × 2–3.5 cm 4a. var. *patens*
- 2b. Leaf blades 5–9 × 0.7–1.8 cm ... 4b. var. *yunnanensis*

4a. *Oplismenus patens* var. *patens*

疏穗竹叶草(原变种) shu sui zhu ye cao (yuan bian zhong)

Oplismenus compositus (Linnaeus) P. Beauvois subsp. *patens* (Honda) T. Koyama; *O. compositus* var. *patens* (Honda) Ohwi.

Leaf blades oblong-lanceolate to ovate-lanceolate, 10–15 × 2–3.5 cm, glabrous on both surfaces. Upper glume awn 1/2 length of awn of lower glume. Lower lemma 7–9-veined, awn 2–2.5 mm. Fl. and fr. Sep–Nov.

Undergrowth in moist forests on hillsides. Guangdong, Hainan, Taiwan, Yunnan [Japan].

4b. *Oplismenus patens* var. *yunnanensis* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 471. 1984.

云南竹叶草 yun nan zhu ye cao

Leaf blades lanceolate to narrowly lanceolate, 5–9 × 0.7–1.8 cm. Upper glume awn 1/3–1/2 length of awn of lower glume. Lower lemma awn ca. 1 mm. Fl. and fr. autumn–winter.

• Moist places in open forests. Hainan, Yunnan.

4c. *Oplismenus patens* var. *angustifolius* (Chia) S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 470. 1984.

狭叶竹叶草 xia ye zhu ye cao

Oplismenus compositus (Linnaeus) P. Beauvois var. *angustifolius* L. C. Chia, Fl. Hainan. 4: 540. 1977.

Leaf blades lanceolate to linear-lanceolate, 5–9 × 0.4–0.7 cm. Upper glume awn 1/5 length of awn of lower glume. Lower lemma 7-veined. Fl. and fr. autumn–winter.

• Moist places in open forests. Hainan, Yunnan.

155. *ICHNANTHUS* P. Beauvois, Ess. Agrostogr. 56. 1812.

距花黍属 ju hua shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Navicularia Raddi (1823), not Heister ex Fabricius (1759).

Perennial or rarely annual. Culms varying from tall and canelike to rambling and decumbent. Leaf blades linear to ovate but usually lanceolate and asymmetrically narrowed at the base. Inflorescence a panicle or the primary branches simple and racemelike. Spikelets lanceolate, laterally compressed, florets 2; glumes prominently keeled, 3–7-veined, acuminate; lower glume usually more than half spikelet length; upper glume equaling or longer than lower glume; upper floret with a semicircular to oblong callus, this laterally expanded into 2 membranous wings adnate to the lemma base, these often represented in dried material by scars, upper lemma dorsally compressed, smooth and shiny, the margins flat or inrolled.

About 30 species: New World tropics and subtropics, one species pantropical including China.

1. *Ichnanthus pallens* (Swartz) Munro ex Benth var. *major* (Nees) Stieber, Syst. Bot. 12: 207. 1987 [*“majus”*].

大距花黍 da ju hua shu

Panicum pallens Swartz var. *majus* Nees, Fl. Bras. Enum. Pl. 2: 138. 1829; *Ichnanthus vicinus* (F. M. Bailey) Merrill; *Panicum vicinum* F. M. Bailey.

Rambling perennial. Culms long, slender, decumbent and rooting at the lower nodes, ascending to 15–50 cm. Leaf sheaths pubescent or only margins ciliate; leaf blades ovate-lanceolate to ovate, tessellate, 3–8 × 1–2.5 cm, glabrous or puberulous on both surfaces, apex sharply acuminate; ligule ca. 1 mm, a ciliate membrane. Panicles terminal and axillary from upper nodes, 5–10 cm, usually with soft hairs in the axils, the branches spaced, loosely ascending, subracemose with laxly

arranged spikelets. Spikelets 4–5 mm; glumes with obvious veins, lower glume 3–3.5 mm, 3-veined, apex usually long attenuate; upper glume 5-veined, acuminate; lower lemma herbaceous, 5-veined; upper floret much shorter than lower lemma, 2–2.5 mm, shiny white to light brown, oblong, obtuse, scars at base ca. 1 mm. Fl. and fr. Aug–Nov. $2n = 40$.

Damp places in forests, along shady streamsides. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan, Yunnan [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; W Africa, Australia (Queensland), Pacific Islands (Polynesia), South America].

Ichnanthus pallens var. *pallens* is distinguished by its smaller (2.5–4 mm), plumper spikelets, lower glume without a long attenuate apex, and more compact panicle. It mostly occurs in America, from Mexico to Argentina, and in the Caribbean, but a few specimens with these spikelet dimensions are known from W Africa and Malaysia.

156. *PANICUM* Linnaeus, Sp. Pl. 1: 55. 1753.

黍属 shu shu

Chen Shouliang (陈守良); Stephen A. Renvoize

Annuals or perennials. Culms erect, geniculate ascending or decumbent. Leaves basal or cauline; leaf blades filiform or linear to lanceolate or ovate, usually flat. Inflorescence usually a terminal open panicle, variously condensed or occasionally spicate rarely racemose. Spikelets usually symmetrical and dorsally compressed, disarticulating below the glumes; 2-flowered, the lower floret staminate or barren, the upper bisexual. Glumes herbaceous to membranous, ovate or oblong, obtuse to acute, acuminate or cuspidate; lower usually shorter than the spikelet, rarely equal, an internode between the glumes sometimes present, upper glume as long as spikelet, or slightly shorter; lower lemma similar to upper glume, with or without a palea; upper floret coriaceous, bony or cartilaginous, the margins of the lemma inrolled and clasping the palea, apex obtuse to acute or apiculate, crested or excavated. Hilum rounded to oval. $x = 9, 10$.

About 500 species: pantropical, extending into temperate regions of North America; 21 species (four introduced) in China.

Panicum miliaceum (Proso Millet) is grown in China as a cereal crop. *Panicum coloratum* (Buffalo Grass), *P. maximum* (Guinea Grass), and *P. virgatum* (Switch Grass) have been introduced to China and are widely grown for fodder.

- 1a. Upper floret rugose 1. *P. maximum*
- 1b. Upper floret papillate or smooth.
 - 2a. Glumes or at least the lower, acuminate to cuspidate.
 - 3a. Plant perennial.
 - 4a. Panicle effuse, spikelets 3.5–4 mm 11. *P. elegantissimum*
 - 4b. Panicle moderately branched, spikelets 2–3 mm.
 - 5a. Lower glume 1/4–1/3 length of spikelet 7. *P. coloratum*
 - 5b. Lower glume 2/3–3/4 length of spikelet 13. *P. virgatum*
 - 3b. Plant annual.
 - 6a. Spikelets 1.5–2 mm 12. *P. humile*
 - 6b. Spikelets 3–5 mm.
 - 7a. Panicle dense, branches drooping; spikelets 4–5 mm; cultivated 14. *P. miliaceum*
 - 7b. Panicle open, branches spreading or ascending; spikelets 3–3.5 mm; wild 15. *P. curviflorum*
 - 2b. Glumes obtuse or acute.
 - 8a. Leaf-leaf blades ovate to lanceolate.
 - 9a. Culms herbaceous.
 - 10a. Spikelets ca. 1.3 mm 16. *P. trichoides*
 - 10b. Spikelets 1.5–2 mm 17. *P. brevifolium*
 - 9b. Culms terete, woody.
 - 11a. Lower glume separated by an internode; upper lemma glabrous at the apex 18. *P. notatum*
 - 11b. Lower glume not separated by an internode; upper lemma ciliolate at the apex.
 - 12a. Lower glume 1/4–1/3 length of spikelet 21. *P. khasianum*
 - 12b. Lower glume 1/2–3/4 length of spikelet.
 - 13a. Panicle branches not tangled 19. *P. sarmentosum*
 - 13b. Panicle branches tangled 20. *P. incommutatum*
 - 8b. Leaf-leaf blades linear to narrowly lanceolate.
 - 14a. Panicle spikelike or if primary branches well developed then ascending or appressed and the secondary branches very short 10. *P. auritum*
 - 14b. Panicle open, primary branches spreading.
 - 15a. Plant annual.
 - 16a. Lower glume cufflike, 1/6–1/3 length of spikelet, obtuse to bluntly acute.
 - 17a. All panicle branches spreading 9. *P. sumatrense*
 - 17b. Secondary or tertiary panicle branches appressed, lower lemma 7–9-veined 3. *P. dichotomiflorum*
 - 16b. Lower glume ovate or oblong, acute to acuminate, 1/3–1/2 length of spikelet.
 - 18a. Lower glume not separated by an internode; spikelets in pairs and clustered toward the ends of the branches 5. *P. bisulcatum*
 - 18b. Lower glume separated by an internode; spikelets not in pairs, evenly spread throughout the panicle 8. *P. luzonense*
 - 15b. Plant perennial.
 - 19a. Lower glume acute.
 - 20a. Culms scrambling, woody below 6. *P. amoenum*
 - 20b. Culms erect, herbaceous 7. *P. coloratum*
 - 19b. Lower glume obtuse, cufflike.
 - 21a. Secondary branches well developed, spreading; lower glume separated by an internode 4. *P. decompositum*
 - 21b. Secondary or tertiary branches short, appressed; lower glume not separated by an internode.

- 22a. Plant with wiry culms 2. *P. repens*
 22b. Plant with soft, herbaceous culms 3. *P. dichotomiflorum*

1. *Panicum maximum* Jacquin, Icon. Pl. Rar. 1: 2. 1781.

大黍 da shu

Megathyrsus maximus (Jacquin) B. K. Simon & S. W. L. Jacobs; *Panicum hirsutissimum* Steudel; *P. jumentorum* Persoon; *P. maximum* var. *hirsutissimum* (Steudel) Oliver; *P. polygamum* Swartz.

Perennial, rhizomatous; rhizome stout. Culms robust, erect, 1–3 m tall, nodes glabrous or pilose. Leaves basal and cauline; leaf sheaths glabrous to hispid; leaf blades linear to narrowly lanceolate, flat, 20–60 × 1–3.5 cm, narrowed at base, glabrous or pilose, margins scabrid, apex acuminate; ligule 1–3 mm, membranous, with dense cilia dorsally. Panicle oblong or pyramidal in outline, 10–45 cm, much branched; branches spreading, lowest arranged in a whorl. Spikelets oblong, 3–4.5 mm, glabrous or pubescent, often tinged purple, obtuse or acute, occasionally overtopped by long hairs from apex of pedicel; lower glume broadly ovate, 1/3–1/2 length of spikelet, 3-veined, obtuse or acute; upper glume ovate-oblong, as long as spikelet, 5-veined, acute; lower floret staminate, lemma similar to upper glume, palea well developed; upper floret thinly coriaceous, pale yellow or green, shiny, finely transverse rugulose. Fl. and fr. Aug–Oct. $2n = 32$.

Widely cultivated for forage. Guangdong, Taiwan [native to tropical Africa and America].

2. *Panicum repens* Linnaeus, Sp. Pl., ed. 2, 1: 87. 1762.

铺地黍 pu di shu

Perennial, rhizomatous. Culms tough, erect or decumbent, 30–125 cm tall. Leaves cauline; leaf sheaths glabrous, striate, puberulous to ciliate on margins, especially toward throat; leaf blades linear, flat or convolute, often stiff and pungent, markedly distichous, ascending close to the culm, 7–25 × 0.2–0.8 cm, apex acute or acuminate; ligule 0.5–1.5 mm, a ciliate membrane. Panicle terminal, narrowly oblong in outline, 5–20 cm, sparsely to moderately branched; branches glabrous, scabrid, ascending. Spikelets ovate, 2.5–3 mm, acute; lower glume broadly ovate, 1/3 length of spikelet, hyaline, 1(–3)-veined, clasping at the base of the spikelet, obtuse or acute; upper glume ovate, as long as spikelet, membranous, 7–9-veined, acute; lower floret staminate, lemma similar to upper glume, palea well developed; upper floret almost as long as spikelet, pale yellow, shiny. Fl. and fr. Jun–Nov. $2n = 40$.

Moist places, marine habitats, streams. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [tropical and subtropical locations worldwide].

3. *Panicum dichotomiflorum* Michaux, Fl. Bor.-Amer. 1: 48. 1803.

洋野黍 yang ye shu

Panicum paludosum Roxburgh.

Aquatic annual or rhizomatous perennial. Culms geniculately ascending, rooting at lower nodes, branching, succulent,

30–110 cm tall, upper nodes glabrous, often conspicuous. Leaves cauline; leaf sheaths striate, glabrous, lower sheaths often inflated; leaf blades linear, flat, 7–35 × 0.5–1 cm, glabrous, scabrid, base straight or subcordate, apex acute; ligule 1–2 mm, a ciliate membrane. Panicle terminal or axillary, pyramidal when fully exerted, 10–20 cm, much branched; branches glabrous, scabrid, secondary and tertiary branches often appressed. Spikelets lanceolate to narrowly ovate, 3–4 mm, glabrous, acuminate; lower glume broadly ovate, 1/6–1/3 length of spikelet, clasping at the base of the spikelet, membranous, 0–1-veined, obtuse to acute; upper glume as long as spikelet, 7–9-veined; lower lemma similar to upper glume, palea absent or present and well developed; upper floret 2/3 length of spikelet, green or pale yellow, smooth, shiny. Fl. and fr. Jun–Oct.

Shallow waters, swampy places. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [India, Malaysia; tropics of the New World].

4. *Panicum decompositum* R. Brown, Prodr. 191. 1810.

多子黍 duo zi shu

Panicum proliferum Lamarck var. *decompositum* (R. Brown) Thellung.

Perennial, caespitose. Culms erect, 60–100 cm tall, nodes glabrous. Leaves basal; leaf sheaths striate, glabrous; leaf blades linear, flat, 15–30 × 0.5–0.8 cm, glabrous, tough, base straight, apex tapering to a fine point; ligule ca. 1 mm, a ciliate membrane. Panicle broadly ovate in outline when fully exerted, terminal, 20–40 cm, much branched; branches rigid, ascending and spreading, scabrid or smooth. Spikelets elliptic, 2–3 mm, glabrous, acuminate; lower glume broadly ovate, 1/5–1/3 length of spikelet, clasping the base of the spikelet, 0–1-veined, obtuse or acute, separated by an internode; upper glume as long as spikelet, 7-veined; lower lemma similar to upper glume, palea poorly developed; upper floret slightly shorter than spikelet, pale yellow, smooth, shiny.

Taiwan [Australia, Pacific Islands].

5. *Panicum bisulcatum* Thunberg, Nova Acta Regiae Soc. Upsal. 7: 141. 1815.

糠稷 kang ji

Panicum acroanthum Steudel; *P. acroanthum* var. *brevipedicellatum* Hackel.

Annual. Culms erect or ascending, sometimes rooting at lower nodes, 30–180 cm tall, nodes glabrous. Leaves cauline; leaf sheaths striate, glabrous, ciliate on the margins, especially toward the throat; leaf blades linear, 5–20 × 0.5–1.5 cm, subglabrous, base rounded, apex acuminate; ligule ca. 0.5 mm, a ciliate membrane. Panicle ovate or orbicular in outline, 10–40 cm, loose, much branched; branches slender, flexuous, scabrid, with the spikelets in pairs and clustered toward the ends of the branches. Spikelets elliptic, 2–2.5 mm, sparsely puberulous; lower glume ovate, 1/2 length of spikelet, 1–3-veined, acute or acuminate; upper as long as spikelet, 5-veined; lower lemma similar to upper glume, palea absent; upper floret as long as

spikelet, pale yellow, smooth, shiny. Fl. and fr. Sep–Nov. $2n = 36$.

Moist places. Anhui, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [India, Japan, Korea, Philippines; Australia, Pacific Islands].

6. *Panicum amoenum* Balansa, J. Bot. (Morot) 4: 142. 1890.

可爱黍 ke ai shu

Perennial. Culms woody, scrambling 1–3 m long. Leaves cauline; leaf sheaths striate, glabrous, the margins ciliate toward the throat; leaf blades linear, flat, 10–28 × 0.5–1.5 cm, glabrous, scabrid or smooth, base truncate or rounded, apex acuminate; ligule ca. 0.2 mm, membranous. Panicle broadly ovate to oblong in outline, 15–40 cm, much branched; branches slender, scabrid, spreading at maturity. Spikelets elliptic-oblong, 1.2–1.5 mm, glabrous; lower glume ovate, 1/2 length of spikelet, 3-veined; upper glume as long as spikelet, 5-veined; lower lemma similar to upper glume, palea absent; upper floret coriaceous, pale yellow, smooth, shiny. Fl. and fr. Jul–Dec.

Grasslands. S Yunnan [Borneo, NE India, Malaysia, Myanmar, Thailand, Vietnam].

7. *Panicum coloratum* Linnaeus, Mant. Pl. 1: 30. 1767.

光头黍 guang tou shu

Perennial, tufted. Culms erect or ascending from a knotty base, 15–100 cm tall. Leaves basal and cauline; leaf sheaths glabrous, pilose or hispid; ligule 0.5–1 mm, a ciliate membrane; leaf blades linear, flat, 7–30 × 0.5–1 cm, glabrous or pilose, base straight to amplexicaul, apex acute or acuminate. Panicle ovate in outline, 4–30 cm, much branched; branches ascending or spreading, the spikelets evenly spread or clustered on the branches. Spikelets ovate-elliptic, 2–3 mm, glabrous, acute; lower glume broadly ovate, 1/4–1/3 length of spikelet, 1–3-veined, acute to acuminate; upper glume ovate, as long as spikelet, 7–9-veined, acute; lower floret staminate, lemma similar to upper glume, palea well developed; upper floret pale yellow or brown, smooth, shiny.

Introduced for pasture [native to tropical and subtropical Africa; introduced elsewhere].

8. *Panicum luzonense* J. Presl in C. Presl, Reliq. Haenk. 1: 308. 1830.

大罗湾草 da luo wan cao

Panicum cambogiense Balansa; *P. cruciabile* Chase.

Annual, tufted, hispid. Culms erect or geniculately ascending, 30–150 cm tall, nodes bearded. Leaves cauline; leaf sheaths loose; leaf blades linear to linear-lanceolate, flat, 5–20(–40) × 0.5–1.5 cm, base cordate, margins scabrid, apex acute; ligule ciliate. Panicles terminal and axillary, ovate to oblong in outline, 10–30(–50) cm, moderately branched with the spikelets evenly spread throughout the panicle, branches scabrid. Spikelets elliptic to obovate, somewhat plump, 2–2.5 mm, glabrous; lower glume broadly ovate, 1/3–1/2 length of spikelet, 5–7-veined, acute, separated by an internode; upper glume ovate, as long as spikelet, 9–11-veined, transverse veins present, acute; lower lemma similar to upper glume, palea well developed but

floret barren; upper floret elliptic, yellow, smooth, shiny. Fl. and fr. Aug–Oct. $2n = 18$.

Fields, forest margins. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Myanmar, Philippines, Sri Lanka; Australia].

9. *Panicum sumatrense* Roth ex Roemer & Schultes, Syst. Veg. 2: 434. 1817.

细柄黍 xi bing shu

Panicum flexuosum Retzius; *P. psilopodium* Trinius; *P. psilopodium* var. *coloratum* J. D. Hooker; *P. psilopodium* var. *epaleatum* Keng ex S. L. Chen, T. D. Zhuang & X. L. Yang.

Annual. Culms erect or decumbent, 20–60(–150) cm tall, nodes dark in color, glabrous. Leaves cauline; leaf sheaths loose, glabrous; leaf blades linear, flat, 8–40 × 0.4–0.8 cm, glabrous, base cordate to straight, apex acute or tapering; ligule ca. 1 mm, a ciliate membrane. Panicle terminal, oblong or ovate in outline, 10–40 cm, densely branched and drooping or sparsely branched and erect; branches slender, scaberulous. Spikelets oblong in outline, 2.5–3.5 mm, glabrous; lower glume broadly ovate or cufflike, 1/4–1/3 length of spikelet, 3-veined, bluntly acute; upper glume as long as spikelet, 9–13-veined; lower lemma similar to upper glume, palea present or absent; upper floret brown or yellow, smooth, shiny. Fl. and fr. Jul–Oct. $2n = 54$.

Rather dry situations. Guizhou, Taiwan, Xizang, Yunnan [India, Malaysia, Philippines, Sri Lanka].

Special forms of this variable species have been selected for cultivation. Plants with a denser and more profuse panicle, which droops at maturity under the weight of the spikelets, are grown as a cereal crop. Wild plants with more lightly branched, erect panicles and sparse spikelets may be distinguished as *Panicum psilopodium*. Although the cultivated types are readily identifiable, there are sufficient intermediates to make a clear boundary with the wild types impossible to define.

Panicum cristatellum Keng (Sinensia 11: 412. 1940), described from Jiangsu (Jiangyin), may be referable to *P. sumatrense*.

10. *Panicum auritum* J. Presl ex Nees, Fl. Bras. Enum. Pl. 2: 176. 1829.

紧序黍 jin xu shu

Hymenachne aurita (J. Presl ex Nees) Balansa; *H. insulicola* (Steudel) L. Liu; *Panicum insulicola* Steudel; *Sacciolepis insulicola* (Steudel) Ohwi.

Perennial, rhizomatous. Culms geniculately ascending, branched, up to 4 m long, nodes glabrous. Leaves cauline; leaf sheaths shorter than internodes, glabrous, sometimes ciliate on margins and at throat, striate; leaf blades linear, 10–60 × 0.5–2.5(–3.5) cm, glabrous, base cordate, apex acuminate; ligule short, membranous, ca. 0.5 mm. Panicle contracted to spikelike, 10–45 cm; branches appressed, glabrous, scabrid. Spikelets lanceolate or elliptic, 2–3 mm, glabrous, acute; lower glume ovate, 1/3 length of spikelet, membranous, 3-veined; upper glume as long as spikelet, 5–7-veined; lower lemma similar to upper glume, palea poorly developed; upper floret as long as spikelet, pale yellow, smooth, shiny. Fl. and fr. Aug–Oct.

Streams, lakesides, forest margins. Fujian, Guangdong, Hainan,

Yunnan [Bhutan, India, Indonesia, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

Panicum auritum may be confused with *Hymenachne amplexicaulis*, since both species have a similarly contracted panicle. The *Hymenachne* may be distinguished by the membranous upper lemma, which clasps the palea only at the base, leaving it free at the apex, and by the larger spikelets 4.5–6 mm.

11. *Panicum elegantissimum* J. D. Hooker, Fl. Brit. India 7: 52. 1896 [“1897”].

旱黍草 han shu cao

Panicum curviflorum Hornemann var. *suishaense* (Hayata) Veldkamp; *P. suishaense* Hayata; *P. trypheron* Schultes var. *suishaense* (Hayata) C. C. Hsu.

Perennial, tufted. Culms erect, 25–60 cm tall, nodes glabrous. Leaves mostly basal; leaf sheaths pilose to hispid; leaf blades linear, flat, 12–50 × 0.3–0.8 cm, pilose, base narrowed, apex acuminate; ligule a ciliate collar. Panicle oblong in outline, 10–30 cm, moderately branched; pedicels pilose. Spikelets ovate, 3–4 mm, glabrous, acuminate, upper glume and lower lemma divergent at maturity; lower glume ovate, 1/2–2/3 length of spikelet, 3–5-veined, acuminate, separated by an internode; upper glume ovate, as long as spikelet, 7-veined, acuminate; lower floret barren, lemma similar to upper glume, palea poorly developed; upper floret pale yellow, rarely black, smooth, shiny. Fl. and fr. May–Oct. $2n = 36$.

Dry grasslands, mountain slopes. Guangdong, Guangxi, Taiwan, Xizang [Borneo, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

12. *Panicum humile* Nees ex Steudel, Syn. Pl. Glumac. 1: 84. 1854.

南亚稷 nan ya ji

Panicum austroasiaticum Ohwi; *P. watense* Mez; *P. vesicum* R. R. Stewart, nom. illeg. superfl.

Annual, slender. Culms erect, branched, 20–70 cm tall. Leaves mostly cauline; leaf sheaths glabrous, occasionally ciliate on the margins; leaf blades linear, flat, 7–20 × 0.2–0.6 cm, glabrous, base tapering, apex acute or acuminate; ligule ca. 1 mm, a ciliolate membrane. Panicles axillary or terminal, ovate or oblong in outline, usually scarcely exerted from the uppermost sheath, 5–15 cm, moderately branched. Spikelets ovate, 1.5–2 mm, glabrous, upper glume and lower lemma divergent at maturity; lower glume ovate, 1/2–3/4 length of spikelet, 3-veined, acuminate or cuspidate; upper glume ovate, as long as spikelet, 3–5-veined acuminate; lower floret barren, lemma similar to upper glume, palea present; upper floret pale yellow, smooth, shiny. Fl. and fr. Aug–Dec. $2n = 18$.

Fields on rather dry soils, mountain slopes. Guangdong, Guangxi, Hainan, Taiwan, Xizang [India, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; tropical Africa].

13. *Panicum virgatum* Linnaeus, Sp. Pl. 1: 59. 1753.

柳枝稷 liu zhi ji

Chasea virgata (Linnaeus) Nieuwland; *Milium virgatum* (Linnaeus) Lunell; *Panicum giganteum* Scheele; *P. glaberrimum* Steudel; *P. purinissum* Bernhardt ex Trinius.

Perennial with scaly rhizomes. Culms tough, erect, 60–200 cm tall, usually unbranched, nodes glabrous or pubescent. Leaves basal and cauline; leaf sheaths rounded, glabrous; leaf blades linear, flat, 20–40 × 0.3–1.5 cm, glabrous, apex acuminate; ligule 1.5–7 mm, a ciliate fringe, membranous at the base. Panicle open, oblong or rhomboid in outline, 15–55 cm, the spikelets often clustered on the secondary branches. Spikelets ovate, 3–5 mm, glabrous; glumes ovate, acuminate; lower glume 2/3–3/4 length of spikelet, 5-veined; upper glume as long as spikelet, 5-veined; lower floret staminate, lemma similar to upper glume, 5–7-veined, palea well developed; upper floret pale, shiny. Fl. and fr. Jul–Oct. $2n = 21, 25, 30, 32, 36, 72$.

Commonly cultivated for forage [native to North America].

14. *Panicum miliaceum* Linnaeus, Sp. Pl. 1: 58. 1753.

稷 ji

Annual. Culms robust, 20–150 cm tall, glabrous or lower nodes and internodes pubescent or hispid. Leaves cauline; leaf sheaths hispid; leaf blades linear or narrowly lanceolate, 15–40 × 1–2.5 cm, glabrous to pilose or hispid, base cordate to amplexicaul, apex finely tapering; ligule 1.5–3 mm, a fringe of hairs from a membranous base. Panicle oblong to ovate in outline, 15–35 cm, drooping at maturity with the weight of the dense spikelets which are clustered toward the ends of the branches. Spikelets ovate to ovate-oblong, 4–5 mm, glabrous, acute to acuminate; lower glume ovate, 1/2–3/4 length of spikelet, 5-veined, acute or acuminate, separated by a short internode; upper glume equal to spikelet, 9–13-veined, acute or acuminate; lower floret barren, lemma similar to upper glume, palea reduced or absent; upper floret orange or yellow, smooth, shiny, usually persistent. Fl. and fr. Jul–Oct. $2n = 36, 40$.

Commonly cultivated, especially in mountainous regions [cultivated in Bhutan, India, Japan, and widely elsewhere].

15. *Panicum curviflorum* Hornemann, Hort. Bot. Hafn., Suppl. 116. 1819.

弯花黍 wan hua shu

Panicum trypheron Schultes.

Annual, loosely tufted. Culms erect or geniculately ascending, (15–)30–90 cm tall, nodes glabrous. Leaves mostly basal; leaf sheaths striate, hispid with tubercle-based hairs; leaf blades linear or lanceolate, flat, 7–30 × 0.2–0.9 cm, hispid, base straight, apex acute or acuminate; ligule 0.3–1 mm, a fringe of hairs. Panicle open, oblong in outline, 10–35 cm, axis smooth, moderately branched; branches ascending or spreading, scabrid. Spikelets lanceolate, 3–3.5 mm, glabrous, acuminate; glumes broadly ovate, scaberulous on veins, acuminate to cuspidate; lower glume 1/2–2/3 length of spikelet, 5-veined, clasping at the base, separated by an internode; upper glume as long as spikelet, 7–9-veined; lower floret barren, lemma similar to upper glume, finely acute, palea poorly developed; upper floret oblong, 3/4 length of spikelet, pale yellow or olive green, shiny, obtuse.

Grasslands, disturbed places. Yunnan [India, Indonesia, New Guinea, Pakistan, Sri Lanka, Thailand].

16. *Panicum trichoides* O. Swartz, Prodr. 24. 1788.

发枝稷 fa zhi ji

Annual, delicate. Culms geniculately ascending, rooting from lower nodes, 10–80 cm tall, branched, nodes puberulous. Leaves cauline; leaf sheaths striate, pilose or hispid; leaf blades lanceolate, membranous, $3-8 \times 0.5-2$ cm, pilose, base asymmetrically cordate or narrowed, apex acuminate; ligule ca. 0.2 mm, a ciliate membrane. Panicle ovate or oblong in outline, 4–20 cm, much branched; branches fine and bearing the spikelets on long pedicels. Spikelets asymmetrically ovate, 1–1.5 mm, pubescent; lower glume ovate, 1/2 length of spikelet, 1–3-veined, separated by an internode; upper glume as long as spikelet, 3–5-veined; lower lemma similar to upper glume, palea 1/2 as long as lemma; upper floret as long as spikelet, thinly coriaceous, glabrous, white, granulose. Fl. and fr. Sep–Dec. $2n = 18$.

Roadsides, waste places. Guangdong, Hainan [tropical America; introduced in tropical Africa and Asia].

17. *Panicum brevifolium* Linnaeus, Sp. Pl. 1: 59. 1753.

短叶黍 duan ye shu

Panicum arborescens Linnaeus; *P. brevifolium* var. *hirtifolium* (Ridley) Jansen; *P. hirtifolium* Ridley; *P. longiglume* H. Peng & L. H. Zhou; *P. ovalifolium* Poir.

Annual. Culms rambling, often rooting at lower nodes, 15–100 cm tall, nodes glabrous or pubescent. Leaves cauline; leaf sheaths puberulous or glabrous, ciliate on margins; ligule ca. 0.2 mm, a ciliate membrane; leaf blades narrowly ovate to ovate, $5-10 \times 1-3$ cm, membranous, glabrous or pilose, cross veins present, base amplexicaul, apex finely acute to acuminate. Panicle oblong or ovate in outline, 5–15 cm, much branched; branches delicate, often tangled, glabrous or pilose, glandular patches present. Spikelets asymmetrically borne on the pedicels, ovate or elliptic in outline, 1.5–2 mm, sparsely puberulous to pilose; lower glume ovate, as long as spikelet, hyaline, 1–3-veined, separated by an internode; upper glume as long as spikelet, 5-veined; lower lemma similar to upper glume, palea well developed; upper floret white, scaberulous, shiny. Fl. and fr. May–Dec. $2n = 36$.

Humid places, forest margins. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; tropical Africa].

18. *Panicum notatum* Retzius, Observ. Bot. 4: 18. 1786.

心叶稷 xin ye ji

Panicum montanum Roxburgh.

Perennial. Culms scrambling, often rooting at lower nodes, 1–2 m long, branched, terete, glabrous, nodes glabrous to puberulous. Leaves cauline; leaf sheaths striate, puberulous to subglabrous, ciliate on margins toward throat; leaf blades lanceolate, $5-20 \times 1-3$ cm, subglabrous to pubescent, cross veins present, margins scabrid, base cordate, apex finely pointed to acuminate; ligule scarcely developed, ca. 0.5 mm, a ciliate membrane. Panicle broadly ovate in outline, 10–40 cm, much branched; branches slender, spreading, glabrous, smooth or scabrid, bearing spikelets toward the extremities. Spikelets elliptic, 2–2.5 mm, puberulous; lower glume ovate or oblong, 3/4 as

long to equaling the spikelet, 3–5-veined, separated by an internode; upper glume as long as spikelet, 3–5-veined; lower lemma similar to upper glume, palea absent; upper floret as long as spikelet, pale yellow or green, smooth, shiny. Fl. and fr. May–Nov. $2n = 36$.

Forest margins. Fujian, Guangdong, Guangxi, Taiwan, Xizang, Yunnan [Bhutan, Borneo, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

19. *Panicum sarmentosum* Roxburgh, Fl. Ind. 1: 311. 1820.

卵花黍 luan hua shu

Perennial. Culms rambling or climbing, up to 15 m long, branched, glabrous to puberulous or hispid, terete, solid. Leaves cauline; leaf sheaths striate, puberulous; ligule ca. 0.5 mm, a ciliate membrane; leaf blades narrowly lanceolate, $10-35 \times 1-3$ cm, puberulous, margins scabrid, base abruptly narrowed, apex acuminate. Panicle oblong to ovate in outline, 15–30 cm, axis glabrous or pilose, much branched; branches viscid or smooth. Spikelets ovate, 1.5–2 mm, sparsely puberulous to glabrous; lower glume ovate, 2/3–3/4 length of spikelet, 3–5-veined; upper glume as long as spikelet, 5-veined; lower lemma similar to upper glume, palea well developed; upper floret as long as spikelet, pale brown, smooth, shiny, apex apiculate.

Forest shade. Hainan, Taiwan [India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand; Australia].

20. *Panicum incommutatum* Trinius, Gram. Panic. 200. 1826.

藤竹草 teng zhu cao

Panicum submontanum Hayata.

Perennial. Culms rambling, often rooting at lower nodes, 1–2 m long, branched, terete, subglabrous to puberulous, nodes glabrous or puberulous. Leaves cauline; leaf sheaths loose, striate, puberulous; leaf blades narrowly lanceolate, $10-25 \times 1-2$ cm, pilose, base abruptly narrowed, apex acuminate; ligule ca. 1 mm, ciliate. Panicle oblong to ovate in outline, 10–23 cm, the axis puberulous, much branched; branches tangled, viscid. Spikelets ovate, 1.5–2 mm, sparsely puberulous to glabrous; lower glume ovate, 2/3–3/4 length of spikelet, 3–5-veined; upper glume as long as spikelet, 5-veined; lower lemma similar to upper glume, palea well developed; upper floret as long as spikelet, pale brown, smooth, shiny. Fl. and fr. Jul–Mar. $2n = 36$.

Forest shade. Fujian, Guangdong, Guangxi, Jiangxi, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Australia].

21. *Panicum khasianum* Munro ex J. D. Hooker, Fl. Brit. India 7: 54. 1896 [“1897”].

滇西黍 dian xi shu

Perennial. Culms rambling, often rooting at lower nodes, 1–2 m long, branched, terete, nodes glabrous. Leaves cauline; leaf sheaths striate, loose, glabrous, hispid or sparsely ciliate on margins and toward throat; leaf blades narrowly lanceolate, $10-30 \times 1-3$ cm, subglabrous to pilose or hispid, base abruptly narrowed, apex acuminate; ligule 0.5–1 mm, a ciliate membrane. Panicle broadly oblong to orbicular in outline, 15–35 cm, much

branched; branches spreading, scabrid, bearing spikelets mostly in the upper half. Spikelets elliptic-oblong, glabrous; lower glume ovate, 1/4–1/3 length of spikelet, 0–5-veined, acute or obtuse, not separated by an internode; upper glume as long as spikelet, 5-veined; lower lemma similar to upper glume, palea

absent; upper floret as long as spikelet, pale yellow, smooth, shiny, minutely ciliate at the apex. Fl. and fr. Jul–Dec.

Humid grasslands, valley slopes; 1000–2500 m. W Yunnan [Bhutan, NE India].

157. HYMENACHNE P. Beauvois, Ess. Agrostogr. 48. 1812.

膜稈草属 mo fu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Aquatic perennials. Culms long, decumbent, spongy, rooting at lower nodes, internodes solid, filled with aerenchyma. Leaf blades linear or broadly linear. Inflorescence usually a cylindrical spike-like panicle, rarely with spreading primary branches. Spikelets lanceolate, dorsally compressed, veins prominent, florets 2; lower glume usually about 1/3 spikelet length, base clasping; upper glume shorter than or subequaling spikelet, 5-veined; lower lemma as long as spikelet, 5-veined, apex acute to shortly awned; lower palea absent or much reduced; upper lemma membranous, rarely thinly cartilaginous, smooth, margins hyaline, gripping edges of palea below but free toward apex, apex acute.

Five species: tropics of the Old World and New World; three species (one endemic) in China.

Hymenachne is a genus of swamp grasses similar to *Sacciolepis*, and both are segregates from the large genus *Panicum*. The culms of *Sacciolepis* are hollow, but in *Hymenachne* they are filled with aerenchyma.

- 1a. Panicle open, up to 9 cm wide; spikelets loose; culm nodes villous 1. *H. patens*
 1b. Panicle spike-like, 1–2 cm wide; spikelets dense; culm nodes glabrous.
 2a. Spikelets 4–6 mm; upper glume and lower lemma cuspidate-acuminate or extended into mucro up to 2 mm 2. *H. amplexicaulis*
 2b. Spikelets 2–3.2 mm; upper glume and lower lemma acute to acuminate.
 3a. Spikelets 3–3.2 mm, lanceolate, acuminate 3. *H. assamica*
 3b. Spikelets 2–2.5 mm, ovate-lanceolate, acute 10. *Panicum auritum* (see p. 507)

1. *Hymenachne patens* L. Liu, Bot. Res. Acad. Sin. 4: 35. 1989.

展穗膜稈草 zhan sui mo fu cao

Culms decumbent, ascending to ca. 50 cm, nodes 4 or 5, villous. Leaf blades linear-lanceolate, 10–20 × 0.5–1 cm, glabrous on both surfaces, base rounded and clasping, apex acuminate. Panicle 15–20 × 4–9 cm, open; branches 5–12 cm, distant, laxly ascending, spikelets on side branchlets, 2 or 3 per node; pedicels 1–2 mm, smooth. Spikelets green or brownish green, 3.2–4 × ca. 1 mm, acute; lower glume 1/3–1/2 as long as spikelet, 3–5-veined; upper glume subequal to spikelet, herbaceous with membranous margins, 5-veined, acute; lower lemma similar to upper glume but slightly longer; upper lemma slightly shorter than spikelet, thinly cartilaginous, smooth, margins flat below middle, apex acute. Anthers ca. 1 mm. Fl. and fr. Jun–Oct.

- Wet field margins; ca. 100 m. Anhui, Fujian, Jiangxi.

The open panicle and villous nodes are very unusual in *Hymenachne*, but the spikelets are typical of the genus.

2. *Hymenachne amplexicaulis* (Rudge) Nees, Fl. Bras. Enum. Pl. 2: 276. 1829.

膜稈草 mo fu cao

Panicum amplexicaule Rudge, Pl. Guian. 1: 21. 1805; *Hymenachne acutigluma* (Steudel) Gilliland; *H. pseudointerrupta* C. Mueller; *Panicum acutiglumum* Steudel.

Culms decumbent, up to 1 m tall, 6–10 mm in diam.; nodes many, brown, glabrous. Leaf blades broadly linear, thick, 30–40 × ca. 2 cm, glabrous on the adaxial surface and margins loosely tuberculate-hairy, base rounded and slightly clasping, apex acuminate. Ligule membranous, 1–2 mm. Panicle 20–40 × 1–2 cm; spike-like, branches 0.5–2 cm, erect, appressed; rachis winged; pedicels scabrous. Spikelets narrowly lanceolate, 4.5–6 × ca. 1 mm, veins smooth at base, otherwise scabrous; both glumes and lower lemma separated by a short stipe; lower glume ovate, ca. 1.2 mm, 1-veined, acuminate; upper glume and lower lemma lanceolate, 3–4 mm, apex with 0.5–2 mm awn; upper lemma ca. 3 mm, margins flat, apex acuminate. Anthers 0.75–1 mm. Caryopsis ca. 1.5 mm, apex rounded. Fl. and fr. summer to autumn.

Streams in shallow water, ricefields; below 1000 m. Hainan, Taiwan, Yunnan [India, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

3. *Hymenachne assamica* (J. D. Hooker) Hitchcock, Lingnan Sci. J. 7: 222. 1931 [“1929”].

弊草 bi cao

Panicum assamicum J. D. Hooker, Fl. Brit. India 7: 40. 1896 [“1897”].

Culms decumbent, 50–70 cm tall, ca. 5 mm in diam., nodes many, brown, glabrous. Leaf sheaths with one margin tuberculate-ciliate; leaf blades linear-lanceolate, 10–20 × 0.4–1.2 cm, a few setae at base above ligule, base rounded, apex acuminate; ligule 0.3–0.5 mm. Panicle narrow, dense, pale

green, 8–18 × 1–3 cm; branches 1–4 cm, appressed to rachis with tightly clustered spikelets; rachis scabrous, narrowly winged; pedicels 0.2–0.8 mm, scabrous. Spikelets lanceolate, 3–3.2 × ca. 1 mm, veins scabrous toward apex, otherwise smooth, glumes and lower lemma not separated; lower glume broadly ovate, 1/3 spikelet length, 1–5-veined, acute; upper glume slightly shorter or as long as lower lemma, 5-veined,

nearly smooth, sharply acute; lower lemma as long as spikelet, sharply acute; upper lemma ca. 2.5 mm, margins flat for most of their length or only toward apex, apex acute. Fl. and fr. Jul–Oct.

Streams. Guangdong, Guangxi, Hainan, Yunnan [NE India, Thailand].

158. *SACCIOLEPIS* Nash, Man. Fl. N. States 89. 1901.

囊颖草属 nang ying cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Leaf blades linear to convolute; ligule membranous. Inflorescence a narrowly cylindrical, densely spike-like panicle. Spikelets asymmetrical, lanceolate-oblong to ovate, usually laterally or rarely dorsally compressed, plump, florets 2; glumes prominently ribbed, lower glume 1/4–3/4 spikelet length, broad, loose and slightly inflated, upper glume equaling spikelet, deeply concave and gibbous on the back; lower lemma resembling upper glume but less gibbous, staminate or neuter, its palea often much reduced; upper floret readily deciduous, the lemma dorsally compressed, often much shorter than spikelet, thinly coriaceous to cartilaginous, smooth, shiny, margins inrolled or flat but never hyaline. $x = 9$.

About 30 species: tropics, predominantly in Africa; three species in China.

This is a genus of aquatic and marshland grasses, recognized by the spike-like panicle of asymmetrical, ribbed spikelets.

- 1a. Perennial with spongy, often floating stems; spikelets dorsally compressed, 3–5 mm 1. *S. interrupta*
 1b. Annuals with firm stems, not floating; spikelets laterally compressed, 1.5–2.8 mm.
 2a. Spikelets 2–2.8 mm, lanceolate 2. *S. indica*
 2b. Spikelets 1.5–2 mm, ovate 3. *S. myosuroides*

1. *Sacciolepis interrupta* (Willdenow) Stapf in Prain, Fl. Trop. Africa 9: 757. 1920.

间序囊颖草 jian xu nang ying cao

Panicum interruptum Willdenow, Sp. Pl., ed. 4, 1: 341. 1797; *Hymenachne interrupta* (Willdenow) Buse; *Panicum inundatum* Kunth, nom. illeg. superfl.; *Sacciolepis simaoensis* Y. Y. Qian.

Vigorous aquatic perennial. Culms rooting and floating in water, spongy, succulent, hollow, smooth, glabrous, 20–50 cm tall or more, up to 1 cm in diam. Leaf sheaths loose, papery; leaf blades linear, flat, soft, 4–12 × 0.3–0.6 cm, base abruptly rounded, apex acuminate; ligule truncate. Panicle spike-like, 10–30 cm. Spikelets light green, asymmetrically oblong, lightly dorsally compressed, 3.3–5 mm, glabrous, acute to subacute; lower glume broadly ovate, 1/4–1/3 spikelet length, 3–5-veined; upper glume ovate, slightly gibbous, 9-veined, acute; lower floret neuter or infrequently staminate, lemma as long as upper glume, ovate, 7-veined; lower palea present, often much reduced; upper lemma yellowish, narrowly ovate, 2/3–3/4 spikelet length, acute. Fl. and fr. Jun–Dec. $2n = 18$.

Swamps, shallow water, rice fields. SW Yunnan [India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; Africa].

Sacciolepis interrupta has a mainly Asian distribution. *Sacciolepis africana* C. E. Hubbard & Snowden is its counterpart in Africa, but has on average somewhat shorter (2.5–4 mm), more obtuse spikelets. However, the division between the two species is not clear-cut, and there is some overlap in individual characters.

2. *Sacciolepis indica* (Linnaeus) Chase, Proc. Biol. Soc. Washington 21: 8. 1908.

囊颖草 nang ying cao

Aira indica Linnaeus, Sp. Pl. 1: 63 [*“spicata”*], errata [1231, *“indicum”*]. 1753; *Panicum angustum* Trinius; *Sacciolepis angusta* (Trinius) Stapf; *S. spicata* Honda ex Masamune, nom. illeg. superfl.

Annual. Culms slender, weakly ascending from a branch-like, decumbent base, 20–100 cm tall. Leaf sheaths slightly keeled; leaf blades linear, flat to loosely involute, 5–20 × 0.2–0.5 cm, apex acute; ligule 0.2–0.5 mm. Panicle spike-like, 11–16 × 0.3–0.5 cm, axis glabrous. Spikelets green or purplish green, lanceolate, laterally compressed, 2–2.8 mm, glabrous or papillose-hispid, obtuse; glumes ovate, herbaceous with broad hyaline margins and apex, lower glume 1/3–1/2 spikelet length, 3–7-veined; upper glume 7–11-veined; lower lemma as long as upper glume; palea small and hyaline; upper lemma yellowish, narrowly ovate, 1/2 spikelet length. Fl. and fr. Jul–Nov. $2n = 18$.

Moist places, valleys, streams. Anhui, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan, Myanmar, Nepal, Thailand, Vietnam; Africa, Australia, Pacific Islands].

The name *Aira indica* was originally given as *“Aira spicata,”* but this was corrected by Linnaeus in the errata on the final page [1231] of *Species Plantarum*.

The combination *“Sacciolepis indica* var. *angusta* (Trinius) Keng” (Fl. Ill. Pl. Prim. Sin. Gram. 662. 1959) was not validly published because a full and direct reference to the basionym was not provided.

3. *Sacciolepis myosuroides* (R. Brown) Chase ex E. G. Camus & A. Camus in Lecomte, Fl. Indo-Chine 7: 460. 1922.

鼠尾囊颖草 shu wei nang ying cao

Annual. Culms slender, tufted, erect or slightly decumbent at the base, 15–100 cm tall. Leaf sheaths smooth; leaf blades linear, flat, 3–20 × 0.1–0.5 cm, adaxial surface papillose, apex acuminate; ligule ca. 0.5 mm. Panicle very slender, densely spikeletlike, 2–20 × 0.2–0.5 cm, axis glabrous. Spikelets purple, ovate-elliptic, slightly curved, laterally compressed, 1.5–2 mm, glabrous or pilose, acute or subobtuse; lower glume 1/2–2/3 spikelet length, 3–5-veined; upper glume 7–9-veined; lower lemma with a small palea; upper lemma slightly shorter than spikelet. Fl. and fr. winter. $2n = 36$.

Moist places and shallow water, rice fields. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Xizang, Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Pacific Islands].

- 1a. Culms 30–100 cm tall; leaf blades 10–20 cm; panicle 6–20 cm 3a. var. *mysuroides*
 1b. Culms 15–30 cm tall; leaf blades 3–5 cm; panicle 2–4 cm 3b. var. *nana*

3a. *Sacciolepis mysuroides* var. *mysuroides*

鼠尾囊颖草(原变种) shu wei nang ying cao (yuan bian zhong)

Panicum mysuroides R. Brown, Prodr. 189. 1810; *Hymenachne mysuroides* (R. Brown) Balansa; *Panicum spiciforme* Hochstetter ex A. Richard; *Sacciolepis mysuroides* var. *spiciformis* (Hochstetter ex A. Richard) Engler; *S. spiciformis* (Hochstetter ex A. Richard) Stapf.

Culms erect from a decumbent base, rooting at the lower nodes, 30–100 cm tall. Leaf blades 10–20 × 0.2–0.5 cm. Panicle 6–20 × 0.2–0.5 cm. Fl. and fr. winter. $2n = 36$.

Moist places, shallow water and rice fields. Guangdong, Guizhou, Hainan, Yunnan, Xizang [India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, Australia, Pacific Islands].

3b. *Sacciolepis mysuroides* var. *nana* S. L. Chen & T. D. Zhuang, Bull. Bot. Res., Harbin 4: 124. 1984.

矮小囊颖草 ai xiao nang ying cao

Culms 15–30 cm tall. Leaf blades 3–5 × 0.1–0.3 cm. Panicle 2–4 × ca. 0.3 cm.

- Shallow water along streams. Guangdong, Guangxi, S Yunnan.

159. OTTOCHLOA Dandy, J. Bot. 69: 54. 1931.

露籽草属 lu zi cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Hemigymnia Stapf in Prain, Fl. Trop. Africa 9: 741. 1920, not Griffith (1842).

Perennials. Culms tufted or rambling and stoloniferous. Leaf blades lanceolate; ligule membranous, truncate, ciliate, or sometimes obscure. Inflorescence an open panicle, primary branches spaced along the central axis, spikelets borne on short secondary branches, singly or in appressed secondary racemelets. Spikelets dorsally compressed, 2-flowered; glumes similar, subequal, herbaceous, 1/2–2/3 spikelet length, 3–5(–7)-veined; lower floret herbaceous, sterile or staminate, its lemma as long as the spikelet, 7–9-veined; upper lemma as long as the spikelet, coriaceous to cartilaginous, flattened on the back, smooth or rugulose, margins narrow, hyaline, incurved upward. $x = 9$.

Three species: Old World tropics; one species in China.

This genus resembles *Panicum*, but can be immediately distinguished by its short glumes.

1. *Ottochloa nodosa* (Kunth) Dandy, J. Bot. 69: 55. 1931.

露籽草 lu zi cao

Perennial. Culms slender, decumbent, rooting and branching at the nodes, ascending up to 60 cm. Leaf sheaths conspicuously ciliate along one margin; leaf blades narrowly lanceolate, 4–11 × 0.5–1 cm, smooth, glabrous, base rounded or cordate, margins scabrous, apex acuminate; ligule ca. 0.3 mm. Panicle 10–15 cm, branches 3–8 cm, stiffly spreading, subverticillate in the lower part, the spikelets grouped in clusters or short racemelets, or sometimes loosely spaced. Spikelets elliptic to elliptic-oblong, 2–3.2 mm, acute; glumes lanceolate, lower glume 1/2 spikelet length, 3–5-veined; upper glume 1/2–2/3 spikelet length, 5–7-veined; lower lemma 7-veined; upper lemma smooth, apex laterally compressed to a very small crest. Fl. and fr. Jul–Sep. $2n = 18$. Fl. and fr. Jul–Sep. $2n = 18$.

Forests (not in deep shade), forest margins, clearings, often scrambling over other plants; 100–1700 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa, NE Aus-

tralia, Pacific Islands (Polynesia)].

The name *Ottochloa malabarica* (Linnaeus) Dandy (based on *Poa malabarica* Linnaeus) has been applied to this grass. The identity of *P. malabarica* is unclear from the protologue, which probably includes more than one species, but the name has more frequently been applied to the completely different species *Leptochloa fusca*. *Poa malabarica*, a name of uncertain application, has been formally rejected.

- 1a. Spikelets 2.8–3.2 mm 1a. var. *nodosa*
 1b. Spikelets 2–2.5 mm 1b. var. *micrantha*

1a. *Ottochloa nodosa* var. *nodosa*

露籽草(原变种) lu zi cao (yuan bian zhong)

Panicum nodosum Kunth, Enum. Pl. 1: 97. 1833, based on *P. multinode* J. Presl, Reliq. Haenk. 1: 303. 1830, not Lamarck (1798); *Hemigymnia arnottiana* (Nees ex Steudel) Stapf; *H. multinodis* (J. Presl) Stapf; *Ottochloa arnottiana* (Nees ex Steudel) Dandy; *Panicum arnottianum* Nees ex Steudel.

Spikelets 2.8–3.2 mm; upper glume 1/2–2/3 spikelet length; lower lemma 7-veined.

Forests, forest margins, clearings; 100–1700 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand; Africa, NE Australia, Pacific Islands (Polynesia)].

1b. *Ottochloa nodosa* var. *micrantha* (Balansa ex A. Camus) S. L. Chen & S. M. Phillips, *Novon* 13: 467. 2003.

小花露籽草 xiao hua lu zi cao

Hemigymnia arnottiana Stapf var. *micrantha* Balansa ex A. Camus in Lecomte, *Fl. Indo-Chine* 7: 455. 1922.

Spikelets 2–2.5 mm; upper glume ovate, ca. 1/2 spikelet length, 7-veined; lower lemma 5–7-veined. Fl. and fr. Jul–Nov.

Valleys, moist forest margins. Guangdong, Hainan [Vietnam].

The name “*Panicum nodosum* var. *micranthum* Balansa” (J. Bot. (Morot) 4: 142. 1890) is a *nomen nudum* and was therefore not validly published. The combination *Ottochloa nodosa* var. *micrantha* was not previously validly published by P. C. Keng (*Iconogr. Cormophyt. Sin.* 5: 160. 1976) because no reference to the basionym was provided.

160. *CYRTOCOCCUM* Stapf in Prain, *Fl. Trop. Africa* 9: 15. 1917.

弓果黍属 gong guo shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual or perennial. Culms decumbent, rooting at the nodes, much branched and leafy. Leaf blades linear-lanceolate to narrowly ovate; ligule membranous. Inflorescence an open or contracted panicle. Spikelets asymmetrical, obovate, laterally compressed, florets 2, lower floret sterile, upper floret bisexual; glumes both shorter than spikelet, unequal, membranous to herbaceous, 3–5-veined; lower glume smaller, ovate, clasping, subacute; upper glume boat-shaped, obtuse; lower lemma usually equal to spikelet, 5-veined, nearly straight on the back, its palea small or absent; upper lemma laterally compressed, gibbously semiorbicular, subcoriaceous to crustaceous, smooth or minutely pitted, a little greenish crest near the apex which swells at maturity, upper palea dorsally slightly convex. $x = 9$.

Eleven species: Old World tropics, in shady places; two species in China.

This genus is a segregate from *Panicum* distinguished by its laterally compressed, gibbous spikelets with short glumes and a crested upper lemma.

- 1a. Pedicels mostly shorter than the spikelet, stout; panicle contracted; spikelets reddish brown 1. *C. oxyphyllum*
1b. Pedicels much longer than the spikelet, filiform; panicle open, often diffuse; spikelets purplish 2. *C. patens*

1. *Cyrtococcum oxyphyllum* (Hochstetter ex Steudel) Stapf, Hooker's *Icon. Pl.* 31: t. 3096. 1922.

尖叶弓果黍 jian ye gong guo shu

Panicum oxyphyllum Hochstetter ex Steudel, *Syn. Pl. Glumac.* 1: 65. 1853; *Cyrtococcum pilipes* (Nees & Arnott ex Buse) A. Camus; *Panicum hermaphroditum* Steudel; *P. pilipes* Nees & Arnott ex Buse.

Culms rambling, smooth and glabrous, 15–50 cm tall. Leaf sheaths glabrous to pubescent, ciliate on one margin; leaf blades narrowly lanceolate, 5–18 × 0.5–1.5 cm, glabrous to pilose, midvein abaxially distinct, apex acuminate; ligule 1–1.5 mm. Panicle 3–12 × 1–2 cm, contracted, branches ascending, up to 3 cm, pilose with long scattered hairs or hairs mostly confined to the axils; pedicels stout, short. Spikelets reddish brown at maturity, ca. 2 mm, glabrous except for some hairs at the base (hairs up to 2/3 length of lower glume); glumes 3-veined, acute, the lower 1.2–1.5 mm, the upper slightly shorter than spikelet; lower lemma obtuse or subtruncate; upper lemma yellowish or yellowish brown, smooth and shining. Anthers ca. 1 mm. Fl. and fr. Oct–Mar. $2n = 36$.

Damp places in shade. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, India, Malaysia, Myanmar, Philippines, Sri Lanka, Vietnam; Australia].

2. *Cyrtococcum patens* (Linnaeus) A. Camus, *Bull. Mus. Natl. Hist. Nat.* 27: 118. 1921.

弓果黍 gong guo shu

Culms creeping, smooth and glabrous, 15–60 cm tall. Leaf sheaths loosely pilose with tubercle-based hairs; leaf blades lanceolate, 3–15 × 0.3–2 cm, pubescent on both surfaces or subglabrous, basal margins with a few long, stiff, tubercle-based hairs, apex acuminate; ligule 0.5–2 mm, subrounded. Panicle 5–30(–40) cm, often diffuse, branches loosely ascending to widely spreading, very slender, glabrous; pedicels filiform, longer than spikelets. Spikelets purplish at maturity, 1.3–1.8 mm, varying from glabrous to appressed-pubescent or shortly hispid with stiff, conspicuously tubercle-based hairs; glumes 3-veined, the lower ca. 1/2 spikelet length, the upper 2/3 spikelet length; lower lemma subequaling spikelet, margins ciliate, apex obtuse; upper lemma minutely pitted. Anthers ca. 0.8 mm. Fl. and fr. Sep–Feb. $2n = 18, 36$.

Moist places in grasslands and forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Pacific Islands (Polynesia)].

Cyrtococcum patens is a very variable species, and specimens with large, diffuse panicles have a different habit from small- or narrow-panicked forms. This difference is acknowledged here at varietal rank, but it should be realized that variation is continuous and intermediates will be encountered.

Spikelet pubescence varies from completely glabrous, through forms with sparse to dense, short, appressed hairs, to forms with some or all of the basal hair tubercles enlarged and prominent. This last-mentioned form has been separated as var. *schmidtii* (Hackel) A. Camus.

us. It is found throughout the entire size range of the species, and also over the whole geographic range, and is not taxonomically significant.

- 1a. Panicle up to 17 cm; leaf blades $3-8 \times 0.3-1$ cm 2a. var. *patens*
 1b. Panicle large and diffuse, 16–30 cm; leaf blades $7-15 \times 1-2$ cm 2b. var. *latifolium*

2a. *Cyrtococcum patens* var. *patens*

弓果黍(原变种) gong guo shu (yuan bian zhong)

Panicum patens Linnaeus, Sp. Pl. 1: 58. 1753; *Cyrtococcum muricatum* (Retzius) Bor; *C. patens* var. *schmidtii* (Hackel) A. Camus; *C. patens* var. *warburgii* (Mez) Reeder; *C. radicans* (Retzius) Stapf; *C. warburgii* (Mez) Stapf; *Panicum carinatum* J. Presl & C. Presl; *P. muricatum* Retzius; *P. obliquum* Roth ex Roemer & Schultes; *P. radicans* Retzius; *P. schmidtii* Hackel; *P. warburgii* Mez.

Culms 15–30 cm tall. Leaf blades $3-8 \times 0.3-1$ cm; ligule 0.5–1 mm. Panicle 5–15 cm. Fl. and fr. Sep–Feb. $2n = 18$.

Moist places in grasslands and forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Pacific Islands (Polynesia)].

2b. *Cyrtococcum patens* var. *latifolium* (Honda) Ohwi, Acta Phytotax. Geobot. 11: 47. 1942.

散穗弓果黍 san sui gong guo shu

Panicum patens Linnaeus f. *latifolium* Honda, Bot. Mag. (Tokyo) 37: 25. 1923; *Cyrtococcum accrescens* (Trinius) Stapf; *Panicum accrescens* Trinius; *P. patens* var. *latifolium* (Honda) Honda.

Culms up to 60 cm tall. Leaf blades $7-15 \times 1.2-2$ cm; ligule 1–2 mm. Panicle 16–30 cm. Fl. and fr. autumn–winter. $2n = 36$.

Moist places in shade, sometimes forming an undercover. Guangdong, Guangxi, Guizhou, Hunan, Taiwan, Xizang, Yunnan [India, Japan (Ryukyu Islands), Malaysia, Thailand, Vietnam].

161. SETIACIS S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 26: 217. 1988.

刺毛头黍属 ci mao tou shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials. Culms decumbent at the base, usually rooting at the nodes. Leaf blades flat, linear-lanceolate. Inflorescence a terminal panicle, spikelets solitary or paired near the base. Spikelets dorsally compressed, florets 2; glumes herbaceous; lower glume shorter than spikelet, 5–7-veined; upper glume subequaling spikelet, 9–11-veined, its apex never thickened; lower lemma similar to upper glume, 11-veined; lower palea oblong, keels ciliate; upper lemma slightly convex on back, cartilaginous, apex obtuse, slightly thickened with several hairs; upper palea cartilaginous, apex pubescent. Caryopsis ellipsoid.

- One species: S China (Hainan).

This genus is similar to *Acroceras* and *Lasiacis* (Grisebach) Hitchcock, but differs in the upper glume apex lacking a thickened crest or woolly hairs, the ciliate keels of the lower palea, and the cartilaginous upper floret bearing several hairs at its apex. The leaf epidermis has similar long cells on both surfaces, dumb-bell-shaped or nodular silica bodies, and parallel-sided stomatal subsidiary cells, confirming the separation of this genus from *Acroceras*.

1. *Setiacis diffusa* (L. C. Chia) S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 26: 219. 1988.

刺毛头黍 ci mao tou shu

Acroceras diffusum L. C. Chia, Fl. Hainan. 4: 538. 1977.

Culms 0.6–1 m tall. Leaf sheaths shorter than internodes, compressed, keeled, one margin ciliate; leaf blades $10-15 \times 1-1.3$ cm, both surfaces glabrous, base slightly rounded, margins thickened and repand, midvein obscure with transverse veinlets.

apex acuminate; ligule ca. 0.5 mm. Panicle lax, ca. 15×9 cm, branches 7–10, with slender branchlets. Spikelets oblong, ca. 3.2 mm; lower glume ovate-lanceolate, ca. 2/3 spikelet length, 5–7-veined; upper glume and lower lemma similar, 9–11-veined; lower floret with an oblong membranous palea; upper lemma glabrous, shining. Caryopsis ca. 1.7 mm. Fl. and fr. Sep–Oct.

- Moist places in forests. Hainan.

162. ACROCERAS Stapf in Prain, Fl. Trop. Africa 9: 621. 1920.

凤头黍属 feng tou shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Neohusnotia A. Camus.

Annuals or perennials. Culms decumbent, often rooting near the base. Leaf blades flat, lanceolate or linear-lanceolate, usually with obscure transverse veins; ligule a narrow membrane. Inflorescence of lax racemes along a central axis, sometimes panicle-like due to irregular secondary branching; spikelets paired or rarely single, pedicels of each pair connate at base. Spikelets lanceolate to oblong, plump, dorsally or weakly laterally compressed, glabrous, florets 2; glumes subequal or lower glume shorter, papery; upper

glume and lower lemma thickened and laterally compressed at apex to form a green crest; upper lemma dorsally compressed, crustaceous, smooth or finely striate, apex glabrous with a little green crest; upper palea with reflexed apex slightly protruding from lemma. $x = 9$.

Nineteen species: throughout the tropics (12 species endemic to Madagascar); two species in China.

Acroceras species are grasses of damp, shady situations, recognized by the thickened, green crests at the tips of the spikelet scales. The leaf anatomy contrasts with that of the closely related genus *Setiatis*, with long cells differing in shape on the abaxial and adaxial surfaces, silica bodies short and dumbbell-shaped to cross-shaped, and stomatal subsidiary cells dome-shaped.

- 1a. Spikelets ca. 4 mm; nodes glabrous; inflorescence with simple racemes 1. *A. munroanum*
 1b. Spikelets 5–5.5 mm; nodes pubescent; inflorescence with compound racemes 2. *A. tonkinense*

1. *Acroceras munroanum* (Balansa) Henrard, Blumea 3: 444–445. 1940.

凤头黍 feng tou shu

Panicum munroanum Balansa, J. Bot. (Morot) 4: 140. 1890; *Acroceras crassiapiculatum* (Merrill) Alston; *Panicum crassiapiculatum* Merrill.

Perennial. Culms slender, long, creeping and rooting, the erect tips 15–40 cm tall. Leaf sheaths glabrous or one margin ciliate; leaf blades lanceolate, $3-7 \times 0.4-0.9$ cm, glabrous or sparsely pilose, base subcordate, margins glabrous, apex acuminate; ligule ca. 0.4 mm. Panicle $4-6 \times 2-3$ cm; racemes 3–6, short, erect, unbranched; spikelets on short pedicels along racemes and upper part of main axis, usually paired or single toward raceme apex. Spikelets ca. 4 mm, elliptic, stramineous when mature, subglabrous; lower glume broadly ovate, ca. 3.5 mm; upper glume and lower lemma similar, as long as spikelet, 5–7-veined, apex crested, slightly protruding; lower palea hyaline, narrow; upper lemma smooth, shining, 3–3.5 mm. Fl. and fr. Sep–Oct. $2n = 18$.

Grassland on hill slopes, light shade of forest margins. Hainan [Cambodia, India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

2. *Acroceras tonkinense* (Balansa) C. E. Hubbard ex Bor, Indian Forest Rec., Bot. 1(3): 78. 1938.

山鸡谷草 shan ji gu cao

Panicum tonkinense Balansa, J. Bot. (Morot) 4: 140. 1890; *Neohusnotia tonkinensis* (Balansa) A. Camus.

Perennial. Culms up to 100 cm tall, nodes densely pubescent with soft white hairs. Leaf sheaths glabrous or with tubercle-based hairs, one margin tuberculate-ciliate; leaf blades lanceolate, $10-20 \times 1-3$ cm, glabrous or abaxial surface pilose, margins thickened, pectinate-ciliate at base, scabrous, midvein prominent abaxially, apex narrowly acuminate; ligule ca. 1 mm, obtuse. Panicle open, $15-25 \times 5-10$ cm, axis and branches stiff, scabrous; racemes ascending, with secondary branching; spikelets widely spaced, paired or single in upper part. Spikelets 5–5.5 mm; lower glume broadly elliptic, $3/4$ spikelet length, 5-veined; upper glume and lower lemma as long as spikelet, 5-veined, apex slightly thickened; lower palea hyaline, narrow; upper lemma smooth, shining, slightly shorter than spikelet, apex thickened and protruding. Fl. and fr. Aug–Oct.

Moist places in forest shade. Hainan, Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

This is a more robust species than *Acroceras munroanum*, with larger leaves and harshly scabrous leaf margins and inflorescence.

163. *ECHINOCHLOA* P. Beauvois, Ess. Agrostogr. 53. 1812, nom. cons.

稗属 bai shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Tema Adanson, nom. rej.

Annual or perennial. Culms often coarse and robust. Leaf blades flat, linear or broadly linear; ligule absent (ciliate in some species outside China). Inflorescence composed of racemes along a central axis; racemes simple or compound, densely spiculate, spikelets paired in 4 rows, or congested on secondary racemelets. Spikelets narrowly elliptic to subrotund, plump, plano-convex, often hispidulous or spinulose, acute to awned; lower glume triangular, $1/3-1/2(-3/5)$ spikelet length, sheathing; upper glume and lower lemma equaling the spikelet or upper glume somewhat shorter in cultivated forms, prominently 5–7-veined, acute to rostrate or lower lemma extended into a stout awn; upper lemma coriaceous, smooth, shining, terminating in a short, laterally compressed, incurving beak; upper palea acute, apex briefly reflexed. $x = 9$.

About 35 species: tropical and warm-temperate regions of the world; eight species (at least one introduced) in China.

The reflexed upper palea tip, although a very tiny character, is nevertheless important for distinguishing *Echinochloa* from neighboring genera, especially *Brachiaria*. The absence of a ligule is also a good spot character for recognition of the genus in China.

Species of *Echinochloa* typically grow in aquatic or moist situations. Several have become widespread weeds, especially of irrigated crops, and two are sometimes cultivated as minor cereals.

- 1a. Grain persisting at maturity; spikelets plumply ovate; branches of inflorescence incurving; cultivated plants.
 2a. Spikelets dark greenish when mature, awnless; racemes rather spaced, simple 1. *E. frumentacea*

- 2b. Spikelets purplish brown when mature, acute to awned, awn 0.5–2 cm; racemes very dense, closely packed, usually branched 2. *E. esculenta*
- 1b. Grain readily deciduous at maturity; spikelets ovate, ovate-lanceolate or ovate-elliptic; branches of inflorescence not incurving; wild plants.
- 3a. Lower lemma convex, hard and shining 6. *E. glabrescens*
- 3b. Lower lemma flat on the back, herbaceous.
- 4a. Spikelets ovate, 3.8–6 mm; culms erect, forming narrow tuft 3. *E. oryzoides*
- 4b. Spikelets elliptic-ovate, mostly 2–4 mm; culms spreading, forming loose tuft.
- 5a. Racemes neatly 4-rowed, simple, openly spaced, often erect; spikelets awnless, acute, 2–3 mm 4. *E. colona*
- 5b. Racemes untidily 2- to several-rowed, at least the longer often with short branchlets; spikelets acuminate to shortly awned, 2–4 mm.
- 6a. Racemes distinctly compound with many short branchlets; spikelets 2–3 mm; awn of lower lemma 1–1.5 cm 5. *E. crusgalli*
- 6b. Racemes simple or only inconspicuously branched; spikelets 2.5–4 mm; lower lemma acute to long-awned.
- 7a. Inflorescence green or purple-tinged, moderately dense; spikelets 3–4 mm; lower lemma acuminate or awned 7. *E. crusgalli*
- 7b. Inflorescence dark purple, very dense; spikelets 2.5–3 mm; lower lemma awned, awn 3–5 cm 8. *E. caudata*

1. *Echinochloa frumentacea* Link, Hort. Berol. 1: 204. 1827.

湖南稗子 hu nan bai zi

Panicum frumentaceum Roxburgh, Fl. Ind. 1: 307. 1820, not Salisbury (1796); *Echinochloa colona* (Linnaeus) Link var. *frumentacea* Ridley; *E. crusgalli* (Linnaeus) P. Beauvois var. *edulis* Hitchcock, nom. illeg. superfl.; *E. crusgalli* var. *frumentacea* (Link) W. P. Wight; *Oplismenus frumentaceus* (Link) Kunth.

Annual. Culms robust, erect, 1–1.5 m tall. Leaf sheaths smooth and glabrous; leaf blades linear, soft, 15–40 × 1–2.4 cm, glabrous, margins thickened and wavy. Inflorescence erect, lanceolate, 10–20 cm, axis robust, scabrous along edges and with tubercle-based hairs; racemes 1–3 cm, curved, simple, closely spaced and overlapping. Spikelets greenish, tardily deciduous, plump, ovate-elliptic to rotund, 2.5–3.5 mm, pubescent to hispid, awnless; lower glume 1/3–2/5 as long as spikelet; upper glume slightly shorter than spikelet; lower lemma herbaceous, sterile; upper lemma 2–3 mm. Caryopsis long persistent, eventually falling. Fl. and fr. Aug–Sep. $2n = 36, 54$.

A crop plant. Anhui, Guangxi, Guizhou, Heilongjiang, Henan, Nei Mongol, Ningxia, Sichuan, Taiwan, Yunnan [cultivated in Africa and tropical Asia].

Echinochloa frumentacea is cultivated both for grain and as a forage crop. It is thought to be a cultivated derivative of *E. colona* that arose in India and perhaps Africa.

2. *Echinochloa esculenta* (A. Braun) H. Scholz, Taxon 41: 523. 1992.

紫穗稗 zi sui bai

Panicum esculentum A. Braun, Index Sem. Hort. Berol. 1861(App.): 3. 1861; *Echinochloa frumentacea* Link subsp. *utilis* (Ohwi & Yabuno) Tzvelev; *E. utilis* J. Ohwi & Yabuno.

Annual. Culms robust, erect, 1–1.5 m tall. Leaf sheaths smooth and glabrous; leaf blades linear, 20–50 × 1.2–2.5 cm, glabrous, margins thickened and wavy. Inflorescence erect, lanceolate, 10–30 cm, axis robust, scabrous along edges and with

tubercle-based hairs; racemes 2–6 cm, robust, usually branched, closely spaced and overlapping. Spikelets purplish, tardily deciduous, plump, ovate or obovate-elliptic, 3.5–4 mm, hispid along veins with tubercle-based hairs; lower glume 1/3 as long as spikelet, acute; upper glume slightly shorter than spikelet; lower lemma herbaceous, sterile, acute or with a 0.5–2 cm awn; upper lemma 2.8–3.5 mm. Caryopsis long persistent, eventually falling. Fl. and fr. Aug–Oct. $2n = 54, 56, 72$.

A crop plant. Guizhou, Hubei, Yunnan [cultivated in warm-temperate regions of Asia and Africa; introduced in America].

Echinochloa esculenta is cultivated both for grain and forage, like *E. frumentacea*, and the two are most easily distinguished by the color of the seeding heads. *Echinochloa esculenta* is thought to be a cultivated derivative of *E. crusgalli* that arose in China, Japan, and Korea.

3. *Echinochloa oryzoides* (Arduino) Fritsch, Verh. Zool.-Bot. Ges. Wien 41: 742. 1891.

水田稗 shui tian bai

Panicum oryzoides Arduino, Animadv. Bot. Spec. Alt. 16, t. 5. 1764; *Echinochloa coarctata* Kossenko; *E. crusgalli* (Linnaeus) P. Beauvois subsp. *oryzicola* (Vasinger) T. Koyama; *E. crusgalli* var. *oryzicola* (Vasinger) Ohwi; *E. macrocarpa* Vasinger; *E. oryzicola* (Vasinger) Vasinger; *E. oryzoides* subsp. *phyllopogon* (Stapf) Tzvelev; *E. persistentia* Z. S. Diao; *E. phyllopogon* (Stapf) Stapf ex Kossenko; *E. phyllopogon* subsp. *oryzicola* (Vasinger) Kossenko; *Panicum oryzicola* Vasinger; *P. phyllopogon* Stapf.

Annual. Culms erect, forming a narrow tuft up to 1 m tall. Leaf sheaths and blades glabrous or rarely lower leaves with a dense tuft of hairs on abaxial side at junction of sheath and blade; leaf blades stiffly erect, linear, flat, 10–30 × 1–1.5 cm, margins thickened and scabrous. Inflorescence 8–15 × 1.5–3 cm; racemes simple. Spikelets light green, ovate, 3.8–6 mm; glumes hispid along veins, lower glume 1/2–2/3 as long as spikelet, acuminate; upper glume acuminate; lower lemma acuminate or with an awn up to 2 cm; upper lemma 3.5–5 mm. Fl. and fr. Jul–Oct. $2n = 54$.

A weed of rice fields. Anhui, Guangdong, Guizhou, Hainan, Hebei, Henan, Hunan, Jiangsu, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Pakistan, Russia, Turkmenistan, Uzbekistan; Europe, America].

Echinochloa oryzoides is adapted as a weed of rice (*Oryza*), which it resembles in habit. A variant from ricefields in Italy has a dense band of hairs on the outer side of the leaf sheath and blade junction, particularly on the lower leaves. This is the basis of the name *E. phyllopogon*.

4. *Echinochloa colona* (Linnaeus) Link, Hort. Berol. 2: 209. 1833.

光头稗 *guang tou bai*

Panicum colonum Linnaeus, Syst. Nat., ed. 10, 2: 870. 1759; *Echinochloa crusgalli* (Linnaeus) P. Beauvois subsp. *colona* (Linnaeus) Honda; *Milium colonum* (Linnaeus) Moench; *Oplismenus colonus* (Linnaeus) Kunth; *P. crusgalli* subsp. *colonom* (Linnaeus) Makino & Nemoto.

Annual. Culms erect or ascending, up to 60 cm or more tall. Leaf sheaths compressed and keeled; leaf blades linear, flat, 3–20 × 0.3–0.7 cm, glabrous, sometimes with transverse purple bands, margins slightly scabrous, apex acute. Inflorescence narrow, 5–10 cm; racemes 1–2 cm, erect or sometimes stiffly diverging, simple, separated or overlapping by up to half their length or more, rachis usually without long, tubercle-based hairs, spikelets tightly congested in 4 neat rows. Spikelets plumply ovate-oblong, 2–3 mm, hirtellous, sharply acute; lower glume ca. 1/2 as long as spikelet; lower lemma staminate or sterile; upper lemma whitish at maturity, elliptic. Fl. and fr. summer and autumn. $2n = 36$.

A weed of damp places and irrigated fields. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [warm regions throughout the world].

Echinochloa colona is a widespread, weedy species, distinguished by its short, neat, usually rather openly spaced racemes of rounded, awnless spikelets.

5. *Echinochloa cruspavonis* (Kunth) Schultes, Mant. 2: 269. 1824.

孔雀稗 *kong que bai*

Oplismenus cruspavonis Kunth, Nov. Gen. Sp. (quarto ed.) 1: 108. 1815 [“1816”]; *Echinochloa crusgalli* (Linnaeus) P. Beauvois var. *cruspavonis* (Kunth) Hitchcock; *Panicum cruspavonis* (Kunth) Nees.

Perennial or rarely annual. Culms robust, usually decumbent at base and forming a large clump, 1.2–1.8 m tall. Leaf sheaths loose, smooth and glabrous; leaf blades linear, lush, 10–40 × 1–1.5 cm, glabrous, midrib broad and white, margins harshly scabrous. Inflorescence nodding, large, loose, 15–25 cm; branches mostly compound, spikelets many, crowded on secondary branchlets. Spikelets purple-tinged, ovate-lanceolate, 2–3 mm, hispid on veins, the hairs not tubercle-based; lower glume 1/3–2/5 as long as spikelet; upper glume rostrate; lower lemma sterile, herbaceous, 5–7-veined, with a stout, 1–1.5 cm awn; upper lemma 2–2.5 mm. Fl. and fr. summer–autumn. $2n = 36, 54$.

Streamsides and other damp places. Anhui, Fujian, Guangdong, Guizhou, Hainan, Shaanxi, Sichuan [throughout the tropics].

This is a segregate from *Echinochloa crusgalli* with a larger, more branched inflorescence and smaller spikelets.

6. *Echinochloa glabrescens* Kossenko, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 11: 40. 1949.

硬稗 *ying fu bai*

Echinochloa crusgalli (Linnaeus) P. Beauvois var. *formosensis* Ohwi; *E. glabrescens* var. *barbata* Kossenko; *E. glabrescens* var. *glabra* Kossenko; *E. glabrescens* var. *pilosa* Kossenko; *E. micans* Kossenko; *E. pachychloa* Kossenko.

Culms erect or slightly decumbent at base, 50–120 cm tall. Leaf sheaths smooth and glabrous; leaf blades stiffly erect, linear, flat, 10–30 × 0.6–1.2 cm, glabrous, margins thickened, apex acuminate. Inflorescence narrow, 8–15 × 1–2(–3) cm; racemes 1–4 cm, simple. Spikelets light green, 3.5–5 mm, awnless or awned; glumes 5-veined; lower glume 1/3–1/2 as long as spikelet, acute; upper glume equal to spikelet, inconspicuously scabrous to shortly hispid along veins, cuspidate to awn-tipped; both lemmas coriaceous, hard and shining, especially down the center, the lower cuspidate to awned. Fl. and fr. summer–autumn. $2n = 54$.

Damp places, streams. Guangdong, Guangxi, Guizhou, Jiangsu, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Japan, Korea, Nepal; Africa].

This is an extreme variant from the *Echinochloa crusgalli* gene pool distinguished by the hard, glossy lower floret.

7. *Echinochloa crusgalli* (Linnaeus) P. Beauvois, Ess. Agrostogr. 53. 1812.

稗 *bai*

Annual. Culms coarse, erect or geniculately ascending, 20–150 cm tall. Leaf blades linear, 5–40 × 0.2–1.2 cm, usually glabrous, smooth except for scabrous margins, apex acute. Inflorescence erect, lanceolate to ovate or pyramidal, 6–22 cm; racemes 2–10 cm, usually ascending, simple or the longest with inconspicuous branchlets near the base, rachis usually with tubercle-based setae, spikelets loosely to densely crowded. Spikelets green or purplish, ovate, 2.5–4 mm, spinulose along veins; lower glume ca. 1/3 as long as spikelet, acute; lower lemma sterile, herbaceous, acuminate or extended into an awn to 3 cm; upper lemma pale brownish at maturity, elliptic, 2–3 mm. Fl. and fr. summer and autumn. $2n = 36, 48, 54, 72$.

Damp weedy places, streamsides, rice fields. Throughout China [warm-temperate and subtropical regions of the world].

Echinochloa crusgalli is a widespread, polymorphic weed with many intergrading variants. The following varieties may be recognized in China:

- 1a. Racemes with some secondary branching.
 - 2a. Racemes soft; awn of lower lemma 5–15(–30) mm 7a. var. *crusgalli*
 - 2b. Racemes stiff; awn of lower lemma absent or less than 5 mm 7b. var. *mitis*
- 1b. Racemes all simple.

- 3a. Spikelets 3–4 mm, awnless 7c. var. *zelayensis*
 3b. Spikelets 2.5–3 mm, awnless or with awn less than 5 mm.
 4a. Leaf blades 2–5 mm broad; racemes erect, appressed to axis 7d. var. *austrojaponensis*
 4b. Leaf blades 4–10 mm broad; racemes ascending.
 5a. Spikelets green 7e. var. *breviseta*
 5b. Spikelets purplish 7f. var. *praticola*

7a. *Echinochloa crusgalli* var. *crusgalli*

稗(原变种) bai (yuan bian zhong)

Panicum crusgalli Linnaeus, Sp. Pl. 1: 56. 1753; *Echinochloa hispidula* (Retzius) Nees; *Milium crusgalli* (Linnaeus) Moench; *Panicum hispidulum* Retzius; *Pennisetum crusgalli* (Linnaeus) Baumgarten.

Culms 50–150 cm tall. Leaf blades 10–40 × 0.5–2 cm. Inflorescence pyramidal, 6–20 cm; axis scabrous or with tubercle-based setae; racemes ascending, soft. Spikelets 3–4 mm, veins with tubercle-based setae; lower lemma with 5–15(–30) mm awn.

Damp weedy places, streamsides, rice fields. Throughout China [warm-temperate and subtropical regions of the world].

7b. *Echinochloa crusgalli* var. *mitis* (Pursh) Petermann, Fl. Lips. Excurs. 82. 1838.

无芒稗 wu mang bai

Panicum crusgalli var. *mite* Pursh, Fl. Amer. Sept. 66. 1813 [“1814”]; *Echinochloa crusgalli* subsp. *spiralis* (Vasinger) Tzvelev; *E. spiralis* Vasinger.

Culms robust, erect, 50–120 cm tall. Leaf blades 20–30 × 0.6–1.2 cm. Inflorescence 10–20 cm; racemes ascending or spreading, stiff, usually branched. Spikelets ca. 3 mm, awnless or with an awn less than 5 mm.

Roadsides, streamsides. Throughout China [warm-temperate and subtropical regions of the world].

7c. *Echinochloa crusgalli* var. *zelayensis* (Kunth) Hitchcock, Bull. U.S.D.A. 772: 238. 1920.

西来稗 xi lai bai

Oplismenus zelayensis Kunth, Nov. Gen. Sp. (quarto ed.) 1: 108. 1816 [“1815”]; *Echinochloa zelayensis* (Kunth) Schultes; *Panicum zelayense* (Kunth) Steudel.

Culms 50–75 cm tall. Leaf blades 5–20 × 0.4–1.2 cm. Inflorescence 11–19 cm. Spikelets 3–4 mm, hispid along veins but without tubercle-based setae; lower lemma usually awnless.

Streams, rice fields. Throughout China [America].

7d. *Echinochloa crusgalli* var. *austrojaponensis* Ohwi, Acta Phytotax. Geobot. 11: 38. 1942 [“*austro-japonensis*”].

小旱稗 xiao han bai

Culms 20–40 cm tall. Leaf blades often involute, 0.2–0.5

cm broad. Inflorescence narrow; racemes short, erect, appressed to axis. Spikelets purplish, 2.5–3 mm, hispid along veins; lower lemma awnless or with a short awn.

Streams, damp grasslands. Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [Japan (Ryukyu Islands), Philippines].

7e. *Echinochloa crusgalli* var. *breviseta* (Döll) Podpéra, Kvetena Moravy 6: 475. 1926.

短芒稗 duan mang bai

Panicum crusgalli var. *brevisetum* Döll, Fl. Bad. 1: 232. 1857.

Culms 30–70 cm tall. Leaf blades 8–15 × 0.4–0.6 cm. Inflorescence narrow, 8–10 cm. Spikelets green, ca. 3 mm, hispid along veins; lower lemma awnless or with a short awn less than 5 mm.

Grasslands. Guangdong, Taiwan [India, Malaysia, Sri Lanka; Africa].

7f. *Echinochloa crusgalli* var. *praticola* Ohwi, Acta Phytotax. Geobot. 11: 37. 1942.

细叶旱稗 xi ye han bai

Echinochloa crusgalli subsp. *submutica* (Meyer) Honda; *Panicum crusgalli* var. *submuticum* Meyer.

Culms usually purplish at base, 20–70 cm tall. Leaf blades 0.4–1 cm broad. Racemes simple, short, loose. Spikelets purplish, 2.5–3 mm, hispid along veins or with tubercle-based setae; lower lemma awnless.

Roadsides and other disturbed places. Anhui, Guangxi, Guizhou, Hebei, Hubei, Jiangsu, Taiwan, Yunnan [Japan].

This variety grows in rather drier conditions than the other varieties.

8. *Echinochloa caudata* Roshevitz in Komarov, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 91. 1936.

长芒稗 chang mang bai

Echinochloa crusgalli (Linnaeus) P. Beauvois subsp. *caudata* (Roshevitz) Tzvelev; *E. crusgalli* var. *caudata* (Roshevitz) Kitagawa.

Annual. Culms forming small dense tufts, 1–2 m tall. Leaf sheaths glabrous to tuberculate-hairy; leaf blades broadly linear, 10–40 × 1–2 cm, glabrous, margins thickened and scabrous. Inflorescence slightly nodding, spikelets dense, 10–25 × 1.5–4 cm, axis scabrous and bearing long tubercle-based setae. Spikelets purplish, ovate-elliptic, 2.5–4 mm; lower glume 1/3–2/5 as long as spikelet, acuminate; upper glume equaling spikelet, 5-veined, with a stout 0.1–0.2 mm mucro; lower lemma herbaceous, loosely hispid along veins, awn 3–5 cm; upper lemma coriaceous. Fl. and fr. summer–autumn.

Streams, fields, roadsides. Anhui, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Nei Mongol, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia (Far East)].

This is a segregate from *Echinochloa crusgalli* with a very dense, purple inflorescence and long awns.

164. ALLOTEROPSIS Presl, Reliq. Haenk. 1: 343. 1830.

毛颖草属 mao ying cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Culms erect or decumbent. Leaf blades convolute, linear or lanceolate. Inflorescence composed of slender racemes, these digitate or in whorls on a short common axis, each raceme with a weakly unilateral, narrowly triquetrous rachis, spikelets in pairs or clusters. Spikelets ovate to elliptic, dorsally compressed, florets 2; glumes unequal, acute to briefly awned; lower glume 1/2 spikelet length, membranous, 3-veined; upper glume as long as spikelet, herbaceous, 5–7-veined, ciliate along margins; lower floret staminate, lemma herbaceous, glabrous; lower palea much shorter than the anthers, bifid; upper lemma cartilaginous, margins inrolled, shortly awned; upper palea acute, the flaps basally auriculate. Caryopsis ellipsoid. $x = 9$.

Five species: tropical and S Africa, India, SE Asia, Australia; two species in China.

Alloteropsis is best distinguished from other panicoid genera by its awned spikelets and ciliate upper glume.

- 1a. Tussocky perennial; leaf blades linear, base narrow, margins smooth; raceme rachis pilose 1. *A. semialata*
 1b. Annual; leaf blades lanceolate, base cordate, margins pectinate; raceme rachis glabrous 2. *A. cimicina*

1. *Alloteropsis semialata* (R. Brown) Hitchcock, Contr. U. S. Natl. Herb. 12: 210. 1909.

毛颖草 mao ying cao

Perennial, tussocky from a short rhizome. Culms slender, erect, 30–70 cm, nodes bearded. Basal leaf sheaths persistent, densely and conspicuously silky hairy; leaf blades linear, flat or convolute, stiff, 10–50 × 0.1–1 cm, abaxial surface glabrous, adaxial surface sparsely to densely hairy, base narrow; ligule membranous, ca. 1 mm. Inflorescence digitate; racemes 2–4, 4–12 cm, narrowly ascending, rachis pilose, spikelets grouped on pedicels of varying length. Spikelets lanceolate, 5–6 mm, pale to dark brown, sometimes with transverse banding; glumes sharply acute to shortly awned; lower glume ovate; upper glume margins ciliate, occasionally winged; lower lemma with a small palea corresponding to a thin triangular basal patch on the lemma; upper lemma ovate-lanceolate, ca. 4 mm, smooth, with a rigid 2–3 mm awn-point. Anthers orange, ca. 3 mm. Fl. and fr. Feb–Aug. $2n = 18$.

Hill slopes. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Thailand, Vietnam; Africa, Pacific Islands].

Alloteropsis semialata is a polymorphic species, and is unique among grasses in possessing leaf anatomy corresponding to both C_3 and C_4 photosynthetic types. These physiological variants correspond very approximately to the color variants recognized below, which have been raised to subspecific rank for that reason. However, other morphological characters that have been used to separate the subspecies in South Africa do not result in a division into two taxa in China, so the subspecies are not upheld here. Investigations in South Africa have shown var. *eckloniana* to be diploid ($2n = 18$), whereas var. *semialata* comprises a polyploid series from tetraploid to octoploid.

- 1a. Lower lemma pale; racemes with loosely arranged spikelets 1a. var. *semialata*
 1b. Lower lemma purplish brown or with dark transverse bands; racemes with congested spikelets 1b. var. *eckloniana*

1a. *Alloteropsis semialata* var. *semialata*

毛颖草(原变种) mao ying cao (yuan bian zhong)

Panicum semialatum R. Brown, Prodr. 192. 1810; *Axonopus semialatus* (R. Brown) J. D. Hooker; *Oplismenus semialatus* (R. Brown) Desvaux; *Urochloa semialata* (R. Brown) Kunth.

Leaf anatomy: C_4 . Spikelets lax. Lower lemma pale. Fl. and fr. Feb–Aug. $2n = 18$.

Hill slopes. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Yunnan [India, Malaysia; Africa, Pacific Islands].

1b. *Alloteropsis semialata* var. *eckloniana* (Nees) Pilger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 14e: 37. 1940.

紫纹毛颖草 zi wen mao ying cao

Bluffia eckloniana Nees, Del. Sem. Hort. Hamburg. 1834: 8. 1834; *Alloteropsis eckloniana* (Nees) Hitchcock; *A. semialata* subsp. *eckloniana* (Nees) Gibbs-Russell; *Axonopus semialatus* var. *ecklonianus* (Nees) Peter; *A. semialatus* var. *ecklonii* Stapf, nom. illeg. superfl.; *Panicum semialatum* var. *ecklonianum* (Nees) Hackel ex T. Durand & Schinz.

Leaf anatomy: C_3 . Spikelets usually congested. Lower lemma purplish brown or with dark transverse bands. Fl. and fr. Feb–Aug. $2n = 54$.

Hill slopes. Guangdong, Guangxi, Yunnan [India, Indonesia, Malaysia; Africa, Pacific Islands].

2. *Alloteropsis cimicina* (Linnaeus) Stapf, Prain, Fl. Trop. Africa 9: 487. 1919.

臭虫草 chou chong cao

Milium cimicinum Linnaeus, Mant. Pl. 184. 1771; *Axonopus cimicinus* (Linnaeus) P. Beauvois; *Panicum cimicinum* (Linnaeus) Retzius; *Urochloa cimicina* (Linnaeus) Kunth.

Annual. Culms tufted, ascending, up to 60 cm tall. Leaf sheaths tuberculate-hispid; leaf blades lanceolate, cordate, 3–10 × 1–2 cm, abaxial surface pectinate-setose along margins and veins, adaxial surface glabrous; ligule ca. 1 mm, ciliate. Inflorescence digitate; racemes 4–6, 10–15 cm, narrowly ascending, rachis glabrous, bare of spikelets in the lower part, spikelets paired or single. Spikelets elliptic, 3.5–5.5 mm, pale green; low-

er glume ovate-lanceolate, ca. 2 mm, acuminate; upper glume papery, elliptic, shiny, margins ciliate with silky white or pinkish hairs, apex caudate; lower lemma similar to upper glume but thicker and glabrous; upper lemma ovate-elliptic, 3/5 spikelet length, obtuse with a fine scabrous 2–3 mm awn; upper palea

papillose with swollen lacrimiform hairs. Anthers purple, ca. 1 mm. Fl. Sep. $2n = 36$.

Weedy places, dry open forest. Hainan [Cambodia, India, Indonesia, Malaysia, Myanmar, New Guinea, Sri Lanka, Thailand; Africa, Australia, Pacific Islands].

165. BRACHIARIA (Trinius) Grisebach, Ledebour, Fl. Ross. 4: 469. 1853.

臂形草属 bi xing cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Panicum sect. *Brachiaria* Trinius, Gram. Panic. 51, 125. 1826.

Annual or perennial. Leaf blades linear to lanceolate, often with cartilaginous margins. Inflorescence composed of racemes along a central axis; raceme rachis triquetrous or flattened, sometimes winged; spikelets sessile or pedicelled, single or paired, rarely in fascicles or on secondary racemelets. Spikelets plump, usually elliptic, florets 2; lower glume adaxial, varying in length from very small and veinless to many-veined and subequaling spikelet, base sheathing, sometimes extended downward as a short stipe; upper glume and lower lemma similar, as long as spikelet, membranous or cartilaginous; upper lemma coriaceous, smooth, striate or rugose, margins inrolled, apex obtuse to acute, occasionally minutely mucronate; upper palea apex tucked within lemma. $x = 7, 9$.

About 100 species: tropics and subtropics mainly of the Old World, especially Africa; nine species (one endemic) in China.

Brachiaria is sometimes included within *Urochloa*, but usually they can be distinguished without difficulty.

- 1a. Culms robust, up to 2 m tall; inflorescence with 10–20 racemes 1. *B. mutica*
- 1b. Culms slender, up to 60 cm tall; inflorescence with less than 10 racemes.
 - 2a. Inflorescence with erect appressed racemes; fertile floret smooth and shiny, obtuse, readily falling from spikelet 2. *B. eruciformis*
 - 2b. Inflorescence with spreading racemes; fertile floret rugulose, acute to mucronate, persistent within the spikelet.
 - 3a. Spikelets 1.5–2.7 mm; leaf blades broadly lanceolate, 1–4 cm long.
 - 4a. Spikelets elliptic, 2–2.7 mm 3. *B. villosa*
 - 4b. Spikelets ovate, gibbous, 1.5–2 mm 4. *B. semiundulata*
 - 3b. Spikelets 2.5–4 mm; leaf blades lanceolate or linear-lanceolate, 4–15 cm long.
 - 5a. Spikelets paired, one subsessile and one pedicelled 5. *B. ramosa*
 - 5b. Spikelets single (except sometimes at raceme base).
 - 6a. Rachis of racemes triquetrous, 0.2–0.4 mm wide; spikelets herbaceous, pubescent or glabrous.
 - 7a. Spikelets contiguous, 3.8–4 mm, pubescent 6. *B. fusiformis*
 - 7b. Spikelets distant, 2.5–3.5 mm, glabrous 7. *B. kurzii*
 - 6b. Rachis of racemes flat on back, 0.4–0.5 mm wide; spikelets cartilaginous, glabrous or almost so.
 - 8a. Lower glume 1/3–1/2 spikelet length, separated from upper glume by a short internode; upper lemma subacute 8. *B. subquadripa*
 - 8b. Lower glume 1/2–3/5 spikelet length, not separated from upper glume; upper lemma mucronate 9. *B. urochlooides*

1. *Brachiaria mutica* (Forsskål) Stapf in Prain, Fl. Trop. Africa 9: 526. 1919.

巴拉草 ba la cao

Panicum muticum Forsskål, Fl. Aegypt.-Arab. 20. 1775; *Brachiaria purpurascens* (Raddi) Henrard; *P. barbinode* Trinius; *P. purpurascens* Raddi; *Urochloa mutica* (Forsskål) T. G. Nguyen.

Robust perennial. Culms stout, trailing and rooting freely from lower nodes, ascending to 2 m, 5–8 mm in diam., nodes densely villous. Leaf sheaths villous or glabrous; leaf blades broadly linear, 10–30 × 1–2 cm, thinly pilose or subglabrous; ligule membranous, 1–1.3 mm. Inflorescence axis 7–20 cm; racemes 10–20, 5–15 cm, single, paired or grouped; rachis narrow, winged, scabrous; spikelets paired or single in upper part of raceme, in untidy rows or sometimes on short secondary

branchlets in lower part of raceme; pedicels usually setose. Spikelets elliptic, green or purplish, 2.5–3.5 mm, glabrous, acute; lower glume triangular, 1/4–1/3 spikelet length, 1-veined; upper glume 5-veined; upper lemma rugulose, apex obtuse. Fl. and fr. Aug–Nov.

Forming a dense cover along streams and in other wet places, sometimes forming floating rafts. Fujian, Hong Kong, cultivated in Taiwan [tropical Africa and America].

This is a forage grass (Para Grass) widely cultivated in tropical regions of the world and often found as a naturalized escape. Its country of origin is unknown.

2. *Brachiaria eruciformis* (Smith) Grisebach, Fl. Ross. 4: 469. 1853.

臂形草 bi xing cao

Panicum eruciforme Smith in Sibthorp & Smith, Fl. Gra-

eca 1: 44, t. 59. 1806; *Brachiaria isachne* (Roth ex Roemer & Schultes) Stapf; *Echinochloa eruciformis* (Smith) Koch; *Moorochloa eruciformis* (Smith) Veldkamp; *P. caucasicum* Trinius; *P. isachne* Roth ex Roemer & Schultes.

Annual. Culms loosely tufted, slender, much branched, geniculately ascending, 30–40 cm tall, nodes softly hairy. Leaf sheaths glabrous or loosely tuberculate-hairy; leaf blades linear-lanceolate, 1.5–10.5 × 0.3–0.6 cm, glabrous or pilose; ligule ciliate. Inflorescence axis 3–6 cm; racemes 4–10, 1–3 cm, erect or narrowly ascending; rachis narrow, triquetrous, ciliate or scabrous; spikelets single, in 2 rows, overlapping. Spikelets elliptic, 1.8–3 mm, pilose, subacute; lower glume 0.2–0.3 mm, membranous, glabrous; upper glume and lower lemma as long as spikelet, 5-veined; upper floret readily deciduous, oblong, ca. 1.5 mm, thinly crustaceous, smooth, glossy, apex obtuse. Fl. and fr. summer–autumn. $2n = 18$.

Open and disturbed situations on hill slopes and in dry fields as an arable weed. Fujian, Guizhou, Yunnan [India, Malaysia, Thailand; N Africa, Mediterranean region].

This is the only species of *Brachiaria* occurring in China with a fertile floret which is shed from the mature spikelet. The fertile floret is also distinctive due to its smooth, glossy texture and obtuse apex.

This species and two close relatives in Africa have been placed in the separate genus *Moorochloa* Veldkamp.

3. *Brachiaria villosa* (Lamarck) A. Camus in Lecomte, Fl. Indo-Chine 7: 433. 1922.

毛臂形草 mao bi xing cao

Annual. Culms loosely tufted, slender, usually decumbent and branching below, 10–40(–50) cm tall. Leaf sheaths glabrous or pubescent, especially along margins and mouth; leaf blades broadly lanceolate, 1–4 × 0.3–1 cm, both surfaces glabrous to densely pubescent, base rounded or subcordate, margins cartilaginous, scabrous, apex acute; ligule ciliate. Inflorescence axis 3–7 cm; racemes 4–8, (1–)3–6 cm, secund, ascending; rachis triquetrous, ± villous; spikelets mostly single. Spikelets elliptic, 2–2.7 mm, without a stipe, glabrous or pubescent, sometimes transversely bearded below apex, acute or subacute; lower glume 1/3–1/2 spikelet length, clasping, 3-veined, acute; upper glume separated from lower by a slight internode, 5-veined; upper lemma striate and transversely rugulose, apex acute to minutely mucronate. Fl. and fr. Jul–Oct. $2n = 36$.

Mountain or hill slopes, fields, roadsides, other weedy or grassy places. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Myanmar, Nepal, Philippines, Thailand, Vietnam; Africa].

This is a weedy species recognizable by its short, broad, usually softly hairy leaf blades and secund racemes of rather small spikelets.

- 1a. Leaves, culms and spikelets pubescent 3a. var. *villosa*
 1b. Leaves, culms and spikelets glabrous
 except sheath margins 3b. var. *glabrata*

3a. *Brachiaria villosa* var. *villosa*

毛臂形草(原变种) mao bi xing cao (yuan bian zhong)

Panicum villosum Lamarck, Tab. Encycl. Méth. Bot. 1: 173. 1791; *Brachiaria villosa* var. *barbata* Bor; *P. coccosperrum* Steudel; *Urochloa coccosperrma* (Steudel) Stapf ex Reeder; *U. villosa* (Lamarck) T. Q. Nguyen.

Culms to 40 cm but often shorter. Leaf sheaths and blades ± pubescent. Spikelets puberulous or pubescent, upper glume and lower lemma sometimes with a subapical transverse white fringe.

Hill slopes, fields. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Myanmar, Nepal, Philippines, Thailand, Vietnam; Africa].

Forms with bearded spikelets have been separated as var. *barbata*, but as the type of *Panicum villosum* itself has bearded spikelets, the autonymic variety (var. *villosa*) is clearly synonymous and has statutory priority.

3b. *Brachiaria villosa* var. *glabrata* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22(6): 472. 1984.

无毛臂形草 wu mao bi xing cao

Culms ca. 50 cm. Leaf sheaths and blades glabrous except for ciliolate sheath margins. Spikelets glabrous, apex without white beard (but pedicels loosely hirsute).

- Roadsides, grassy places; ca. 800 m. Yunnan.

4. *Brachiaria semiundulata* (Hochstetter) Stapf in Prain, Fl. Trop. Africa 9: 556. 1919.

短颖臂形草 duan ying bi xing cao

Panicum semiundulatum Hochstetter ex A. Richard, Tent. Fl. Abyss. 2: 364. 1851.

Annual. Culms loosely tufted, slender, decumbent at base, rooting at lower nodes, 20–50 cm tall. Leaf sheaths pubescent; leaf blades ovate-lanceolate, 1–3 × 0.1–0.8 cm, both surfaces densely pubescent, margins cartilaginous, crinkled-serrate; ligule ciliate. Inflorescence axis 2–7 cm; racemes 5–8, 0.5–2 cm, ascending; rachis triquetrous, setose; spikelets single, in neat 2 rows, overlapping. Spikelets ovate, plump, strongly gibbous on abaxial side, flat on adaxial side, 1.5–2 mm, glabrous to pubescent, subacute; lower glume 1/3–2/5 spikelet length, 3-veined; upper glume 4/5 spikelet length, 5-veined; upper lemma swollen, striate, transversely rugulose, apex acute. Fl. and fr. Jul–Oct.

Mountain slopes, fields. Hainan, Yunnan [tropical Africa, S Asia].

5. *Brachiaria ramosa* (Linnaeus) Stapf in Prain, Fl. Trop. Africa 9: 542. 1919.

多枝臂形草 duo zhi bi xing cao

Panicum ramosum Linnaeus, Mant. Pl. 1: 29. 1767; *P. brachylachnum* Steudel; *P. canescens* Roth ex Roemer & Schultes; *Urochloa ramosa* (Linnaeus) T. Q. Nguyen.

Annual. Culms tufted, loosely ascending, 30–60 cm tall. Leaf sheaths glabrous to pubescent; leaf blades narrowly lanceolate, 4–12 × 0.4–0.8 cm, velvety-pubescent, margins thickened and slightly wavy, scaberulous, apex acuminate; ligule

short, ciliate. Inflorescence axis 6–13 cm; racemes 3–6, 2–5 cm, loosely erect to ascending; rachis triquetrous, hispid; spikelets mostly borne in loosely contiguous pairs, one spikelet subsessile, the other shortly pedicelled, single toward raceme apex, lightly appressed to axis. Spikelets elliptic, 2.5–3.5 mm, with a 0.1–0.5 mm basal stipe, glabrous, pubescent or hispidulous, acute to cuspidate; lower glume broadly ovate, 1/3–1/2 spikelet length, 5-veined; upper glume 5–7-veined; upper lemma distinctly rugose, apex acute. Fl. and fr. summer–autumn. $2n = 32$, 36.

Grasslands, hill slopes, weedy places. Hainan, Yunnan [Bhutan, Cambodia, India, Malaysia, Nepal, Pakistan, Thailand, Vietnam; Africa].

6. *Brachiaria fusiformis* Reeder, J. Arnold Arbor. 29: 274. 1948.

细毛臂形草 *xi mao bi xing cao*

Brachiaria subquadriflora var. *setulosa* S. L. Chen & Y. X. Jin; *Urochloa fusiformis* (Reeder) Veldkamp.

Annual. Culms loosely tufted, branching, 30–50 cm tall, basal internodes purplish, pubescent, upper internodes glabrescent. Leaf sheaths densely pilose; leaf blades lanceolate, 4–5.5 × 0.7–0.9 cm, densely pilose, base rounded, margins cartilaginous, scaberrulous and spinulose, apex acute; ligule 0.5–1.5 mm. Inflorescence axis 6–8 cm, pubescent; racemes 4–5, 3–5 cm, narrowly ascending to suberect, lowermost with basal racemelets; rachis triquetrous, 0.3–0.4 mm wide; spikelets single, their own length apart or overlapping; pedicels setose. Spikelets narrowly elliptic, 3.8–4 mm, with a 0.3–0.5 mm basal stipe, herbaceous, softly pubescent, strongly veined, apex sharply contracted, shortly acuminate; lower glume 1/2 spikelet length, clasping, 3–5-veined, obtuse; upper glume as long as spikelet, 5-veined, cross veinlets toward apex; lower lemma similar to upper glume, back flat to slightly sulcate; upper lemma shorter than spikelet, inconspicuously punctate-rugulose, apex acute, minutely scabrous-pubescent, slightly crested.

Mountain slopes. Yunnan (Yongsheng) [Indonesia, New Guinea, Philippines].

The Chinese population of this little-known species has larger spikelets than specimens from tropical SE Asia, but is otherwise typical. In the Philippines the spikelets have an apical fringe of longer hairs, but other *Brachiaria* species are also variable in this character. The very slender, triquetrous rachis and contracted, acuminate spikelet apex are unusual in the genus.

7. *Brachiaria kurzii* (J. D. Hooker) A. Camus in Lecomte, Fl. Indo-Chine 7: 438. 1922.

无名臂形草 *wu ming bi xing cao*

Panicum kurzii J. D. Hooker, Fl. Brit. India 7: 38. 1896 [“1897”]; *Urochloa kurzii* (J. D. Hooker) T. Q. Nguyen.

Annual. Culms decumbent or shortly stoloniferous, rooting at lower nodes, 15–60 cm long, nodes pubescent. Leaf sheaths glabrous, outer margin ciliate; leaf blades lanceolate, 5–8 × 0.8–1.8 cm, sparsely pilose, base cordate, margins thickened, setose near base, apex acuminate. Inflorescence axis 5–8 cm; racemes 3–7, 5–7.5 cm, divergent, the lower with short

racemelets bearing 2 (or infrequently more) spikelets; rachis triquetrous, 0.2–0.4 mm wide, with scattered bristles; spikelets single, distant; pedicels scabrid. Spikelets elliptic, 2.5–3.5 mm, glabrous, apex acute; lower glume ovate, 1/3 spikelet length, clasping, 3–5-veined, obtuse; upper glume 1/2 spikelet length, 7-veined, acuminate; lower lemma similar to upper glume, as long as spikelet, 5–7-veined, acute; upper lemma shorter than spikelet, rugose, apex briefly apiculate.

Thickets; ca. 1400 m. Yunnan (Jianshui) [India, Indonesia, Thailand; Australia (Queensland)].

8. *Brachiaria subquadriflora* (Trinius) Hitchcock, Lingnan Sci. J. 7: 214. 1931 [“1929”].

四生臂形草 *si sheng bi xing cao*

Annual or short-lived perennial. Culms slender, straggling, rooting at lower nodes, 20–60 cm tall, nodes pubescent. Leaf sheaths loose, glabrous or with tubercle-based hairs or ciliate margins; leaf blades lanceolate or linear-lanceolate, 4–15 × 0.4–1 cm, glabrous or pubescent, base subrounded, margins thicker and scabrous, apex acute or acuminate. Inflorescence axis 3–10 cm; racemes 3–6, 2–4 cm, divergent to reflexed; rachis flat, 0.7–1 mm wide, narrowly winged, nearly glabrous; spikelets single, in 2 rows; pedicels glabrous. Spikelets elliptic to narrowly obovate, (3–)3.5–4 mm, glabrous, acute; lower glume broadly ovate, 1/3–1/2 spikelet length, 5–7-veined; upper glume separated from lower glume by a short internode, 5–7-veined; upper lemma finely rugose, apex subacute. Fl. and fr. Sep–Nov. $2n = 72$.

Hill slopes, grassy places, fields, open forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan, Yunnan [tropical Asia, Australia, Pacific Islands].

This species is a troublesome weed.

- 1a. Spikelets elliptic, broadest at middle, acuminate 8a. var. *subquadriflora*
- 1b. Spikelets narrowly obovate, broadest above middle, acute 8b. var. *miliiformis*

8a. *Brachiaria subquadriflora* var. *subquadriflora*

四生臂形草(原变种) *si sheng bi xing cao* (yuan bian zhong)

Panicum subquadriflorum Trinius, Gram. Panic. 145. 1826; *P. pseudodistachyum* Hayata; *Urochloa subquadriflora* (Trinius) R. D. Webster.

Leaf sheaths and blades usually glabrous, rarely with tubercle-based hairs on sheaths or pubescent on both surfaces of blades. Pedicels glabrous. Spikelets elliptic, broadest in middle, glabrous. Fl. and fr. Sep–Nov.

Mountain slopes, grassy places, fields, open forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan [tropical Asia, Pacific Islands].

8b. *Brachiaria subquadriflora* var. *miliiformis* (Presl) S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 472. 1984.

锐头臂形草 *rui tou bi xing cao*

Panicum miliiforme Presl, Reliq. Haenk. 1: 300. 1830; *Brachiaria miliiformis* (Presl) A. Chase.

Leaf sheaths glabrous or loosely tuberculate-hairy or margins ciliate. Pedicels glabrous. Spikelets narrowly obovate, broadest above middle, 3–3.5 mm, acute. Fl. and fr. autumn. $2n = 54-56, 72$.

Roadsides, grassy places. Hong Kong, Yunnan [India, Malaysia, Sri Lanka].

9. *Brachiaria urochlooides* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 471. 1984. [*“urocoides”*].

尾稃臂形草 wei fu bi xing cao

Annual. Culms slender, decumbent and rooting at base, branching, 40–60 cm tall. Leaf sheaths glabrous or with tubercle-based hairs, ciliate along one margin; leaf blades linear-lanceolate, $5-9 \times 0.3-0.5$ cm, both surfaces with tubercle-based

hairs, margins cartilaginous, scabrous, apex acute; ligule ciliate, hairs ca. 1 mm. Inflorescence axis 1–2.5 cm; racemes 2–4, 1.5–3 cm, secund, ascending; rachis scarcely winged, 0.5–0.6 mm wide, scabrous on edges; spikelets single or paired in the lower part. Spikelets lanceolate, 3.5–4 mm, without a stipe, subglabrous, abruptly acuminate; lower glume ovate, $1/2-3/5$ spikelet length, clasping, 3–5-veined, acute; upper glume 5-veined, thinly pubescent near margins; upper lemma clearly shorter than spikelet, ca. 2.5 mm, rugulose, apex mucronate. Fl. and fr. May–Oct.

• Grassy places. S Yunnan.

This species resembles *Urochloa* in its mucronate upper lemma, but the lower glume is adaxial and characters of the leaf epidermis show it to be better placed in *Brachiaria*.

166. *UROCHLOA* P. Beauvois, Ess. Agrostogr. 52. 1812.

尾稃草属 wei fu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials, often coarse and weedy. Leaf blades linear to broadly lanceolate; ligule a ciliate membrane. Inflorescence composed of racemes along a central axis; spikelets single or paired on a flattened or triquetrous rachis. Spikelets lanceolate or elliptic, plano-convex, cuspidate to acuminate, florets 2; lower glume abaxial, variable in length; upper glume and lower lemma similar, as long as spikelet, membranous to firmly papery; upper lemma coriaceous, rugulose or granular, margins inrolled, shorter than spikelet with a slender mucro lying within the cuspidate spikelet tip. $x = 7, 10, 16$.

Twelve species: tropics of the Old World; four species in China.

Urochloa is closely related to *Brachiaria*, and the two are united by some authors. They are distinguished mainly by habit, *Urochloa* having rather more flattened, cuspidate spikelets enclosing a pronounced mucro from the upper lemma. The different spikelet orientation is also characteristic, though not obvious when the spikelets are paired. In *Urochloa* the lower glume faces outward, whereas in *Brachiaria* it lies against the rachis.

- 1a. Lower glume $2/3-3/4$ spikelet length 1. *U. paspaloides*
- 1b. Lower glume less than $1/3$ spikelet length.
 - 2a. Spikelets 2–2.5 mm 2. *U. reptans*
 - 2b. Spikelets 3.5–5 mm.
 - 3a. Perennial from a knotty rootstock; spikelets paired; fertile floret with a tiny mucro ca. 0.1 mm 3. *U. setigera*
 - 3b. Annual, spikelets usually single or paired only at base; fertile floret with a pronounced mucro 0.3–1 mm 4. *U. panicoides*

1. *Urochloa paspaloides* J. Presl, Reliq. Haenk. 1: 318. 1830.

雀稗尾稃草 que bai wei fu cao

Brachiaria ambigua (Trinius) A. Camus; *B. paspaloides* (J. Presl) C. E. Hubbard; *Panicum ambiguum* Trinius; *Urochloa ambigua* (Trinius) Pilger.

Annual. Culms slender, spreading, branching and rooting at lower nodes, 20–60 cm or more tall, nodes pubescent. Leaf sheaths glabrous or loosely pilose; leaf blades linear, $5-20 \times 0.3-0.8$ cm, thinly pilose on both surfaces with tubercle-based hairs, apex acuminate; ligule ca. 1 mm. Inflorescence axis 1.5–4 cm; racemes 2–4, 2–5 cm, rather stiffly ascending; rachis narrow, triquetrous, scabrous; spikelets usually paired, loosely overlapping. Spikelets lanceolate, 3.5–4 mm, glabrous, sharply acute; lower glume lanceolate, $2/3-3/4$ spikelet length, 5–7-veined, acute and apiculate; upper glume 5–7-veined, sharply acute; lower lemma obscurely 5-veined, palea very small; upper lemma elliptic-oblong, only slightly shorter than spikelet, finely rugulose, mucro 0.4–0.5 mm. Fl. and fr. May–Oct. $2n = 36$.

Mountain slopes, forests. Hainan, Yunnan [India, Japan (Ryukyu Islands), Malaysia, Philippines, Sri Lanka].

This is the only species of *Urochloa* in China with a long lower glume.

2. *Urochloa reptans* (Linnaeus) Stapf in Prain, Fl. Trop. Africa 9: 601. 1920.

尾稃草 wei fu cao

Annual. Culms slender, creeping, rooting at lower nodes, ascending to 10–50 cm tall. Leaf sheaths glabrous, one margin densely ciliate; leaf blades lanceolate, $2-6 \times 0.3-1.2$ cm, glabrous or loosely hispidulous, base subcordate, margins scabrous, pectinate-ciliate at base; ligule ca. 1 mm, ciliate. Inflorescence pyramidal, axis 1–8 cm; racemes 3–6(–12), 0.5–4 cm, spreading; rachis triquetrous, scabrous; spikelets paired, crowded, pedicels setose. Spikelets ovate or ovate-elliptic, 2–2.5 mm, usually glabrous, acute; lower glume cufflike, $1/8-1/4$ spikelet length, thinly membranous, veinless or obscurely 3-veined, truncate or rounded; upper glume (5–)7–9-veined; lower lemma 5-veined, palea well developed; upper lemma broadly elliptic, 1.8–2 mm, finely rugose, apiculate. Fl. and fr. summer–autumn. $2n = 14, 18$.

Grassy places, fields. Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Taiwan, Yunnan [tropics throughout the world].

This weedy species is widely distributed in the Old World and introduced in America. It is a borderline species in the genus: the small, plump spikelets are reminiscent of *Brachiaria*, where it is placed by some authors.

- 1a. Rachis and pedicels with long tubercle-based setae 2a. var. *reptans*
1b. Rachis and pedicels glabrous 2b. var. *glabra*

2a. *Urochloa reptans* var. *reptans*

尾稃草(原变种) wei fu cao (yuan bian zhong)

Panicum reptans Linnaeus, Syst. Nat., ed. 10, 2: 870. 1759; *Brachiaria prostrata* (Lamarck) Grisebach; *B. reptans* (Linnaeus) C. A. Gardner & C. E. Hubbard; *Panicum prostratum* Lamarck.

Rachis of raceme and pedicels with long tubercle-based setae.

Grassy places, fields. Guangdong, Guangxi, Guizhou, Hunan, Sichuan, Taiwan, Yunnan [tropics throughout the world].

2b. *Urochloa reptans* var. *glabra* S. L. Chen & Y. X. Jin, Acta Phytotax. Sin. 22: 475. 1984.

光尾稃草 guang wei fu cao

Rachis of raceme and pedicels glabrous.

- Grassy and waste places. Yunnan.

3. *Urochloa setigera* (Retzius) Stapf in Prain, Fl. Trop. Africa 9: 598. 1920.

刺毛尾稃草 ci mao wei fu cao

Panicum setigerum Retzius, Observ. Bot. 4: 15. 1786; *Brachiaria setigera* (Retzius) C. E. Hubbard; *Urochloa cordata* Keng ex S. L. Chen & Y. X. Jin.

Perennial from a knotty base. Culms rigid, decumbent, ascending to 1 m, nodes densely bearded. Leaf sheaths puberulous and with tubercle-based hairs, one margin ciliate; leaf blades lanceolate, 8–15 × 1.8–2.5 cm, pubescent, base cordate-amplexicaul, margins scabrous, pectinate-ciliate usually at least

to the middle, apex acuminate; ligule ca. 2 mm, ciliate. Inflorescence axis 6–13 cm; racemes 6–12, 2–5 cm, ascending; spikelets usually paired, setose especially on pedicels. Spikelet ovate-lanceolate, 4–5 mm, densely pubescent, acuminate-cuspidate; lower glume ovate, ca. 1/5 spikelet length, triangular, subacute; upper glume (5–)7–9-veined; lower lemma slightly shorter than upper glume, staminate or sterile, 5–7-veined, palea well developed, keels very narrowly winged upward; upper lemma broadly elliptic, coriaceous, rugulose, mucro ca. 0.1 mm. Fl. and fr. Jul–Sep.

Forests. Guangdong, Hainan [India, Myanmar, Nepal, Sri Lanka, Thailand].

4. *Urochloa panicoides* P. Beauvois, Ess. Agrostogr. 53. 1812.

类黍尾稃草 lei shu wei fu cao

Panicum panicoides (P. Beauvois) Hitchcock; *Urochloa jinshaicola* B. S. Sun & Z. H. Hu; *U. longifolia* B. S. Sun & Z. H. Hu; *U. longifolia* var. *yuanmuensis* (B. S. Sun & Z. H. Hu) S. L. Chen & Y. X. Jin; *U. yuanmuensis* B. S. Sun & Z. H. Hu.

Annual. Culms loosely tufted, geniculate ascending, 20–80 cm tall, nodes bearded. Leaf sheaths loose, with tubercle-based setae, one margin densely ciliate; leaf blades linear-lanceolate, 5–15(–20) × 0.5–1.5 cm, glabrous to thinly pilose, margins pectinate-ciliate at least toward amplexicaul base, apex acuminate; ligule 1.5–2 mm. Inflorescence axis 3–6 cm; racemes 3–10, 2–6 cm, stiff, diverging; rachis flattened, setose mainly from the short stout pedicels; spikelets usually borne singly or in pairs at base, occasionally mostly paired, overlapping by ca. 1/3 their length. Spikelets ovate-elliptic, 4–5 mm, glabrous or pubescent, cuspidate; lower glume ovate, 1/4–1/3 spikelet length, 3–5-veined, obtuse; upper glume 5–9-veined with evident cross veins; upper lemma rugose, mucro 0.4–1 mm. Fl. and fr. Sep–Oct.

Moist grasslands, lakesides. Sichuan, Yunnan [Bhutan, India; E and S Africa].

Urochloa setigera can be confused with forms of *U. panicoides* with pubescent, paired spikelets, especially when the base is missing. *Urochloa panicoides* has less abruptly cuspidate spikelets, a more coarsely rugose fertile floret, and a much longer mucro on the upper lemma.

167. *ERIOCHLOA* Kunth, Nov. Gen. Sp. 1: 94. 1816.

野黍属 ye shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Leaf blades linear, flat; ligule ciliate. Inflorescence of racemes along a central axis, spikelets pedicellate, single, paired or clustered on a narrow rachis, adaxial. Spikelets lanceolate to elliptic, thinly biconvex, subcartilaginous, acute to aristate, a little globose swelling at spikelet base, florets 2; lower glume vestigial; upper glume equaling spikelet, facing outward, often awn-pointed; lower lemma similar but usually slightly shorter, neuter or staminate, with or without palea; upper lemma crustaceous, papillose, margins inrolled, apex obtuse and often mucronate. $x = 9$.

About 30 species: tropical and warm-temperate regions of the world, especially tropical Africa and America; two species in China.

The main diagnostic feature of *Eriochloa* is the beadlike swelling at the spikelet base. This is formed by the swollen lowest rachilla internode and adnate lower glume. The lanceolate, pointed spikelets are also characteristic.

- 1a. Racemes densely pilose; spikelets single, 4.5–5 mm; upper lemma subacute to acute 1. *E. villosa*

1b. Racemes glabrous or almost so; spikelets paired or in threes, 3–4 mm; upper lemma with ca. 0.5 mm mucro 2. *E. procera*

1. *Eriochloa villosa* (Thunberg) Kunth, Révis. Gramin. 1: 30. 1829.

野黍 *ye shu*

Paspalum villosum Thunberg in Murray, Syst. Veg., ed. 14, 105. 1784; *Eriochloa villosa* var. *stenantha* Ohwi; *Panicum tuberculiflorum* Steudel.

Annual. Culms erect or geniculately ascending, branching, 30–100 cm tall, nodes pubescent. Leaf sheaths loose, glabrous, pubescent or ciliate along one margin; leaf blades broadly linear, 5–25 × 0.5–1.5 cm, pubescent, margins firm, wavy, scaberrulous, apex acute. Inflorescence axis 7–15 cm; racemes 4–8, 1.5–4 cm, erect or only slightly diverging; spikelets single, closely overlapping in 2 rows; axis and rachis densely pubescent, rachis margins and pedicels villous with spreading hairs. Spikelets ovate-elliptic, plump, thinly cartilaginous, dully shining, 4.5–5(–6) mm, acute, basal swelling ca. 0.5 mm; free portion of lower glume ca. 0.2 mm truncate frill; upper glume and lower lemma 5–7-veined, puberulous, lower palea absent; upper lemma weakly rugulose, subacute. Fl. and fr. Jul–Oct. $2n = 54$.

Mountain slopes, moist places. Anhui, Fujian, Guangdong, Guizhou, Heilongjiang, Henan, Hubei, Jiangxi, Jiangsu, Jilin, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Tianjin, Yunnan, Zhejiang [Japan, Korea, Russia (Far East), Vietnam].

2. *Eriochloa procera* (Retzius) C. E. Hubbard, Bull. Misc. In-

form. Kew 1930: 256. 1930.

高野黍 *gao ye shu*

Agrostis procera Retzius, Observ. Bot. 4: 19. 1786; *A. ramosa* (Retzius) Poirét; *Eriochloa annulata* (Flüggé) Kunth; *E. hackelii* Honda; *E. ramosa* (Retzius) Kuntze; *Milium ramosum* Retzius; *Paspalum annulatum* Flüggé.

Annual or short-lived perennial. Culms erect or geniculately ascending, branching, 30–150 cm tall, nodes pubescent. Leaf sheaths keeled, glabrous; leaf blades linear, 8–20 × 0.2–0.8 cm, glabrous, apex acuminate. Inflorescence axis 10–20 cm; racemes several, 3–7 cm, loosely ascending, bare of spikelets proximally; spikelets mostly paired, single toward raceme apex; axis and rachis very slender, puberulous, pedicels usually without setae, those of a pair often partially connate. Spikelets lanceolate, 3–4 mm, herbaceous, sharply acute, basal swelling ca. 0.3 mm and often purplish; lower glume minute; upper glume and lower lemma 5-veined, pilose with appressed silky hairs, lower palea absent; upper lemma rugulose-punctulate, mucro 0.3–0.5 mm. Fl. and fr. summer–autumn. $2n = 36$.

Streams, moist places. Fujian, Guangdong, Hainan, Taiwan [India, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia; introduced in Africa, tropical America].

This species is a good forage grass.

168. THUAREA Persoon, Syn. Pl. 1: 110. 1805.

蒺藜草属 *chu lei cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials. Culms creeping. Leaf blades linear-lanceolate, stiff; ligule ciliate. Inflorescence monoecious, composed of a single deciduous raceme with foliaceous rachis bearing 1–2 persistent bisexual or female spikelets at the base and several deciduous staminate spikelets above, spikelets secund in one row; staminate portion of the rachis shedding the spikelets after fertilization and folding onto the fertile spikelets, thus enclosing them in a capsule-like fruit-case. Bisexual spikelets adaxial, biconvex, florets 2; lower glume small or suppressed; upper glume equal to spikelet, 5-veined; lower floret neuter or staminate, its lemma resembling upper glume, palea often deeply split; upper floret fertile, thinly papery, its lemma with flat margins and hairy apex. Staminate spikelets similar but both florets staminate, smaller than the bisexual florets, with thinner scales. $x = 9$.

Two species: Madagascar to Polynesia, on sandy seashores; one species in China.

1. *Thuarea involuta* (G. Forster) R. Brown ex Smith, Cycl. 35. 1817 [“1819”].

蒺藜草 *chu lei cao*

Ischaemum involutum G. Forster, Fl. Ins. Austr. 73. 1786; *Thuarea latifolia* R. Brown; *T. media* R. Brown; *T. sarmentosa* Persoon.

Culms long and creeping, much branched, rooting at nodes, flowering culms up to 20 cm tall. Leaf sheaths loose, imbricate on the short erect shoots, pilose or only ciliate along margins; leaf blades 2–5 × 0.3–0.8 cm, usually puberulous on both surfaces; ligule 0.5–1 mm. Inflorescence a terminal raceme, not exerted from the uppermost spathe-like leaf sheath; rachis broad and winglike in lower fertile part, nar-

rowed above in staminate part. Spikelets pubescent; staminate spikelet oblong-lanceolate, 3–4 mm; fertile spikelet ovate-lanceolate, 3.5–4.5 mm. Fl. and fr. Apr–Dec.

Sandy seashores. Guangdong, Hainan, Taiwan [Indonesia, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Indian Ocean Islands, Madagascar, Pacific Islands (Polynesia)].

The short flowering shoots bend down as the seed ripens, and the seed may become buried in the sand. The plant is an efficient sand binder, and the prostrate, rooting stems form widely spreading mats. With its curious, watertight, buoyant fruit-case, this grass is also adapted to long-distance dispersal by sea.

The combination *Thuarea involuta* has often been attributed to Roemer & Schultes (Syst. Veg. 2: 808. 1817), but this was not published until November 1817, whereas Smith published in May of that year.

169. PASPALUM Linnaeus, Syst. Nat., ed. 10, 2: 855. 1759.

雀稗属 que bai shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials or annuals. Culms tufted, or with creeping rhizomes and stolons. Leaf blades linear or narrowly lanceolate, flat; ligule membranous. Inflorescence composed of single, digitate or scattered racemes; rachis flat, often winged; spikelets single or paired, pedicellate in 2–4 rows, densely crowded, lower lemma abaxial. Spikelets orbicular, ovate or elliptic plano-convex; lower glume absent or rarely present as a small scale; upper glume as long as spikelet or nearly so, rarely absent, convex, membranous to subpapery, 3–7-veined; lower lemma resembling upper glume, flat, neuter without palea; upper lemma usually coriaceous to crustaceous, rarely softer, margins inrolled, apex obtuse to apiculate. $x = 10$.

About 330 species: tropical and warm-temperate regions, especially in the New World; 16 species (two endemic, eight introduced) in China.

This genus includes a number of good forage grasses and also some widespread weeds.

- 1a. Spikelets with a marginal ciliate fringe of silky hairs; hairs 1–2 mm.
 - 2a. Racemes 2, paired; stoloniferous perennial 1. *P. conjugatum*
 - 2b. Racemes usually more than 2, spread along an axis.
 - 3a. Spikelets 3–4 mm; upper floret equal to 2/3 length of spikelet 2. *P. dilatatum*
 - 3b. Spikelets 2–3 mm; upper floret equal to or only slightly shorter than spikelet.
 - 4a. Spikelets light green or purplish, ovate; upper glume pubescent, fringed along whole length 3. *P. urvillei*
 - 4b. Spikelets brown, obovate; upper glume puberulous, fringed only above middle 4. *P. virgatum*
- 1b. Spikelets glabrous or pubescent, without a marginal fringe of silky hairs.
 - 5a. Upper glume and lower lemma broadly winged along margins 5. *P. fimbriatum*
 - 5b. Upper glume and lower lemma not winged.
 - 6a. Both glumes absent; upper lemma papery, with conspicuous riblike veins. 6. *P. malacophyllum*
 - 6b. Upper glume present; upper lemma cartilaginous or coriaceous, with obscure veins.
 - 7a. Plants with long stolons and/or rhizomes; racemes 2(–3), paired, the spikelets borne singly; spikelets lanceolate to ovate or obovate.
 - 8a. Plant with robust woody rhizomes; upper glume and lower lemma cartilaginous and shiny, obtuse 7. *P. notatum*
 - 8b. Plant with slender stolons; upper glume and lower lemma papery, acute.
 - 9a. Upper glume pubescent; spikelets plano-convex, obovate-oblong 8. *P. distichum*
 - 9b. Upper glume glabrous; spikelets strongly flattened, lanceolate-oblong 9. *P. vaginatum*
 - 7b. Plants tufted; racemes up to 20 along a common axis, the spikelets single or paired; spikelets broadly elliptic, obovate or suborbicular.
 - 10a. Fertile floret dark glossy brown at maturity; spikelets usually glabrous.
 - 11a. Lower lemma conspicuously rugose inside margins; spikelets paired 10. *P. plicatulum*
 - 11b. Lower lemma usually smooth, occasionally slightly rugose; spikelets usually single, occasionally paired.
 - 12a. Pedicels glabrous; nodes, culm apex and leaf blades often glabrous 11. *P. scrobiculatum*
 - 12b. Pedicels pilose; nodes, culm apex and leaf blades densely hairy 12. *P. hirsutum*
 - 10b. Fertile floret yellowish green to pale brown at maturity; spikelets pubescent or glabrous.
 - 13a. Spikelets 1–1.5 mm 13. *P. paniculatum*
 - 13b. Spikelets 2–3 mm.
 - 14a. Rachis 2–4 mm wide; spikelets 2–2.5 mm, paired, pubescent 14. *P. longifolium*
 - 14b. Rachis 1–1.5 mm wide; spikelets 2.5–3 mm, single or loosely paired.
 - 15a. Upper glume pubescent especially along the margins; leaf blades hirsute, 5–8 mm wide 15. *P. thunbergii*
 - 15b. Upper glume glabrous; leaf blades glabrous, 3–4 mm wide 16. *P. delavayi*

1. Paspalum conjugatum Bergius, Acta Helv. Phys.-Math. 7: 129. 1772.

两耳草 liang er cao

Perennial with long stolons. Culms in small tufts along the stolons, compressed, nearly solid, 30–60 cm tall. Leaf sheaths keeled, glabrous or pilose along upper margins and mouth, a line of hairs abaxially at junction with blade; leaf blades lanceolate-linear, thin, 5–20 × 0.5–1 cm, glabrous or papillose-pilose along margins, apex acute. Inflorescence digitate; racemes 2,

divaricate, very slender, 6–12 cm; spikelets single, in 2 rows; rachis 0.5–1 mm wide. Spikelets pale yellowish, ovate to suborbicular, 1.5–1.8 mm, abruptly acute; upper glume hyaline, 2-veined with the veins marginal, ciliate along margins with long silky hairs; lower lemma similar but not ciliate; upper lemma pallid at maturity, ovate, as long as spikelet, crustaceous, obscurely striate. Fl. and fr. May–Sep. $2n = 40, 80$.

Open places in forests, forest margins, mostly on moist soils, sometimes forming a sward. Fujian, Guangxi, Hainan, Hong Kong, Taiwan, Yunnan [tropics and subtropics throughout the world].

This is a distinctive species, easily recognized by the combination of a stoloniferous habit and an inflorescence composed of a pair of widely spreading racemes with small, pale, fringed spikelets.

2. *Paspalum dilatatum* Poiret, Encycl. 5: 35. 1804.

毛花雀稗 mao hua que bai

Digitaria dilatata (Poiret) H. J. Coste.

Perennial from a short rhizome. Culms forming a coarse, spreading tuft, 50–150 cm tall, ca. 5 mm in diam., glabrous. Leaf sheaths glabrous or pilose in the lower part; leaf blades linear, 10–45 × 0.3–1.2 cm, glabrous, apex attenuate; ligule 2–4 mm. Inflorescence axis 2–20 cm; racemes 2–10, 5–12 cm, spaced, diverging, axils pilose; spikelets paired; rachis 1–1.5 mm wide, glabrous. Spikelets green or purplish, broadly ovate, 3–4 mm, sharply acute; upper glume membranous, 5–9-veined, sparsely pubescent to almost glabrous on back, margins fringed with long white hairs; lower lemma similar but not hairy; upper lemma pallid at maturity, orbicular, ca. 2 mm, clearly shorter than spikelet, papillose-striate, apex rounded. Fl. and fr. May–Jul. $2n = 40$, 50–63.

Roadsides, waste places, naturalized. Fujian, Guangxi, Guizhou, Hong Kong, Hubei, Shanghai, Taiwan, Yunnan, Zhejiang [native to South America].

This native of South America is now widely distributed throughout the tropics as a forage grass and also occurs as a weed of cultivation.

3. *Paspalum urvillei* Steudel, Syn. Pl. Glumac. 1: 24. 1853.

丝毛雀稗 si mao que bai

Perennial from a short rootstock. Culms robust, up to 2 m tall, glabrous. Leaf sheaths densely hispid, long hairs at the mouth; leaf blades linear, 15–50 × 0.5–1.5 cm, glabrous or pilose at the base, apex attenuate; ligule 3–5 mm. Inflorescence axis 10–30 cm; racemes 10–25, 8–15 cm, narrowly ascending or suberect; spikelets paired; rachis ca. 0.5 mm wide. Spikelets light green or purplish, ovate, 2–3 mm, sharply acute; upper glume membranous, 3-veined with laterals marginal, appressed-pubescent on back, margins densely fringed with long white hairs; lower lemma similar but glabrous on back; upper lemma elliptic, striate, obtuse. Fl. and fr. May–Oct. $2n = 40$, 60.

Roadsides, waste places, introduced. Fujian, Hong Kong, Taiwan [native to South America].

This is a native of South America related to *Paspalum dilatatum* and likewise introduced widely in the tropics as a forage grass and weed.

4. *Paspalum virgatum* Linnaeus, Syst. Nat., ed. 10, 2: 855. 1759.

粗秆雀稗 cu gan que bai

Perennial from short rootstock. Culms robust, forming a dense tussock, erect, 1–2 m tall. Leaf sheaths compressed, usually papillose-hirsute at margins and summit; leaf blades linear, flat, stiff, 30–75 × 1–2.5 cm, margins serrate, apex acuminate; ligule 2–3 mm. Inflorescence axis 10–30 cm; racemes up to 20, 5–15 cm, ascending or drooping; spikelets paired, in 4 dense rows; rachis 0.5–1.5 mm wide, scabrous, glabrous or with a few setae. Spikelet brownish, obovate, 2.2–3 mm, acute;

upper glume membranous, 3–5-veined, dorsally puberulous, margins fringed with short silky hairs above middle; lower lemma resembling upper glume but glabrous; upper lemma brownish, as long as spikelet, coriaceous, finely punctulate-striate, subacute. Fl. and fr. summer–autumn. $2n = 40$, 80.

Moist or swampy ground, naturalized. N Taiwan [native to America from the United States to Brazil].

5. *Paspalum fimbriatum* Kunth, Nov. Gen. Sp. 1: 93. 1816 [“1815”].

裂颖雀稗 lie ying que bai

Annual. Culms tufted, erect, 30–100 cm tall. Leaf sheaths thinly hispid; leaf blades linear-lanceolate, 10–30 × 0.3–1 cm, both surfaces coarsely appressed hispid especially toward base, margins pectinate-ciliate, apex acuminate; ligule ca. 2 mm. Inflorescence axis 6–10 cm; racemes 3–5, 3–7 cm, loosely ascending, axils with long stiff hairs; spikelets usually paired but one of the pair often reduced; rachis flat, 1.2–1.5 mm wide, serrate-margined. Spikelets often purplish, circular in outline, 2.5–3.5 mm, acute; upper glume ovate, 3-veined, with stiff marginal wings ca. 1 mm wide, wings lacerate, wing margin ciliate with short stout hairs; lower lemma similar to upper glume but wing less developed; upper lemma ovate-elliptic, slightly shorter than spikelet, smooth, shining. Fl. and fr. summer–autumn. $2n = 40$.

Recently naturalized. Taiwan [native to Central and South America and the West Indies].

Paspalum fimbriatum is easily separable from other species of *Paspalum* in China by its distinctive, winged spikelets.

6. *Paspalum malacophyllum* Trinius, Sp. Gram. 3: t. 271. 1836.

稜稃雀稗 leng fu que bai

Perennial with short rhizomes. Culms slender to robust, 1–2 m tall. Leaf sheaths papillose-pilose in upper part and mouth; leaf blades linear-lanceolate, flat, 10–40 × 0.6–3 cm, glabrous or pilose, the lower narrowed to a slender base, apex long acuminate; ligule ca. 2 mm. Inflorescence axis 4–20 cm; racemes up to 30, 3–6 cm, ascending, axils long pilose; spikelets paired, in 4 dense rows; rachis winged, 0.5–1.5 mm wide, margins scabrous, sometimes setose. Spikelets often purplish, oblong-navicular, 1.5–2.5 mm, glabrous; both glumes absent; lower lemma as long as spikelet, concave, membranous, 3-veined with laterals marginal; upper lemma dorsally convex, papery, 5-veined, veins prominent and forming ribs, apex acute. Fl. and fr. summer–autumn. $2n = 20$, 40.

Cultivated. Gansu [native to South America].

This is the only species of *Paspalum* in China lacking both glumes.

The species is cultivated for hay and sometimes used in soil conservation work.

7. *Paspalum notatum* Flügge, Gram. Monogr., Paspalum 106. 1810.

百喜草 bai xi cao

Perennial with stout, woody, many-noded rhizomes and stolons forming a mat. Culms 15–80 cm tall. Leaf sheaths

keeled, compressed, glabrous; leaf blades broadly linear, flat or folded, stiffly spreading, $5-30 \times 0.3-1$ cm, glabrous, apex acuminate; ligule very short. Inflorescence of 2(-3) racemes at culm apex; racemes 4-9(-16) cm, recurved-ascending; spikelets single, in 2 row; rachis 1-1.8 mm wide, scabrous. Spikelets green, ovate to obovate, plumply plano-convex, 2.5-3.5 mm, smooth, shining, obtuse; upper glume cartilaginous, 3-veined, glabrous; lower lemma resembling upper glume but slightly shorter; upper lemma pale green, slightly shorter than spikelet, finely striate, obtuse. Fl. and fr. Sep. $2n = 40, 30$.

Cultivated. Fujian, Gansu, Hebei, Yunnan [native to tropical and subtropical America].

This species is widely introduced in tropical and warm-temperate regions as a forage grass and also sometimes for erosion control.

8. *Paspalum distichum* Linnaeus, Syst. Nat., ed. 10, 2: 855. 1759.

双穗雀稗 shuang sui que bai

Digitaria paspalodes Michaux; *Paspalum paspalodes* (Michaux) Scribner.

Perennial with rhizomes and stolons. Culms 20-50 cm tall, nodes usually pubescent. Leaf sheaths keeled, glabrous, margins ciliate; leaf blades linear, $5-10 \times 0.3-0.7$ cm, glabrous, apex acute; ligule 2-3 mm. Inflorescence of 2(-3) racemes arising together or separated by a short axis; racemes 3-7 cm; spikelets single, in 2 rows; rachis straplike, 1.5-2 mm wide. Spikelets pallid, obovate-oblong, plano-convex, 3-3.5 mm, acute; lower glume vestigial or a narrow triangular scale up to 1/2 spikelet length or more; upper glume papery, 3-5-veined with distinct middle vein, loosely appressed pubescent; lower lemma 3-5-veined, usually glabrous; upper lemma pale green, almost equal to spikelet, cartilaginous, apex apiculate and minutely pubescent. Fl. and fr. May-Sep. $2n = 40, 48, 60$.

Fields, roadsides, ditches and other disturbed places, mostly on moist fertile soils. Anhui, Fujian, Guangxi, Guizhou, Hainan, Henan, Hong Kong, Hubei, Hunan, Jiangsu, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [tropical and warm-temperate regions of the world].

The length of the lower glume is very variable, even within a single raceme. The spikelets are not obviously hairy because the pubescent upper glume faces inward, but the creeping habit together with paired racemes of plump spikelets are distinctive. Rarely the upper glume is glabrous, but such specimens can be separated from the closely related *Paspalum vaginatum* by spikelet shape and by the longer, apiculate fertile floret.

9. *Paspalum vaginatum* Swartz, Prodr. 21. 1788.

海雀稗 hai que bai

Digitaria vaginata (Swartz) Magnier ex Debeaux; *Paspalum distichum* subsp. *vaginatum* (Swartz) Maire; *Paspalum distichum* var. *vaginatum* (Swartz) Grisebach; *Sanguinaria vaginata* (Swartz) Bubani.

Perennial with short rhizome and long stolons. Culms solitary or tufted, many-noded, 10-50 cm tall. Leaf sheaths imbricate, often keeled, margins membranous; leaf blades distichous, linear, rather stiffly ascending, $2.5-15 \times 0.3-0.8$ cm, apex acute; ligule 0.5-1 mm. Inflorescence of (1-)2(-3) racemes arising

together at culm apex; racemes 2-5 cm, usually closely approximate when young, later spreading; spikelets single, in 2 rows; rachis 1-2 mm wide. Spikelets pale brownish green, narrowly lanceolate-oblong, strongly flattened, 3.5-4 mm, acute; lower glume absent or rarely a tiny vestige; upper glume thinly papery, weakly 5-veined, midvein often suppressed, glabrous; lower lemma resembling upper glume; upper lemma pale green, 2.5-3 mm, shorter than spikelet, cartilaginous, apex minutely pubescent. Fl. and fr. Jun-Sep.

Sandy seashores, swamps, along the margins of slow-moving streams. Hainan, Hong Kong, Taiwan, Yunnan [tropics and subtropics throughout the world].

This is one of the first plants to colonize the seashore. It is an efficient sand binder and a common saltmarsh plant, where it may form pure stands. It is sometimes also found in inland saline marshes.

10. *Paspalum plicatulum* Michaux, Fl. Bor.-Amer. 1:45. 1803.

皱稗雀稗 zhou fu que bai

Panicum plicatulum (Michaux) Kuntze.

Perennial. Culms tufted, erect or ascending, usually compressed, 30-150 cm tall. Leaf sheaths longer than internodes, keeled, glabrous or pubescent at base; leaf blades linear, usually folded at base, flat above, $10-50 \times 0.3-1$ cm, adaxial surface pilose at base and mouth, apex acuminate; ligule 1-2 mm. Inflorescence axis 3-15 cm; racemes 3-10, 5-8 cm, laxly ascending to spreading, axils pilose; spikelets paired; rachis 0.75-1 mm wide. Spikelets brown at maturity, obovate, 2-3 mm, subacute to obtuse; upper glume membranous, 5-veined, glabrous or sometimes appressed-pubescent; lower lemma membranous, 3-5-veined, glabrous, with short transverse wrinkles just inside the slightly raised margin; upper lemma deep brown, strongly convex dorsally, subequaling spikelet, smooth, shiny. Fl. and fr. summer-autumn. $2n = 20, 40, 60$.

Cultivated in Gansu [native to tropical and subtropical America].

"*Paspalum plicatum* Persoon" (Syn. Pl. 1: 86. 1805) is merely an orthographical variant of *P. plicatulum*.

This species is used for fodder.

11. *Paspalum scrobiculatum* Linnaeus, Mant. Pl. 1: 29. 1767.

鸭跖草 ya jie cao

Perennial or annual. Culms tufted, slender to robust, erect or decumbent and rooting at lower nodes, 30-90(-150) cm tall. Leaf sheaths compressed, keeled, usually glabrous; leaf blades linear or linear-lanceolate, $10-40 \times 0.4-1.2$ cm, usually glabrous, base subrounded, margins scabrous, apex acuminate; ligule 0.5-1 mm. Inflorescence of 2-5(-8) racemes, subdigitate or on a short axis; racemes 3-10 cm, ascending to widely spreading; spikelets usually single, overlapping in 2 rows, sometimes paired especially in middle of raceme; rachis ribbonlike, 1.5-3 mm wide, margins scabrous. Spikelets green becoming brown, suborbicular, ovate or broadly elliptic, 2-3 mm, glabrous, obtuse to apiculate; upper glume membranous, 3-7-veined; lower lemma membranous or sometimes indurate, 3-5(-7)-veined; upper lemma brown at maturity, subequaling spikelet, coriaceous, finely striate, obtuse. Fl. and fr. May-Nov. $2n = 20, 40$ or 60.

Roadsides, weedy places, often on damp soils. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [tropics and subtropics of the Old World; introduced in America].

This polymorphic species complex is thought to comprise an apomictic swarm. Some of its components have been described as separate species, but variation is continuous throughout. Robust forms are sometimes separated as *Paspalum auriculatum* J. Presl & C. Presl. Three recognizable entities are maintained here at varietal rank.

- 1a. Spikelets, or some of them, often paired, broadly obovate, 2–2.2 mm; lower lemma 3–5-veined; upper lemma yellow-brown or mid-brown 11c. var. *orbiculare*
- 1b. Spikelets single, usually suborbicular, 2–3 mm; lower lemma 5–9-veined; upper lemma dark brown at maturity.
 - 2a. Spikelets 2.5–3 mm; leaf blades usually glabrous, 10–20 × 0.4–1.2 cm 11a. var. *scrobiculatum*
 - 2b. Spikelets 2–2.5 mm; leaf blades usually pilose, 5–15 × 0.2–0.6 cm 11b. var. *bispicatum*

11a. *Paspalum scrobiculatum* var. *scrobiculatum*

鸭跖草(原变种) ya jie cao (yuan bian zhong)

Annual or perennial. Culms erect or decumbent at base, up to 90(–150) cm tall. Leaf blades 10–20 × 0.4–1.2 cm, usually glabrous. Spikelets single, usually suborbicular, 2.5–3 mm; upper glume 7–13-veined, lower lemma 7–9-veined, veins often concolorous with back; upper lemma dark brown at maturity. Fl. and fr. May–Sep. $2n = 40$.

Roadsides, weedy places, often on damp soils. Guangxi, Hainan, Taiwan, Yunnan [India, tropical SE Asia].

An annual form is cultivated in India as a cereal (Kodo Millet).

11b. *Paspalum scrobiculatum* var. *bispicatum* Hackel, Allg. Bot. Z. Syst. 20: 146. 1914.

圆雀稗 nan que bai

Paspalum akoense Hayata; *P. commersonii* Lamarck; *P. scrobiculatum* var. *commersonii* (Lamarck) Stapf.

Perennial. Culms tufted, 30–50 cm tall. Leaf blades 5–15 × 0.2–0.6 cm, pilose, rarely glabrous. Spikelets single, usually suborbicular, 2–2.3 mm; upper glume and lower lemma 5–7-veined, veins often concolorous with back; upper lemma dark brown at maturity. Fl. and fr. Jul–Oct. $2n = 20, 40, 60, 90$.

Hill slopes. Fujian, Guangdong, Guangxi, Jiangsu, Sichuan, Taiwan, Yunnan, Zhejiang [tropics and subtropics of the Old World].

11c. *Paspalum scrobiculatum* var. *orbiculare* (G. Forster) Hackel, Bot. Jahrb. Syst. 6: 233. 1885.

圆果雀稗 yuan guo que bai

Paspalum orbiculare G. Forster, Fl. Ins. Austr. 7. 1786; *P. thunbergii* Kunth ex Steudel var. *minus* Makino.

Perennial. Culms tufted, erect, 30–90 cm tall. Leaf blades 10–20 × 0.5–1 cm, usually glabrous. Spikelets often paired, at least in middle part of raceme, broadly obovate, 2–2.2 mm; upper glume and lower lemma 3–5-veined, veins green, back pallid; upper lemma yellow-brown or mid-brown at maturity. Fl. and fr. Jun–Nov. $2n = 20, 40, 54, 60$.

Hill slopes, roadsides, fields. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [SE Asia; Australia, Pacific Islands (Polynesia)].

This variety is unusual in *Paspalum scrobiculatum* in frequently having paired spikelets, although often the inner spikelet of the pair is reduced. There is also a less well-defined difference from var. *bispicatum* in shape of the spikelet and color of the spikelet veins, and for this reason this variety is sometimes treated as a separate species. However, when the inner spikelets are vestigial or absent, the racemes are 2-rowed and then the two varieties are very difficult to separate.

12. *Paspalum hirsutum* Retzius, Observ. Bot. 2: 7. 1781.

台湾雀稗 tai wan que bai

Paspalum formosanum Honda.

Perennial. Culms tufted, slender, 20–40 cm tall, pilose-tomentose on nodes and below inflorescence. Leaf sheaths compressed, hirsute; leaf blades lanceolate, 5–18 × 0.3–0.5 cm, both surfaces densely hirsute, apex acuminate; ligule ca. 2 mm. Racemes 2–4, 2–3 cm; spikelets single, in 2 rows; rachis flattened, winged, ca. 1.5 mm wide; pedicels pilose with soft white hairs. Spikelets broadly elliptic, 2–2.3 mm, usually glabrous, subacute; upper glume membranous, 3–5-veined, occasionally minutely pubescent on margins; lower lemma 5–7-veined, glabrous, subacute; upper lemma brown, as long as spikelet, cartilaginous, finely punctulate-striate, obtuse. Fl. and fr. May–Oct.

• Hill slopes. Guangdong, Guangxi, Taiwan.

Paspalum hirsutum is a local segregate from the *P. scrobiculatum* complex distinguished by its slender facies coupled with hirsute leaves, and particularly by its hairy nodes, culm apex, and pedicels. The hirsute leaves are very similar to those of *P. thunbergii*, but that species has puberulous spikelets and a pallid fertile floret.

This species may have a wider distribution if specimens from SE Asia referred to *Paspalum scrobiculatum* var. *homeri* (Henrard) Koning & Sosef are conspecific.

13. *Paspalum paniculatum* Linnaeus, Syst. Nat., ed. 10, 2: 855. 1759.

开穗雀稗 kai sui que bai

Perennial, forming coarse tussocks. Culms erect or geniculately ascending, 30–120 cm tall, nodes pubescent. Leaf sheaths often hispid; leaf blades linear-lanceolate, flat, 9–50 × 0.6–2.5 cm, scabrid or hispid, margins usually undulate, apex acuminate; ligule 0.2–0.5 mm. Inflorescence axis 5–20 cm; racemes 7–60, fascicled, 4–12 cm, ascending or spreading; spikelets paired; rachis ca. 0.5 mm wide. Spikelets brown at maturity, orbicular or obovate, 1–1.5 mm; upper glume membranous, subequaling spikelet, 3-veined, pubescent; lower lemma resembling upper glume, subglabrous on central portion of back; upper lemma as long as spikelet, pallid at maturity.

Moist places along roadsides, naturalized. Taiwan [native to Afri-

ca, Australia, New Guinea, Pacific Islands (Polynesia), and South America].

14. *Paspalum longifolium* Roxburgh, Fl. Ind. 1: 283. 1820.

长叶雀稗 chang ye que bai

Paspalum scrobiculatum Linnaeus var. *longifolium* (Roxburgh) Domin.

Perennial. Culms tufted, fairly robust, usually erect, 80–130 cm tall, many-noded, glabrous. Leaf sheaths broad, papery, overlapping and concealing the nodes, keeled, papillose-pilose along margins; leaf blades linear, 10–20 × 0.5–1 cm, glabrous, apex acuminate; ligule 1–2 mm, usually with tawny hairs on back. Inflorescence axis 4–10 cm; racemes 5–20, 4–8 cm, ascending; spikelets normally paired, occasionally single but 2nd vestigial spikelet present; densely overlapping; rachis broadly winged, (1.5–)2–4 mm wide, purplish, margins scabrous with conspicuous close-set teeth; pedicels scabrous. Spikelets purple or pale green, broadly obovate, narrowed to base, lightly plano-convex, 2–2.5 mm, apiculate; upper glume and lower lemma membranous, 3-veined with laterals marginal, minutely crisped-pubescent; upper lemma pallid, as long as spikelet, punctulate-striate, subacute. Fl. and fr. Jul–Oct. $2n = 40, 50$.

Mountain slopes, field margins, in moist and swampy places. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam; N Australia, Pacific Islands].

This is a rather lush, leafy species. The broad, purplish rachis bearing very closely packed, paired, shortly hairy spikelets is characteristic.

15. *Paspalum thunbergii* Kunth ex Steudel, Nomencl. Bot., ed. 2, 2: 273. 1841.

雀稗 que bai

Paspalum dissectum Thunberg, Fl. Jap. 45. 1784, not (Linnaeus) Linnaeus (1762); *P. scrobiculatum* Linnaeus var. *thunbergii* (Kunth ex Steudel) Makino.

Perennial from short knotty rootstock. Culms tufted, erect, 50–100 cm tall, nodes glabrous or pilose. Leaf sheaths keeled, hirsute; leaf blades linear, 10–25 × 0.5–0.8 cm, hirsute on both

surfaces, rarely glabrous, apex acuminate; ligule 0.5–1.5 mm. Inflorescence axis 1–9 cm; racemes 2–6, 3–10 cm, laxly ascending or spreading, axils pilose; spikelets commonly paired at least in central part of raceme or a vestigial 2nd spikelet present; rachis ca. 1 mm wide, margins scaberulous; pedicels minutely puberulous. Spikelets elliptic to orbicular-elliptic, plumply plano-convex, 2.5–3 mm, rounded or subacute; upper glume membranous, 3-veined with laterals marginal, sparsely pubescent especially along margins; lower lemma similar but glabrous; upper lemma pallid, as long as spikelet, coriaceous, punctulate-striate, obtuse. Fl. and fr. May–Oct. $2n = 20, 40$.

Fields, waste places, usually on moist soils. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India (Darjeeling, Sikkim), Japan, Korea].

This species is similar to *Paspalum scrobiculatum*, but most easily distinguished by its pale fertile floret. The marginal pubescence on the spikelets is a good confirmatory character.

16. *Paspalum delavayi* Henrard, Repert. Spec. Nov. Regni Veg. 24: 239. 1928.

云南雀稗 yun nan que bai

Perennial from a short thick rhizome. Culms erect, 50–70 cm tall, 4–6-noded, lower nodes glabrous or puberulous. Leaf sheaths compressed, keeled, lowest hirsute, upper glabrous; leaf blades flat, fairly rigid, 10–15 × 0.3–0.4 cm but upper blades much shorter, glabrous, apex acuminate; ligule 3–4 mm. Inflorescence axis 3–6 cm; racemes 2–3, 2.5–4 cm, axils glabrous or bearded; pedicels paired but lateral spikelets poorly developed except sometimes in middle of raceme, spikelets in 2–3 irregular rows; rachis ca. 1 mm wide. Spikelets pale green, elliptic to obovate, 2.8–3 mm, glabrous, acute; upper glume and lower lemma 3-veined with laterals marginal; upper lemma yellowish green, ovate, ca. 2.5 mm, slightly shorter than spikelet, minutely punctate, obtuse. Fl. and fr. May–Sep.

• Dry mountain slopes, along moist roadsides; 1200–1900 m. Yunnan.

170. AXONOPUS P. Beauvois, Ess. Agrostogr. 12. 1812.

地毯草属 di tan cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, rarely annuals. Culms tufted or stoloniferous. Leaf blades flat or involute, often obtuse; ligule short, membranous-ciliolate. Inflorescence composed of 2 to many slender racemes, mostly subdigitate but sometimes along a short central axis; spikelets borne singly, subsessile, alternating in 2 rows along the narrow triquetrous rachis, lower lemma adaxial. Spikelets lanceolate to oblong, flatly biconvex, florets 2 (but apparently 1); lower glume absent; upper glume membranous, as long as spikelet, obscurely 4- or 5-veined; lower floret neuter, reduced to an empty lemma similar to upper glume, its palea absent; upper floret crustaceous, lemma margins inrolled, apex obtuse. $x = 9, 10$.

About 110 species: tropical and subtropical America, one species in Africa; two species (both introduced) in China.

Many species of *Axonopus* are good forage or lawn grasses. The two species found in China have been widely introduced in the humid tropics of the world.

- 1a. Nodes of culm bearded; spikelets 2–2.7 mm; upper floret shorter than spikelet; leaf blades 6–12 mm wide 1. *A. compressus*
 1b. Nodes of culm glabrous; spikelets 1.6–2 mm; upper floret equaling spikelet; leaf blades 3–6 mm wide 2. *A. fissifolius*

1. *Axonopus compressus* (Swartz) P. Beauvois, Ess. Agrostogr. 12. 1812.

地毯草 di tan cao

Milium compressum Swartz, Prodr. 24. 1788; *Paspalum compressum* (Swartz) Raspail (1825), not Rafinesque (1817); *P. guadaloupense* Steudel.

Perennial with vigorous creeping stolons, forming sward. Culms 15–60 cm tall, nodes bearded. Leaf sheaths loose, strongly compressed, keeled, basal sheaths imbricate; leaf blades broadly linear to lanceolate, flat or folded, 5–20 × 0.6–1.2 cm, glabrous or adaxial surface pilose, apex obtuse; ligule 0.3–0.5 mm. Racemes 2–5, digitate or subdigitate, 4–10 cm, only slightly diverging; rachis glabrous. Spikelets oblong-lanceolate, 2–2.7 mm, pilose or glabrous, apex acute; upper glume and lower lemma 2–4-veined, midvein absent, laterals marginal; upper lemma pale, oblong-elliptic, shorter than spikelet, obtuse with an apical tuft of hairs; stigmas pale. Fl. and fr. summer–autumn. $2n = 40, 50, 60, 80$.

Roadsides, weedy places on moist ground, naturalized. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [native to tropical America; widely introduced elsewhere].

This is a good lawn and fodder grass.

2. *Axonopus fissifolius* (Raddi) Kuhlmann, Comm. Linh. Electr., Bot. 67(Bot. 11): 87. 1922.

类地毯草 lei di tan cao

Paspalum fissifolium Raddi, Agrostogr. Bras. 26. 1823; *Axonopus affinis* Chase; *A. compressus* var. *affinis* (Chase) M. R. Henderson; *Paspalum xizangense* B. S. Sun & H. Sun.

Perennial with creeping stolons. Culms compressed, 15–50 cm tall, nodes glabrous. Leaf sheaths compressed, strongly keeled; leaf blades broadly linear, folded, 5–20 × 0.3–0.6 cm, apex obtuse; ligule ca. 0.2 mm. Racemes 2–4, 2-paired, any others spaced slightly below, 3–8 cm, only slightly diverging; rachis glabrous. Spikelets oblong-elliptic, 1.5–2 mm, pilose near margins and apex or subglabrous, apex subacute; upper glume and lower lemma 2–4-veined, midvein absent; upper lemma pale, ovate, as long as spikelet, obtuse with a short apical tuft of hairs; stigmas purple. Fl. and fr. summer–autumn. $2n = 54, 80$.

Moist muddy or sandy meadows, naturalized. Taiwan, Xizang [native to tropical America].

This species is similar to *Axonopus compressus*, but tends to favor rather cooler and more waterlogged situations. It is naturalized in Taiwan and has also been found in Xizang.

171. **SETARIA** P. Beauvois, Ess. Agrostogr. 51. 1812, nom. cons., not Acharius ex Michaux (1803).

狗尾草属 gou wei cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Chaetochloa Scribner, nom. rej.

Annuals or perennials. Culms usually tufted, slender to robust or canelike. Leaf blades linear to lanceolate, sometimes plicate or narrowed to a false petiole; ligule ciliate from a membranous base. Inflorescence a panicle, dense and spikelike or open with the spikelets contracted around the primary branches; spikelets (or some of them) subtended by one to several bristles which persist on the branches after the spikelets fall. Spikelets elliptic, plano-convex, sometimes gibbous, awnless, florets 2; glumes and lower lemma membranous to herbaceous; lower glume ovate from a clasping base, usually less than 1/2 spikelet length, 3–5-veined; upper glume half as long to equaling spikelet, several-veined; lower floret staminate or neuter, sometimes sulcate, its palea present, reduced or absent; upper lemma crustaceous, strongly convex, rugose, punctate or smooth, margins inrolled. $x = 9$.

About 130 species: tropics and subtropics, extending to warm-temperate regions of the world; 14 species (three endemic, one introduced) in China.

The bristles in the inflorescence represent modified branchlets. The genus includes pasture grasses, a cereal crop, and a few noxious weeds.

- 1a. Panicle open to contracted with obvious, spaced branches; spikelets usually subtended by a solitary bristle (some lacking a bristle, or rarely with up to 3).
- 2a. Leaf blades plicate, fusiform-lanceolate to linear-lanceolate, narrowed toward base.
 - 3a. Leaf blades 2–7 cm wide; panicle branches up to 20 cm long; lower glume 1/3–1/2 spikelet length, usually acute to obtuse; lower lemma with narrow falcate apex, longer than upper lemma 1. *S. palmifolia*
 - 3b. Leaf blades 1–3 cm wide; panicle branches up to 8 cm long; lower glume 1/4–1/3 spikelet length, usually broadly obtuse to truncate; lower lemma equaling upper lemma 2. *S. plicata*
- 2b. Leaf blades flat, not plicate, linear or linear-lanceolate, straight or rounded at base.
 - 4a. Upper glume subequaling spikelet; only branch or branchlet tips extending into a bristle, rarely a solitary bristle below a few spikelets 3. *S. yunnanensis*
 - 4b. Upper glume distinctly shorter than spikelet; most spikelets subtended by one or more bristles.
 - 5a. Tufted annual; upper lemma coarsely rugose 4. *S. intermedia*
 - 5b. Perennials, sometimes rhizomatous; upper lemma smooth or finely punctate-rugose.
 - 6a. Plant tufted; bristles stiff, stout; lower floret usually staminate with well-developed palea 5. *S. forbesiana*
 - 6b. Plant with long scaly rhizomes; bristles slender; lower floret neuter with reduced palea.

- 7a. Spikelets elliptic; lower lemma equal to spikelet; upper lemma smooth, shiny 6. *S. chondrachne*
 7b. Spikelets lanceolate; lower lemma slightly shorter than spikelet; upper lemma
 punctate-rugulose 7. *S. guizhouensis*
 1b. Panicle densely spikelike with congested branchlets, sometimes lobed; spikelets subtended by several to many
 bristles.
 8a. Each branchlet from the main axis with only one mature spikelet; upper glume up to 1/2 as long as spikelet,
 upper floret clearly exposed.
 9a. Spikelets (2.2–)2.5–3.5 mm; lower floret often staminate, its palea ovate, as wide as upper floret; upper
 lemma coarsely rugose 8. *S. pumila*
 9b. Spikelets 1.8–2.3(–2.5) mm; lower floret neuter, its palea lanceolate, much narrower than upper floret;
 upper lemma finely rugose 9. *S. parviflora*
 8b. Each branchlet from the main axis with several mature spikelets; upper glume 2/3 as long to equaling spikelet.
 10a. Upper glume 2/3–3/4 length of fertile floret, upper lemma exposed above it; spikelets 2.8–3 mm, acute 10. *S. faberi*
 10b. Upper glume subequaling fertile floret, almost completely covering upper lemma; spikelets
 2–2.5(–3) mm, usually obtuse.
 11a. Upper floret falling free from the glumes and lower lemma at maturity; cultivated plant 11. *S. italica*
 11b. Upper floret retained within spikelet, this falling whole; wild plants.
 12a. Bristles retrorsely scabrous 14. *S. verticillata*
 12b. Bristles antrorsely scabrous.
 13a. Spikelets 2–2.5 mm; lower glume 1/4–1/3 as long as the spikelet, usually obtuse 12. *S. viridis*
 13b. Spikelets 2.5–3 mm; lower glume ca. 1/2 as long as the spikelet, acuminate 13. *S. arenaria*

1. *Setaria palmifolia* (J. König) Stapf, J. Linn. Soc., Bot. 42: 186. 1914.

棕叶狗尾草 zong ye gou wei cao

Panicum palmifolium J. König, Naturforscher 23: 208. 1788 [*“palmaefolium”*]; *Chamaeraphis palmifolia* Kuntze; *Chaetochloa palmifolia* Hitchcock & Chase; *Panicum neurodes* Schultes; *P. palmifolium* Willdenow ex Poiret (1816), not J. König (1788); *P. plicatum* Willdenow (1809), not Lamarck (1791).

Perennial from a short knotty rhizome. Culms erect or slightly geniculate, 75–200 cm tall, 3–7(–10) mm in diam. Leaf sheaths usually sparsely hispid, margins tuberculate-ciliate near ligule, otherwise glabrous; leaf blades fusiform-lanceolate, plicate, 20–60 × 2–7 cm, glabrous or hispid, narrowed toward base, apex acuminate; ligule 2–3 mm, ciliate. Panicle 20–60 × 2–10 cm, branches up to 20 cm, laxly spreading, flexuous, some spikelets subtended by a single 5–15 mm bristle. Spikelets broadly lanceolate, 3–4 mm, acute; lower glume triangular-ovate, 1/3–1/2 as long as spikelet, obtuse to acute; upper glume ovate, 1/2–3/4 as long as spikelet, 5–7-veined, acute; lower lemma neuter, often distinctly longer than upper floret, 5-veined, tipped with a short incurved beak; lower palea narrow, hyaline, 2/3 as long as lemma; upper lemma indistinctly rugulose to almost smooth, slightly shiny, apex apiculate, green and compressed. Fl. and fr. Aug–Dec. $2n = 36, 54$.

Open forests, thicket margins, shady pathsides. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [W Africa, tropical Asia].

Panicum palmifolium Willdenow ex Poiret (1816) is a *nomen novum* for the illegitimate later homonym *P. plicatum* Willdenow (1809), not Lamarck (1791), but is itself illegitimate as a later homonym of *P. palmifolium* J. König (1788). Both *Chaemaeraphis palmifolia* and *Chaetochloa palmifolia* are based on *P. palmifolium* Willdenow ex Poiret, but must be treated as *nomina nova* rather than new combinations.

This species is used for food and medicine.

2. *Setaria plicata* (Lamarck) T. Cooke, Fl. Bombay 2: 919. 1908.

皱叶狗尾草 zhou ye gou wei cao

Perennial from a knotty rootstock. Culms loosely tufted, erect or decumbent, 45–130 cm tall, up to 6 mm in diam. Leaf sheaths ± papillose-pilose, margins usually ciliate; leaf blades narrowly lanceolate, plicate, thin, 10–40 × 1–3 cm, papillose-pilose, hispidulous or glabrous, narrowed toward base, apex attenuate; ligule ca. 3 mm, ciliate. Panicle 15–33 cm, branches up to 8 cm, loose, ascending, some spikelets subtended by a single 10–20 mm bristle. Spikelets ovate-oblong, 3–4 mm, acute; glumes with broad papery margins; lower glume ovate-orbicular, 1/4–1/3 as long as spikelet, obtuse to truncate; upper glume 1/2–3/4 as long as spikelet, 5–7-veined, obtuse or acute; lower lemma staminate or neuter, usually equaling upper floret, 5-veined; lower palea often well developed; upper lemma usually distinctly rugose, rarely smooth, apiculate. Fl. and fr. Jun–Oct. $2n = 36$.

Open forests, valleys, moist roadsides. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, Indochina, Japan, Malaysia, Nepal, Thailand].

Setaria plicata is a more slender species than *S. palmifolia*, with a narrower panicle of shorter branches. However, the two species intergrade and must be separated by a combination of characters, as none is reliable on its own. Besides the key characters, *S. plicata* usually has a more distinctly rugose upper floret and shows a greater tendency to develop anthers in the lower floret.

- 1a. Upper lemma distinctly rugose 2a. var. *plicata*
 1b. Upper lemma nearly smooth, shiny 2b. var. *leviflora*

2a. *Setaria plicata* var. *plicata*

皱叶狗尾草(原变种) zhou ye gou wei cao (yuan bian zhong)

Panicum plicatum Lamarck, Tab. Encycl. 1: 171, no. 892.

1791; *P. excurrens* Trinius; *P. neurodes* var. *blepharoneuron* A. Braun; *Setaria excurrens* (Trinius) Miquel; *S. palmifolia* var. *blepharoneuron* (A. Braun) Veldkamp.

Culms up to 130 cm tall. Upper lemma distinctly rugose. Fl. and fr. Jun–Oct. $2n = 36$.

Moist roadsides, valleys, understory of forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, Japan, Malaysia, Nepal, Thailand].

2b. *Setaria plicata* var. *leviflora* (Keng ex S. L. Chen) S. L. Chen & S. M. Phillips, **comb. nov.**

光花狗尾草 guang hua gou wei cao

Basionym: *Setaria excurrens* (Trinius) Miquel var. *leviflora* Keng ex S. L. Chen, Bull. Nanjing Bot. Gard. 1988–1989: 3. 1990.

Culms up to 70 cm tall. Upper lemma nearly smooth, shiny.

• Mountain slopes, in open forests. Guangdong, Guangxi, Sichuan.

This combination was not previously validly published by Chen and Sheng (Bull. Bot. Res., Harbin 4(1): 64. 1984) because the basionym was not at that time validly published. Chen and Sheng cited the basionym from Keng (Clav. Gen. Sp. Gram. Sin. 126, 227. 1957 and Fl. Ill. Pl. Prim. Sin. Gram. 707. 1959), where no Latin description was provided.

3. *Setaria yunnanensis* Keng & G. D. Yu ex P. C. Keng & Y. K. Ma, Acta Bot. Yunnan. 2: 418. 1980.

云南狗尾草 yun nan gou wei cao

Annual. Culms rather slender, ca. 70 cm tall, ca. 1.5 mm in diam., nodes pubescent. Leaf sheaths glabrous or papillose-pilose, margins ciliate; leaf blades linear-lanceolate, thin, 3–14 × 0.4–1.2 cm, papillose-pilose on both surfaces, narrowed toward base, apex acuminate. Panicle open, 4–17 × 0.5–3 cm, branches ascending, simple or the lowermost with secondary branchlets, every branchlet tip extended into a 1–8 mm bristle, rarely a few spikelets also subtended by a single bristle; axis scabrous to ciliate along the edges. Spikelets ovate-lanceolate to elliptic, 2.4–2.6 mm, yellowish green or tinged purple; lower glume triangular, 1/3 as long as spikelet, 1–3-veined, acute or acuminate; upper glume as long as or slightly shorter than spikelet, 5-veined, acute or obtuse; lower lemma as long as spikelet, subpapery, 3–5-veined, acute; upper lemma as long as lower, finely punctate-rugose. Fl. and fr. Jun–Oct.

• Roadsides, streams, coniferous forests; 2300–3900 m. Sichuan, Xizang, Yunnan.

This species, with a bristle only at the branch tips, is close to *Paspalidium*. The bristles are very inconspicuous when they are shorter than the spikelets.

4. *Setaria intermedia* Roemer & Schultes, Syst. Veg. 2: 489. 1817.

间序狗尾草 jian xu gou wei cao

Panicum tomentosum Roxburgh; *Setaria tomentosa* (Roxburgh) Kunth.

Annual. Culms slender, geniculate at base and rooting from nodes, up to 60 cm tall, glabrous. Leaf sheaths usually loose, lower glabrous and smooth, upper papillose-pilose, margins densely ciliate especially at mouth; leaf blades broadly linear, thin, 10–35 × 0.6–1 cm, papillose-hispid along the main veins, apex acuminate; ligule densely ciliate. Panicle contracted, narrowly lanceolate, 10–17 × 1–1.5 cm, lowest branches 1.5–2 cm, spikelets subtended by 1–2(–3 or more) bristles; axis scabrous to puberulous; bristles 3–10 mm, stiff. Spikelets elliptic-ovate, 1.5–2 mm, acute; glumes thin, submembranous; lower glume broadly ovate, 1/3–1/2 as long as spikelet, obtuse or acute; upper glume 1/2–2/3 as long as spikelet, 5-veined; lower floret neuter; lower palea almost as long as lemma; upper lemma orange-brown at maturity, dorsally strongly convex, rugose. Fl. and fr. Jul.

Roadsides, fields. Yunnan [Bhutan, India, Japan, Myanmar, Russia, Sri Lanka; E Africa].

This weedy annual is recognized by its sprawling, tufted habit and coarsely rugose, orange-brown fertile floret. The spikelets are usually subtended only by a single bristle, but there are many aborted spikelets in the panicle, giving the appearance of more bristles below each fully developed spikelet.

5. *Setaria forbesiana* (Nees ex Steudel) J. D. Hooker, Fl. Brit. India 7: 81. 1896 [“1897”].

西南莠草 xi nan fu cao

Perennial from a knotty rootstock. Culms rigid, erect or geniculate, 60–170 cm tall, 2–4 mm in diam., glabrous. Leaf sheaths glabrous, margins densely ciliate with silky hairs; leaf blades broadly linear or linear-lanceolate, 10–40 × 0.4–2 cm, glabrous, base subrounded or cuneate, apex acuminate; ligule ca. 3 mm. Panicle open, linear to narrowly pyramidal, 10–40 cm, erect or slightly nodding, branches spaced, ascending, lowest 0.5–2 cm, spikelets subtended by a single bristle; axis scabrous to hispid; bristles 3–4 times spikelet length, stout, stiff green or purple. Spikelets elliptic or ovate, 2.8–3.2 mm, strongly veined; lower glume broadly ovate, 1/3–1/2 as long as spikelet, acute; upper glume 2/3–3/4 as long as spikelet, (5–)7–9-veined; lower floret staminate, as long as upper floret; lower palea well developed; upper lemma finely punctate-rugose. Fl. and fr. Jul–Oct.

Mountain slopes, valleys, roadsides, streams; 300–2000 m. Anhui, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan, Zhejiang [Bhutan, N India, Myanmar, Nepal].

- 1a. Bristles 3–4 times length of spikelet;
lower floret usually staminate 5a. var. *forbesiana*
- 1b. Bristles equal to spikelet or slightly
longer; lower floret neuter 5b. var. *breviseta*

5a. *Setaria forbesiana* var. *forbesiana*

西南莠草(原变种) xi nan fu cao (yuan bian zhong)

Panicum forbesianum Nees ex Steudel, Syn. Pl. Glumac. 1: 98. 1854; *Chaetochloa forbesiana* (Nees ex Steudel) Scribner & Merrill; *Setaria dubia* P. C. Keng & Y. K. Ma.

Spikelet subtended by a stiff bristle 3–4 times its length.

Lower floret usually staminate. Lower palea as long as lower lemma, as broad as upper floret. Fl. and fr. Jul–Oct.

Mountain slopes, valleys, roadsides, streams; 300–2000 m. Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan, Zhejiang [Bhutan, N India, Myanmar, Nepal].

5b. *Setaria forbesiana* var. *brevisetia* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 4: 64. 1984.

短刺西南莠草 duan ci xi nan fu cao

Spikelet subtended by a slender bristle of equal length or only slightly longer. Lower floret usually neuter. Lower palea shorter than lower lemma, narrow. Fl. and fr. Jul–Oct.

• Roadsides. Guizhou.

6. *Setaria chondrachne* (Steudel) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 234. 1930.

莠草 fu cao

Panicum chondrachne Steudel, Syn. Pl. Glumac. 1: 51. 1853; *Chaetochloa chondrachne* (Steudel) Honda; *C. matsumurae* (Matsumura) Keng; *Panicum matsumurae* Hackel; *Setaria matsumurae* Hackel ex Matsumura.

Perennial with slender rhizomes clothed in imbricate, ovate, appressed-pubescent scales. Culms slender, ascending, 60–170 cm tall, glabrous. Leaf sheaths glabrous, long ciliate along margins and at mouth; leaf blades linear-lanceolate, thin, 5–38 × 0.5–2 cm, glabrous or rarely papillose-pilose, base rounded, margins scabrous, apex attenuate; ligule ca. 0.5 mm, densely ciliate. Panicle open, linear to narrowly pyramidal, 12–30 cm, slightly nodding, branches spaced, stiffly spreading, lowest 1–2.5(–5) cm, most spikelets subtended by a single bristle; axis scabrous, sometimes also hispid; bristles 4–10 mm. Spikelets plumply elliptic, ca. 3 mm, acute; lower glume ovate, 1/3–1/2 as long as spikelet, acute; upper glume 3/4 as long as spikelet, 5(–7)-veined; lower floret neuter, as long as upper floret; lower lemma 5-veined; lower palea narrowly lanceolate, shorter than its lemma; upper lemma finally light brown, smooth, shiny, acute. Fl. and fr. Aug–Oct. $2n = 36$.

Woodlands, moist mountain slopes, roadsides. Anhui, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

This is a distinctive species on account of its long, scaly rhizomes, elongate, narrow panicle, and smooth, shiny fertile floret.

7. *Setaria guizhouensis* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 4: 62. 1984.

贵州狗尾草 gui zhou gou wei cao

Perennial with scaly rhizomes. Culms erect, 37 cm or more tall, nodes usually hairy. Leaf sheaths papillose-pilose dorsally and along margins, but nearly glabrous toward ligule; leaf blades linear-lanceolate, 10–15 × 0.4–0.6 cm, scabrous on both surfaces, base subrounded, apex acuminate; ligule ca. 1.5 mm. Panicle linear, 11–35 cm, branches spaced, very short, appressed to axis, spikelets subtended by 1 or 2 slightly flexuous bristles; axis pubescent to pilose. Spikelets elliptic-lanceolate, ca. 2.5 mm, acute; lower glume triangular-ovate, 1/3 as long as

spikelet, acute; upper glume 1/2–2/3 as long as spikelet, 5-veined, acute; lower floret neuter, shorter than upper floret, with or without palea; upper lemma finely rugose-punctate, apex purplish, acute. Fl. and fr. Sep.

• Mountain slopes, thickets, roadsides; 1300–1600 m. Guizhou, Yunnan.

- 1a. Culms ca. 37 cm tall; lower floret without palea 7a. var. *guizhouensis*
1b. Culms more than 37 cm tall; lower floret with palea 7b. var. *paleata*

7a. *Setaria guizhouensis* var. *guizhouensis*

贵州狗尾草(原变种) gui zhou gou wei cao (yuan bian zhong)

Culms ca. 37 cm tall. Panicle ca. 11 cm. Lower floret without palea. Fl. and fr. autumn.

• Mountain slopes, roadsides; ca. 1600 m. Guizhou.

7b. *Setaria guizhouensis* var. *paleata* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 4: 64. 1984.

具稃贵州狗尾草 ju fu gui zhou gou wei cao

Culms more than 37 cm tall. Panicle ca. 35 cm. Lower floret with palea. Fl. and fr. autumn.

• Thickets; ca. 1300 m. Guizhou.

8. *Setaria pumila* (Poiret) Roemer & Schultes, Syst. Veg. 2: 891. 1817.

金色狗尾草 jin se gou wei cao

Panicum pumilum Poiret in Lamarck, Encycl., Suppl. 4: 273. 1816; *Setaria glauca* (Linnaeus) P. Beauvois var. *dura* (I. C. Chung) I. C. Chung; *S. lutescens* (Weigel ex Stuntz) F. T. Hubbard var. *dura* I. C. Chung.

Annual. Culms erect or geniculate, 20–90 cm tall, smooth or scabrous just below inflorescence, nodes glabrous. Leaf sheaths keeled, glabrous; leaf blades linear, 5–40 × 0.2–1 cm, abaxial surface smooth, adaxial surface scabrous or pilose at base; ligule ca. 1 mm. Panicle densely cylindrical, 3–17 × 0.4–0.8 cm; branches reduced to a single mature spikelet subtended by 5–10 or more bristles (sometimes an aborted spikelet also present); axis pubescent; bristles gold, brownish gold or sometimes purple, 2–3 times spikelet length. Spikelets broadly ovate, (2.2–)2.5–3.5 mm; glumes ovate; lower glume 1/3–1/2 as long as spikelet; upper glume 1/2–2/3 as long as spikelet; lower floret usually staminate; lower palea hyaline, ovate, matching the upper floret in size and shape, keels narrowly winged; upper lemma broadly ovate, coarsely rugose. Fl. and fr. Jun–Oct. $2n = 18, 36$.

Waste places, mountain slopes, roadsides, forest margins. Anhui, Beijing, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Ningxia, Shaanxi, Shandong, Shanghai, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [originally from temperate and subtropical Asia and Europe, but now widespread].

The name *Setaria glauca* (Linnaeus) P. Beauvois has been misapplied to this species.

Setaria pumila and *S. parviflora* are different facets of the same polymorphic complex, and are sometimes regarded as a single, variable species. No character taken on its own is reliable for separating the two species, but the combination of all characters listed in the key will enable most specimens to be assigned to one or the other.

The name *Setaria lutescens* var. *dura* refers to a form with the lower lemma hardened and rugose like the upper lemma. This is a rare variant, known from Fujian and Yunnan and also from Korea. Hardening of the lower floret is known to occur occasionally in other genera of *Panicaceae*.

This species is cultivated for forage.

9. *Setaria parviflora* (Poirét) Kerguelén, Lejeunia 120: 161. 1987.

幽狗尾草 you gou wei cao

Cenchrus parviflorus Poirét in Lamarck, Encycl. 6: 52. 1804; *Chaetochloa geniculata* (Poirét) Millspaugh & Chase; *Panicum geniculatum* Poirét; *P. pallidifusum* Schumacher; *P. rubiginosum* Steudel; *Setaria glauca* (Linnaeus) P. Beauvois var. *pallidifusca* (Schumacher) T. Koyama; *S. gracilis* Kunth; *S. pallidifusca* (Schumacher) Stapf & C. E. Hubbard.

Annual or short-lived perennial with basal buds or a short knotty rhizome. Culms erect or geniculate, 20–90 cm tall. Leaf sheaths keeled, glabrous; leaf blades stiff, flat or involute, 5–30 × 0.2–0.8 cm, glabrous or adaxial surface pilose at base, apex acuminate; ligule ca. 1 mm. Panicle densely cylindrical, 2–15 × 0.5–1.2 cm; branches reduced to a single mature spikelet subtended by 8–12 bristles; axis pubescent; bristles golden or purplish brown when mature, 2–3 times spikelet length. Spikelets elliptic, 1.8–2.5 mm; lower glume ovate, 1/3 as long as spikelet, acute; upper glume broadly ovate, ca. 1/2 as long as spikelet, obtuse; lower floret neuter; lower palea firmly membranous, lanceolate, about as long as the upper floret but narrower, keels wingless, minutely papillose; upper lemma ovate-elliptic, finely rugose. Fl. and fr. Oct–Dec. $2n = 72$.

Mountain slopes, roadsides, waste places. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [throughout the tropics and subtropics].

Forms with perennating basal buds persisting for more than one season are sometimes separated as a different species, but there are no other distinguishing features and this character is probably of little significance. Specimens lacking basal parts become impossible to assign to species. However, if they are separated, *Setaria pallidifusca* is the correct name for the annual form.

The perennial form of *Setaria parviflora* has been known as *S. geniculata* P. Beauvois, but that name was based not on *Panicum geniculatum* Poirét (1798), as has been widely supposed, but on *P. geniculatum* Willdenow (1809), which applies to a different species.

This species is a forage grass and is used medicinally.

10. *Setaria faberi* R. A. W. Herrmann, Beitr. Biol. Pflanzen 10: 51. 1910.

大狗尾草 da gou wei cao

Setaria autumnalis Ohwi.

Annual. Culms solitary, erect or geniculate and rooting at the lowermost nodes, 50–120 cm tall, up to 6 mm in diam.,

glabrous. Leaves all cauline; leaf sheaths ciliate on upper margins; leaf blades broadly linear, 10–40 × 0.5–2 cm, glabrous or adaxial surface with scattered hairs, narrowed to base, apex acuminate; ligule 1–2 mm. Panicle densely cylindrical, 5–24 × 0.6–1.3 cm, nodding, branchlets bearing several spikelets each subtended by 1–3 bristles; axis white-pilose; bristles green or brownish purple, 10–15 mm. Spikelets elliptic, 2.8–3 mm, glumes and lower lemma thinly membranous; lower glume 1/3–1/2 as long as spikelet; upper glume 2/3–3/4 as long as spikelet; lower floret neuter; lower palea up to 1/2 as long as lemma, sometimes very small; upper lemma finely rugose under upper glume, almost smooth on exposed apex. Fl. and fr. Jul–Oct. $2n = 36$.

Mountain slopes, roadsides, waste places. Anhui, Fujian, Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea; introduced in North America].

This robust, annual species is frequently confused with large forms of *Setaria viridis*, but has broader, acute spikelets and a shorter upper glume clearly exposing the tip of the upper lemma.

11. *Setaria italica* (Linnaeus) P. Beauvois, Ess. Agrostogr. 51. 1812.

梁 liang

Panicum italicum Linnaeus, Sp. Pl. 1: 56. 1753; *Chaetochloa germanica* (Miller) Smyth; *C. italica* (Linnaeus) Scribner; *C. italica* var. *germanica* (Miller) Scribner; *Chamaeraphis italica* (Linnaeus) Kuntze; *C. italica* var. *germanica* (Miller) Kuntze; *Panicum chinense* Trinius; *P. germanicum* Miller; *P. italicum* var. *germanicum* (Miller) Koeler; *Pennisetum germanicum* (Miller) Baumgarten; *P. italicum* (Linnaeus) R. Brown; *Setaria germanica* (Miller) P. Beauvois.

Annual. Culms robust, erect, up to 150 cm, nodes glabrous. Leaf sheaths glabrous or pubescent, ciliate; leaf blades linear-lanceolate, 15–45 × 0.6–2 cm, usually glabrous; ligule 1–3 mm. Panicle dense, lobed, 6–40 × 0.5–5 cm, very variable, erect or pendent when mature; spikelets subtended by several bristles 1–5 times spikelet length; axis villous. Spikelets elliptic to ovate or subglobose, 2–3 mm, yellow, brown, orange or purple; lower glume 1/3–1/2 as long as spikelet; upper glume about as long as spikelet, 5–7(–9)-veined, obtuse; lower lemma equal to spikelet, 5–7-veined; lower palea absent or narrow, up to 1/2 as long as lemma; upper floret yellow or orange-yellow, oblong or ovate-oblong, cartilaginous, deciduous at maturity, finely rugose to smooth and shiny. Fl. and fr. summer to autumn. $2n = 18$.

Cultivated. Anhui, Beijing, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Jiangxi, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [origin uncertain; now introduced and cultivated sporadically worldwide].

This grass (Foxtail Millet) has been cultivated as a cereal in China since ancient times and exists in many races differing in size, shape, and hairiness of the panicle, color of the grain, and length of the bristles. It is also a useful forage grass. It is thought to be derived from *Setaria viridis*.

12. *Setaria viridis* (Linnaeus) P. Beauvois, Ess. Agrostogr. 51. 1812.

狗尾草 *gou wei cao*

Annual. Culms tufted, erect or geniculate, up to 70(–150) cm tall, 3–7 mm in diam. Leaf sheaths glabrous to papillose-pilose, margins densely ciliate; leaf blades linear to linear-lanceolate, flat, glabrous or papillose-pilose on both surfaces, base subrounded or subtruncate, margins scabrous, apex acuminate; ligule 1–2 mm. Panicle dense, usually cylindrical, usually tapering upward, 1–24 cm, erect or slightly nodding, branchlets bearing several spikelets each subtended by 3–7(–25) bristles; axis pilose or pubescent; bristles green, brown or purple, 4–12 mm. Spikelets elliptic-oblong, 2–2.5(–3) mm, obtuse; lower glume 1/4–1/3 as long as spikelet, obtuse or rarely acute; upper glume elliptic, as long as spikelet, lower lemma equal to spikelet; lower palea about 1/3 as long as lemma; upper lemma pale green, oblong, finely punctate-rugose, obtuse. Fl. and fr. May–Oct. $2n = 18$.

Hill slopes, roadsides, grassy waste places. Anhui, Fujian, Gansu, Guangdong, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [temperate and subtropical regions of the Old World; introduced elsewhere].

- 1a. Culms 5–25 cm tall; panicle ovate or elliptic, 1–4 cm 12c. subsp. *pachystachys*
- 1b. Culms usually more than 25 cm tall; panicle cylindrical, up to 24 cm.
 - 2a. Culms up to 70 cm, much branched at base; panicle to 12 cm, not lobed; spikelets 2–2.5 mm 12a. subsp. *viridis*
 - 2b. Culms 60–150 cm, little branched; panicle to 24 cm, sometimes lobed; spikelets 2.5–3 mm 12b. subsp. *pynocoma*

12a. *Setaria viridis* subsp. *viridis*

狗尾草(原亚种) *gou wei cao (yuan ya zhong)*

Panicum viride Linnaeus, Syst. Nat., ed. 10, 2: 870. 1759; *P. viridescens* Steudel; *Setaria viridis* var. *purpurascens* Petermann; *S. viridis* var. *weinmannii* (Roemer & Schultes) Heynhold; *S. weinmannii* Roemer & Schultes.

Culms branching at base, up to 70 cm tall. Leaf blades broadly linear, 5–20 × 0.2–1.8 cm. Panicle cylindrical, 2–12 × 0.4–1.3 cm; bristles below the spikelet 3–7, green, yellowish brown, purplish red or purple, 4–12 mm. Spikelets livid-green, 2–2.5 mm. Fl. and fr. May–Oct. $2n = 18$.

Mountain slopes, roadsides, grassy waste places. Distribution as for species [temperate and subtropical regions of the Old World; introduced elsewhere].

This is a cosmopolitan annual weed of warm-temperate regions.

12b. *Setaria viridis* subsp. *pynocoma* (Steudel) Tzvelev, Novosti Sist. Vyssh. Rast. 5: 19. 1968.

巨大狗尾草 *ju da gou wei cao*

Panicum pynocomum Steudel, Syn. Pl. Glumac. 1: 462. 1854; *P. viride* var. *giganteum* Franchet & Savatier; *P. viride* var. *majus* Gaudin; *Setaria gigantea* (Franchet & Savatier) Makino; *S. pynocoma* (Steudel) Henrard ex Nakai; *S. viridis* var. *major* (Gaudin) Petermann (1838), not Gray (1821).

Culms little branched at base, 60–150 cm tall. Leaf blades 15–40 × 1–2.5 cm, glabrous on both surfaces. Panicle sometimes lobed, 7–24 × 1.5–2.5 cm; bristles green, brownish or purplish, 7–12 mm. Spikelets 2.5–3 mm. Fl. and fr. Jun–Oct.

Roadsides, forest margins, a crop weed, especially in *Setaria italica* fields; below 2700 m. Gansu, Guizhou, Hebei, Heilongjiang, Hong Kong, Hubei, Hunan, Jilin, Nei Mongol, Shaanxi, Shandong, Sichuan, Xinjiang [Japan, Russia; C and SW Asia, C and S Europe, North America].

This robust form of *Setaria viridis* may be of hybrid origin, resulting from crossing with *S. italica*. Unlike *Setaria italica*, the spikelets are shed whole.

12c. *Setaria viridis* subsp. *pachystachys* (Franchet & Savatier) Masamune & Yanagihara, Trans. Nat. Hist. Soc. Taiwan 31: 327. 1941.

厚穗狗尾草 *hou sui gou wei cao*

Panicum pachystachys Franchet & Savatier, Enum. Pl. Jap. 2: 594. 1879; *Chaetochloa viridis* (Linnaeus) Scribner var. *pachystachys* (Franchet & Savatier) Honda; *Setaria pachystachys* (Franchet & Savatier) Matsumura; *S. viridis* var. *pachystachys* (Franchet & Savatier) Makino & Nemoto.

Culms usually decumbent at base, much branched, 5–25 cm tall. Leaf sheaths densely tuberculate-pilose in the lower part; leaf blades narrowly lanceolate, stiff, 1.5–5 × 0.2–0.4 cm, glabrous but scabrous on both surfaces. Panicle ovate or elliptic, 1–4 cm; bristles below spikelet 10–25, very dense, green, yellow, or purple, 6–8 mm. Spikelets 2–2.5 mm.

Sand and pebbles of the seashore. Guangdong, Taiwan [Japan, Korea].

This is a maritime form characterized by its low, branching habit and short, broad, densely bristly panicle.

13. *Setaria arenaria* Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 4: 77. 1940.

断穗狗尾草 *duan sui gou wei cao*

Setaria viridis var. *sinica* Ohwi.

Annual. Culms densely tufted, geniculate at base, slender, 20–100 cm tall, smooth, glabrous. Leaf sheaths loose, lower papillose-pubescent, upper glabrous, margins and mouth ciliate; leaf blades narrowly lanceolate, thin, 5–15 × 0.2–0.7 cm, glabrous, scabrous on both surfaces, base subrounded, apex long acuminate. Panicle narrowly cylindrical, commonly interrupted below, 2–9 × 0.5–0.8 cm; branchlets with several spikelets, these subtended by 1–4 bristles; axis pilose, rarely glabrous; bristles green or purple, 2–8 mm. Spikelets narrowly elliptic, 2.5–3 mm, acute; lower glume ovate, thinly papery, ca. 1/2 as long as spikelet, acuminate; upper glume as long as spikelet or slightly shorter; lower floret neuter, lemma equal to spikelet, 5-veined; lower palea small, narrowly lanceolate; upper lemma

pale green or yellowish, finely rugose, acuminate. Fl. and fr. Jul–Sep.

• Sandy places; 1000–1300 m. Hebei, Heilongjiang, Nei Mongol, Shanxi.

14. *Setaria verticillata* (Linnaeus) P. Beauvois, Ess. Agrostogr. 51. 1812.

倒刺狗尾草 *dao ci gou wei cao*

Panicum verticillatum Linnaeus, Sp. Pl., ed. 2, 1: 82. 1762; *Chaetochloa brevispica* Scribner & Merrill; *C. verticillata* (Linnaeus) Scribner; *Chamaeraphis italica* (Linnaeus) Kuntze var. *verticillata* (Linnaeus) Kuntze; *C. verticillata* (Linnaeus) Porter; *Panicum asperum* Lamarck; *Pennisetum verticillatum* (Linnaeus) R. Brown; *Setaria brevispica* (Scribner & Merrill) K. Schumann.

Annual. Culms tufted, much branched, ascending, 20–100 cm tall, glabrous. Leaf sheaths thin, glabrous or papillose-pub-

erulous, margins ciliolate; leaf blades broadly linear, flaccid, 5–20 × 0.4–1.8 cm, usually glabrous, base subrounded, margins scabrous, apex long acuminate; ligule 0.5–1 mm. Panicle densely spikelet-like, or lobed with short lateral branches on vigorous specimens, 4–15 cm, spikelets subtended by 1–4 bristles; axis shortly hispidulous; bristles green or brownish, 3–8 mm, retrorsely barbed and often becoming entangled. Spikelets elliptic, 1.8–2.4 mm, green with obvious darker veins, obtuse; lower glume 1/3–1/2 as long as spikelet, obtuse; upper glume boat-shaped, as long as spikelet, 7-veined; lower floret neuter; lower palea much reduced; upper lemma dorsally compressed, finely rugose. Fl. and fr. Jun–Sep. $2n = 18, 36$.

Roadsides, open weedy places; 300–1000 m. Nei Mongol, Taiwan, Yunnan [tropical and warm-temperate regions of the Old World; introduced in America].

This is an easy species to recognize because of its clinging, retrorsely barbed bristles.

172. *PASPALIDIUM* Stapf in Prain, Fl. Trop. Africa 9: 582. 1920.

类雀稗属 *lei que bai shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials. Culms usually thick, often rooting from the lower nodes. Leaf blades flat or involute; ligule a ciliate rim. Inflorescence of short erect racemes; racemes imbricate or distant along the central axis, spikelets borne singly, usually imbricate in 2 neat rows, sometimes also on short basal branchlets; rachis (and branchlet when spikelets clustered) terminating in an inconspicuous point or bristle. Spikelets dorsally compressed or often strongly convex, florets 2; glumes membranous to herbaceous, rounded, lower abaxial, short and broad, upper 1/2 as long to equaling the spikelet; lower floret staminate or neuter, lemma resembling upper glume, lower palea present or absent; upper lemma coriaceous to bony, margins inrolled or only narrowly hyaline; upper palea apex often briefly reflexed. $x = 9$.

About 40 species: throughout the tropics, especially Australia; two species in China.

Most species of *Paspalidium* are clearly distinct from *Setaria*, with a completely different appearance, so for that reason the two genera are maintained here. However, some species of *Setaria* with very few bristles (especially in Australia) are intermediate, and *Paspalidium* is included within *Setaria* by some authors. *Setaria yunnanensis* is the only intermediate species in China.

- 1a. Racemes distant; upper glume 2/3–3/4 length of spikelet; upper lemma granulate 1. *P. flavidum*
1b. Racemes overlapping; upper glume 1/4–1/2 length of spikelet; upper lemma finely rugose 2. *P. punctatum*

1. *Paspalidium flavidum* (Retzius) A. Camus in Lecomte, Fl. Indo-Chine 7: 419. 1922.

类雀稗 *lei que bai*

Panicum flavidum Retzius, Observ. Bot. 4: 15. 1786; *P. floridum* Royle; *P. granulare* Lamarck; *Setaria flavida* (Retzius) Veldkamp.

Perennial. Culms tufted, slightly compressed, 30–100 cm tall from a decumbent base. Leaf sheaths strongly keeled, smooth; leaf blades linear-lanceolate, flat or folded, 5–30 × 0.5–1 cm, base subcordate and tuberculate-setose, apex abruptly acute; ligule ca. 0.5 mm. Inflorescence axis 5–20 cm; racemes 6–9, 1.5–2.5 cm, widely spaced; rachis ca. 0.5 mm wide, slightly winged, prolonged into a point. Spikelets plumply ovate, gibbous, 1.5–2.5 mm, milk-white or purplish; lower glume broadly ovate, ca. 1/2 as long as spikelet; upper glume 2/3–3/4 as long as spikelet, 7-veined; lower lemma as long as spikelet, 5-veined; upper lemma bony, granulate. Fl. and fr. Jul–Oct.

Roadsides, field edges, moist open places; 100–1500 m. Guangdong, Guizhou, Hainan, Taiwan, Yunnan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Indian Ocean Islands (Mauritius, Réunion), Pacific Islands].

2. *Paspalidium punctatum* (N. L. Burman) A. Camus in Lecomte, Fl. Indo-Chine 7: 419. 1922.

尖头类雀稗 *jian tou lei que bai*

Panicum punctatum N. L. Burman, Fl. Indica 26. 1768; *P. mucronatum* Roth ex Roemer & Schultes; *Paspalidium mucronatum* (Roth ex Roemer & Schultes) Ohwi; *Paspalum aquaticum* Masamune & Syozi; *P. punctatum* (N. L. Burman) Stapf ex Ridley (1925), not (Linnaeus) Flügge (1810); *Setaria punctata* (N. L. Burman) Veldkamp.

Perennial. Culms stout, spongy, trailing and rooting at the lower nodes, flowering shoots 50–100 cm or more tall. Leaf sheaths dilated, smooth, margins membranous; leaf blades line-

ar-lanceolate, 10–25 × 0.3–0.8 cm, scabrous, adaxial surface papillose, apex acuminate; ligule 1–2 mm. Inflorescence axis 10–30 cm; racemes 8–15, 1–5 cm, overlapping at least in upper part of inflorescence; rachis 0.5–1.5 mm wide, undulate, apex acicular. Spikelets ovate-oblong, 2–3 mm; lower glume cuff-like, 1/4 as long as spikelet, truncate; upper glume suborbicular, 1/4–1/2 as long as spikelet, 3–5-veined, rounded or truncate; lower floret neuter, lemma ovate, as long as or slightly shorter

than upper floret, prominently 3–5-veined, acute, palea absent; upper lemma ovate, finely rugose, cuspidate-acuminate. Fl. and fr. Jul–Oct.

Floating in fresh water, rooting along marshy streamsides, in wet soil; 100–500 m. Fujian, Guangdong, Hainan, Taiwan [Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam; E Africa].

173. *STENOTAPHRUM* Trinius, Fund. Agrost. 175. 1822 [“1820”].

钝叶草属 *dun ye cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Diastemenanthe Steudel; *Ophiurinella* Desvaux.

Annuals or perennials, stoloniferous. Leaf blades linear to narrowly lanceolate; ligule ciliate. Inflorescence of very short racemes bearing a few sessile spikelets; racemes arranged singly and sunk in pockets on one or both sides of a foliaceous or corky axis, variously disarticulating at maturity, raceme rachis ending in a point. Spikelets ovate-lanceolate to lanceolate; glumes both short or the upper equal to spikelet, membranous; lower floret staminate or neuter, lemma as long as the spikelet, usually coriaceous, rarely papery, smooth, acute; upper lemma slightly shorter than lower lemma, papery, rarely coriaceous, margins flat. $x = 9$.

Seven species: tropics and subtropics, mostly on seashores or near the coast from the Indian Ocean to SE Asia and the Pacific Ocean, one species pantropical; three species (one introduced) in China.

- 1a. Inflorescence with broad foliaceous axis, spikelets not sunk in axis cavities; lower lemma herbaceous, upper lemma coriaceous 1. *S. helferi*
- 1b. Inflorescence with thick, non-foliaceous axis, spikelets sunk in axis cavities; lower lemma cartilaginous, upper lemma papery.
 - 2a. Spikelets on opposite sides of a cylindrical axis, 2.5–3.5 mm, in short racemes; leaf blades sharply acuminate 2. *S. micranthum*
 - 2b. Spikelets on one face of a flattened axis, 4–5 mm, solitary; leaf blades obtuse 3. *S. secundatum*

1. *Stenotaphrum helferi* Munro ex J. D. Hooker, Fl. Brit. India 7: 91. 1896 [“1897”].

钝叶草 *dun ye cao*

Perennial. Culms stoloniferous, flowering shoots 10–40 cm tall. Leaf sheaths loose, laterally compressed, keeled, glabrous; leaf blades broadly linear, 5–17 × 0.5–1.1 cm, glabrous, base truncate, apex abruptly acute; ligule ca. 0.3 mm. Inflorescence 10–15 cm; axis with foliaceous wing, 3–5 mm wide, midrib sharply triquetrous with scabrous margins; racemes 7–18 mm, appressed within the curves of the midrib, bearing 3–7 spikelets, lowest racemes free; raceme rachis triquetrous, margins spinulose. Spikelets ovate-lanceolate, dorsally flattened, 4–4.5 mm, strongly veined, acuminate; glumes herbaceous, acute; lower glume broadly ovate, 1/2–2/3 as long as spikelet, (3–)5–7-veined; upper glume as long as spikelet, 9–11-veined; lower floret staminate or neuter, lemma firmly herbaceous, 7-veined, palea well developed; upper lemma coriaceous, smooth, cuspidate-mucronate, tardily deciduous. Fl. and fr. autumn.

Moist lawns, forest edges, open forests; below 1100 m. Fujian, Guangdong, Hainan, Yunnan [Malaysia, Myanmar, Thailand, Vietnam].

2. *Stenotaphrum micranthum* (Desvaux) C. E. Hubbard in C. E. Hubbard & R. E. Vaughan, Grasses Mauritius Rodriguez, 73. 1940.

锥穗钝叶草 *zhui sui dun ye cao*

Ophiurinella micrantha Desvaux, Mém. Soc. Agric. Angers 1: 179. 1831; *Stenotaphrum diplotaphrum* Pilger; *S. lepturoides* Henslow; *S. subulatum* Trinius.

Annual. Culms decumbent at base, up to 35 cm tall. Leaf sheaths rounded, ciliate along one margin; leaf blades lanceolate, 4–8 × 0.5–1 cm, glabrous or pubescent, apex sharply acuminate; ligule ca. 1 mm. Inflorescence 6–14 cm, slender, cylindrical; axis 1.5–2.5 mm wide; racemes 5–10 mm, sunk in depressions on opposite sides of the axis, bearing (1–)3–6 spikelets; raceme rachis stoutly triquetrous, ciliolate along margins. Spikelets oblong-lanceolate, 2.5–3.5 mm, obtuse to subacute, falling entire; glumes membranous, 1/5–1/4 as long as spikelet or upper glume slightly longer, truncate; lower floret neuter, lemma cartilaginous, flat, enclosing fertile floret in inflorescence axis, 3-veined, grooved on either side of midvein, margins inflexed at lateral veins, lower palea absent; upper lemma papery, subequal to spikelet, smooth, acute. Fl. and fr. spring.

Coral islands on coastal sands, understory of littoral woodlands. South China Sea Islands (Xisha Qundao) [small islands around New Guinea; Australia (Great Barrier Reef Islands), Coral Sea Islands, Indian Ocean Islands, Pacific Islands (Polynesia); probably introduced to E Africa (Tanzania)].

3. *Stenotaphrum secundatum* (Walter) Kuntze, Revis. Gen. Pl. 2: 794. 1891.

侧钝叶草 *ce dun ye cao*

Ischaemum secundatum Walter, Fl. Carol. 249. 1788.

Perennial, stoloniferous and forming a dense sward. Culms much branched, flowering shoots 10–30 cm tall. Leaf sheaths strongly keeled, often grouped in flabellate clusters; leaf blades

broadly linear, folded when young, up to 15×0.4 –1 cm, apex obtuse; ligule ca. 0.5 mm. Inflorescence 5–12 cm, slender, cylindrical; axis corky, disarticulating into segments at maturity; racemes 4–10 mm, reduced to 1–3 spikelets embedded in one face of the rachis, alternating on either side of the sinuous midrib; raceme rachis a stout pointed appendage within the axis cavity. Spikelets lanceolate, 4–5 mm, acute; lower glume up to 1/4 as long as spikelet; upper glume as long as spikelet; lower

floret staminate, lemma cartilaginous, 3-veined, palea well developed; upper lemma papery, subequal to spikelet, smooth, acute. Fl. and fr. summer.

Cultivated as lawn grass. Hong Kong [tropical and subtropical shores on both sides of Atlantic Ocean, extending around S Africa to Mozambique].

This grass is widely cultivated in the moist tropics as a lawn grass (St. Augustine Grass).

174. MELINIS P. Beauvois, Ess. Agrostogr. 54. 1812.

糖蜜草属 tang mi cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Rhynchelytrum Nees.

Annuals or perennials. Culms tufted, often decumbent at the base. Leaf sheaths usually loose; leaf blades linear; ligule a ciliate rim. Inflorescence a panicle; pedicels slender, glabrous or with a few long hairs at the tip. Spikelets elliptic or oblong, laterally compressed, hairy or glabrous; lower glume small or absent; upper glume as long as spikelet, membranous to papery, 5–9-veined, acute, emarginate or 2-lobed, awned or awnless, sometimes gibbous on the back and tapering to a beak; lower floret staminate or neuter, lemma resembling the upper glume, 3–7-veined, palea with ciliate or scaberulous keels or absent; upper floret laterally compressed, membranous to thinly cartilaginous, readily deciduous. $x = 9$.

Twenty-two species: mainly in tropical and S Africa; two species introduced throughout the tropics, including China.

1a. Leaf blades densely tomentose, sticky; panicle dark purple; spikelets 1.7–2.2 mm, usually glabrous 1. *M. minutiflora*

1b. Leaf blades glabrous; panicle silvery-pink; spikelets 2–12 mm, conspicuously villous with fluffy spreading hairs 2. *M. repens*

1. Melinis minutiflora P. Beauvois, Ess. Agrostogr. 54. 1812.

红毛草 hong mao cao

糖蜜草 tang mi cao

Muhlenbergia brasiliensis Steudel; *Panicum melinis* Trinus, nom illeg. superfl.; *P. minutiflorum* (P. Beauvois) Raspail; *Suardia picta* Schrank; *Tristegis glutinosa* Nees.

Saccharum repens Willdenow, Sp. Pl., ed. 4, 1: 322. 1797; *Rhynchelytrum repens* (Willdenow) C. E. Hubbard; *R. roseum* (Nees) Stapf & C. E. Hubbard; *Tricholaena rosea* Nees.

Perennial. Culms tufted, geniculately ascending, rooting at lower nodes, 50–150 cm tall. Leaf sheaths and blades densely tomentose with glandular hairs, slightly sticky with a strong smell; leaf blades linear, 5–20 \times 0.5–1.5 cm. Panicle purplish, narrowly ovate, 10–20 cm; pedicels glabrous, scaberulous, rarely with a few hairs toward the apex. Spikelets narrowly ovate-oblong, 1.7–2.2 mm; lower glume ovate, 0.1–0.4 mm, veinless; upper glume prominently 7-veined, obtusely 2-lobed, awnless or with a mucro to 1 mm from the sinus; lower floret neuter without a palea, lemma similar to upper glume but narrower, prominently 5-veined, acutely 2-lobed, awnless or with a slender awn to 15 mm from the sinus; upper floret whitish, thinly cartilaginous, smooth, shining, slightly shorter than lower lemma. Fl. and fr. Jul–Oct. $2n = 36$.

Introduced into S China as a fodder grass, locally naturalized. Hong Kong, Taiwan, Yunnan [native to Africa].

This species has been introduced into many tropical countries for fodder (Molasses Grass).

2. Melinis repens (Willdenow) Zizka, Biblioth. Bot. 138: 55. 1988.

Annual or loosely tufted short-lived perennial. Culms geniculately ascending, often rooting at lower nodes, up to 150 cm tall. Leaf sheaths loose, usually with tubercle-based hairs; leaf blades linear, up to 20 \times 0.2–1.4 cm. Panicle silvery-pink or purple, ovate to oblong, 8–20 cm, fluffy; branches capillary; pedicels with a few long hairs. Spikelets ovate, 2–4.5 mm, densely villous, hairs up to 6 mm; lower glume narrowly oblong, 0.3–1.5 mm, 1-veined, with stiff short hairs, separated from the upper by a short internode; upper glume 5-veined, gibbous below middle, tapering upward into a glabrous membranous beak 1/4–1/2 its length, emarginate, mucronate or with short awn up to 1 mm; lower floret staminate, lemma similar to upper glume but narrower and less gibbous, palea keels ciliate; upper floret whitish, thinly cartilaginous, smooth, shining, ca. 2 mm. Fl. and fr. Jun–Nov. $2n = 36$.

Grasslands, open or disturbed places, naturalized. Fujian, Guangdong, Taiwan [native to Africa].

This is a polymorphic, pantropical weed, recognizable by its pink, fluffy panicles.

175. DIGITARIA Haller, Hist. Stirp. Helv. 2: 244. 1768, nom. cons., not Heister ex Fabricius (1759), nom. rej.

马唐属 ma tang shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Leptoloma Chase; *Syntherisma* Walter.

Annual or perennial. Culms erect or decumbent, occasionally stoloniferous. Leaf blades linear or linear-lanceolate; ligule membranous. Inflorescence of digitately arranged racemes, sometimes on a short axis or with secondary branchlets, very rarely paniculate; spikelets usually in groups of 2–3(–4), imbricate to effuse, the latter often on notably long and unequal pedicels. Spikelets puberulous to villous, typically in stripes between the well-defined veins, rarely glabrous; lower glume absent or reduced to a little scale up to 1/4 spikelet length; upper glume variable; lower lemma usually \pm equal to spikelet; upper floret pallid to black, apex subacute to acuminate, rarely apiculate. $x = 9$.

About 250 species: tropical and warm-temperate regions of the world; 22 species (three endemic) in China.

Digitaria has been traditionally divided on the nature of the spikelet hairs, which may be clavate, capitate, verrucose (warty, appearing beaded), or with crooked tips. As good magnification is required to see these features, the grouping of the spikelets on the raceme is a more practical aid to identification. Many species have regularly paired spikelets, which present no difficulty. In those species where the spikelets are grouped in clusters of 3 or more, care must be taken, as often the longest pedicel of a group is partially fused to the rachis so that the spikelets appear alternately paired and single, or sometimes one spikelet may be vestigial, or the spikelets may be paired toward the raceme tips.

Many species are very variable in spikelet pubescence and lemma nervation, even within a single raceme. Additionally, there are a number of complexes of intergrading species, so intermediates may occasionally be encountered. This has led to the publication of many superfluous names.

- 1a. Inflorescence an open panicle with long capillary branches 1. *D. fujianensis*
- 1b. Inflorescence composed of racemes.
 - 2a. Spikelets of a pair heteromorphic, lower spikelet glabrous or almost so, upper spikelet conspicuously hairy.
 - 3a. Annual; midrib of rachis narrow, clearly winged; lower lemma with 7 slender veins 10. *D. ciliaris*
 - 3b. Perennial and stoloniferous or annual; midrib of rachis thick, scarcely winged; lower lemma with 7–11 thick, prominent veins.
 - 4a. Perennial, stoloniferous; spikelets 4–4.5 mm, spaced on rachis 3. *D. heterantha*
 - 4b. Annual; spikelets ca. 3 mm, imbricate on rachis 4. *D. bicornis*
 - 2b. Spikelets all similar.
 - 5a. Tussocky perennial; leaf sheaths breaking up into fibers at base 2. *D. fibrosa*
 - 5b. Annuals or short-lived perennials; leaf sheaths not forming fibrous tussock.
 - 6a. Spikelets paired; pedicels with truncate tips.
 - 7a. Lower glume absent or almost so 5. *D. setigera*
 - 7b. Lower glume small but clearly present.
 - 8a. Raceme rachis with smooth margins; racemes 2–3 6. *D. radicata*
 - 8b. Raceme rachis with scabrous margins; racemes often more than 3.
 - 9a. Upper glume 1/3–1/2 length of spikelet.
 - 10a. Lateral veins of lower lemma scabrous toward apex; upper glume subacute; upper lemma acuminate, equaling lower lemma 7. *D. sanguinalis*
 - 10b. Lateral veins of lower lemma smooth; upper glume rounded; upper lemma apiculate, exceeding lower lemma 8. *D. cruciata*
 - 9b. Upper glume 1/2–3/4 length of spikelet; lateral veins of lower lemma smooth; upper lemma not exceeding lower lemma.
 - 11a. Racemes erect, forming a narrow fascicle; spikelets 2.2–2.8 mm 9. *D. henryi*
 - 11b. Racemes widely spreading at maturity; spikelets 2.5–3.5 mm 10. *D. ciliaris*
 - 6b. Spikelets in groups of 3 or more, at least in middle part of raceme (sometimes a pedicel fused to the rachis, or a spikelet abortive, or if paired pedicels long and flexuous); pedicels usually with discoid tips.
 - 12a. Spikelets with capitate or clavate hairs (if glabrous, pedicel tips hairy).
 - 13a. Tips of pedicels with a circlet of stiff, overtopping hairs or spicules up to 1 mm.
 - 14a. Spikelets 1.8–2.5 mm; upper glume 2/3–4/5 spikelet length 11. *D. ternata*
 - 14b. Spikelets 1.2–1.5 mm; upper glume 1/4–1/2 spikelet length 12. *D. stricta*
 - 13b. Tips of pedicels without overtopping hairs or spicules.
 - 15a. Rachis of raceme flat, winged; spikelets 2–2.2 mm 20. *D. ischaemum*
 - 15b. Rachis of raceme slenderly triquetrous, not or scarcely winged; spikelets 1.3–2 mm.
 - 16a. Spikelets 1.8–2 mm; leaves conspicuously hispid 13. *D. hengduanensis*
 - 16b. Spikelets 1.3–1.7 mm; leaves glabrous to pilose.
 - 17a. Racemes 2–5, 3–8 cm; culms 30–90 cm; spikelets pubescent; apex of fertile floret protruding above lower lemma 14. *D. abludens*
 - 17b. Racemes 5–8, 10–17 cm; culms 80–110 cm; spikelets coarsely villous; apex of fertile floret not protruding 15. *D. jubata*
 - 12b. Spikelets with smooth or verrucose hairs (tips sometimes coiled), or glabrous; pedicel tips glabrous.

- 18a. Upper lemma pale yellowish brown or gray at maturity; plant stoloniferous.
 19a. Spikelets 1.7–2.3 mm; lower lemma with equidistant veins 16. *D. mollicoma*
 19b. Spikelets 1.2–1.5 mm; lower lemma with broader intervein spaces flanking
 midvein 17. *D. longiflora*
 18b. Upper lemma dark brown to blackish purple at maturity; plant usually tufted.
 20a. Spikelets glabrous 19. *D. stewartiana*
 20b. Spikelets pilose.
 21a. Racemes 2–4, divaricate; spikelets elliptic, 2–2.2 mm 20. *D. ischaemum*
 21b. Racemes (2–)3–10, ascending; spikelets elliptic-oblong, 1.2–1.9 mm.
 22a. Upper glume 1/4–1/2 spikelet length 22. *D. fauriei*
 22b. Upper glume subequaling spikelet.
 23a. Rachis 0.5–0.8 mm broad; spikelets 1.4–1.9 mm 21. *D. violascens*
 23b. Rachis 0.3–0.5 mm broad; spikelets 1.2–1.5 mm 18. *D. leptalea*

1. *Digitaria fujianensis* (L. Liu) S. M. Phillips & S. L. Chen, Novon 13: 467. 2003.

福建薄稃草 *fu jian bao fu cao*

Leptoloma fujianensis L. Liu, Bot. Res. Acad. Sin. 1: 41. 1983.

Annual. Culms tufted, erect, 30–50 cm tall, 4–5-noded. Leaf sheaths papillose-pilose; leaf blades linear or linear-lanceolate, 6–20 × 0.3–0.6 cm, thinly pilose, margins thickened, smooth, apex acuminate; ligule brown, 2–3 mm. Inflorescence paniculate, open, 12–18 cm; branches capillary, 5–10 cm, spreading; spikelets toward the panicle periphery; pedicels long, capillary, scaberulous. Spikelets lanceolate-elliptic, 3.3–4 mm, acute; lower glume ca. 0.5 mm, veinless, obtuse or emarginate; upper glume 3/4–4/5 as long as spikelet, 3–5-veined, appressed silky pubescent between lateral veins and along margins; lower lemma as long as spikelet, 7-veined, margins and intervein spaces appressed silky pubescent; upper lemma yellowish, apiculate. Anthers purplish, ca. 2 mm. Fl. and fr. Jul.

- Between rocks. Fujian.

This is a very unusual species on account of its diffuse, paniculate inflorescence, but the spikelets are typical of *Digitaria*. It is similar to *D. cognata* (Schultes) Pilger, from the E United States, but that species has smaller (2.5–3 mm) spikelets and shorter leaf blades. *Digitaria tomentosa* (Koenig) Henrard, from Thailand and S India, also has an open, paniculate inflorescence, but differs in its broader leaf blades, up to 8 mm wide, and especially by the smaller (2.2–2.5 mm) spikelets with tiny glumes.

2. *Digitaria fibrosa* (Hackel) Stapf, Bull. Misc. Inform. Kew 1912: 428. 1912.

纤维马唐 *xian wei ma tang*

Panicum fibrosum Hackel, Oesterr. Bot. Z. 51: 330. 1901; *Digitaria fibrosa* var. *yunnanensis* (Henrard) L. Liu; *D. yunnanensis* Henrard.

Perennial forming a dense tussock. Culms surrounded at base by fibrous remains of old leaf sheaths, erect, 30–50 cm tall. Leaf sheaths pilose to hirsute; leaf blades linear, flat, up to 25 × 0.25–0.4 cm, subglabrous, pilose or hirsute, apex acuminate; ligule ca. 0.5 mm. Inflorescence subdigitate, axis usually glabrous, hairy in hirsute specimens; racemes 2–4, suberect, 4–11 cm; spikelets paired or ternate, loosely arranged; rachis slenderly triquetrous, not winged; pedicels tips slightly swollen.

Spikelets oblong-lanceolate, 2.8–3.3 mm, pilose with white or brownish, minutely capitate hairs; lower glume very small, subrounded; upper glume ca. 4/5 as long as spikelet but narrow, 3-veined, pilose; lower lemma as long as spikelet, 7-veined, hairiness variable, usually glabrous and purple-tinged on either side of midvein, 2nd intervein space and margins usually pilose, rarely pilose throughout; upper lemma dark brown to purplish black. Fl. and fr. May–Aug.

Mountain grasslands. Fujian, Guangdong, Guangxi, Sichuan, Yunnan [Laos, Myanmar, Thailand].

Digitaria fibrosa is sometimes included in *D. setifolia* Stapf. Both have an identical habit, inflorescence, and spikelet structure, but *D. setifolia* has narrower, inrolled, filiform leaves and is confined to South Africa. *Digitaria fibrosa* is maintained here on account of this difference and the disjunct distribution.

This is the only species in China with a tussocky, fibrous base. Hairiness of the leaves and spikelets is variable, but the loose, narrowly ascending racemes of rather large spikelets with dark fertile florets are easily recognizable.

3. *Digitaria heterantha* (J. D. Hooker) Merrill, Enum. Philipp. Fl. Pl. 1: 54. 1923.

二型马唐 *er xing ma tang*

Paspalum heteranthum J. D. Hooker, Fl. Brit. India 7: 16. 1896 [“1897”], based on *Panicum heteranthum* Nees & Meyen (1841), not Link (1827); *Digitaria baliensis* Ohwi; *D. bantamensis* Ohwi; *D. dispar* Henrard, nom. illeg. superfl.; *D. heterantha* var. *hirtella* L. C. Chia; *D. shimadana* Ohwi.

Perennial, stoloniferous. Culms branching and rooting at lower nodes, 50–100 cm tall. Leaf sheaths glabrous to papillose-pilose; leaf blades broadly linear, 5–15 × 0.3–0.6 cm, glabrous to papillose-pilose on both surfaces; ligule 1–2 mm. Inflorescence digitate; racemes 2–4, stiffly ascending to divaricate, 5–15(–20) cm, the longer sparsely spiculate at base; spikelets paired, not imbricate, appressed and appearing slightly sunken; rachis triquetrous, thick, scarcely winged. Spikelets lanceolate, 3.5–4.5(–6) mm, those of a pair different, lower spikelet glabrous, upper spikelet villous; lower glume very small, veinless; upper glume lanceolate, 1/2 as long as to equaling spikelet, 3–5-veined; lower lemma as long as spikelet, closely 7–11-veined, veins equidistant, thick, prominent, interspaces slitlike; upper spikelet with rows of silky hairs, usually also setose, the hairs spreading halo-like at maturity; upper lemma pallid, acuminate. Fl. and fr. Jun–Oct. $2n = 36, 72$.

Coastal sands. Fujian, Guangdong, Hainan, Taiwan [Indonesia, Malaysia, Palau Islands, Philippines, Thailand, Vietnam].

4. *Digitaria bicornis* (Lamarck) Roemer & Schultes, Syst. Veg. 2: 470. 1817.

异马唐 yi ma tang

Paspalum bicorne Lamarck, Tabl. Encycl. 1: 176. 1791; *Digitaria biformis* Willdenow; *Panicum bicorne* (Lamarck) Kunth; *P. biforme* (Willdenow) Kunth.

Annual. culms decumbent, rooting at lower nodes, 30–60 cm tall. Leaf sheaths glabrous or lower sheaths papillose-pilose; leaf blades linear, 2.5–15 × 0.2–0.9 mm, usually scabrid on both surfaces, rarely sparsely pilose; ligule 1–3.5 mm. Inflorescence digitate or subdigitate; racemes 2–5, 4–14 cm; spikelets paired, imbricate; rachis triquetrous, ca. 1 mm wide, winged. Spikelets lanceolate, ca. 3 mm, those of a pair usually different; lower spikelet glabrous, upper spikelet pubescent; lower glume very small, almost absent or up to 0.4 mm, triangular or bifid, veinless; upper glume lanceolate, ca. 2/3 length of spikelet, 3-veined, pilose; lower lemma as long as spikelet, 7-veined, lower spikelet with equidistant veins, upper spikelet with wider glabrous interspaces on either side of midvein, lateral veins crowded near margins, rows of silky hairs between lateral veins, usually also setose, the hairs spreading halo-like at maturity; upper lemma yellowish, slightly shorter than spikelet. Fl. and fr. May–Sep. $2n = 54$, 72.

Waste ground, often on sand, including seashore sand; below 2000 m. Fujian, Hainan, Yunnan [India, Indonesia, Malaysia, Myanmar, New Guinea, Sri Lanka, Thailand; Africa, Australia; introduced in America].

5. *Digitaria setigera* Roth ex Roemer & Schultes, Syst. Veg. 2: 474. 1817.

海南马唐 hai nan ma tang

Digitaria hainanensis Hitchcock ex Keng; *Digitaria microbachne* (J. Presl) Henrard; *D. microstachya* Henrard; *D. pruriens* (Fischer ex Trinius) Buse; *D. sanguinalis* (Linnaeus) Scopoli var. *pruriens* (Fischer ex Trinius) Prain; *Panicum microbachne* J. Presl; *P. pruriens* Fischer ex Trinius; *P. sanguinale* Linnaeus var. *microbachne* (J. Presl) Hackel; *Syntherisma microbachne* (J. Presl) Hitchcock.

Annual. Culms tufted, decumbent, branching and rooting at lower nodes, 30–100 cm tall. Leaf sheaths glabrous or papillose-pilose; leaf blades linear-lanceolate, 5–20 × 0.3–1 cm, glabrous on both surfaces, papillose-pilose at base, base subrounded, apex acuminate; ligule 1–2 mm. Inflorescence digitate or subdigitate, axis 1–4 cm; racemes 5–12, stiff, 5–15 cm; spikelets paired, imbricate by about 2/3 their length; rachis triquetrous, narrowly winged, ca. 0.6 mm broad, margins scabrous. Spikelets narrowly lanceolate-oblong, 2–2.5(–3) mm, acute; lower glume absent or a minute rim; upper glume up to 1/3 as long as spikelet, 1–3-veined, margins ciliate, apex villous with overtopping hairs; lower lemma as long as spikelet, 5–7-veined, veins evenly spaced or with a wider interspace flanking the midvein, lateral intervein spaces and margins appressed pubescent to villous, rarely ciliate or setose; upper lemma yellowish to gray, subequaling lower lemma, acuminate. Fl. and fr. Jun–Nov. $2n = 27$, 36, 54, 72.

Moist slopes, stream banks, roadsides and weedy places. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Thailand, Vietnam; E Africa (Tanzania), Australia, Indian Ocean Islands (Seychelles), Madagascar, Pacific Islands].

This coarse, weedy species is widespread in warm parts of Asia. Spikelet pubescence is very variable, as in most members of the complex around *Digitaria ciliaris*, but the species can be readily distinguished by the lack of a lower glume and the presence of only a very short upper glume.

Specimens have sometimes been misidentified as *Digitaria corymbosa* Merrill. True *D. corymbosa* is a synonym of *D. compacta* (Roemer & Schultes) Veldkamp from India.

6. *Digitaria radicata* (J. Presl) Miquel, Fl. Ned. Ind. 3: 437. 1857.

红尾翎 hong wei ling

Panicum radicosum J. Presl, Reliq. Haenk. 1: 297. 1830; *Digitaria chinensis* Hornemann var. *hirsuta* (Honda) Ohwi; *D. formosana* Rendle; *D. formosana* var. *hirsuta* (Honda) Henrard; *D. radicata* var. *hirsuta* (Honda) C. C. Hsu; *D. tenuispica* Rendle; *D. timorensis* (Kunth) Balansa; *Panicum formosanum* (Rendle) Makino & Nemoto; *P. timorense* Kunth; *Syntherisma formosana* (Rendle) Honda; *S. formosana* var. *hirsuta* Honda.

Annual. Culms slender, trailing, branching, 30–50 cm tall, glabrous. Leaf sheaths usually glabrous; leaf blades linear-lanceolate, 2–6 × 0.3–0.7 cm, abaxial surface scabrous, adaxial surface glabrous, pubescent or papillose-pilose at base; ligule 0.75–2 mm. Inflorescence digitate; racemes 2–3(–4), slender, 4–10 cm; spikelets paired, loosely imbricate by about half their length; rachis triquetrous, narrowly winged, ca. 0.6 mm broad, margins smooth or almost so. Spikelets narrowly lanceolate, 2.8–3 mm; lower glume triangular, 0.2–0.3 mm; upper glume narrow, long triangular, 1/3–2/3 as long as spikelet, 1–3-veined, villous throughout; lower lemma as long as spikelet, 5–7-veined, a broad intervein space on either side of midvein, lateral veins very close together near margin, appressed silky pubescent, very rarely with a ciliate fringe, never setose; upper lemma yellowish at maturity, narrowly lanceolate. Anthers 0.5–1 mm. Fl. and fr. summer–autumn. $2n = 18$.

Moist grasslands, roadsides, weedy places. Anhui, Fujian, Guangdong, Hainan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Philippines, Thailand; Australia, Indian Ocean Islands, Madagascar, Pacific Islands; introduced in Pakistan, Tanzania, and a few other places].

This species is related to *Digitaria ciliaris*, but differs in its slender, trailing habit, fewer digitate racemes with smooth-edged rachis, and narrow spikelets with contiguous lateral veins in the lower lemma, which thereby appears 3-veined.

This species is used for forage.

7. *Digitaria sanguinalis* (Linnaeus) Scopoli, Fl. Carniol., ed. 2, 1: 52. 1771.

马唐 ma tang

Panicum sanguinale Linnaeus, Sp. Pl. 1: 57. 1753; *Paspalum sanguinale* (Linnaeus) Lamarck.

Annual. Culms erect or decumbent at base, 10–80 cm tall,

glabrous or nodes bearded. Leaf sheaths glabrous or sparsely papillose-pilose; leaf blades linear-lanceolate, 5–20 × 0.4–1.2 cm, glabrous or pilose, margins thickened, scabrous; ligule 1–3 mm. Inflorescence digitate or subdigitate, axis 1–2 cm; racemes 4–12, stiff, 5–18 cm; spikelets paired, overlapping by about 2/3 their length; rachis winged, midrib triquetrous, margins scabrous. Spikelets elliptic-lanceolate, 3–3.5 mm, acute; lower glume small, ca. 0.2 mm, triangular; upper glume lanceolate, 1/3–1/2 spikelet length, 3-veined, pubescent, subacute; lower lemma as long as spikelet, 7-veined, veins evenly spaced or a broader interspace flanking the midvein, midvein smooth, lateral veins setiform-scabrous especially toward the apex, appressed-pubescent on lateral intervein spaces and margins, rarely also setose; upper lemma greenish gray or light brown, lanceolate, as long as spikelet, apex acuminate. Anthers ca. 1 mm. Fl. and fr. Jun–Sep. $2n = 28, 36$.

Fields, roadsides, weedy places. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang [warm-temperate and upland subtropical regions throughout the world].

The scabrous veins of the lower lemma, although a small character requiring a good lens, are the best means of distinguishing this species from *Digitaria ciliaris*.

This species is a good forage grass.

8. *Digitaria cruciata* (Nees ex Steudel) A. Camus in Lecomte, Fl. Indo-Chine 7: 399. 1922.

十字马唐 shi zi ma tang

Panicum cruciatum Nees ex Steudel, Syn. Pl. Glumac. 1: 39. 1853; *Paspalum sanguinale* (Linnaeus) Lamarck var. *cruciatum* (Nees ex Steudel) J. D. Hooker.

Annual. Culms decumbent at base, branching and rooting at lower nodes, 30–100 cm tall, nodes thinly hispid. Leaf sheaths glabrous or hispid; leaf blades linear-lanceolate, 5–20 × 0.3–1 cm, papillose-hispid on both surfaces or adaxial surface glabrous, margins thickened, undulate, scabrous; ligule 1–2.5 mm. Inflorescence subdigitate, axis 1–5 cm; racemes 5–8, 3–15 cm; spikelets paired, imbricate; rachis winged, ca. 1 mm broad, midrib triquetrous, margins scabrous. Spikelets plumply elliptic-oblong, 2.5–3 mm; lower glume minute, veinless; upper glume broadly ovate, 1/3 as long as spikelet, 3-veined, subglabrous, margins membranous, apex broadly obtuse; lower lemma slightly shorter than upper lemma, 7-veined with intervein spaces nearly equidistant, glabrous or margins pilose; upper lemma pale purplish gray at maturity, apex abruptly apiculate, exerted from spikelet. Fl. and fr. Jun–Oct. $2n = 18, 36, 72$.

Upland grasslands; 1000–2700 m. Guizhou, Hubei, Sichuan, Xizang, Yunnan [Bhutan, N India, Myanmar, Nepal].

This species is a common weed in the Himalayan region, generally occurring at higher altitudes than other members of the *Digitaria ciliaris* complex. It is usually clearly distinguished by its relatively broad spikelets with a short, rounded upper glume and apiculate apex to the fertile floret.

Digitaria cruciata var. *esculenta* Bor is a minor cereal cultivated in the Khasi hills of NE India. It has longer racemes than the wild form, and a turgid, persistent grain. The name has been misapplied to wild-growing plants in Xizang (Lhasa).

9. *Digitaria henryi* Rendle, J. Linn. Soc., Bot. 36: 323. 1904.

亨利马唐 heng li ma tang

Digitaria sasakii (Honda) Tuyama; *Panicum henryi* (Rendle) Makino & Nemoto; *Syntherisma henryi* (Rendle) Newbold; *S. sasakii* Honda.

Perennial. Culms tufted, slender, prostrate, often rooting at lower nodes, 20–50 cm tall. Leaf sheaths glabrous; leaf blades narrowly lanceolate, 3–8 × 0.2–0.5 cm, glabrous or sparingly hispid near base, apex acute; ligule 1–2 mm. Inflorescence subdigitate, axis short; racemes 3–9, erect and clustered, never divergent, 4–8 cm; spikelets paired; rachis flat, winged ca. 0.5 mm broad, margins scaberulous. Spikelets lanceolate, 2.2–2.8 mm, acuminate; lower glume ca. 0.2 mm; upper glume lanceolate, 1/2 as long as spikelet, 3-veined, pilose; lower lemma slightly longer than upper lemma, 7-veined with broader intervein spaces flanking the midvein, pilose along lateral intervein spaces and margins; upper lemma yellowish green to gray, apex acute. Fl. and fr. summer–autumn. $2n = 36$.

Sandy seashores, grasslands near the sea. Fujian, Guangdong, Guangxi, Hainan, Shanghai, Taiwan [S Japan, Vietnam; naturalized in Hawaii].

The spikelets of *Digitaria henryi* resemble those of *D. ciliaris*, to which it is closely related, but *D. henryi* is a rather smaller, more slender plant of different habit, most obviously distinguishable by its cluster of erect racemes.

10. *Digitaria ciliaris* (Retzius) Koeler, Descr. Gram. 27. 1802.

纤毛马唐 xian mao ma tang

Annual. Culms decumbent at base, branching and rooting at lower nodes, 30–100 cm tall. Leaf sheaths ± pilose; leaf blades linear to linear-lanceolate, 5–20 × 0.3–1 cm, adaxial surface usually pilose, margins thickened and scabrous; ligule 1–2 mm. Inflorescence digitate or subdigitate, axis short; racemes 3–10, 5–17 cm; spikelets paired, imbricate by about 2/3 their length; rachis winged, ca. 1 mm broad, midrib triquetrous, margins scabrous. Spikelets lanceolate, 2.5–3.5 mm, acute; lower glume very small, triangular; upper glume lanceolate, 2/3–4/5 as long as spikelet, 3-veined, pilose; lower lemma as long as spikelet, 7-veined, veins evenly spaced or a broader glabrous interspace flanking the midvein, lateral interveins appressed pubescent to ciliate or villous, sometimes with a halo-like fringe, sometimes setose; upper lemma yellowish green, gray or pale brown, elliptic, as long as lower lemma, apex acuminate. Fl. and fr. May–Oct. $2n = 36, 54, 72$.

Roadsides, weedy places. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [throughout the tropics and subtropics, but rare in Africa].

Digitaria ciliaris is a pantropical, weedy annual very variable in spikelet pubescence and nervation. It lies at the center of a complex of similar and somewhat intergrading, weedy species including *D. bicornis*, *D. cruciata*, *D. henryi*, *D. radicata*, *D. sanguinalis*, and *D. setigera*. Occasionally intermediate specimens will be encountered that are difficult to place.

Most species in this complex include forms with or without stiff, glassy bristles near the margins of the lower lemma. These lie flat along the lemma when young, coloring yellow and spreading as a conspicuous pectinate fringe at maturity. The pectinate form of *Digitaria ciliaris* is sometimes distinguished at varietal rank.

- 1a. Lower lemma pubescent to villous, but not setose 10a. var. *ciliaris*
 1b. Lower lemma pubescent to villous and also setose, bristles spreading at maturity 10b. var. *chrysoblephara*

10a. *Digitaria ciliaris* var. *ciliaris*

纤毛马唐(原变种) xian mao ma tang (yuan bian zhong)

Panicum ciliare Retzius, Observ. Bot. 4: 16. 1786; *Digitaria adscendens* (Kunth) Henrard; *D. chinensis* Hornemann; *D. sanguinalis* (Linnaeus) Scopoli var. *ciliaris* (Retzius) Parlato; *D. sericea* (Honda) Honda ex Ohwi; *Panicum adscendens* Kunth; *Syntherisma ciliaris* (Retzius) Schrader; *S. sericea* Honda.

Lower lemma pubescent to villous, but lacking glassy bristles. $2n = 36, 54$.

Roadsides, weedy places. Beijing, Fujian, Guangdong, Guizhou, Hainan, Hubei, Jiangxi, Nei Mongol, Ningxia, Shandong, Shanghai, Shanxi, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [throughout the tropics and subtropics].

10b. *Digitaria ciliaris* var. *chrysoblephara* (Figari & De Notaris) R. R. Stewart, Kew Bull. 29: 444. 1974.

毛马唐 mao ma tang

Digitaria chrysoblephara Figari & De Notaris, Mem. Reale Accad. Sci. Torino, ser. 2, 14: 364. 1852; *D. adscendens* (Kunth) Henrard subsp. *chrysoblephara* (Figari & De Notaris) Henrard; *D. ciliaris* subsp. *chrysoblephara* (Figari & De Notaris) S. T. Blake.

Lower lemma pilose and also setose with hard glassy bristles, these spreading and yellowing at maturity; sometimes bristles only present on upper spikelet of a pair. $2n = 72$.

Roadsides, fields, weedy places. Anhui, Fujian, Gansu, Guangdong, Hainan, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan [tropical and warm-temperate regions of the world].

This variety is sometimes included in *Digitaria bicornis*, and there is some similarity, especially when the spikelets are heteromorphic. However, *D. bicornis* is a distinct species with only 2 or 3 racemes, a thick midrib, appressed spikelets, which appear slightly sunken, and thick, prominent veins on the lower lemma, with the intervein spaces forming slitlike furrows.

11. *Digitaria ternata* (Hochstetter ex A. Richard) Stapf, Fl. Cap. 7: 376. 1898.

三数马唐 san shu ma tang

Cynodon ternatus Hochstetter ex A. Richard, Tent. Fl. Abyss. 2: 405. 1851; *Panicum ternatum* (Hochstetter ex A. Richard) Hochstetter ex Steudel; *Paspalum ternatum* (Hochstetter ex A. Richard) J. D. Hooker; *Syntherisma ternata* (Hochstetter ex A. Richard) Newbold.

Annual. Culms loosely tufted, ascending, up to 100 cm tall, glabrous or pilose with long fine hairs below inflorescence. Leaf sheaths puberulous or glabrous; leaf blades linear, $10-30 \times 0.6-1$ cm, adaxial surface papillose-pilose, base subrounded, apex acuminate; ligule 1–2 mm. Inflorescence subdigitate, axis villous; racemes 3–8, 10–20 cm; spikelets ternate; rachis broadly winged, ca. 1 mm broad, midrib low, margins scabrous; pedicel tips hispid with 0.2–0.8 mm setae. Spikelets oblong-lanceolate or elliptic-lanceolate, 1.8–2.5 mm, pale grayish green, hairs clavate; lower glume absent; upper glume $2/3-3/4$ as long as spikelet, narrower than spikelet, intervein spaces and margins appressed-pilose to hirsute; lower lemma as long as spikelet, 5-veined with a central group of 3 and 2 marginal veins, intervein spaces and margins hairy; upper lemma blackish brown at maturity, as long as spikelet. Anthers 0.4–0.8 mm. Fl. and fr. Jun–Sep. $2n = 36$.

Grassy, weedy places. Guangxi, Guizhou, Hong Kong, Sichuan, Yunnan [Bhutan, India, Indonesia, Malaysia, Nepal, Philippines, Thailand; Africa; introduced in America and Australia].

This species is a good forage grass.

12. *Digitaria stricta* Roth ex Roemer & Schultes, Syst. Veg. 2: 474. 1817.

竖毛马唐 shu mao ma tang

Annual. Culms tufted, slender, erect, 20–40 cm tall. Leaf sheaths loose, keeled, glabrous or papillose-pilose, especially at mouth; leaf blades linear, soft, $5-20 \times 0.3-0.5$ cm, adaxial surface tuberculate-hispid in lower $1/3$, apex finely acuminate; ligule 1–1.5 mm. Inflorescence subdigitate, axis 1–3 cm; racemes 2–8 or more, 5–12 cm; spikelets ternate; rachis triquetrous, narrowly winged, margins scabrous; pedicels scabrous, tips slightly dilated with overtopping spicules up to 1 mm. Spikelets elliptic, 1.2–1.4 mm, hairs clavate, rarely glabrous; lower glume absent; upper glume variable, $1/4-1/2$ as long as spikelet, rarely vestigial or absent, veinless or 1–3-veined; lower lemma slightly shorter than spikelet, 3–5-veined, intervein spaces and margins sparsely pubescent to villous; upper lemma chestnut brown to purplish black with a paler, apiculate, slightly protruding apex. Anthers ca. 0.3 mm. Fl. and fr. autumn.

Grasslands; below 1800 m. Fujian, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Pakistan, Sri Lanka].

This species is allied to *Digitaria ternata*, which has bigger spikelets with a longer upper glume.

Digitaria stricta is a fairly uniform species, recognizable by its slender, tufted habit and small spikelets with exposed, dark upper floret ringed by setae from the pedicel apex. However, the spikelet pubescence is variable, ranging from subglabrous to conspicuously villous forms, and the small upper glume may sometimes be only vestigial or even occasionally completely absent. Two extreme variants from the typical plant have been given varietal status, as follows.

- 1a. Spikelets glabrous or almost so 12b. var. *glabrescens*
 1b. Spikelets sparsely to densely hairy with clavate hairs.
 2a. Upper glume distinct 12a. var. *stricta*
 2b. Upper glume absent 12c. var. *denudata*

12a. *Digitaria stricta* var. *stricta*

竖毛马唐(原变种) shu mao ma tang (yuan bian zhong)

Agrostis pilosa Retzius; *Digitaria puberula* Link; *D. royleana* (Nees ex J. D. Hooker) Prain; *Paspalum royleanum* Nees ex J. D. Hooker; *Setaria stricta* (Roth ex Roemer & Schultes) Kunth.

Spikelets obviously hairy with clavate hairs, pubescence varying from short and appressed to longer, dense and spreading; upper glume 1/4–1/2 as long as spikelet.

Grasslands; ca. 1800 m. Yunnan [Bhutan, India, Myanmar, Nepal, Pakistan, Sri Lanka].

12b. *Digitaria stricta* var. *glabrescens* Bor, Webbia 11: 336. 1955.

秃穗马唐 tu sui ma tang

Digitaria glabrescens (Bor) L. Liu.

Spikelets glabrous or nearly so; otherwise like var. *stricta*.

Hill slopes, fields; ca. 200 m. Fujian [N India].

12c. *Digitaria stricta* var. *denudata* (Link) Henrard, Monogr. *Digitaria*, 175. 1950.

露籽马唐 lu zi ma tang

Digitaria denudata Link, Hort. Berol. 1: 222. 1827; *Panicum denudatum* (Link) Kunth.

Upper glume absent; otherwise like var. *stricta*.

Streams, grasslands; 1000–1800 m. Sichuan, Xizang, Yunnan [India, Nepal].

13. *Digitaria hengduanensis* L. Liu, Bot. Res. Acad. Sin. 4: 37. 1989.

横断山马唐 heng duan shan ma tang

Annual. Culms loosely tufted, slender, 30–60 cm tall. Leaf sheaths papillose-hispid; leaf blades linear-lanceolate, 3–8 × 0.2–0.6 cm, papillose-hispid on both surfaces, apex acute; ligule 0.5–2 mm. Inflorescence axis 2–5 cm; racemes 2–7, loosely ascending, 3–10 cm; spikelets mostly in lax pairs, distant, lower sometimes on short branchlets; rachis slender, triquetrous, narrowly winged, angles scabrous; pedicels of a pair very unequal, one flexuous, up to 8 mm, the other about as long as spikelet, tips discoid. Spikelets elliptic, 1.8–2 mm, hairs clavate; lower glume minute; upper glume as long as spikelet, 3-veined, intervein spaces and margins densely hairy; lower lemma similar to upper glume, 5–7-veined; upper lemma yellowish brown, finally chestnut brown, ca. 1.6 mm, apex apiculate. Fl. and fr. Aug–Oct.

• Forest margins, riverside sands, mountain grasslands; 1200–3000 m. Sichuan, Yunnan.

14. *Digitaria abludens* (Roemer & Schultes) Veldkamp, Blumea 21: 53. 1973.

粒状马唐 li zhuang ma tang

Panicum abludens Roemer & Schultes, Syst. Veg. 2: 457. 1817; *Digitaria granularis* (Trinius ex Sprengel) Henrard; *D.*

pedicellaris (Trinius ex J. D. Hooker) Prain, nom. illeg. superfl.; *Paspalum granulare* Trinius ex Sprengel; *P. pedicellare* Trinius ex J. D. Hooker.

Annual. Culms erect or ascending, 30–90 cm tall. Leaf sheaths usually glabrous; leaf blades linear or linear-lanceolate, 2–15 × 0.2–0.4 cm, scabrous or papillose-pilose; ligule 1–3 mm. Inflorescence axis 1–4 cm; racemes 2–5, loosely spiculate, divaricate, 3–8 cm; spikelets paired or ternate, or the clusters grading into short branchlets; rachis slenderly triquetrous, not winged, ca. 0.5 mm broad, margins scabrous; pedicels very unequal, smoothly terete, spreading out from rachis, tips disklike. Spikelets elliptic, 1.3–1.7 mm, hairs clavate; lower glume absent; upper glume narrower than spikelet and 1/2–4/5 as long, 3–5-veined, intervein spaces and margins pubescent; lower lemma slightly shorter than spikelet, 5–7-veined, interveins and margins pubescent, tip subrounded; upper lemma slightly protruding, yellowish brown becoming chestnut at maturity with a pale apiculate apex. Anthers 0.4–0.65 mm. Fl. and fr. Jun–Oct. $2n = 36$.

Hill slopes, forest margins; below 1000 m. Hainan, S Henan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand].

15. *Digitaria jubata* (Grisebach) Henrard, Blumea 1: 100. 1934.

棒毛马唐 bang mao ma tang

Paspalum jubatum Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 84. 1868.

Annual. Culms solitary, erect, 80–110 cm tall. Leaf sheaths shortly pilose to glabrescent; leaf blades linear, 10–20 × 0.3–0.5 cm, scabrous, base subrounded, apex acuminate; ligule 1–2 mm. Inflorescence axis 9–13 cm; racemes 5–8, verticillate at base, slender, ascending, slightly flexuous, often compound; spikelets several in clusters or on short ascending racemelets; rachis very slender, triquetrous, not winged, margins scabrous; pedicels up to 1 cm, scabrous, tips slightly expanded with longer spicules below. Spikelets elliptic, 1.5–1.7 mm, often purpletinged, hairs capitate; lower glume absent; upper glume slightly shorter than spikelet, 3-veined, villous, acute; lower lemma as long as spikelet or slightly shorter, 3–5-veined, villous; upper lemma yellowish brown or purplish brown, as long as spikelet, narrowly acute, apex usually extended. Anthers ca. 0.5 mm. Fl. and fr. Jun–Sep.

Mountain grasslands. Guizhou, Yunnan [NE India].

Digitaria jubata appears to be a species of rather restricted distribution. It is similar to *D. abludens*, but has taller, solitary (vs. tufted) culms, and longer racemes with the branchlets and pedicels lying closer to the rachis (vs. widely spreading). The spikelet pubescence is denser, with more obviously pin-headed hairs.

16. *Digitaria mollicoma* (Kunth) Henrard, Blumea 1: 97. 1934.

绒马唐 rong ma tang

Paspalum mollicomum Kunth, Enum. Pl. 1: 47. 1833; *Digitaria hayatae* (Honda ex Ohwi); ?*D. magna* (Honda) Tuyama; *Panicum hayatae* (Honda) Makino & Nemoto (1925), not A. Camus (1923); ?*P. hayatae* var. *magnum* (Honda) Makino & Nemoto; *Syntherisma hayatae* Honda; ?*S. hayatae* var. *magna* Honda; ?*S. magna* (Honda) Honda.

Short-lived perennial, stoloniferous and mat-forming. Culms slender, flowering shoots ascending, 20–50 cm tall. Leaf sheaths glabrous to pilose; leaf blades linear-lanceolate, 2–6 × 0.3–0.5 cm, glabrous to pilose, short and patent on the stolons, longer and softer on the flowering shoots; ligule 1–2 mm. Inflorescence digitate; racemes 2–3(–5), 3–9 cm; spikelets ternate; rachis ribbonlike, winged, ca. 1 mm broad, margins scabrous; pedicels usually terete, smooth, tips discoid. Spikelets elliptic, 1.7–2.3 mm, hairs smooth or verrucose; lower glume absent or nearly so; upper glume as long as or slightly shorter than spikelet, 3–5-veined, pilose; lower lemma as long as spikelet, with 7 equidistant, rather prominent veins, pilose; upper lemma yellow to pale brown at maturity. Anthers 0.5–0.9 mm. Fl. and fr. Aug–Oct.

Dry sandy soils, near seashores; below 1200 m. Anhui, Jiangxi, Taiwan, Zhejiang [Indonesia, Malaysia, Philippines; Pacific Islands].

Digitaria magna is an inadequately known entity which may be synonymous with *D. mollicoma*. *Syntherisma hayatae* var. *magna* was described from Taiwan, but the protologue is not sufficient to establish its identity.

17. *Digitaria longiflora* (Retzius) Persoon, Syn. Pl. 1: 85. 1805.

长花马唐 chang hua ma tang

Paspalum longiflorum Retzius, Observ. Bot. 4: 15. 1786; *Digitaria propinqua* (R. Brown) P. Beauvois; *Panicum longiflorum* (Retzius) J. F. Gmelin; *P. parvulum* Trinius, nom. illeg. superfl.; *P. propinquum* R. Brown; *Syntherisma longiflora* (Retzius) H. C. Skeels.

Annual or short-lived perennial, usually with slender, many-noded stolons. Culms ascending, leafy, 10–40 cm tall. Leaf sheaths pubescent or glabrous; leaf blades broadly linear, 2–5 × 0.2–0.4 cm, glabrous or papillose-pilose at base, apex acute; ligule 1–1.5 mm. Inflorescence digitate; racemes 2–3, arching at maturity, 2–5 cm; spikelets ternate; rachis ribbonlike, winged, 0.5–0.8 mm broad, midrib low and rounded; pedicels terete, smooth, with discoid tips. Spikelets elliptic, 1.2–1.5 mm, apex acuminate, hairs verrucose; lower glume absent; upper glume as long as spikelet, 5-veined, densely appressed-pubescent; lower lemma as long as spikelet, 7-veined, glabrous between middle and lateral veins, otherwise pubescent; upper lemma yellowish brown or pale gray, apex acuminate. Anthers 0.6–0.8 mm. Fl. and fr. Apr–Oct. $2n = 18$.

Field margins, grasslands, weedy places; 600–1100 m. Fujian, Guangdong, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam; Old World tropics, America].

Digitaria fuscescens (J. Presl) Henrard differs from *D. longiflora* only by its glabrous spikelets and slightly longer, fractionally exerted upper floret. Most likely it is simply a glabrous variant of *D. longiflora*. It is widespread throughout the tropics, and although reported from S China, no specimens have been seen.

18. *Digitaria leptalea* Ohwi, Acta Phytotax. Geobot. 11: 31. 1942.

丛立马唐 cong li ma tang

Digitaria leptalea var. *recticulmis* Ohwi.

Perennial, tufted or stoloniferous. Culms ascending, leafy, up to 40 cm tall. Leaf sheaths pubescent or glabrescent; leaf blades linear, 2–5(–10) × 0.2–0.4 cm, glabrous or margins papillose-pilose at base, apex acute; ligule 1–1.5 mm. Inflorescence digitate; racemes 2–3, ascending, slightly arching at maturity, 2–7 cm; spikelets ternate; rachis ribbonlike, narrowly winged, 0.3–0.5 mm broad, midrib low; pedicels almost smooth, with discoid tips. Spikelets elliptic, 1.2–1.5 mm, apex acuminate, hairs verrucose; lower glume an obscure rim; upper glume subequaling spikelet, 5-veined, densely appressed-pubescent; lower lemma as long as spikelet, 7-veined, similar to upper glume; upper lemma purplish black when fully mature. Anthers ca. 0.4 mm. Fl. and fr. Apr–Oct. $2n = 18$.

Dry banks and hillsides. Taiwan [Japan (Ryukyu Islands)].

Digitaria leptalea closely resembles *D. longiflora*, but has a very slender rachis and its dark purplish fertile floret is like that of the closely related *D. violascens*.

19. *Digitaria stewartiana* Bor, Kew Bull. [6] 1951: 166. 1951.

昆仑马唐 kun lun ma tang

Digitaria ischaemum (Schreber) Muhlenberg subsp. *stewartiana* (Bor) Tzvelev.

Annual. Culms tufted, slender, decumbent at base, ascending, 15–30 cm tall. Leaf sheaths glabrous; leaf blades up to 6 × 0.5 cm, glabrous, base subrounded, margins scabrous, apex acuminate; ligule 1–1.5 mm. Inflorescence subdigitate; racemes 2–3, 4–5 cm; spikelets ternate; rachis ribbonlike, broadly winged, midrib triquetrous; pedicels terete, scabrous, tips cupuliform. Spikelets elliptic, 1.8–2 mm, glabrous; lower glume usually absent; upper glume ca. 4/5 as long as spikelet, hyaline, translucent, glabrous, 3-veined, broadly obtuse; lower lemma purplish, as long as spikelet, 5-veined with 3 central veins close together and outer 2 marginal, veins connected at tip; upper lemma purplish brown at maturity. Anthers ca. 0.5 mm. Fl. and fr. summer–autumn.

Mountains; 2000–3000 m. Xinjiang, Xizang [Kashmir].

This seldom collected species is allied to *Digitaria ischaemum*, but differs in its glabrous spikelets and delicate, rounded upper glume. It may prove to be a high-altitude variant of *D. ischaemum* when better known.

This species is used for forage.

20. *Digitaria ischaemum* (Schreber) Muhlenberg, Descr. Gram. 131. 1817.

止血马唐 zhi xue ma tang

Panicum ischaemum Schreber in Schweigger, Spec. Fl. Erlang. 16. 1804; *Digitaria asiatica* (Ohwi) Tzvelev; *D. humifusa* Persoon; *D. ischaemum* subsp. *asiatica* (Ohwi) Tzvelev; *D. ischaemum* var. *asiatica* Ohwi; *Panicum humifusum* (Persoon) Kunth; *Paspalum humifusum* (Persoon) Poirét; *Syntherisma humifusa* (Persoon) Rydberg.

Annual, whole plant often purple-tinged. Culms loosely tufted, erect or ascending, 15–40 cm tall. Leaf sheaths loose, usually keeled, glabrous or pilose; leaf blades linear-lanceolate,

5–12 × 0.4–0.8 cm, ± pilose, base subrounded, apex acuminate; ligule ca. 0.6 mm. Inflorescence digitate or on a short axis; racemes 2–4, divaricate, 2–9 cm; spikelets ternate; rachis ribbon-like, winged, 0.8–1.1 mm broad, midrib white, rounded or triquetrous, narrower than the green or purple wings, margins serrulate; pedicels angular, scabrous, tips discoid. Spikelets elliptic, 2–2.2 mm, pilose with verrucose hairs, some with curled tips; lower glume absent or a tiny hyaline rim; upper glume as long as spikelet or slightly shorter, 3–5-veined, intervein spaces and margins appressed-pilose; lower lemma as long as spikelet, 5–7-veined, interveins and margins appressed-pilose; upper lemma purplish brown to blackish at maturity. Fl. and fr. Jun–Nov. $2n = 36$.

Open grassy places. Anhui, Fujian, Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang [Japan, Pakistan, Russia; Europe, North America].

Digitaria ischaemum is very close to *D. violascens*, but has a slightly stouter habit with broader leaves, a few short, widely spreading racemes, and larger, plumper spikelets. It also has a more temperate distribution.

Digitaria ischaemum, *D. fauriei*, *D. longiflora*, and *D. violascens* belong to a group of *Digitaria* known as the *Verrucipilae* because of their warty spikelet hairs. A compound microscope is required to see this, but the hairs have a beadlike appearance under moderate magnification. These spikelet hairs also have curled tips in *D. ischaemum* (and sometimes in *D. violascens*), which led to the hairs being described as capitate or clavate in the past.

21. *Digitaria violascens* Link, Hort. Berol. 1: 229. 1827.

紫马唐 *zi ma tang*

Digitaria chinensis (Nees) A. Camus (1923), not Hornemann (1819); *D. pertenuis* Buse; *D. thwaitesii* (Hackel) Henrard var. *tonkinensis* Henrard; *D. violascens* (Link) var. *villosa* Keng; *Panicum steudelianum* Domin; *P. violascens* (Link) Kunth; *Paspalum chinense* Nees; *P. minutiflorum* Steudel (1853), not Desvaux (1831); *Syntherisma chinensis* (Nees) Hitchcock.

Annual. Culms loosely tufted, infrequently shortly stoloniferous, 20–60 cm tall. Leaf sheaths glabrous or pilose, especially at mouth; leaf blades linear-lanceolate, 5–15 × 0.2–0.6 cm, scabrous, glabrous or adaxial surface pilose at base, apex acute; ligule 1–2 mm. Inflorescence subdigitate; racemes (2–)

3–7(–10), ascending, 3–12 cm; spikelets ternate; rachis ribbon-like, winged, 0.5–0.8 mm broad, midrib low and rounded, margins serrate; pedicels angular, scabrous, with discoid tips. Spikelets elliptic-oblong, 1.4–1.9(–2.5) mm, hairs verrucose, sometimes hook-tipped; lower glume absent; upper glume lanceolate, slightly shorter than spikelet, 3(–5)-veined, intervein spaces and margins appressed-pubescent; lower lemma as long as spikelet, 5–7-veined, intervein spaces and margins pubescent, but usually glabrous flanking the middle vein; upper lemma dark brown or purplish black at maturity. Anthers 0.3–0.6 mm. Fl. and fr. Jul–Nov. $2n = 36$.

Hillsides, roadsides, weedy places; ca. 1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Australia, South America].

This widespread, weedy species is closely related to *Digitaria longiflora*, and there is some overlap between the two. *Digitaria violascens* tends to be tufted rather than stoloniferous, with 3 or more longer racemes, angular, scabrous pedicels, a shorter, 3-veined upper glume, and distinctive, blackish fruits.

22. *Digitaria fauriei* Ohwi, Acta Phytotax. Geobot. 11: 31. 1942.

佛欧里马唐 *fo ou li ma tang*

Annual. Culms tufted, shortly stoloniferous at base, 15–20 cm tall, glabrous. Leaf sheaths subcompressed, glabrescent; leaf blades 3–5 × 0.2–0.4 cm, sparsely pilose; ligule ca. 0.4 mm, truncate. Inflorescence subdigitate; racemes 2–4, erect, slender, 3–5 cm; spikelets ternate; rachis winged, 0.8–1 mm broad, wing broader than midrib, margins scabrous. Spikelets oblong-elliptic, 1.3–1.5 mm, pale green, apex acute, hairs white becoming dirty yellow, verrucose, often with coiled tips; lower glume absent; upper glume 1/4–1/2 as long as spikelet; lower lemma elliptic, 5–7-veined, pilose, obtuse; upper lemma purplish black at maturity, elliptic-ovate, subequaling lower lemma. Anthers 0.3–0.5 mm. Fl. and fr. autumn.

• Near seashores, open places. Taiwan (Taipei).

This species is reported in the literature to have paired spikelets, but in fact they are ternate and the hairs are verrucose with coiled tips, not capitate. The species is close to the widespread, weedy *Digitaria violascens*, but is remarkable for its very short upper glume, clearly exposing the purple upper floret, and its curling spikelet hairs.

176. *PSEUDORAPHIS* Griffith ex Pilger, Notizbl. Bot. Gart. Berlin-Dahlem 10: 210. 1928.

伪针茅属 *wei zhen mao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Aquatic or semi-aquatic perennials. Culms decumbent to stoloniferous, many-noded, rooting at lower nodes or floating. Leaf sheaths compressed; leaf blades linear to lanceolate; ligule membranous or ciliate. Inflorescence open or contracted, composed of racemes on all sides of a common axis; racemes solitary or grouped, rachis slender, bearing 1 to several alternate shortly pedicelled spikelets, terminating in a bristle. Spikelets lanceolate, terete or slightly dorsally compressed, florets 2; lower glume very small, veinless; upper glume equaling the spikelet, firmly herbaceous, scabrous to setose, long-acuminate or briefly awned; lower lemma resembling upper glume but usually slightly shorter, enclosing a shorter hyaline palea; upper floret 1/2 as long, shortly stipitate, membranous, smooth, shiny. Caryopsis eventually much larger than upper floret and filling spikelet when mature. $x = 7, 9$.

Six species: India to Japan and throughout SE Asia to Australia; three species in China.

- 1a. Inflorescence open, lanceolate to ovate; racemes spreading, 2–3-spiculate 1. *P. brunoniana*
 1b. Inflorescence contracted, linear to oblong; racemes erect, usually 1-spiculate.
 2a. Spikelets numerous; upper glume longer than lower lemma, narrowly acuminate; lower lemma 7-veined; 2
 stamens in lower floret 2. *P. sordida*
 2b. Spikelets 10 or less; upper glume slightly shorter than lower lemma, acute; lower lemma 13-veined; 3 stamens
 in lower floret 3. *P. balansae*

1. *Pseudoraphis brunoniana* (Wallich & Griffith) Pilger, Notizbl. Bot. Gart. Berlin-Dahlem 10: 210. 1928.

伪针茅 *wei zhen mao*

Panicum brunonianum Wallich & Griffith, J. Asiat. Soc. Bengal 5: 574. 1836; *Chamaeraphis brunoniana* (Wallich & Griffith) A. Camus; *C. spinescens* (R. Brown) Poir. var. *brunoniana* (Wallich & Griffith) J. D. Hooker.

Culms soft, compressed, usually floating, emergent flowering shoots 20–40 cm, nodes pubescent. Leaf sheaths usually longer than internodes, mouth with lanceolate auricles adnate to the ligule; leaf blades linear-lanceolate, 3–9 × 0.3–0.6 cm, base contracted, apex acute; ligule membranous, lacerate, ciliate. Inflorescence open, lanceolate to ovate in outline, 5–10 cm; racemes stiff, ascending to patent, bearing (1–)2–3 distant spikelets on a slender scabrous rachis, terminal bristle (7–)15–30 mm. Spikelets 5.5–8(–10) mm; lower glume 0.5–1 mm, broadly rounded or truncate; upper glume lanceolate, as long as spikelet, 7–11-veined, sparsely spinulose on veins and margins, apex slenderly acuminate; lower lemma slightly shorter than upper glume, 7–9-veined; anthers 3, 1.3–2 mm; upper lemma ca. 2 mm. Fl. and fr. Jul–Aug.

Rooting in shallow water, floating in deep water. Anhui, Guangdong, Taiwan [Bangladesh, NE India, Myanmar, Philippines, Thailand, Vietnam].

This species is closely related to *Pseudoraphis spinescens* (R. Brown) Vickery, with which it has often been confused. *Pseudoraphis spinescens* has a widespread distribution from India and Sri Lanka through Malaysia and Indonesia to Australia. It differs in its densely hairy nodes with shiny, white, appressed, silky hairs; longer racemes bearing 5–10 approximate spikelets, usually with a shorter terminal bristle; and by its caudate upper glume much exceeding the lower lemma.

2. *Pseudoraphis sordida* (Thwaites) S. M. Phillips & S. L. Chen, Novon 13: 469. 2003.

瘦脊伪针茅 *shou ji wei zhen mao*

Panicum sordidum Thwaites, Enum. Pl. Zeyl. 443. 1864; *Chamaeraphis spinescens* (R. Brown) Poir. var. *depauperata* Nees ex J. D. Hooker; *Pseudoraphis depauperata* (Nees ex J. D. Hooker) Keng; *P. spinescens* (R. Brown) Vickery var. *depauperata* (Nees ex J. D. Hooker) Bor; *P. ukishiba* Ohwi.

Culms tufted, slender, 20–50 cm, internodes often purplish, nodes pubescent to subglabrous. Leaf sheaths loose, auricles variable, often inconspicuous; leaf blades linear, 2–6 × 0.2–0.4 cm, base contracted, apex acute; ligule a ciliate membrane. Inflorescence contracted, almost spikelike, oblong, 2–8 cm, enclosed at the base by the uppermost leaf sheath or only slightly exserted; racemes erect, bearing a single spikelet (rarely 2), terminal bristle 8–12 mm. Spikelets 4–6 mm; lower glume 0.6–0.8 mm; upper glume as long as the spikelet, 7 main veins with thinner intermediaries, sparsely strigose on lower back and near margins, sharply acuminate; lower lemma subequal to upper glume, 7-veined; anthers 2, 0.6–1.1 mm; upper lemma 1.3–1.4 mm. Fl. and fr. autumn.

Shallow lakes, streams; 100–500 m. Fujian, Hubei, Hunan, Jiangsu, Shandong, Yunnan, Zhejiang [India, Japan, Korea, Sri Lanka].

The name “*Chamaeraphis depauperata* Nees ex Steudel” (Syn. Pl. Glumac. 1: 49. 1853) was not validly published because it was merely cited as a synonym of *Panicum asperum* Wight ex Steudel (1853), not Lamarck (1779).

3. *Pseudoraphis balansae* Henrard, Blumea, Suppl. 1: 230. 1937.

长稃伪针茅 *chang fu wei zhen mao*

Pseudoraphis longipaleacea L. C. Chia.

Perennial, with rhizomes. Culms slender, floating, 20–70 cm long when flowering, smooth, nodes glabrous. Leaf sheaths loose, keeled, glabrous, mouth with lanceolate auricles adnate to the ligule; leaf blades linear, soft, 3–5 × 0.2–0.4 cm, abaxial surface smooth, adaxial surface scabrous, base rounded, apex subacute; ligule membranous, white, glabrous, subtruncate. Inflorescence linear, 4–5 cm, composed of few spikelets; racemes erect, alternate, bearing a single spikelet (rarely 2), terminal bristle 8–24 mm. Spikelets 4.5–6.5 mm, acute; lower glume 0.5–0.7 mm, obtuse or subtruncate; upper glume as long as or slightly shorter than lower lemma, glabrous, 7–9-veined, acute; lower lemma equal to spikelet, 13-veined; anthers 3, ca. 3 mm; upper lemma ca. 2.5 mm. Fl. and fr. Sep–Oct.

Ponds, lakes. Hainan [Thailand, Vietnam].

Pseudoraphis balansae is distinctive in the genus because its spikelets are merely acute, lacking the drawn-out, narrow tip on the upper glume found in most species. The short, subacute leaves, white, truncate ligule, and few-spicate inflorescence are also characteristic.

177. PENNISETUM Richard, Syn. Pl. 1: 72. 1805.

狼尾草属 *lang wei cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Gymnotrix P. Beauvois.

Annuals or perennials. Culms tufted or rhizomatous, prostrate to over 3 m tall. Leaf blades flat, folded or convolute; ligule a

ciliate membrane. Inflorescence a spike-like panicle, cylindrical to subglobose; branches numerous, contracted into short clusters of one or more spikelets subtended by an involucre of bristles; involucres sessile or with a short basal stipe, deciduous with the spikelets at maturity leaving peduncle stumps or scars on the main axis; bristles slender, scabrous, sometimes plumose, simple or very rarely branched, very unequal, outer shorter, often innermost stouter and conspicuously exceeding the rest. Spikelets usually lanceolate, dorsally compressed, herbaceous, acute or obtuse, florets 2, glumes and lower lemma variable; glumes often small and not exceeding 1/2 spikelet length; lower lemma staminate or neuter, equaling spikelet or reduced; upper lemma equaling spikelet, herbaceous or indurated, obtuse to acute. $x = 9$.

About 80 species: throughout the tropics; 11 species (four endemic, four introduced) in China.

Pennisetum is a large and variable genus, but the bristly, spike-like inflorescence is always readily recognizable. The only other panicoid genus with a similar bristly inflorescence is *Setaria*, but in that genus the bristles are not deciduous with the spikelets, instead remaining on the rachis at maturity. The bristles are derived from reduced panicle branches.

Many species provide good forage. Several species, including *Pennisetum glaucum* in China, are used for food.

- 1a. Inflorescence reduced to 2–4 spikelets within the uppermost leaf sheath; low sward-forming perennial 1. *P. clandestinum*
- 1b. Inflorescence spike-like, clearly exserted above the leaves.
 - 2a. Bristles of involucre obviously branched above base 2. *P. lanatum*
 - 2b. Bristles of involucre unbranched or branched only at extreme base.
 - 3a. Inflorescence axis with sharp decurrent wings below each involucre; upper floret deciduous; bristles densely woolly with crinkled hairs 3. *P. polystachion*
 - 3b. Inflorescence axis not winged; upper floret persistent; bristles glabrous or hairs not crinkled, often tubercle-based.
 - 4a. Culms robust, often 2 m or more; upper lemma indurated in lower half, membranous toward apex; anthers with apical tuft of hairs.
 - 5a. Perennial; bristles longer than spikelets 4. *P. purpureum*
 - 5b. Annual; bristles shorter than spikelets 5. *P. glaucum*
 - 4b. Culms usually less than 1.5 m; upper lemma of uniform texture; anthers without apical tuft of hairs.
 - 6a. Involucres with a basal 2–3 mm stipe; bristles glabrous 6. *P. alopecuroides*
 - 6b. Involucres subsessile or basal stipe less than 1 mm; bristles glabrous or plumose.
 - 7a. Inflorescence axis glabrous; plant with long spreading rhizomes.
 - 8a. Bristles equaling or longer than spikelets 7. *P. flaccidum*
 - 8b. Bristles shorter than spikelets (except longest) 8. *P. sichuanense*
 - 7b. Inflorescence axis puberulous to hirtellous; plant loosely tufted or base decumbent.
 - 9a. Bristles soft, numerous, plumose; leaf sheaths glabrous 9. *P. qianningense*
 - 9b. Bristles stiff, mostly in a single whorl, glabrous or thinly plumose; lower leaf sheaths papillose-pilose.
 - 10a. Leaf blades 1.2–2 cm wide; inflorescence 20–30 cm 10. *P. longissimum*
 - 10b. Leaf blades 0.2–1.2 cm wide; inflorescence less than 20 cm 11. *P. shaanxiense*

1. *Pennisetum clandestinum* Hochstetter ex Chiovenda, *Annuario Reale Ist. Bot. Roma* 8: 41. 1903.

铺地狼尾草 pu di lang wei cao

Perennial, low, sward forming with slender rhizomes and extensive, stouter, much branched stolons. Vegetative shoots up to 20 cm tall, flowering shoots compact, 2–4 cm tall. Leaf sheaths loose, imbricate, subinflated; leaf blades linear, up to 15 × 0.2–0.5 cm on vegetative shoots, 1–4 cm on flowering shoots; ligule ca. 1.2 mm. Inflorescence reduced to 2–4 spikelets enclosed within the uppermost leaf sheath, only spikelet tips protruding; bristles very delicate, 1/2–3/4 as long as spikelet, scaberrulous to ciliolate. Spikelets linear-lanceolate, 13–20 mm, acuminate; lower glume absent; upper glume cufflike, 1–3 mm or sometimes absent; lower floret neuter, lower lemma as long as spikelet, 10–13-veined, palea absent; upper lemma similar; anthers long exserted on threadlike filaments up to 5 cm; stigma simple or shortly bifid, up to 3 cm. Fl. and fr. summer–autumn. $2n = 36$.

Naturalized. Taiwan, Yunnan [native to E Africa].

This is a most unusual species of *Pennisetum* with a highly reduced inflorescence. The bristles must be searched for within the uppermost leaf sheaths. The anthers emerge at night on their long filaments and are visible in the morning as a grayish white haze over the sward.

This species is widely introduced in upland areas of the tropics and subtropics on fertile soils as a pasture and lawn grass (Kikuyu Grass). It has now become an invasive, difficult to eradicate weed in some parts of the world.

2. *Pennisetum lanatum* Klotzsch, *Bot. Ergebn. Reise Walde-mar* 65. 1862.

西藏狼尾草 xi zang lang wei cao

Perennial with extensive branching rhizomes clothed in cataphylls. Culms erect, 25–150 cm tall. Leaf sheaths usually pubescent; leaf blades linear, 10–45 × 0.4–1.3 cm, pubescent to villous or occasionally glabrous; ligule 1–2 mm. Inflorescence linear, 5–15 × 1.5–2.5 cm; axis loosely pubescent, with shallow angular ribs below the cupular involucre-scars; involucre enclosing 2–4 shortly pedicelled spikelets; bristles greenish, softly plumose, rarely almost glabrous, branched (often several times)

above the base. Spikelets ovate-lanceolate, 4–5.5 mm; lower glume 1/3–2/5 as long as spikelet, 3-veined, subacute to rotund, rarely apiculate; upper glume 1/2 as long as spikelet, obtuse to apiculate; lower floret staminate, lemma as long as spikelet, acuminate; upper lemma slightly shorter than lower, acute; anthers without hairs at tip. Fl. and fr. Aug–Oct.

Dry mountain slopes; above 1500 m. W Xizang [Afghanistan, NW India, Kashmir, Nepal, Pakistan].

This is a distinctive species on account of its long, scaly rhizomes and branched bristles in the inflorescence.

3. *Pennisetum polystachion* (Linnaeus) Schultes, Mant. 2: 146. 1824.

牧地狼尾草 mu di lang wei cao

Panicum polystachion Linnaeus, Syst. Nat., ed. 10, 2: 870. 1759; *Cenchrus setosus* Swartz; *Panicum cenchroides* Richard; *P. erubescens* Willdenow; *Pennisetum purpurascens* Kunth; *P. setosum* (Swartz) Richard.

Short-lived perennial or annual. Culms much branched, 50–150 cm tall. Leaf blades linear, 10–20 × 0.3–1.5 cm, hispid. Inflorescence linear, 10–25 × 0.8–1 cm, yellow or purplish; axis angular with sharp decurrent wings below the involucre, these densely packed, often spreading at right angles at maturity; involucre with numerous bristles obscuring the single spikelet, densely ciliate in lower half with crinkled matted hairs, longest bristle 1–2 cm. Spikelet narrowly lanceolate, 3–4.5 mm; lower glume absent or a small triangular scale; upper glume as long as spikelet, 5-veined, obtuse, ciliolate, apiculate; lower floret staminate or neuter, lemma similar but slightly shorter, obtusely 3-lobed; upper floret 2/3 spikelet length, cartilaginous, smooth, shiny, readily deciduous at maturity; anthers without hairs at tip. $2n = 54$.

Naturalized. Hainan, Hong Kong, Taiwan [throughout the tropics].

This is a widespread and polymorphic species, sometimes cultivated for pasture or fodder. The soft, crinkled hairs around the spikelet and the deciduous upper floret are clear-cut characters for recognition.

4. *Pennisetum purpureum* Schumacher, Beskr. Guin. Pl. 44. 1827.

象草 xiang cao

Gymnotrix nitens Andersson; *Pennisetum benthamii* Steudel; *P. flexispica* K. Schumann; *P. hainanense* H. R. Zhao & A. T. Liu; *P. macrostachyum* Benth (1849), not (Brongniart) Trinius (1834); *P. nitens* (Andersson) Hackel.

Perennial forming large tussocks, often with short rhizomes. Culms robust, decumbent and rooting at the base, ascending to 2–4 m tall. Leaf sheaths glabrous or hispid; leaf blades linear, up to 120 × 5 cm, abaxial surface glabrous, adaxial surface hispid or papillose-pilose at base, midrib prominent, margins scabrous; ligule 1.5–5 mm. Inflorescence linear, 10–30 × 1–3 cm, golden, brownish or purplish; axis densely pilose, closely beset with small peduncle stumps; involucre comprising many slender bristles, enclosing 1–5 spikelets, terminal spikelet fertile, subsessile, laterals when present staminate with 1–2 mm

pedicels; inner bristles thinly plumose, longest 1–4 cm. Spikelets 5–7 mm; lower glume vestigial or absent; upper glume 1/4–1/2 as long as spikelet, acute; lower floret staminate or neuter, lemma 1/2–3/4 spikelet length, 5–7-veined, minutely hispidulous, acuminate; upper lemma membranous and obviously 5-veined toward narrowly acuminate tip, lower half cartilaginous, smooth and shiny; anthers with a tuft of short hairs at tip. Fl. and fr. Aug–Oct. $2n = 27, 28$.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan [native to Africa].

This is an excellent forage grass, native in Africa, but now introduced to many tropical countries (Elephant Grass, Napier Grass).

5. *Pennisetum glaucum* (Linnaeus) R. Brown, Prodr. 1: 195. 1810.

御谷 yu gu

Panicum glaucum Linnaeus, Sp. Pl. 1: 56. 1753; *Alopecurus typhoides* N. L. Burman; *Panicum americanum* Linnaeus; *Pennisetum americanum* (Linnaeus) Leeke; *P. americanum* subsp. *typhoideum* Maire & Weiller; *P. spicatum* (Linnaeus) Körnicke var. *typhoideum* T. Durand & Schinz; *P. typhoides* (N. L. Burman) Stapf & C. E. Hubbard; *P. typhoideum* Richard, nom. illeg. superfl.

Annual. Culms robust, up to 3 m tall, densely pubescent at nodes and below inflorescence. Leaf sheaths loose, smooth; leaf blades 20–100 × 2–5 cm, both surfaces and margins scabrous; base subcordate; ligule 2–3 mm. Inflorescence linear to broadly elliptic, dense, 40–50 × 1.5–2.5 cm; axis densely pubescent; involucre persistent, enclosing 1–9 spikelets, basal stipe pubescent, 1–25 mm; bristles usually shorter than spikelets, almost glabrous to densely plumose. Spikelets obovate, 3.5–4.5 mm; lower glume minute, ca. 1 mm; upper glume 1.5–2 mm, 3-veined; lower floret staminate, lemma ca. 2.5 mm, 5-veined, margins membranous and ciliate, palea thinly papery, puberulous; upper lemma 5–7-veined, thinly papery, puberulous, margins ciliate, tip obtuse; anthers with a tuft of short hairs at tip. Fl. and fr. Sep–Oct. $2n = 14$.

Cultivated. N and E China [native to Africa; widely introduced elsewhere].

This is a cultivated species grown for both grain and forage, and is especially suited to regions with a short growing season (Bulrush Millet, Pearl Millet).

6. *Pennisetum alopecuroides* (Linnaeus) Sprengel, Syst. Veg. 1: 303. 1825.

狼尾草 lang wei cao

Panicum alopecuroides Linnaeus, Sp. Pl. 1: 55. 1753; *Cenchrus purpurascens* Thunberg; *Gymnotrix japonica* (Trinius) Kunth var. *viridescens* Miquel; *Pennisetum alopecuroides* var. *erythrochaetum* Ohwi; *P. chinense* Steudel; *P. compressum* R. Brown; *P. dispiculatum* L. C. Chia; *P. japonicum* Trinius; *P. purpurascens* (Thunberg) Kuntze (1891), not Kunth (1816).

Perennial forming dense tussocks. Culms stout, 30–120 cm tall, hispid below inflorescence. Leaf sheaths papery, keeled, imbricate at culm base; leaf blades linear, flat or often

involute, 10–80 × 0.3–1 cm, base papillose-hispid, apex long acuminate; ligule 0.5–2.5 mm. Inflorescence linear, 5–25 × 1.5–3.5 cm; axis hispid, peduncle stumps short with crateriform tips; involucre usually enclosing one spikelet, rarely 2, basal stipe (1–)2–3 mm; bristles greenish or purple, longest 2–3 cm but not conspicuously longer than the others, all slender, hispid. Spikelet lanceolate, 5–8 mm; lower glume 0.6–3 mm, 0–1-veined, obtuse; upper glume ovate-lanceolate, 1/3–2/3 as long as spikelet, 3–5-veined; lower lemma as long as spikelet, 7–11-veined; upper lemma lanceolate, as long as spikelet, papery, acuminate; anthers usually glabrous, occasionally with 1 or 2 hairs at tip. Fl. and fr. summer and autumn. $2n = 18$.

Grassy hillsides, roadsides, field margins; sea level to 3200 m. Anhui, Beijing, Fujian, Guangdong, Guizhou, Hainan, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Tianjin, Xizang, Yunnan, Zhejiang [NE India, Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines; Australia, Pacific Islands (Polynesia)].

This species is used for forage.

7. *Pennisetum flaccidum* Grisebach, Gött. Nachr. 1868: 86. 1868.

白草 bai cao

Pennisetum centrasiaticum Tzvelev; *P. centrasiaticum* var. *lanpingense* S. L. Chen & Y. X. Jin; *P. centrasiaticum* var. *qinghaiense* Y. H. Wu; *P. flaccidum* var. *interruptum* Grisebach; *P. longissimum* S. L. Chen & Y. X. Jin var. *axiglaurum* B. S. Sun & X. Yang; *P. mongolicum* Franchet; *P. sichuanense* S. L. Chen & Y. X. Jin var. *equidistans* B. S. Sun & X. Yang; *P. sinense* Mez.

Perennial with tough spreading rhizomes. Culms tufted, up to 1 m tall. Leaf sheaths loose, subglabrous, rounded, imbricate at base; leaf blades linear with a broad white midrib, 3–25 × 0.2–1.2 cm, glabrous, acuminate; ligule 1–2 mm. Inflorescences terminal and also sometimes axillary from upper leaf sheaths, linear, straight or slightly flexuous, loose to moderately dense, 5–18 cm; axis glabrous, smooth or scaberrulous, beset with short peduncle stumps or scars; involucre enclosing 1 spikelet (rarely 2); bristles many, usually pale green, occasionally purple-tinged, soft, slender, longest 0.9–2 cm, rarely inner thinly plumose. Spikelet narrowly ovate-oblong, 4–7 mm; lower glume usually 1/4 spikelet length or less, obtuse, acute or erose; upper glume 1/3–3/4 spikelet length, 1–3-veined, acuminate; lower floret staminate, lemma as long as spikelet, 3–5(–7)-veined, concave along midline, acuminate-rostrate, palea fully developed; upper lemma acuminate-rostrate, 5-veined; anthers without hairs at tip. Fl. and fr. Jul–Oct.

Hillsides, field margins, roadsides on dry sandy soils, sometimes also on slightly saline alluvial soils on flood plains; 800–5000 m. Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, NW India, Kashmir, Nepal, Pakistan, Tajikistan; SW Asia (Iran)].

This is a widespread and rather variable species, but it always has tough, spreading rhizomes, a glabrous inflorescence axis, and involucre of soft bristles. The bristles are usually glabrous, but occasionally a few hairs are present on some of the inner bristles. Specimens with axillary inflorescences (the basis of *Pennisetum centrasiaticum* var. *qinghai-*

ense) occur throughout the range of the species and do not merit separate status.

This species is a good forage grass.

8. *Pennisetum sichuanense* S. L. Chen & Y. X. Jin, Bull. Nanjing Bot. Gard. 1988–1989: 5. 1990.

四川狼尾草 si chuan lang wei cao

Perennial, rhizomatous. Culms tufted, erect, 40–60 cm tall. Leaf sheaths loose, usually shorter than internodes, hispidulous throughout, pilose at mouth; leaf blades linear, 3–12 × 0.2–0.5 cm, both surfaces papillose-pilose when young; ligule 1.5–2 mm. Inflorescence narrowly linear, dense, erect or slightly curved, 5–12 × 0.6–1 cm; axis pubescent; involucre enclosing one spikelet; bristles glaucous, sparse, 0.3–0.5 cm, usually shorter than spikelet. Spikelet ovate-lanceolate, 4–6 mm; lower glume ovate, membranous, 1/3–1/2 as long as spikelet, 0–3-veined, acute; upper glume thickly membranous, slightly shorter than spikelet, 3–5-veined, acute or acuminate; lower floret usually staminate, lemma as long as spikelet, thickly membranous; upper lemma slightly shorter than spikelet, papery, acute; anthers without hairs at tip. Fl. and fr. Aug–Nov.

• Mountainsides, stream banks; 2000–3000 m. Sichuan, Yunnan.

This species is close to *Pennisetum flaccidum*.

9. *Pennisetum qianningense* S. L. Zhong, J. S. W. Agric. Coll. 1982(4): 75. 1982 [*“qianningensis”*].

乾宁狼尾草 qian ning lang wei cao

Perennial forming loose tufts. Culms ascending, 50–130 cm tall, nodes pilose. Leaf sheaths glabrous but pilose at mouth; leaf blades linear, flat with broad white midrib, 10–40 × 0.4–1 cm, glabrous, apex acuminate; ligule 1–2 mm. Inflorescence linear, 10–17 × 1.5–2 cm; axis puberulous, ribbed, peduncle stumps ca. 1 mm; involucre enclosing 1(–3) spikelets, basal stipe ca. 0.5 mm; bristles purplish brown, soft, numerous, plumose in the lower part, mostly about as long as the spikelet, longest twice as long, up to 2 cm. Spikelets lanceolate, 5–6.5 mm; lower glume ovate, membranous, 1–1.5 mm, veinless; upper glume lanceolate, 1/2–2/3 as long as spikelet, 5-veined; lower floret staminate or neuter, lemma as long as spikelet; upper lemma herbaceous; anthers without hairs at tip. Fl. and fr. May–Sep.

• Dry mountain slopes, valleys, roadsides; 1500–3200 m. Sichuan, Yunnan.

Pennisetum qianningense is very similar to *P. orientale* Richard, but that species has a pubescent inflorescence axis and definitely plumose bristles, which often enclose more than one spikelet. *Pennisetum orientale* is a widespread species extending from N India, Nepal, and Pakistan to C and SW Asia and N Africa. It is to be expected in neighboring parts of China.

10. *Pennisetum longissimum* S. L. Chen & Y. X. Jin, Bull. Bot. Res., Harbin 4: 65. 1984.

长序狼尾草 chang xu lang wei cao

Pennisetum baojiense W. X. Tong.

Perennial forming loose tussocks. Culms decumbent, rooting at base, up to 1.8 m tall, 8–14-noded. Leaf sheaths usually

longer than internodes, glabrous or papillose-pilose; leaf blades linear, 50–90 × 0.5–2 cm; ligule 2.5–3 mm. Inflorescence up to 30 cm, usually pendulous; axis densely hispidulous with angular ribs, peduncle stumps crowded, very short with a tuft of spiculae; involucre enclosing 1(–3) spikelets, basal stipe ca. 0.5 mm; bristles glaucous or purple, stiff, glabrous, unequal, one conspicuously longer and stouter, up to 4 cm. Spikelets lanceolate, 6–8 mm; lower glume ovate, ca. 1/4 as long as spikelet, 0–1-veined, obtuse, acute or erose; upper glume 1/3–1/2 as long as spikelet, 1–3(–5)-veined, acuminate; lower floret usually neuter, lemma as long as spikelet, 5–7-veined, scaberulous, acuminate-rostrate; upper lemma similar but usually slightly shorter; anthers without hairs at tip. Fl. and fr. Jul–Oct.

• Open hill slopes; 500–2000 m. Gansu, Guizhou, Shaanxi, Sichuan, Yunnan.

This species is very similar to *Pennisetum shaanxiense*, but is rather more vigorous. The involucre bristles appear to be always glabrous.

11. *Pennisetum shaanxiense* S. L. Chen & Y. X. Jin, Bull. Bot. Res., Harbin 4: 68, pl. 3. 1984.

陕西狼尾草 shan xi lang wei cao

Pennisetum longissimum var. *intermedium* S. L. Chen & Y. X. Jin.

Perennial forming loose tufts. Culms ascending from a shortly decumbent rooting base, 80–150 cm tall. Lower leaf sheaths papillose-pilose especially at mouth; leaf blades linear, thin, flaccid, 30–50 × 0.5–1.8 cm, subglabrous, smooth except for papillose-pilose base, margins scabrous; ligule ca. 2.5 mm. Inflorescence linear, 10–20 × 1.5–2 cm; axis densely hispidulous with angular ribs, peduncle stumps crowded, very short with a tuft of spiculae; involucre narrow, ascending, enclosing 1 spikelet; bristles purple, stiff, glabrous or inner thinly plumose in the lower part, unequal with one much longer than rest, longest 1.5–2.5 cm. Spikelet ovate-lanceolate, 5–6 mm; lower glume ovate, submembranous, ca. 2 mm, 1-veined or veinless, obtuse or erose; upper glume 1/3–1/2 as long as spikelet, 1–3-veined, acuminate; lower floret neuter, lemma as long as spikelet, 5–7-veined, palea small or absent; upper lemma 5–7-veined; anthers without hairs at tip. Fl. and fr. Jul–Nov.

• Mountain slopes, roadsides, field margins; 500–1100 m. Gansu, Hunan, Qinghai, Shaanxi, Sichuan, Yunnan.

This species is variable in the hairiness of the involucre bristles, which are never more than thinly hairy, and the hairs may be confined to the stout, longest bristle, or even absent altogether. The species can be recognized by its thin, flat leaves with papillose-pilose lower sheaths, hispidulous rachis, narrow involucre of stiff bristles, and empty lower lemma.

178. *CENCHRUS* Linnaeus, Sp. Pl. 2: 1049. 1753.

蒺藜草属 ji li cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Culms usually branched near the base. Leaf blades usually flat; ligule a ciliate rim. Inflorescence spike-like, cylindrical, composed of spiny or bristly deciduous burrs arranged along an angular, often sinuous rachis; burrs sessile or with an obconical basal stipe, each composed of 1 or more sessile spikelets surrounded by an involucre of spines and bristles; bristles flexuous or more often spinous, ± flattened, grooved on the outer face, united below, the degree of union varying from a small basal disk to a deep cupule, inner spines or bristles often ciliate around spikelets. Spikelets lanceolate, acute; glumes unequal, shorter than spikelet, lower sometimes suppressed; lower floret membranous, staminate or neuter; upper floret firmer, protogynous. Lodicules absent.

Twenty-three species: tropical and warm-temperate regions of the world; four species (all introduced) in China.

- 1a. Inner spines of burr extended beyond spikelets as long, slender bristles, connate only at base; outer bristles often longer than spikelets, numerous 1. *C. ciliaris*
- 1b. Inner spines of burr stiff, flattened, connate to form a deep cupule; outer bristles shorter than inner spines or absent.
 - 2a. Burr consisting of several whorls of connate, flattened spines, free tips emerging at irregular intervals over body of burr 2. *C. incertus*
 - 2b. Burr consisting of 1 whorl of connate, flattened spines, usually surrounded by whorls of smaller, finer bristles.
 - 3a. Spines of burr retrorsely barbed, tenaciously prickly; outer bristles many 3. *C. echinatus*
 - 3b. Spines of burr antrorsely barbed; outer bristles few or absent 4. *C. setigerus*

1. *Cenchrus ciliaris* Linnaeus, Mant. Pl. 2: 302. 1771.

水牛草 shui niu cao

Pennisetum ciliare (Linnaeus) Link.

Perennial, tufted or shortly rhizomatous. Culms erect or ascending from a decumbent or stoloniferous base, slender to moderately stout, sometimes much branched, up to 1 m tall. Leaf sheaths glabrous or pubescent; leaf blades linear, green or grayish, 10–50 × 0.4–0.8 cm, with scattered, tubercle-based

hairs; ligule 0.5–3 mm. Inflorescence 3–15 cm, densely bristly, burrs contiguous, rachis puberulous. Burrs composed of many bristles; bristles antrorsely barbed; inner bristles 7–14 mm (one stouter and slightly longer), connate at extreme base to form a shallow disc 0.5–1.5 mm wide, somewhat flattened around spikelets, grooved on outer face, ciliate on inner margins, tips extended into flexuous bristles clearly exceeding spikelets; outer bristles numerous, shorter, slender. Spikelets 1–4 in burr, 3–5 mm; lower glume 1/3–1/2 spikelet length; upper glume ca. 1/2 spikelet length. $2n = 36$.

Pastures and weedy places, introduced. Taiwan [native to India, Pakistan; Africa, SW Asia; introduced in America and Australia].

This is a polymorphic species occurring naturally from Africa to India. Some superior strains have been selected and distributed in warm parts of the world for pasture and fodder in dry areas (Buffel Grass), and the grass has become a widespread weed. It was introduced to Taiwan as a pasture grass, and is now naturalized in the south of that island.

Cenchrus ciliaris may easily be mistaken for a species of *Pennisetum*, as the basal fusion of the bristles is rather slight. However, the flattening and grooving of the bristles around the spikelets is a characteristic feature of *Cenchrus* and is not found in *Pennisetum*.

2. *Cenchrus incertus* M. A. Curtis, Boston J. Nat. Hist. 1: 135. 1837.

光梗蒺藜草 guang geng ji li cao

Annual or short-lived perennial. Culms geniculate, decumbent or erect, 40–100 cm tall. Leaf sheaths keeled, loose, glabrous or pilose near margins; leaf blades linear or narrowly lanceolate, 3–20 × 0.2–0.6 cm, glabrous on both surfaces; ligule 0.5–1.5 mm. Inflorescence 1.5–6.5 × ca. 1 cm, open or compact, rachis scabrous. Burrs variable, globose or ovoid, ca. 1 cm, stipe glabrous, spines retrorsely barbed, connate for much of their length, spiny tips diverging irregularly throughout body of burr, involucre cupule cleft on 2 sides, pubescent, spines rigid, long and slender to short and broad. Spikelets 2–3 in burr, 3.5–6 mm; lower glume 1/3–1/2 spikelet length; upper glume 3/4 spikelet length. Fl. and fr. autumn.

Seashore sand dunes. Liaoning [native to America].

This native of America is now widespread as a weed.

3. *Cenchrus echinatus* Linnaeus, Sp. Pl. 2: 1050. 1753.

蒺藜草 ji li cao

Annual. Culms geniculate, usually rooting at basal nodes, 15–90 cm tall. Leaf sheaths keeled, usually imbricate at base; leaf blades linear or linear-lanceolate, 5–20(–40) × 0.4–1 cm, glabrous to pubescent; ligule ca. 1 mm. Inflorescence 3–10 ×

ca. 1 cm, burrs contiguous, rachis scabrous. Burrs globose, 0.4–1 cm, truncate, stipe pubescent, all spines and bristles retrorsely barbed; inner spines connate for 1/3–1/2 their length forming a globose cupule, the flattened free tips triangular, erect or bent inward, cupule and tips pubescent, outer spines in 2 divergent whorls, a median whorl of stout rigid spines equaling the inner teeth, and an outermost whorl of relatively few short, slender bristles. Spikelets 2–4 in burr, 4.5–7 mm; lower glume 1/2 spikelet length; upper glume 2/3–3/4 spikelet length. Fl. and fr. summer. $2n = 34, 68$.

Seashore sand dunes, roadsides, waste places. Fujian, Guangdong, Hainan, Taiwan, Yunnan [native to America; now a widespread weed of the tropics and subtropics].

The name *Cenchrus caliculatus* Cavanilles has been misapplied to this species in China. *Cenchrus caliculatus* is a larger species with culms to 2 m tall and an inflorescence to 24 cm. It is further distinguished by its burrs, which have only a shallow basal cupule. It occurs in Indonesia, Australia, and the S Pacific Islands.

4. *Cenchrus setigerus* Vahl, Enum. Pl. 2: 395. 1805.

倒刺蒺藜草 dao ci ji li cao

Perennial. Culms somewhat bulbous at base, geniculately ascending, 20–60 cm tall. Leaf sheaths keeled, scabrous; leaf blades linear, 2–20 × 0.4–0.8 cm, adaxial surface pilose with long scattered hairs; ligule ca. 0.5 mm. Inflorescence rather stiff, 4–12 × 0.6–0.7 cm, burrs overlapping by about half their length, rachis scabro-puberulous. Burrs broadly oblong with rounded base, 0.3–0.7 cm, sessile; inner spines connate for 1/4–1/2 their length forming a tough cupule, flattened free tips narrowly triangular, erect, antrorsely scaberulous with a broad green groove on outer face, inner face shortly ciliate; outer spines very short or almost suppressed, reduced to bristles around periphery of cupule. Spikelets 1–4 in burr, 3.5–5 mm; lower glume 1/2 spikelet length; upper glume 4/5 spikelet length. $2n = 34, 36$.

Introduced and cultivated for fodder. Yunnan (Honghe) [native to NW India, Pakistan; E and NE Africa, SW Asia].

179. *SPINIFEX* Linnaeus, Mant. Pl. 2: 163, 300. 1771.

鬣刺属 lie ci shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, rhizomatous; dioecious or sometimes androdioecious. Leaf blades hard, linear to subulate-involute; ligule a line of hairs. Inflorescence terminal, compound, composed of many single racemes subtended by prophylls and spatulate sheaths and condensed into a compact fascicle. Staminate inflorescence with exserted racemes bearing several spikelets and ending in a short point. Female or bisexual inflorescence stellately globose, falling entire, composed of numerous racemes reduced to a single basal spikelet hidden among subtending spathes, its rachis prolonged into a long needle-like spine. Spikelets dorsally compressed, staminate spikelets herbaceous, female spikelets papery. Staminate spikelet with shorter glumes and both florets staminate. Female spikelet with glumes equal to spikelet and lower floret sometimes paleate and staminate. Upper lemma in both slightly indurate with flat hyaline margins. $x = 9$.

Four species: seashores from India to Japan, SE Asia, and Australia; one species in China.

1. *Spinifex littoreus* (N. L. Burman) Merrill, Philipp. J. Sci. 7: 229. 1912.

老鼠芳 lao shu li

Stipa littorea N. L. Burman, Fl. Indica 29. 1767; *Spinifex*

squarrosus Linnaeus; *Stipa spinifex* Linnaeus.

Culms stoloniferous, hard, stout, many-noded, rooting and copiously branching at nodes, flowering shoots ascending to 30–100 cm, internodes farinose. Leaf sheaths broad, rounded on back, imbricate; leaf blades distichous, very tough, involute-

subulate, curved, 5–20 × 0.2–0.3 cm, margins scabrous, apex spiny; ligule densely ciliate. Staminate inflorescence of 2–5 clustered turbinate heads 5–10 × 6–8 cm; racemes 3–6 cm, bearing 5–10 loosely imbricate spikelets. Staminate spikelets lanceolate, 8–12 mm; glumes oblong-lanceolate, 7–9-veined, lower glume 1/2 spikelet length, upper glume 2/3 spikelet length; lower lemma 5-veined, 8–10 mm, palea with winged ciliate keels; upper lemma with unkeeled palea. Female inflorescence globose, 20–35 cm in diam.; racemes unispiculate with needle-like 10–18 cm rachis. Female spikelets lanceolate-oblong, 10–20 mm, acuminate; glumes oblong-lanceolate, low-

er glume many-veined, upper glume 7–9-veined; lower lemma ovate-lanceolate, 5-veined, palea absent; upper lemma lanceolate, yellowish. Fl. and fr. summer-autumn.

Sandy beaches, seashore dunes. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Cambodia, India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

This species is an efficient sand binder, forming large colonies and stabilizing dunes. The female inflorescences act as tumbleweeds. The seeds within are dispersed as the spiky head is transported along the coast by wind and sea.

25. Tribe ISACHNEAE

柳叶箬族 liu ye ruo zu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annuals or perennials. Leaf blades narrowly lanceolate to ovate; ligule a line of hairs, rarely absent. Inflorescence an open or contracted panicle. Spikelets all alike, florets 1 or 2, when 2 lower florets bisexual or male, upper floret bisexual or female, dorsally compressed, awnless, disarticulating above glumes and sometimes tardily between florets; glumes shorter than or equaling spikelet, membranous, deciduous or persistent; lemmas rounded on back, membranous to leathery, obscurely 0–7-veined, glabrous or pubescent, margins inrolled and clasping edges of palea. Caryopsis ellipsoid to plano-convex; hilum round to oval. Leaf anatomy: non-Kranz; microhairs slender or stout. $x = 10$.

Five genera and ca. 100 species: throughout the tropics, but mainly in Asia; three genera and 20 species (four endemic) in China.

- 1a. Upper lemma indurate 180. *Isachne*
- 1b. Upper lemma membranous.
 - 2a. Spikelets with 2 florets; glumes persistent 181. *Coelachne*
 - 2b. Spikelets with 1 floret; glumes deciduous 182. *Sphaerocaryum*

180. ISACHNE R. Brown, Prodr. 196. 1810.

柳叶箬属 liu ye ruo shu

Annual or perennial. Culms erect or decumbent or creeping, many-noded. Leaf blades narrowly lanceolate to ovate, margin frequently white and thickened; ligule a line of stiff hairs. Inflorescence an open or contracted panicle, branches and pedicels sometimes spotted with yellow glandular patches. Spikelets with 2 florets, florets both bisexual or lower floret bisexual or male and upper floret male or female, separated by a short internode or contiguous, disarticulating below each floret; glumes falling soon after florets, subequal, 3/4 to as long as spikelet, 5–9-veined; lower lemma variable, resembling the upper or of different size and texture; upper lemma orbicular to broadly elliptic, papery to leathery, glabrous or pubescent with short curved hairs, 5–7-veined, obtuse. Stamens 3. Caryopsis ellipsoid or subglobose.

About 90 species: throughout the tropics, but mainly in Asia; 18 species (four endemic) in China.

- 1a. Florets unequal in size and of different texture; lower floret longer, flatter and more delicate.
 - 2a. Upper floret 1/2 length of lower floret; panicle eglandular 1. *I. hainanensis*
 - 2b. Upper floret slightly shorter and broader than lower floret; panicle glandular.
 - 3a. Perennial; culms to 80 cm tall, nodes glabrous; leaf blades narrowly lanceolate, 3–11 cm 2. *I. globosa*
 - 3b. Annual; culms to 25 cm tall, nodes hispid; leaf blades ovate-amplexicaul, 2–3 cm 3. *I. pulchella*
- 1b. Florets equal in size or nearly so and of similar texture.
 - 4a. Spikelets 2 mm or more.
 - 5a. Panicle branches and pedicels glandular.
 - 6a. Leaf sheaths longer than internodes; nodes pubescent; glumes truncate 4. *I. truncata*
 - 6b. Leaf sheaths shorter than internodes; nodes glabrous; glumes obtuse to rounded.
 - 7a. Leaf blades linear, 0.3–1 cm wide, suberect; panicle 5–14 cm; spikelets globose 5. *I. himalaica*
 - 7b. Leaf blades lanceolate, 0.8–1.8 cm wide, ascending; panicle 17–25 cm; spikelets elliptic to obovate 6. *I. hoi*
 - 5b. Panicle branches and pedicels eglandular.
 - 8a. Lemmas densely ciliate along margins, otherwise glabrous; culms 30–60 cm tall 7. *I. ciliatiflora*
 - 8b. Lemmas not above; culms 5–25 cm tall.
 - 9a. Leaf blades ovate-lanceolate or lanceolate 1–1.8 cm wide; glumes densely scabrid-hispidulous, obtuse or subrounded 8. *I. repens*
 - 9b. Leaf blades narrowly lanceolate, 0.4–0.8 cm wide; glumes glabrous, subacute 9. *I. sikkimensis*

4b. Spikelets less than 2 mm.

10a. Culms up to 30 cm tall, often much less; plant decumbent or mat-forming.

11a. Leaf blades linear-lanceolate, 2–6 cm; pedicels often glandular 10. *I. clarkei*

11b. Leaf blades lanceolate-ovate, 1–3.5 cm; pedicels eglandular.

12a. Panicle branches and pedicels minutely scaberrulous; leaf blades 2–3.5 cm, abruptly acuminate 11. *I. nipponensis*

12b. Panicle branches and pedicels smooth; leaf blades 1–2 cm, acute.

13a. Spikelets 1–1.4 mm; panicle with 15–30 spikelets (fewer in depauperate specimens) ... 12. *I. myosotis*13b. Spikelets 1.4–2 mm; panicle sparse, usually with fewer than 12 spikelets 13. *I. pauciflora*

10b. Culms 30–100 cm tall, erect or ascending; plant tufted.

14a. Panicle eglandular; spikelets 1–1.5 mm, whitish 14. *I. albena*

14b. Panicle glandular (sometimes sparsely); spikelets 1.2–2 mm, green, purplish or brownish.

15a. Leaf blades 1–2.5 cm, sheaths very short; panicle 1.5–4 cm, branches stiffly horizontal 15. *I. confusa*

15b. Leaf blades 3–20 cm, sheaths not short; panicle 4–22 cm, branches ascending or spreading.

16a. Leaf blades 3–10 × 0.4–0.8 cm; leaf sheaths glabrous (except margin).

17a. Glumes boat-shaped, usually glabrous, rarely hispidulous or scaberrulous above middle; leaf sheaths shorter than internodes 2. *I. globosa*17b. Glumes ovate-elliptic, hirtellous above middle; leaf sheaths about as long or longer than internodes 16. *I. guangxiensis*

16b. Leaf blades 9–20 × 1–2.4 cm; leaf sheaths hairy.

18a. Leaf sheaths densely hirsute; leaf blades 9–12 × 1.3–2.4 cm 17. *I. sylvestris*18b. Leaf sheaths hispid with sharp patent hairs; leaf blades 12–20 × 1–1.2 cm 18. *I. scabrosa*

1. *Isachne hainanensis* P. C. Keng, Acta Phytotax. Sin. 10: 23. 1965.

海南柳叶箬 *hai nan liu ye ruo*

Annual. Culms slender, creeping, branching and rooting at lower nodes, 8–15 cm tall. Leaf sheaths shorter than internodes, papillose-hispid, outer margin ciliate; leaf blades ovate-elliptic, thin, 0.8–1.5 × 0.3–0.6 cm, subglabrous or abaxial surface papillose-hispid, base rounded, margins not thickened, ciliate, apex acute; ligule almost absent. Panicle ovate in outline, 2–3.5 cm, eglandular, moderately branched; branches and pedicels slender, pedicels mostly longer than spikelets. Spikelets 1.7–1.8 mm, greenish or purplish green; florets clearly dissimilar; lower floret male, upper floret raised on distinct internode, bisexual; glumes subequaling or shorter than spikelet, elliptic-lanceolate, 5–7-veined, glabrous, apex obtuse; lower lemma herbaceous, elliptic-oblong, dorsally flattened, smooth, glabrous; anthers 1.3–1.5 mm; upper lemma crustaceous, strongly plano-convex, 1/2 length of lower floret, densely pubescent. Fl. and fr. Oct–Dec.

• Valleys, moist places; 300–500 m. Guangdong, Hainan.

This species is very close to *Isachne pulchella*, but the whole plant is eglandular and has exceptionally small leaf blades and a small upper floret raised on a conspicuous internode. The anthers are also longer than in *I. pulchella*.

2. *Isachne globosa* (Thunberg) Kuntze, Revis. Gen. Pl. 2: 778. 1891.

柳叶箬 *liu ye ruo*

Perennial. Culms slender to moderately robust, erect or decumbent and rooting at lower nodes, up to 80 cm tall, nodes glabrous, eglandular or with glandular ring. Leaf sheaths shorter than internodes, glabrous except for ciliate outer margin; leaf blades narrowly lanceolate, 3–10 × 0.4–0.8 cm, glabrous, scabrid, base rounded, apex acute; ligule 1–2 mm. Panicle open,

ovate in outline, 4–11 cm, glandular, many-spiculate; branches and pedicels filiform, flexuose; pedicels variable in length, shorter or longer than spikelets. Spikelets elliptic-globose, 1.5–2(–2.2) mm, greenish or purplish brown; florets slightly to clearly dissimilar; lower floret male, upper floret female; glumes subequal, as long as or shorter than florets, broadly elliptic, 5–7(–9)-veined, usually glabrous, rarely hispidulous or scaberrulous above middle, apex broadly rounded; lower lemma oblong, cartilaginous to subcrustaceous, shallowly convex, back sometimes sulcate, smooth, glabrous; anthers 0.8–1.3 mm; upper lemma crustaceous, shorter and more convex, slightly rough, back glabrous or puberulous, upper margins ciliate. Fl. and fr. summer to autumn. $2n = 60$.

Wet places, forming colonies, and as a weed of rice fields. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific Islands].

This is a widespread and very variable species. It includes several ill-defined entities that have been given specific rank in the past. The typical form, from Japan, has spikelets with the florets only slightly dissimilar, nearly equal in length and texture and the upper floret rounded on the back without a central groove. This form is the most common entity in China. Specimens from India usually have more clearly unequal florets, the lower one longer and thinner, with a deep, longitudinal groove on the back. This form may have a glabrous or pubescent upper floret, and the pubescent variant is the basis of the name *Isachne miliacea*. In SE Asia this division breaks down, with many intermediate forms. Specimens in which the florets are nearly equal but the lower one is grooved also occur in China. There is much variation in habit and spikelet size unrelated to other characters.

This species is a forage grass, but also a troublesome weed of rice fields.

1a. Panicle open; lower lemma glabrous 2a. var. *globosa*
1b. Panicle dense; lower lemma densely ciliate 2b. var. *compacta*

2a. *Isachne globosa* var. *globosa*

柳叶箬(原变种) liu ye ruo (yuan bian zhong)

Milium globosum Thunberg in Murray, Syst. Veg., ed. 14, 109. 1784; *Isachne australis* R. Brown; *I. globosa* var. *brevispicula* Ohwi; *I. miliacea* Roth ex Roemer & Schultes.

Panicle open; branches slender. Lower lemma glabrous; upper lemma puberulous.

Wet places, forming colonies, and as a weed of rice fields. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Taiwan, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Malaysia, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific Islands].

2b. *Isachne globosa* var. *compacta* W. Z. Fang ex S. L. Chen, Bull. Nanjing Bot. Gard. 1988–1989: 2. 1990.

紧穗柳叶箬 jin sui liu ye ruo

Panicle dense, cylindrical; branches stout, short. Lower lemma densely ciliate.

• Grasslands. Fujian (Xiamen Shi).

This taxon does not correspond well to *Isachne globosa* and may prove to be a different species when better known. Its characters are not, therefore, included in the species description.

3. *Isachne pulchella* Roth in Roemer & Schultes, Syst. Veg. 2: 476. 1817.

矮小柳叶箬 ai xiao liu ye ruo

Isachne dispar Trinius; *I. heterantha* Hayata; *Panicum bellum* Steudel, nom. illeg. superfl.; *Sphaerocaryum pulchellum* (Roth) Merrill; *Studelella pulchella* (Roth) Honda.

Annual. Culms very slender, straggling, branching and rooting at lower nodes, 10–25 cm tall, nodes hispid with a glandular ring below. Leaf sheaths shorter than internodes, papillose-hispid at base above node, otherwise pilose or subglabrous, outer margin ciliate; leaf blades ovate or ovate-lanceolate, 2–3 × 0.8–1 cm, scabrid to thinly hispid, base cordate-amplexicaul with pectinate margin, apex shortly acuminate; ligule ca. 2 mm. Panicle narrowly ovate to pyramidal in outline, 2.5–5 cm, glandular; primary branches inserted singly, stiffly and regularly spreading with branchlets to their base; pedicels mostly shorter than spikelets. Spikelets plumply elliptic, 1.3–1.8(–2) mm, gray-green or purplish green; florets clearly dissimilar; lower floret male, upper floret bisexual or female; glumes slightly shorter than lower floret; lower glume elliptic-oblong, 5-veined, upper glume broadly elliptic, 7-veined both glabrous, apex obtuse; lower lemma herbaceous, elliptic-oblong, dorsally flattened, smooth, glabrous; anthers 0.3–0.5 mm; upper lemma slightly shorter, crustaceous, strongly plano-convex, pubescent. Fl. and fr. May–Oct.

Marshy ground and shallow water, gregarious and forming patches. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [Bangladesh, India, Malaysia, Nepal, Thailand, Vietnam].

The description in Roemer and Schultes (1817) was taken from the manuscript of Roth (Nov. Pl. Sp. 58. 1821).

This taxon grades into small, slender forms of *Isachne globosa* and is sometimes included within that species (as the synonym *I. dispar*). However, this creates an unacceptably wide range of variation within *I. globosa*. Typical forms of *I. pulchella* are quite different from typical forms of *I. globosa*. *Isachne pulchella*, as recognized here, comprises small, delicate plants with short, broad leaf blades, hairy nodes with a glandular ring below, small spikelets with clearly dissimilar florets, a soft, herbaceous lower floret lacking a dorsal groove, and a pubescent upper floret. The anthers are shorter than in small forms of *I. globosa*.

4. *Isachne truncata* A. Camus, Notul. Syst. (Paris) 2: 205. 1912.

平颖柳叶箬 ping ying liu ye ruo

Isachne chinensis Merrill; *I. truncata* var. *cordata* A. Camus; *I. truncata* var. *crispa* P. C. Keng; *I. truncata* var. *maxima* P. C. Keng.

Perennial, shortly rhizomatous. Culms erect from ascending base, 30–80 cm tall, internodes short, nodes pubescent. Leaf sheaths longer than internodes, overlapping, glabrous or pilose, outer margin ciliate; leaf blades lanceolate, regularly distichous, 5–11 × 0.8–1.4 cm, abaxial surface glabrous to densely pubescent, adaxial surface glabrous or puberulous, margins strongly thickened, base rounded to cordate, apex acuminate; ligule ca. 2 mm. Panicle open, finally ovate, 8–20 cm, glandular; lower primary branches in groups of 2 or 3, upper single, long naked below, scaberulous; pedicels 2 to several times longer than spikelets. Spikelets obovate or subglobose, (1.8–)2–2.2 mm, green or brownish; florets similar; glumes subequal or lower slightly shorter, very broadly ovate, 9–11-veined, glabrous or upper or both pubescent, apex subtruncate but margins incurving; lemmas subleathery, smooth, pilose toward apex especially on margins, and also at base of floret, otherwise glabrous. Fl. and fr. Aug–Oct.

Mountain slopes, forest margins. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Yunnan, Zhejiang [Vietnam].

The habit of this species is distinctive, with closely overlapping leaf sheaths obscuring the culm, hairy nodes, and a glandular panicle with the lower branches often 2 or 3 together. The smooth florets are also characteristic.

5. *Isachne himalaica* J. D. Hooker, Fl. Brit. India 7: 23. 1896 [“1897”].

喜马拉雅柳叶箬 xi ma la ya liu ye ruo

Perennial. Culms slender, stiffly erect or with a shortly decumbent rooting base, 30–80 cm tall, paler below the nodes but not glandular. Leaf sheaths shorter than internodes, glabrous except for stiffly ciliate outer margin; leaf blades broadly linear, suberect to ascending, 5–15 × 0.3–1 cm, glabrous to thinly hispid, margins prominently thickened, apex acuminate; ligule 2–3 mm. Panicle open, elliptic to ovate in outline, 5–14 × 2–8 cm, glandular; primary branches inserted singly, obliquely spreading, scaberulous, branchlets and pedicels capillary, flexuose, smooth. Spikelets globose, 1.9–2.2 mm, pale; florets similar; glumes equaling spikelet or a little shorter, broadly ovate, deeply concave, 7–9-veined, papillose-hispid or with only a few api-

cal bristles or glabrous, apex rounded but margins incurling; lemmas strongly plano-convex, minutely roughened, subglabrous or pubescent with slightly longer hairs toward apex.

Swampy places; ca. 2000 m. Xizang [Afghanistan, Bhutan, N India, Nepal, Pakistan].

This is a Himalayan species with an erect habit and a loose, only moderately branched panicle of quite large, globose, often purple spikelets on flexuose, glandular pedicels. The leaf blades are narrower than in other similar species and are usually held fairly upright.

6. *Isachne hoi* P. C. Keng, Acta Phytotax. Sin. 10: 11. 1965.

浙江柳叶箬 zhe jiang liu ye ruo

Perennial. Culms decumbent at base, rooting and branching at lower nodes, ascending to 45–85 cm tall, nodes glabrous, indistinctly glandular. Leaf sheaths shorter than internodes, glabrous except for stiffly ciliate outer margin; leaf blades lanceolate, 8–14 × 0.8–1.8 cm, abaxial surface scabrid-pubescent with short stiff papillose-based hairs, adaxial surface scaberulous, base rounded, apex acuminate; ligule ca. 2 mm. Panicle very open, 17–25 cm; primary branches inserted singly, divaricate, spikelets scattered; branches slender, flexuose, scaberulous, with elongate glandular patches; pedicels shorter than spikelets (except where terminating branchlets), shortest ca. 0.5 mm. Spikelets elliptic or obovate, ca. 2 mm, green or purplish green; glumes ovate, slightly shorter than florets at maturity, 7–9-veined, short stiff papillose-based hairs toward apex on lower glume and over most of back on upper glume, apex obtuse; florets similar, pilose, upper slightly shorter. Fl. and fr. Sep–Nov.

- Moist valleys, hillside forests. Guangdong, Hunan, Zhejiang.

The leaf blades are obviously rough when stroked with a finger, but the sheaths are smooth (unlike *Isachne scabrosa*). The panicle branches are also rough, except along the elongate glandular patches, and the spikelets are borne on very short pedicels.

7. *Isachne ciliatiflora* Keng ex P. C. Keng, Acta Phytotax. Sin. 10: 13. 1965.

纤毛柳叶箬 xian mao liu ye ruo

Perennial. Culms loosely tufted, ascending, rooting at lower nodes, 30–60 cm tall, nodes eglandular. Leaf sheaths glabrous except for ciliate outer margin; leaf blades linear-lanceolate, 5–15 × 0.5–1 cm, smooth, glabrous, base rounded, apex acuminate; ligule ca. 1 mm. Panicle open, 5–15 cm, eglandular; primary branches laxly ascending, moderately branched with scattered spikelets, smooth; pedicels equaling or longer than spikelets. Spikelets oblong, ca. 2.5 mm; florets slightly dissimilar, lower floret bisexual, upper floret usually female; glumes similar, ovate-oblong, slightly shorter than spikelet, 5–7-veined, glabrous, obtuse; lower lemma elliptic-oblong, shallowly convex, cartilaginous, densely white-ciliate along whole length of margin, otherwise glabrous; upper lemma similar but slightly shorter and more ovate. Fl. and fr. Jun–Sep.

- Moist places; 1500–1800 m. Sichuan.

This species is related to *Isachne globosa*, but differs in having an eglandular panicle and densely ciliate lemma margins.

8. *Isachne repens* Keng, Sunyatsenia 1: 129. 1933.

匍匐柳叶箬 pu fu liu ye ruo

Isachne kunthiana (Wight & Arnott ex Steudel) Miquel subsp. *nudiglumis* (Hackel) T. Koyama; *I. kunthiana* var. *nudiglumis* (Hackel) T. Koyama; *I. myosotis* Nees var. *nudiglumis* Hackel.

Slender trailing herb, annual or short-lived perennial. Culms stoloniferous with 1 or 2 wiry roots from lower nodes, flowering branches up to 25 cm tall, nodes pubescent. Leaf sheaths glabrous or hispid, outer margin ciliate becoming setose near ligule; leaf blades lanceolate, 5–7 × 1–1.8 cm, abaxial surface glabrous or papillose-hispid, adaxial surface glabrous or thinly pilose, base obtuse to rounded, apex acuminate; ligule 1–2 mm. Panicle elliptic to ovate in outline, 3–5.5 cm, eglandular; branches ascending to spreading, branches and pedicels stout, smooth, lateral pedicels shorter than spikelets. Spikelets broadly elliptic, 2.1–2.4 mm, green; florets similar; glumes equal to spikelet or upper slightly shorter, lower glume narrower, 7–9-veined, upper 9–11-veined, densely scabrid-hispidulous, spicules longer toward apex; lemmas pale, ovate to subrotund, weakly convex, leathery, smooth, pubescent on the inrolled margins toward apex; palea of upper floret puberulous. Fl. and fr. Oct–Dec.

Moist places in forests. Fujian, Guangdong, Guangxi, Hainan, Taiwan [Japan (S Ryukyu Islands)].

This species is very close to *Isachne schmidtii* Hackel, from Indonesia and peninsular Malaysia, which is somewhat smaller, with shorter leaf blades, a more contracted panicle, and especially differs in its glumes extending beyond the florets. *Isachne schmidtii* has often been confused in the literature with *I. kunthiana* (Wight & Arnott ex Steudel) Miquel, from India and Sri Lanka, which also has glumes longer than the florets, but differs by its underground rhizomes and glabrous or setose glumes.

9. *Isachne sikkimensis* Bor, Kew Bull. [4] 1949: 115. 1949.

锡金柳叶箬 xi jin liu ye ruo

Slender herb, annual or short-lived perennial. Culms decumbent, rooting at the base, branching, up to 20 cm tall, basal internodes wiry, purplish, nodes bearded or glabrous. Leaf sheaths purplish green, pubescent, outer margin ciliate; leaf blades narrowly lanceolate, 3–7 × 0.4–0.8 cm with the upper much longer than the lower, both surfaces but especially abaxial papillose-pilose, or subglabrous, margins scaberulous, base rounded, apex acute; ligule ca. 1.5 mm. Panicle open, 4–10 cm, eglandular; primary branches well spaced, smooth, slender, divaricate; pedicels longer than spikelets. Spikelets elliptic, 2–2.4 mm; florets similar; glumes equal to spikelet, herbaceous with broad scarious margins, slightly shining, prominently 5–9-veined, glabrous or rarely upper glume sparsely hirtellous, apex rounded but appearing subacute through incurling margins, lemmas pale creamy-brown, leathery, elliptic-oblong, weakly convex, 1.5–2 mm, glabrous or puberulous.

Streams, damp roadsides; 2200–2600 m. Xizang [Bhutan, India (Darjeeling, Sikkim), Nepal].

The spikelets are distinctive in being more elongate than usual, with slightly shining, green, glabrous glumes and only weakly convex lemmas.

10. *Isachne clarkei* J. D. Hooker, Fl. Brit. India 7: 24. 1896 ["1897"].

小柳叶箬 xiao liu ye ruo

Isachne beneckeii Hackel; *I. tenuis* Keng ex P. C. Keng.

Delicate annual. Culms very slender, laxly ascending, base often decumbent, rooting at lower nodes but not stoloniferous, 12–30 cm tall, panicles terminating main stem and also short lateral branches. Leaf sheaths pilose, sometimes sparsely, outer margin ciliate; leaf blades linear-lanceolate, thin, 2–6 × 0.3–0.7 cm, glabrous or pilose, margins firm, apex acute; ligule 1–1.5 mm. Panicle open, ovate to pyramidal in outline, 1.5–8 cm, many-spiculate when well developed; branches and pedicels regularly spaced, divaricate at maturity, capillary, smooth; pedicels longer than spikelets, often with a gland halfway along their length. Spikelets subglobose, 1–1.5 mm, green or purplish; florets similar; glumes subequal to spikelet, ovate, lower (3–)5-veined, upper 7-veined, hispidulous to setose above middle, margins broad, incurving at apex; lemmas whitish, strongly convex, leathery, densely pubescent. Fl. and fr. Jul–Nov.

Damp mountain grasslands, streams, valleys; 1300–2400 m. Fujian, Taiwan, Xizang, Yunnan [NE India, Indonesia, Malaysia, Myanmar, Philippines, Vietnam].

The specimens from India (Sikkim) cited by Hooker in the protologue are *Isachne sikkimensis*.

11. *Isachne nipponensis* Ohwi, Acta Phytotax. Geobot. 4: 30. 1935.

日本柳叶箬 ri ben liu ye ruo

Low herb forming loose mats. Culms slender, creeping, rooting and branching at nodes, flowering branches up to 15 cm tall. Leaf sheaths thinly pubescent, outer margin ciliate; leaf blades lanceolate-ovate, thin, 2–3.5 × 0.5–0.9 cm, abaxial surface glabrous or pilose, adaxial surface hispid with long scattered hairs, margins white, finely scabrid, base obtuse, apex shortly acuminate; ligule ca. 1 mm. Panicle broadly ovate in outline, 2–8 cm, eglandular, rather sparsely branched, spikelets 10–50; branches and pedicels widely spreading, very slender, scaberulous. Spikelets broadly elliptic, (1.3–)1.5–1.8 mm, green infrequently tinged purplish; florets similar; glumes equal to spikelet or lower slightly shorter, ovate-elliptic, shortly hispid above the middle, often with a few stout, sometimes overtopping bristles, apex obtuse, lower glume 3–5-veined, upper glume 5–7-veined; lemmas broadly elliptic, leathery, thinly pubescent near margins and apex. Fl. and fr. summer to autumn. $2n = 40$.

Wet shady places; below 1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan, Korea (Cheju Island)].

Isachne nipponensis is very close to *I. myosotis*, but has a rather looser growth, larger leaves and spikelets, and a broader, very open panicle with slender, scaberulous branches.

Isachne nipponensis var. *kiangsiensis* P. C. Keng (Acta Phytotax. Sin. 10: 21. 1965), described from Jiangxi, has smooth, glandular panicle branches and pedicels and may represent a different species.

12. *Isachne myosotis* Nees, Hooker's J. Bot. Kew Gard. Misc. 2: 98. 1850.

荏弱柳叶箬 ren ruo liu ye ruo

Isachne micrantha Merrill; *I. myosotis* var. *micrantha* (Merrill) Jansen; *I. myosotis* var. *minor* Honda; *I. nipponensis* var. *minor* (Honda) Nemoto.

Small mat-forming annual. Culms very slender, prostrate, branching and rooting at nodes, flowering branches up to 10 cm tall. Leaf sheaths thinly to densely hispid with spreading hairs, or hairs confined to margins; leaf blades lanceolate-ovate, 1–2(–3) × 0.2–0.5 cm, both surfaces hispid, densely or sometimes inconspicuously appressed-hairy, base rounded, apex acute; ligule ca. 0.7 mm. Panicle ovate or contracted, 1.5–5 cm, eglandular, spikelets usually 15–30 (fewer in depauperate specimens); branches spiculate to base, with short stiff branchlets and pedicels, smooth. Spikelets subglobose, 1–1.4 mm, tinged purplish; florets similar; glumes equal to spikelet, separated by a short internode, ovate-oblong, 5(–7)-veined, hispid usually above middle, occasionally hispid almost to base or almost glabrous, apex obtuse; lemmas strongly convex, leathery, puberulous to densely pubescent. Fl. and fr. May–Oct. $2n = 20$.

Wet ground, shallow water in ditches. Fujian, Taiwan [Indonesia, New Guinea, Philippines].

This small species is recognizable on account of its delicate, mat-forming habit, small, broad leaf blades, smooth panicle branches, and tiny spikelets. It is barely separable from *Isachne pauciflora*.

13. *Isachne pauciflora* Hackel, Publ. Bur. Sci. Gov. Lab. 35: 80. 1906.

瘦脊柳叶箬 shou ji liu ye ruo

Isachne beneckeii Hackel var. *depauperata* Hackel ex Merrill; *I. debilis* Rendle; *I. depauperata* (Hackel ex Merrill) Merrill; *I. pauciflora* var. *depauperata* (Hackel ex Merrill) Jansen.

Low mat-forming herb, probably annual. Culms very slender, prostrate, branching and rooting at nodes, flowering branches up to 15 cm tall. Leaf sheaths subglabrous to hispid, outer margin ciliate; leaf blades ovate-lanceolate, 0.6–2 × 0.3–0.4 cm, thinly appressed-hispid, base cordate, apex acute; ligule ca. 0.7 mm. Panicle 1.5–2 cm, sparsely branched, eglandular, spikelets 4–12(–17); branches and pedicels short, stiff, smooth. Spikelets elliptic or obovate, 1.4–2 mm, tinged purplish brown; florets similar; glumes equal to spikelet, separated by a short internode, ovate-oblong, 5–7-veined, hispid above middle, sometimes sparsely or glabrous, obtuse but appearing acute because of incurved margins; lemmas strongly convex, leathery, puberulous. Fl. and fr. Apr–May.

Wet soils. Taiwan [Philippines].

Isachne pauciflora intergrades with *I. myosotis*, differing only in its rather looser habit and fewer, slightly larger spikelets borne in a sparse panicle.

14. *Isachne albens* Trinius, Sp. Gram. 1(8): t. 85. 1828.

白花柳叶箬 bai hua liu ye ruo

Isachne albens var. *magna* (Merrill) Jansen; *I. arisanensis* Hayata; *I. beneckeii* Hackel var. *magna* Merrill; *I. magna* (Merrill) Merrill; *Panicum albens* (Trinius) Steudel.

Perennial. Culms erect or decumbent at base, branching and rooting at basal nodes, 30–100 cm tall. Leaf sheaths glabrous or outer margin often ciliate; leaf blades narrowly lanceolate, firm, 7–15 × 0.8–1.8 cm, abaxial surface glabrous, strongly veined, adaxial surface glabrous to hispidulous, margins thickened, apex acuminate; ligule 1–2 mm. Panicle open, effuse, ovate-elliptic or pyramidal in outline, 9–30 cm, eglandular; primary branches smooth or almost so with capillary branchlets; pedicels varying in length. Spikelets elliptic-globose, 1–1.5 mm, whitish green; florets similar, lower floret usually bisexual, upper floret usually female; glumes herbaceous with inflexed scarious margins, 5–7(–9)-veined, usually glabrous, occasionally with a few stiff bristles above middle, obtuse, lower glume equal to spikelet, upper glume slightly shorter; lower lemma very slightly longer than upper, leathery, globose to elliptic-ovate, puberulous or subglabrous, obtuse, upper lemma hairier. Fl. and fr. summer–autumn. $2n = 60$.

Rocky mountainsides, streams, forest margins, other moist open places; 500–2600 m. Fujian, Guangdong, Guangxi, Guizhou, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, N India, Indonesia, Myanmar, Nepal, Thailand, Vietnam].

This widespread species is distinguished by its relatively tall habit and large, eglandular panicle of numerous small, pale spikelets. Specimens of *Isachne scabrosa* without obvious glands may key out here, but they can be distinguished by their papillose-hispid leaf sheaths.

15. *Isachne confusa* Ohwi, Bull. Tokyo Sci. Mus. 18: 14. 1947.

紊乱柳叶箬 wen luan liu ye ruo

Perennial. Culms stiffly erect, 35–45 cm tall, unbranched, nodes widely spaced, glabrous. Leaf sheaths very short, much shorter than internodes and shorter than blade, slightly inflated, glabrous or setose; leaf blades lanceolate-ovate, thick, tough, 1–2.5 × 0.3–0.7 cm, veins many, riblike, abaxial surface minutely papillose, adaxial surface scabrid or hispidulous on veins, margins pectinate-setose, apex acuminate; ligule absent. Panicle broadly pyramidal, 1.5–4 cm, glandular; branches stiff, horizontally spreading, close-set, smooth; pedicels stout, shorter than or equaling spikelets. Spikelets globose, 1.2–1.3 mm, brownish green; florets similar; glumes shorter than florets, thickly membranous with broad scarious margins, lower glume 3-veined, upper glume 5-veined, densely hispid with thick hairs, apex rounded; lemmas strongly plano-convex, leathery, back minutely white-granular, margins scurfy-pubescent, lower lemma very slightly longer and narrower.

Shallow soil over rocks, swampy grasslands, lake and stream margins, sometimes in shallow water. Hong Kong [India (Nicobar Islands), Indonesia, Malaysia, Myanmar, New Guinea, Thailand, Vietnam; Australia].

This is a distinctive species with remarkably short leaf sheaths, exposing long lengths of internode, and a small, stiff panicle of horizontally tiered branches.

16. *Isachne guangxiensis* W. Z. Fang, Acta Phytotax. Sin. 22: 306. 1984.

广西柳叶箬 guang xi liu ye ruo

Isachne albens Trinius var. *glandulifera* P. C. Keng.

Perennial. Culms slender, branching and rooting at lower nodes, ca. 40 cm tall, nodes slightly swollen, puberulous. Leaf sheaths loose, slightly longer to slightly shorter than internodes, glabrous except for ciliate outer margin; leaf blades linear-lanceolate, 5–9 × 0.6–0.8 cm, abaxial surface puberulous, adaxial surface glabrous, margins slightly thickened, base subrounded, apex acuminate; ligule ca. 2 mm. Panicle open, ovate in outline, 6–10 cm, glandular; branches 1–2 per node, scaberulous, lower part naked, pedicels slender, equaling or longer than spikelets. Spikelets elliptic, 1.5–1.9 mm, yellowish green; florets similar, lower male or bisexual, upper bisexual; glumes ovate-elliptic, equaling or slightly longer than florets, hirtellous above middle, obscurely 7–9-veined, acute; lemmas subleathery, glabrous. Fl. and fr. autumn.

• Damp and shady places. Fujian, Guangxi, Hong Kong.

Isachne hirsuta (J. D. Hooker) P. C. Keng var. *angusta* W. Z. Fang (Acta Phytotax. Sin. 22: 308. 1984), described from Hunan, and *I. hirsuta* var. *yongxiouensis* W. Z. Fang (loc. cit.), described from Jiangxi, appear to match this species except that they have hairy leaves. The types have not been seen. They are excluded from *I. sylvestris* (of which *I. hirsuta* is a synonym) because they lack the glandular, nodal ring found in that species, and also the leaf blades are smaller.

17. *Isachne sylvestris* Ridley, J. Straits Branch Roy. Asiatic Soc. 44: 206. 1905.

刺毛柳叶箬 ci mao liu ye ruo

Isachne albens Trinius var. *hirsuta* J. D. Hooker; *I. albens* var. *sylvestris* (Ridley) Jansen; *I. hirsuta* (J. D. Hooker) P. C. Keng.

Perennial. Culms ascending or decumbent, rooting at lower nodes, 35–65 cm tall, a brown glandular ring below each node. Leaf sheaths densely papillose-hirsute; leaf blades lanceolate to broadly lanceolate, 9–12 × 1.3–2.4 cm, abaxial surface puberulous to tomentose with scattered bristles, adaxial surface glabrous or setose, margins thickened and papillose-setose toward ligule, apex acute; ligule ca. 3 mm. Panicle elliptic in outline, 18–22 cm, glandular, many-spiculate; branches inserted singly, smooth. Spikelets elliptic or ovate-elliptic, 1.3–1.9 mm, grayish green or purple tinged; florets nearly similar, bisexual or rarely lower male and upper female; glumes equal or subequal to spikelet, 7-veined, papillose-hispidulous especially above middle, obtuse; lemmas leathery, lower lemma glabrous, flatter and slightly longer than upper; upper lemma pubescent. Fl. and fr. Aug–Dec.

Valley grasslands; 500–800 m. Fujian, Guangdong [Bangladesh, NE India, Indonesia, Malaysia].

This species is recognized by the combination of broad leaf blades with hirsute sheaths and a glandular panicle of small spikelets.

18. *Isachne scabrosa* J. D. Hooker, Fl. Brit. India 7: 23. 1896 [“1897”].

糙柳叶箬 cao liu ye ruo

Perennial, leaf sheaths and internodes sometimes flushed purple. Culms rambling, hard, 60–100 cm tall, often a glandular ring below some nodes. Leaf sheaths shorter than internodes, papillose-hispid with sharp patent hairs toward mouth, outer margin pectinate-ciliate; leaf blades linear-lanceolate, 12–20 × 1–1.2 cm, scabrid, glabrous or thinly hispid, base narrowly rounded, apex acuminate; ligule 3–5 mm. Panicle open, elliptic to broadly ovate in outline, 10–20 cm, much branched, glandular but sometimes very sparsely so; primary branches inserted singly, slender, loosely spreading, branchlets and pedicels smooth; pedicels shorter or longer than spikelets. Spikelets plumply elliptic, 1.5–1.7(–2.2) mm, pale or purple tinged; flo-

rets similar; glumes equal to spikelet, 5–7-veined, glabrous or sparsely setose, with broad incurving margins, subacute, lower glume elliptic, upper glume broader; lemmas smooth, glabrous or puberulous above the middle, minutely ciliate along upper margins.

Marshes and slow streams, forming colonies; ca. 1100 m. Xizang [NE India, Nepal].

Isachne scabrosa has been confused with *I. himalaica*, but the former species has a more rambling habit, glandular nodes, hispid leaf sheaths, somewhat larger leaf blades, and a panicle with more spikelets and less obviously glandular pedicels. However, the two species are very similar and may intergrade.

181. COELACHNE R. Brown, Prodr. 187. 1810.

小丽草属 xiao li cao shu

Low-growing annuals or perennials. Culms slender, ascending or decumbent. Leaf blades small, linear to lanceolate; ligule a line of hairs. Inflorescence an open or contracted panicle. Spikelets 2-flowered, florets dissimilar, the lower bisexual, the upper female, separated by a slender rachilla internode; glumes persistent, subequal, shorter than the spikelet, 1–7-veined, broadly obtuse; lemmas both membranous, veinless or obscurely veined, glabrous or pubescent, obtuse, the upper a little shorter than the lower; palea similar to lemma. Stamens 2–3. Caryopsis ovate-elliptic.

Eleven species: tropics of the Old World, in marshy places and on streamsides; one species in China.

1. *Coelachne simpliciuscula* (Wight & Arnott ex Steudel) Munro ex Benth, J. Linn. Soc., Bot. 19: 93. 1881.

小丽草 xiao li cao

Panicum simpliciusculum Wight & Arnott ex Steudel, Syn. Pl. Glumac. 1: 96. 1854.

Annual. Culms slender, prostrate and mat-forming, rooting at lower nodes, 10–20 cm tall. Leaf sheaths loose, glabrous or upper margins ciliate; leaf blades soft, lanceolate, 1–3 × 0.2–0.5 cm, glabrous or hirtellous along veins; ligule hairs 0.1–0.5 mm. Panicle linear, loosely spiciform, 3–8 × 0.5–1 cm, spike-

lets borne on short erect branches. Spikelets green or often purplish, 2–3 mm; rachilla internode 0.6–0.8 mm; glumes broadly ovate, herbaceous with membranous margins, lower glume 0.9–1.2 mm, 1–3(–5)-veined, upper glume ca. 1.5 mm, 5–7-veined; lemmas lanceolate, lower lemma 2–2.3 mm, glabrous or puberulous, lower palea equal to lemma; upper lemma 1.6–1.7 mm, pubescent below middle on center back and margins. Anthers 2–3, ca. 0.3 mm. Caryopsis brown at maturity, ca. 1.2 mm. Fl. and fr. Sep–Dec.

Streams, wet valley bottoms. Guangdong, Guizhou, Sichuan, Yunnan [Bhutan, Cambodia, India, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

182. SPHAEROCARYUM Nees ex J. D. Hooker, Fl. Brit. India 7: 246. 1896 [“1897”].

稗苳属 bai jin shu

Graya Arnott ex Steudel (1854), not Endlicher (1841).

Annual. Culms trailing, many-noded. Leaf blades ovate, amplexicaul, with obscure cross veins; ligule a line of hairs. Inflorescence a panicle; pedicels glandular. Spikelets 1-flowered, floret bisexual; glumes deciduous, veinless or 1-veined, obtuse; lemma membranous, 1-veined, pubescent, obtuse; palea equal to lemma. Stamens 3. Caryopsis ovate.

One species: India to SE Asia including S China.

1. *Sphaerocaryum malaccense* (Trinius) Pilger, Repert. Spec. Nov. Regni Veg. 45: 2. 1938.

稗苳 bai jin

Panicum malaccense Trinius, Gram. Panic. 204. 1826; *Sphaerocaryum elegans* Nees ex Steudel.

Culms very slender and delicate, trailing, forming loose mats, rooting at lower nodes, sometimes a glandular ring below the nodes, 10–30 cm tall. Leaf sheaths papillose-hispid, margins ciliate; leaf blades ovate-cordate, 1–1.5 × 0.6–1 cm, ± hispidulous, margins ciliate-serrulate, apex acute. Panicle shortly ex-

serted from uppermost sheath, 2–5 × 1–2 cm, ovate with many spikelets on 1–3 mm capillary glandular pedicels. Spikelets ovate to subglobose, ca. 1 mm, glumes falling before the floret; glumes hyaline, glabrous, the lower 2/3 spikelet length, veinless, the upper equal to spikelet or slightly shorter, 1-veined; lemma equal to spikelet, pubescent; palea similar to lemma. Anthers yellow, ca. 0.3 mm. Caryopsis brownish at maturity, ca. 0.7 mm. Fl. and fr. autumn. $2n = 18$.

Damp swampy places; below 1500 m. Anhui, Fujian, Guangdong, Guangxi, Jiangxi, Taiwan, Yunnan, Zhejiang [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam].

26. Tribe ERIACHNEAE

鸚鵡草族 zhe gu cao zu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals or perennials. Leaf blades narrow; ligule a line of hairs. Inflorescence a terminal panicle. Spikelets all alike, slightly laterally compressed, florets 2 without a rachilla extension, disarticulating below each floret; glumes persistent, membranous to papery, of variable length, (1–)7–14-veined, acute to acuminate; florets similar, both fertile, dorsally compressed, narrowly elliptic; lemmas leathery to crustaceous or sometimes cartilaginous, (3–)5–9-veined, hairy, margins inrolled and clasping palea keels, apex entire, awnless or with a straight or curved awn. Caryopsis ellipsoid to linear. Leaf anatomy Kranz PS type; microhairs slender or stout. $x = (9), 10, 12$.

Two genera and ca. 40 species: mainly in Australia, a few species extending into S and SE Asia; one species in China.

This small tribe resembles *Isachneae* and *Panicaceae* in its embryo structure and indurate lemmas with inrolled margins. However, the combination of bisexual florets, hairy, awned lemmas, and Kranz leaf anatomy distinguishes it from both.

183. ERIACHNE R. Brown, Prodr. 183. 1810.

鸚鵡草属 zhe gu cao shu

Annual or perennial. Leaf blades mostly rolled. Panicle open, contracted or spike-like with solitary, pedicellate spikelets. Glumes subequal, rounded on the back, 1/2 as long to much exceeding the florets, papery with hyaline or scarious margins; floret callus short, obtuse; lemmas pilose, grooved or smooth, usually awned but sometimes merely acute; paleas usually similar to lemmas in texture and indumentum, entire or bidentate, keels rounded, usually distant, sometimes excurrent into awns, margins hyaline and embracing the caryopsis. Stamens 3, rarely 2. Caryopsis \pm ellipsoid, dorsally compressed.

About 40 species: Australia, a few species extending into SE Asia, India, and Sri Lanka; one species in China.

1. *Eriachne pallescens* R. Brown, Prodr. 184. 1810.

鸚鵡草 zhe gu cao

Aira chinensis Retzius; *Eriachne chinensis* Hance.

Perennial. Culms tufted, erect, wiry, glabrous, smooth, 20–60 cm tall, 5–8-noded. Leaf sheaths usually shorter than internodes, ciliate along margins and mouth; leaf blades stiff, convolute, papillose-pilose, 2–10 cm; ligule ca. 0.5 mm. Panicle open, 5–10 cm, branches inserted singly, very slender, smooth, glabrous, up to 5 cm. Spikelets purplish, 4–5.5 mm; glumes ovate-lanceolate, 3–4 mm, 9–10-veined, glabrous, sharply acute; lemmas 3–3.5 mm, densely hispid, apex constricted, bidentate, awned from sinus; awn erect, rather stout, subequal to lemma

body; palea equal to its lemma, dorsally hispid. Anthers 2, 2–2.4 mm. Caryopsis oblong, ca. 2 mm. Fl. and fr. May–Oct.

Dry stony hillsides, grassland, sometimes the dominant ground-cover. Fujian, Guangdong, Guangxi, Jiangxi [E India, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam; Australia].

The names *Aira chinensis* Retzius (1783) and *Eriachne chinensis* Hance (1861) are based on different types. Although *A. chinensis* is the earliest legitimate name for the species, its specific epithet cannot be transferred to *Eriachne* without creating a later homonym, which would be illegitimate. *Eriachne pallescens* is therefore the correct name for the species.

This is a good forage grass.

27. Tribe ARUNDINELLEAE

野古草族 ye gu cao zu

Sun Bixing (孙必兴 Sun Bi-sin); Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annual or perennial. Leaf blades usually linear; ligule very short, membranous, margin sometimes ciliate. Inflorescence a panicle, often large with numerous spikelets, primary branches frequently racemose, spikelets usually paired (in China), often immature at emergence. Spikelets all alike, narrowly lanceolate to ovate, slightly laterally or dorsally compressed, florets 1 or 2, falling entire or breaking up; glumes equal to spikelet or lower glume usually shorter, membranous to leathery, 3–5-veined, often tuberculate-setose; lower floret (when florets 2) staminate or barren, its lemma resembling upper glume, often persistent, 3–5-veined, usually with a narrow palea; upper floret (or single floret) bisexual, its lemma membranous, thinly leathery or cartilaginous, entire to 2-lobed, awned from apex or sinus, rarely awnless; awn geniculate with twisted column, or straight, sometimes deciduous. Caryopsis with linear or punctiform hilum. Leaf anatomy mainly Kranz MS type, including the genera in China.

Twelve genera and ca. 175 species: tropics of both hemispheres, but mainly in Africa and Asia; two genera and 25 species (ten endemic) in China.

- 1a. Spikelets with 1 floret, falling entire 184. *Garnotia*
 1b. Spikelets with 2 florets, breaking up at maturity 185. *Arundinella*

184. GARNOTIA Brongniart in Duperrey, Voy. Monde, Phan. 2: 132. 1832.

耳稈草属 er fu cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Berghausia Endlicher; *Miquelia* Arnott & Nees (1843), not Meisner (1838).

Annual or perennial. Culms stiffly erect and unbranched, or weak, geniculate and branching; nodes usually pubescent. Leaf blades linear to lanceolate; ligule short, membranous, lacerate or ciliate. Panicle usually contracted, narrow with appressed branches, infrequently branches widely spreading; spikelets commonly paired, sometimes solitary or in threes; pedicels unequal. Spikelets with 1 floret, narrowly lanceolate, dorsally compressed, base often with a tuft of short stiff hairs, these sometimes sparse or absent, disarticulating below spikelet; glumes as long as spikelet, subequal, lower slightly longer, thinly herbaceous, 3-veined, glabrous or hispid, acute to acuminate, awned or awnless; lemma about as long as upper glume, membranous, 1–3-veined, apex entire or 2-toothed, awned or rarely awnless; awn slender, straight, flexuous, or geniculate from base or with a brown twisted column; palea subequal to lemma, margins ciliate, auriculate at base. $2n = 20$.

About 30 species: India and Nepal eastward through SE Asia to Polynesia, Hawaii, and Australia (Queensland), one species in the Seychelles; five species (two endemic) in China.

1a. Lemma with geniculate awn; annual.

2a. Spikelets 4–6 mm, excluding awns; glumes often with tubercle-based hairs 1. *G. ciliata*

2b. Spikelets 2–4 mm, excluding awns; glumes glabrous, scabrid.

3a. Culm nodes hairy; leaf blades lanceolate, 5–15 mm wide 2. *G. tenella*

3b. Culm nodes glabrous; leaf blades linear, 3–6 mm wide 3. *G. yunnanensis*

1b. Lemma awnless or with straight awn; perennial.

4a. Panicle branches appressed or loosely ascending; culms 20–60 cm 4. *G. acutigluma*

4b. Panicle at maturity with stiffly spreading branches; culms 60–130 cm 5. *G. patula*

1. *Garnotia ciliata* Merrill, Philipp. J. Sci. 13: 130. 1918.

纤毛耳稈草 xian mao er fu cao

Garnotia ciliata var. *conduplicata* Santos; *G. ciliata* var. *glabriuscula* Santos; *G. conduplicata* (Santos) Santos.

Annual, tufted. Culms delicate, usually decumbent at base, rooting at lower nodes, 20–70 cm tall, nodes hispid. Leaf sheaths loose, usually longer than internodes, hispid with tubercle-based hairs or nearly glabrous; leaf blades narrowly lanceolate, fairly thick, flat or folded, 3–12 cm × 2–8(–11) mm, hispid or villous, margins wavy; ligule ca. 0.5 mm. Panicle narrow, 5–15 cm; branches widely spaced, up to 5 cm, stout, appressed to rachis; pedicels scaberulous. Spikelets 4–6 mm, base glabrous or shortly bearded; glumes villous or sparsely pilose to glabrous, hairs tubercle-based, apex acuminate or short awned; glume awns 0.5–3 mm; lemma faintly 1–3-veined, glabrous, awned from between 2 delicate acuminate lobes; awn geniculate, column ca. 2 mm, bristle 7–10 mm. Fl. and fr. Aug–Oct.

• Near streams, roadsides, moist places on rocks; 900–1000 m. Guangdong.

2. *Garnotia tenella* (Arnott ex Miquel) Janowski, Repert. Spec. Nov. Regni Veg. 17: 86. 1921.

脆枝耳稈草 cui zhi er fu cao

Berghausia tenella Arnott ex Miquel, Anal. Bot. Ind. 2: 22. 1851; *Garnotia brevifolia* Ohwi; *G. fragilis* Santos; *G. nitens* Santos; *G. tenuis* Santos (1950), not Keng ex S. L. Chen (1990).

Annual, tufted. Culms ascending or decumbent at base, 15–60 cm tall, often branched, rooting at lower node, nodes hispid or villous. Leaf sheaths loose, lower longer than inter-

nodes, usually glabrous, occasionally margins villous; leaf blades narrowly lanceolate, flat, thin, 5–15 cm × 5–15 mm, hispid, villous with tubercle-based hairs or shortly hairy, margins wavy; ligule 0.3–1.5 mm. Panicle narrow, 6–18 cm; branches loosely ascending, 1.5–7 cm, fascicled at lower nodes, paired or solitary toward apex; spikelets in pairs or threes; pedicels scabrid, appressed. Spikelets 2–4 mm, base very shortly hairy or glabrous; glumes equal or lower glume slightly longer, glabrous, scabrid, apex acute, acuminate or awned; glume awns 1–2.5 mm; lemma faintly 1-veined, typically awned from emarginate apex, lower spikelets in panicle occasionally awnless or mucronate; awn geniculate, column 2–3 mm, bristle ca. 7 mm. Fl. and fr. Aug–Oct.

Moist stony places on mountain slopes, near streams, shady places, dense forests; ca. 1700 m. Guangdong, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

3. *Garnotia yunnanensis* B. S. Sun, J. Yunnan Univ. 21: 96. 1999.

云南耳稈草 yun nan er fu cao

Annual, tufted. Culms erect, unbranched or branching from lower nodes, 20–60 cm tall, 1–1.5 mm in diam., purplish red, nodes glabrous. Leaf sheaths smooth, glabrous, lower shorter than internodes; leaf blades linear, flat, 5–13 cm × 3–6 mm, abaxial surface glabrous, adaxial surface glabrous or scattered pilose; ligule ca. 0.7 mm. Panicle linear, 6–23 cm; branches erect, up to 8 cm, 3–4 at lower nodes; spikelets in pairs. Spikelets 3–5 mm, base shortly hairy; glumes equal or lower glume slightly shorter, glabrous, scabrid on veins, apex narrowly obtuse, awned; glume awns 0.5–3 mm; lemma obscurely veined, awned from 2-toothed apex, some spikelets in panicle with short straight awn, others geniculately awned; awn column ca. 2 mm, brown, bristle 7–9 mm. Fr. Oct.

• Roadsides, among rocks, wet places; ca. 1400 m. Yunnan (Menglian).

4. *Garnotia acutigluma* (Steudel) Ohwi, Bot. Mag. (Tokyo) 55: 393. 1941.

三芒耳稈草 *san mang er fu cao*

Urachne acutigluma Steudel, Syn. Pl. Glumac. 1: 121. 1854; *Garnotia caespitosa* Santos; *G. himalayensis* Santos; *G. khasiana* Santos; *G. tenuis* Keng ex S. L. Chen (1990), not Santos (1950); *G. kengii* S. L. Chen; *G. mindanaensis* Santos; *G. trisetia* Hitchcock; *G. trisetia* var. *decumbens* Keng.

Perennial, tufted. Culms erect or ascending from decumbent base, 20–60 cm tall, usually unbranched, rooting at nodes, nodes pubescent. Leaf sheaths often hirsute along collar and margins, otherwise glabrous; leaf blades variable, linear to narrowly lanceolate, flat or folded, 5–20(–35) cm × 2–7 mm, adaxial surface hispid or scabrid, hairs tubercle-based or not, abaxial surface usually glabrous; ligule 0.2–0.5 mm. Panicle narrow, 8–25(–40) cm; branches appressed or loosely erect or ascending; spikelets in threes at lower nodes, paired or solitary toward apex. Spikelets 3–5 mm, base usually conspicuously pilose; glumes subequal with lower slightly longer, scabrid on veins, apex acute to awned; glume awns 0.5–7 mm with lower glume longer awned; lemma 1–3-veined, awned; awn 8–15 mm, straight or slightly flexuous, capillary, uniform throughout. Fl. and fr. Aug–Dec.

Moist mountain slopes, moist shady places along streams, mixed forests; 300–1700 m. Guangdong, Guangxi, Guizhou, Taiwan, Yunnan [Bangladesh, Bhutan, NE India, Indonesia, Malaysia, Myanmar, Philippines, N Vietnam; naturalized in Hawaii].

Garnotia kengii was published as a *nomen novum* for *G. tenuis* Keng ex S. L. Chen (1990), not Santos (1950).

5. *Garnotia patula* (Munro) Benth, Fl. Hongk. 416. 1861.

耳稈草 *er fu cao*

Perennial, tussocky. Culms stiffly erect, (30–)60–130 cm tall, unbranched, nodes pubescent. Leaf sheaths keeled, longer than internodes, glabrous or thinly pilose; leaf blades linear, flat or folded, 15–60 cm × 4–12 mm, tapering to base and apex, glabrous to sparsely pilose, sometimes with tubercle-based hairs; ligule 2–5 mm. Panicle open, 15–40(–65) cm; branches stiffly divaricate, up to 12 cm, often rebranched, in threes near base, paired to solitary toward apex, varying from closely set and densely spiculate to widely spaced and sparsely spiculate.

Spikelets 3.7–6.3 mm, base shortly pubescent; glumes scaberulous on veins, apex acute, acuminate or awned, or only lower glume with a mucro; glume awns up to 7 mm, longer ones very fine; lemma 3-veined, apex acuminate, awned or awnless; awn to 15 mm, straight or undulate, very slender. Fl. and fr. Aug–Oct.

Valleys, forest margins, moist grassy slopes, moist field boundaries; 500–1000 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [E Myanmar, N Vietnam].

This species is quite different in habit from the others found in China. It is a much more robust plant, tussock forming, taller, and with a distinctive, open panicle of stiffly spreading branches.

- 1a. Glumes awned, awn of lower glume 2–8 mm; lemma awned, awn 7–15 mm 5a. var. *patula*
- 1b. Glumes acuminate or lower glume mucronate; lemma awnless or mucronate 5b. var. *mutica*

5a. *Garnotia patula* var. *patula*

耳稈草(原变种) *er fu cao* (yuan bian zhong)

Berghausia patula Munro, Proc. Amer. Acad. Arts 4: 362. 1860; *Garnotia drymeia* Hance; *G. maxima* Santos; *G. patula* var. *grandior* Santos; *G. patula* var. *hainanensis* Santos; *G. patula* var. *partitipilosa* Santos; *G. patula* var. *strictor* Santos; *G. poilanei* A. Camus.

Culms 60–130 cm tall. Glumes awned, awn of lower glume 2–8 mm. Lemma awned; awn 7–15 mm, slender, scaberulous, usually straight, rarely crinkled. Fl. and fr. Aug–Oct.

Valleys, woodland margins, moist grassy slopes, moist field boundaries; 500–1000 m. Fujian, Guangdong, Guangxi, Hainan [N Vietnam].

5b. *Garnotia patula* var. *mutica* (Munro) Rendle, J. Linn. Soc., Bot. 36: 387. 1904.

无芒耳稈草 *wu mang er fu cao*

Berghausia mutica Munro, Proc. Amer. Acad. Arts 4: 362. 1860; *Garnotia mutica* (Munro) Druce; *G. patula* var. *mucronata* L. C. Chia; *G. tectorum* J. D. Hooker.

Culms 30–100 cm tall. Glumes acuminate or lower glume with a mucro. Lemma acuminate, awnless or with a mucro to 1.5 mm. Fl. and fr. Sep–Oct.

Moist woodland margins, streams. Guangdong, Guangxi, Hainan, Yunnan [E Myanmar, N Vietnam].

185. ARUNDINELLA Raddi, Agrostogr. Bras. 36. 1823.

野古草属 *ye gu cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial or annual, sometimes with scaly rhizomes. Leaf blades usually linear; ligule very short, membranous, a dense fringe of long hairs behind at base of blade. Panicle open or contracted, usually with simple racemelike primary branches; central axis smooth, scabrid or hispid on angles; spikelets paired; pedicels unequal, briefly connate. Spikelets with 2 florets, lanceolate to ovate, gaping, often purplish; lower floret staminate or barren, upper floret bisexual; rachilla disarticulating between florets; glumes unequal, upper as long as spikelet, often caudate, lower shorter, acute to caudate; lower lemma similar in texture to upper glume, often persistent, smooth, 3–5-veined, awnless, its palea hyaline; upper lemma terete, smaller than the lower, firmer in texture, scaberulous,

apex entire or 2-toothed, often awned, rarely awnless, occasionally lateral teeth also awned; awn usually geniculate with brown twisted column, sometimes caducous; palea margins sometimes auriculate; callus short, rounded, bearded. $x = 7$.

About 60 species: tropical and subtropical regions, but mainly in Asia; 20 species (eight endemic) in China.

- 1a. Upper lemma with an awn and 2 lateral bristles; pedicels often with stiff hairs at apex (if lateral bristles absent, lemma bidentate and pedicels with apical hairs).
 - 2a. Awn almost straight; nodes concealed in leaf sheaths, bearded 1. *A. barbinodis*
 - 2b. Awn clearly geniculate; nodes exposed, glabrous or bearded.
 - 3a. Culms 0.2–0.5 m tall, 0.5–1.5 mm in diam.; leaf blades 1–2 mm wide; spikelets 4.5–5.5 mm 2. *A. nodosa*
 - 3b. Culms (0.5–)1–2.5 m tall, 1.5–5 mm in diam.; leaf blades 3–9 mm wide; spikelets (3–)5–8 mm.
 - 4a. Panicle loose; nodes usually glabrous (bearded in var. *tengchongensis* which has spikelets 3–3.5 mm); spikelets (3–)5–6.5 mm, usually glabrous 3. *A. setosa*
 - 4b. Panicle contracted, dense; nodes woolly; spikelets 6–8 mm, usually with tubercle-based hairs 4. *A. khaseana*
- 1b. Upper lemma awnless or with a single awn, lateral bristles absent; pedicels without stiff hairs at apex.
 - 5a. Upper lemma not awned, or awn very short and inconspicuous (2.5 mm or less).
 - 6a. Upper lemma 2.5–3.5 mm; awn absent or a straight mucro up to 1.5 mm.
 - 7a. Plant with spreading scaly rhizomes; culms 2–5 mm in diam.; leaf blade (4–)7–15 mm wide 5. *A. hirta*
 - 7b. Plant with short rhizomes; culms 1–2 mm in diam.; leaf blade 4–6 mm wide 6. *A. fluiatilis*
 - 6b. Upper lemma 1.3–2.5 mm; caducous awn present on some spikelets, geniculate, up to 2.5 mm.
 - 8a. Culms to 2 m or more, stout; panicle 30–70 cm, lower branches 12–30 cm; spikelets 3.5–4 mm 7. *A. decempedalis*
 - 8b. Culms to 1 m, more slender; panicle 7–30 cm, lower branches 2–7 cm; spikelets 2.5–3.5 mm 8. *A. bengalensis*
 - 5b. Upper lemma awned, awn conspicuous, projecting from spikelet.
 - 9a. Glumes setose with stiff tubercle-based hairs on veins; panicle densely contracted or spikelike, usually less than 12 cm.
 - 10a. Axis of panicle densely pubescent; spikelets purplish 9. *A. hookeri*
 - 10b. Axis of panicle scabrid; spikelets yellowish brown or grayish red.
 - 11a. Leaf blades leathery, glabrous; culms branched at lower nodes; panicle branches less than 7 cm; spikelets yellowish brown 10. *A. flavida*
 - 11b. Leaf blades papery, hispid; culms unbranched; panicle branches up to 18 cm; spikelets purplish 11. *A. tricholepis*
 - 9b. Glumes glabrous or hispidulous on veins; panicle open or loosely contracted, (8–)15–60 cm.
 - 12a. Culms 1–3 m; panicle 20–60 cm.
 - 13a. Spikelets 2–2.8 mm 12. *A. parviflora*
 - 13b. Spikelets 3.5–7 mm.
 - 14a. Leaf blades 0.5–1.5 cm wide; panicle open or loosely contracted, central axis visible, branches ascending, loosely spiculate 13. *A. nepalensis*
 - 14b. Leaf blades 1–2.5 cm wide; panicle dense, central axis concealed, branches suberect, densely spiculate 14. *A. cochinchinensis*
 - 12b. Culms less than 1 m tall; panicle 5–30 cm (to 50 cm in *A. longispicata*).
 - 15a. Panicle 30–50 cm, lowest branch to 20 cm 15. *A. longispicata*
 - 15b. Panicle 5–30 cm, lowest branch to 8(–15) cm.
 - 16a. Spikelets 6–7 mm; culms loosely tufted, with scaly rhizomes 16. *A. grandiflora*
 - 16b. Spikelets 3.5–5.2 mm; culms densely tufted, with or without rhizomes.
 - 17a. Panicle branches smooth or almost so; callus hairs 1/2 length of lemma; mountain meadows 17. *A. yunnanensis*
 - 17b. Panicle branches usually scabrid or hispidulous; callus hairs 1/4–1/3(–1/2) lemma length; river banks and floodlands.
 - 18a. Culms 15–35 cm tall; leaves mainly basal; nodes bearded; panicle branches almost smooth 18. *A. pubescens*
 - 18b. Culms 30–80 cm tall; leaves cauline; nodes glabrous or pubescent; panicle branches hispidulous.
 - 19a. Plant not rhizomatous; callus hairs 1/4–1/3 length of lemma 19. *A. rupestris*
 - 19b. Plant strongly rhizomatous; callus hairs 1/2 length of lemma 20. *A. intricata*

1. *Arundinella barbinodis* Keng ex B. S. Sun & Z. H. Hu,
Acta Bot. Yunnan. 2: 329. 1980.

Perennial, loosely tufted. Culms erect, herbaceous, 60–130 cm tall, 1–2 mm in diam., nodes densely bearded with appressed silky hairs. Leaf sheaths longer than internodes, sparingly puberulous to softly pilose, margins ciliate; leaf blades linear, flat, 20–35 cm × 3–7 mm, thinly pubescent on

毛节野草 mao jie ye gu cao

both surfaces or abaxial surface glabrescent, apex acute; ligule ca. 0.5 mm. Panicle very loose, open, 30–35 cm; branches slender, 9–20 cm, patent or ascending, solitary or paired, spikelet pairs mostly distant; pedicels scabrid, without apical bristles. Spikelets 4.5–5.5 mm, widely gaping, pale with dark green veins; glumes glabrous, scabrid on veins; lower glume 3.5–4 mm, 3–5-veined, apex caudate; upper glume 7-veined, apex narrowly acuminate; lower floret staminate or barren, ca. 4 mm; upper floret 2.5–3 mm, lemma apex awned, awn flanked by 2 slender erect bristles; bristles 1–2 mm; awn almost straight, slightly twisted in lower part, pale throughout, 5–6 mm; callus hairs 1/3 length of lemma. Fl. and fr. Sep–Nov.

• Grassy slopes, roadsides, among rocks, light shade; 600–1500 m. Fujian, Guangdong, Hunan, Jiangxi, Zhejiang.

This grass has a softer habit than *Arundinella setosa*, with which it has been confused. It also differs in its bearded nodes, which are not exposed as in *A. setosa*, but are hidden within the overlapping leaf sheaths. The non-geniculate awn is another clear difference between the two species.

2. *Arundinella nodosa* B. S. Sun & Z. H. Hu, Acta Bot. Yunnan. 2: 327. 1980.

多节野古草 duo jie ye gu cao

Perennial, densely tufted. Culms erect, slender, hard, 20–50 cm tall, 0.5–1.5 mm in diam., 7–13-noded, nodes glabrous. Leaf sheaths shorter than internodes, densely tuberculate-hispid, glabrescent; leaf blades linear, 3–12 cm × 1–2 mm, with tubercle-based hairs on both surfaces, glabrescent; ligule 0.3–0.5 mm. Panicle sparse, 4–8 cm; central axis and branches scaberulous; branches few, 2.5–5 cm, laxly ascending; pedicels with a few long stiff hairs at apex. Spikelets 4.5–5.5 mm, green tinged purple; glumes setose along veins; lower glume 3.5–5 mm, 3-veined; upper glume 5-veined; lower floret staminate or barren, shorter than glumes; upper floret ca. 2 mm, lemma apex awned, awn flanked by 2 slender erect bristles; bristles 1.5–1.8 mm; awn geniculate, 4.5–5.5 mm; callus hairs 1/3 length of lemma. Fl. and fr. Aug–Dec.

• River banks among rocks, floodlands; ca. 500 m. Yunnan (Jinghong).

This is a slender species close to *Arundinella setosa*, found in the same riverine habitats as *A. fluvialis* and *A. rupestris*, but differing from the latter two by the lateral bristles flanking the geniculate awn on the upper lemma.

3. *Arundinella setosa* Trinius, Gram. Panic. 63. 1826.

刺芒野古草 ci mang ye gu cao

Perennial, tufted from a short rhizome with scaly buds. Culms erect or base geniculate, hard, (35–)60–180 cm tall, 1.5–4 mm in diam., sometimes branched, 3–7(–9)-noded, nodes glabrous. Leaf sheaths shorter than internodes, glabrous or infrequently tuberculate-hispid; leaf blades linear, 10–40(–70) cm × 3–9 mm, usually glabrous, sometimes tuberculate-hispid; ligule ca. 0.5 mm. Panicle open or somewhat contracted, 10–45 cm; central axis and branches scabrid; branches 5–20 cm, stiffly ascending or spreading, solitary or fasciculate, loosely spiculate; pedicels scabrid, apex usually with long stiff hairs. Spikelets 5–6.5 mm, green tinged purple; glumes glabrous or rarely

setose, scaberulous along veins; lower glume 4.5–5.5 mm, 3(–5)-veined; upper glume 5-veined; lower floret staminate or barren, shorter than glumes or equaling lower glume; upper floret 2.5–3 mm, lemma apex awned, awn flanked by 2 slender erect bristles; bristles mostly 1–2.5 mm; awn geniculate with brown twisted column, 6–10 mm; callus hairs 1/4–1/3 length of lemma. Fl. and fr. Aug–Dec.

Open forests, forest margins, grassy hillsides; 200–2300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

This is a variable species. The culms are slender or stout, and the leaves are occasionally hairy. The nodes are almost always glabrous, but can be bearded in very hairy specimens. The stiff bristles at the tips of the pedicels are usually obvious, but may sometimes be scanty or even absent. The length of the lateral bristles at the lemma tip is very variable. The bristles are frequently about as long as the column of the awn, but may be considerably shorter and in extreme cases almost absent. Forms without obvious bristles may be separated at varietal rank.

- 1a. Upper lemma with 2 lateral bristles arising at base of awn 3a. var. *setosa*
- 1b. Upper lemma without or with vestigial lateral bristles.
 - 2a. Spikelets 5–6 mm; awn with 1–2.5 mm column 3b. var. *esetosa*
 - 2b. Spikelets 3–3.5 mm; awn with ca. 0.5 mm column 3c. var. *tengchongensis*

3a. *Arundinella setosa* var. *setosa*

刺芒野古草(原变种) ci mang ye gu cao (yuan bian zhong)

Arundinella sinensis Rendle; *Danthonia neuroelytrum* Steudel.

Culm nodes glabrous; leaf sheaths loose; leaf blades usually glabrous. Panicle 15–45 cm, branches up to 20 cm; pedicels with long stiff hairs at apex. Spikelets 6–7 mm; glumes glabrous; upper lemma with 1–2.5 mm lateral bristles; awn 6–10 mm, geniculate, column 1.3–2.6 mm, obviously twisted; callus hairs 1/4–1/3 length of lemma. Fl. and fr. Aug–Dec.

Open forests, grassy slopes; 200–2300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

3b. *Arundinella setosa* var. *esetosa* Bor ex S. M. Phillips & S. L. Chen, Novon 15: 468. 2005.

无刺芒野古草 wu ci ye gu cao

Arundinella bidentata Keng; *A. hubeiensis* D. M. Chen (1983), not *A. hupeiensis* Keng & X. P. Liou (2002); *A. macauensis* Bor.

Culm nodes glabrous; leaf sheaths and blades glabrous or tuberculate-hispid. Panicle 15–45 cm; branches up to 20 cm; pedicels with long stiff hairs at apex. Spikelets 5–6 mm; glumes glabrous or setose; upper lemma without or with very short lateral bristles; awn 6–10 mm, geniculate, column 1.3–2.6 mm,

obviously twisted; callus hairs 1/4–1/3 length of lemma. Fl. and fr. Jul–Nov.

Dry mountain slopes, dry grasslands; 500–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Yunnan, Zhejiang [India, N Myanmar, Nepal].

This name was previously published by Bor (Grasses Burma, Ceylon, India, Pakistan, 425. 1960), but not validly so because no type was indicated.

Arundinella bidentata and *A. macauensis* are both based on exceptionally hairy specimens densely hispid in all their parts. *Arundinella bidentata* has short, blunt apical lemma lobes lacking bristles, whereas in *A. macauensis* the lobes are tipped by very short bristles. *Arundinella hupeiensis* Keng & X. P. Liou may also belong here, but it has not been possible to see the type (L. Y. Tai & C. H. Chien 465, holotype, N; isotype, HIB).

3c. *Arundinella setosa* var. *tengchongensis* B. S. Sun & Z. H. Hu ex S. L. Chen, Bull. Nanjing Bot. Gard. 1988–1989: 2. 1990.

腾冲野古草 *teng chong ye gu cao*

Culm nodes bearded; leaf sheaths and blades thinly pilose; leaf blades flat, 12–25 cm × 5–9 mm. Panicle elliptic in outline, 17–21 cm; branches 3–6 cm, ascending; pedicels with a few stiff hairs at apex. Spikelets 3–3.5 mm; glumes glabrous; upper lemma thinly cartilaginous, scabrid, without lateral bristles; awn 2.3–2.6 mm, column ca. 0.5 mm; callus hairs 1/2 length of lemma.

- Thickets on mountain slopes; ca. 2000 m. W Yunnan.

This variety has the setose pedicel tips of *Arundinella setosa*, but differs substantially in its bearded nodes, smaller spikelets, long callus hairs, lack of lemma lateral bristles, and awn structure. It will probably prove to be a distinct species when better known.

4. *Arundinella khaseana* Nees ex Steudel, Syn. Pl. Glumac. 1: 115. 1854.

滇西野古草 *dian xi ye gu cao*

Arundinella suniana S. M. Phillips & S. L. Chen.

Perennial forming large tussocks, base clothed in papery old sheaths. Culms stout, canelike, 1–2.5 m tall, 3–5 mm in diam., internodes long, 2–3-noded, nodes woolly with cream hairs. Leaf sheaths shorter than internodes, loose, pilose or glabrescent; leaf blades linear, flat or convolute, rigid, 15–30 cm × 5–8 mm, glabrous or hairy, apex finely acuminate; ligule 0.3–0.5 mm. Panicle usually contracted, dense, infrequently looser, 15–35 cm; central axis and branches scabrid-hispidulous; branches 2.5–10 cm, fasciculate in middle part, ascending; pedicels scabrid, apex often with stiff bristles. Spikelets 6–8 mm, purple; glumes setose on raised veins; lower glume 6–6.5 mm; upper glume as long as spikelet; lower floret staminate, as long as lower glume; upper lemma 2-lobed, awned from sinus, 2 slender erect bristles arising from lobes; bristles ca. 1 mm; awn geniculate with brown twisted column, 5–6 mm; callus hairs ca. 1/3 length of lemma. Fl. and fr. Apr–Aug.

Grasslands, often in wet meadows; 600–1500 m. Yunnan [NE India, N Myanmar].

5. *Arundinella hirta* (Thunberg) Tanaka, Bull. Sci. Fak. Terk. Kjusu Imp. Univ. 1: 196, 208. 1925.

毛秆野古草 *mao gan ye gu cao*

Perennial, loosely tufted with stout scaly rhizomes. Culms erect, 60–150 cm tall, 2–5 mm in diam., glabrous or less often tuberculate-hispid or densely pilose, nodes glabrous or bearded. Leaf sheaths usually tuberculate-hispid on margins, often thinly hispid throughout, less often densely pilose or completely glabrous; leaf blades broadly linear, 10–50 cm × (4–)7–15 mm, tuberculate-setose on margins only, or thinly hispid to densely pilose on both surfaces, or glabrous, apex long-acuminate; ligule 0.2–0.7 mm. Panicle contracted, narrowly elliptic-oblong in outline, 8–45 cm; central axis scabrid to setose; branches 5–20 cm, ascending, lower often with branchlets, densely spiculate; pedicels scabrid. Spikelets 3–4.8 mm, plump; glumes glabrous or rarely hispid, scabrid along prominent veins; lower glume 2.5–4 mm, 3(–5)-veined; upper glume 5–7-veined; lower floret subequal to spikelet; upper floret 2.5–3.5 mm, lemma apex acute to shortly mucronate, callus hairs nearly 1/2 length of lemma. Fl. and fr. Jul–Oct. $2n = 28, 34, 36, 56$.

Grassy mountain slopes, river banks, roadsides, field margins; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea, E Russia].

This polymorphic species exhibits much minor variation in the hairiness of culms, nodes, and leaves, and many infraspecific names have been applied. The name *Arundinella anomala* has been used in the past for plants with glabrous culms and glabrous to moderately hairy leaf sheaths, whereas plants with densely hairy culms and leaf sheaths have been referred to *A. hirta*. However, the protologue of *A. hirta* states that the culms are glabrous. In practice, the different combinations of hairiness of culms, nodes, and leaves make a subdivision into two entities impracticable on this character, even at infraspecific rank. Rarely variants occur with setose spikelets, and these can be recognized at varietal rank.

- 1a. Spikelets glabrous 5a. var. *hirta*
- 1b. Spikelets with stiff tubercle-based hairs 5b. var. *hondana*

5a. *Arundinella hirta* var. *hirta*

毛秆野古草(原变种) *mao gan ye gu cao* (yuan bian zhong)

Poa hirta Thunberg in Murray, Syst. Veg., ed. 14, 113. 1784; *Arundinella anomala* Steudel; *A. hirta* subsp. *anomala* (Steudel) Tzvelev; *A. kengiana* N. X. Zhao; *Panicum mandshuricum* Maximowicz; *P. mandshuricum* var. *pekinense* Maximowicz; *P. williamsii* Hance.

Spikelets glabrous, lacking tubercle-based hairs.

Grassy mountain slopes, river banks, roadsides, field margins; 100–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan [Japan, Korea, N Myanmar, E Russia, N Vietnam].

5b. *Arundinella hirta* var. *hondana* Koidzumi, Bot. Mag. (Tokyo) 39: 303. 1925.

庐山野古草 *lu shan ye gu cao*

Arundinella hondana (Koidzumi) B. S. Sun & Z. H. Hu.

Spikelets setose with tubercle-based hairs.

Thickets on mountainsides. Jiangxi, Zhejiang [Japan, Korea].

6. *Arundinella fluviatilis* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 63: 111. 1926.

溪边野古草 xi bian ye gu cao

Perennial, densely tufted with a short rhizome. Culms 40–80 cm tall, 1–2 mm in diam., internodes and nodes glabrous. Leaf sheaths smooth, glabrous, shorter or longer than internodes, margins membranous, sometimes ciliate, especially at mouth; leaf blades linear, stiff, often involute, 5–15(–20) cm × 4–6 mm, glabrous on both surfaces; ligule 0.4–0.7 mm. Panicle narrow, 4–15 cm; central axis scabrid-hispidulous; branches 2–6 cm, erect or narrowly ascending; usually solitary; pedicels 1–3 mm, scabrid. Spikelets 3.5–4.5 mm, purplish; glumes smooth or almost so along veins; lower glume 2.6–3.5 mm, 5-veined; upper glume 5-veined; lower floret staminate; upper floret 2.6–3.4 mm, lemma shortly awned; awn straight, 0.3–1.5 mm; callus hairs usually ca. 1/2 length of lemma. Fl. and fr. Jul–Nov.

• Watersides, land flooded during summer, rock fissures, between stones; 200–500 m. Guizhou, Hubei, Hunan, Jiangxi, Sichuan.

This is a rather small, slender variant from the *Arundinella hirta* complex, typically lacking conspicuous, stout, scaly rhizomes and apparently confined to wet places by streams. *Arundinella hirta* var. *riparia* (Honda) T. Koyama, from Japan, is very similar and also occurs on rocky stream banks, but the upper floret has a longer awn to 3.75 mm.

Arundinella hirta (Thunberg) Tanaka var. *depauperata* (Rendle) Keng (Claves Gen. Sp. Gram. Prim. Sin. 230. 1957; *A. anomala* Steudel var. *depauperata* Rendle, J. Linn. Soc., Bot. 36: 341. 1904), described from Hubei, is another slender variant from rocky streamsides that will key out to *A. fluviatilis*. It differs from that species by its stoloniferous habit, leafy vegetative shoots with concealed nodes, and short callus hairs only 1/4 as long as the fertile floret. Occasionally specimens of typical, more robust, broad-leaved *A. hirta* also occur with short callus hairs. Possibly none of these slender variants merits separate specific status, but they do present a recognizable habit and occupy a particular ecological niche.

7. *Arundinella decempedalis* (Kuntze) Janowski, Repert. Spec. Nov. Regni Veg. 17: 84. 1921.

丈野古草 zhang ye gu cao

Panicum decempedale Kuntze, Revis. Gen. Pl. 2: 783. 1891; *Arundinella clarkei* J. D. Hooker.

Perennial. Culms very stout, erect, up to 2.5 m, 7–10 mm in diam., nodes densely pubescent, glabrescent. Leaf sheaths slightly inflated, tuberculate-hispid when young, margins ciliate; leaf blades linear-lanceolate, flat, rather rigid, 30–60 cm × 10–25 mm, glabrous or tuberculate-hispid, midrib broad, white, apex long acuminate; ligule 0.5–1 mm. Panicle loosely contracted, (20–)30–70 cm; central axis almost smooth; branches numerous, slender, 10–25 cm, ascending or spreading, fascicled or in whorls, loosely spiculate, scabrid; pedicels slender, scabrid. Spikelets 3.5–4 mm; glumes glabrous; lower glume ca. 3 mm, 3–5-veined, scabrid on veins; upper glume 5–7-veined, glabrous; lower floret staminate, equaling or shorter than lower glume; upper floret 2.2–2.3 mm, lemma apex narrowed into a poorly developed awn or awnless; awn soon deciduous, geni-

culate with short brown twisted column, up to 2.5 mm; callus hairs 2/5 length of lemma. Fl. and fr. Jul–Nov.

Grassy mountain slopes, hill thickets; 400–1500 m. W Yunnan [NE India, N Myanmar].

8. *Arundinella bengalensis* (Sprengel) Druce, Bot. Soc. Exch. Club Brit. Isles 4: 605. 1917 [“1916”].

孟加拉野古草 meng jia la ye gu cao

Panicum bengalense Sprengel, Syst. Veg. 1: 311. 1825; *Arundinella wallichii* Nees ex Steudel.

Perennial, with branching scaly rhizomes. Culms solitary, erect, moderately slender to stout, 50–120 cm tall, 1.5–4 mm in diam., nodes bearded or glabrescent. Leaf sheaths loose, densely tuberculate-hispid, rarely subglabrous; leaf blades broadly linear, flat, 6–30 cm × 5–15 mm, tuberculate-hispid on both surfaces, rarely subglabrous, midrib broad, white, apex finely acuminate; ligule 0.3–0.5 mm. Panicle narrowly cylindrical, dense, 6–30(–40) cm; central axis scabrid; branches spikelike, 2–7 cm, erect, arranged in whorls of (1–)2–6, secund, densely spiculate; pedicels short, densely scabrid. Spikelets not gaping, 2.5–3.5 mm; lower glume 2–2.5 mm, 3-veined, hispidulous on veins, apex acute; upper glume 5-veined, usually tuberculate-setose on veins; lower floret staminate, longer than lower glume; upper floret ca. 2 mm, lemma apex narrowed into a poorly developed awn; awn soon deciduous, geniculate with short brown twisted column, 1–1.5 mm; callus shortly pubescent. Fl. and fr. Aug–Oct.

Plains, hill thickets, moist meadows, river banks, ditches, forming open spreading patches; 100–1800 m. Guangdong, Guangxi, Guizhou, Hainan, S Sichuan, SE Xizang, Yunnan [Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

The panicle appears awnless at first sight, but close inspection will reveal very reduced, easily deciduous awns on at least some of the spikelets.

9. *Arundinella hookeri* Munro ex Keng, Nat. Centr. Univ. Sci. Rep., Nanking, Ser. B, 2(3): 50. 1936.

西南野古草 xi nan ye gu cao

Arundinella chenii Keng; *A. villosa* Arnott ex Steudel var. *himalaica* J. D. Hooker.

Perennial, tufted with a short knotty rhizome, base clothed with old papery sheaths. Culms erect or ascending, herbaceous, (18–)30–60(–90) cm tall, 1–3 mm in diam., internodes glabrous, 1–2-noded, nodes purple, glabrous or puberulent. Leaf sheaths shorter than internodes, densely hirsute; leaf blades mainly basal, linear-lanceolate, 2–20 cm × 2–12 mm, densely villous, apex acute; ligule 0.2–0.5 mm. Panicle contracted, oblong or narrowly pyramidal in outline, 3–12 cm; central axis densely pubescent; branches 1–2(–3) cm, suberect or ascending, inserted singly, spaced below, crowded above, densely spiculate; pedicels short, densely pubescent. Spikelets 5–7 mm, gray-green tinged purplish; glumes 5-veined, setose on veins, apex caudate; lower glume 3.5–5 mm; upper glume 4.5–6 mm; lower floret staminate, ± equaling lower glume; upper floret 2.5–3.5 mm, lemma apex emarginate, awned; awn geniculate with

brown twisted column, 2–5 mm; callus hairs 2/5 length of lemma. Fl. and fr. Oct–Nov.

Common on mountainsides, open forests, meadows; 1800–3200 m. W Guizhou, SW and W Sichuan, SE Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

This slender species is recognized by its tufts of hairy leaves; compact panicle with short, broad branches of densely packed, large spikelets; setose, caudate glumes; and clearly visible, geniculate awns.

10. *Arundinella flavida* Keng, Nat. Centr. Univ. Sci. Rep., Nan-king, Ser. B, 2(3): 44. 1936.

硬叶野草 ying ye ye gu cao

Perennial, with stout scaly rhizomes. Culms erect, stiff, 50–120 cm, 2–3 mm in diam., branching at lower nodes forming leafy fascicles, nodes glabrous or pubescent. Leaf sheaths glabrous or shortly tuberculate-hispid, margins ciliate; leaf blades erect or stiffly divaricate, flat, leathery, (6–)15–30 cm × 5–10 mm, glabrous except for basal fringe and spaced bristles on lower margins, lacking an obvious midvein, apex acuminate; ligule ca. 0.2 mm. Panicle narrowly elliptic-oblong in outline, fairly dense, 9–15(–27) cm; central axis scabrid; branches 1.5–7 cm, narrowly ascending, lower often with branchlets; pedicels slender, finely scaberulous. Spikelets 4–5 mm, yellowish brown; glumes 3(–5)-veined, setose from large tubercles along the raised veins, apex narrowly acuminate; lower glume 3.1–3.7 mm; upper glume 3.8–4.1 mm; lower floret equal to lower glume or slightly longer; upper floret 2–2.5 mm, lemma apex entire, awned; awn geniculate with brown twisted column, 2.2–3 mm; callus hairs 1/4 length of lemma. Fl. and fr. Sep–Nov.

Dry slopes; ca. 500 m. Guangxi, Guizhou [Vietnam].

This is a lowland species with distinctive, smooth, leathery leaf blades and a rather dense panicle of setose, awned spikelets.

11. *Arundinella tricholepis* B. S. Sun & Z. H. Hu, Acta Bot. Yunnan. 2: 321. 1980.

毛颖野草 mao ying ye gu cao

Perennial, with short scaly rhizomes. Culms erect, often solitary, 1–1.2 m tall, 2–3 mm in diam., 5–6-noded, internodes glabrous, nodes densely pubescent. Leaf sheaths sparingly tuberculate-hairy when young, glabrescent, margins ciliate; leaf blades linear-lanceolate, 15–40 cm × 5–15 mm, densely tuberculate-hairy on both surfaces; ligule up to 0.8 mm. Panicle contracted, 30–45 cm; central axis slightly scabrid; branches slender, up to 18 cm, ascending or spreading, loosely spiculate; pedicels slightly scabrid. Spikelets 3.5–4.2 mm, purplish; glumes setose along veins; lower glume ca. 4 mm, 5-veined; upper glume 5–7-veined; lower floret staminate, equal to lower glume or slightly longer; upper floret 2–2.3 mm, lemma awned; awn geniculate with brown twisted column, ca. 3 mm; callus hairs 1/4 length of lemma. Fl. and fr. Jul–Dec.

• Roadsides, mountain slopes; 1500–1700 m. W Yunnan.

This is a variant of *Arundinella nepalensis* distinguished by its sparsely setose glumes.

12. *Arundinella parviflora* B. S. Sun & Z. H. Hu, Acta Bot. Yunnan. 2: 319. 1980.

小花野草 xiao hua ye gu cao

Perennial, tufted with short scaly rhizomes. Culms 0.6–1.2(–2) m tall, 2–5 mm in diam., often branched, internodes glabrous, nodes pubescent. Leaf sheaths glabrous; leaf blades broadly linear, 10–25 cm × 4–10 mm, sparingly tuberculate-hispid on both surfaces. Panicle loosely contracted, narrowly oblong in outline, 16–32 cm; central axis and branches somewhat scabrid; branches 5–13 cm, fasciculate or whorled, spikelets solitary in upper part; pedicels glabrous. Spikelets 2–2.5(–2.8) mm, purplish; glumes subequal, glabrous; lower glume 1.9–2.5 mm, 5-veined; upper glume as long as spikelet, 5-veined; lower floret staminate or bisexual, slightly longer than lower glume, mucronate or shortly awned; upper floret bisexual or often reduced, lemma 1.1–1.8 mm, apex awned; awn 1.3–2.8 mm, weakly geniculate with slightly twisted column; callus hairs ca. 1/3 length of lemma. Fl. and fr. Jul–Dec.

• Thickets at roadsides; 1000–1400 m. W Yunnan.

This species has remarkably small spikelets, and the sex of the two florets is variable, with the lower floret sometimes bisexual and the upper one reduced.

13. *Arundinella nepalensis* Trinius, Gram. Panic. 62. 1826.

石芒草 shi mang cao

Acratherum miliaceum Link; *Arundinella glabra* Nees ex Hooker & Arnott; *A. miliacea* (Link) Nees; *A. pilaxilis* B. S. Sun & Z. H. Hu; *A. pilomarginata* B. S. Sun; *A. virgata* Janowski.

Perennial, tufted with short scaly rhizomes. Culms erect, slender to stout, 0.9–2(–3) m tall, 2–7 mm in diam., simple or branched, internodes usually glabrous, 6–8-noded, nodes appressed silky pubescent. Leaf sheaths usually glabrous, occasionally tuberculate-pilose, usually bearded at mouth; leaf blades linear-lanceolate, stiff, flat or convolute, 10–50 cm × 5–18 mm, glabrous or thinly to densely tuberculate-pilose, apex long acuminate; ligule 0.3–0.5 mm. Panicle open or loosely contracted, 10–50 cm; central axis scaberulous or almost smooth; branches numerous, slender, 7–20 cm, subverticillate, simple or lowest branched, loosely spiculate; pedicels smooth or scabrid. Spikelets (3.5–)4–5.5 mm; pale green to dark purple; glumes usually glabrous; lower glume 3–3.5 mm, strongly 3-veined; upper glume 4.5–5.5 mm, faintly 5-veined; lower floret staminate or barren, equaling or longer than lower glume; upper floret 2–2.5 mm, lemma awned; awn geniculate with brown twisted column, 3.5–5 mm; callus hairs 1/4–1/3 length of lemma. Fl. and fr. Aug–Nov.

Mountain grasslands, hill thickets; 500–1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, SE Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Pakistan, Thailand, Vietnam; Africa, Australia].

This is a widespread species showing much variation in height and vigor, hairiness of the vegetative parts, and compactness of the panicle. The many-noded culms are characteristic, with silky-pubescent nodes and a banded effect from green internodes alternating with yellowish leaf sheaths, together with a panicle of numerous whorled branches.

Arundinella pilaxilis is based on a variant with tuberculate-hispid

culms. *Arundinella pilomarginata* is based on a specimen from Yunnan with the lower glume ciliate on one or both margins in some of the spikelets.

14. *Arundinella cochinchinensis* Keng, Nat. Centr. Univ. Sci. Rep., Nanking, Ser. B, 2(3): 24. 1936.

大序野古草 *da xu ye gu cao*

Perennial, loosely tufted with stout scaly rhizomes. Culms stout, erect, 1.5–3 m tall, 3–10 mm in diam., many-noded, nodes appressed silky-pilose. Leaf sheaths tuberculate-hispid when young, margin densely tuberculate-ciliate; leaf blades linear-lanceolate, flat, 30–80 cm × 10–25 mm, tuberculate-hispid or glabrescent, midrib broad, white, apex finely acuminate; ligule 1–1.5 mm. Panicle narrowly oblong in outline, dense, 30–60 × 5–10 cm; central axis scaberulous; branches numerous, 5–15 cm, suberect, crowded in whorls, densely spiculate; pedicels scaberulous. Spikelets 4–5 mm, green; glumes glabrous; lower glume 3–3.8 mm, 3–5-veined, scabrid along midvein; upper glume as long as spikelet, 3–5-veined; lower floret staminate, slightly longer than lower glume; upper floret ca. 2 mm, lemma awned; awn geniculate with brown twisted column, ca. 4 mm; callus hairs ca. 1/4 length of lemma. Fl. and fr. Jul.

Mountain grasslands, hill thickets; 500–1500 m. SW Guangxi, SW Guizhou, S Yunnan [Thailand, Vietnam].

This large, robust species is similar in habit to *Arundinella decempedalis*, and grows in the same habitats, but does not occur west of Yunnan. The panicle is denser, with rather shorter branches, and the spikelets have well-developed, persistent awns.

15. *Arundinella longispicata* B. S. Sun, J. Yunnan Univ. 21: 94. 1999 [*“longiscata”*].

长序野古草 *chang xu ye gu cao*

Perennial, loosely tufted, rhizomatous. Culms ascending, 35–90 cm tall, ca. 3 mm in diam., internodes glabrous, 5-noded, nodes bearded. Leaf sheaths longer than internodes, hispid with tubercle-based hairs; leaf blades linear, flat, 24–33 cm × 7–8 mm, tuberculate-hispid, midrib broad, white, margins scabrid, apex acuminate; ligule ca. 0.5 mm. Panicle large, open, 30–50 cm; central axis scabrid; branches up to 20 cm, in distant whorls, loosely ascending, bare in lower part, spikelet pairs spaced, spikelets not overlapping; pedicels scabrid, longer of pair twice spikelet length. Spikelets 4.7–4.8 mm, brownish green; glumes glabrous, midvein scabrid; lower glume ca. 4.2 mm, 3-veined; upper glume as long as spikelet, 5-veined; lower floret staminate, subequal to lower glume; upper floret ca. 2.4 mm, lemma apex awned; awn geniculate, ca. 3.5 mm, brown twisted column very short; callus hairs fine, woolly, almost 1/2 length of lemma. Fl. and fr. Jul–Sep.

• Streamsides; ca. 2000 m. Yunnan.

16. *Arundinella grandiflora* Hackel, Repert. Spec. Nov. Regni Veg. 8: 514. 1910.

大花野古草 *da hua ye gu cao*

Perennial, loosely tufted with scaly rhizomes. Culms erect, 0.6–1.2 m tall, 2–5 mm in diam., internodes glabrous, 3-noded, nodes blackish, bearded or glabrous. Leaf sheaths with tub-

ercle-based hairs when young, glabrescent; leaf blades linear-lanceolate, flat, rather rigid, 10–30 cm × 5–14 mm, glabrous on both surfaces, lacking an obvious midvein, margins scabrid or tuberculate-ciliate, apex acuminate; ligule ca. 0.5 mm. Panicle contracted, lanceolate in outline, 10–30 cm; central axis smooth, glabrous; branches up to 10(–15) cm, single or paired, densely spiculate, usually with branchlets; pedicels smooth. Spikelets 6–7 mm, purple or purplish red; glumes glabrous, smooth or veins scabrid; lower glume 3.8–4.5 mm, (3–)5(–7)-veined; upper glume as long as spikelet, 5-veined; lower floret staminate or barren, slightly longer than lower glume; upper floret 3–3.5 mm, lemma scabrid on back, apex awned; awn geniculate with brown twisted column, 5–6 mm; callus hairs ca. 1/3 length of lemma. Fl. and fr. Jul–Sep.

• Open forests, mountain slope thickets; 1700–2600 m. NC Yunnan.

This is a well-defined species with relatively short culms, broad leaf blades, a contracted inflorescence with secondary branching, smooth axis and pedicels, and large, glabrous spikelets.

17. *Arundinella yunnanensis* Keng ex B. S. Sun & Z. H. Hu, Acta Bot. Yunnan. 2: 326. 1980.

云南野古草 *yun nan ye gu cao*

Perennial, tufted, rhizome absent. Culms wiry, 30–50 cm tall, 1–1.5 mm in diam., often branched below, 4–7-noded, internodes and nodes glabrous. Leaf sheaths mostly shorter than internodes, glabrous; leaf blades firm, often involute, 3–10 cm × 1–3 mm, glabrous except adaxial surface at base; ligule almost absent. Panicle narrow, 8–19 cm; central axis and branches glabrous, smooth or slightly scabrid; branches spaced in lower part, 4–7.5 cm, erect, loosely spiculate; pedicels slightly scabrid. Spikelets 4.5–5.2 mm, glaucous or flushed purplish; glumes glabrous, smooth or scabrid on upper part of midvein; lower glume 2.5–3.5 mm, 3–5-veined; upper glume as long as spikelet, 5-veined; lower floret staminate, slightly longer than lower glume; upper floret 2.6–3 mm, lemma slightly scabrid on back, apex awned; awn geniculate with brown twisted column, 2–4 mm; callus hairs 1/2 length of lemma. Fl. and fr. Aug–Sep.

• Mountain meadows; ca. 3000 m. SE Xizang, NW Yunnan.

18. *Arundinella pubescens* Merrill & Hackel, Philipp. J. Sci. 2: 419. 1907.

毛野古草 *mao ye gu cao*

Arundinella caespitosa Janowski; *A. filiformis* Janowski; *A. hispida* (Humboldt & Bonpland ex Willdenow) Kuntze subsp. *humilior* (Hackel) Hackel; *A. humilior* (Hackel) Jansen.

Perennial forming small dense tuft, rhizomes absent. Culms erect, slender, 15–35 cm tall, ca. 1 mm in diam., internodes glabrous or thinly hirsute upward, 4–6-noded below middle, nodes bearded. Leaves mainly basal; leaf sheaths longer than internodes, glabrous to hirsute, margins ciliate, bearded at mouth; leaf blades linear or often inrolled, pale green, stiff, 6–16 cm × 2–6 mm, tuberculate-hirsute on both surfaces or glabrous, apex finely acute; ligule ca. 0.3 mm. Panicle open or loosely contracted, narrowly oblong to lanceolate in outline, 12–30 cm; central axis scabrid or sparingly pilose; branches erect to spreading, 1.5–4 cm, mostly single or paired; pedicels

smooth or scaberulous. Spikelets 3.5–4.5 mm, greenish or purplish; glumes glabrous; lower glume 2.3–2.5 mm, 3–5-veined, scabrid along veins; upper glume as long as spikelet, 5-veined; lower floret staminate, longer than lower glume; upper floret 2–2.2 mm, lemma apex 2-denticulate, awned; awn geniculate with brown twisted column, 3–6 mm; callus hairs 1/4 length of lemma. Fl. and fr. Apr.

Shady rock fissures along river banks. Taiwan [Philippines].

19. *Arundinella rupestris* A. Camus, Bull. Mus. Natl. Hist. Nat. 25: 367. 1919.

岩生野古草 *yan sheng ye gu cao*

Arundinella fluvialis var. *pachyathera* Handel-Mazzetti; *A. rupestris* var. *pachyathera* (Handel-Mazzetti) B. S. Sun & Z. H. Hu.

Perennial, tufted, rhizomes absent, base with persistent papery sheaths. Culms very slender, erect or decumbent and rooting at base, 30–80 cm tall, ca. 1 mm in diam., 7–10-noded, nodes glabrous or pubescent. Leaf sheaths longer than internodes, thinly pilose, glabrescent, one margin ciliate, bearded at mouth; leaf blades linear or often involute, 5–20 cm × 2–5 mm, glabrous or adaxial surface thinly pilose, apex finely acuminate; ligule ca. 0.25 mm. Panicle loosely contracted, 7–15 cm; central axis and branches scabrid-hispidulous; branches narrowly ascending, 3–7 cm, loosely spiculate; pedicels scabrid. Spikelets 3.5–4 mm, yellowish green or purplish; glumes glabrous, smooth or midvein scabrid; lower glume 2.5–3.5 mm, 3–5-veined; upper glume as long as spikelet, 5-veined; lower floret staminate, as long as lower glume; upper floret 2.5–3 mm, lemma apex 2-

denticulate, awned; awn geniculate with brown twisted column, 2–5 mm; callus hairs 1/4–1/3 length of lemma. Fl. and fr. May–Oct.

River banks, floodlands, rock fissures; 300–500 m. Guangxi, Guizhou, Hunan [Thailand, Vietnam].

This is a lowland, riverine species with tufts of wiry, many-noded culms. The lower leaf blades and upper part of the lower sheaths are often broken away, exposing the nodes.

20. *Arundinella intricata* Hughes, Bull. Misc. Inform. Kew 1920(3): 112. 1920.

错立野古草 *cuo li ye gu cao*

Perennial, densely tufted, strongly rhizomatous. Culms erect or ascending, 35–80 cm tall, 1.5–2 mm in diam., 5–9-noded, nodes glabrous. Leaf sheaths longer than internodes, glabrous or pilose, one margin ciliate; leaf blades linear, 11–20 cm × 2–5 mm, glabrous or pilose, margins scabrid, apex finely acuminate; ligule ca. 0.5 mm. Panicle loosely contracted, narrowly elliptic in outline, 10–17 cm; central axis and branches scabrid-hispidulous; branches narrowly ascending, 3–6 cm, loosely spiculate; pedicels scabrid. Spikelets 3.8–4.5 mm, usually purple tinged; glumes glabrous, veins scaberulous; lower glume 2.5–3 mm, 3–5-veined; upper glume as long as spikelet, 5-veined; lower floret staminate, as long as lower glume; upper floret 2.2–3 mm, lemma apex subentire, awned; awn geniculate with brown twisted column, 2.7–5 mm; callus hairs ca. 1/2 length of lemma.

Cliffs, sandy river banks. Xizang [Bhutan, NE India].

This species is reputed to be a good soil binder.

28. Tribe ANDROPOGONEAE

高粱族 *gao liang zu*

Chen Shouliang (陈守良), Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips, Stephen A. Renvoize

Annual or perennial. Leaf blades linear, rarely lanceolate or filiform; ligule membranous, rarely ciliate. Inflorescence composed of fragile (infrequently tough) racemes, these arranged in a terminal panicle with elongate central axis, or more frequently subdigitate, paired or solitary, often axillary, subtended by spathes and spatheoles and gathered into a compound panicle. Racemes usually bearing paired spikelets (with a terminal triad), rarely spikelets single or in threes, usually one spikelet of a pair sessile and the other pedicelled, infrequently both pedicelled; rachis fracturing at maturity beneath each spikelet pair. Spikelets of a pair alike or more often dissimilar in shape and sex, when dissimilar sessile spikelet bisexual or female, pedicelled spikelet male or barren, rarely pedicelled spikelet vestigial or absent and sessile spikelet then apparently single; sometimes 1 or more of lowermost pairs in raceme infertile, resembling pedicelled spikelets, persistent (homogamous pairs); rachis internodes and pedicels filiform, linear or thickened, sometimes very stout and partially enclosing spikelet, falling with adjacent sessile spikelet, pedicelled spikelet falling separately; callus at base of sessile spikelet obtuse to pungent. Sessile spikelet with 2 florets, usually dorsally compressed; glumes enclosing florets, hardened, lower glume facing outward, very variable, convex or 2-keeled, upper glume boat-shaped, fitting between internode and pedicel; lower floret male or barren, lower lemma hyaline, 2-keeled, lower palea suppressed when floret barren; upper floret fertile, upper lemma hyaline, narrow, entire or 2-toothed, awnless or bearing a geniculate awn with twisted column, upper palea short or absent. Pedicelled spikelet usually lanceolate, papery, often smaller than pedicelled spikelet; pedicel resembling rachis internode, rarely absent or fused to internode. Leaf anatomy Kranz MS. $x = 5, 9$.

About 85 genera and ca. 1000 species: throughout the tropics, extending into warm-temperate regions; 41 genera (one or two introduced) and 204 species (42 endemic, seven or eight introduced) in China.

Members of this tribe can usually be readily recognized by their fragile racemes bearing paired spikelets, one sessile and the other pedicelled. The dispersal unit is thus composed of sessile spikelet, rachis internode, and pedicel (the pedicelled spikelet falls separately), all of which contribute to the protection of the seed and are frequently ornamented or modified.

In the more primitive members both spikelets of a pair are alike and fertile and are arranged in a terminal panicle. In most genera, however, the

pedicelled spikelet has lost its fertility and differs in shape and texture from the sessile one. In some genera the pedicelled spikelet is much reduced, and in extreme cases its pedicel is reduced to a vestige or fused to the adjacent internode. The sessile spikelets then appear single, but the fragile rachis gives a good clue to the correct tribe.

Another trend apparent throughout the tribe is the reduction of the large, terminal inflorescence to a few digitate or paired racemes, often arising from the axils of specialized leaves with inflated sheaths and reduced blades (spathes). In the most complex genera the ultimate unit is a boat-shaped sheath without a blade (spatheole) subtending 1 or 2 short racemes, and by repeated branching many of these units are gathered into a leafy compound panicle.

The spikelets contain 2 florets, but this is not obvious as the florets are delicate and usually reduced. However, it is seldom necessary to dissect the spikelets in order to identify a member of *Andropogoneae*. The apex of the upper lemma and position of the awn are sometimes important for identification. If the awn is gently drawn out, the small lemma at its base can be examined with a lens.

See the drawings of *Andropogoneae* features on page 3 of this volume.

Key 1

- 1a. Spikelets all unisexual, separated in different inflorescences or in different parts of the same inflorescence.
 - 2a. Male and female spikelets in different inflorescences, the female in sheathed axillary “cobs” (cultivated maize) 226. *Zea*
 - 2b. Male and female spikelets in different parts of same inflorescence.
 - 3a. Female spikelets enclosed in a beadlike, bony utricule 223. *Coix*
 - 3b. Female spikelets not enclosed in a bony utricule.
 - 4a. Female spikelets conspicuously transversely constricted; racemes all solitary, in spatulate axillary clusters 224. *Chionachne*
 - 4b. Female spikelets not transversely constricted; racemes digitate, at least the terminal 225. *Polytoca*
- 1b. Spikelets all bisexual, or at least the sessile spikelet of a pair, male and female not separated.
 - 5a. Spikelets single, without an accompanying vestigial spikelet or pedicel (if spikelets awnless and rachis internodes stout, see Key 4).
 - 6a. Inflorescence of many racemes on an elongate central axis 186. *Spodiopogon*
 - 6b. Inflorescence of solitary or digitate racemes.
 - 7a. Leaf blades linear; raceme rachis tough 207. *Dimeria*
 - 7b. Leaf blades lanceolate; raceme rachis fragile 208. *Arthraxon*
 - 5b. Spikelets paired, but sometimes pedicelled spikelet vestigial or represented only by the pedicel.
 - 8a. Rachis internodes and pedicels slender, filiform to linear, or if widened upward the upper lemma awned.
 - 9a. Spikelets of a pair similar in shape, usually both fertile Key 2
 - 9b. Spikelets of a pair different in shape and sex (rarely pedicelled spikelet vestigial or reduced to pedicel) Key 3
 - 8b. Rachis internodes and pedicels stout, angular, columnar or widening upward, internode and pedicel sometimes joined; upper lemma awnless Key 4

Key 2

- 1a. Inflorescence with elongate central axis, longer than lowest raceme.
 - 2a. Lower glume papery, convex, the veins raised 186. *Spodiopogon*
 - 2b. Lower glume membranous or leathery, the veins flat.
 - 3a. Raceme rachis fragile; 1 spikelet of the pair sessile 187. *Saccharum*
 - 3b. Raceme rachis tough; all spikelets pedicelled.
 - 4a. Panicle loose; glumes cartilaginous to leathery 188. *Miscanthus*
 - 4b. Panicle contracted or spikelike; glumes membranous 189. *Imperata*
- 1b. Inflorescence of solitary or subdigitate racemes.
 - 5a. Inflorescences axillary.
 - 6a. Inflorescence a solitary raceme; spikelets laterally compressed; upper glume with long fine awn 192. *Pogonatherum*
 - 6b. Inflorescence of 2–4 subdigitate racemes; spikelets dorsally compressed; upper glume awn-pointed 193. *Eulaliopsis*
 - 5b. Inflorescence terminal.
 - 7a. Spikelets in groups of 3, 2 sessile and 1 pedicelled 194. *Polytrias*
 - 7b. Spikelets paired.
 - 8a. Culms rambling; leaf blades lanceolate; spikelets sparsely hairy; lower glume concave to grooved along median line 195. *Microstegium*
 - 8b. Culms erect; leaf blades linear; spikelets conspicuously hairy; lower glume convex to flat or slightly concave.
 - 9a. Slender annuals 191. *Pseudopogonatherum*
 - 9b. Robust perennials.

- 10a. Raceme rachis tough, both spikelets of pair pedicelled 188. *Miscanthus*
 10b. Raceme rachis fragile; 1 spikelet of pair sessile 190. *Eulalia*

Key 3

- 1a. Sessile spikelets male or barren, hard, involucrelike, awnless; pedicelled spikelets fertile, long awned 197. *Germainia*
 1b. Sessile spikelets fertile, often awned; pedicelled spikelets male, barren, or suppressed.
 2a. Racemes borne on an elongate central axis or its branches, axis longer than lowest raceme, not supported by spathes.
 3a. Rachis internodes and pedicels without a purple translucent median line.
 4a. Lower glume of sessile spikelet laterally compressed; raceme often reduced to a triad 200. *Chrysopogon*
 4b. Lower glume of sessile spikelet dorsally compressed; raceme of several spikelet pairs below terminal triad.
 5a. Glumes of sessile spikelet leathery; panicle usually loose, racemes of 2–7 spikelet pairs; lodicules ciliate 198. *Sorghum*
 5b. Glumes of sessile spikelets firmly cartilaginous; panicle dense, racemes of 5–15 spikelet pairs; lodicules glabrous 199. *Pseudosorghum*
 3b. Rachis internodes and pedicels with a purple translucent median line.
 6a. Racemes of 1–5(–8) spikelet pairs, often reduced to triads 202. *Capillipedium*
 6b. Racemes of more than 8 spikelet pairs 203. *Bothriochloa*
 2b. Racemes solitary, paired or subdigitate, often supported by spathes.
 7a. Rachis internodes and pedicels with a purple translucent median line 203. *Bothriochloa*
 7b. Pedicels and rachis internodes without a translucent median line.
 8a. Lower floret of sessile spikelet staminate, with well-developed palea.
 9a. Pedicel lacking a spikelet, partially fused to lower glume; sessile spikelet broadly truncate, apex with scarious colored band (*A. intermedius* with pedicelled spikelet) 196. *Apocopsis*
 9b. Pedicel bearing a spikelet, free from lower glume.
 10a. Ligule a line of hairs; raceme solitary; lower glume of sessile spikelet deeply grooved, apex elongate, scarious 204. *Sehima*
 10b. Ligule membranous; racemes often more than 1; lower glume of sessile spikelet not as above.
 11a. Sessile spikelet laterally compressed, smooth; raceme solitary, reduced to spatulate triad, these numerous, crowded into compound panicle 206. *Apluda*
 11b. Sessile spikelet dorsally compressed; racemes (1 or) 2 or more, terminal or axillary.
 12a. Rachis internodes and pedicels stoutly linear to thickly clavate; sessile spikelet often rugose or knobbly 205. *Ischaemum*
 12b. Rachis internodes and pedicels filiform to linear; sessile spikelet smooth, grooved along midline 195. *Microstegium*
 8b. Lower floret of sessile spikelet barren, reduced to a lemma, palea absent.
 13a. Awn arising from low down on lemma back; culms slender, often trailing, leaf blades lanceolate 208. *Arthraxon*
 13b. Awn arising from apex of lemma, or from sinus of 2-lobed apex.
 14a. Lower glume of sessile spikelet 2-keeled; callus inserted into hollowed internode apex.
 15a. Racemes solitary 209. *Schizachyrium*
 15b. Racemes paired or digitate.
 16a. Leaves not aromatic; racemes not deflexed, borne on unequal terete raceme bases 210. *Andropogon*
 16b. Leaves aromatic; racemes usually deflexed at maturity, borne on subequal flattened raceme bases 211. *Cymbopogon*
 14b. Lower glume of sessile spikelet convexly rounded without keels; callus attached obliquely, its apex visible.
 17a. Upper lemma 2-toothed, awned from sinus 212. *Hyparrhenia*
 17b. Upper lemma entire, awned from apex.
 18a. Raceme with 2 large homogamous spikelet pairs at base, forming an involucre 213. *Themeda*
 18b. Raceme with or without homogamous spikelet pairs, but not forming an involucre.
 19a. Sessile spikelet with pungent callus 214. *Heteropogon*
 19b. Sessile spikelet with obtuse callus.

- 20a. Inflorescence terminal, composed of (1 or)2–8
subdigitate racemes 201. *Dichanthium*
- 20b. Inflorescence a small spathate raceme, racemes
grouped in bunches on flexuous peduncles,
forming a compound panicle 215. *Pseudanthistiria*

Key 4

- 1a. Inflorescence terminal, racemes solitary, subdigitate or spread along an elongate axis.
 - 2a. Sessile spikelet with pectinate, often spinose margins, or margins tuberculate; raceme solitary 220. *Eremochloa*
 - 2b. Sessile spikelet without pectinate margins; racemes solitary to many.
 - 3a. Pedicel joined to rachis internode; pedicelled spikelet absent 218. *Mnesithea*
 - 3b. Pedicel free; pedicelled spikelet present 216. *Phacelurus*
- 1b. Inflorescence of axillary racemes from the upper leaf axils.
 - 4a. Sessile spikelets alternating on raceme in 2 opposite rows; pedicelled spikelets absent; pedicel joined to
rachis internode 222. *Ophiuros*
 - 4b. Sessile spikelets all on one side of raceme; pedicelled spikelets well developed to vestigial; pedicel free or
partially or completely joined to rachis internode.
 - 5a. Spikelets of a pair similar (if 2 sessile ornamented spikelets at each node, see *Mnesithea*); racemes
tough or tardily disarticulating; rachis articulation line usually oblique without central peg 217. *Hemarthria*
 - 5b. Spikelets of a pair different; racemes easily disarticulating; rachis articulation line \pm straight with
central peg.
 - 6a. Sessile spikelet globose, reticulately ornamented 221. *Hackelochloa*
 - 6b. Sessile spikelet not globose, smooth or with longitudinal slits or grooves between the veins.
 - 7a. Lower floret of sessile spikelet staminate, its palea well developed; spikelets smooth 219. *Rottboellia*
 - 7b. Lower floret of sessile spikelet barren, its palea reduced or absent; spikelets with 2–7
longitudinal slots or grooves between the veins, rarely smooth 218. *Mnesithea*

186. SPODIOPOGON Trinius, Fund. Agrost. 192. 1820.大油芒属 *da you mang shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Eccoilopus Steudel.

Perennials, often rhizomatous. Culms erect, many-noded, simple or branched. Leaf blades linear to lanceolate, flat, sometimes narrowed to a pseudopetiole; ligule membranous, often hairy on margin or back. Inflorescence terminal, an open or contracted panicle with elongate central axis, primary branches subverticillate, typically capillary, smooth, bearing 1 or more racemes; racemes short, rachis fragile or tough, sessile and pedicelled spikelet of a pair similar, both pedicelled when rachis tough, both fertile, rarely spikelets solitary; rachis internodes and pedicels slender or thickened upward, often with cupular apex. Spikelets usually lanceolate, scarcely compressed; callus subglabrous to shortly bearded; glumes equal, firmly papery, lower glume rounded on back, puberulous to villous, closely many-veined, veins prominent, raised into ridges, apex acute to shortly awned; upper glume usually resembling lower glume, sometimes keeled; lower floret often staminate, lemma lanceolate to ovate, palea usually present; upper lemma deeply 2-lobed, awned from sinus; awn geniculate. $x = 10$.

Fifteen species: Turkey eastward to India, Thailand, and Japan, one species extending northward to Siberia; nine species (six endemic) in China.

Species with a tough rachis and pedicellate spikelets are sometimes separated as the genus *Eccoilopus*. However, the racemes have distinct joints in these species, so the lack of disarticulation at maturity appears to be a secondary development. The spikelets are typical of *Spodiopogon*.

- 1a. Racemes not disarticulating at maturity; spikelets of a pair both pedicelled.
 - 2a. Culms decumbent at base, branched; leaf blades lanceolate, 9–15 cm 1. *S. bambusoides*
 - 2b. Culms erect, not branched; leaf blades linear or linear-lanceolate, 15–60 cm.
 - 3a. Spikelets narrowly lanceolate, 5–6 mm; awn 12–18 mm 2. *S. cotulifer*
 - 3b. Spikelets broadly lanceolate, 4–5 mm; awn 0–5 mm 3. *S. formosanus*
- 1b. Racemes disarticulating at maturity; spikelets of a pair 1 sessile and 1 pedicelled, or spikelets solitary.
 - 4a. Lower leaf blades sagittate with long pseudopetiole 4. *S. sagittifolius*
 - 4b. Lower leaf blades not sagittate, pseudopetiole present or not.
 - 5a. Plant tufted; leaf blades pseudopetiolate; panicle branches 5–15 cm 5. *S. duclouxii*
 - 5b. Plant rhizomatous; leaf blades not pseudopetiolate; panicle branches 2–6(–8) cm.
 - 6a. Primary branches of panicle much branched, branchlets many.

- 7a. Leaf blades villous; racemes of 7–11 spikelets 6. *S. dubius*
 7b. Leaf blades glabrous or abaxial surface tuberculate-hispid; racemes of 1–3 spikelets 7. *S. yuexiensis*
 6b. Primary branches simple or sparsely branched, branchlets few or none.
 8a. Culms 60–200 cm tall, not branched; leaf blades 10–40 cm; awn 10–15 mm 8. *S. sibiricus*
 8b. Culms 20–50 cm tall, branched; leaf blades 4–8 cm; awn 7–10 mm 9. *S. tainanensis*

1. *Spodiopogon bambusoides* (P. C. Keng) S. M. Phillips & S. L. Chen, *Novon* 15: 468. 2005.

竹油芒 zhu you mang

Eccoilopus bambusoides P. C. Keng, *Guihaia* 13: 320. 1993.

Perennial, tufted. Culms decumbent at base, rooting at lower nodes, hard, 1–1.4 m tall, 2–3 mm in diam., branched. Leaf sheaths smooth, glabrous, lower blades disarticulating from sheaths; leaf blades lanceolate, 9–15 × 1–1.7 cm, smooth, glabrous, base cuneate, apex acuminate; ligule ca. 1 mm, ciliolate. Panicle elliptic in outline, 10–12 cm; branches spreading, 3–5 cm, undivided below middle, much branched above, ultimate branchlets shortly bearded at apex and bearing a spikelet pair or 3 spikelets; spikelets of a pair both pedicellate, pedicels unequal, clavate upward, shorter pedicel stout. Spikelets 4–4.7 mm; callus hairs ca. 0.7 mm; lower glume lanceolate-oblong, pilose, veins scaberulous, apex subacute or minutely mucronate; upper glume obtuse; lower floret staminate, palea well developed; upper lemma 2-lobed to below middle; awn 6–8 mm. Anthers 2.8–3 mm. Fl. and fr. Sep–Nov.

• Grassy mountain slopes. Guangxi, Guizhou.

2. *Spodiopogon cotulifer* (Thunberg) Hackel in A. Candolle & C. Candolle, *Monogr. Phan.* 6: 187. 1889.

油芒 you mang

Andropogon cotulifer Thunberg in Murray, *Syst. Veg.*, ed. 14, 903. 1784; *Eccoilopus andropogonoides* Steudel; *E. cotulifer* (Thunberg) A. Camus; *E. cotulifer* var. *sagittiformis* Ohwi; *Eulalia cotulifera* (Thunberg) Munro; *Miscanthus cotulifer* (Thunberg) Benth; *Saccharum cotuliferum* (Thunberg) Roberty.

Perennial. Culms solitary, erect, 60–150 cm tall, 3–8 mm in diam., unbranched. Leaf sheaths smooth, papery; leaf blades linear-lanceolate, 15–60 × 0.8–2 cm, scabrid, abaxial surface sparsely hispid, adaxial surface villous above ligule, base narrowed, lower blades pseudopetiolate, apex finely acute; ligule 2–3 mm. Panicle open, ovate-oblong in outline, 15–30 cm; branches capillary, flexuous, 3–10 cm, usually tipped by a single raceme, infrequently branched; racemes 3–10-noded, articulation lines present, shortly bearded, not disarticulating at maturity, spikelets of a pair both pedicellate; rachis internodes 4–7 mm, filiform, apices swollen; pedicels unequal, clavate upward, shorter pedicel stout. Spikelets 5–6 mm; callus hairs ca. 1 mm; lower glume narrowly lanceolate, subglabrous to hispid, veins scabrid, margins densely hispid, apex emarginate, shortly awned to 1.5 mm; upper glume similar; lower floret sterile, palea narrow; upper lemma 2-lobed to middle; awn 12–18 mm. Anthers 2.5–3 mm. Fl. and fr. Sep–Nov. *2n* = 40.

Grassy hillsides, valleys, roadsides; 200–1000 m. Anhui, Fujian,

Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [N India, Japan, Kashmir, S Korea].

The spikelets drop very readily at maturity, leaving slender, articulated raceme axes bearing paired, clavate pedicels of distinctive and easily recognizable appearance.

3. *Spodiopogon formosanus* Rendle, *J. Linn. Soc., Bot.* 36: 351. 1904.

台湾油芒 tai wan you mang

Eccoilopus formosanus (Rendle) A. Camus; *E. formosanus* var. *tohoensis* (Hayata) Honda; *E. taiwanicus* Honda; *E. tohoensis* (Hayata) A. Camus; *Spodiopogon kawakamii* Hayata; *S. kawakamii* var. *sativus* Honda; *S. tohoensis* Hayata.

Perennial, shortly rhizomatous. Culms erect, 60–130 cm tall, 2.5–5 mm in diam., unbranched. Leaf sheaths glabrous, mouth tuberculate-hispid; leaf blades linear-lanceolate, 20–50 × 1–1.5 cm, glabrous, abaxial surface smooth, adaxial surface scabrid, base narrowed, lower blades pseudopetiolate, apex acute; ligule 2–3 mm. Panicle open, ovate in outline, 5–15 cm; branches 3–6 cm, distal part branched; racemes 1–3-noded, articulation lines present, not bearded, not disarticulating at maturity, spikelets of a pair both pedicellate; rachis internodes 2–4 mm; pedicels unequal, clavate upward, shorter pedicel stout. Spikelets 4–5 mm, plump; callus hairs 0.2–0.5 mm; lower glume broadly lanceolate, glabrous to hispid, veins smooth except near apex, apex emarginate, minutely mucronate; upper glume with mucro to 0.5 mm; lower floret sterile; upper lemma 2-lobed in upper 1/3; awn 0–5 mm. Anthers 2–3 mm. Fl. and fr. summer–autumn.

• Dry mountain slopes; 1000–2000 m. Taiwan.

This species has been cultivated as a grain crop in the uplands of Taiwan.

4. *Spodiopogon sagittifolius* Rendle, *J. Linn. Soc., Bot.* 36: 352. 1904.

箭叶大油芒 jian ye da you mang

Perennial from a short knotty rhizome. Culms erect, 60–100 cm tall, 2–3 mm in diam., 3–4-noded, unbranched. Leaf sheaths glabrous; leaf blades linear-lanceolate, 8–30 × 0.5–1.5 cm, abaxial surface tuberculate-pilose, adaxial surface glabrous, margins smooth, base of lower blades deeply sagittate with pilose pseudopetiole up to 10 cm and acuminate lobes to 1.5 cm, apex acuminate; ligule 2–6 mm. Panicle open, lanceolate in outline, 9–20 cm; branches 2–5 cm, pilose in axils, unbranched, tipped by a solitary spikelet, a spikelet pair, or 3 spikelets; disarticulating at maturity, rachis internodes (when present) and pedicels slenderly clavate, 3/4 as long to equaling spikelets, shortly ciliate. Spikelets 4–6 mm, yellowish green; callus hairs

ca. 1.5 mm; lower glume lanceolate-oblong, pilose, 11–13-veined, veins smooth, apex subacute; upper glume similar, 8–11-veined, emarginate; lower floret staminate, palea well developed; upper lemma 2-lobed to below middle; awn 12–20 mm. Anthers 3.5–4 mm. Fl. and fr. autumn.

- Mountain slopes, forests, grasslands; 1500–1800 m. Yunnan.

Spodiopogon lacei Hole, from Bhutan, NE India, N Myanmar, and N Thailand, is another species with sagittate leaf blades. It differs in its more robust culms to 2.5 m tall and 3–4 mm thick; denser, brownish panicle of 2- or 3-noded, dense racemes with shorter, clavate rachis internodes; and by the upper glume of the sessile spikelet, which is strongly keeled and smooth without prominent veins.

5. *Spodiopogon duclouxii* A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 551. 1921.

滇大油芒 dian da you mang

Perennial, tufted from a tough rootstock. Culms erect, 120–160 cm tall, 3–5 mm in diam., 8–10-noded, unbranched. Leaf sheaths glabrous; leaf blades linear-lanceolate, 30–60 × 1.2–1.8 cm, abaxial surface thinly pilose, adaxial surface scaberulous, base of lower blades narrowed into up to 8 cm pseudopetiole, upper blades narrowed to sheath, apex finely acuminate; ligule 1.4–1.5 mm, back villous. Panicle open, 10–30 cm; branches in distant whorls, capillary, flexuous, 5–15 cm, mostly unbranched, tipped by a raceme; racemes 2–5-noded with 7–13 spikelets, sometimes branched with up to 40 spikelets, disarticulating at maturity, one spikelet of a pair sessile, the other pedicellate; rachis internodes and pedicels slenderly clavate, margins ciliate, hairs 0.7–1 mm. Spikelets 4.5–5 mm; callus hairs ca. 1 mm; lower glume lanceolate, thinly pilose, veins smooth below middle, scaberulous above, apex acuminate; upper glume ciliate on margins, acuminate or emarginate and mucronate; lower floret sterile, palea reduced; upper lemma 2-lobed to middle; awn 5.5–8 mm. Anthers 2–3 mm. Fl. and fr. Aug–Nov.

- Moist grasslands. Sichuan (Miyi), Yunnan.

This is a robust species lacking creeping, scaly rhizomes. The pseudopetiolate lower leaf blades are often missing on herbarium specimens, but the species can also be recognized by the long, flexuous panicle branches.

6. *Spodiopogon dubius* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 186. 1889.

绒毛大油芒 rong mao da you mang

Perennial, with spreading scaly rhizomes. Culms solitary or tufted, erect, 1–2 m tall, 4–5 mm in diam., branched or unbranched. Leaf sheaths glabrous to villous, woolly at apex; leaf blades broadly linear, 20–30 × 1.2–1.5 cm, thinly appressed-pilose to densely villous, base rounded, apex long acuminate; ligule ca. 0.3 mm, margin densely ciliate. Panicle dense, narrowly oblong in outline, 10–22 cm; branches 2–5 cm, branchlets many, short, pilose in axils; racemes 2–4-noded with 7–11 spikelets, disarticulating at maturity, one spikelet of a pair sessile, the other pedicellate; internodes and pedicels 2–2.5 mm, slender with expanded tips, densely ciliate. Spikelets 4–5 mm; callus hairs 1.5–2 mm; lower glume narrowly lanceolate, vil-

lous with ca. 3 mm hairs, veins smooth, apex subacute or emarginate; upper glume villous on keel, apex acute; lower floret sterile, palea absent; upper lemma 2-lobed to middle; awn 8–10 mm. Anthers 1.8–2.3 mm. Fl. and fr. summer–autumn.

Mountain slopes, forest margins; ca. 2400 m. Xizang [NW India, Nepal].

The name “*Spodiopogon villosus* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 58. 1997, not Nees, 1838) belongs here, but was not validly published because no Latin description was provided.

7. *Spodiopogon yuexiensis* S. L. Zhong, J. S. W. Agric. Coll. 1982(4): 77. 1982.

白玉大油芒 bai yu da you mang

Perennial, rhizomatous. Culms 0.6–2 m tall, 2–6 mm in diam. Leaf sheaths glabrous; leaf blades lanceolate or linear-lanceolate, 8–30 × 0.3–2.2 cm, glabrous or abaxial surface tuberculate-hispid, margins scabrid, base narrow, apex acuminate; ligule 0.5–1 mm. Panicle open, lanceolate-oblong in outline, 6–27 cm; branches 2–8 cm, much branched, ultimate branchlets articulated, bearded at articulation; racemes mostly reduced to a solitary, readily disarticulating spikelet, or 1 or 2 pedicelled spikelets also present; branchlets and pedicels slender, glabrous, 6–7 mm, as long as or longer than spikelets. Spikelets 4.5–5 mm; callus hairs 2–3 mm, soft; lower glume lanceolate, softly pilose, hairs ca. 2 mm, grayish white or purplish; lower floret staminate, palea well developed; upper lemma 2-lobed to below middle; awn 8–12 mm. Anthers 3–3.5 mm. Fl. and fr. Jul–Nov.

- Roadsides, river banks, thickets; 1600–3000 m. W Sichuan.

Most spikelets on the type of *Spodiopogon yuexiensis* fall singly without any trace of an attached rachilla segment or pedicel.

The name “*Spodiopogon baiyuensis* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 57. 1997) belongs here, but was not validly published because no Latin description was provided.

8. *Spodiopogon sibiricus* Trinius, Fund. Agrost. 192. 1820.

大油芒 da you mang

Perennial, with spreading scaly rhizomes. Culms solitary, erect, 70–200 cm tall, 2–4 mm in diam., unbranched. Leaf sheaths glabrous; leaf blades linear-lanceolate, (10–)20–40 × 0.8–2 cm, glabrous or pubescent, base narrowed almost to midrib on lower blades, apex setaceously acuminate; ligule 1–2 mm. Panicle loosely contracted, narrowly lanceolate in outline, 10–20 cm; branches 2–6 cm, unbranched or lower branches branched once or twice, branchlets glabrous or pilose in axils; racemes 2–3-noded with 7–9 spikelets, disarticulating at maturity, one spikelet of a pair sessile, the other pedicellate; rachis internodes and pedicels 2.5–5 mm, slenderly clavate, ciliate, hairs 1.5–2 mm. Spikelets 4.5–6 mm; callus hairs 1.5–2.5 mm; lower glume broadly lanceolate, pilose with soft spreading hairs, veins smooth except near apex, apex acute or slightly emarginate, sometimes mucronate; upper glume acute or mucronate; lower floret staminate, palea well developed; upper lemma 2-lobed to lower 1/3; awn 10–15 mm. Anthers ca. 3 mm. Fl. and fr. summer–autumn. $2n = 40$.

Mountain slopes, roadsides, forest margins; below 1100 m. Anhui,

Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi, Shandong, Sichuan, Zhejiang [Japan, Korea, Mongolia, Russia (Siberia)].

- 1a. Spikelets 4.5–6 mm 8a. var. *sibiricus*
1b. Spikelets 6.5–8 mm 8b. var. *grandiflorus*

8a. *Spodiopogon sibiricus* var. *sibiricus*

大油芒(原变种) da you mang (yuan bian zhong)

Andropogon sibiricus (Trinius) Steudel; *Saccharum sibiricum* (Trinius) Roberty; *Spodiopogon depauperatus* Hackel var. *purpurascens* Honda; *S. sibiricus* var. *purpurascens* (Honda) Honda; *S. sibiricus* var. *tenuis* (Kitagawa) Kitagawa; *S. sibiricus* var. *tomentosus* Koidzumi; *S. tenuis* Kitagawa.

Leaf blades 20–40 cm; rachis internodes 2.5–5 mm; spikelets 4.5–6 mm.

Mountain slopes, roadsides, forest margins. Anhui, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea, Mongolia, Russia (Siberia)].

8b. *Spodiopogon sibiricus* var. *grandiflorus* L. Liu ex S. M. Phillips & S. L. Chen, var. nov.

大花大油芒 da hua da you mang

Type: China. Sichuan: Barkam Xian, 2600 m, 1 Sep 1957, *Li Xin* 71733 (holotype, PE).

Haec varietas a S. sibirico var. *sibirico* *spiculis majoribus* 7–8 mm *longis differt*.

Leaf blades 10–19 cm; rachis internodes 5–7 mm; spikelets 6.5–8 mm.

- 2400–2600 m. Sichuan.

This is a local variant with larger spikelets than usual. The type specimen was labeled at varietal rank by L. Liu, but the taxon was described at specific rank, as “*Spodiopogon grandiflorus* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 57. 1997), which name was not validly published because no Latin description was provided.

9. *Spodiopogon tainanensis* Hayata, Bot. Mag. (Tokyo) 21: 53. 1907.

台南大油芒 tai nan da you mang

Spodiopogon gracilis Honda; *S. hayatae* Honda; *S. hogoensis* Hayata; *S. ramosus* Keng; *S. tainanensis* var. *hogoensis* (Hayata) Ohwi; *S. tainanensis* var. *takeoi* (Hayata) Honda; *S. takeoi* Hayata.

Perennial, rhizomatous. Culms erect or ascending, slender, 40–70 cm tall, 1–2 mm in diam., branched. Leaf sheaths glabrous or tuberculate-pilose upward and along margins; leaf blades linear-lanceolate, 6–14 × 0.3–0.8 cm, thinly pilose to glabrescent, narrowed to base, apex acuminate; ligule 1–2 mm. Panicle lax, narrowly lanceolate to ovate in outline, 5–12 cm; branches 2–4 cm, simple or once branched; racemes 1–3-noded with 3–9 spikelets, disarticulating at maturity, one spikelet of a pair sessile, the other pedicellate; rachis internodes 3–4 mm; pedicels 2.5–3 mm, ciliate, hairs up to 3 mm. Spikelets 4.5–6 mm; callus hairs 1–1.5 mm; lower glume lanceolate, softly pilose to silky villous, apex subacute or mucronate; upper glume acute, mucronulate; lower floret staminate, palea well developed; upper lemma 2-lobed to lower 1/4–1/3; awn 7–10 mm. Anthers 2.5–3.2 mm. Fl. and fr. Jun–Oct. $2n = 20^*$.

- Grassy mountain slopes; 2300–3400 m. S Gansu, Jiangsu, Sichuan, Taiwan, Xizang, Yunnan.

Species exclusae

The following two species names were not validly published because no Latin description was provided and no type was indicated. They do not appear to correspond with any known species of *Spodiopogon*. It has not been possible to validate the names here, as the specimens on which they were based have not been located.

“*Spodiopogon ludingensis*” L. Liu, Fl. Reipubl. Popularis Sin. 10(2): 55. 1997, nom. inval.

泸定大油芒 lu ding da you mang

Perennial. Culms erect, ca. 80 cm tall, 3–4 mm in diam., 3–5-noded. Leaf blades lanceolate, 10–20 × 0.5–1.2 cm; puberulous. Panicle purplish black, ca. 10 cm; branches 1–3 cm; racemes 2–3-noded, one spikelet of a pair sessile, the other pedicellate. Spikelets ca. 4 mm; callus glabrous; lower glume 9–11-veined, veins scabrid, puberulous between veins, apex obtuse or truncate; upper lemma 2-lobed to middle; awn 6–7 mm. Anthers ca. 1.5 mm. Fl. and fr. Aug–Oct.

- Dry mountain slopes; 1500–1600 m. W Sichuan.

“*Spodiopogon paucistachyus*” L. Liu, Fl. Reipubl. Popularis Sin. 10(2): 57. 1997, nom. inval.

寡穗大油芒 gua sui da you mang

Perennial. Culms erect, stiff, ca. 50 cm tall, 2–4 mm in diam., many-noded, farinose below node. Leaf sheaths purplish, longer than internodes; leaf blades lanceolate, 5–10 × 0.4–0.8 cm, puberulous, base contracted into false petiole, lower margin softly tuberculate-hairy, apex acute. Panicle lax, ca. 5 cm; branches 1–2 per node; racemes with 1 or 2 spikelet pairs; rachis internodes glabrous; pedicels pilose. Spikelets 6–6.5 mm; callus hairs ca. 2 mm; lower glume 9-veined, lower back softly pilose with ca. 3 mm hairs; upper lemma 2-lobed to middle; awn ca. 12 mm. Anthers ca. 2.5 mm. Fl. and fr. summer–autumn.

- Mountain slopes; 2600–2700 m. W Sichuan.

187. SACCHARUM Linnaeus, Sp. Pl. 1: 54. 1753.

甘蔗属 gan zhe shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Erianthus Michaux; *Narenga* Bor; *Ripidium* Trinius (1820), not Bernhardi (1801).

Perennials, rhizomatous or tufted. Culms robust, up to 7 m tall. Leaf blades cauline, narrowly to broadly linear, midrib usually broad, white; ligule membranous, margin ciliate. Inflorescence terminal, a large plumose panicle with elongate central axis, its branches bearing numerous hairy racemes; racemes fragile, sessile and pedicelled spikelet of a pair similar, both fertile; rachis internodes and pedicels filiform with cupular apex, pedicels resembling internodes but often shorter. Spikelets usually small, lanceolate, dorsally compressed or pedicelled spikelet more rounded on back; callus short, obtuse, bearded, often with long silky hairs surrounding the spikelet; lower glume membranous, thinly cartilaginous, or becoming leathery below, flat to broadly convex, veins indistinct, laterally 2-keeled; upper glume boat-shaped, resembling lower glume in texture and color; lower floret reduced to an empty hyaline lemma; upper floret bisexual, lemma entire, rarely 2-toothed, sometimes very narrow or small, with or without a short straight awn; stamens 2–3. $x = 10$.

Between 35 and 40 species: throughout the tropics and subtropics, but mainly in Asia; 12 species (two endemic, two introduced) in China.

Species with awns are sometimes separated as the genus *Erianthus*, but this is an artificial distinction. *Saccharum* includes the important crop plant *S. officinarum* (sugarcane).

The fluffy callus hairs are an efficient aid to wind dispersal.

1a. Spikelets awned, awn clearly exerted from glumes.

2a. Awn 4–8 mm.

3a. Panicle much branched; racemes with 3–4 joints; culms 2–3 m tall, glabrous below panicle 1. *S. ravennae*

3b. Panicle simple; racemes with numerous joints; culms 0.7–1.5 m tall, hirsute below panicle 2. *S. formosanum*

2b. Awn 10–28 mm.

4a. Spikelets 4–6 mm; awn 13–28 mm 3. *S. longesetosum*

4b. Spikelets 2–3.5 mm; awn 10–15 mm 4. *S. rufipilum*

1b. Spikelets awnless or a short awn concealed within glumes (if exerted, awn up to 6 mm and panicle brown).

5a. Lower glume glabrous on back; callus hairs much longer than spikelet.

6a. Plant rhizomatous; leaf blades 0.2–0.8 cm wide, narrowed to midrib at base; wild plant 5. *S. spontaneum*

6b. Plant clump-forming; leaf blades 1–6 cm wide, laminate to base; cultivated plant.

7a. Culm apex and axis of panicle glabrous; rachis internodes glabrous; spikelets 3.5–4 mm 6. *S. officinarum*

7b. Culm apex and axis of panicle pilose; rachis internodes pilose; spikelets ca. 4.5 mm.

8a. Culms 3–4 m tall, 3–4 cm in diam.; leaf blades ca. $100 \times 3-5$ cm 7. *S. sinense*

8b. Culms ca. 2 m tall, 1–2 cm in diam.; leaf blades ca. $50 \times 1-2$ cm 8. *S. barberi*

5b. Lower glume hairy on back (if subglabrous, panicle purplish); callus hairs equal to or shorter than spikelet.

9a. Lower glume with white hairs, hairs 2–3 times longer than spikelet.

10a. Culms 1.5–4(–6) m tall; rachis internodes 3–5 mm; upper lemma mucronate or with awn to 3 mm 9. *S. arundinaceum*

10b. Culms up to 7 m tall, rachis internodes 6–7 mm; upper lemma awnless 10. *S. procerum*

9b. Lower glume subglabrous or with brown hairs, hairs shorter than spikelet.

11a. Inflorescence coppery or purplish brown; nodes white bearded; callus hairs white or purplish; lower glume subglabrous 11. *S. narenga*

11b. Inflorescence golden brown; nodes brown bearded; callus hairs golden brown; lower glume hirsute 12. *S. fallax*

1. *Saccharum ravennae* (Linnaeus) Linnaeus in Murray, Syst. Veg., ed. 13, 88. 1774.

沙生蔗茅 sha sheng zhe mao

Andropogon ravennae Linnaeus, Sp. Pl., ed. 2, 2: 1481. 1763; *Erianthus ravennae* (Linnaeus) P. Beauvois.

Perennial, forming large clumps. Culms (1.5–)2–3(–4) m tall, ca. 1 cm in diam., lower nodes yellowish villous, glabrous below panicle. Lower leaf sheaths hirsute with tubercle-based hairs, upper sheaths smooth; leaf blades $50-120 \times 0.5-1.8$ cm, woolly above ligule with long yellowish hairs, otherwise glabrous, margins scabrid, tapering to midrib at base, apex filiform; ligule a narrow rim, back villous with ca. 2 mm hairs. Panicle dense, lobed, $30-50 \times 10-15$ cm, grayish sometimes tinged pink, axis glabrous, branches much branched; racemes short, crowded, with 3–4 joints; rachis internodes 2–3 mm,

silky villous. Spikelets 3–6 mm, purplish; callus hairs as long as spikelet; lower glume lanceolate, membranous, back glabrous or pilose with spreading hairs, keels scabrid, apex attenuate, minutely notched; lower lemma $3/4$ as long to subequaling glumes; upper lemma elliptic, apex acute, awned; awn almost straight, 4–8 mm. Anthers 3, 2.1–2.2 mm. Fl. and fr. autumn. $2n = 20, 60$.

Sandy places; 1200–3000 m. Xinjiang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, S Europe; introduced in America].

This is a polymorphic species showing much variability in the disposition of hairs on the glumes. Sometimes the spikelets are slightly dimorphic, with the sessile spikelet almost glabrous and the pedicelled one strongly pilose. This species has a more profusely branched panicle with shorter racemes than others in China.

The stout clumps are useful in erosion control. This grass is also used for forage when young.

2. *Saccharum formosanum* (Stapf) Ohwi, Acta Phytotax. Geobot. 11: 152. 1942.

台蔗茅 tai zhe mao

Erianthus formosanus Stapf, Bull. Misc. Inform. Kew 1898: 228. 1898; *E. pollinioides* Rendle; *Saccharum formosanum* var. *pollinioides* (Rendle) Ohwi.

Perennial, rhizomatous. Culms 0.7–1.9 m tall, 2–5 mm in diam., nodes glabrous, hirsute below panicle. Leaf sheaths longer or upper shorter than internodes; leaf blades flat or involute, 30–100 × 0.3–0.6 cm, pilose at base, otherwise glabrous, margins scabrid, base straight, apex long acuminate; ligule ca. 0.5 mm, margin ciliate. Panicle obovate in outline, 15–24 cm, grayish white or pinkish, unbranched, axis 8–12 cm, shorter than racemes or subequaling lowest racemes, silky pilose; racemes 15–30, 11–12 cm, ascending or spreading; rachis internodes ca. 2.5 mm, silky villous, hairs 2–3 times spikelet length. Spikelets 3–3.6 mm; callus hairs short, ca. 0.5 mm; lower glume lanceolate, papery, brown, membranous and pallid near apex, back pilose with white or purplish hairs 2–3 times spikelet length, keels scabrid above, apex attenuate, minutely notched; lower lemma equaling glumes; upper lemma lanceolate, upper margins ciliate, apex subentire, awned; awn slender, 6–8 mm. Anthers 2, 1.5–2 mm. Fl. and fr. Aug–Nov.

• Open grassy hillsides. Fujian, Guangdong, Guizhou, Hainan, Jiangxi, Taiwan, Yunnan, Zhejiang.

Saccharum formosanum is closely related to *Eulalia fastigiata* (Nees ex Steudel) Stapf ex Bor (*S. fastigiatum* Nees ex Steudel; *Erianthus fastigiatus* (Nees ex Steudel) Andersson) from Bhutan, NE India, and Nepal. The latter species differs in its slightly larger (3.5–4.7 mm) spikelets, shorter spikelet and internode hairs not much exceeding the spikelet, and possession of 3 anthers. The two species are undoubtedly congeneric, but lie on the boundary between *Saccharum* and *Eulalia*, and have been placed in different genera in recent Floras. The inflorescence axis is shorter than is usual in *Saccharum*, but longer than in *Eulalia*, in which genus the racemes are usually digitate. On balance, the two species seem best placed in *Saccharum*.

3. *Saccharum longesetosum* (Andersson) V. Narayanaswami in Bor, Fl. Assam 5: 461. 1940 [*“longisetosum”*].

长齿蔗茅 chang chi zhe mao

Erianthus longesetosus Andersson, Öfvers. Kongl. Vetensk.-Akad. Förh. 12: 163. 1855; *Eccoilopus hookeri* (Hackel) Grassl; *E. longesetosus* (Andersson) Grassl; *Erianthus hookeri* Hackel; *E. rockii* Keng; *Saccharum hookeri* (Hackel) V. Narayanaswami; *S. longesetosum* var. *hookeri* (Hackel) U. Shukla.

Perennial. Culms 1–3 m tall, 0.5–1 cm in diam., many-noded, glabrous or hairy below panicle. Leaf sheaths longer than internodes, mouth bearded; leaf blades linear-elliptic, 30–50 × 1.5–2(–4) cm, glabrous, abaxial surface glaucous, tapering to base and apex, apex acuminate; ligule 2.3–2.5 mm. Panicle elliptic or oblong in outline, nodding, 15–40 cm, golden brown, branched, axis glabrous or pilose; racemes 3–10 cm; rachis internodes 2.5–4 mm, ciliate with long silky hairs. Spikelets 4–6 mm; callus hairs slightly shorter to longer than spikelet, white or pale yellow; lower glume lanceolate to elliptic-oblong, car-

tilaginous, golden brown, glossy, thinner and paler near apex, back glabrous or sparsely to densely pilose below middle, upper margins ciliate, apex bidenticulate; lower lemma slightly shorter than glumes; upper lemma linear-oblong, margins ciliate, shortly 2-toothed, awned; awn 1.3–2.8 cm. Anthers 3, 2–3 mm. Fl. and fr. Aug–Oct. $2n = 30$.

Grassy hillsides; 300–2700 m. Guangxi, Guizhou, Sichuan, Xizang, Yunnan [Bhutan, N India, Myanmar, Thailand].

This species is variable in spikelet length and hairiness of the panicle. The callus hairs vary from slightly shorter to considerably longer than the spikelet, and the lower glume may be glabrous, thinly hairy, or densely hairy. Sometimes the pedicelled spikelet is hairier than the sessile spikelet. Particularly hairy specimens may be separated as var. *hookeri*, but there are many intermediate forms. The species as a whole is recognizable by its broad leaf blades glaucous below and evenly tapering to each end, together with a nodding, golden brown panicle of long-awned spikelets.

Neither combination “*Erianthus longisetosus* [sic] var. *hookeri* Bor” (Grasses Burma, Ceylon, India, Pakistan, 151. 1960) nor “*Saccharum longisetosum* [sic] var. *hookeri* Bor” (loc. cit. 212) was validly published because Bor proposed them simultaneously for the same taxon and based on the same type (alternative names; Saint Louis Code, Art. 34.2).

4. *Saccharum rufipilum* Steudel, Syn. Pl. Glumac. 1: 409. 1854.

蔗茅 zhe mao

Erianthus fulvus Nees ex Hackel (1889), not (Bory) Kunth (1829); *E. lancangensis* Y. Y. Qian; *E. pallens* Hackel; *E. rufipilus* (Steudel) Grisebach; *Miscanthus rufipilus* (Steudel) Grassl.

Perennial, tussocky. Culms up to 3.5 m tall, 0.3–0.7 mm in diam., nodes bearded, silky villous below panicle. Leaf sheaths longer than internodes, smooth, margin and mouth hairy; leaf blades flat or involute, tough, 20–60 × 0.5–1.5 cm, glabrous, abaxial surface farinose, narrowed to base, apex acuminate; ligule 1–3 mm, ciliate. Panicle narrowly oblong in outline, very dense, 18–45 cm, cream or pinkish with long hairs obscuring the spikelets, unbranched or shortly branched at base, axis villous; racemes 2–4(–9) cm; rachis internodes 1.5–2.5 mm, villous. Spikelets 2.5–3.5 mm; callus hairs ca. 3 times spikelet length; lower glume lanceolate, thinly cartilaginous, dark brown at maturity, back subglabrous, margins shortly ciliate or occasionally with longer hairs, apex palely membranous, sharply acuminate; lower lemma slightly longer than glumes, apex attenuate, sometimes awnlike; upper lemma linear-lanceolate, entire, awned; awn 1–1.5 cm. Anthers (1–)3, 1–1.5 mm. Fl. and fr. Jun–Oct. $2n = 20$.

Dry grassy and rocky hillsides; 1300–2600 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, N India, Myanmar, Nepal, Pakistan].

This species can be recognized by its elongate, narrow panicle of small, pointed, long-awned spikelets sunk among copious long hairs. Some specimens from Yunnan appear to have only one anther.

5. *Saccharum spontaneum* Linnaeus, Mant. Pl. 2: 183. 1771.

甜根子草 tian gen zi cao

Imperata spontanea (Linnaeus) P. Beauvois; *Saccharum spontaneum* var. *roxburghii* Honda.

Perennial, with long rhizomes. Culms 1–4 m tall, 0.4–1 cm in diam., 5–10-noded, often hollow in center, nodes bearded, softly pilose below inflorescence. Leaf sheaths pilose at mouth and margin, sometimes tuberculate-pilose throughout; leaf blades 60–180 × 0.2–0.8 cm, glaucous, glabrous, margins serrate, tapering to midrib at base, apex long attenuate; ligule brown, 2–8 mm. Panicle 20–40 cm, axis silky pilose; racemes 4–17 cm; rachis internodes 1.5–5 mm, pilose with long silky hairs. Spikelets 3–4 mm; callus hairs 3–4 times length of spikelet; lower glume papery and dark brown below middle at maturity, membranous and pallid above, back glabrous, margins ciliate above, apex acuminate; lower lemma ovate-lanceolate, equal to glumes; upper lemma linear or linear-oblong, awnless. Lodicules ciliate. Anthers 3, 1.5–2 mm. Fl. and fr. Jul–Sep. $2n = 40–128$.

Mountain slopes, gravelly river beds, low grassy places, forming colonies; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, Cambodia, India, Indonesia, Japan, Malaysia, Myanmar, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Turkmenistan, Vietnam; Africa, SW Asia, Australia, Pacific Islands].

There are numerous local strains comprising a complex series of chromosome numbers. This species hybridizes readily with cultivated sugarcane (*Saccharum officinarum*) and is used in sugarcane breeding programs. The name *S. spontaneum* var. *juncifolium* Hackel (*S. juncifolium* (Hackel) Janaki-Ammal) has been applied to extreme forms with the leaf blades narrowed to the midrib along their whole length.

This species is a good forage grass and an efficient soil binder.

6. *Saccharum officinarum* Linnaeus, Sp. Pl. 1: 54. 1753.

甘蔗 gan zhe

Perennial, forming tall clumps. Culms 3–6 m tall, 2–5 cm in diam., 20–40-noded, solid, nodes glabrous, glabrous below inflorescence. Leaf sheaths glabrous, pilose at mouth; leaf blades 70–150 × 4–6 cm, usually glabrous, midrib large, white, margins sharply serrate, base rounded, apex acuminate; ligule 2–3 mm, ciliate. Panicle 50–100 cm, axis glabrous but pilose at nodes; racemes 10–25 cm; rachis internodes 3–6 mm, glabrous. Spikelets 3.5–4 mm; callus hairs 2–3 times length of spikelet; lower glume oblong, uniformly firm throughout, buff-colored, back glabrous, margins membranous and ciliate above, apex acuminate; lower lemma oblong-lanceolate, subequal to glumes; upper lemma linear, awnless. Lodicules glabrous. Anthers 3. Fl. and fr. autumn. $2n = 80$.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Sichuan, Taiwan, Xizang, Yunnan [SE Asia, Pacific Islands; widely cultivated elsewhere].

This is the commercial crop sugarcane, now widely cultivated in tropical regions of the world. Most present-day cultivars contain genes from *Saccharum spontaneum*. Sugar is extracted from the soft, central tissue of the culm. The dyed inflorescence is used as an ornament.

7. *Saccharum sinense* Roxburgh, Pl. Coromandel 3: t. 232. 1818.

竹蔗 zhu zhe

Saccharum officinarum Linnaeus subsp. *sinense* (Rox-

burgh) Burkill; *S. spontaneum* Linnaeus var. *sinense* (Roxburgh) Andersson.

Perennial. Culms 3–4 m tall, 3–4 cm in diam., many-noded, solid, softly pilose below inflorescence. Leaf blades ca. 100 × 3–5 cm, glaucous, glabrous, midrib large, white, margins serrate; ligule ca. 2 mm. Panicle 30–60 cm, axis with white silky hairs; rachis internodes pilose. Spikelets ca. 4.5 mm; callus hairs 2–3 times length of spikelet; lower glume lanceolate, dark brown; lower lemma oblong-lanceolate; upper lemma linear, 1.2–3 mm or reduced, awnless. Lodicules glabrous. Anthers 3, 1.5–2 mm. Fl. and fr. Nov–Mar. $2n = 106–120^*$.

• Cultivated. S. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [of cultivated origin; cultivated elsewhere].

Canes of this form of cultivated sugarcane were sent from Guangzhou to Calcutta in 1796, establishing its cultivation in India. Like *Saccharum barberi*, this is a primitive form of sugarcane of hybrid origin with introgression from wild species. A number of different clones exists, and these are usually included in *S. officinarum* as the Pansahi group, of which the best known is the Uba cane. The clone Tekcha, which was cultivated in Taiwan for many years, also belongs here. *Saccharum sinense* clones have been used in breeding programmes, and many modern cultivars have this species in their ancestry.

The leaf blades and uppermost part of the culms are used for forage. The whole culm except the apex is used for sugar and medicine.

8. *Saccharum barberi* Jeswiet, Arch. Suikerindustr. Ned.-Indie 12: 396. 1925.

细秆甘蔗 xi gan gan zhe

Saccharum officinarum Linnaeus subsp. *barberi* (Jeswiet) Burkill.

Perennial with short stout rhizomes. Culms solid, up to 2 m tall, 1–2 cm in diam., solid, nodes bearded, softly pilose below inflorescence. Leaf sheaths longer than internodes; leaf blades ca. 50 × 1–2 cm, margins serrate; ligule well developed. Panicle very large, axis with white silky hairs. Spikelets oblong; callus hairs longer than spikelet; lower glume oblong, glabrous, margin infolded; lower lemma slightly shorter than glumes; upper lemma narrowly linear, awnless. Fl. and fr. summer and autumn. $2n = 82–124$.

Cultivated. Guangxi, Taiwan, Yunnan [originating in Bangladesh and India].

This name covers a group of slender, relatively hardy, cultivated sugarcane clones originating in subtropical N India. These are ancient types not far removed from wild *Saccharum spontaneum* and now usually included in *S. officinarum* under cultivar names. They have mostly been superseded by modern, commercial varieties.

9. *Saccharum arundinaceum* Retzius, Observ. Bot. 4: 14. 1786.

斑茅 ban mao

Perennial, forming large clumps. Culms robust, (0.7–)1–6 m tall, 1–2 cm in diam., glabrous. Leaf sheaths glabrous or pubescent, ciliate at mouth and margins; leaf blades (60–)100–200 × 1–2 cm, abaxial surface glabrous, adaxial surface velvety

with long soft hairs on broad lower midvein, margins serrate, base narrow, apex long attenuate; ligule 1–2 mm. Panicle (25–) 30–80 cm, much branched, axis glabrous; racemes 3–5.5 cm; rachis internodes 3–5 mm, pilose with long silky hairs. Spikelets 3–4 mm, straw-colored tinged purple upward; callus hairs ca. 1 mm, shorter than spikelet; lower glume thinly cartilaginous, back pilose with silky hairs twice length of spikelet, keels scabrid, apex acuminate; upper glume usually glabrous in sessile spikelet, rarely thinly pilose, clearly pilose in pedicelled spikelet; lower lemma subequal to glumes; upper lemma lanceolate, apex mucronate or with awn to 3 mm. Lodicules glabrous. Anthers 1.8–2 mm. Fl. and fr. Aug–Dec. $2n = 30, 40, 50, 60$.

Hill slopes, riversides, dry stream beds, often on sandy soils. S Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

It is necessary to look carefully, preferably using a disarticulated spikelet, in order to distinguish the basal, short callus hairs from the long, silky hairs of the rachis internodes, pedicels, and glumes.

This species is used for forage in China.

Saccharum arundinaceum is similar to *S. bengalense* Retzius, from N India and Pakistan. The latter species is distinguished mainly by its rather narrow panicle and much narrower leaf blades, which are channeled and consist mostly of midrib.

- 1a. Culms up to 6 m; upper glume of sessile spikelet glabrous 9b. var. *arundinaceum*
- 1b. Culms up to 1.5 m; upper glume of sessile spikelet thinly pilose 9b. var. *trichophyllum*

9a. *Saccharum arundinaceum* var. *arundinaceum*

斑茅(原变种) ban mao (yuan bian zhong)

Erianthus arundinaceus (Retzius) Jeswiet; *Ripidium arundinaceum* (Retzius) Grassl; *Saccharum barbicostatum* Ohwi.

Culms up to 6 m tall. Inflorescence usually large, 30–80 × 6–17 cm. Upper glume of sessile spikelet glabrous.

Hill slopes, or along riversides, dry stream beds, often on sandy soils. S Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

9b. *Saccharum arundinaceum* var. *trichophyllum* (Handel-Mazzetti) S. M. Phillips & S. L. Chen, Novon 15: 469. 2005.

毛颖斑茅 mao ying ban mao

Erianthus griffithii J. D. Hooker var. *trichophyllum* Handel-Mazzetti, Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 58: 154. 1921; *Erianthus trichophyllum* (Handel-Mazzetti) Handel-Mazzetti.

Culms up to 1.5 m tall. Inflorescence narrow, 25–50 × 4.5–6 cm. Upper glume of sessile spikelet thinly pilose with long silky hairs.

Open grassy places; 600–1900 m. Yunnan [India (Sikkim)].

This is a small variant, apparently of local distribution, distinguished mainly by the hairy upper glume of the sessile spikelet.

10. *Saccharum procerum* Roxburgh, Fl. Ind. 1: 248. 1820.

狭叶斑茅 xia ye ban mao

Erianthus procerus (Roxburgh) Raizada; *Ripidium procerum* (Roxburgh) Grassl.

Perennial, forming large clumps. Culms very robust, up to 7 m tall, glabrous. Leaf sheaths glabrous except at mouth and margins; leaf blades 60–150 × 2–5 cm, abaxial surface glabrous, adaxial surface velvety with long soft hairs on broad lower midvein, midrib white, thick, margins coarsely serrate, base narrow, apex long attenuate; ligule less than 1 mm. Panicle 30–80 cm, much branched, axis glabrous; racemes 4–5 cm; rachis internodes 6–7 mm, pilose with long silky hairs. Spikelets 3–4.3 mm, straw-colored or tinged purplish; callus hairs 1–2.5 mm, shorter than spikelet; lower glume thinly cartilaginous, back pilose with long silky hairs 2–3 times spikelet length, keels smooth, apex cuspidate; upper glume glabrous in sessile spikelet, pilose in pedicelled spikelet; lower lemma subequal to glumes; upper lemma lanceolate-oblong, apex apiculate, awnless. Lodicules glabrous. Anthers 3, ca. 1.6 mm.

Streams, valley bottoms; below 1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Xizang, Yunnan [Bangladesh, NE India, Myanmar, Nepal, Thailand].

This very large and ornamental species is used for forage and fiber. It intergrades with *Saccharum arundinaceum*, but tends to have more widely spaced spikelet pairs and lacks a definite awnlet on the upper lemma.

11. *Saccharum narenga* (Nees ex Steudel) Wallich ex Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 119. 1889.

河八王 he ba wang

Eriochrysis narenga Nees ex Steudel, Syn. Pl. Glumac. 1: 411. 1854; *E. porphyrocoma* Hance; *Narenga porphyrocoma* (Hance) Bor; *Saccharum porphyrocomum* (Hance) Hackel; *Sclerostachya narenga* (Nees ex Steudel) Grassl.

Perennial from a short stout rhizome. Culms 1–3(–5) m tall, 5–8 mm in diam., nodes bearded, hirsute below panicle. Leaf sheaths hispid with tubercle-based hairs; leaf blades 1–1.5 m × 0.6–2 cm, adaxial surface thinly hispidulous, abaxial surface glabrous, margins scabrid, tapering to midrib at base, apex attenuate; ligule 3–4 mm, rounded. Panicle narrowly elliptic-oblong in outline, 20–50 cm, copper brown or purplish brown, axis white-pilose; racemes arising almost from main axis, stiffly ascending, densely spiculate, lowest 6–10 cm; rachis internodes 1.7–2.5 mm, ciliate. Spikelets 2.5–3 mm, brown, glossy; callus hairs about equaling spikelet, white or purplish; lower glume narrowly lanceolate-oblong, leathery, back glabrous or thinly pilose below middle, keels scabrid and margins ciliate near apex, apex narrowly truncate; lower lemma equal to glumes; upper lemma narrow, truncate, awnless. Anthers 3, 1.2–1.5 mm. Fl. and fr. Aug–Nov. $2n = 30$.

Open mountain slopes, dry grassy places. Anhui, Fujian, Guangdong, Guizhou, Henan, Jiangsu, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, India, Myanmar, Nepal, Pakistan, Thailand, Vietnam].

12. *Saccharum fallax* Balansa, J. Bot. (Morot) 4: 80. 1890.

金猫尾 jin mao wei

Erianthus chrysothrix Hackel; *E. fallax* (Balansa) Ohwi; *Narenga fallax* (Balansa) Bor; *N. fallax* var. *aristata* (Balansa) L. Liu; *Saccharum fallax* var. *aristatum* Balansa; *Sclerostachya fallax* (Balansa) Grassl.

Perennial. Culms 1.5–3 m tall, 8–12 mm in diam., nodes bearded with golden-brown hairs, hirsute below panicle. Leaf sheaths usually longer than internodes, margin brown-hirsute; leaf blades stiff, 40–80 × 1–1.5 cm, uppermost usually very small, glabrous or tuberculate-pilose, margins scabrid, base narrowed, apex acuminate; ligule ca. 1.5 mm. Panicle loosely oblong in outline, 30–60 cm, golden or ferruginous brown, axis pilose, bearded at nodes, primary branches sparsely branched in lower part; racemes flexuously ascending, densely spiculate, 8–

16 cm; rachis internodes 2–2.4 mm, ciliate. Spikelets 3–4 mm, brown; callus hairs a little shorter than spikelet, brown; lower glume oblong-lanceolate, papery becoming herbaceous toward apex, back brown-hirsute, apex narrowly truncate; lower lemma 3/4 length of glumes; upper lemma oblong, obtuse and awnless or minutely mucronate, varying to shortly 2-toothed and awned from sinus; awn twisted, bent, up to 6 mm. Anthers 3, 1.6–2.2 mm. Fl. and fr. Aug–Oct.

Hill slopes; 400–1000 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [NE India, Indonesia, Laos, Myanmar, Vietnam].

This is a very handsome grass with a striking golden or rusty brown, softly hairy inflorescence. The racemes often contain a mixture of awned and awnless spikelets in varying proportions. Even adjacent spikelets may differ in this character, which is not related to whether the spikelet is sessile or pedicelled.

188. MISCANTHUS Andersson, Öfvers. Kongl. Vetensk.-Akad. Förh. 12: 165. 1855.

芒属 mang shu

Chen Shouliang (陈守良); Stephen A. Renvoize

Diandranthus L. Liu; *Imperata* subg. *Triarrhena* Maximowicz; *Rubimons* B. S. Sun; *Triarrhena* (Maximowicz) Nakai.

Perennial, tufted or rhizomatous. Culms slender to robust, erect, solid. Leaves basal or cauline; leaf blades large, linear, flat, broad or narrow; ligule membranous. Inflorescence a panicle, often large and plumose, of racemes arranged on a long or short axis; raceme axis tough, internodes slender, spikelets paired, both spikelets pedicelled, pedicels slender, flattened, slightly clavate. Spikelets similar, lanceolate, dorsally compressed; callus bearded with hairs shorter than, as long as, or longer than the spikelet; glumes papery or membranous; lower floret usually represented by a hyaline sterile lemma; upper floret bisexual, lemma hyaline, awned or awnless. Stamens 2–3. Caryopsis oblong or ellipsoid.

Fourteen species, mostly in SE Asia and the Pacific Islands, extending to tropical Africa; seven species (two endemic) in China.

This genus is readily recognized by its paniculate inflorescence of racemes, which have a tough rachis, and also by its paired spikelets, both of which are pedicelled.

1a. Stamens 2.

2a. Callus hairs longer than spikelet, golden brown in color 6. *M. nepalensis*

2b. Callus hairs shorter than spikelet, purple or white in color 7. *M. nudipes*

1b. Stamens 3.

3a. Panicle spike-like with short racemes appressed to the axis; spikelets straight-awned; lower glume distinctly 2-keeled 1. *M. paniculatus*

3b. Panicle large, usually open with spreading racemes; spikelets awnless or geniculately awned; lower glume weakly 2-keeled.

4a. Spikelets awnless.

5a. Culms 300–700 cm tall, branching at nodes; inflorescence 20–40 cm 2. *M. lutaripariensis*

5b. Culms 65–160 cm tall, unbranched; inflorescence 7–30 cm 3. *M. sacchariflorus*

4b. Spikelets awned.

6a. Axis more than 2/3 the length of the panicle 4. *M. floridulus*

6b. Axis up to 1/2 the length of the panicle 5. *M. sinensis*

1. *Miscanthus paniculatus* (B. S. Sun) Renvoize & S. L. Chen, Kew Bull. 60: 607. 2006.

红山茅 hong shan mao

Rubimons paniculatus B. S. Sun, Acta Bot. Yunnan. 19: 239. 1997.

Plant rhizomatous. Culms 30–100 cm tall, 3–4 mm in diam., 3–4-noded, nodes puberulous. Leaf sheaths slightly compressed, usually shorter than internodes, glabrous, ciliate at

apex; leaf blades linear, flat, 10–40 × 0.2–0.8 cm, glabrous or pilose, narrowed to midrib toward base, apex acuminate; ligule 0.5–1.5 mm, ciliate, obtuse. Panicle 5–15 cm; axis glabrous. Racemes short, 2–6 cm, appressed. Spikelets lanceolate, 5–6 mm, awned; callus hairs 0.5–2 mm; glumes unequal; lower glume ca. 5 mm, back scabrid, pilose, obscurely 2–3-veined between 2 keels, or veinless, keels hispidulous, upper margin pilose, apex 2-lobed or 2-toothed; upper glume ca. 6 mm, obscurely 3–5-veined or veinless, scabrid, margins pilose, apex acuminate; lower lemma linear-lanceolate, 4.5–6 mm, 3–5-

veined, puberulous; upper lemma ca. 5 mm, 1–3-veined, margins pilose, apex acuminate, awned; awn ca. 2 mm, straight. Anthers 3, ca. 3 mm. Caryopsis oblong.

• Dry mountain slopes; 2500–3100 m. W Guizhou, Sichuan, Yunnan.

This is a distinctive species easily recognized by its reduced inflorescence. The spikelets are typical of *Miscanthus*, and for this reason the recognition of the separate genus *Rubimons* is unjustified.

2. *Miscanthus lutarioriparius* L. Liu ex Renvoize & S. L. Chen, Kew Bull. 60: 605. 2006.

南荻 nan di

Plant robust, from a rhizomatous rootstock. Culms stout, canelike, 3–7 m tall, 10–20 mm in diam. in lower part, branching, branches ascending, branch buds invested with pubescent or pilose scales, internodes mostly hollow, becoming solid toward apex, nodes glabrous in lower part of culm, pubescent in upper part, lower nodes often bearing adventitious roots. Leaves cauline, glabrous; leaf blades linear, flat, 50–90 × 1.5–3 cm, midrib prominent, adaxial surface pilose at base behind ligule, margins scabrid, base rounded or tapering to a pseudopetiole, apex finely acuminate; ligule ca. 0.5 mm, margin pilose, auricles ca. 1 mm or absent. Panicle large, 20–40 × 10–15 cm; axis glabrous, 10–25 cm. Racemes 20–40, 10–30 cm, rachis puberulous at base, otherwise glabrous; lower pedicel 1.5–2 mm, upper pedicel 4.5–5.5 mm. Spikelets 4–6.5 mm, pilose, awnless; callus hairs ca. 10 mm, exceeding the spikelet; glumes subequal, membranous, apex attenuate; lower glume 3–5-veined, back pilose with ca. 10 mm hairs; upper glume 3-veined, back glabrous, margins pubescent; lower lemma lanceolate, hyaline, 3.5–4.5 mm, veinless, pilose; upper lemma similar to lower, 3–4 mm; upper palea hyaline, pilose, reduced to a small scale. Anthers 3, ca. 2 mm. Caryopsis lanceolate, ca. 2 mm.

• River banks, lakesides; below 100 m. Hubei, Hunan.

3. *Miscanthus sacchariflorus* (Maximowicz) Hackel in Engler & Prantl, Nat. Pflanzenfam. 2: 23. 1887.

荻 di

Imperata sacchariflora Maximowicz, Prim. Fl. Amur 331. 1859; *Triarrhena sacchariflora* (Maximowicz) Nakai.

Plant rhizomatous; rhizomes long, slender, covered by short, striate, glabrous or pubescent cataphylls. Culms slender, erect, 65–160 cm tall, solid, unbranched. Leaves cauline; leaf sheaths striate, glabrous; leaf blades linear, flat, 20–50 × 0.5–1.5 cm, glabrous, midrib prominent, base tapering, straight or rounded, margins scabrid, apex acuminate; ligule ca. 0.5 mm, fringed with 1–2 mm cilia. Panicle 7–30 cm; axis 5–15 cm, glabrous or pilose at base. Racemes 4–24, 5–20 cm; rachis internodes glabrous, nodes pilose or glabrous; lower pedicel 1–2.5 mm, upper pedicel 2–5 mm. Spikelets 4–6 mm, pilose, awnless; callus hairs 8–12 mm, exceeding the spikelet; glumes subequal, membranous, 4–6 mm, veins obscure, apex acuminate; lower glume densely pilose with long hairs on margins; upper glume shortly pilose at apex; lower lemma lanceolate, hyaline, ca. 3 mm, 0–1-veined, apex and margins puberulous; upper lemma

similar to lower; upper palea a small, veinless, puberulous scale. Anthers 3, 2–2.5 mm. Caryopsis oblong.

Mountain slopes, river banks. Gansu, Hebei, Henan, Shaanxi [Japan, Korea, Russia].

4. *Miscanthus floridulus* (Labillardière) Warburg ex K. Schumann & Lauterbach, Fl. Schutzgeb. Südsee 166. 1901.

五节芒 wu jie mang

Saccharum floridulum Labillardière, Sert. Austro-Caledon. 13: t. 18. 1824; *Eulalia japonica* Trinius; *Miscanthus japonicus* (Trinius) Andersson.

Plant tufted, robust. Culms erect, 1.5–4 m tall, 6–15 mm in diam., unbranched, nodes usually glabrous, or uppermost sometimes bearded. Leaves cauline, congested; leaf sheaths longer than internodes, overlapping, glabrous, pilose at throat; leaf blades linear, flat, tough, 20–85 × 0.5–4 cm, glabrous, midrib prominent, margins scabrid, base rounded, apex acuminate; ligule 1–3 mm, densely pilose on back. Panicle oblong or elliptic, dense, 20–50 cm; axis 25–45 cm. Racemes numerous, 10–30 cm, appressed or ascending, glabrous, scaberulous; rachis internodes puberulous, nodes glabrous; lower pedicel 1–3.5 mm, upper pedicel 2.5–8 mm. Spikelets 2.5–4(–6) mm, awned; callus hairs 4–6 mm, white, spreading, as long as the spikelet; glumes subequal, membranous, golden brown, 2.5–4(–6) mm, margins pilose near apex, veins obscure, apex acuminate; lower lemma lanceolate, hyaline, 3–3.5 mm, veinless, pilose; upper lemma similar to lower, 2–2.5 mm; awn geniculate, 5–6(–10) mm; upper palea a small hyaline scale. Anthers 3, 1–1.5 mm. Caryopsis oblong, ca. 1.5 mm.

Slopes, valleys, grassy places. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Jiangsu, Sichuan, Taiwan, Yunnan, Zhejiang [SE Asia].

The plants are cultivated for hedges and as ornamentals, the rhizomes are used for medicine, the culms are used for papermaking, and the young leaves are used for forage.

5. *Miscanthus sinensis* Andersson, Öfvers. Kongl. Vetensk.-Akad. Förh. 12: 166. 1855.

芒 mang

Miscanthus condensatus Hackel; *M. flavidus* Honda; *M. kanehirae* Honda; *M. purpurascens* Andersson; *M. sinensis* subsp. *purpurascens* (Andersson) Tzvelev; *M. sinensis* var. *condensatus* (Hackel) Makino; *M. sinensis* var. *purpurascens* (Andersson) Matsumura; *M. transmorrisonensis* Hayata.

Plant tufted or shortly rhizomatous. Culms (30–)80–200 (–400) cm tall, 3–10 mm in diam., solid, unbranched, nodes glabrous or puberulous. Leaves basal and cauline; leaf sheaths glabrous or pilose; leaf blades linear, flat, 18–75 × 0.3–2(–4) cm, glabrous, glaucous or pilose, midrib prominent, margins scabrid or smooth, base tapering or broad and rounded, apex acuminate; ligule 0.5–4 mm, ciliolate. Panicle (10–)20–36 cm; axis 6–16 cm, subglabrous to pilose or puberulous. Racemes (4–)10–40(–100), (8–)10–30 cm; rachis internodes glabrous, scaberulous or smooth, nodes glabrous; lower pedicel 0.5–1.5 mm, upper pedicel 1.5–4 mm. Spikelets 4–6.5 mm, pilose or glabrous, awned; callus hairs 5–8 mm, exceeding the spikelet;

glumes subequal, membranous, 4–6.5 mm, 5-veined, back glabrous or pilose, puberulous at apex and along upper margins, apex acuminate; lower lemma lanceolate, hyaline, 3.5–4 mm, veinless, apex and margins puberulous, otherwise glabrous; upper lemma similar to lower, 2.5–3.5 mm; awn geniculate, 4–12 mm; upper palea a 1–2 mm scale. Anthers 3, ca. 2.5 mm. Caryopsis ellipsoid, ca. 2 mm.

Mountain slopes, coasts, disturbed places; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Hubei, Jiangsu, Jiangxi, Jilin, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

This is a widespread species with a broad range of variation. Although the variants may be locally distinct, there are too many intermediates to allow a more detailed taxonomy to be followed. The main variants are as follows: *Miscanthus condensatus*: plants robust, 200–400 cm tall; leaf blades broad, 20–40 mm wide; panicle dense, of up to 100 racemes; Japan (including Ryukyu Islands), especially on coasts; *M. purpurascens*: glumes conspicuously pilose; throughout the range of *M. sinensis*; *M. transmorrisonensis*: panicles of 5–10 racemes; Taiwan.

The name "*Miscanthus jinxianensis* L. Liu" (Fl. Reipubl. Popularis Sin. 10(2): 7. 1997) was not validly published because no Latin description was provided. It probably refers to a slightly large form of *M. sinensis*. The specimen on which it is based has not been seen.

6. *Miscanthus nepalensis* (Trinius) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 104. 1889.

尼泊尔芒 ni bo er mang

Eulalia nepalensis Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 2: 333. 1833; *Diandranthus nepalensis* (Trinius) L. Liu.

Plant tufted. Culms erect, 20–200 cm tall, 2–7 mm in diam., glabrous or pilose immediately below inflorescence, nodes glabrous. Leaves basal and cauline; leaf sheaths glabrous, striate, pilose at throat; leaf blades linear, flat or folded, 15–60 × 0.3–2.5 cm, glabrous or pilose, margins scabrid, base tapering, straight or rounded, apex acuminate; ligule 1–3 mm, ciliate, dorsally pilose. Panicle oblong or equidimensional, 8–24 cm; axis 1.5–16 cm, glabrous. Racemes 7–80, flexuous, 8–18 cm; rachis glabrous; lower pedicel 1–2 mm, upper pedicel 2.5–5.5 mm. Spikelets 2–3 mm, golden brown, awned; callus hairs 5–11 mm, much longer than spikelet, pale to golden brown; glumes subequal or upper slightly longer, membranous, 1–5-

veined; lower glume glabrous or margins sparsely pilose with 4–6 mm hairs, apex emarginate; upper glume glabrous, margins and apex hyaline, apex acute; lower lemma ovate, hyaline, 1.5–2 mm, veinless; upper lemma lanceolate, hyaline, 1.5–2 mm; awn straight or flexuous, 5–17 mm; upper palea a ca. 1 mm scale. Anthers 2, 1–1.5 mm. Caryopsis ellipsoid, ca. 1.5 mm.

Mountain slopes; 1900–2800 m. Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal; introduced in Malaysia].

7. *Miscanthus nudipes* (Grisebach) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 109. 1889.

双药芒 shuang yao mang

Erianthus nudipes Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 92. 1868; *Diandranthus aristatus* L. Liu; *D. brevipilus* (Handel-Mazetti) L. Liu; *D. corymbosus* L. Liu; *D. eulalioides* (Keng) L. Liu; *D. nudipes* (Grisebach) L. Liu; *?D. ramosus* L. Liu; *D. szechuanensis* (Keng ex S. L. Zhong) L. Liu; *D. taylorii* (Bor) L. Liu; *D. tibeticus* L. Liu; *D. wardii* (Bor) L. Liu; *D. yunnanensis* (A. Camus) L. Liu; *Miscanthus brevipilus* Handel-Mazzetti; *M. eulalioides* Keng; *M. nudipes* subsp. *yunnanensis* A. Camus; *M. szechuanensis* Keng ex S. L. Zhong; *M. taylorii* Bor; *M. wardii* Bor; *M. yunnanensis* (A. Camus) Keng.

Plant tufted. Culms erect, 25–120 cm tall, unbranched, 3–5-noded, nodes glabrous. Leaves basal and cauline; leaf sheaths pilose, glabrescent; leaf blades linear, flat or folded, 10–40 cm × 0.15–0.8 cm, pilose, base straight or rounded, apex tapering to a fine point; ligule 1–1.5 mm, dorsally ciliate. Panicle 10–30 cm; axis 3–20 cm, glabrous or pilose. Racemes 4–20, 5–20 cm; rachis pilose; lower pedicel 0.5–1.5 mm, or lower spikelet subsessile, upper pedicel 1.5–4 mm; pubescent apex. Spikelets 4–6.5 mm, pilose, awned; callus hairs 1–5 mm, purple or white; glumes subequal, membranous, 5–7-veined, pilose, margins hyaline, apex acute to 2-toothed or truncate; lower lemma membranous or hyaline, 3.5–6 mm, 0–1-veined, apex acute or obtuse; upper lemma membranous or hyaline, 2.5–5 mm, 0–1-veined, 2-toothed, the teeth finely acuminate, or apex entire; awn geniculate or flexuous, 6–11 mm; upper palea 2–5 mm. Anthers 2, 2–3.5 mm. Caryopsis fusoid, ca. 2 mm.

Mountain slopes; 1000–3600 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India (Assam, Sikkim), Nepal].

189. IMPERATA Cirillo, Pl. Rar. Neapol. 2: 26. 1792.

白茅属 bai mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, strongly rhizomatous. Culms erect, unbranched. Leaf blades mainly basal, linear, flat or rolled; ligule membranous. Inflorescence a terminal, silky-white, spike-like panicle, branches bearing numerous very short racemes; racemes with tough rachis, spikelets of a pair both pedicelled with one pedicel longer than the other, deciduous at maturity within a plumose involucre of hairs; rachis internodes and pedicels persistent, densely silky hairy, tips expanded. Spikelets small, delicate, ± terete, enveloped in hairs; callus very small, pilose with long hairs usually exceeding the spikelet; glumes subequal, lanceolate, membranous or lower glume herbaceous, back long-pilose; lower floret reduced to an empty hyaline veinless lemma, shorter than spikelet; upper lemma similar to lower, apex obtuse, denticulate, ciliate, awnless; palea short, broad. Lodicules absent. Stamens 1 or 2. $x = 10$.

About ten species: throughout the tropics, extending to warm-temperate regions; three species (one endemic) in China.

Imperata conferta (Presl) Ohwi has been reported in the literature from Taiwan, but its presence has not been confirmed. It is native to Indonesia, the Philippines. Distinguishing characters are given in the key below.

- 1a. Callus hairs equal to or slightly shorter than spikelet; stigmas yellowish brown 3. *I. flavida*
 1b. Callus hairs 3 times longer than spikelet; stigmas purplish black.
 2a. Panicle narrowly conical, loose, branches spreading; stamen 1 *I. conferta* (see note above)
 2b. Panicle cylindrical, dense, branches appressed; stamens 2.
 3a. Culms up to 1.2 m tall; leaf blades 0.2–2 cm wide; panicle 6–20 cm 1. *I. cylindrica*
 3b. Culms up to 2.8 m tall; leaf blades 1.2–2.8 cm wide; panicle 40–50 cm 2. *I. latifolia*

1. *Imperata cylindrica* (Linnaeus) Raeuschel, Nomencl. Bot., ed. 3, 3: 10. 1797.

白茅 bai mao

Perennial, basal sheaths becoming fibrous; rhizomes widely spreading, tough, scaly. Culms solitary or tufted, 25–120 cm tall, 1.5–3 mm in diam., 1–4-noded, nodes glabrous or bearded. Leaf sheaths glabrous or pilose at margin and mouth; leaf blades flat or rolled, stiffly erect, 20–100 × 0.8–2 cm, culm blades 1–3 cm, adaxial surface puberulous, margins scabrid, base straight or narrowed, apex long acuminate; ligule 1–2 mm. Panicle cylindrical, copiously hairy, 6–20 cm, lowermost branches sometimes loose. Spikelets 2.5–6 mm; callus with 12–16 mm silky hairs; glumes 5–9-veined, back with long silky hairs ca. 3 times glume length, apex slightly obtuse or acuminate; lower lemma ovate-lanceolate, 2/3 length of glumes, ciliate, acute or denticulate; upper lemma ovate, 1/2 length of glumes, denticulate, ciliate, palea equal to lemma. Anthers 2, 2–4 mm. Stigmas purplish black. Fl. and fr. Apr–Aug. $2n = 20$.

River and seashore sands, disturbed grassy places, cultivations. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Russia, Sri Lanka, Thailand, Turkmenistan, Uzbekistan, Vietnam; Africa, SW Asia, Australia, S Europe].

This species is extremely polymorphic, but nevertheless easily recognizable by its dense, narrowly cylindrical, silky white inflorescence. The blackish stigmas are persistent and very obvious among the white hairs. The species has been classified into three varieties, which show some geographic separation. Two occur in China and a third is found in Africa. However, there is a great deal of intergradation and also variation within the varieties.

This widespread, noxious weed of disturbed ground and cultivation spreads vigorously by its rhizomes, which are almost impossible to eradicate, and may cover large areas of ground. It flourishes in grasslands that are frequently burned, and the young shoots provide good fodder. It is also used for medicine and fiber.

- 1a. Leaf blades rolled; spikelets 4.5–6 mm;
 anthers 3–4 mm 1a. var. *cylindrica*
 1b. Leaf blades flat; spikelets 2.5–4(–4.5)
 mm; anthers 2–3 mm 1b. var. *major*

1a. *Imperata cylindrica* var. *cylindrica*

白茅(原变种) bai mao (yuan bian zhong)

Lagurus cylindricus Linnaeus, Syst. Nat., ed. 2, 2: 878. 1759; *Imperata arundinacea* Cirillo; *I. arundinacea* var. *eu-*

ropaea Andersson; *I. cylindrica* var. *europaea* (Andersson) Ascherson & Graebner; *Saccharum cylindricum* (Linnaeus) Lamarck.

Culm nodes usually glabrous. Leaf blades rolled, apex hard, spiny. Panicle very dense. Spikelets 4.5–6 mm; anthers 3–4 mm.

River and seashore sands, dry grassy places on lower mountain slopes. Xizang [Afghanistan, Kazakhstan, Kyrgyzstan, Russia, Turkmenistan, Uzbekistan; N Africa, SW Asia, S Europe].

This variety has been reported in the literature from Xizang, but no specimens have been seen.

1b. *Imperata cylindrica* var. *major* (Nees) C. E. Hubbard in C. E. Hubbard & R. E. Vaughan, Grasses Mauritius Rodriguez, 96. 1940.

大白茅 da bai mao

Imperata koenigii var. *major* Nees, Fl. Afr. Austral. III. 90.1841; *Imperata arundinacea* var. *koenigii* (Retzius) Benth; *I. cylindrica* subsp. *koenigii* (Retzius) Tzvelev; *I. cylindrica* var. *koenigii* (Retzius) Pilger; *I. koenigii* (Retzius) P. Beauvois; *Saccharum koenigii* Retzius.

Culm nodes often bearded, sometimes sparsely or occasionally glabrous. Leaf blades flat. Panicle slightly loose below. Spikelets 2.5–4(–4.5) mm; anthers 2–3 mm.

Open grassy places, cultivations. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, India, Indonesia, Japan, Korea, Malaysia, Myanmar, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia (Iran), Australia].

2. *Imperata latifolia* (J. D. Hooker) L. Liu, Vasc. Pl. Hengduan Mts. 2: 2299. 1994.

宽叶白茅 kuan ye bai mao

Imperata arundinacea var. *latifolia* J. D. Hooker, Fl. Brit. India 7: 106. 1896 [“1897”]; *I. cylindrica* var. *latifolia* (J. D. Hooker) C. E. Hubbard.

Perennial, basal sheaths becoming fibrous; rhizomes widely spreading. Culms up to 2.8 m tall, 6–10 mm in diam., 3–8-noded, nodes glabrous. Leaf sheaths usually longer than internodes, crowded below, glabrous, bearded at mouth; leaf blades flat, up to 120 × 1.2–2.8 cm, adaxial surface with yellowish long soft hairs at base, otherwise glabrous, margins scabrid, base narrowed to midrib, apex long acuminate; ligule ca. 2 mm. Panicle cylindrical, copiously hairy with slight pinkish tinge, 40–50 cm. Spikelets 3–4.5 mm; callus with ca. 12 mm silky

hairs; lower glume 5–7-veined, back pilose below middle with long silky hairs ca. 3 times glume length, apex ciliate; upper glume 3-veined in lower part, scabrid, margin ciliate; lower lemma ca. 2.5 mm, margin ciliate; upper lemma resembling lower, palea broadly ovate, subequal to lemma. Anthers 2, 2–2.5 mm. Stigmas red. Fl. and fr. summer to autumn.

Swampy grasslands; ca. 800 m. SW Sichuan [N India].

3. *Imperata flavida* Keng ex S. M. Phillips & S. L. Chen, Novon 15: 469. 2005.

黄穗白茅 *huang sui bai mao*

Perennial, basal sheaths becoming fibrous; rhizomes spreading, internodes very short. Culms solitary or tufted, 70–125 cm tall, 3–7 mm in diam., 3- or more-noded, nodes glabrous. Leaf sheaths longer than internodes, crowded below, glabrous except for silky hairs at mouth; leaf blades flat, 20–

60 × 0.5–1 cm, culm blades 1–7 cm, glabrous or adaxial surface puberulous, margins smooth, base narrowed to midrib, apex long acuminate; ligule 0.5–1 mm. Panicle cylindrical, silky hairy, 12–17 cm, branches short, erect or ascending, discrete below. Spikelets 3–4 mm; callus hairs ca. 4 mm, equal to spikelet; glumes 4–5(–7)-veined, back pilose in lower 1/3 with silky hairs about as long as spikelet, upper margins ciliate, apex obtuse or erose; lower lemma broadly oblong, ca. 1/2 length of glumes, ciliate, irregularly denticulate; upper lemma oblong, 1/3 length of glumes, 2–3-denticulate, ciliate, palea similar to lemma. Anthers 2, 2.5–2.8 mm. Stigmas yellowish brown. Fl. and fr. summer to autumn.

• Mixed forests, along rivers, valleys. Hainan.

This species, which appears to be confined to Hainan, can be readily distinguished from the more common *Imperata cylindrica* by its much shorter spikelet hairs and yellow-brown (vs. purple-black) stigmas.

190. *EULALIA* Kunth, Révis. Gramin. 1: 160. 1829.

黄金茅属 *huang jin mao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial, rarely annual. Culms tufted, usually erect and unbranched. Leaf blades linear to narrowly lanceolate; ligule short, membranous, margin ciliate. Inflorescence terminal, composed of several to many racemes inserted digitately or along a short axis; racemes elongate with many spikelet pairs, hairy, fragile, sessile and pedicelled spikelets of a pair similar, pedicelled often slightly narrower, both fertile; rachis internodes linear, ciliate along angles; pedicels resembling internodes, usually slightly shorter and more slender. Spikelets lanceolate to narrowly oblong, dorsally compressed; callus short, bearded, hairs usually less than 1/2 spikelet length; glumes cartilaginous to leathery; lower glume flat or slightly concave, hairy, back veinless or inconspicuously veined, flanks rounded in lower half, keeled toward apex, acute to truncate; upper glume boat-shaped, 1-keeled down midline; lower floret reduced to an empty hyaline lemma, rarely absent; upper lemma linear to oblong, occasionally broader, shortly 2-toothed or 2-lobed to middle, awned (*E. manipurensis* awnless); awn geniculate, sometimes weakly; palea small or absent. Stamens 3. $x = 9, 10$.

About 30 species: tropical and subtropical regions of the Old World; 14 species (five endemic) in China.

1a. Basal leaf sheaths covered in dense woolly hairs.

2a. Basal leaf sheath hairs creamy or golden brown.

3a. Sessile spikelets 6–6.5 mm; raceme hairs pinkish 1. *E. siamensis*

3b. Sessile spikelets 4.6–5.7 mm; raceme hairs yellowish 2. *E. speciosa*

2b. Basal leaf sheath hairs dark brown or reddish brown.

4a. Culms robust, 2–5 mm in diam.; leaf blades 25–50 cm 2. *E. speciosa*

4b. Culms slender, 1–1.7 mm in diam.; leaf blades 15–30 cm.

5a. Culms 6–9-noded; spikelets 3–3.5 mm; lower glume pilose with whitish brown hairs, apex truncate

..... 3. *E. micranthera*

5b. Culms 2–3-noded; spikelets 3.5–5 mm; lower glume densely villous with golden brown hairs, apex subacute

..... 4. *E. phaeothrix*

1b. Basal leaf sheaths glabrous, or appressed hairy between veins.

6a. Sessile spikelet 5–7 mm; lower glume 2-veined between lateral keels, veins connected below apex.

7a. Leaf blades 8–16 mm wide, apex acute 1. *E. siamensis*

7b. Leaf blades 4–6(–8) mm wide, apex acuminate-filiform 5. *E. quadrinervis*

6b. Sessile spikelet 3–5 mm; lower glume usually not or only obscurely veined between lateral keels.

8a. Spikelets awnless 6. *E. manipurensis*

8b. Spikelets awned.

9a. Plant with slender spreading stolons; raceme hairs brown; lower lemma absent 7. *E. leschenaultiana*

9b. Plant tufted or rhizomatous; raceme hairs white or purplish (spikelets often brown); lower lemma present.

10a. Leaf blades conspicuously pruinose on abaxial surface, lanceolate or linear-lanceolate, 5–10 mm wide.

11a. Leaf blades 3–8 cm, glabrous; upper lemma 2-lobed to middle 8. *E. brevifolia*

11b. Leaf blades 10–20 cm, tomentose; upper lemma very shortly 2-toothed 9. *E. pruinosa*

- 10b. Leaf blades green or reddish, linear, 2–6 mm wide.
- 12a. Racemes with long silky hairs concealing the spikelets; plant with slender spreading rhizomes 10. *E. mollis*
- 12b. Racemes with shorter hairs, spikelets obvious; plant without long rhizomes.
- 13a. Leaf blades inrolled, tough; upper glume with 2–2.5 mm awn 11. *E. pallens*
- 13b. Leaf blades flat, herbaceous; upper glume not awned.
- 14a. Inflorescence with ca. 5 cm axis; upper lemma very shortly 2-toothed 12. *E. splendens*
- 14b. Inflorescence digitate or axis less than 5 cm; upper lemma deeply 2-toothed.
- 15a. Culm glabrous below inflorescence; raceme hairs silvery white; upper lemma 2-toothed to middle 13. *E. trispicata*
- 15b. Culm densely pilose below inflorescence; raceme hairs faintly mauve tinged; upper lemma 2-toothed in upper 1/4 14. *E. yunnanensis*

1. *Eulalia siamensis* Bor, Kew Bull. 1954: 499. 1954.

二色金茅 er se jin mao

Perennial; basal sheaths woolly with creamy brown or golden hairs, or appressed pilose. Culms tufted, robust, up to 2.5 m tall, 3–4 mm in diam., pilose below inflorescence, nodes glabrous or bearded. Leaf sheaths glabrous or pilose; leaf blades linear, tough, 60–100 × 0.5–1 cm, abaxial surface pinkish gray, subglabrous to villous or sericeous, adaxial surface green, villous throughout or just above ligule, margins scabrid, base narrowed, apex finely acuminate; ligule ca. 2 mm. Racemes 4–7, subdigitate, drooping, 15–21 cm, hairs silvery or pale mauve; rachis internodes and pedicels ca. 2/3 spikelet length, ciliate. Sessile spikelet 6–6.5 mm, brown; callus hairs 2/5 spikelet length; lower glume lanceolate-oblong, back flat, villous in lower 2/3, 2 anastomosing veins between keels below apex, margins long-ciliate in upper 1/3, narrowed to emarginate apex; upper lemma narrow, puberulous on back, shortly 2-toothed; awn 2.5–3.5 cm. Anthers 3.7–4.5 mm. Fl. and fr. autumn.

Dry grassy slopes, open woodlands; 500–1500 m. SW Yunnan [Myanmar, N Thailand].

This is a large, handsome species of apparently restricted distribution.

- 1a. Basal sheaths woolly with cream or golden hairs 1a. var. *siamensis*
- 1b. Basal sheaths appressed pilose with white hairs 1b. var. *latifolia*

1a. *Eulalia siamensis* var. *siamensis*

二色金茅(原变种) er se jin mao (yuan bian zhong)

Basal sheaths woolly with cream or golden hairs; leaf blades subglabrous to villous. Upper lemma 2-toothed in upper 1/5 or less.

Open woodlands. ?SW Yunnan [Myanmar, Thailand].

This variety is reported from SW Yunnan, but its presence in China has not been confirmed.

1b. *Eulalia siamensis* var. *latifolia* (Rendle) S. M. Phillips & S. L. Chen, **comb. nov.**

宽叶金茅 kuan ye jin mao

Basionym: *Pollinia quadrinervis* Hackel var. *latifolia* Rendle, J. Linn. Soc., Bot. 36: 357. 1904; *Eulalia wightii* (J. D.

Hooker) Bor var. *latifolia* (Rendle) B. S. Sun & S. Wang.

Basal sheaths appressed pilose between veins with white silky hairs; leaf blades glabrous or abaxial surface appressed-sericeous. Upper lemma 2-toothed in upper 1/3.

Dry grassy slopes; 1800 m. Yunnan [N Thailand].

2. *Eulalia speciosa* (Debeaux) Kuntze, Revis. Gen. Pl. 2: 775. 1891.

金茅 jin mao

Erianthus speciosus Debeaux, Actes Soc. Linn. Bordeaux 32: 53. 1878; *Eulalia birmanica* (J. D. Hooker) A. Camus; *E. velutina* (Hackel) O. Kuntze; *Pollinia birmanica* J. D. Hooker; *P. phaeothrix* Hackel var. *aurea* A. Camus; *P. speciosa* (Debeaux) Hackel; *P. velutina* Hackel; *Pseudopogonatherum speciosum* (Debeaux) Ohwi.

Perennial, base swollen; basal sheaths woolly with golden brown hairs, becoming fibrous. Culms 0.7–2 m tall, 2–5 mm in diam., white-villous below inflorescence, nodes farinose, sometimes pilose. Leaf sheaths glabrous or pilose; leaf blades linear, 25–50 × 0.4–0.7 cm, adaxial surface farinose, white-pilose at base, otherwise glabrous, apex finely acuminate; ligule ca. 1 mm. Racemes 4–7(–13) on a 3–4 cm axis, 10–25 cm, hairs whitish, pale yellowish or golden brown; rachis internodes and pedicels 2/3 as long to subequaling spikelet, ciliate. Sessile spikelet 4.6–5.7 mm, dark brown; callus hairs 1/6–1/3 spikelet length; lower glume narrowly lanceolate-oblong, back concave, villous below middle, hairs evenly spread or concentrated at flanks, veinless between keels, upper keels stiffly ciliate, apex subobtusate; upper lemma narrow, margins pilose, 2-toothed in upper 1/3; awn 1.5–2 cm. Anthers ca. 3.5 mm. Fl. and fr. Aug–Nov.

Grassy hillsides. Anhui, Fujian, Guangdong, Guizhou, Hainan, Henan, Hubei, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Cambodia, NE India, Japan, Korea, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

This species is usually easy to recognize due to its swollen base clothed in golden brown, velvety sheaths, which split into fine fibers with age. Occasionally specimens occur with dark reddish brown or pallid basal hairs. These are simply color variants, and more than one color may even occur on the same specimen.

A particularly vigorous form from Yunnan, N Myanmar, and N Thailand has been separated as *Eulalia birmanica*. This has long, straight rachis internodes subequaling the spikelet. The type has dark brown basal sheath hairs, but other specimens with long rachis inter-

nodes have golden sheath hairs. It simply represents a rather extreme form of this variable species and intergrades with more typical forms.

3. *Eulalia micranthera* Keng & S. L. Chen, Fl. Hainan. 4: 539. 1977.

微药金茅 wei yao jin mao

Perennial; basal sheaths woolly with reddish brown hairs. Culms slender, 0.8–1 m tall, ca. 1.7 mm in diam., 6–9-noded, villous below inflorescence with whitish yellow hairs, brown-tomentose around lower nodes, upper nodes glabrous. Leaf sheaths glabrous or thinly pilose above nodes; leaf blades linear, 15–27 × 0.3–0.4 cm, glabrous or abaxial surface thinly pilose, apex long acuminate; ligule ca. 1 mm. Racemes 4–5, digitate, 10–12 cm, hairs whitish at first, becoming pale yellowish brown; rachis internodes and pedicels 3/4 spikelet length, ciliate. Sessile spikelet 3–3.5 mm, brown with pallid tips; callus hairs ca. 1/5 spikelet length; lower glume narrowly oblong, back concave, veinless between keels, pilose with spreading hairs increasing to 2 mm above middle, apex emarginate-truncate or bimucronulate; upper lemma narrow, 2-toothed in upper 1/3; awn 1.5–2 cm. Anthers 2.3–2.4 mm. Fl. and fr. autumn–winter.

• Along streams. Hainan.

This is a more slender species than *Eulalia speciosa*, with the same basal sheath hair color as *E. phaeothrix*. However, it lacks the tussocky habit of *E. phaeothrix* and has smaller spikelets of differing shape and hairiness.

4. *Eulalia phaeothrix* (Hackel) Kuntze, Revis. Gen. Pl. 2: 775. 1891.

棕茅 zong mao

Pollinia phaeothrix Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 168. 1889.

Perennial, forming dense tussocks; basal sheaths woolly with dark reddish brown hairs, finally fibrous. Culms slender, 0.3–0.8(–1) m tall, 1–1.5 mm in diam., 2- or 3-noded, white-villous below inflorescence, nodes sometimes farinose and bearded below. Leaf sheaths pilose or glabrescent; leaf blades narrowly linear, 15–30 × 0.1–0.4 cm, glabrous or pilose, apex acute; ligule 0.5–1 mm. Racemes (1–)2–6(–8), digitate, 4–11(–15) cm, hairs golden brown; rachis internodes and pedicels 1/2–2/3 spikelet length, densely ciliate. Sessile spikelet 3.5–5.5 mm, dark brown; callus hairs 1/8 spikelet length; lower glume oblong-lanceolate, back flat or slightly concave, lower 2/3 villous, hairs uniform or concentrated toward margins, veinless between keels, apex pallid, ciliate, subacute; upper lemma narrow, 2-lobed to about middle; awn 1–2 cm. Anthers 2.5–3 mm. Fl. and fr. Aug–Nov.

Grassy hillsides. Hainan, Sichuan, Yunnan [S India, Sri Lanka, Thailand, Vietnam].

This species is common in the hills of S India and Sri Lanka, where it forms dense tussocks of narrow leaves with velvety, dark reddish brown basal sheaths. The culms are wiry, and bear brown, densely golden-villous racemes.

5. *Eulalia quadrinervis* (Hackel) Kuntze, Revis. Gen. Pl. 2: 775. 1891.

四脉金茅 si mai jin mao

Pollinia quadrinervis Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 158. 1889; *Eulalia quadrinervis* var. *latigluma* B. S. Sun & S. Wang; *P. villosa* var. *cheifuensis* Franchet; *Pseudopogonatherum quadrinerve* (Hackel) Ohwi.

Perennial, tufted from a short scaly rhizome; basal sheaths glabrous, rarely thinly appressed pilose between veins. Culms 0.6–1.2 m tall, 2–4 mm in diam., pilose below inflorescence, nodes glabrous. Leaf sheaths densely villous to hirsute with tubercle-based hairs, or subglabrous; leaf blades linear, 10–40 × 0.4–0.6 cm, glabrous to tuberculate-villous, abaxial surface glaucous, apex acuminate-filiform; ligule 1–1.5 mm. Racemes 2–7, subdigitate, 10–18 cm, hairs white or pale mauve; rachis internodes and pedicels 1/2–2/3 spikelet length, silky villous. Sessile spikelet 5–6.5 mm, golden brown; callus hairs 1/3 spikelet length, white; lower glume narrowly elliptic, back slightly concave and villous below middle, flat and glabrous above, 2–4 green veins between keels, connected by veinlets below apex and between lateral veins, upper keels shortly pectinate-ciliate, apex membranous, subacute; upper lemma ovate-oblong, 2-lobed in upper 1/3; awn 1.2–2 cm. Anthers 2.7–3.4 mm. Fl. and fr. Sep–Nov.

Dry mountain slopes, grassy places. Anhui, Fujian, Guangdong, Henan, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, N India, Japan, Korea, Myanmar, Nepal, Philippines, Thailand, Vietnam].

Eulalia quadrinervis is very close to *E. villosa* (Sprengel) Nees (*E. wightii* (J. D. Hooker) Bor). The latter species is distributed from Africa to S India and differs in its acute leaf blades and leathery, broader lower glume, which is concave down the whole midline and usually hairy only on the flanks. A few specimens from Yunnan with acute leaf blades are better placed in *E. quadrinervis*.

6. *Eulalia manipurensis* Bor, Grasses Burma, Ceylon, India, Pakistan, 156. 1960.

无芒金茅 wu mang jin mao

Eulalia mutica B. S. Sun & M. Y. Wang.

Perennial, tufted; basal sheaths glabrous. Culms (0.35–)0.75–1 m tall, 2–4 mm in diam., glabrous at nodes and below inflorescence, nodes blackish. Leaf sheaths glabrous or margin ciliate; leaf blades linear, (13–)45–60 × 0.2–0.6 cm, abaxial surface glabrous, adaxial surface hispid with tubercle-based hairs, margins scabrid, apex finely acuminate; ligule ca. 0.5 mm, margin ciliate. Racemes 5–20 or more, subdigitate on an axis to 3 cm, 8–16 cm, hairs white; rachis internodes and pedicels ca. 2/3 spikelet length, densely woolly-ciliate. Spikelets 2.8–3.5 mm, chestnut brown, glossy; callus hairs short, ca. 0.5 mm; lower glume narrowly elliptic-oblong, cartilaginous, back flat, flanks villous in lower 2/3, upper keels stiffly ciliate, veinless between keels, apex acute; upper lemma oblong, apex truncate-denticulate, awnless. Anthers 1.8–2 mm. Fl. and fr. Jul–Nov.

Mountain slopes, wet grasslands; ca. 1600 m. W Yunnan (Tengchong) [Bangladesh, N Myanmar].

7. *Eulalia leschenaultiana* (Decaisne) Ohwi, Bull. Tokyo Sci. Mus. 18: 2. 1947.

龚氏金茅 gong shi jin mao

Andropogon leschenaultianus Decaisne, Nouv. Ann. Mus. Hist. Nat. 3: 357. 1834; *A. aureofulvus* Steudel; *Eulalia cumingii* (Nees) A. Camus; *Pollinia cumingii* Nees.

Perennial, forming tufts on long trailing stolons; basal sheaths glabrous. Culms very slender, 0.3–0.7 m tall, ca. 1 mm in diam., usually pilose below inflorescence, lower nodes bearded. Leaf sheaths ciliate along margin, bearded at mouth; leaf blades linear-lanceolate, 4–10 × 0.2–0.4 cm, glabrous or thinly hispid with tubercle-based hairs, apex acute; ligule ca. 0.5 mm, ciliolate. Racemes 1–3, solitary or digitate, 3–8 cm, hairs golden brown; rachis internodes and pedicels ca. 2/3 spikelet length, ciliate. Sessile spikelet 3–4 mm, golden brown; callus hairs 1/4 spikelet length; lower glume narrowly oblong, ± leathery, back flat, densely villous except below apex, obscurely 1–2-veined between keels, connected by veinlets below apex, apex broadly truncate, densely ciliolate; lower lemma absent; upper lemma oblanceolate, 2-toothed in upper 1/4, teeth ciliate; awn 8–15 mm, column pubescent. Anthers 1.7–2 mm. Fl. and fr. autumn.

Dry exposed hillsides. Fujian, Guangdong, Jiangxi, Taiwan [Indonesia, Malaysia, Philippines, Thailand, Vietnam].

This species is unusual in lacking a lower lemma. The purple stigmas are exerted at the apex of the spikelet, rather than laterally which is more usual, and are an obvious feature of the racemes.

A variant occurs in N India and Nepal with smaller spikelets (2.5–3 mm) and slightly swollen culm bases with white-hairy basal sheaths. This has been described as *Pollinia cumingii* Nees var. *parviflora* Hackel. It may occur in adjacent parts of China.

8. *Eulalia brevifolia* Keng ex P. C. Keng, Acta Bot. Yunnan. 4: 351. 1982.

短叶金茅 duan ye jin mao

Perennial, rhizomatous; rhizome short, branching, densely clothed in scale leaves. Culms with scales at base, 0.5–0.7 m tall, branched above base, glabrous. Leaf sheaths glabrous, lower longer but upper shorter than internodes; leaf blades lanceolate, reddish when dry, 3–8 × 0.5–0.7 cm, glabrous, abaxial surface pruinose, base subcordate, apex acute; ligule ca. 0.5 mm. Racemes 5, digitate, 3–4 cm, hairs whitish; rachis internodes (2–)3–4(–6) mm, densely ciliate. Sessile spikelet 4–4.5 mm, pinkish brown; callus hairs 1/3 spikelet length; lower glume oblong-lanceolate, back almost flat, villous below middle, finely 1-veined between keels, apex obtuse; upper lemma 2-lobed to below middle; awn ca. 6 mm, slightly twisted. Anthers ca. 2.5 mm. Fl. and fr. May–Dec.

• Dry mountain slopes; 1700–2600 m. Yunnan.

9. *Eulalia pruinosa* B. S. Sun & M. Y. Wang, J. Yunnan Univ. 21: 94. 1999.

粉背金茅 fen bei jin mao

Perennial; basal sheaths closely imbricate, appressed hispid between veins. Culms up to 1.8 m tall, ca. 3 mm in diam., glabrous, lower nodes waxy. Leaf sheaths firm, smooth, glabrous, lower longer but upper shorter than internodes, stiffly bearded at mouth; leaf blades linear-lanceolate, 10–20 × 0.8–1 cm, tomentose on both surfaces, abaxial surface glaucous, base

rounded, apex acute; ligule ca. 1 mm. Racemes 5–7, digitate, 11–17 cm, hairs dirty white tinged purplish; rachis internodes and pedicels 3/4 spikelet length, ciliate. Sessile spikelet ca. 4.5 mm, purplish; callus hairs 1/3 spikelet length; lower glume narrowly elliptic-oblong, papery, back concave and villous below middle, flanks ciliate at upper 1/3, 2-veined between keels, connected by veinlets below apex, upper keels scabrid, apex narrowly truncate-emarginate; upper lemma narrowly ovate, very shortly 2-toothed; awn 0.9–1.3 cm, column glabrous. Anthers not seen. Fr. Oct.

• Mountain slopes, roadside banks; 1900–2700 m. Yunnan.

10. *Eulalia mollis* (Grisebach) Kuntze, Revis. Gen. Pl. 2: 775. 1891.

银丝金茅 yin si jin mao

Erianthus mollis Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 92. 1868; *Pollinia mollis* (Grisebach) Hackel.

Perennial, loosely tufted, with slender spreading rhizomes. Culms ascending or decumbent, 0.25–0.5 m tall, 1–2 mm in diam., villous below inflorescence, nodes glabrous. Leaf sheaths glabrous with ciliate margin or pilose, bearded at mouth; leaf blades linear, 3–8 × 0.2–0.5 cm, glabrous or hispid with tubercle-based hairs, margins thickened, smooth, apex acuminate; ligule a ciliate rim. Racemes 3–7, digitate, 4–7 cm, hairs silvery white or pinkish; rachis internodes and pedicels 2/3 spikelet length, densely hairy with long silky hairs exceeding and obscuring spikelets. Spikelets 4–5 mm, dark brown, pallid near apex, keels green; callus hairs 1/2 spikelet length; lower glume lanceolate, back flat, densely hairy with silky hairs ca. 1.5 times spikelet length or more, veinless between keels, apex obscurely emarginate or 2-mucronate; upper lemma narrowly oblong, shortly 2-toothed; awn 0.8–1.5 cm, fine, almost straight. Anthers ca. 2 mm.

Dry grassy mountainsides; ca. 2000 m. Xizang [Bhutan, N India, Nepal].

This is a relatively small, Himalayan species.

11. *Eulalia pallens* (Hackel) Kuntze, Revis. Gen. Pl. 2: 775. 1891.

白健秆 bai jian gan

Pollinia pallens Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 156. 1889.

Perennial, densely tufted from a short rhizome; basal sheaths glabrous. Culms hard, 0.4–1 m tall, 1.5–2.5 mm in diam., glabrous. Leaf sheaths glabrous, lower longer and upper shorter than internodes; leaf blades tough, narrow, involute, pale green, lower 25–40 × 0.2–0.3 cm (when flattened), abaxial surface smooth, glabrous, adaxial surface strongly ribbed, hirsute, margin scabrid; ligule very short, densely ciliolate. Racemes 3–11, subdigitate, 6–13 cm, hairs white; rachis internodes and pedicels 1/2–3/4 spikelet length, ciliate. Sessile spikelet 3.5–4.5 mm, pallid; callus hairs 1/8 spikelet length; lower glume oblong-lanceolate, membranous, back slightly concave, villous except near apex, veinless between keels, upper keels smooth or pectinate-scabrid, apex narrowly trun-

cate or 2-toothed; upper glume apex with 2–2.5 mm awn; upper lemma narrow, 2-toothed in upper 1/4; awn ca. 1 cm, column ciliate. Anthers purplish black, 1.8–2 mm. Fl. and fr. Oct–Nov.

Grassy places. NW Guangxi, S and W Guizhou, Yunnan [NE India].

This is a distinctive species, clearly differing from others in China by its tough, inrolled leaf blades and awned upper glume. The blackish anthers are striking among the white raceme hairs.

12. *Eulalia splendens* Keng & S. L. Chen, Bull. Bot. Res., Harbin 12: 315. 1992.

红健儿 hong jian gan

Perennial; basal sheaths glabrous. Culms ca. 1 m tall, ca. 4 mm in diam., pilose below inflorescence. Leaf sheaths longer than internodes, usually glabrous; leaf blades linear, hard, 15–30 × 0.3–0.4 cm, but uppermost less than 1 cm and basal longer than 40 cm, abaxial surface glabrous, adaxial surface pilose, margins scabrid; ligule ca. 0.5 mm. Inflorescence composed of 7–9 racemes on a ca. 5 cm axis, hairs white; rachis internodes and pedicels 2–3 mm, villous. Sessile spikelet ca. 4 mm, yellowish brown; callus hairs ca. 1 mm; lower glume oblong-lanceolate, membranous, lower back slightly concave, with ca. 4 mm soft hairs below middle, veinless between keels, margins ciliate, apex subhyaline, acute; upper lemma elliptic, very shortly 2-toothed; awn 5–8 mm, weakly geniculate. Anthers ca. 2 mm. Fl. and fr. autumn.

• Mountain slopes; ca. 800 m. Guangxi, Guizhou, Yunnan (Jinghong).

This species is very close to *Eulalia fastigiata* (Nees ex Steudel) Stapf ex Bor from Bhutan, NE India, and Nepal, but differs in the racemes being inserted singly or in pairs, rather than in whorls. These two species, and the related *Saccharum formosanum*, lie on the boundary between *Saccharum* and *Eulalia*. The presence of a central inflorescence axis, thin glumes, scarcely toothed upper lemma, and weak awn are all characters more typical of *Saccharum*.

13. *Eulalia trispicata* (Schultes) Henrard, Blumea 3: 453. 1940.

三穗金茅 san sui jin mao

Andropogon trispicatus Schultes, Mant. 2: 452. 1824; *Eulalia argentea* Brongniart; *E. tristachya* (Steudel) Kuntze; *Polinia tristachya* (Steudel) Thwaites; *Pseudopogonatherum trispicatum* (Schultes) Ohwi; *Saccharum tristachyum* Steudel.

Perennial, tussocky; basal sheaths glabrous. Culms slender, 0.3–1.2 m tall, ca. 2 mm in diam., nodes glabrous, glabrous or infrequently thinly pilose below inflorescence. Leaf sheaths usually glabrous or upper margin pilose; leaf blades linear, 10–40 × 0.2–0.6 cm, abaxial surface glabrous, adaxial surface pilose especially at base, apex finely acuminate; ligule very short, ca. 0.5 mm, margin ciliate. Racemes 3–16, subdigitate or inserted on a short axis to 1.5 cm, 4–15 cm, hairs silvery white; rachis internodes and pedicels ca. 1/2 spikelet length, densely ciliate, hairs longer at apex. Sessile spikelet 2.5–4.5 mm, chestnut brown or purplish; callus hairs short, ca. 0.5 mm; lower glume narrowly oblong-lanceolate, papery, back flat, lower flanks villous, upper keels ciliate, veinless between keels, apex narrowly truncate, entire or bimucronate; upper lemma linear, 2-toothed to about middle; awn 0.7–2 cm. Anthers 2–2.8 mm. Fl. and fr. autumn. $2n = 20$.

Grassy mountainsides. Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

This slender, small-spicate species is widespread in tropical Asia and is to be expected elsewhere in S China.

14. *Eulalia yunnanensis* Keng & S. L. Chen, Bull. Bot. Res., Harbin 12: 316. 1992.

云南金茅 yun nan jin mao

Perennial; basal sheaths glabrous, finally fibrous. Culms slender, ca. 0.6 m tall, ca. 2 mm in diam., nodes glabrous, densely pilose below inflorescence. Leaf sheaths softly ciliate along margins, otherwise glabrous; leaf blades linear, 4–15 × 0.2–0.4 cm, apical blades much reduced, abaxial surface glabrous, adaxial surface villous at base, apex acuminate; ligule rounded, ca. 2 mm. Racemes 5–7, digitate, 8–10 cm, hairs silvery white with faint mauve tinge; rachis internodes ca. 3 mm, 3/4 spikelet length, densely ciliate, pedicel similar but shorter. Sessile spikelet ca. 4 mm, chestnut brown; callus with short soft hairs; lower glume narrowly oblong-lanceolate, papery, back flat, villous below middle, upper keels greenish, scabrid, veinless between keels, apex narrowly truncate, subentire or emarginate; upper lemma narrow, 2-toothed in upper 1/4; awn 1.3–1.5 cm. Anthers ca. 2 mm. Fl. and fr. autumn.

• Mountain slopes, grassy places; 1400–2200 m. Yunnan.

This species is very close to, and probably no more than an extreme local variant of, *Eulalia trispicata*.

191. PSEUDOPOGONATHERUM A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 204. 1921.

假金发草属 jia jin fa cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Eulalia sect. *Pseudopogonatherum* (A. Camus) Pilger; *Puliculum* Stapf ex Haines.

Annual. Culms solitary or tufted, slender, glabrous. Leaf blades narrowly linear, often inrolled; ligule a narrow membranous rim, margin densely ciliate. Inflorescence terminal, composed of several to many subdigitate racemes in a dense brushlike cluster; racemes tough or fragile, spikelets of a pair similar, usually both pedicelled on unequal pedicels (one sessile and the other pedicelled in *P. koretrostachys*), both fertile; rachis internodes and pedicels linear, hairy along angles. Spikelets lanceolate or lanceolate-oblong; callus obtuse to acuminate, shortly bearded; glumes membranous or papery; lower glume slightly convex, flanks rounded, 2-keeled upward, back usually hairy, veinless between keels, keels ciliate toward apex, apex truncate or bidentate; upper glume boat-shaped,

apex mucronate or awned; lower floret reduced to an oblong hyaline lemma or absent; upper lemma stipelike, entire or 2-toothed, awned; awn well developed, geniculate, column dark brown, hairy, limb pallid; palea usually absent. Stamens 1–3.

Three to five species: NE India and Myanmar through SE Asia to the Philippines, Australia, and the Pacific Islands; three species (one endemic) in China.

This genus has been included in *Eulalia*, but is distinguished by its delicate, annual habit, pedicelled spikelets on tough or only tardily fracturing racemes, and very narrow intercostal long cells in the leaf epidermis.

Pseudopogonatherum irritans (R. Brown) A. Camus is likely to occur in SE China. It is found from Myanmar, Thailand, Vietnam, and the Philippines through Indonesia to Australia.

- 1a. Spikelets of a pair with one sessile and the other pedicelled 3. *P. koretrostachys*
 1b. Spikelets of a pair both pedicelled.
 2a. Spikelets 3.5–4 mm; anthers ca. 1 mm *P. irritans* (see note above)
 2b. Spikelets 2–3 mm; anthers ca. 0.5 mm.
 3b. Awn of upper lemma 1.5–3 cm, clearly geniculate, pilose 1. *P. contortum*
 3a. Awn of upper lemma 0.6–0.7 cm, not geniculate, glabrous 2. *P. filifolium*

1. *Pseudopogonatherum contortum* (Brongniart) A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 205. 1921.

笔草 bi cao

Pogonatherum contortum Brongniart in Duperrey, Voy. Monde 2(2): 90. 1831; *Erianthus contortus* (Brongniart) Kuntze.

Culms erect, 25–50 cm tall. Leaf sheaths glabrous; leaf blades becoming involute, 10–30 × 0.1–0.2 cm, abaxial surface glabrous, adaxial surface thinly pilose; ligule ca. 0.2 mm. Racemes 1–20, subdigitate, 3–6 cm, white hairy, tough, all spikelets pedicelled, disarticulating from pedicels at maturity; pedicels usually unequal, as long as or shorter than internode, villous. Spikelets 1.8–3 mm, brown, glossy; callus hairs up to 1/2 spikelet length; lower glume narrowly oblong or lanceolate-oblong, pubescent to villous except near apex, or sometimes glabrous, upper flanks pilose, apex 2-toothed; upper glume with mucro or awn 0.5–4(–12) mm; lower lemma ca. 1 mm; upper lemma entire or minutely toothed; awn 1.5–3 cm, column pilose, hairs ca. 1 mm. Anthers 1–3, ca. 0.5 mm.

Grassy places on mountain slopes, open and disturbed grassy hillsides, sometimes gregarious; 700–1700 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Sichuan, Yunnan [Bhutan, India, Indonesia, Myanmar, Nepal, Thailand, Vietnam; Australia, Pacific Islands].

This widespread, annual species comprises a variable complex of many intergrading forms, some of which have been accorded separate status, either at specific or infraspecific rank. Two varieties have been recognized in China; var. *contortum*, with callus hairs less than 1/2 the spikelet length and pedicels of the spikelet pairs unequal, occurs in Indonesia and Australia.

- 1a. Pedicels of spikelet pair unequal; upper glume with awn up to 4 mm 1a. var. *linearifolium*
 1b. Pedicels of spikelet pair equal, as long as rachis internode; upper glume with 0.5–1 mm mucro 1b. var. *sinense*

1a. *Pseudopogonatherum contortum* var. *linearifolium* Keng ex S. L. Chen, Acta Phytotax. Sin. 18: 489. 1980.

线叶笔草 xian ye bi cao

Spikelet pair with unequal pedicels; callus hairs 1/2 spikelet length; upper glume with up to 4 mm awn. Fl. and fr. autumn.

• Grassy places on mountain slopes; 1100–1700 m. Guangxi, Sichuan, W Yunnan.

The name “*Eulalia contorta* var. *linearifolia* Keng” (Claves Gen. Sp. Gram. Prim. Sin. 237. 1957) belongs here, but was not validly published because no Latin description was provided.

1b. *Pseudopogonatherum contortum* var. *sinense* Keng & S. L. Chen, Fl. Hainan. 4: 540. 1977.

中华笔草 zhong hua bi cao

Spikelet pair with equal pedicels, rachis internode equaling pedicels; callus 0.2–0.3 mm, obtuse; upper glume with 0.5–1 mm mucro. Fl. and fr. autumn.

• Hill slopes; ca. 700 m. Fujian, Guangdong, Guangxi, Hainan, Jiangxi.

This is probably the same taxon as *Pseudopogonatherum collinum* (Balansa) A. Camus, from N Vietnam, which is often included within *P. contortum*.

The name “*Eulalia contorta* var. *sinensis* Keng” (Claves Gen. Sp. Gram. Prim. Sin. 237. 1957) belongs here, but was not validly published because no Latin description was provided.

2. *Pseudopogonatherum filifolium* (S. L. Chen) H. Yu, Y. F. Deng & N. X. Zhao, Novon 14: 242. 2004.

假金发草 jia jin fa cao

Eulalia filifolia S. L. Chen, Gram. Orient. Sin. 249. 1962; *Pseudopogonatherum capilliphyllum* S. L. Chen, nom. illeg. superfl.

Culms slender, 17–30 cm tall, 3–4-noded, glabrous. Leaf sheaths glabrous; leaf blades usually involute, 5–17 × ca. 0.1 cm, abaxial surface glabrous, adaxial surface puberulous and pilose; ligule ca. 0.1 mm. Racemes 1–3, 2–4.5 cm, white hairy, tough, all spikelets pedicelled, disarticulating from pedicels at maturity; rachis internodes ca. 1.3 mm, ciliate; pedicels of a pair equal. Spikelets ca. 2 mm, yellowish brown; callus hairs 0.3–1.7 mm; lower glume pilose on back, obtuse; upper glume boat-shaped, mucronate, mucro 0.1–1 mm; lower lemma ovate-oblong, ca. 1 × 0.5 mm; upper lemma entire; awn 6–7 mm, weakly geniculate, column glabrous. Anthers 3, ca. 0.7 mm. Fl. and fr. Sep–Dec.

- Grassy hillsides. Anhui.

3. *Pseudopogonatherum koretrostachys* (Trinius) Henrard, *Blumea* 4: 521. 1941.

刺叶假金发草 *ci ye jia jin fa cao*

Andropogon koretrostachys Trinius, *Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math.* 2: 273. 1833; *A. asthenostachys* Steudel; *Eulalia setifolia* (Nees) Pilger; *Pollinia setifolia* Nees; *Pseudopogonatherum setifolium* (Nees) A. Camus.

Culms erect or geniculately ascending, 30–60 cm tall. Leaf sheaths glabrous; leaf blades usually involute, 5–20 × 0.1–0.2 cm, glabrous or adaxial surface pilose; ligule ca. 0.5 mm. Racemes (1–)7–25 or more, subdigitate, 2–8 cm, white hairy, tardily fragile, one spikelet of a pair sessile, the other pedicelled;

rachis internodes and pedicels 1/2 spikelet length, villous. Spikelets 2–3 mm, brown; callus hairs 1/5–1/4 spikelet length; lower glume narrowly lanceolate-oblong, villous except near apex, sometimes sparsely so or glabrous, upper flanks villous, apex 2-toothed or truncate and minutely 2-mucronate; upper glume with 3–6 mm awn; lower lemma ca. 1 mm; upper lemma shortly 2-toothed; awn 1.5–2 cm, column shortly ciliate, hairs ca. 0.25 mm. Anthers 3, 0.5–0.7 mm. Pedicelled spikelet easily deciduous, maturing before sessile spikelet. Fl. and fr. Sep–Nov.

Hill slopes, roadsides. Anhui (Tai Hu), Fujian, Guangdong, Guangxi, Hainan, Jiangxi, SE Yunnan, Zhejiang [Indonesia, Laos, Malaysia, Philippines, Thailand].

This is a variant from the *Pseudopogonatherum contortum* complex with one spikelet of the pair sessile. It also has short hairs on the column of the awn.

192. *POGONATHERUM* P. Beauvois, *Ess. Agrostogr.* 56. 1812.

金发草属 *jin fa cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Pogonopsis J. Presl.

Perennials, densely tufted. Culms slender, branching, drooping or trailing, several- to many-noded. Leaf blades linear or linear-lanceolate, lower blades deciduous; ligule a membranous ciliate rim. Inflorescence a single raceme borne on a flexuous peduncle, racemes many, terminating the culm branches; raceme fragile, sessile and pedicelled spikelets of a pair similar, both fertile; rachis internodes and pedicels shorter than spikelets, linear with expanded apex, ciliate. Sessile spikelet oblong, laterally compressed; callus obtuse, bearded with long silky hairs; glumes subequal, membranous or thinly cartilaginous; lower glume strongly convex, 3–5-veined, apex truncate, 2–3-lobed, ciliate; upper glume slightly longer than lower glume, strongly keeled, apex 2-toothed, a long, fine, flexuous awn from sinus; lower floret male with palea or reduced to a hyaline lemma or absent; upper lemma oblong, hyaline, 2-lobed for 1/3–1/2 its length, awned; awn long, very slender, geniculate near base; upper palea subequal to lemma. Stamens 1–2. Pedicelled spikelet often smaller, lacking a lower floret, upper floret bisexual or female.

Four species: India to SE Asia, NE Australia, and Polynesia; three species (one endemic) in China.

- 1a. Sessile spikelet 1.3–2 mm; stamen 1; awn of upper lemma strongly reflexed above base 1. *P. crinitum*
- 1b. Sessile spikelet 2.3–3 mm; stamens 2; awn of upper lemma slightly bent above base.
 - 2a. Lower glume of pedicelled spikelet awnless; lower floret of sessile spikelet staminate; anthers ca. 1.8 mm 2. *P. paniceum*
 - 2b. Lower glume of pedicelled spikelet awned; lower floret of sessile spikelet absent or reduced to a small lemma; anthers ca. 0.5 mm 3. *P. biaristatum*

1. *Pogonatherum crinitum* (Thunberg) Kunth, *Enum. Pl.* 1: 478. 1833.

金丝草 *jin si cao*

Andropogon crinitus Thunberg in Murray, *Syst. Veg.*, ed. 14, 903. 1784; *A. monandrus* Roxburgh; *Homoplitis crinita* (Thunberg) Trinius; *Ischaemum crinitum* (Thunberg) Trinius; *Pogonatherum saccharoideum* P. Beauvois var. *crinitum* (Thunberg) F. N. Williams; *P. saccharoideum* var. *monandrum* (Roxburgh) Hackel.

Culms erect or geniculate, sometimes trailing, very slender, 10–30 cm tall, 0.5–0.8 mm in diam., branching from near base. Leaf sheaths glabrous or puberulous, mouth long ciliate; leaf blades 1.5–5 × 0.1–0.4 cm, scaberulous-puberulous, apex acute. Raceme 1.5–3 cm (excluding awns), yellowish; rachis internodes and pedicels 1/3–2/3 spikelet length, hairs silky white. Sessile spikelet 1.3–2 mm, membranous; callus hairs equal to or

slightly longer than spikelet; lower glume scabrid on back, apex ciliate with ca. 0.2 mm hairs; upper glume awn 1.5–1.8 cm; lower floret absent or only lemma present; awn of upper lemma 1.8–2.4 cm, strongly geniculate near base, column very short, dark brown, limb fine, diverging at right angle or more from spikelet. Stamen 1, anther ca. 1 mm. Pedicelled spikelet similar to sessile but smaller; lower glume awnless. Fl. and fr. May–Sep.

Mountain slopes, forests, moist places along roadsides and streams; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Malaysia, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Australia (Queensland)].

This is a more delicate species than *Pogonatherum paniceum*, forming a uniform tuft lacking dense bunches of branchlets, with tiny spikelets and strongly bent lemma awns.

This species is used medicinally.

2. *Pogonatherum paniceum* (Lamarck) Hackel, Allg. Bot. Z. Syst. 12: 178. 1906.

金发草 *jin fa cao*

Saccharum paniceum Lamarck, Encycl. 1: 595. 1785; *Perotis polystachya* Willdenow; *Pogonatherum saccharoideum* P. Beauvois, nom. illeg. superfl.

Culms stiffly erect at base, 30–60 cm tall, 1–2 mm in diam., hard and unbranched in lower part, repeatedly branched forming dense fascicles of very slender branchlets in upper part. Leaf sheaths glabrous or puberulous, mouth long ciliate; leaf blades stiff, 1.5–5.5 × 0.15–0.4 cm, scabrid, apex acuminate. Raceme 1.3–3 cm (excluding awns), yellowish; rachis internodes and pedicels ca. 1/2 spikelet length, hairs silky white. Sessile spikelet 2.3–3 mm, thinly cartilaginous; callus hairs shorter than spikelet; lower glume scabrid or puberulous on back, apex ciliate with 0.5–1 mm hairs; upper glume awn 1.3–2 cm; lower floret staminate, lemma slightly shorter than lower glume, palea subequalling lemma; awn of upper lemma 1.5–1.8 cm, weakly geniculate near base, column not strongly demarcated, limb very fine. Stamens 2, anthers ca. 1.8 mm. Pedicelled spikelet similar to sessile but smaller; lower glume awnless. Fl. and fr. Mar–Oct.

Mountain slopes, roadsides, streams; 100–2300 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Sichuan, Taiwan, Yunnan [Afghanistan, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Thailand, Vietnam; SW Asia (Arabia), Australia (Queensland)].

3. *Pogonatherum biaristatum* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 13: 76. 1993.

二芒金发草 *er mang jin fa cao*

Culms 40–60 cm tall, 1–2 mm in diam., hard, unbranched in lower part, branched above; branches ascending. Leaf sheaths glabrous, mouth ciliate; leaf blades stiff, 2–4.5 × 0.1–0.3 cm, scabrid, puberulous at base, apex long acuminate. Raceme 2–3 cm (excluding awns), yellowish; rachis internodes and pedicels shorter than spikelet. Sessile spikelet ca. 3 mm; callus hairs 0.5–3 mm; lower glume scabrid and with scattered soft hairs on back, apex densely ciliate; upper glume awn ca. 1.6 cm; lower floret absent or represented by a small linear-lanceolate lemma; awn of upper lemma ca. 1.7 cm, weakly geniculate near base, column not strongly demarcated, limb very fine. Stamens 2, anthers ca. 0.5 mm. Pedicelled spikelet smaller than sessile; lower glume with straight ca. 1.5 cm awn. Fl. and fr. early summer.

• Forests. Hainan.

193. *EULALIOPSIS* Honda, Bot. Mag. (Tokyo) 38: 56. 1924.

拟金茅属 *ni jin mao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Pollinidium Stapf ex Haines.

Perennial. Leaf blades narrow; ligule a long-ciliate rim. Inflorescences terminal and axillary from upper leaf sheaths, composed of a few subdigitate racemes; racemes conspicuously hairy, fragile, sessile and pedicelled spikelets of a pair similar, both fertile; rachis internodes and pedicels flat, ciliate. Spikelets elliptic-oblong, lightly laterally compressed below middle, flat above; callus densely bearded; glumes villous below middle; lower glume papery, convex, 5–9-veined, veins prominent, apex shortly 2–3-toothed; upper glume 3–9-veined, apex acute or 2-toothed, with or without an awn-point; lower floret male or sterile, lemma and palea well developed, hyaline; upper lemma lanceolate-oblong, hyaline, entire or minutely 2-toothed, awned; awn weakly geniculate; upper palea broadly ovate, glabrous or apex long ciliate. Stamens 3.

Two species: Afghanistan and India to China and Philippines; one species in China.

1. *Eulaliopsis binata* (Retzcius) C. E. Hubbard, Hooker's Icon. Pl. 33: t. 3262, p. 6. 1935.

拟金茅 *ni jin mao*

Andropogon binatus Retzcius, Observ. Bot. 5: 21. 1789; *A. involutus* Steudel; *A. notopogon* Steudel; *Eulaliopsis angustifolia* (Trinius) Honda; *Pollinia eriopoda* Hance; *Pollinidium binatum* (Retzcius) C. E. Hubbard; *Spodiopogon angustifolius* Trinius; *S. binatus* (Retzcius) Roberty.

Perennial; basal sheaths woolly with creamy hairs. Culms densely tufted, erect, 30–80 cm tall, nodes glabrous. Leaf sheaths glabrous, hairy at mouth; leaf blades tough, involute or rarely flat, 10–30 × 0.1–0.4 cm, uppermost very reduced, glabrous, adaxial surface and margins scabrid; ligule ca. 0.2 mm

with hairs to 2 mm. Racemes 2–4, 2–5 cm, softly golden-villous; rachis internodes 2–2.5 mm, golden-villous on one or both margins, sometimes thinly. Spikelets 3.8–6 mm, yellowish; callus hairs up to 3/4 spikelet length; lower glume villous along lower margins and in tufts on back; upper glume slightly longer than lower, similarly villous, apex with a 0.3–2 mm awnlet; lower lemma narrowly oblong, equal to lower glume; upper lemma subequal to lower lemma; awn 4–9 mm. Anthers ca. 2.5 mm.

Dry mountain slopes; Guangdong, Guangxi, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Taiwan, Yunnan [Afghanistan, Bhutan, India, Japan, Myanmar, Nepal, Pakistan, Philippines, Thailand].

This species is a source of fiber.

194. *POLYTRIAS* Hackel in Engler & Prantl, Nat. Pflanzenfam. 2(2): 24. 1887.

单序草属 *dan xu cao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Aethonopogon Kuntze; *Eulalia* sect. *Polytrias* (Hackel) Pilger.

Perennial, low, stoloniferous. Leaf blades broadly linear; ligule short, truncate, ciliate. Inflorescence a single terminal raceme; raceme hairy, fragile, densely spiculate, the spikelets borne in threes, 2 sessile and 1 pedicelled at each node, sessile and pedicelled spikelets similar, both fertile or pedicelled spikelet male or barren, occasionally lowermost spikelets paired; rachis internodes broadly linear, densely ciliate on margins, shorter than spikelets; pedicel similar but more slender. Spikelets oblong; callus bearded; glumes cartilaginous becoming membranous in upper 1/3; lower glume flat, villous, flanks keeled, clasping upper glume, obscurely 2-veined between keels, apex truncate, ciliate; upper glume slightly longer than lower, 1–3-veined, keeled along midvein; lower floret absent; upper lemma small, broad, 2-cleft, awned; awn geniculate; palea very small or absent. Stamens 3.

One species: SE Asia, including China.

1. *Polytrias indica* (Houttuyn) Veldkamp, *Blumea* 36: 180. 1991.

单序草 dan xu cao

Perennial forming loose mats. Culms slender, decumbent, rooting and branching at nodes, erect shoots 10–30 cm tall, nodes glabrous or bearded. Leaf sheaths lightly compressed, glabrous or rarely pubescent; leaf blades purplish glaucous, 2–5 × 0.2–0.4 cm, stiffly pilose with tubercle-based hairs, margins scabrid, apex acuminate; ligule 0.2–0.5 mm. Raceme 2–7 cm, shortly exserted from uppermost leaf sheath at maturity; rachis internodes and pedicels golden-ciliate. Spikelets 3–4 mm, brown, densely hairy with soft golden hairs; callus hairs 1/3 spikelet length; lower glume villous below middle, hairs usually extending slightly beyond apex, keels green; upper glume densely pubescent except near base, villous on upper keel; upper lemma broadly oblong to ovate, teeth narrow, tipped with hairs; awn slender, 0.8–1.2 cm, puberulous. Anthers 2.5–3 mm. Stigmas exserted from apex of spikelet. Fl. and fr. summer to autumn.

Grassy places on mountain slopes, grassy spaces, lawns, wastelands, roadsides. Hainan, Hong Kong [Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Vietnam; introduced elsewhere as a lawn grass].

- 1a. Lower glume with long hairs exceeding glume apex 1a. var. *indica*
 1b. Lower glume with shorter hairs not exceeding 2/3 of glume length 1b. var. *nana*

1a. *Polytrias indica* var. *indica*

单序草(原变种) dan xu cao (yuan bian zhong)

Phleum indicum Houttuyn, Nat. Hist. 13: 198. 1782; *Andropogon amaurus* Buse, nom. illeg. superfl.; *A. diversiflorus* Steudel; *A. firmandus* Steudel; *Eulalia praemorsa* (Nees ex Steudel) Stapf ex Ridley; *Pollinia praemorsa* Nees ex Steudel; *Polytrias amaura* Kuntze, nom. illeg. superfl.; *P. diversiflora* (Steudel) Nash; *P. praemorsa* (Nees ex Steudel) Hackel.

Spikelets 3 per node; lower glume long villous, hairs extending beyond glume apex; upper lemma cordate.

Grassy spaces. Hong Kong [Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Vietnam].

This grass has been widely known as *Polytrias amaura*, based on *Andropogon amaurus*, which is a superfluous name for *A. diversiflorus*.

1b. *Polytrias indica* var. *nana* (Keng & S. L. Chen) S. M. Phillips & S. L. Chen, *Novon* 15: 470. 2005.

短毛单序草 duan mao dan xu cao

Eulalia nana Keng & S. L. Chen, Fl. Hainan. 4: 539. 1977; *Polytrias amaura* var. *nana* (Keng & S. L. Chen) S. L. Chen.

Spikelets 2–3 per node; lower glume with hairs not extending to glume apex; upper lemma oblong.

- Grassy places on mountain slopes. Hainan.

195. MICROSTEGIUM Nees in Lindley, *Nat. Syst. Bot.*, ed. 2, 447. 1836.

莠竹属 you zhu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Ischnochloa J. D. Hooker.

Perennial or annual. Culms slender, creeping or rambling, usually much branched and rooting at lower nodes. Leaf blades broadly linear to lanceolate or elliptic, base narrow, apex acuminate to setaceous; ligule membranous, truncate, back pubescent. Inflorescence terminal, composed of 1 to many subdigitate racemes on a short axis; racemes elongate, sparsely hairy, usually fragile, sessile and pedicelled spikelets of a pair similar, rarely both spikelets unequally pedicelled; rachis internodes filiform to clavate or inflated; pedicels resembling internodes but shorter. Sessile spikelet lanceolate, dorsally compressed; callus shortly bearded; glumes herbaceous to cartilaginous; lower glume deeply grooved on back or with a broad median channel, margins inflexed, 2-keeled at least toward apex; upper glume boat-shaped, acute to shortly awned; lower floret almost always sterile, reduced to a single scale or absent; upper floret bisexual, lemma linear to cordate, deeply 2-lobed, shortly 2-toothed, or rarely entire, usually awned; awn flexuous or geniculate. Stamens 2–3. Pedicelled spikelet resembling the sessile but slightly narrower and less concave, occasionally slightly smaller and staminate.

About 20 species: India to Japan and SE Asia, a few species in Africa; 13 species (three endemic) in China.

The name *Microstegium glaberrimum* (Honda) Koidzumi (Bot. Mag. (Tokyo) 43: 394. 1929; *Pollinia glaberrima* Honda, Bot. Mag. (Tokyo) 39: 42. 1925), described from Taiwan, has been misapplied in recent literature to forms of *M. ciliatum*. The protologue describes a grass with only 2 or 3 short racemes of small (ca. 2 mm), awnless spikelets. The type has not been seen, and it has not proved possible to establish the identity of this taxon.

- 1a. Rachis internodes filiform, glabrous or villous, equaling or longer than spikelets.
 - 2a. Rhizomatous perennial; raceme solitary; rachis internodes and pedicels long-ciliate 1. *M. batangense*
- 2b. Annuals; racemes 2–7; rachis internodes and pedicels glabrous or almost so.
 - 3a. Stamens 3; lower lemma reduced or absent 2. *M. fauriei*
 - 3b. Stamens 2; lower lemma well developed, slightly shorter than glumes.
 - 4a. Spikelets of a pair one sessile, the other pedicelled; raceme rachis fragile 3. *M. nudum*
 - 4b. Spikelets of a pair both pedicelled, one pedicel long, the other short; raceme rachis tough.
 - 5a. Spikelets 1-awned (from upper lemma); lower glume smooth, apex subentire; nodes of culm glabrous 4. *M. japonicum*
 - 5b. Spikelets 3-awned (from upper glume and both lemmas); lower glume scabrid, apex 2-cleft; nodes of culm pubescent 5. *M. somae*
- 1b. Rachis internodes linear to clavate, inflated upward, hairy on angles, usually shorter than spikelets.
 - 6a. Upper lemma well developed, 3–4 mm, split to about middle into 2 long, acute lobes.
 - 7a. Culms rambling, up to 2 m; leaf blades 15–20 cm, pseudopetiolate, at least the lower; racemes 6–20; pedicelled spikelet awned 6. *M. petiolare*
 - 7b. Culms erect, up to 40 cm; leaf blades 3–8 cm, not pseudopetiolate; racemes 2–3; pedicelled spikelet awnless or almost so 7. *M. lanceolatum*
 - 6b. Upper lemma small, 1–2 mm, shortly 2-lobed or entire.
 - 8a. Anthers 0.3–0.5 mm; awn often very short, included within spikelet; sessile spikelet 4–5 mm.
 - 9a. Lower glume with transverse veinlets below apex; leaf blades 5–8 mm wide 8. *M. vimineum*
 - 9b. Lower glume with transverse veinlets below apex and down flanks; leaf blades 8–12 mm wide 9. *M. reticulatum*
 - 8b. Anthers 0.8–2.5 mm; awn clearly exserted from spikelet; sessile spikelet 2–4(–5) mm.
 - 10a. Spikelets 2–2.5 mm; lower glume flat on back or almost so, veins obscure 10. *M. delicatulum*
 - 10b. Spikelets 2.8–5 mm; lower glume grooved on back, veins obvious.
 - 11a. Anthers 0.8–1.5 mm; upper glume with 0.3–3 mm awnlet; awn flexuous, column obscure 11. *M. ciliatum*
 - 11b. Anthers 1.5–3.5 mm; upper glume acute or minutely mucronate; geniculate, column distinct.
 - 12a. Sessile spikelet 2.8–4 mm; anthers 1.5–2.5 mm; upper lemma emarginate, glabrous 12. *M. fasciculatum*
 - 12b. Sessile spikelet 4.5–5 mm; anthers 3–3.5 mm; upper lemma bifid, ciliate 13. *M. multiciliatum*

1. *Microstegium batangense* (S. L. Zhong) S. M. Phillips & S. L. Chen, **comb. nov.**

巴塘莠竹 ba tang you zhu

Basionym: *Arthraxon batangensis* S. L. Zhong, J. S. W. Agric. Coll. 1982(4): 97. 1982.

Perennial with tough, spreading rhizomes. Culms slender, much branched at lower nodes, sprawling, ascending to 20–45 cm, nodes glabrous. Leaf sheaths glabrous; leaf blades linear-lanceolate, firm, glaucous, 1–5.5 cm × 1.5–2 mm, smooth, abaxial surface glabrous, adaxial surface sparsely setose toward ligule with 2–3 mm bristles, apex acuminate; ligule 0.6–1 mm. Raceme solitary, 3.5–6.5 cm; rachis internodes filiform, ciliate with ca. 2 mm hairs, equaling spikelet. Sessile spikelets 6–7.8 mm; callus hairs 2–3 mm; lower glume linear-lanceolate, keels rounded in lower 2/3, sharp and scabrid above, deeply grooved between keels in middle 1/3, 5–7-veined with transverse veinlets, apex acuminate; upper glume with rounded keel, 7-veined with transverse veinlets, upper margins shortly ciliate, apex acute and mucronate; lower floret male with well-developed palea, anthers ca. 3 mm; upper lemma 3.5–4 mm, 2-lobed to below middle, lobes acuminate, ciliate on outer margins; awn geniculate, 1–1.4 cm; upper palea well developed. Pedicelled spikelet lanceolate, male and weakly awned or reduced and barren. Fl. and fr. Aug–Oct.

• Dry river valleys, under shrubs; 2600–3100 m. Sichuan.

This grass is not a species of *Arthraxon* because the awn arises from the sinus of the 2-lobed lemma, not from low down the lemma back. The habit, grooved lower glume of the sessile spikelet, and the usually well-developed pedicelled spikelet indicate that it is better placed in *Microstegium*.

2. *Microstegium fauriei* (Hayata) Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 410. 1930.

法利莠竹 fa li you zhu

Annual. Culms decumbent, rooting at lower nodes, up to 50–100 cm, nodes glabrous or pubescent. Leaf sheaths glabrous or pubescent; leaf blades narrowly lanceolate, 5–20 × 0.3–1 cm, thinly pilose to tomentose, apex acuminate; ligule ca. 2 mm. Racemes 3–10, spreading, 4–10 cm; rachis internodes filiform, glabrous or lower edges sparsely ciliate, equaling or slightly longer than spikelet. Spikelets 4–5.5 mm; callus shortly bearded; lower glume lanceolate, back shallowly concave, obscurely 2-veined between keels, glabrous, keels stoutly pectinate-ciliate, apex shortly 2-toothed; upper glume hispid on keel, apex attenuate into 1(–3) mm awnlet; lower floret absent; upper lemma ca. 1 mm, hyaline, minutely 2-toothed; awn fine, flexuous, 2–2.5 cm, apex hairlike; upper palea ca. 1.5 mm, irregularly toothed. Anthers 3, 1.5–1.8 mm. Fl. and fr. Aug–Oct.

Montane forests and forest margins, moist places on pathsides, clearings, streams, forming colonies; middle elevations. Fujian, Guangdong, Taiwan [Indonesia, Malaysia].

- 1a. Nodes of culm glabrous; leaf blades
glabrous or sparingly pilose 2a. subsp. *fauriei*
1b. Nodes of culm shortly bearded; leaf
blades tomentose 2b. subsp. *geniculatum*

2a. *Microstegium fauriei* subsp. *fauriei*

法利莠竹(原亚种) fa li you zhu (yuan ya zhong)

Pollinia fauriei Hayata, Icon. Pl. Formosan. 7: 73. 1918.

Culms 50–80 cm, nodes glabrous. Leaf blades glabrous or adaxial surface sparingly pilose with soft, tubercle-based hairs. Racemes 4–6, 5–9 cm.

- Montane forest margins. Taiwan.

2b. *Microstegium fauriei* subsp. *geniculatum* (Hayata) T. Koyama, Grasses Japan Neighboring Regions, 516. 1987.

膝曲莠竹 xi qu you zhu

Pollinia geniculata Hayata, Icon. Pl. Formosan. 7: 73. 1918; *Microstegium hendersonii* (C. E. Hubbard) C. E. Hubbard; *Pollinia hendersonii* C. E. Hubbard.

Culms up to 100 cm, nodes pubescent. Leaf blades tomentose on both surfaces. Racemes 5–10, 6–10 cm.

Montane forests, moist places on pathsides, clearings, streams. Fujian, Guangdong, Taiwan [Indonesia, Malaysia].

3. *Microstegium nudum* (Trinius) A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 201. 1921.

竹叶茅 zhu ye mao

Pollinia nuda Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 2: 307. 1833; *Eulalia nuda* (Trinius) Kuntze; *Leptatherum royleanum* Nees; *Microstegium arisanense* (Hayata) A. Camus; *Pollinia arisanensis* Hayata.

Annual. Culms rambling, rooting at lower nodes, 20–80 cm long, nodes pubescent. Leaf sheaths glabrous, one margin ciliate; leaf blades narrowly lanceolate, thin, 3–8 × 0.5–1.1 cm, usually glabrous, midvein a white line below middle, apex acute; ligule ca. 0.5 mm. Racemes 2–7, very slender, slightly flexuous, lower becoming divaricate, 4–8 cm; rachis internodes filiform, glabrous, longer than spikelet. Sessile spikelet 3.5–5 mm; callus hairs 1–1.3 mm; lower glume narrowly lanceolate-oblong, back shallowly concave, glabrous or rarely hispidulous near apex, 2–4-veined, apex attenuate, hyaline, sometimes 2-toothed; upper glume weakly keeled or rounded on back, acuminate; lower lemma lanceolate, hyaline, slightly shorter than glumes; upper lemma linear, hyaline, 1.5–3 mm, emarginate; awn very fine, flexuous, 1–2 cm, apex hairlike, tangled; upper palea absent or minute. Anthers 2, 0.5–1 mm. Fl. and fr. Aug–Oct.

Moist mountainsides, forest undergrowth; ca. 3000 m. Anhui, Fujian, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Nepal, Pakistan, Philippines, Vietnam; Africa, Australia].

4. *Microstegium japonicum* (Miquel) Koidzumi, Bot. Mag. (Tokyo) 43: 394. 1929.

日本莠竹 ri ben you zhu

Pollinia japonica Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 290. 1866; *Leptatherum japonicum* (Miquel) Franchet & Savatier; *Microstegium nudum* (Trinius) A. Camus subsp. *japonicum* (Miquel) Tzvelev.

Annual. Culms trailing, rooting at lower nodes, up to 80 cm long, nodes glabrous. Leaf sheaths glabrous, one margin ciliate; leaf blades ovate-lanceolate, 2–5 × 0.6–1.2 cm, glabrous, midvein obscure except near base, base rounded, apex acute; ligule 0.2–0.5 mm. Racemes 3–7, very slender, slightly flexuous, lower becoming divaricate, 4–6 cm; rachis internodes filiform, glabrous, longer than spikelet; spikelets both pedicelled, shorter pedicel ca. 1 mm, longer 2.5–3 mm. Spikelets 3–4 mm; callus very shortly bearded or subglabrous in lower spikelet; lower glume narrowly lanceolate-oblong, back shallowly concave, 2–4-veined, keels scabrid, otherwise smooth, apex attenuate, hyaline, subacute or minutely 2-toothed; upper glume weakly keeled or rounded on back, apex acuminate; lower lemma lanceolate, hyaline, slightly shorter than glumes; upper lemma linear, hyaline, emarginate; awn very fine, flexuous, ca. 1 cm, apex hairlike, tangled; upper palea absent or minute. Anthers 2, 0.5–0.7 mm. Fl. and fr. Jul–Sep.

Mountainsides, forest margins, roadsides. Anhui, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang [Japan, Korea].

This species is very close to *Microstegium nudum*, but differs mainly in its pedicelled spikelets.

5. *Microstegium somae* (Hayata) Ohwi, Acta Phytotax. Geobot. 11: 155. 1942 [“*somai*”].

多芒莠竹 duo mang you zhu

Polliniopsis somae Hayata, Icon. Pl. Formosan. 7: 76. 1918 [“*somai*”]; *Microstegium japonicum* subsp. *somae* (Hayata) Koyama.

Annual. Culms slender, trailing, rooting at lower nodes, ascending to 30–40 cm, nodes bearded. Leaf sheaths glabrous, one margin ciliate; leaf blades ovate-lanceolate, 3–4 × 0.3–0.6 cm, glabrous, base rounded, apex acute; ligule 0.2–0.5 mm. Racemes 3–5, very slender, slightly flexuous, 3–8 cm; rachis internodes filiform, glabrous, equaling or longer than spikelets; spikelets both pedicelled, shorter pedicel 1–1.5 mm, longer 2.5–3 mm. Spikelets 4–5 mm; callus hairs 1/4–1/3 spikelet length; lower glume narrowly lanceolate-oblong, back shallowly concave, 4-veined, scabrid, apex 2-cleft, lobes usually mucronate; upper glume weakly keeled, scabrid, apex 2-toothed with 2–10 mm awn; lower lemma linear-lanceolate, hyaline, ca. 2 mm, 2-toothed with up to 1 cm awn; upper lemma similar to lower but slightly shorter; awn ca. 12 mm; upper palea absent. Anthers 2, 0.6–0.8 mm. Fl. and fr. autumn to winter.

Montane forests. Anhui, Fujian, Taiwan [Japan (Ryukyu Islands)].

This species may prove to be a variant of *Microstegium japonicum* with extra awns developed, but it seems sufficiently distinct on the basis of specimens available at present.

6. *Microstegium petiolare* (Trinius) Bor, Indian Forest Rec., Bot. 1(3): 87. 1938.

柄莠竹 bing you zhu

Spodiopogon petiolaris Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 2: 301. 1833; *Andropogon petiolaris* (Trinius) Steudel; *Ischaemum petiolare* (Trinius) Hackel; *Microstegium yunnanense* R. J. Yang.

Perennial, clump-forming or rambling. Culms hard, up to 2 m long, farinose below nodes, nodes densely bearded in tuft at sheath margin or all round. Leaf sheaths glabrous or tuberculate-pilose, margins broad at apex, extended into ligule; leaf blades lanceolate, 15–20 × 1–1.5 cm (excluding pseudopetiole), adaxial surface glabrous, adaxial surface pilose, midvein white, margins scabrid, base narrowed to a pseudopetiole up to 4 cm in lower blades, apex setaceous; ligule 4–11 mm. Racemes 6–20, corymbiform on 2–5 cm axis, lower racemes sometimes on side branches, straw-colored tinged purplish, 6–10 cm; rachis internodes linear, shortly ciliate, equaling spikelet. Sessile spikelet 4.7–5 mm; callus hairs short, soft; lower glume oblong, back grooved, granular-scabrid, 6–8-veined, sharply keeled, keels slightly winged near apex, apex obtuse-denticulate; upper glume sharply keeled, granular-scabrid, apiculate; lower floret staminate, lemma narrowly oblong, subequaling glumes, palea well developed; upper lemma ovate-oblong, 3–4 mm, 2-lobed to about middle; awn geniculate, 0.8–1 cm. Anthers 3, ca. 3 mm. Fl. and fr. Aug–Oct.

Grassy places along roadsides, sometimes scrambling through shrubs; ca. 2100 m. Yunnan [NE India, Myanmar, Nepal].

This is a distinctive species used for forage. The hard, rambling culms, broad, pseudopetiole leaf blades with long ligules, and corymbose inflorescence of many racemes all contribute to a recognizable habit.

7. *Microstegium lanceolatum* (Keng) S. M. Phillips & S. L. Chen, **comb. nov.**

披针叶莠竹 pi zhen ye you zhu

Basionym: *Ischaemum lanceolatum* Keng, J. Wash. Acad. Sci. 21: 155. 1931.

Perennial, forming large tussocks. Culms stiff, up to 40 cm tall, branched below, many-noded, nodes glabrous. Leaf sheaths glabrous or pubescent at junction with blade; leaf blades lanceolate, tough, glaucous, 3–8 × 0.3–1 cm, uppermost much reduced, glabrous, base constricted, margins firm, closely scabrid, apex acute; ligule firm, 2–3 mm. Racemes 2–3, subdigitate, erect, slender, 3–6 cm, brownish or purplish; rachis internodes linear, ciliate along angles, shorter than spikelet. Sessile spikelet 5–6 mm; callus hairs ca. 1 mm; lower glume lanceolate-oblong, papery, 4–7-veined, flat across back but grooved between median veins, keels indistinctly winged and scaberulous near apex, apex subentire; upper glume 3-veined, acute; lower floret with well-developed lemma and palea, lemma margins pilose above middle; upper lemma oblong, ca. 4 mm, bifid to middle or slightly below, outer margins of lobes pilose; awn of upper lemma 0.8–1.2 cm. Pedicelled spikelet laterally compressed, resembling sessile or rudimentary, shortly awned or awnless.

• Habitat unknown; 2800–3000 m. Yunnan.

This species is known only from the type gathering. It was first described in *Ischaemum*, but is anomalous in that genus because of its slender, linear rachis internodes and pedicels, and grooved lower glume of the sessile spikelet.

8. *Microstegium vimineum* (Trinius) A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 201. 1921.

柔枝莠竹 rou zhi you zhu

Andropogon vimineus Trinius, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 2: 268. 1833; *Arthraxon nodosus* Komarov; *Eulalia cantonensis* (Rendle) Hitchcock; *Microstegium cantonense* (Rendle) A. Camus; *M. dilatatum* Koidzumii; *M. imberbe* (Nees ex Steudel) Tzvelev; *M. nodosum* (Komarov) Tzvelev; *M. vimineum* subsp. *nodosum* (Komarov) Tzvelev; *M. vimineum* var. *imberbe* (Nees ex Steudel) Honda; *M. vimineum* var. *willdenowianum* (Nees ex Steudel) Sur; *M. willdenowianum* Nees ex Steudel; *Pollinia cantonensis* Rendle; *P. imberbis* Nees ex Steudel; *P. imberbis* var. *willdenowiana* (Nees ex Steudel) Hackel; *P. viminea* (Trinius) Merrill; *P. willdenowiana* (Nees ex Steudel) Benth.

Annual. Culms decumbent, up to 1 m long. Leaf sheaths shorter than internodes, upper usually enclosing cleistogamous spikelets; leaf blades narrowly elliptic, 4–9 × 0.5–0.8 cm, pubescent, often sparsely, midvein white, apex acuminate; ligule ca. 0.5 mm. Racemes 1–6, ascending, 4–6 cm; rachis internodes linear-clavate, ciliate, shorter than spikelet. Sessile spikelet 4–5.5 mm; lower glume narrowly lanceolate-oblong, back deeply grooved, puberulous-scaberulous or occasionally hispidulous, 0–4-veined between keels, veins connected by veinlets below apex, apex subtruncate; upper glume scabrid on keel, acuminate; lower floret reduced to an inconspicuous linear-lanceolate scale or absent; upper lemma lanceolate or oblong, 1–1.5 mm, acute or bidentate, awnless or shortly awned; awn weakly geniculate, often included within spikelet, up to 6(–9) mm; upper palea ovate, ca. 1 mm. Anthers 3, 0.5–1.5 mm. Fl. and fr. Aug–Nov.

Forest margins, moist grassy places. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Japan, Korea, Myanmar, Nepal, Philippines, Russia, Vietnam; SW Asia (Iran); introduced in America and elsewhere].

This is a variable species, usually with apparently awnless spikelets, where in fact a weakly developed awn is enclosed within the glumes. Sometimes the awn is exerted and obvious; rarely it is completely absent. The fertile lemma is accompanied by an ovate upper palea, clasping the opposite side of the caryopsis. Additionally an inconspicuous, linear-filiform remnant of the lower floret is often present.

9. *Microstegium reticulatum* B. S. Sun ex H. Peng & X. Yang, Acta Phytotax. Sin. 34: 213. 1996.

网脉莠竹 wang mai you zhu

Annual. Culms very slender, weak, decumbent, up to 50 cm tall. Leaf sheaths glabrous, without cleistogamous spikelets; leaf blades lanceolate to narrowly ovate, thin, 5–6 × 0.8–1.2 cm, pilose with tubercle-based hairs, base narrow, apex acute; ligule ca. 0.8 mm. Racemes 1–3(–4), 3–5 cm; rachis internodes

linear-clavate, ciliolate or glabrous. Sessile spikelet 5–6 mm, pallid with green veins; lower glume cartilaginous, back grooved, smooth or minutely scaberulous, flanks keeled above middle, veins reticulately connected by veinlets below apex and along most of length of glume flanks; upper glume smooth, acuminate; lower floret reduced to a small lanceolate scale; upper lemma lanceolate, ca. 1.5 mm, acute, awnless; upper palea ovate, 0.5–0.8 mm. Anthers 3, ca. 0.5 mm. Fl. and fr. Sep–Oct.

Roadsides, ditches, grasslands; 1500–2500 m. Yunnan [NE India].

This taxon represents an extreme local variant from the *Microstegium vimineum* complex. It is distinguished from typical *M. vimineum* by the combination of a more delicate habit, broader leaf blades, and a conspicuously reticulately veined lower glume.

10. *Microstegium delicatulum* (J. D. Hooker) A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 200. 1921.

荍弱莠竹 ren ruo you zhu

Pollinia delicatula J. D. Hooker, Fl. Brit. India 7: 117. 1896 [“1897”].

Annual. Culms very slender, weak, rambling, ascending to ca. 50 cm, nodes pilose. Leaf sheaths glabrous or with scattered setae, one margin ciliate; leaf blades linear-elliptic, thin, flaccid, 6–10 × 0.5–0.8 cm, thinly hispid on adaxial surface with tubercle-based hairs, puberulous on abaxial surface, base setose, apex acuminate, setaceous; ligule ca. 0.5 mm. Racemes 3–5, pale, slender, erect, 3–6 cm; rachis internodes linear, inflated upward, shorter than spikelet, margins ciliate. Sessile spikelet 2–2.5 mm; callus hairs ca. 1 mm; lower glume oblong, back flat or shallowly grooved, smooth, glossy, scabrid near apex, veins obscure, keels shortly ciliolate above middle, apex broadly obtuse; upper glume sharply keeled, apex acute, minutely mucronate; lower floret absent; upper lemma tiny, ca. 0.2 mm, broad, rounded; awn geniculate, 6–8 mm; upper palea ca. 0.2 mm. Anthers 3, ca. 1 mm. Pedicelled spikelet similar to sessile or reduced and awnless. Fl. and fr. Oct–Dec.

Forest margins; ca. 600 m. Yunnan [Myanmar, Thailand].

11. *Microstegium ciliatum* (Trinius) A. Camus, Ann. Soc. Linn. Lyon, n.s., 68: 201. 1921.

刚莠竹 gang you zhu

Pollinia ciliata Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 2: 305. 1833; *Andropogon biaristatus* Steudel; *A. formosanus* Rendle var. *minor* Rendle; *Microstegium biaristatum* (Steudel) Keng; *M. biforme* Keng; *M. ciliatum* var. *formosanum* (Hackel) Honda; *M. ciliatum* var. *integrum* Ohwi; *M. formosanum* (Hackel) A. Camus; *Pollinia ciliata* Trinius var. *formosana* (Hackel) Honda; *P. formosana* (Hackel) Hayata; *P. monantha* var. *formosana* Hackel.

Perennial. Culms wiry, creeping, 1 m or more long, pubescent below inflorescence, nodes glabrous or pilose. Leaf sheaths pilose or glabrous, one margin ciliate; leaf blades linear-elliptic, 6–16 × 0.5–1.5 cm, adaxial surface thinly pilose with short tubercle-based hairs, abaxial surface softly pilose, apex acuminate into a setaceous point; ligule 1–2 mm. Racemes

3–15, flexuous, usually pale green, fastigiate, 6–10 cm; rachis internodes linear, slightly inflated upward, shorter than spikelet, margins ciliate. Sessile spikelet 3–4 mm; callus hairs 1–1.5 mm; lower glume narrowly lanceolate, back sharply grooved at lower midline, glabrous or scaberulous toward apex, 2-veined between keels, upper keels stiffly pectinate-ciliate, apex 2-toothed; upper glume sharply keeled, apex acuminate into a 0.3–3 mm hairlike awnlet; lower lemma absent or very small; upper lemma linear or lanceolate, occasionally broader, 0.5–1 mm, apex usually entire; awn 1–2 cm, flexuous with weakly developed column and fine hairlike apex. Anthers 3, 0.8–1.5 mm. Fl. and fr. Sep–Dec.

Open woodlands, shady banks, pathsides, forming loose mats. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, India, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

This species is closely related to *Microstegium fasciculatum*, and the two are difficult to distinguish, at least in the herbarium. *Microstegium ciliatum* is a more slender species, forming loose mats rather than large, rambling colonies, usually with pale green rather than purplish inflorescences. The spikelets are narrower, with obviously longer, flexuous awns and an awned upper glume. Occasionally some spikelets in an inflorescence have tiny anthers (the basis of *M. biforme*).

The name “*Ischnochloa monostachya* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 65. 1997) has been placed in synonymy under this species (in Fl. Yunnan. 9: 637. 2003), but was not validly published because no Latin description was provided.

12. *Microstegium fasciculatum* (Linnaeus) Henrard, Blumea 3: 453. 1940.

蔓生莠竹 man sheng you zhu

Andropogon fasciculatus Linnaeus, Sp. Pl. 2: 1047. 1753; *A. formosanus* var. *minor* Rendle; *Microstegium gratum* (Hackel) A. Camus; *M. monanthum* (Nees ex Steudel) A. Camus; *M. vagans* (Nees ex Steudel) A. Camus; *Pollinia ciliata* var. *breviaristata* Rendle; *P. grata* Hackel; *P. monantha* Nees ex Steudel; *P. vagans* Nees ex Steudel.

Perennial. Culms rambling, rooting at base, branching, up to 4 m long, internodes sometimes pubescent, nodes pilose. Leaf sheaths pubescent to tuberculate-hispid, at least below blade, one margin ciliate; leaf blades narrowly elliptic, 10–18 × (0.5–)0.8–2 cm, pilose, more densely on abaxial surface, base sometimes setose, apex acuminate into a setaceous point; ligule 1–2 mm. Racemes 3–12, purplish, flexuous, fastigiate, 7–12 cm; rachis internodes linear, slightly inflated upward, shorter than spikelet, margins ciliate. Sessile spikelet 2.8–4 mm; callus hairs 1–1.5 mm; lower glume elliptic-oblong, back shallowly grooved or almost flat, scabrid-hispidulous, 2-veined between keels, upper keels stiffly pectinate-ciliate, apex subentire; upper glume sharply keeled, apex acuminate or with a brief mucro; lower floret usually absent; upper lemma ovate, ca. 0.5 mm, rounded to emarginate; awn geniculate with distinct column, 5–8 mm; upper palea lanceolate, 0.7–1.2 mm, obtuse or 3-dentate. Anthers 3, 1.5–2.5 mm. Fl. and fr. Aug–Jan. *2n* = 80.

Forming extensive colonies, moist banks, slopes, usually in shade. Guangdong, Guizhou, Hainan, Hubei, Sichuan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Thailand, Vietnam; Africa].

Normally the lower floret is completely absent in this species. In a few gatherings (including the type of *Pollinia vagans*) the lower floret is represented by a well-developed palea supporting stamens. A specimen from Hong Kong has a rudimentary lower lemma, but no lower palea. The presence or absence of parts of the lower floret appears to be of no taxonomic significance.

13. *Microstegium multiciliatum* B. S. Sun, J. Yunnan Univ. 21: 95. 1999 [*"multicilliatum"*].

多纤毛莠竹 duo xian mao you zhu

Perennial. Culms rambling, robust, thinly pilose, nodes pubescent. Leaf sheaths hispid with tubercle-based hairs; leaf blades oblong-elliptic, up to 23–25 × 2–2.5 cm, thinly pilose with tubercle-based hairs, base setose, apex acuminate into a

setaceous point; ligule 1.5–2 mm. Racemes ca. 10, whitish tinged purple, 9–12 cm; rachis internodes linear, slightly inflated upward, equaling or shorter than spikelet, margins ciliate. Sessile spikelet 4.5–5 mm; callus hairs 1–1.5 mm; lower glume narrowly oblong, back grooved below middle, smooth except below apex, upper keels stiffly pectinate-ciliate, obscurely 2-veined between keels, apex subentire; upper glume sharply keeled, upper margins broadly hyaline, fimbriate, apex subacute; lower floret absent or represented by ca. 1 mm scale; upper lemma 0.8–1 mm, deeply 2-lobed, lobes lanceolate, ciliate; awn geniculate with distinct column, 10–12 mm; upper palea broad, ca. 1.5 mm, 3-dentate, apex ciliate with ca. 1.5 mm hairs. Anthers 3, 3–3.5 mm.

• Mountain slopes. W Yunnan (Tengchong).

196. *APOCOPIS* Nees, Proc. Linn. Soc. London 1: 93. 1841.

楔颖草属 xie ying cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Amblyachyrum Hochstetter ex Steudel.

Annual or perennial. Culms slender. Leaf blades linear; ligule short, membranous. Inflorescence terminal, composed of (1 or)2(–4) erect, closely appressed racemes; racemes fragile, spikelets imbricate, usually single, sessile spikelets present, pedicelled spikelets normally suppressed, sometimes a few basal spikelets enlarged, barren, awnless; rachis internodes shorter than spikelets, linear, ciliate; pedicels slender, partly adnate to margin of lower glume, occasionally bearing a rudimentary spikelet (developed in *A. intermedius*). Sessile spikelet dorsally compressed, florets 2; callus obtuse; lower glume papery to leathery, broad, flattened, 7(–9)-veined, apex broadly truncate or emarginate; upper glume narrowly lanceolate, 3-veined, 2-keeled, margins inflexed; lower floret staminate, lower lemma and palea similar, hyaline; upper floret variable, female, bisexual, male or barren, upper lemma linear-lanceolate, entire or 2-toothed, with geniculate puberulous awn, infrequently awnless, palea shorter and broader. Lodicules absent. Stamens 2.

Fifteen species: tropical Asia; four species (one endemic) in China.

- 1a. Lower glume dark brown with pale yellowish transverse apical band; awn usually absent 1. *A. paleaceus*
- 1b. Lower glume pale greenish yellow with dark red transverse apical band; awn present.
 - 2a. Sessile spikelet 6–9 mm, upper floret male or barren; pedicelled spikelet present, female, awned 4. *A. intermedius*
 - 2b. Sessile spikelet 3.5–6 mm, upper floret bisexual; pedicelled spikelet absent.
 - 3a. Sessile spikelet 3.5–4 mm; lower glume papery, obovate-cuneate 2. *A. breviglumis*
 - 3b. Sessile spikelet 4.5–6 mm; lower glume herbaceous, obovate 3. *A. wrightii*

1. *Apocopis paleaceus* (Trinius) Hochreutiner, Bull. New York Bot. Gard. 6: 262. 1910.

楔颖草 xie ying cao

Ischaemum paleaceum Trinius, Mém. Acad. Imp. Sci. St.-Petersbourg, Sér. 6, Sci. Math. 2: 293. 1833; *Andropogon himalayensis* Steudel; *A. paleaceus* (Trinius) Steudel; *Apocopis himalayensis* (Steudel) W. Watson; *A. royleanus* Nees.

Perennial with spreading rhizomes. Culms tufted, up to 60 cm tall, 3–7-noded. Leaf sheaths glabrous below middle, tuberculate-hispid toward blade; leaf blades linear-lanceolate, 2.5–7 × 0.2–0.6 cm, tuberculate-hispid, rarely glabrous, margins thickened, sometimes pectinate-hispid, apex acute; ligule 0.5–1 mm. Racemes 2–4, 2–4 cm; rachis internodes 2–2.5 mm, golden ciliate; pedicel golden bearded. Sessile spikelet 3.8–5 mm; callus golden bearded; lower glume broadly oblong, leathery, dark brown with a pale yellowish scarious band around apex and upper margins, glabrous, 2 outermost veins on each

side connected below apex, connected vein minutely exserted, apex truncate, erose-denticulate, ciliolate; florets subequaling glumes; lower lemma lanceolate, apex obtuse to truncate; upper lemma apex truncate, awnless, or 2-denticulate, mucronate to shortly awned. Anthers 2.5–3 mm. Pedicelled spikelet absent. Fl. and fr. Apr–Aug.

Open hillsides. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, N India, Laos, Malaysia, Myanmar, Nepal, Vietnam].

Some specimens from NE India have exserted, geniculate awns to 7 mm long.

2. *Apocopis breviglumis* Keng & S. L. Chen, Acta Phytotax. Sin. 13(1): 59. 1975.

短颖楔颖草 duan ying xie ying cao

Perennial. Culms loosely tufted, glabrous, ca. 50 cm tall, 7–9-noded. Leaf sheaths pilose, hairs denser toward ligule; leaf blades linear or linear-lanceolate, 3–13 × 0.25–0.6 cm, upper-

most very reduced, tuberculate-pilose, apex acuminate; ligule ca. 1 mm. Racemes 2, 2.5–4.5 cm, lowermost spikelets barren, awnless; rachis internodes ca. 2 mm, yellowish brown ciliate. Sessile spikelet 3.5–4 mm; callus yellowish brown bearded; lower glume obovate-cuneate, firmly herbaceous, glabrous, greenish yellow with a scarious red-brown band across apex, veins straight, terminating below apex, connected there by transverse veinlets, apex truncate, erose, ciliate; florets longer than upper glume, exerted apices red; lower lemma oblong, truncate-denticulate, ciliate; upper lemma apex subentire, awned; awn 2.2–2.8 cm. Pedicelled spikelet absent. Fl. and fr. summer–autumn.

• Grassy mountain slopes. S Sichuan, N Yunnan.

This species is similar to *Apocopsis wrightii*, but with smaller, broader spikelets.

3. *Apocopsis wrightii* Munro, Proc. Amer. Acad. Arts 4: 363. 1860.

瑞氏楔颖草 rui shi xie ying cao

Perennial. Culms tufted, wiry at base, 30–60 cm tall, branching above base, 6–7-noded. Leaf sheaths glabrous or pilose; leaf blades linear, 8–12 × (0.2–)0.3–0.6 cm, uppermost very reduced, tuberculate-pilose, rarely glabrous, apex acuminate; ligule ca. 1 mm. Racemes 2, 3–5 cm, lowermost spikelets barren, awnless; rachis internodes 1.5–2 mm, yellowish brown ciliate; pedicel yellowish brown bearded. Sessile spikelet 4.5–6 mm; callus yellowish brown bearded; lower glume obovate-oblong, firmly herbaceous, glabrous or thinly hispid, greenish yellow with a scarious red-brown band across apex, veins green, straight, terminating below apex, connected there by transverse veinlets, apex truncate, erose, ciliate; florets longer than lower glume, exerted apices red; lower lemma oblong-lanceolate; upper lemma apex 2-denticulate or subentire, awned; awn geniculate, 2–3 cm. Anthers ca. 2.5 mm. Pedicelled spikelet absent or rudimentary. Fl. and fr. Aug–Oct.

Dry grassy hillsides. Anhui, Fujian, Guangdong, Guangxi, Jiangxi, Yunnan, Zhejiang [Thailand].

4. *Apocopsis intermedius* (A. Camus) Chai-Anan, Thai Forest Bull., Bot. 6: 46. 1972.

异穗楔颖草 yi sui xie ying cao

Lophopogon intermedium A. Camus, Bull. Mus. Natl. Hist. Nat. 25: 285. 1919; *Apocopsis heterogamus* Keng & S. L. Chen; *A. tridentatus* Benth var. *intermedius* (A. Camus) Roberty; *A. wrightii* Munro var. *macranthus* S. L. Chen; *Sclerandrium intermedium* (A. Camus) C. E. Hubbard.

Perennial, shortly rhizomatous. Culms erect, ca. 50 cm tall, 7–9-noded. Leaf sheaths glabrous to hirsute; leaf blades linear-lanceolate, 6–15 × 0.3–0.5 cm, uppermost very reduced, tuberculate-pilose when young, or sometimes densely hispid; ligule ca. 1.5 mm. Racemes 2, 2–4 cm, lowermost spikelets barren, awnless; rachis internodes 2.5–3 mm, loosely ciliate with yellowish brown soft hairs. Sessile spikelet 6–9 mm; callus hairs yellowish brown; lower glume oblong, firmly herbaceous, glabrous or hispid, greenish yellow with a scarious brown or red band across apex, veins green, straight, terminating below apex, with transverse veinlets, apex truncate, ciliate; florets longer than lower glume, exerted apices red; lower lemma oblong-lanceolate; upper floret usually barren, lemma linear-lanceolate, apex entire or 2-toothed, awned; awn geniculate, 2–3 cm. Anthers 4–5 mm. Pedicelled spikelet developed, ca. 5 mm; glumes pilose, lower glume narrowly oblong-lanceolate, apex obtuse, upper floret female, lemma awned; awn 2–3 cm. Fl. and fr. autumn.

Streams, valleys, roadsides. Guangdong, S Yunnan, Zhejiang [Thailand, N Vietnam].

This species is anomalous in *Apocopsis* in possessing a developed pedicelled spikelet, which is female with the stigmas often exerted and visible. This is typical of the related genus *Germainia*, but that has a tough rachis with the fertile pedicelled spikelets falling from the raceme. In *A. intermedius* the base of the pedicel is fused to the margin of the lower glume of the sessile spikelet, as is usual in *Apocopsis*, and it appears to be very close to *A. wrightii*.

197. *GERMAINIA* Balansa & Poitrasson, Bull. Soc. Hist. Nat. Toulouse 7: 344. 1873.

吉曼草属 ji man cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial or annual. Leaf blades linear; ligule short, membranous. Inflorescence terminal, composed of 1 or 2(–6) digitate racemes; racemes with large imbricate persistent sessile spikelets covering smaller pedicelled deciduous spikelets; rachis internodes tough, short, or almost absent and then inflorescence capitate and sessile spikelets forming an involucre, the lower sometimes lacking a pedicelled spikelet. Sessile spikelet male or barren, dorsally compressed, florets usually 2; lower glume lanceolate to oblong, leathery or papery, broadly convex, 7–9-veined, apex truncate or denticulate or retuse; upper glume longer and narrower than lower glume, membranous, 3-veined, apex truncate; upper lemma awnless or rarely mucronate. Pedicelled spikelet fertile, subterete, floret 1(–2); callus pungent, obliquely attached to pedicel; lower glume apex truncate; lower floret usually suppressed; upper lemma entire, stipitiform, awned; awn geniculate, pubescent. Lodicules absent. Stamens 2.

Nine species: NE India to SE Asia and Australia; one species in China.

1. *Germainia capitata* Balansa & Poitrasson, Bull. Soc. Hist. Nat. Toulouse 7: 344. 1873.

吉曼草 ji man cao

Perennial; basal sheaths persistent, glabrous to tomentose. Culms tufted, erect, 50–60 cm tall, unbranched. Leaf sheaths glabrous or pilose; leaf blades erect, stiff, 5–35 × 0.3–0.9 cm, pubescent to glabrous, margins scabrid, acuminate; ligule scari-

ous, ca. 1 mm. Raceme 1(–2) on a long stiff peduncle, 2–3 cm, greenish, narrowly capitulate. Sessile spikelets 4, involucrelike, 1.3–2.2 cm, 2 florets present; lower glume oblong, leathery, smooth, glabrous or sparsely pilose, apex retuse to obliquely 2-toothed; upper glume puberulous, apex rounded to truncate; lemmas and paleas reddish brown, subhyaline; stamens 2 in each floret; anthers 6–8 mm. Pedicelled spikelets 3, dark brown; pedicel 5–7 mm; callus stiffly bearded, hairs brown; lower glume narrowly lanceolate-

oblong, leathery, puberulous; awn 2-geniculate, stout, 6–9.5 cm, column hispidulous, limb shorter than column, puberulous. Fl. and fr. autumn.

Dry hillsides; 800–1000 m. Guangdong, Yunnan (Lingchuan) [Indonesia, New Guinea, Thailand, Vietnam; Australia].

The elongate involucre of hard sessile spikelets, tipping the culms after the long-awned pedicellate spikelets have fallen, are an unmistakable feature of this grass.

198. *SORGHUM* Moench, Methodus, 207. 1794, nom. cons., not *Sorgum* Adanson (1763).

高粱属 gao liang shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Andropogon subg. *Sorghum* Hackel.

Perennial or annual, with or without rhizomes. Culms usually robust, erect. Leaf blades linear to linear-lanceolate; ligule a ciliate membrane. Inflorescence a large terminal panicle with elongate central axis; primary branches simple or branched, bearing short dense racemes of paired spikelets; racemes fragile (tough in cultivated species); rachis internodes and pedicels slender, ciliate. Sessile spikelet dorsally compressed; callus obtuse, bearded, inserted into internode apex; lower glume usually leathery, shallowly convex, rounded on flanks, becoming 2-keeled and winged upward, usually hairy, apex membranous; upper glume boat-shaped, keeled upward; lower floret reduced to an empty hyaline lemma; upper lemma 2-toothed, awned from sinus or infrequently awnless; awn bigeniculate, glabrous. Lodicules ciliate. Pedicelled spikelet well developed or reduced to a glume, usually much narrower than sessile spikelet, awnless.

About 30 species: tropics and subtropics of the Old World, one species endemic to Mexico, otherwise introduced in America; five species (three introduced) in China.

The genus includes species of agricultural importance, including the tropical cereal sorghum, and several species grown for forage.

- 1a. Nodes of culm conspicuously bearded; panicle branches simple 1. *S. nitidum*
- 1b. Nodes of culms glabrous or shortly pubescent; panicle branches subdivided.
 - 2a. Plants with rhizomes; wild.
 - 3a. Culms slender, 0.5–1.5 m tall; panicle lanceolate, 20–40 cm; sessile spikelet elliptic; lower glume apex clearly 3-denticulate 2. *S. halepense*
 - 3b. Culms robust, 1.5–3 m tall; panicle ovate, 30–55 cm; sessile spikelet ovate; lower glume apex apiculate or obscurely denticulate 3. *S. propinquum*
 - 2b. Plants without rhizomes; usually cultivated.
 - 4a. Panicle rather lax; racemes usually tardily fragile at maturity; sessile spikelets elliptic, 6–7.5 mm; grain enclosed by the glumes 4. *S. sudanense*
 - 4b. Panicle often dense; racemes tough at maturity; sessile spikelets ovate to subrotund, 3.5–6 mm; grain large, exposed between the gaping glumes 5. *S. bicolor*

1. *Sorghum nitidum* (Vahl) Persoon, Syn. Pl. 1: 101. 1805.

光高粱 guang gao liang

Holcus nitidus Vahl, Symb. Bot. 2: 102. 1791; *Andropogon nitidus* (Vahl) Kunth; *A. serratus* Thunberg var. *nitidus* (Vahl) Hackel; *Holcus fulvus* R. Brown; *H. fulvus* var. *nitidus* (Vahl) Honda; *Sorghum fulvum* (R. Brown) P. Beauvois; *S. nitidum* var. *fulvum* (R. Brown) Handel-Mazzetti.

Perennial forming loose tufts. Culms erect, 0.6–2 m tall; nodes bearded with pale spreading hairs. Leaf sheaths glabrous or pilose; leaf blades linear, 10–40(–50) × 0.4–1 cm, glabrous to hispid, bearded at base; ligule 1–1.5 mm. Panicle lanceolate in outline, 15–30 cm, glabrous but with soft hairs at the nodes; primary branches whorled, simple, flexuous, 2–5 cm, lower part bare; racemes borne at branch ends, fragile, composed of 2–4

spikelet pairs; internodes and pedicels brown-ciliate. Sessile spikelet ovate-lanceolate, 3.5–5 mm; lower glume leathery, black-brown at maturity, glossy, glabrous below middle, upper part and margins hispid with brown hairs; upper lemma awnless or awned; awn 1–1.5 cm. Pedicelled spikelet usually staminate, elliptic, 3–3.7 mm, papery, light brown. Fl. and fr. summer–autumn. $2n = 10, 20$.

Meadows, grassy hillsides; 300–1400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand; NE Australia, Pacific Islands].

This is a distinctive species not closely related to others found in China. It is easily recognizable by its conspicuously bearded nodes and small, blackish, glossy spikelets. It occurs in both awned and awnless forms.

2. *Sorghum halepense* (Linnaeus) Persoon, Syn. Pl. 1: 101. 1805.

石茅 shi mao

Holcus halepensis Linnaeus, Sp. Pl. 2: 1047. 1753; *Andropogon halepensis* (Linnaeus) Brotero; *A. sorghum* (Linnaeus) Brotero subsp. *halepensis* (Linnaeus) Hackel.

Perennial with vigorous spreading rhizomes. Culms 0.5–1.5 m tall, 4–6 mm in diam.; nodes puberulous. Leaf sheaths glabrous; leaf blades linear or linear-lanceolate, 25–80 × 1–4 cm, glabrous; ligule 0.5–1 mm, glabrous. Panicle lanceolate to pyramidal in outline, 20–40 cm, soft white hairs in basal axil; primary branches solitary or whorled, spreading, lower part bare, upper part branched, the secondary branches tipped by racemes; racemes fragile, composed of 2–5 spikelet pairs. Sessile spikelet elliptic, 4–5 mm; callus obtuse, bearded; lower glume subleathery, often pale yellow or yellowish brown at maturity, shortly pubescent or glabrescent, 5–7-veined, veins distinct in upper part, apex 3-denticulate; upper lemma acute and mucronate or 2-lobed and awned; awn 1–1.6 cm. Pedicelled spikelet staminate, narrowly lanceolate, 4.5–7 mm, often violet-purple. Fl. and fr. summer–autumn. $2n = 40$.

Introduced. Streams, valleys, waste ground, a weed in fields. Anhui, Fujian, Guangdong, Hainan, Sichuan, Taiwan, Yunnan [India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, S Europe].

This species is thought to have originated in the Mediterranean region, but is now widely distributed as a serious weed in warm-temperate regions of the world. The forage known as Johnson Grass is a selection of *Sorghum halepense*. It introgresses with grain sorghum (*S. bicolor*) where both species grow together.

3. *Sorghum propinquum* (Kunth) Hitchcock, Lingnan Sci. J. 7: 249. 1931 [“1929”].

拟高粱 ni gao liang

Andropogon propinquus Kunth, Enum. Pl. 1: 502. 1833; *A. halepensis* (Linnaeus) Brotero var. *propinquus* (Kunth) Hackel; *A. sorghum* (Linnaeus) Brotero var. *propinquus* (Kunth) Hackel.

Perennial, loosely tufted with a few stout rhizomes. Culms 1.5–3 m tall, up to 1 cm in diam., many-noded; nodes puberulous. Leaf sheaths glabrous, ciliate at mouth and margins; leaf blades yellowish green, linear or linear-lanceolate, 40–90 × 3–5 cm, glabrous, midvein robust, margins ciliate; ligule 0.5–1 mm, puberulous. Panicle open, ovate or broadly ovate, 30–55 cm; primary branches in whorls of 3–6; lower part bare, upper part branched, branches tipped by racemes; racemes fragile, composed of 3–7 spikelet pairs. Sessile spikelet ovate, 3.8–4.5 mm; callus obtuse, pubescent with pale hairs; lower glume subleathery, pale or purple-tinged, thinly pilose, 9–13-veined, veins distinct in upper part, apex acute to apiculate or tridentate; upper lemma acute or emarginate, awnless, rarely with short awn. Pedicelled spikelet staminate, linear-lanceolate, 4–5.5 mm, yellowish to pale purple. Fl. and fr. summer–autumn. $2n = 20$.

Streambanks, moist places. Fujian, Guangdong, Hainan, Sichuan,

Taiwan, Yunnan (Funing, Hekou) [S India, Indonesia, Malaysia, Philippines, Sri Lanka].

This species is closely related to *Sorghum halepense*, but is diploid, is larger with a more profuse panicle, and has a different geographic distribution. It is sometimes used for fodder. A form with larger (4.5–5 mm) sessile spikelets, *S. propinquum* var. *siamense* (Piper) Snowden, occurs from S India to Thailand, but has not been found in China.

4. *Sorghum sudanense* (Piper) Stapf in Prain, Fl. Trop. Africa 9: 113. 1917.

苏丹草 su dan cao

Andropogon sorghum subsp. *sudanensis* Piper, Proc. Biol. Soc. Washington 28(4): 33. 1915; *A. sudanensis* (Piper) Leppan & Bosman; *Sorghum vulgare* Persoon var. *sudanense* (Piper) Hitchcock.

Annual. Culms 1–2.5 m tall, 3–6 mm in diam. Leaf sheaths glabrous or pilose at mouth and base; leaf blades linear or linear-lanceolate; 15–30 × 1–3 cm, glabrous; ligule brown. Panicle lax, 15–30 × 6–12 cm; branches slender, branched; racemes usually tardily fragile at maturity, composed of 2–5 spikelet pairs. Sessile spikelet elliptic, 6–7.5 mm; callus hairy; lower glume leathery, thinner upward, thinly strigillose, distinctly 11–13-veined; upper lemma ovate or ovate-elliptic, apex 2-lobed, awned; awn 10–16 mm. Pedicelled spikelet male or barren, linear-lanceolate, persistent. Caryopsis elliptic or obovate-elliptic, 3.5–4.5 mm, enclosed within glumes. Fl. and fr. Jul–Sep. $2n = 20$.

Naturalized. Anhui, Beijing, Fujian, Guizhou, Heilongjiang, Henan, Nei Mongol, Ningxia, Shaanxi, Xinjiang, Zhejiang [native to Africa; now widely cultivated for forage].

This taxon is a cultivated selection (Sudan Grass) from *Sorghum × drummondii* (Steudel) Millspaugh & Chase. It originated in Africa, but is widely grown for forage and is now naturalized in China. *Sorghum × drummondii* is a general name given to the wide variety of weedy forms that have arisen in Africa by hybridization between the cereal *S. bicolor* and its wild progenitor *S. arundinaceum* (Desvaux) Stapf.

5. *Sorghum bicolor* (Linnaeus) Moench, Methodus, 207. 1794.

高粱 gao liang

Holcus bicolor Linnaeus, Mant. Pl. 2: 301. 1771; *Andropogon bicolor* (Linnaeus) Roxburgh; *A. sorghum* (Linnaeus) Brotero; *A. sorghum* var. *technicus* Körnicke; *Holcus cernuus* Arduino; *H. dochna* Forsskål; *H. sorghum* Linnaeus; *Sorghum cernuum* (Arduino) Host; *S. dochna* (Forsskål) Snowden; *S. nervosum* Besser ex Schultes; *S. technicum* (Körnicke) Rosh-e-vitz; *S. vulgare* Persoon, nom. illeg. superfl.

Annual. Culms erect, robust, 3–5 m tall, 2–5 cm in diam.; nodes glabrous or pubescent. Leaf sheaths glabrous or slightly farinose; leaf blades linear or linear-lanceolate, 40–70 × 3–8 cm, glabrous; ligule subrounded, ciliate. Panicle very variable, lax or dense, cylindrical or pyramidal to obovate in outline, up to 60 cm, main axis elongate to very short; primary branches ascending or spreading, lower branches sometimes almost as long as panicle, stiff or pendulous; racemes tough at maturity, composed of 2–6 spikelet pairs. Sessile spikelet variable, broadly obovate to subglobose, 3.5–5.5 mm; callus hispid; lower glume leathery to papery, glabrous to pilose, pale creamy-

green to dark brown or blackish at maturity, upper lemma usually awned; awn 0.4–1.5 cm. Pedicelled spikelet male or barren, linear-lanceolate, persistent or deciduous. Caryopsis large, often exposed between the gaping glumes. Fl. and fr. Jun–Sep. $2n = 20$.

Cultivated in China [native to Africa; widely cultivated in the tropics].

Sorghum bicolor is the important, tropical cereal sorghum. Originating in Africa, its cultivation for both grain and fodder spread throughout the tropics and subtropics of the Old World. It was introduced with the slave trade to America, including warm parts of the United States. It is now cultivated throughout most of China.

There is a multiplicity of forms of cultivated sorghum, derived by human selection and all fully interfertile. Some forms have sweet culms. Many species names have been proposed in the past in an attempt to categorize this variation, but they represent no more than intergrading cultivars within the common species pool.

The name *Holcus saccharatus* Linnaeus (*Sorghum saccharatum* (Linnaeus) Moench) has been identified as this species, but its application is uncertain (see Davidse & Turland in Taxon 50: 577–580. 2001) and the name has been formally rejected.

The principal races grown in China are as follows.

‘bicolor’

高粱 gao liang

Panicle loose with long branches, to 40 cm. Sessile spikelets broadly obovate; glumes leathery, glossy. Grain relatively small, enclosed within the glumes or only the top protruding.

Cultivated for grain; a primitive type.

‘cernuum’

弯头高粱 wan tou gao liang

Panicle elliptic or ovate-elliptic, dense, 8–20 cm, curved or erect. Sessile spikelets broadly ovate, whitish; glumes thin, papery, transversely wrinkled, densely white-villous to glabrescent. Grain pale, subrotund to orbicular, usually much flattened, protruding beyond the glumes.

Cultivated in Xinjiang for grain and forage.

‘dochna’

甜高粱 tian gao liang

Culms with sweet juice. Panicle elongate, to 50 cm; branches racemose or corymbose, the lower ones half as long as panicle or more. Sessile spikelets broadly elliptic to obovate; glumes crustaceous, striately veined above middle. Grain elliptic or elliptic-oblong, enclosed by the glumes or only slightly protruding.

Cultivated for grain and forage throughout most of China, including forms used for making brooms.

‘nervosum’

多脉高粱 duo mai gao liang

Panicle elongate, dense, elliptic in outline, to 40 cm. Sessile spikelets elliptic to broadly elliptic; glumes papery, prominently veined ± throughout. Grain broadly elliptic, protruding beyond the glumes.

Cultivated for grain, mainly in N China.

199. PSEUDOSORGHUM A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 662. 1920.

假高粱属 jia gao liang shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual. Leaf blades cauline, linear; ligule membranous, margin ciliate. Inflorescences terminal and also axillary, contracted, composed of a central axis bearing fascicles of racemes; racemes with several to many spikelet pairs, narrow, 1-sided, fragile; rachis internodes and pedicels slenderly linear, white ciliate on edges. Sessile spikelet dorsally compressed, lanceolate-oblong; callus very small, obtuse, bearded with long silky hairs, inserted into internode apex; glumes firmly cartilaginous, glossy, lower glume shallowly convex, rounded on flanks becoming keeled upward, apex narrowly truncate; upper glume boat-shaped; lower floret reduced to an empty hyaline lemma; upper lemma deeply 2-lobed, lobes ciliate, awned from sinus; awn geniculate, glabrous. Lodicules glabrous. Pedicelled spikelet male or barren, somewhat narrower than sessile, awnless.

One species: tropical Asia, including China.

1. Pseudosorghum fasciculare (Roxburgh) A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 662. 1920.

假高粱 jia gao liang

Andropogon fascicularis Roxburgh, Fl. Ind. 1: 269. 1820; *A. tonkinensis* Balansa; *A. zollingeri* Steudel; *Bothriochloa gracilis* W. Z. Fang; *B. yunnanensis* W. Z. Fang; *Pseudosorghum zollingeri* (Steudel) A. Camus; *Sorghum fasciculare* (Roxburgh) Haines; *S. zollingeri* (Steudel) Kuntze.

Plant tufted. Culms slender, erect or ascending, up to 2 m, many-noded, simple or branched below, nodes glabrous. Leaf

sheaths usually with tubercle-based hairs; leaf blades linear, 10–40 × 0.4–1 cm, glabrous on both surfaces, margins scaberrulous, apex acute; ligule 2–4 mm. Inflorescence 4–13 cm, fascicles with up to 10 racemes; racemes composed of 5–15 spikelet pairs. Sessile spikelet 3.8–4.5 mm, yellowish or purplish; lower glume smooth, glossy, scabrid-puberulous near apex; upper slightly longer than lower; upper lemma ca. 2 mm; awn 1.2–1.8 cm. Pedicelled spikelet narrowly lanceolate, male or barren, glumes sometimes enclosing hyaline lemmas.

Damp places; below 1000 m. Yunnan [India, Indonesia, Myanmar, Philippines, Thailand, Vietnam].

200. CHRYSOPOGON Trinius, Fund. Agrost. 187. 1820, nom. cons.金须茅属 *jin xu mao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Centrophorum Trinius, nom. rej.; *Pollinia* Sprengel, nom. rej.; *Rhaphis* Loureiro, nom. rej.; *Vetiveria* Bory.

Perennial, tufted or with spreading rhizomes. Leaf blades mostly basal, usually narrow; ligule a short ciliate rim or line of hairs. Inflorescence a lax terminal panicle; primary branches whorled, filiform, usually unbranched, each bearing a raceme; racemes composed of few to many spikelet pairs, or more usually reduced to a triad of 1 sessile bisexual spikelet flanked by 2 pedicellate male or barren spikelets; rachis internodes and pedicels slender. Sessile spikelet laterally compressed; callus elongate, acute to pungent, usually bearded; lower glume cartilaginous to leathery, often spinulose; upper glume boat-shaped, usually shortly awned; lower floret reduced to an empty hyaline lemma; upper lemma entire or 2-toothed, awned from apex or sinus or infrequently awnless; awn geniculate, glabrous to pubescent. Pedicelled spikelet dorsally compressed, well developed or reduced, male or barren.

Forty-four species: tropical and warm-temperate regions of the Old World, mainly in Asia and Australia, one species in the SE United States (Florida) and Cuba; four species (one introduced) in China.

Vetiveria has traditionally been separated from *Chrysopogon* on the basis of its longer racemes composed of a number of spikelet pairs in addition to the terminal triad. However, it has long been known that intermediates exist, and present knowledge of the group shows that separation into two genera is no longer tenable.

- 1a. Racemes composed of 5–13 spikelet pairs and a terminal triad; callus rounded, subglabrous; plant cultivated 1. *C. zizanioides*
 1b. Racemes reduced to a triad of 1 sessile and 2 pedicelled spikelets (rarely with 1–4 spikelet pairs); callus pungent, bearded; plant wild.
 2a. Lower glume of sessile spikelet tuberculate-spinulose; sessile spikelets ca. 7 mm; culms robust, often more than 1 m tall 2. *C. gryllus*
 2b. Lower glume of sessile spikelet not spinulose; sessile spikelets 4–6 mm; culms 20–90 cm tall.
 3a. Upper lemma of sessile spikelet with geniculate 4–6 cm awn; pedicels with golden hairs 3. *C. orientalis*
 3b. Upper lemma of sessile spikelet with straight 0.4–0.7 cm awn; pedicels glabrous 4. *C. aciculatus*

1. *Chrysopogon zizanioides* (Linnaeus) Roberty, Bull. Inst. Franç. Afrique Noire 22: 106. 1960.

香根草 *xiang gen cao*

Phalaris zizanioides Linnaeus, Mant. Pl. 2: 183. 1771;
Vetiveria zizanioides (Linnaeus) Nash.

Tussocky perennial; roots stout, aromatic. Culms robust, 1–2.5 m tall, ca. 5 mm in diam. Leaf sheaths glabrous, lower sharply keeled and imbricate in fanlike clusters; leaf blades linear, pale green, stiff, 30–90 × 0.5–1 cm, pilose on adaxial surface toward base, otherwise glabrous; ligule a scarious rim. Panicle oblong in outline, 20–30 cm, usually contracted, purplish; branches numerous, lowermost 5–20 cm, bare at base, smooth or slightly scaberrulous; racemes slender, with 5–13 spikelet pairs and a terminal triad; internodes and pedicels slightly scabrid. Sessile spikelet linear-lanceolate to almost linear, 4–5 mm; callus rounded, subglabrous; lower glume mucronate, 3–5-veined, veins spinulosely aculeate, apex acute; upper glume spinulosely aculeate on keel, not awned; upper lemma slightly 2-toothed, awnless or mucronate; mucro 0–2 mm, not exerted. Pedicelled spikelet staminate, sparingly aculeolate or almost smooth. Fl. and fr. Aug–Oct. $2n = 20$.

Commonly cultivated. Fujian, Guangdong, Hainan, Jiangsu, Sichuan, Taiwan, Yunnan (Xixuangbanna), Zhejiang [native to India; cultivated elsewhere].

This species (Vetiver Grass) is said to have originated in India, but is now distributed throughout warm parts of the Old World and introduced into the S United States and West Indies. It has long been cultivated for the oil extracted from the aromatic roots, which is used in perfumery. More recently, its potential as a soil binder to prevent erosion

has been recognized. It is planted in hedges for this purpose, particularly along the contours of sloping ground. The deep, non-invasive root system holds the plants firm, while the stiff, dense leaves trap soil and prevent it being washed away. It is also used as a forage grass.

2. *Chrysopogon gryllus* (Linnaeus) Trinius, Fund. Agrost. 188. 1820.

刺金须茅 *ci jin xu mao*

Andropogon gryllus Linnaeus, Cent. Pl. 2: 33. 1756; *A. echinulatus* Nees ex Steudel; *A. gryllus* subsp. *echinulatus* (Nees ex Steudel) Hackel; *Chrysopogon echinulatus* (Nees ex Steudel) W. Watson; *C. gryllus* subsp. *echinulatus* (Nees ex Steudel) Cope; *Rhaphis gryllus* (Linnaeus) Trinius.

Perennial forming tough tussocks. Culms robust, up to 1.5 m tall, scabrid below panicle. Leaf sheaths strongly keeled at base; leaf blades linear, glaucous, up to 30 × 0.2–0.4 cm, sparsely to densely hispid with tubercle-based hairs or glabrous, apex subacute to acuminate; ligule ca. 0.5 mm, a ciliate rim. Panicle open to contracted, 6–25 cm, purplish; branches stiffly ascending to loosely spreading, 3–15 cm, tipped by a single triad or also with 1–4 spikelet pairs below the triad. Sessile spikelet ca. 7 mm; callus subacute, 1.3–1.7 mm, bearded with golden hairs, obliquely attached to branch apex; lower glume narrowly oblong, tuberculate-spinose along intumed flanks, sometimes hispidulous at apex, apex truncate or 2-toothed; upper glume hispid on keel toward apex, awnless, mucronate or with an awn up to 10 mm; upper lemma minutely 2-toothed, awned; awn geniculate, 1.2–3.5 cm, column puberulous. Pedicelled spikelet staminate, 7–11 mm; lower glume with 3.5–7 mm awn. Pedicel 2/3–3/4 length of sessile spikelet, glabrous. Fl. and fr. autumn.

Mountain slopes; ca. 2500 m. S Xizang, Yunnan (Menghai) [Afghanistan, Bhutan, India, Nepal, Pakistan; SW Asia (Caucasus, Iraq), Europe].

3. *Chrysopogon orientalis* (Desvaux) A. Camus in Lecomte, Fl. Indo-Chine 7: 332. 1922.

金须草 jin xu cao

Rhaphis orientalis Desvaux, Opusc. Sci. Phys. Nat. 69. 1831; *Andropogon wightianus* Nees ex Steudel; *Chrysopogon sinensis* Rendle.

Perennial, tufted, shortly rhizomatous. Culms 30–90 cm tall, glabrous or puberulous below inflorescence. Leaf sheaths glabrous or puberulous; leaf blades linear, 3–10 × 0.2–0.4 cm, lower margins tuberculate-setose, otherwise glabrous, apex subacute; ligule 0.2–0.7 mm. Panicle open, 6–20 cm, purplish brown; branches laxly spreading, 3.5–6 cm, tipped by a single triad. Sessile spikelet 4.7–5.5 mm; callus pungent, 2–4 mm, bearded with golden hairs, obliquely attached to branch apex; glumes leathery; lower glume narrowly lanceolate, smooth, glabrous, pilosulous near apex, apex obtuse; upper glume setulose on upper keel, awned, awn 1.2–1.8 cm; upper lemma entire, awned; awn geniculate, 4–6 cm, column puberulous. Pedicelled spikelet male or barren, 5.3–7 mm; lower glume with 5–15 mm awn. Pedicel 3/4 length of sessile spikelet, ciliate with golden hairs. Fl. and fr. Jun–Sep.

Hill slopes, coastal sand at low elevations. Fujian, Guangdong, Hainan [India, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

4. *Chrysopogon aciculatus* (Retzius) Trinius, Fund. Agrost. 188. 1820.

竹节草 zhu jie cao

Andropogon aciculatus Retzius, Observ. Bot. 5: 22. 1789; *Centrophorum chinense* Trinius.

Perennial with extensively creeping rhizomes, sward forming; rhizomes stout, close-noded. Culms decumbent at base or ascending, 20–50 cm tall. Leaf sheaths glabrous or ciliate at mouth; leaf blades broadly linear, 3–5 × 0.4–0.6 cm, glabrous or adaxial surface pilose near base, margins serrate, apex subacute; ligule 0.1–0.3 mm. Panicle dense, oblong in outline, 5–9 cm, purplish brown; branches erect when dry, 1.5–3 cm, tipped by a single triad. Sessile spikelet 3.5–4 mm; callus acicular, 4–6 mm, bearded with golden hairs, obliquely attached to branch apex; glumes leathery; lower glume lanceolate, 2-keeled upward, lower back smooth, glabrous, upper back thinner, keels hispidulous, apex acute to 2-toothed; upper glume setulose on upper keel, acuminate or mucronate, mucro 1–2 mm; upper lemma entire, awned; awn straight, 4–7 mm. Pedicelled spikelet staminate, 4–5.7 mm; lower glume acuminate or with mucro to 1 mm. Pedicel 3/4 length of sessile spikelet, glabrous. Fl. and fr. Jun–Oct. $2n = 20$.

Dry open grasslands, waste ground, lawns; 500–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam; Australia, Pacific Islands (Polynesia)].

Rarely, racemes of this species may have one or more spikelet pairs below the triad.

This is a ground-cover grass used for erosion control and lawns. It sometimes becomes a noxious weed. The needle-sharp callus on the diaspore can injure cattle and other animals, catching in fur and then penetrating the skin.

201. *DICHANTHIUM* Willemet, Ann. Bot. (Usteri) 18: 11. 1796.

双花草属 shuang hua cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Eremopogon Stapf; *Lepeocercis* Trinius.

Perennial, rarely annual. Leaf blades often cauline, linear; ligule membranous. Inflorescence of single or subdigitate racemes, terminal or also axillary and sometimes supported by spathes; racemes usually with 1 or more basal homogamous spikelet pairs, spikelets often imbricate; rachis internodes and pedicels slender, solid, bearded, truncate or oblique at apex. Sessile spikelet dorsally compressed; callus short, obtuse; lower glume papery to cartilaginous, broadly convex to slightly concave, sometimes pitted, rounded on flanks, becoming 2-keeled upward, apex obtuse; upper glume boat-shaped, dorsally keeled, awnless; lower floret reduced to an empty hyaline lemma; upper lemma stipitiform, entire, awned from apex; awn geniculate, glabrous or puberulous. Stamens (2–) 3. Pedicelled spikelet similar to the sessile, male or barren, awnless.

About 20 species: Africa through India to SE Asia and Australia; three species in China.

Dichanthium is closely related to *Bothriochloa*, but can be distinguished by its pedicels and rachis internodes being solid and lacking a median, purple line. The species present in China are not clear-cut and are also variable within themselves due to polyploidy and apomixis. All three species provide good grazing and now occur widely in tropical regions as introductions or escapes.

- 1a. Peduncle pilose below inflorescence 1. *D. aristatum*
- 1b. Peduncle glabrous.
 - 2a. Lower glume of sessile spikelet obovate, winged along keels; leaf sheaths compressed; ligule less than 1 mm, margin ciliate 2. *D. caricosum*
 - 2b. Lower glume of sessile spikelet oblong, not winged along keels; leaf sheaths terete; ligule 1–2 mm, margin lacerate 3. *D. annulatum*

1. *Dichanthium aristatum* (Poir.) C. E. Hubbard, Bull. Misc. Inform. Kew 1939: 654. 1939.

毛梗双花草 mao geng shuang hua cao

Andropogon aristatus Poir. in Lamarck, Encycl., Suppl. 1: 585. 1811; *A. caricosus* Linnaeus var. *mollicomus* (Kunth) Hackel; *A. mollicomus* Kunth.

Perennial. Culms geniculate to suberect, 20–60 cm tall, nodes glabrous or pubescent. Leaf sheaths usually longer than internodes; leaf blades flat, 1.5–8(–20) × 0.3–0.6 cm, glabrous or thinly pilose on both surfaces; ligule ca. 0.6 mm, minutely fimbriate. Inflorescence terminal; peduncle softly pilose near the summit; racemes (1–)2–4, subdigitate, 2–5 cm, with 1–6 pairs of homogamous spikelets. Sessile spikelet 3–5 mm; lower glume obovate, subleathery, 8–10-veined, pubescent on lower back, slightly glossy, margins glabrous or shortly ciliate, keels often narrowly winged, apex rounded; upper glume glabrous or ciliate along margins and keel; awn 1.2–2 cm. Caryopsis ca. 1.8 mm. Pedicelled spikelet many-veined, resembling sessile. Fl. and fr. Jun–Nov. $2n = 20, 40, 60$.

Hill slopes; 500–1500 m. Taiwan, Yunnan [India, Indonesia, Malaysia; introduced elsewhere].

This species is very close to, and may simply be a variant of, *Dichanthium caricosum*.

2. *Dichanthium caricosum* (Linnaeus) A. Camus, Bull. Mus. Natl. Hist. Nat. 27: 549. 1921.

单穗草 dan sui cao

Andropogon caricosus Linnaeus, Sp. Pl., ed. 2, 2: 1480. 1763.

Perennial, stoloniferous. Culms tufted at nodes of stolons, geniculately ascending, 30–60 cm tall, nodes glabrous or pubescent. Leaf sheaths compressed, keeled, shorter than internodes; leaf blades flat, 15–20 cm × 2.5–5 mm, glabrous or with a few hairs at base, margins smooth or scabrid, apex acuminate; ligule less than 1 mm, margin ciliate. Inflorescence terminal; peduncle

glabrous; racemes (1–)2–4, 2.5–5 cm, with 1–3 pairs of homogamous spikelets. Sessile spikelet 3–3.5 mm; lower glume obovate-elliptic or obovate-oblong, papery, 8–12-veined, glabrous or often sparsely hirsute on lower back, slightly glossy, margins shortly ciliate, keels winged, apex rounded; upper glume ciliate above middle, apex obtuse; awn 1.5–2.5 cm, weakly geniculate. Caryopsis obovate-oblong. Pedicelled spikelet many-veined, resembling sessile. Fl. and fr. Oct–Mar. $2n = 20, 40$.

Hill slopes, roadsides; 300–1000 m. Guizhou, Yunnan [India, Malaysia, Myanmar, Sri Lanka, Thailand; introduced elsewhere].

3. *Dichanthium annulatum* (Forsskål) Stapf in Prain, Fl. Trop. Africa 9: 178. 1917.

双花草 shuang hua cao

Andropogon annulatus Forsskål, Fl. Aegypt.-Arab. 173. 1775; *Bothriochloa tuberculata* W. Z. Fang; *Dichanthium annulatum* var. *bullisetosum* B. S. Sun & S. Wang.

Perennial. Culms tufted, erect or sometimes straggling, 30–100 cm tall, nodes bearded with spreading hairs. Leaf sheaths terete, shorter than internodes; leaf blades flat, 8–30 × 0.2–0.4 cm, glabrous or adaxial surface stiffly pilose, margins smooth or scaberulous, apex acuminate; ligule 1–2 mm, lacerate. Inflorescence terminal; peduncle glabrous; racemes 2–8, subdigitate, suberect, 4–5 cm, with 0–6 pairs of homogamous spikelets. Sessile spikelet 3–5 mm; lower glume elliptic-oblong or oblong, firmly papery, 5–9-veined, subglabrous or pubescent to villous on lower back, upper flanks often with long spreading hairs, keels shortly ciliate, not or barely winged, apex obtuse; upper glume ciliate along keel and margins, apex acute or obtuse; awn 1.6–2.4 cm. Caryopsis obovate. Pedicelled spikelet many-veined, pubescent to villous with spreading tubercle-based hairs. Fl. and fr. Jun–Nov. $2n = 20, 40$.

Mountain slopes, disturbed ground; 100–2200 m. Guangdong, Guangxi, Guizhou, Hainan, Hubei, Sichuan, Taiwan, Yunnan [India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines; Africa, Pacific Islands; introduced in America and Australia].

202. *CAPILLIPEDIUM* Stapf in Prain, Fl. Trop. Africa 9: 169. 1917.

细柄草属 xi bing cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial or annual. Culms erect, decumbent or rambling. Leaf blades linear, sometimes aromatic; ligule membranous, margin ciliolate. Inflorescence a terminal open panicle with elongate central axis; branches capillary, subdivided, each branchlet tipped by a short raceme; racemes with 1–5(–8) spikelet pairs, often reduced to triads of 1 sessile and 2 pedicelled spikelets, basal homogamous spikelet pairs absent; rachis internodes and pedicels slender, with a median translucent stripe between thickened margins. Sessile spikelet dorsally compressed; callus very short, obtuse, shortly bearded; lower glume cartilaginous, broadly convex to slightly concave, flanks rounded, keeled toward apex, apex acute to obtuse; upper glume boat-shaped, dorsally keeled; lower floret reduced to a small empty hyaline lemma; upper lemma stipitiform, entire, awned from apex; awn geniculate, glabrous or puberulous. Pedicelled spikelet male or barren, similar to the sessile or smaller, herbaceous.

About 14 species: E Africa, tropical Asia, Australia; five species (one endemic) in China.

This homogeneous genus is distinguished from *Bothriochloa* by the combination of an elongate inflorescence and few-spiculate racemes.

1a. Sessile spikelet 2.6–3 mm.

2a. Culms woody, 1.5–3.5 m tall; pedicelled spikelet 1/2–2 times longer than sessile spikelet 1. *C. assimile*

2b. Culms herbaceous, 0.5–1.1 m tall; pedicelled spikelet equal to sessile spikelet or slightly longer 2. *C. kuoi*

1b. Sessile spikelet 3–3.8 mm.

3a. Culms up to 30 cm, much branched; nodes glabrous; leaf blades 6–10 cm; lower glume of sessile spikelet acute or bidentate 3. *C. kwashotense*

3b. Culms up to 120 cm, not or little branched; nodes bearded; leaf blades 15–30 cm; lower glume of sessile spikelet obtuse.

4a. Racemes 1(–3)-noded, with 1(–3) sessile spikelets; lower glume of sessile spikelet 2-veined and channeled on back 4. *C. parviflorum*

4b. Racemes 3–8-noded, with more than 3 sessile spikelets; lower glume of sessile spikelet often 4–5-veined and flat on back 5. *C. spicigerum*

1. *Capillipedium assimile* (Steudel) A. Camus in Lecomte, Fl. Indo-Chine 7: 314. 1922.

硬秆子草 ying gan zi cao

Andropogon assimilis Steudel, Syn. Pl. Glumac. 1: 397. 1854; *A. glaucopsis* Steudel; *A. subrepens* Steudel; *Bothriochloa assimilis* (Steudel) Ohwi; *B. picta* Ohwi; *Capillipedium glaucopsis* (Steudel) Stapf; *Dichanthium assimile* (Steudel) Deshpande.

Perennial, often straggling. Culms decumbent and rooting at base, woody, 1.5–3.5 m tall, 1.5–5 mm in diam., fastigiate branched, nodes glabrous or pubescent. Leaf sheaths glabrous, bearded at mouth; leaf blades linear-lanceolate, 6–15 × 0.3–0.6 cm, glabrous or hispidulous, base tapering, apex setaceous acuminate; ligule ca. 0.7 mm. Panicle pyramidal, 5–12 × ca. 4 cm; branches pilose in axils; racemes composed of triads, sometimes with 1 or 2 additional spikelet pairs, greenish or pinkish; rachis internodes and pedicels long ciliate. Sessile spikelet 2.1–2.9 mm; lower glume elliptic-oblong or lanceolate, back 2–5-veined, slightly convex, glossy, glabrous or hispidulous, upper margins keeled, ciliate-hispid; upper glume ciliate along margins; awn of upper lemma 0.6–1.5 cm. Pedicelled spikelet linear-lanceolate, up to twice length of sessile spikelet. Fl. and fr. Aug–Dec. *2n* = 40.

Streams, forests, or mountain slopes. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

This grass is said to have the appearance of a small bamboo. It differs from the other common species, *Capillipedium parviflorum*, by its taller, woody, fasciculate branching culms, shorter leaf blades with narrowed base, smaller sessile spikelets, and pedicels ciliate along the length of both margins.

2. *Capillipedium kuoi* L. B. Cai, Acta Biol. Plateau Sin. 12: 34. 1994.

郭氏细柄草 guo shi xi bing cao

Perennial, loosely tufted. Culms erect or geniculate at base, herbaceous, 50–110 cm tall, 1.5–2.3 mm in diam., few branched, nodes pubescent. Leaf sheaths glabrous or sparsely tuberculate-hairy; leaf blades linear, 10–20 × 0.5–0.8 cm, adaxial surface scabrid or hispid at base, abaxial surface glabrous or sparsely pubescent; ligule ca. 1.6 mm. Panicle ovate in outline, 10–18 cm; branches pilose in axils; racemes composed of 1–3 spikelet pairs and a terminal triad; rachis internodes and pedicels ciliate. Sessile spikelet ca. 3 mm; lower glume elliptic-lan-

ceolate, back 4–6-veined, slightly sulcate, pilose, margins keeled, thinly ciliate, apex denticulate; upper glume glabrous; awn of upper lemma 0.8–1.2 cm. Pedicelled spikelet equal to or slightly longer than sessile spikelet. Fl. and fr. Jun–Oct.

• Moist roadside thickets, ditch banks; 600–1900 m. SW Sichuan, SE Xizang, NW Yunnan.

3. *Capillipedium kwashotense* (Hayata) C. C. Hsu, J. Jap. Bot. 37: 280. 1962.

绿岛细柄草 lü dao xi bing cao

Andropogon kwashotensis Hayata, Icon. Pl. Formosan. 7: 80. 1918; *Bothriochloa kwashotensis* (Hayata) Ohwi.

Perennial, rhizomatous. Culms solitary or tufted, hard, 15–30 cm tall, ca. 1 mm in diam., much branched above base, nodes glabrous. Leaf sheaths glabrous; leaf blades linear-lanceolate, 6–11 × 0.3–0.5 cm, glabrous, long tubercle-based bristles above ligule, apex setaceous acuminate; ligule ca. 1 mm. Panicle small, elliptic in outline, 4–8 cm; branches simple or little branched; racemes composed of 3–4 spikelet pairs below the terminal triad, straw-colored; rachis internodes and pedicels long ciliate. Sessile spikelet 3–3.8 mm; lower glume narrowly lanceolate-oblong, back 5–7-veined, flat, not glossy, scaberulous on veins, margins keeled and scabrid above middle, apex acute or bidentate; upper glume scabrid on upper keel; awn of upper lemma 1–1.6 cm. Pedicelled spikelet resembling the sessile, staminate. Fl. and fr. autumn. *2n* = 40*.

Cliffs and slopes near the sea. Taiwan [Japan (Iriomote Island in S Ryukyu Islands)].

This nearly endemic species is apparently confined to the eastern coast of Taiwan and a few offshore islands, where it is locally abundant and used for forage. It can withstand salt water.

4. *Capillipedium parviflorum* (R. Brown) Stapf in Prain, Fl. Trop. Africa 9: 169. 1917.

细柄草 xi bing cao

Holcus parviflorus R. Brown, Prodr. 199. 1810; *Andropogon cinctus* Steudel; *Bothriochloa parviflora* (R. Brown) Ohwi; *Chrysopogon pictus* Hance.

Perennial. Culms tufted, 50–120 cm tall, 0.5–2 mm in diam., not or little branched, nodes bearded. Leaf sheaths glabrous or pilose, ciliate at mouth; leaf blades 15–30 × 0.3–0.8 cm, scaberulous or pubescent, usually hispid with tubercle-based hairs toward base, base rounded, apex acuminate; ligule 0.5–1 mm. Panicle oblong in outline, 9–20 × 2–5 cm; branches untidily flexuous, pilose in axils; racemes usually composed of triads, occasionally with 1–2 additional spikelet pairs, purple;

rachis internodes and pedicels shortly ciliate at base. Sessile spikelet 3–4 mm; lower glume oblong-lanceolate, slightly glossy, back 2-veined, shallowly concave between veins, hispidulous, margins keeled, pectinate-ciliate above middle, apex narrowly obtuse; upper glume ciliate along upper margins; awn of upper lemma 1–1.5 cm. Pedicelled spikelet equaling the sessile and often staminate, or smaller and barren. Fl. and fr. Aug–Dec. $2n = 20, 40, 60$.

Mountain slopes, streams. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Thailand; Africa, SW Asia, Australia].

Capillipedium parviflorum introgresses with *C. assimile* at the tetraploid level where both species are sympatric, resulting in apomictic hybrids. Tetraploid *C. parviflorum* also introgresses extensively with tetraploid *Bothriochloa bladhii*, likewise forming apomictic, hybrid races that cause much taxonomic difficulty. The name *B. glabra* has been applied to these hybrids.

5. *Capillipedium spicigerum* S. T. Blake, Pap. Dept. Biol. Univ. Queensland 2(3): 43. 1944.

多节细柄草 duo jie xi bing cao

Andropogon micranthus Kunth var. *spicigerus* (Benth.) Hackel; *A. parviflorus* Roxburgh var. *spicigerus* (Benth.)

Domin; *A. spicigerus* (S. T. Blake) Reeder; *Bothriochloa spicigera* (Benth.) T. Koyama; *Capillipedium parviflorum* (R. Brown) Stapf var. *spicigerum* (Benth.) C. Hsu; *Chrysopogon parviflorus* (R. Brown) Benth. var. *spicigerus* Benth.

Perennial. Culms tufted, up to 150 cm tall, unbranched, nodes bearded. Leaf sheaths usually pilose, ciliate at mouth; leaf blades 15–40 × 0.5–0.8 cm, scaberulous or pubescent, usually hispid with tubercle-based hairs toward base, base rounded, apex acuminate; ligule 0.5–1 mm. Panicle oblong-ovate in outline, 10–18 × 5–8 cm; branches untidily flexuous, pilose in axils; racemes composed of 3–7 spikelet pairs below the terminal triad, purple; rachis internodes and pedicels ciliate. Sessile spikelet 3–4 mm; lower glume oblong-lanceolate, slightly glossy, back 4–5-veined, scarcely depressed along midline, sparsely hispidulous, margins keeled, pectinate-ciliate above middle, apex narrowly obtuse; upper glume ciliate along upper margins; awn of upper lemma 1.2–1.8 cm. Pedicelled spikelet equaling the sessile and often staminate, or smaller and barren. Fl. and fr. autumn. $2n = 40$.

Mountain slopes. Hong Kong, Taiwan, Zhejiang [Indonesia, Japan (Ryukyu Islands), Philippines; Australia].

This species is thought to have arisen by hybridization between *Capillipedium parviflorum* and *Bothriochloa bladhii*, resulting in intermediates with several spikelet pairs per raceme. It tends to be slightly more robust than *C. parviflorum*.

203. **BOTHRIOCHLOA** Kuntze, Revis. Gen. Pl. 2: 762. 1891.

孔颖草属 kong ying cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Amphilophis Nash; *Gymnandropogon* (Nees) Duthie.

Perennial. Leaf blades linear or lanceolate, sometimes aromatic; ligule membranous, margin ciliate. Inflorescence terminal, usually of digitate, subdigitate, or corymbiform racemes, infrequently paniculate; racemes shortly pedunculate, composed of several spikelet pairs (if paniculate, more than 8 spikelet pairs present), basal homogamous spikelet pairs absent; rachis internodes and pedicels slender with a median translucent stripe between thickened margins. Sessile spikelet dorsally compressed; callus short, obtuse, bearded; lower glume cartilaginous with herbaceous apex, occasionally herbaceous throughout, broadly convex to slightly concave, flanks rounded, back sometimes with 1–3 deep circular pits, apex subacute; upper glume boat-shaped, dorsally keeled; lower floret reduced to an empty hyaline lemma; upper lemma stipitiform, entire, awned from apex; awn geniculate, glabrous. Pedicelled spikelet similar to the sessile or smaller, herbaceous.

About 30 species: throughout the tropics and subtropics; three species in China.

The rachis internodes and pedicels of the closely related genera *Bothriochloa* and *Capillipedium* are most distinctive, providing an easy diagnostic character for these genera. The central cells, between the thickened margins, are translucent and frequently purple pigmented. *Dichanthium* also belongs to this group, but has normal, solid internodes and pedicels. Circular, pitted glands on the lower glume are another remarkable feature of some species in this group.

- 1a. Inflorescence with an elongate central axis 1. *B. bladhii*
- 1b. Inflorescence subdigitate.
 - 2a. Lower glume of sessile spikelet without a circular pit 2. *B. ischaemum*
 - 2b. Lower glume of sessile spikelet with a circular pit 3. *B. pertusa*

1. *Bothriochloa bladhii* (Retzius) S. T. Blake, Proc. Roy. Soc. Queensland 80: 62. 1969.

臭根子草 chou gen zi cao

Perennial, tufted. Culms erect or decumbent at base, fairly robust, up to 130 cm tall, many-noded, nodes glabrous or ap-

pressed bearded. Leaf sheaths glabrous; leaf blades linear, 10–40 × 0.2–1 cm, hairy with tubercle-based hairs on both surfaces or abaxial surface glabrous, apex finely acuminate; ligule 0.5–1.5 mm. Inflorescence 9–20 cm, composed of many racemes borne in loose whorls along an elongate central axis, axis usually longer than lowest raceme, sometimes paniculate with

branched peduncles; racemes 2–5 cm, often purplish, not obviously hairy; rachis internodes and pedicels thinly ciliate, shortly bearded at apex. Sessile spikelet 3–4 mm; lower glume narrowly oblong-lanceolate, herbaceous or cartilaginous and glossy, 5–7-veined, back slightly concave, glabrous or pubescent below middle, sometimes with a pit, margins keeled and scabrid near apex; awn of upper lemma 1–2.5 cm. Pedicelled spikelet barren or rarely staminate, narrower than sessile spikelet, sometimes pitted. Fl. and fr. Jul–Oct. $2n = 40, 60, 80$.

Exposed slopes, waste ground; 400–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Taiwan, Xinjiang, Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Nepal, New Guinea, Pakistan, Thailand, Vietnam; Africa, SW Asia, Australia; introduced in America].

Bothriochloa bladhii hybridizes easily and frequently with some other species of *Bothriochloa*, and also with *Capillipedium parviflorum* and *Dichanthium annulatum*, blurring the boundaries between these genera and leading to a host of intermediates. New, apomictic races have arisen from among these products of introgression, causing much taxonomic difficulty. The name *B. glabra* has been applied to hybrids between *B. bladhii* and *C. parviflorum*.

Bothriochloa bladhii is most practicably treated in a broad sense to include all forms with an elongate inflorescence axis. Additionally, the habit is usually not stoloniferous, and the racemes are less obviously hairy than in *B. ischaemum* and *B. pertusa*.

- 1a. Lower glume of sessile and pedicelled spikelet without pits on back 1a. var. *bladhii*
- 1b. Lower glume of sessile and pedicelled spikelet with 1–3 pits on back 1b. var. *punctata*

1a. *Bothriochloa bladhii* var. *bladhii*

臭根子草(原变种) *chou gen zi cao* (yuan bian zhong)

Andropogon bladhii Retzius, Observ. Bot. 2: 27. 1781; *Amphilophis intermedia* Stapf; *Andropogon glaber* Roxburgh; *A. intermedius* R. Brown; *A. vachellii* Nees; *Bothriochloa anamitica* Kuntze; *B. glabra* (Roxburgh) A. Camus; *B. intermedia* (R. Brown) A. Camus; *Dichanthium bladhii* (Retzius) Clayton.

Lower glume of both sessile and pedicelled spikelets usually without pits on back. Fl. and fr. Jul–Oct.

Exposed slopes, waste ground. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Taiwan, Xinjiang, Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Nepal, New Guinea, Pakistan, Thailand, Vietnam; Africa, SW Asia, Australia; introduced in America].

1b. *Bothriochloa bladhii* var. *punctata* (Roxburgh) R. R. Stewart, Kew Bull. 29: 444. 1974.

孔颖臭根子草 *kong ying chou gen zi cao*

Andropogon punctatus Roxburgh, Fl. Ind. 1: 268. 1820; *Bothriochloa intermedia* (R. Brown) A. Camus var. *punctata* (Roxburgh) Keng; *B. punctata* (Roxburgh) L. Liu.

Lower glume of sessile and pedicelled spikelets with 1–3 pits on back. Fl. and fr. Jul–Nov.

Exposed slopes, waste ground; 400–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Taiwan, Xinjiang, Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Ne-

pal, New Guinea, Pakistan, Thailand, Vietnam; Africa, SW Asia, Australia; introduced in America].

2. *Bothriochloa ischaemum* (Linnaeus) Keng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 10: 201. 1936.

白羊草 *bai yang cao*

Andropogon ischaemum Linnaeus, Sp. Pl. 2: 1047. 1753; *Amphilophis ischaemum* (Linnaeus) Nash; *Andropogon ischaemum* var. *songaricus* Ruprecht ex Fischer & Meyer; *Bothriochloa ischaemum* var. *songarica* (Ruprecht ex Fischer & Meyer) Celarier & J. R. Harlan.

Perennial, tussocky from a branching rootstock. Culms slender, erect or geniculately ascending, 25–70 cm tall, 3–6-noded, nodes glabrous or appressed bearded. Leaf sheaths keeled, congested at plant base; leaf blades linear, 5–16 × 0.2–0.3 cm, usually sparingly hairy with tubercle-based hairs, apex acuminate; ligule ca. 1 mm. Inflorescence composed of 5–15 racemes, subdigitate or inserted on a brief axis; racemes 3–7 cm, silvery-green or tinged purplish brown; rachis internodes and pedicels ciliate with long white or pinkish silky hairs. Sessile spikelet 4–5 mm; lower glume oblong-lanceolate, usually cartilaginous, sometimes herbaceous, back flat to slightly concave, 5–7-veined, silky-pilose below middle, lacking a pit, margins keeled and stiffly ciliate near apex; awn of upper lemma 1–1.5 cm. Pedicelled spikelet male or barren, subequal to sessile spikelet, glabrous. Fl. and fr. autumn. $2n = 40, 50, 60$.

Rocky and sandy slopes, roadsides, disturbed places. Anhui, Fujian, Guangdong, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, N India, Kazakhstan, Korea, Kyrgystan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in United States].

Dichanthium annulatum is similar, but can be distinguished by its conspicuously bearded nodes with spreading hairs and by the broadly obtuse sessile spikelet with long hairs on the upper margins. It also lacks a purple stripe on the pedicels.

Bothriochloa ischaemum introgresses with *B. bladhii*, leading to a range of intermediates. The name *Andropogon taiwanensis* Ohwi (J. Jap. Bot. 12: 652. 1936), described from Taiwan, has been applied to one of these intermediates. The name "*Bothriochloa taiwanensis*" (Ohwi, loc. cit.) was not validly published because it was merely cited as a synonym of *A. taiwanensis*.

3. *Bothriochloa pertusa* (Linnaeus) A. Camus, Ann. Soc. Linn. Lyon, n.s., 76: 164. 1931 ["1930"].

孔颖草 *kong ying cao*

Holcus pertusus Linnaeus, Mant. Pl. 2: 301. 1771; *Amphilophis pertusa* (Linnaeus) Stapf; *Andropogon pertusus* (Linnaeus) Willdenow; *Bothriochloa nana* W. Z. Fang; *Dichanthium pertusum* (Linnaeus) Clayton.

Perennial, often stoloniferous, sward forming. Culms erect or geniculately ascending, up to 100 cm tall, 5- or more-noded, nodes bearded. Leaf sheaths keeled; leaf blades linear, 5–20 × 0.1–0.4 cm, tubercle-based hairs on both surfaces or abaxial surface glabrous, apex acute; ligule 0.5–2 mm. Inflorescence

composed of 3–5(–)8 racemes, subdigitate; racemes 3–8 cm, tinged purplish; rachis internodes and pedicels ciliate with long silky hairs. Sessile spikelet 3–4.5 mm; lower glume narrowly elliptic, cartilaginous, back concave, 5–7-veined, glossy, sparsely hirtellous to silky-pilose below middle, a circular pit above hairs, 2-keeled, margins keeled and scabrid near apex; awn of upper lemma 1–2 cm. Pedicelled spikelet male or barren, pur-

plish, subequal to sessile spikelet, glabrous. Fl. and fr. Jul–Oct. $2n = 40, 60$.

Grassy hills, disturbed ground; 1200–1500 m. Guangdong, Sichuan, Yunnan [India, Indonesia, Malaysia, Nepal, Pakistan, Thailand, Vietnam; introduced in Australia and United States].

The type of *Bothriochloa nana* is a stunted specimen of *B. pertusa* with the spikelets infected by a smut fungus.

204. SEHIMA Forsskål, Fl. Aegypt.-Arab. 178. 1775.

沟颖草属 *gou ying cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial or annual. Culms tufted, simple or sparingly branched. Leaf blades narrowly linear; ligule a line of hairs. Inflorescence a single terminal raceme, spikelets paired, dissimilar; rachis internodes and pedicels subinflated, stoutly linear to subclavate, densely white-ciliate along margins. Sessile spikelet bisexual, narrow, compressed between internode and pedicel; callus rounded, inserted into shallowly hollowed internode apex; lower glume leathery, back concave or longitudinally grooved, strongly veined on either side of groove but midvein absent, 2-keeled, keels lateral or becoming dorsal toward base, barely winged, apex elongate, scarious, 2-toothed; upper glume boat-shaped, finely awned; lower floret staminate, well developed with palea; upper lemma 2-lobed, awned from sinus; awn geniculate, column glabrous or ciliolate. Pedicelled spikelet large, conspicuous, usually staminate, lanceolate, strongly dorsally compressed, distinctly veined, midvein present, awnless. $x = 10$ and 20 .

Five species: E Africa through India to SE Asia and Australia; one species in China.

1. *Sehima nervosum* (Rottler) Stapf in Prain, Fl. Trop. Africa 9: 36. 1917.

沟颖草 *gou ying cao*

Andropogon nervosus Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 218. 1803 [“*nervosum*”]; *Ischaemum laxum* R. Brown; *I. nervosum* (Rottler) Thwaites.

Perennial. Culms erect, wiry, 30–100 cm tall, nodes bearded or glabrous. Leaf sheaths glabrous or hispid with tubercle-based hairs; leaf blades linear, flat, tough, pale green, $10\text{--}45 \times 0.2\text{--}0.7$ cm, scabrid, tapering to a filiform apex; ligule 2–3 mm. Raceme 3–12(–18) cm, straight or gently curved;

rachis internodes and pedicels stoutly linear, 3.5–5 mm. Sessile spikelet yellowish green, 7–9 mm; lower glume narrowly oblong, deeply grooved between keels in lower part, with 6 prominent laterally placed intercarinal veins, inner veins anastomosing toward apex, apex scarious, $1/4\text{--}1/3$ glume length, shortly 2-toothed; upper glume with straight, 7–13 mm awn; awn of upper lemma stout, 1.7–3.5 cm, column brown, ciliolate along spiral, limb pallid. Pedicelled spikelet usually flushed purple, 7–10 mm, lower glume conspicuously 7-veined, margins ciliate. Fl. and fr. Jul–Oct.

Dry grasslands; at low elevations. Hainan, Yunnan [India, Indonesia, Laos, Myanmar, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, SW Asia, Australia].

205. ISCHAEMUM Linnaeus, Sp. Pl. 2: 1049. 1753.

鸭嘴草属 *ya zui cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, or sometimes annual. Culms often decumbent and much branched. Leaf blades linear to lanceolate, narrowed to ligule, sometimes pseudopetiolate; ligule membranous; sheath auricles often present. Inflorescence of paired racemes, or occasionally subdigitate, terminal and axillary, exserted or sometimes supported by a spatheole; racemes 1-sided, when paired often locked back to back and appearing as a single cylindrical raceme, spikelets of a pair similar or not; rachis internodes and pedicels stoutly linear to thickly clavate, U-shaped or triquetrous in cross section. Sessile spikelet dorsally compressed; callus truncate or obtuse, inserted into hollowed internode apex; lower glume papery to leathery, shallowly convex or almost flat, 2-keeled or rounded on flanks, sometimes winged, often rugose; upper glume boat-shaped, awnless or with straight awn from apex; lower floret male, well developed with palea; upper lemma usually deeply 2-lobed, awned from sinus, rarely awnless; awn geniculate, glabrous. Pedicelled spikelet as large as sessile or much smaller, upper lemma sometimes geniculately awned.

About 70 species: throughout the tropics but mainly in Asia, especially India; 12 species (one endemic) in China.

1a. Margins of lower glume of sessile spikelet broadly rounded in lower part, narrowly inflexed and keeled above, not coarsely rugose or knobbly.

2a. Spikelets of a pair without obvious awns, or only sessile spikelet awned.

3a. Inflorescence base enclosed in uppermost sheath; plant strongly rhizomatous 1. *I. muticum*

3b. Inflorescence long exserted from uppermost sheath; plant loosely tufted.

- 4a. Racemes villous; sessile spikelet 8–10 mm 2. *I. anthephoroides*
 4b. Racemes glabrous; sessile spikelet 5.5–8 mm 3. *I. aristatum*
 2b. Spikelets of a pair both clearly awned.
 5a. Lower glume of sessile spikelet winged on keels, apex rounded, emarginate.
 6a. Racemes paired; rhizomes absent; culms less than 60 cm 4. *I. ciliare*
 6b. Racemes (2–)3–6; rhizomes present; culms 60–100 cm 5. *I. polystachyum*
 5b. Lower glume of sessile spikelet not winged on keels, apex sharply bicuspidate.
 7a. Spikelets ± glabrous; upper glume of sessile spikelet not winged on keel; callus hairs less than 1 mm 6. *I. timorensis*
 7b. Spikelets hispid; upper glume of sessile spikelet winged on keel; callus hairs ca. 2 mm 7. *I. thomsonianum*
 1b. Margins of lower glume of sessile spikelet narrowly and evenly inflexed and keeled along entire length, often coarsely rugose or knobbly.
 8a. Lower glume of sessile spikelet not transversely rugose or knobbly.
 9a. Lower glume of sessile spikelet wingless, keels pilose; awn 1.8–2.5 cm 8. *I. aureum*
 9b. Lower glume of sessile spikelet winged, glabrous; awn 1–1.2 cm 9. *I. setaceum*
 8b. Lower glume of sessile spikelet transversely rugose or knobbly on flanks.
 10a. Plant annual; lower glume of sessile spikelet coarsely rugose with 4–7 sharp transverse ridges across back 10. *I. rugosum*
 10b. Plant perennial; lower glume of sessile spikelet with rounded knobs on keels in lower part, sometimes also with 2–4 weak ridges across back.
 11a. Culms up to 1 m tall; sessile spikelet 5–7 mm, awned, awn 1–1.5 mm 11. *I. barbatum*
 11b. Culms 1–2 m tall; sessile spikelet 6.5–8 mm, awnless or awn less than 1 mm 12. *I. magnum*

1. *Ischaemum muticum* Linnaeus, Sp. Pl. 2: 1049. 1753.

无芒鸭嘴草 wu mang ya zui cao

Perennial, strongly rhizomatous; rhizomes clothed in cataphylls. Culms often red, much branched, stoloniferous or scrambling, several meters long, flowering culms erect, up to 60 cm, nodes glabrous. Leaf sheaths ciliate along outer margin, otherwise glabrous or sparingly appressed hairy; leaf blades lanceolate, tinged reddish brown, 2–10(–18) × 0.3–1.7 cm, glabrous or abaxial surface sparingly pilose, margins smooth or scaberrulous, base cordate, very shortly pseudopetiolate, apex acute; ligule 0.2–0.6 mm. Racemes usually paired, appressed back to back, 2–5 cm, base enclosed by subtending sheath; rachis internodes and pedicels oblong, triquetrous, outer angle narrowly winged, inner angles glabrous or ciliate. Sessile spikelet lanceolate, 4.8–7 × 2.5–2.8 mm; lower glume leathery with expanded rounded flanks in lower 2/3, herbaceous, strongly veined and sharply 2-keeled below apex, glabrous, winged from near base, apex entire; upper glume winged on upper keel; upper lemma subtire, mucronate or with ca. 1 mm awnlet. Pedicelled spikelet laterally compressed, otherwise resembling sessile or smaller, awnless.

Sands near the sea; below 100 m. Taiwan [Cambodia, India, Indonesia, Japan (S Ryukyu Islands), Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia (Queensland)].

This seashore plant forms extensive colonies that bind the sand at the back of sandy beaches.

2. *Ischaemum anthephoroides* (Steudel) Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 193. 1867 [“*antephoroides*”].

毛鸭嘴草 mao ya zui cao

Rottboellia anthephoroides Steudel, Flora 29: 22. 1846 [“*antephoroides*”]; *Andropogon anthephoroides* (Steudel) Steudel; *A. anthephoroides* var. *eristachyus* (Hackel) Honda; *Ischaemum eristachyum* Hackel.

Perennial. Culms loosely tufted, geniculately ascending to shortly decumbent and rooting at lowest nodes, 30–70 cm tall, branching in lower part, nodes bearded. Leaf sheaths loose, villous; leaf blades linear-lanceolate, 5–20 × 0.3–0.9 cm, villous, margins thickened, smooth, base constricted, apex acuminate; ligule 1–3 mm. Racemes terminal, paired, appressed back to back, 5–8 cm, long exserted; rachis internodes and pedicels stoutly cuneate, triquetrous, villous. Sessile spikelet broadly oblong or obovate, 8–10 × 2.5–3.5 mm; lower glume leathery toward base, flanks rounded in lower 1/3, villous with stiff ca. 3 mm hairs, papery and puberulous above, keeled and winged above middle, wings ca. 0.8 mm wide with ciliate margin, apex truncate-denticulate; upper glume keeled and winged above middle, villous on midline below wing; awn of upper lemma weakly geniculate, up to 1.5 cm. Pedicelled spikelet laterally compressed, otherwise resembling sessile, awnless. Fl. and fr. Jun–Sep.

Sand dunes, sandy slopes, near the sea. Hebei, Shandong, Zhejiang (Dachen Dao) [Japan, Korea].

This species occupies a similar seashore habitat to *Ischaemum muticum*, but has a much more limited, more northerly distribution. It is a much hairier species, with exserted racemes of larger spikelets, and lacks the widely spreading, scaly rhizomes of *I. muticum*.

3. *Ischaemum aristatum* Linnaeus, Sp. Pl. 2: 1049. 1753.

有芒鸭嘴草 you mang ya zui cao

Perennial. Culms loosely tufted, erect or geniculately ascending, 40–80 cm tall, simple or branching, nodes glabrous. Leaf sheaths glabrous or pilose; leaf blades linear-lanceolate, 5–25 × 0.4–1 cm, glabrous or thinly pilose, margins smooth becoming scabrid toward apex, base attenuate or contracted, apex acuminate; ligule 2–3 mm. Racemes terminal, paired, appressed back to back, 4–7 cm; rachis internodes clavate, triquetrous, scabrid or ciliate along outer angle, inner angles glabrous or shortly ciliate. Sessile spikelet oblanceolate to obovate, 5.5–8 × 2–2.3 mm; lower glume leathery with rounded flanks below

middle, herbaceous, broader and 2-keeled above, 5–7-veined, keels narrowly to broadly winged, wing margin scabrid; upper lemma awnless or shortly awned; awn well developed or imperfect, up to 1.2 cm. Pedicelled spikelet dorsally compressed, resembling sessile, asymmetrical, 2-keeled, keels winged, one wing incurled. Fl. and fr. Jul–Oct. $2n = 56, 72$.

Open grassy sandy places, often near the sea; 100–1000 m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Taiwan, NE Yunnan, Zhejiang [Japan, Korea, Vietnam].

This species usually has awnless or only inconspicuously awned racemes, but occasionally the awns are a little longer and more obvious. Longer awns are weakly associated with a more broadly winged sessile spikelet, and the type of the species name falls within this less frequent variant.

- 1a. Lower glume of sessile spikelet obovate, broadly winged; awn present, geniculate, exerted from spikelet 3a. var. *aristatum*
- 1b. Lower glume of sessile spikelet oblanceolate, winged; awn absent or imperfect, included within spikelet 3b. var. *glaucum*

3a. *Ischaemum aristatum* var. *aristatum*

有芒鸭嘴草(原变种) you mang ya zui cao (yuan bian zhong)

Ischaemum crassipes (Steudel) Thellung var. *aristatum* Nakai; *I. crassipes* var. *formosanum* (Hackel) Nakai; *I. crassipes* var. *hondae* (Matsuda) Nakai; *I. guangxiense* Zhao; *I. hondae* Matsuda; *I. sieboldii* Miquel var. *formosanum* Hackel.

Rachis internodes and pedicels often ciliate along outer angle, inner angles glabrous or shortly ciliate. Sessile spikelet obovate, broadly winged, awned; awn exerted, 0.8–1.2 cm, geniculate. $2n = 72$.

Open grassy sandy places, often near the sea; 100–1000 m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, NE Yunnan, Zhejiang [Japan, Korea].

This awned form of *Ischaemum aristatum* is very similar to *I. ciliare*, and the two have been much confused. *Ischaemum ciliare* clearly differs by its laterally compressed, geniculately awned pedicelled spikelets. It also has bearded nodes and a slightly smaller (4–6 mm) sessile spikelet.

3b. *Ischaemum aristatum* var. *glaucum* (Honda) T. Koyama, J. Jap. Bot. 37: 239. 1962.

鸭嘴草 ya zui cao

Ischaemum crassipes var. *glaucum* Honda, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 3: 355. 1930; *Andropogon crassipes* Steudel; *Ischaemum aristatum* subsp. *glaucum* (Honda) T. Koyama; *I. aristatum* var. *momiyamae* (Honda) Hsu; *I. crassipes* (Steudel) Thellung; *I. crassipes* var. *hainanense* Keng; *I. crassipes* var. *momiyamae* Honda; *I. sieboldii* Miquel.

Rachis internodes and pedicels scabrid or shortly ciliate on outer angle, inner angles glabrous or shortly ciliate. Sessile spikelet oblanceolate, narrowly to broadly winged, mucronate or shortly awned; awn included, 0.1–0.3 cm, straight. $2n = 56$.

Sandy places, usually near the sea. S Anhui, Hebei, Jiangsu, Liaoning, Shandong, Zhejiang [Japan, Korea, Vietnam].

4. *Ischaemum ciliare* Retzius, Observ. Bot. 6: 36. 1791.

细毛鸭嘴草 xi mao ya zui cao

Andropogon patentivillosus Steudel; *Ischaemum ciliare* var. *villosum* (Nees) Hackel; *I. indicum* (Houttuyn) Merrill var. *breviaristatum* Zhao; *I. indicum* var. *guangdongense* Zhao; *Spodiopogon obliquivalvis* Nees var. *villosus* Benth; *S. villosus* Nees.

Perennial. Culms slender, loosely tufted, erect, spreading or prostrate and rooting at lower nodes, up to 60 cm tall, nodes bearded. Leaf sheaths sparsely to densely pilose with tubercle-based hairs, or glabrous; leaf blades linear-lanceolate, 5–15 × 0.3–1 cm, tuberculate-villous or sometimes glabrous, base contracted, apex acuminate; ligule 1–2 mm. Racemes terminal, paired, often slightly separated, 2–9 cm; rachis internodes and pedicels oblong, triquetrous, ciliate along angles. Sessile spikelet obovate-oblong, 4–6 × 1.2–1.5 mm; lower glume smooth, glossy, leathery with rounded flanks in lower half, upper half flat, papyraceous, sometimes wrinkled, asperulous, flanks keeled, winged, wings 0.2–0.7 mm wide, forming 2 rounded lobes at apex; upper glume swollen and keeled above middle, keel narrowly winged, apex shortly awned; awn of upper lemma 1–1.5 cm. Pedicelled spikelet laterally compressed; lower glume with a single median winged keel; upper lemma awned.

Moist meadows, field margins, hill thickets; near sea level to 1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam; introduced in America].

This grass has been widely known as *Ischaemum indicum* (Houttuyn) Merrill (*Phleum indicum* Houttuyn), but that name in fact refers to a species of *Polytrias*. *Ischaemum ciliare* is a very variable species, widespread in tropical Asia, and a number of varieties has been described over its range.

5. *Ischaemum polystachyum* J. Presl in C. Presl, Reliq. Haenk. 1: 328. 1830.

簇穗鸭嘴草 cu sui ya zui cao

Ischaemum digitatum Brongniart; *I. duthiei* Stapf ex Bor; *I. fasciculatum* Brongniart.

Perennial, rhizomatous. Culms loosely tufted, sometimes stoloniferous and rooting at lower nodes, 60–100 cm tall, nodes bearded or glabrous. Leaf sheaths glabrous or sparsely to densely pilose with tubercle-based hairs; leaf blades broadly linear, 5–20 × 0.5–1.5 cm, pubescent, rarely glabrescent, base rounded to subcordate, apex acute; ligule 1–2 mm. Racemes (2–)3–6 or more, mostly terminal, subdigitate, 2–9 cm; rachis internodes and pedicels broadly linear, triquetrous, ciliate on outer angle, shortly ciliate on inner angles. Sessile spikelet lanceolate, 4–5 × 1.2–1.4 mm; lower glume leathery with expanded rounded flanks below middle, herbaceous, strongly veined and sharply 2-keeled above, glabrous or villous, keels usually winged, apex 2-toothed; upper glume attenuate into mucro or awnlet to 2 mm; awn of upper lemma 1.2–1.5 cm. Pedicelled spikelet laterally compressed, similar to sessile, upper lemma awned.

Moist places on grassy plains and hillsides; 100–400 m. Guangdong, Guizhou, Yunnan [India, Malaysia, Myanmar, Sri Lanka, Thailand; Africa, Mauritius, Pacific Islands].

This is a widespread, polymorphic species, long known by different names in various parts of its range.

6. *Ischaemum timorense* Kunth, Révis. Gramin. 1: 369. 1830.

帝汶鸭嘴草 di wen ya zui cao

Andropogon timorensis (Kunth) Steudel.

Annual or short-lived perennial. Culms slender, loosely tufted or stoloniferous, rooting at lower nodes, branching, flowering shoots 15–50 cm tall, nodes bearded. Leaf sheaths glabrous except toward throat, sometimes margins ciliate; leaf blades linear-lanceolate, $2-8 \times 0.2-1$ cm, glabrous or pilose with tubercle-based hairs, margins scabrid, base attenuate, apex acuminate; ligule 1–2 mm. Racemes terminal and axillary, paired (rarely 3), loosely arranged, 2–10 cm; rachis internodes and pedicels columnar, triquetrous, ciliate along angles. Sessile spikelet broadly elliptic, $3.5-6 \times 1.2-1.5$ mm; callus hairs 0.5–1 mm, white; lower glume smooth, glossy, leathery with rounded flanks in lower half, upper half papyraceous, prominently many-veined, asperulous, flanks keeled, keels scabrid, wingless, abruptly narrowed to bicuspidate apex; upper glume keeled above middle, keel wingless, apex narrowed into 2–4 mm awnlet; awn of upper lemma 1–1.6 cm. Pedicelled spikelet laterally compressed, resembling sessile, upper lemma awned.

Fields, damp wayside places; below 100 m. Guangdong, Taiwan [India, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand; introduced in Africa and America].

The lower glume of the sessile spikelet occasionally has very narrowly winged keels, but the narrowed, sharply bicuspidate apex is characteristic, differing from the more rounded lower glume apex of *Ischaemum ciliare*. Axillary inflorescences are also uncommon in *I. ciliare*.

7. *Ischaemum thomsonianum* Stapf ex C. E. C. Fischer in Gamble, Fl. Madras 1722. 1934.

尖颖鸭嘴草 jian ying ya zui cao

Ischaemum murinum J. D. Hooker, Fl. Brit. India 7: 135. 1896 [“1897”], not G. Forster (1780).

Annual. Culms slender, shortly stoloniferous at base, branching, 20–45 cm tall, nodes bearded. Leaf sheaths glabrous; leaf blades linear, $2-8.5 \times 0.2-0.6$ cm, glabrous or a few long tubercle-based bristles toward ligule on adaxial surface, base narrowed or shortly pseudopetiolate, apex setaceous acuminate; ligule 3–5 mm. Racemes terminal and axillary, paired, loosely arranged, 1–3 cm; rachis internodes and pedicels columnar, triquetrous, densely ciliate along angles with yellowish hairs. Sessile spikelet lanceolate, $4.5-5.5 \times$ ca. 1 mm; callus densely bearded, hairs ca. 2 mm; lower glume smooth, glossy, leathery with rounded flanks in lower half, upper half herbaceous, many-veined, bristly, flanks keeled, keels scabrid, wingless, narrowed to bicuspidate apex; upper glume markedly longer than lower, awned, keeled above middle, winged on keel, a tuft of bristles below wing, apex elongate, excurrent into an awn up to 6 mm; awn of upper lemma 1–1.8 cm. Pedicelled spikelet laterally compressed, resembling sessile, bristly, upper lemma awned.

Flatlands; ca. 700 m. W Yunnan [India, Myanmar].

This slender, annual grass is very close to *Ischaemum timorense*, but has hairier racemes, narrower, hairy spikelets, and longer awned upper glumes than are usual for that species. It may simply be an extreme variant of *I. timorense*.

8. *Ischaemum aureum* (Hooker & Arnott) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 224. 1889.

金黄鸭嘴草 jin huang ya zui cao

Spodiopogon aureus Hooker & Arnott, Bot. Beechey Voy. 273. 1838.

Perennial from short rhizome. Culms loosely tufted, 20–30 cm tall, internodes short and leaves crowded in lower part, nodes glabrous. Leaf sheaths smooth, glabrous; leaf blades broadly linear, $3-12 \times 0.3-0.8$ cm, smooth, glabrous or a few setae on adaxial surface above ligule, base contracted, apex acuminate; ligule ca. 1 mm, truncate. Racemes terminal, paired, erect but usually separate, 2–5 cm, yellowish hairy; rachis internodes oblong-clavate, triquetrous, outer angle densely ciliate with long yellowish hairs, inner angles shortly ciliate or glabrous. Sessile spikelet lanceolate, $4-5 \times$ ca. 1 mm, yellowish; lower glume subleathery in lower part, 2-keeled, wingless, keels thickened, ciliolate, also pilose with ca. 2 mm yellow hairs, sometimes sparsely or ciliolate throughout, papery and asperulous toward apex with obvious anastomosing veins, apex bicuspidate; upper glume pilose on upper keel, apex 2-toothed, 2–3 mm awn from between teeth; awn of upper lemma 1.8–2.5 cm. Pedicelled spikelet \pm equaling sessile, usually bisexual, slightly laterally compressed, both glumes 1-keeled, shortly awned, upper lemma awned.

Coral rocks and bluffs of the seashore. Taiwan [Japan (Ryukyu Islands)].

This is a very locally distributed grass, with yellowish-hairy racemes and contrasting, reddish brown stigmas. The pedicelled spikelets are usually bisexual, exerting their stigmas and maturing before the sessile spikelets, but otherwise the species is typical of the genus *Ischaemum*.

9. *Ischaemum setaceum* Honda, Bot. Mag. (Tokyo) 38: 54. 1924.

小金黄鸭嘴草 xiao jin huang ya zui cao

Perennial. Culms slender, stoloniferous and rooting at base, ascending to 25 cm, lower internodes short with crowded leaves, nodes glabrous. Leaf sheaths glabrous; leaf blades linear-lanceolate, $3-6 \times 0.3-0.7$ cm, glabrous, apex acuminate; ligule rounded, tongue-like, ca. 1.5 mm. Racemes paired, 2–5 cm; rachis internodes thick, outer angle ciliate with long hairs, inner angles shortly ciliate or glabrous. Sessile spikelet narrowly lanceolate, ca. 4 mm, tinged reddish brown; lower glume subleathery in lower part, 2-keeled, papery and asperulous toward apex with obvious anastomosing veins, keels winged upward, apex bicuspidate; upper glume pilose on keel, apex acuminate or with 1–2 mm awnlet; awn of upper lemma 1–1.2 cm. Pedicelled spikelet resembling sessile, both glumes 1-keeled, cuspidate or mucronate.

• Seashores. S Taiwan (Lan Yu).

No specimens of this narrow endemic have been seen by the authors.

10. *Ischaemum rugosum* Salisbury, Icon. Stirp. Rar. 1, t. 1. 1791.

田间鸭嘴草 tian jian ya zui cao

Andropogon rugosus (Salisbury) Steudel; *A. segetum* (Trinius) Steudel; *Ischaemum akoense* Honda; *I. rugosum* var. *segetum* (Trinius) Hackel; *I. segetum* Trinius.

Annual. Culms loosely tufted, erect to decumbent, 20–100 cm tall, often branching, nodes pubescent. Leaf sheaths loose, papery, lightly keeled, glabrous or pilose with scattered tubercle-based hairs, margins ciliate; leaf blades linear-lanceolate, 10–30 × 0.5–2 cm, glabrous or thinly pilose, margins scabrid, base variable, rounded and constricted, or attenuate and sometimes briefly pseudopetiolate, apex acuminate; ligule 2–5 mm. Racemes terminal and axillary, paired, appressed back to back or slightly separated, 3–11(–13) cm; rachis internodes inflated, thickly clavate, ciliate along midline, inner angles glabrous. Sessile spikelet oblong-ovate, 4–6 × ca. 2 mm; lower glume 2-keeled throughout, crustaceous, yellowish and transversely 4–7-ridged below, ridges sharp, mostly continuous, herbaceous above with many anastomosing green veins, keels scabrid, wingless or winged on one side, apex obliquely obtuse; awn of upper lemma 1.2–2 cm. Pedicelled spikelet dorsally compressed, variable in size, often much reduced especially toward raceme apex, awnless; pedicel elongate when spikelet rudimentary.

Marshy fields, ditch banks, river banks, other wet often slightly saline grassy places; 100–1800 m. Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand; Australia (Queensland); introduced in Africa and America].

This native of tropical Asia is now widespread as a weed in tropical parts of the world, especially as a weed of rice fields.

11. *Ischaemum barbatum* Retzcius, Observ. Bot. 6: 35. 1791.

粗毛鸭嘴草 cu mao ya zui cao

Andropogon lodicularis (Nees) Steudel; *A. meyenianus* (Nees) Steudel; *Ischaemum aristatum* Linnaeus subsp. *barbatum* (Retzcius) Hackel; *I. aristatum* var. *lanuginosum* A. Camus; *I. aristatum* var. *lodiculare* (Nees) Hackel; *I. aristatum* var. *meyenianum* (Nees) Hackel; *I. barbatum* var. *hainanense* Keng & H. R. Zhao; *I. barbatum* var. *scabridulum* Keng & H. R. Zhao; *I. cylindricum* Keng & H. R. Zhao; *I. goebelii* Hackel; *I. imbricatum* var. *pubescens* Keng & H. R. Zhao; *I. lanuginosum* (A. Camus) Keng & H. R. Zhao; *I. lanuginosum* var. *enodulosum* Keng & H. R. Zhao; *I. lanuginosum* var. *erianthum* Keng & H. R. Zhao; *I. nodulosum* Honda; *I. nodulosum* var. *glabriflorum* Keng & H. R. Zhao; *I. rugosum* Salisbury var. *humidum* Keng & H. R. Zhao; *I. sinense* Keng & H. R. Zhao; *I. tien-taiense* Keng & H. R. Zhao; *I. yunnanense* Keng & H. R. Zhao; *Meoschium lodiculare* Nees; *M. meyenianum* Nees.

Perennial. Culms erect or ascending, 30–100 cm tall, often branched at base, nodes glabrous or bearded. Leaf sheaths glabrous to villous, margins ciliate or glabrous; leaf blades linear or narrowly lanceolate, 5–30 × 0.3–0.8 cm, glabrous to villous, margins scaberrulous, base variable, cordate to attenuate or pseudopetiolate, apex acute; ligule 2–5 mm. Racemes terminal, paired, usually appressed back to back, 4–10 cm; rachis internodes oblong, triquetrous, ciliate along outer angle, inner angles glabrous or shortly ciliate. Sessile spikelet lanceolate-oblong, 5–7 × 1.6–2 mm; lower glume 2-keeled throughout, glabrous to villous, leathery, marginal nodules in lower 2/3, these sometimes extended into weak transverse ridges, herbaceous above with many anastomosing green veins, keels asymmetrically winged, one wing wider than the other; awn of upper lemma 1–1.5 cm. Pedicelled spikelet dorsally compressed, as large as sessile but marginal nodules less developed, awnless or awned.

Hill slopes, open grasslands, marshes; near sea level to 1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; W Africa, Australia].

This is a widespread, polymorphic species, to which many specific and infraspecific names have been applied. Variation depends mainly on the degree of hairiness of the leaves and spikelets and the number and prominence of the nodules and ridges on the sessile spikelet. In extreme cases the ridges are particularly well developed and approach the condition in *Ischaemum rugosum*, but such plants can be recognized as *I. barbatum* by their more robust, perennial habit and more oblong sessile spikelets.

12. *Ischaemum magnum* Rendle, J. Bot. 32: 102. 1894.

大穗鸭嘴草 da sui ya zui cao

Ischaemum laeve Ridley.

Perennial. Culms erect, 1–2 m tall, sparingly branched in upper part, nodes glabrous. Leaf sheaths longer than internodes, pilose with tubercle-based hairs, especially along margins and toward blade; leaf blades broadly linear, 5–33 × 0.5–1.8 cm, abaxial surface densely to sparsely appressed pubescent, adaxial surface glabrous, margins scabrid, base narrowed, apex acuminate; ligule 3–5 mm. Racemes terminal, paired, appressed back to back, 6–12 cm; rachis internodes columnar, slightly expanded upward, triquetrous, ciliate along outer angle, sometimes only at base, inner angles glabrous. Sessile spikelet oblong-lanceolate, 6.5–8 × 1.7–2 mm; lower glume 2-keeled throughout, leathery except near apex, usually with 2–4 marginal tubercles in lower half, sometimes almost smooth, or tubercles transversely connected into coarse shallow ridges, herbaceous above with anastomosing green veins, keels narrowly winged; upper lemma entire, awnless or mucronate, or 2-lobed and awned; awn up to 1 cm, weakly geniculate. Pedicelled spikelet dorsally compressed, equaling or slightly longer than sessile, strongly asymmetrical, winged on one keel only, wing 0.3–1.5 mm wide, awnless; pedicel very short, stout.

Moist meadows, field margins; 800–1000 m. W Yunnan [Malaysia, Myanmar].

206. APLUDA Linnaeus, Sp. Pl. 1: 82. 1753.

水蔗草属 shui zhe cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, rambling. Leaf blades linear-lanceolate, often pseudopetiolate; ligule membranous. Inflorescence a single short raceme encircled by a small boat-shaped spatheole; raceme comprising 1 sessile and 2 pedicelled spikelets; spatheoles numerous, crowded into a leafy compound panicle; peduncle very short, spikelet triad deciduous from it at maturity; pedicels both broad, strongly flattened, together with lower glume of sessile spikelet forming a triangular box around fertile floret. Sessile spikelet bisexual, slightly laterally compressed; callus broad, swollen; lower glume herbaceous or subleathery toward base, convex, without keels or wings, 2-toothed; upper glume strongly convex, laterally compressed, membranous with hyaline margins, 1-keeled, awnless; lower floret staminate, well developed with palea; upper lemma deeply 2-lobed and awned from sinus, or entire to emarginate and awnless; awn 4–12 mm. Pedicelled spikelets awnless, unequal, one well developed, staminate, as large as sessile spikelet, the other rudimentary.

One species: S Arabia and Mauritius through India to SE Asia, Australia, and New Caledonia.

1. *Apluda mutica* Linnaeus, Sp. Pl. 1: 82. 1753.

水蔗草 shui zhe cao

Apluda aristata Linnaeus; *A. communis* Nees; *A. geniculata* Roxburgh; *A. microstachya* Nees; *A. mutica* var. *aristata* (Linnaeus) Hackel; *A. varia* Hackel, nom. illeg. superfl.

Culms rooting from lower nodes, up to 3 m long, smooth, glabrous, much branched in upper part, branches flexuous. Leaf sheaths usually glabrous; leaf blades flat, 10–30 × 0.5–2 cm, attenuate to a setaceous apex; ligule 1–2 mm. Spathate panicle up to 50 cm, branches very slender with spaced spathes subtending small clusters of spatheoles; spatheole ovate in side view, herbaceous, multiveined, up to 1 cm, often tipped by a fimbriate ligule and narrow vestigial blade; peduncle 1–1.5 mm; raceme 7–10 mm; pedicels oblong, 3–4 mm, glabrous or

ciliate upward. Sessile spikelet 4–5 mm; lower glume narrowly elliptic-lanceolate; lower lemma as long as or shorter than lower glume; upper lemma deeply 2-lobed with 4–12 mm awn, or entire to emarginate and awnless. Pedicelled spikelets lanceolate, awnless. Fl. and fr. Jul–Dec.

Common in thickets and along forest margins, sometimes forming large masses; below 1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, Cambodia, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; SW Asia (Oman, Socotra), Australia (Queensland), Indian Ocean Islands (Mascarenes), Madagascar, Pacific Islands (New Caledonia)].

This is a polymorphic species widespread in tropical Asia.

207. DIMERIA R. Brown, Prodr. 204. 1810.

觸茅属 xi mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Didactylon Zollinger & Moritzi; *Haplachne* Presl; *Psilostachys* Steudel; *Pterygostachyum* Nees ex Steudel.

Annual or perennial. Culms often delicate, erect to decumbent, nodes bearded, the hairs directed upward. Leaf blades linear; ligule short, membranous. Inflorescence terminal, composed of solitary or subdigitate racemes. Racemes 1-sided, spikelets single, shortly pedicelled, usually overlapping in 2 rows; rachis tough, triquetrous or flattened, spikelets disarticulating from pedicels at maturity; pedicels very short, broad, apex concave, margin truncate. Spikelets lanceolate or narrowly oblong, strongly laterally compressed; callus truncate, shortly bearded; glumes herbaceous or thinly papery, folded with a median keel, keel often winged, lower glume narrower and slightly shorter than upper glume; lower floret reduced to a narrow hyaline lemma; upper floret bisexual, lemma hyaline, a little shorter than upper glume, apex shortly 2-toothed, awned from sinus; awn geniculate, sometimes weakly or almost straight, glabrous; upper palea normally absent. Stamens 2. Caryopsis narrowly oblong, laterally compressed.

About 40 species: India, China, and Japan to Indonesia, the Philippines, and Australia; six species (three endemic) in China.

1a. Raceme with triquetrous rachis.

- 2a. Awn 0.5–2.5 mm; raceme rachis smooth on angles 2. *D. parva*
 2b. Awn 6–11 mm; raceme rachis scabrid on angles 1. *D. ornithopoda*

1b. Raceme with flattened rachis.

- 3a. Perennial; racemes (1–)2–3; rachis usually glabrous along margins.
 4a. Anthers 1.7–2 mm; upper glume obscurely keeled except below apex, or if keeled throughout, wing narrow 3. *D. falcata*
 4b. Anthers ca. 0.8 mm; upper glume distinctly keeled and broadly winged from base to apex 4. *D. guangxiensis*
 3b. Annual; raceme solitary; rachis densely ciliate along margins.
 5a. Upper glume broadly winged from base to apex 5. *D. sinensis*
 5b. Upper glume narrowly winged only in upper 1/3 6. *D. solitaria*

1. *Dimeria ornithopoda* Trinius, Fund. Agrost. 167. 1820.

鵝茅 xi mao

Annual, delicate. Culms very slender, erect, 3–40(–60) cm tall, 2–17-noded. Leaf sheaths keeled, usually hispid, hairs scattered, tubercle-based; leaf blades green when young, becoming reddish, soft, 1.5–5 × 0.1–0.25 cm, hispid with scattered tubercle-based hairs or glabrescent; ligule 0.5–1 mm, lacerate. Racemes 2–3(–5), subdigitate, 1–6(–10) cm, ascending at first, then divergent; rachis triquetrous, scabrid on angles, internodes 1–3 mm; pedicels ca. 0.2 mm, glabrous. Spikelets linear-oblong, 1.7–3.2(–4.5) mm, usually purple or reddish brown; glumes herbaceous with broad scarious margins, scabrid, sometimes with a few long stiff hairs near top of keel, or stiffly pilose throughout, keel usually wingless, occasionally upper glume narrowly winged, apex acute; upper lemma elliptic-lanceolate, 1.6–2 mm; awn 6–11 mm, geniculate; upper palea absent. Anthers 0.4–0.6 mm. Fl. and fr. Sep–Nov.

Streams, moist places, often gregarious; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; SW Asia (Oman), Australia, Pacific Islands (Polynesia)].

This is a widespread, polymorphic species, in which a number of infraspecific taxa has been recognized.

- 1a. Upper glume with rounded midline or sharply keeled only at apex, wingless 1a. subsp. *ornithopoda*
- 1b. Upper glume sharply keeled throughout, keel narrowly winged 1b. subsp. *subrobusta*

1a. *Dimeria ornithopoda* subsp. *ornithopoda*

鵝茅(原亚种) xi mao (yuan ya zhong)

Dimeria hirtella B. S. Sun; *D. tenera* Trinius.

Culms 3–40 cm tall. Racemes 2–3, 1–6 cm. Spikelets 1.7–3 mm; lower glume shorter than spikelet, dorsally scabrid, papery, margin membranous; upper glume with rounded midline or sharply keeled only at apex. Fl. and fr. Oct–Nov.

Streams, moist places; below 2000 m. Anhui, Guangdong, Guangxi, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang [India, Japan, Korea, Malaysia, Philippines; Australia].

1b. *Dimeria ornithopoda* subsp. *subrobusta* (Hackel) S. L. Chen & G. Y. Sheng, Fl. Reipubl. Popularis Sin. 10(2): 172. 1997.

具脊鵝茅 ju ji xi mao

Dimeria ornithopoda var. *subrobusta* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 82. 1889; *D. heterantha* S. L. Chen & G. Y. Sheng.

Culms up to 60 cm tall. Racemes 2–5, 2–8.5(–10) cm. Spikelets (2.5–)3–3.5(–4.5) mm; lower glume slightly shorter or equal to spikelet; upper glume sharply keeled throughout, keel narrowly winged. Fl. and fr. Sep–Oct.

Mountain slopes, streams, valleys; below 1100 m. E, S, and SW China [Japan].

Three varieties have been recognized under this subspecies in China, as follows: var. *subrobusta* Hackel, with culms 9–60 cm tall; spikelets reddish brown or pale, 3–3.5 mm; throughout the range of the subspecies; var. *nana* Keng & Y. L. Yang (J. Nanjing Univ., Nat. Sci. Ed. 1980(4): 109. 1980), with culms 4–12 cm tall, 5–13-noded; spikelets yellow, 3–4 mm; from Anhui; and var. *plurinodis* Keng & Y. L. Yang (loc. cit.), with culms 20–60 cm tall, 8–17-noded; spikelets 2.5–3 mm; from Taiwan.

The name *Dimeria heterantha* is based on an aberrant specimen of *D. ornithopoda*. The lower lemma is a small, hyaline scale, and the upper lemma is geniculate awned as usual. The upper floret possesses a minute palea, and a third awned lemma is placed above it.

2. *Dimeria parva* (Keng & Y. L. Yang) S. L. Chen & G. Y. Sheng, Fl. Reipubl. Popularis Sin. 10(2): 175. 1997.

小鵝茅 xiao xi mao

Dimeria ornithopoda Trinius var. *parva* Keng & Y. L. Yang, J. Nanjing Univ., Nat. Sci. Ed. 1980(4): 108. 1980.

Annual. Culms erect, 5–11 cm tall, 5–15-noded, much branched, nodes slightly pubescent or subglabrous. Leaf sheaths glabrous, longer than internodes except the uppermost; leaf blades linear-lanceolate, 1–3.5 × 0.1–0.25 cm, adaxial surface brownish, abaxial surface pale brown, loosely tuberculate-hairy at base, otherwise glabrous; ligule 0.5–0.7 mm. Racemes 2, 1–2.5 cm; rachis triquetrous, smooth on angles. Spikelets 3–3.5 mm, reddish brown; glumes papery with membranous margins, glabrous, upper glume winged along keel, apex acute or acuminate; upper lemma subentire; awn flexuous, 0.5–2.5 mm, usually exerted from spikelet; upper palea absent. Anthers yellow, ca. 0.5 mm. Caryopsis ca. 1.5 mm.

• Streams. Taiwan.

This species differs from *Dimeria ornithopoda* by its much-branched habit, subglabrous nodes, and subentire upper lemma with a straight awn included within the spikelet.

3. *Dimeria falcata* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 85. 1889.

镰形鵝茅 lian xing xi mao

Perennial. Culms tufted, wiry, erect or rooting at lowest nodes, 20–70 cm tall, branching, 2–9-noded. Leaf sheaths hirsute with short tubercle-based hairs; leaf blades dark green or reddish, linear, 10–20 × 0.2–0.3 mm, hirsute, adaxial surface with broad white midrib, apex finely acuminate; ligule 0.4–0.5 mm. Racemes 2–3, slightly curved, 2–7 cm, divergent; rachis flattened, margins winged, wing margin scabrid or white-ciliate, internodes 1.5–2 mm; pedicels 0.4–0.5 mm, bearded on outer or both margins. Spikelets linear-oblong, 3.5–4.5 mm, reddish brown or nearly purplish; glumes papery, upper glume with broad scarious margins, back rounded, keeled and scabrid or narrowly winged below apex, or keeled and winged throughout, white-pilose near margins and on keel, apex acute; upper lemma oblanceolate, ca. 2.5 mm; awn 7–10 mm, geniculate; upper palea absent. Anthers 1.7–2 mm. Fl. and fr. autumn.

Swampy slopes, lakesides. Fujian, Guangdong, Guangxi, Taiwan [India, Myanmar, Thailand, Vietnam].

- 1a. Raceme rachis scabrid along margins; upper glume obscurely keeled except below apex, winged only below apex 3a. var. *falcata*
 1b. Raceme rachis white-ciliate along margins; upper glume sharply keeled throughout, keel narrowly winged 3b. var. *taiwaniana*

3a. *Dimeria falcata* var. *falcata*

镰形鳶茅(原变种) lian xing xi mao (yuan bian zhong)

Dimeria falcata var. *tenuior* Keng & Y. L. Yang.

Rachis of raceme scabrid along margins. Upper glume rounded on back, only keeled below apex, keel winged or not. Fl. and fr. autumn.

Swampy slopes, lakesides. Fujian, Guangdong, Guangxi, Taiwan [India, Myanmar, Thailand].

3b. *Dimeria falcata* var. *taiwaniana* (Ohwi) S. L. Chen & G. Y. Sheng, Fl. Reipubl. Popularis Sin. 10(2): 179. 1997.

台湾鳶茅 tai wan xi mao

Dimeria taiwaniana Ohwi, Acta Phytotax. Geobot. 4: 58. 1935.

Rachis of raceme white-ciliate along margins. Upper glume distinctly keeled from base to apex, keel narrowly winged.

Moist slopes. Fujian, Taiwan [Vietnam].

4. *Dimeria guangxiensis* S. L. Chen & G. Y. Sheng, Bull. Bot. Res., Harbin 13: 77. 1993.

广西鳶茅 guang xi xi mao

Annual. Culms erect, 35–40 cm tall, 6–8-noded, branching. Leaf sheaths densely hairy, hairs tubercle-based; leaf blades linear-lanceolate, 2–5 × 0.15–0.35 cm, adaxial surface reddish brown, abaxial surface yellowish brown, puberulous, hairs tubercle-based, apex acuminate; ligule ca. 0.5 mm. Racemes 1–2, 2.5–3.5 cm; rachis ca. 0.8 mm wide, usually glabrous. Spikelets oblong, ca. 3.5 mm, brown; lower glume shortly ciliate along keel, upper glume broadly winged along keel, wing margin shortly ciliate; upper lemma ca. 2.5 mm; awn ca. 8 mm, almost straight. Anthers ca. 0.8 mm. Caryopsis ca. 2 mm. Fl. and fr. Oct.

- Grassy hillsides; below 500 m. Guangxi.

5. *Dimeria sinensis* Rendle, J. Linn. Soc., Bot. 36: 359. 1904.

华鳶茅 hua xi mao

Annual. Culms slender, erect, 12–40 cm tall, usually unbranched, 5–8-noded. Leaf sheaths reddish with age, hispid, hairs tubercle-based; leaf blades linear, 1.5–9 × 0.2–0.4 cm, abaxial surface green, smooth and glabrous, adaxial surface reddish, setose with tubercle-based 3–5 mm bristles, especially near margins; ligule ca. 0.5 mm. Raceme solitary, 2–5.5 cm, slightly flexuous; rachis flattened, 0.4–0.7 mm wide, margins narrowly winged, densely ciliate with white silky hairs; internodes ca. 1.5 mm; pedicels 0.3–0.5 mm, white bearded on outer margin. Spikelets oblong, 3.5–4 mm, reddish brown or purplish brown; glumes papery, sharply keeled, keel of upper glume broadly winged from base to apex, lower glume keel and upper glume wing margin densely white-ciliate, abaxial flank silky-white villous near margin, adaxial flank sparsely hairy, apex acute; upper lemma oblong, ca. 2.7 mm; awn 12–14 mm, geniculate; upper palea absent. Anthers ca. 1.2 mm. Caryopsis oblong, ca. 2.5 mm. Fl. and fr. autumn.

Hillsides, roadsides, damp waste ground; below 1000 m. Anhui, Fujian, Guangdong, Guangxi, Jiangsu, Jiangxi, Zhejiang [Thailand].

6. *Dimeria solitaria* Keng & Y. L. Yang, J. Nanjing Univ., Nat. Sci. Ed. 1980(4): 106. 1980.

单生鳶茅 dan sheng xi mao

Annual. Culms erect or slightly geniculate at base, 9–19 cm tall, 3–6-noded. Leaf sheaths puberulous, hairs tubercle-based; leaf blades linear, 1–3 × 0.1–0.25 cm, abaxial surface and margins loosely tuberculate-hairy; ligule ca. 0.4 mm. Raceme solitary, 1.5–2.5 cm; rachis flattened, ca. 1 mm wide, margins densely ciliate. Spikelets oblong, ca. 3 mm, reddish brown; glumes papery, lower glume densely ciliate along keel, densely pubescent near margins; upper glume densely ciliate along keel, narrowly winged along upper 1/2 of keel; upper lemma ca. 2 mm; awn 8–10 mm, geniculate. Anthers ca. 0.8 mm.

- Damp waste ground. Guangdong.

This species is related to *Dimeria sinensis*, but is a smaller plant, with the upper glume winged only in the upper third.

208. *ARTHAXON* P. Beauvois, Ess. Agrostogr. 111. 1812.

荻草属 jin cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Batratherum Nees; *Lucaea* Kunth; *Pleuroplitis* Trinius.

Annual or perennial. Culms slender, much branched, often trailing, nodes bearded or infrequently glabrous. Leaf blades lanceolate to ovate, cordate, often clasping culm, usually pectinate-setose on lower margins; ligule membranous, hairy on margin and back. Inflorescence of subdigitate, slender, fragile racemes, these terminal on culms and branches, not spatulate; rachis internodes and pedicels filiform to linear, glabrous or ciliate on angles; spikelets of a pair dissimilar, or spikelets apparently solitary. Sessile spikelet linear to lanceolate, dorsally or laterally compressed; callus short, truncate; lower glume membranous to leathery, back flat or convex, several-veined, with or without lateral keels, scaberulous to spinulose; upper glume boat-shaped, keel herbaceous, margins hyaline, apex acute to mucronate; lower floret reduced to an empty hyaline lemma; upper lemma hyaline, entire or shortly 2-toothed, awned from near base; awn geniculate, glabrous. Stamens 2 or 3. Caryopsis terete. Pedicelled spikelet variable, awnless, well developed, reduced, or represented by the pedicel only, sometimes almost completely suppressed. $x = 9$.

About 26 species: Old World tropics, mainly in India; introduced in America; 12 species (one endemic) in China.

Arthraxon is a rather isolated genus with no obvious close relatives, distinguished from the other awned *Andropogoneae* by its broad, clasping leaf blades on slender, branching culms, together with a sub-basally awned fertile lemma. It is superficially similar to *Microstegium*, but that genus has awned pedicelled spikelets.

- 1a. Lower glume of sessile spikelet laterally 2-keeled, margins inflexed; perennial; anthers 3.
 - 2a. Keels of lower glume stoutly pectinate-spinose, intercarinal veins usually muricate; leaf blades pubescent; uppermost sheath inflated, spathe-like 1. *A. echinatus*
 - 2b. Keels of lower glume tuberculate or almost smooth, intercarinal veins smooth or scaberulous; leaf blades glabrous or sparsely hispid; uppermost sheath tightly cylindrical.
 - 3a. Plant with knotty rootstock covered in velvety scales; lower glume of sessile spikelet with 2 rows of tubercles along each keel, intercarinal veins obscure except near apex 2. *A. prionodes*
 - 3b. Plant with spreading branching rhizomes; lower glume of sessile spikelet with 1 row of tubercles along each keel, intercarinal veins visible from base 3. *A. epectinatus*
- 1b. Lower glume of sessile spikelet without lateral keels, margins flat; annual or perennial; anthers 2 or 3.
 - 4a. Sessile spikelets 1.2–2.1 mm 6. *A. junnarensis*
 - 4b. Sessile spikelets 2–8 mm.
 - 5a. Pedicelled spikelets present, at least at raceme apex.
 - 6a. Sessile spikelets lanceolate, strongly scabrid to spinulose 7. *A. hispidus*
 - 6b. Sessile spikelets smooth to scaberulous.
 - 7a. Lower glume of sessile spikelet linear, obscurely veined, smooth below middle 11. *A. lancifolius*
 - 7b. Lower glume of sessile spikelet lanceolate or elliptic, strongly 6- or 7-veined with deep grooves between 12. *A. microphyllus*
 - 5b. Pedicelled spikelets absent or vestigial, represented by the pedicel only, this sometimes reduced to a minute stump.
 - 8a. Stamens 2.
 - 9a. Culms 10–30 cm tall; lower glume 5–9-veined 7. *A. hispidus*
 - 9b. Culms 30–60 cm tall; lower glume 9–11-veined 8. *A. multinervis*
 - 8b. Stamens 3.
 - 10a. Sessile spikelets 4–8 mm; anthers (1.5–)2–3.5 mm.
 - 11a. Raceme bases terete, pubescent all over; upper glume broad, leathery, hyaline margins 0.1–0.2 mm; lemma margins ciliate 4. *A. castratus*
 - 11b. Raceme bases flattened on inner face, only flattened surface pubescent; upper glume narrow, leathery, hyaline margins 0.6–0.7 mm; lemma margins glabrous 5. *A. typicus*
 - 10b. Sessile spikelets 2.8–4.2 mm; anthers 0.4–2 mm.
 - 12a. Sessile spikelets apparently awnless; anthers 1.5–2 mm 9. *A. submuticus*
 - 12b. Sessile spikelets with exserted awn; anthers 0.4–0.5 mm 10. *A. nudus*

1. *Arthraxon echinatus* (Nees) Hochstetter, Flora 39: 188. 1856.

粗刺菴草 cu ci jin cao

Andropogon echinatus (Nees) Heyne; *Arthraxon lanceolatus* (Roxburgh) Hochstetter var. *echinatus* (Nees) Hackel; *A. spathaceus* J. D. Hooker; *Batratherum echinatum* Nees.

?Perennial (base not seen). Culms straggling, ascending to 60 cm. Leaf sheaths tuberculate-hispid, uppermost sheath slightly inflated, spathe-like with reduced blade; leaf blades lanceolate, 3–6 cm × 7–13 mm, both surfaces pubescent, base amplexicaul, margins closely pectinate-ciliate along whole length, apex acuminate; ligule ca. 1 mm. Racemes 2–3, ca. 5 cm, sub-erect, yellowish green, enclosed at base in uppermost sheath or finally shortly exserted; rachis internodes ca. 2/3 length of sessile spikelets, shortly ciliate, hairs 0.3–1 mm. Sessile spikelet 5.2–7 mm; lower glume lanceolate, shallowly convex, laterally keeled, margins inflexed, keels stoutly pectinate-spinose, back 3–7-veined between keels, muricate along length of veins, or only toward apex, or occasionally completely absent; upper

lemma acuminate or shortly 2-toothed; awn 8–13 mm. Pedicelled spikelet narrowly lanceolate, 4–4.5 mm, sterile, infrequently reduced toward raceme base; pedicel stout, less than half internode length. Fl. and fr. Aug–Oct. 2n = 18.

Mountain slopes, streams; 1900–2300 m. Yunnan [India, Nepal].

2. *Arthraxon prionodes* (Steudel) Dandy in Andrews, Fl. Pl. Sudan 3: 399. 1956.

茅叶菴草 mao ye jin cao

Andropogon prionodes Steudel, Syn. Pl. Glumac. 1: 383. 1854, based on *A. serrulatus* A. Richard, Tent. Fl. Abyss. 2: 458. 1850, not Link (1827); *Arthraxon lanceolatus* (Roxburgh) Hochstetter var. *glabratus* S. L. Chen & Y. X. Jin; *A. pilophorus* B. S. Sun.

Perennial, loosely tufted, base knotty, covered in silky-tomentose scales. Culms stiff, erect or straggling, 40–60 cm long. Leaf sheaths glabrous or tuberculate-hispid; leaf blades lanceolate to narrowly ovate, tough, glaucous, 2–7 cm × 5–15 mm, usually glabrous, base rounded, margins cartilaginous and pec-

tinat-setose from stout tubercles, apex setaceous acuminate; ligule 0.5–1 mm. Racemes 2–11, 2–7 cm, pale green or tinged purple, suberect; rachis internodes 1/3–2/3 length of sessile spikelets, pilose, hairs increasing to 2–3 mm at apex. Sessile spikelet 5.8–7.2 mm; lower glume linear, strongly convex, laterally keeled, margins inflexed, back obscurely veined below middle, glabrous or puberulous, rarely shortly pubescent, 5 scaberrulous veins between keels toward apex, keels stoutly tuberculate-spinose, a second row of smaller tubercles on inner side of keels; upper lemma subtire to shortly denticulate, teeth 0.1–0.4 mm; awn 10–15 mm; palea absent. Anthers 3, 2.4–3.8 mm. Pedicelled spikelet narrowly lanceolate, 4–5 mm, staminate. Fl. and fr. Jul–Oct. $2n = 16, 36$.

Rocky mountain slopes, streamsides, roadsides. Anhui, Beijing, Henan, Hubei, Jiangsu, Shaanxi, Shandong, Sichuan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India, Myanmar, Pakistan, Thailand, Vietnam; E Africa, SW Asia].

Arthraxon prionodes has often been confused with *A. lanceolatus* (Roxburgh) Hochstetter, from the hills of S India. The latter species differs in its slightly broader, linear-lanceolate sessile glume with a flat back between the tuberculate lateral keels and obvious, raised intercarinal veins clearly visible from the glume base upward.

Occasionally the sessile glume is shortly pubescent, and the name *Arthraxon pilophorus* is based on such a plant. The name *A. lanceolatus* var. *raizadae* (Jain et al.) Welzen has been misapplied in China to this variant. It correctly applies to a low annual from peninsular India with long (6–7 mm), velutinous sessile spikelets.

3. *Arthraxon epectinatus* B. S. Sun & H. Peng, Guizhou Sci. 9: 289. 1991.

光脊荩草 guang ji jin cao

Arthraxon guizhouensis S. L. Chen & Y. X. Jin; *A. xinanensis* S. L. Chen & Y. X. Jin; *A. xinanensis* var. *laxiflorus* S. L. Chen & Y. X. Jin.

Perennial with spreading branching rhizomes. Culms stiff, erect or decumbent, 30–70 cm long. Leaf sheaths glabrous or tuberculate-hispid; leaf blades lanceolate, firm, green or glaucous, 3–10 cm × 4–15 mm, glabrous or sparsely hispid, base subcordate, margins serrulate, pectinate-setose near base, apex slenderly acuminate; ligule 0.5–1.5 mm. Racemes 2–6, 3–10 cm, yellowish green, lax, slightly flexuous; rachis internodes slightly shorter to equaling sessile spikelets, margins villous. Sessile spikelet 5–7 mm; lower glume linear-lanceolate, herbaceous, shallowly convex, laterally keeled, margins inflexed, glabrous, 5–7-veined between keels, veins visible along length of glume, keels scabrid to tuberculate in a single row, tubercles spinescent toward apex; upper lemma awned from 0.75–1.3 mm above base, apex subtire or 2-denticulate, teeth (0.1–) 0.5–0.7 mm; awn 7.5–13 mm; palea 0.5–1 mm. Anthers 3, 2.4–3.5 mm. Pedicelled spikelet narrowly lanceolate, 4.5–6 mm, staminate; pedicel villous. Fl. and fr. Jul–Nov.

Grassy slopes, among rocks, roadsides; 700–2500 m. Gansu (Wenxian), Guizhou, Shaanxi, Sichuan, Yunnan [Bhutan, Nepal].

This grass is easily confused with *Arthraxon prionodes* when the base is absent. However, besides the key characters of the lower glume, *A. epectinatus* is also distinguished by some less obvious differences. The leaf blades are usually a little narrower with the cartilaginous mar-

gin serrulate (vs. smooth) between the tubercle-based bristles, the awn arises slightly higher up the back of the upper lemma, and an upper palea is present. The apex of the upper lemma is not deeply 2-toothed as reported in Chinese literature. The delicate hyaline tissue is easily split down the midline during dissection.

Like *Arthraxon prionodes*, this grass has often been misidentified as the S Indian species *A. lanceolatus* (Roxburgh) Hochstetter, which has flatter, lower glumes with fewer, more prominent intercarinal veins, and a sub-basally awned upper lemma.

4. *Arthraxon castratus* (Griffith) V. Narayanaswami ex. Bor, Fl. Assam 5: 376. 1940.

海南蔴草 hai nan jin cao

Andropogon castratus Griffith, Not. Pl. Asiat. 3: 89. 1851; *A. pilipes* Backer; *A. rudis* Nees ex Steudel; *Arthraxon hainanensis* Keng & S. L. Chen; *A. rudis* (Nees ex Steudel) Hochstetter.

Perennial. Culms straggling, decumbent, rooting from lower nodes, 60–200 cm long, culm apex pubescent. Leaf sheaths glabrous to densely papillose-hispid; leaf blades lanceolate, 3–11 cm × 7–15 mm, glabrous or sparsely appressed-hispid, base cordate, margins pectinate-setose, apex acuminate; ligule 1–2 mm. Racemes 2–5, 3–7 cm, brownish green or purplish brown, raceme bases slenderly terete, pubescent; rachis internodes 1/3–4/5 length of sessile spikelets, softly pilose, hairs 0.4–1.5 mm. Sessile spikelet 4–8 mm; lower glume broadly lanceolate, leathery, weakly convex, not laterally keeled, margins flat, back asperulous, 7–9-veined, tuberculate-spinulose above middle especially near margins, spicules longer toward apex; upper glume longer than lower glume, broadly leathery, hyaline margins 0.1–0.2 mm, spicules present along upper midline; lemma margins ciliate; upper lemma 2-toothed, teeth ca. 0.4 mm; awn 10–14 mm; palea lanceolate, 1/2 length of lemma. Anthers 3, 2–3.8 mm. Pedicelled spikelet absent; pedicel subulate, 1–3 mm, pilose. Fl. and fr. autumn–winter. $2n = 18, 36$.

Dry mountain slopes. Hainan [India, Indonesia, Myanmar, Sri Lanka, Thailand, Vietnam; Australia (Queensland)].

Arthraxon castratus has a distinctive, narrowly elongate, pubescent base to each raceme, and the pubescence is carried down onto the upper part of the culm. The unusually broad, leathery upper glume also imparts a characteristic, broad side view to the spikelets.

5. *Arthraxon typicus* (Buse) Koorders, Exkurs.-Fl. Java 1: 110. 1911.

洱源蔴草 er yuan jin cao

Lucaea typica Buse in Miquel, Pl. Jungh. 467. 1854; *Arthraxon brevistaratus* Hackel; *A. hispidus* (Thunberg) Makino var. *robustior* Welzen; *A. junghuhnii* (Steudel) Hochstetter; *A. maopingensis* S. L. Chen & Y. X. Jin; *Lucaea junghuhnii* Steudel.

Perennial. Culms decumbent, rooting from lower nodes, 60 cm or more long. Leaf sheaths glabrous or tuberculate-hispid; leaf blades ovate or lanceolate, 6–10 cm × 10–23 mm, both surfaces subglabrous to hispid, base amplexicaul, margins pectinate-setose at least toward base, apex cuspidate; ligule 0.5–1 mm. Racemes 5–13, 3–8 cm, pale green or purplish, raceme

bases flattened on inner face, flattened surface pubescent; rachis internodes 1/2–4/5 length of sessile spikelets, glabrous or thinly ciliate, hairs 0.2–0.5 mm. Sessile spikelet 4–5.5 mm; lower glume lanceolate, leathery, weakly convex, margins not inflexed, back asperulous, 7–9-veined, small spinulose tubercles along veins, rarely tubercles sparse; upper glume equaling or slightly longer than lower glume, narrowly leathery, hyaline margins 0.6–0.7 mm, midline smooth; lemma margins not ciliate; upper lemma subentire or 2-toothed, teeth 0.1–0.35 mm; awn 5–11 mm; palea absent. Anthers 3, (1.5–)2–3 mm. Pedicelled spikelet absent; pedicel subulate, glabrous or thinly ciliate, up to 2 mm.

Moist places; 1300–2000 m. Guangdong, Yunnan [NE India, Indonesia, N Myanmar, Nepal, Thailand].

Arthraxon typicus resembles *A. castratus*, but, besides the key characters, differs by its shorter awns and lack of a palea. It is also similar to *A. hispidus*, but is a more vigorous perennial and can be clearly distinguished by the presence of 3 longer anthers. Awn length is variable and, when short, the awn may be exerted from the spikelet by less than ca. 2 mm.

6. *Arthraxon junnarensis* S. K. Jain & Hemadri, J. Bombay Nat. Hist. Soc. 68: 300. 1971.

微穗芨草 wei sui jin cao

Arthraxon hispidus (Thunberg) Makino var. *junnarensis* (Jain & Hemadri) Welzen.

Culms very slender, much branched, 5–30 cm tall. Leaf sheaths glabrous; ligule ca. 0.5 mm; leaf blades lanceolate to ovate, 0.6–3 cm × 3–12 mm, glabrous on both surfaces or laxly tuberculate-hispid, margins pectinate-ciliate below middle. Racemes 2–3, 0.7–0.9 cm; rachis internodes 0.6–1.5 mm, glabrous or pilose. Sessile spikelet 1.2–2.1 mm; lower glume broadly lanceolate, papery, convex, margins not inflexed, 7-veined above middle, veins hispidulous; upper glume glabrous, smooth; lower lemma usually absent, if present, then ca. 1 mm; awn ca. 6 mm. Anthers 2, ca. 0.5 mm. Pedicelled spikelet absent.

Stream banks, damp places; ca. 1100 m. W Yunnan (Zhenkang) [W India].

This is apparently a rare species, otherwise known only from the state of Maharashtra in W India. Specimens from Yunnan have not been seen by the authors.

7. *Arthraxon hispidus* (Thunberg) Makino, Bot. Mag. (Tokyo) 26: 214. 1912.

芨草 jin cao

Annual. Culms slender, sprawling, decumbent, rooting from lower nodes, weakly ascending up to 30 cm or more. Leaf sheaths glabrous to tuberculate-hispid, margin ciliate; leaf blades ovate to narrowly ovate, 2–5 cm × 6–15 mm, glabrous or hispid, base amplexicaul, margins pectinate-setose at least around base, apex sharply acute; ligule 0.5–3 mm. Racemes 2–10 or more, 1.5–4 cm, pale green or purple; rachis internodes (1/2–) 2/3–3/4 length of sessile spikelets, glabrous or sparsely to densely pilose, hairs less than 0.5 mm. Sessile spikelet 3–5 mm; lower glume lanceolate, weakly convex, margins not inflexed,

6–9-veined, veins scabrid-hispidulous to spinulose; upper glume slightly longer than lower, apex cuspidate; awn up to 11 mm, well developed and exerted from glumes, or sometimes reduced and included; palea absent. Anthers 2, 0.7–1 mm. Pedicelled spikelet usually absent; pedicel reduced to a minute stump, sometimes up to 2 mm or more at raceme apex, glabrous, sparsely ciliate, or infrequently densely pilose. Fl. and fr. Sep–Nov. $2n = 10, 18, 36$.

Streamsides, damp meadows, among crops, other moist places; 100–2300 m. Anhui, Fujian, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Nei Mongol, Ningxia, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Nepal, New Guinea, Pakistan, Philippines, Russia (Far East), Sri Lanka, Tajikistan, Thailand, Uzbekistan; Africa, SW Asia (Caucasus, Oman), Australia].

Arthraxon hispidus is an extremely polymorphic, polyploid species, to which many names have been applied, both at specific and infraspecific rank. It is now a widespread weed, occurring in many warm-temperate and tropical parts of the world.

Arthraxon hispidus is based on a gathering from Japan with rather small (ca. 3.5 mm), spinulose spikelets and glabrous raceme internodes and pedicel stumps. *Arthraxon micans* is based on a gathering from NE India with slightly longer (ca. 4.2 mm), merely scabrid spikelets and densely pilose internodes and pedicels. These two entities are often maintained as separate species. While populations at the margins of the distribution of this widespread taxon are often fairly uniform, over the main part of its distribution in SE Asia and China there is every possible combination of characters. It has proved impossible to recognize more than one species in China.

The awn is usually well developed and clearly exerted, but there is continuous variation through more shortly awned forms to those with the awn included within the glumes, thereby making the spikelets appear awnless. The name *Arthraxon hispidus* var. *cryptatherus* has been applied in China to apparently awnless forms, but in fact the type of the species name, from Japan, has included awns. *Arthraxon langsdorffii* is based on a Japanese specimen with well-exserted awns.

Pubescence of the rachis internodes and pedicels, spikelet length, and degree of development of spinules on the lower glume are also very variable and without clear discontinuities. Spikelet length given here applies to specimens seen from China. Elsewhere, spikelets may be as long as ca. 8 mm. Infrequently, lanceolate pedicelled spikelets up to 3.5 mm are present at the raceme apex, including on the type of *Arthraxon micans*. Such specimens are easily distinguished from *A. lancifolius* by their flatter, broader, spinulose sessile spikelets.

- 1a. Leaf blades glabrous or puberulous on abaxial surface; tubercle-based bristles present on lower 1/3 of leaf margins only 7a. var. *hispidus*
- 1b. Leaf blades thinly hispid on both surfaces; tubercle-based bristles present on margins for most of length from base 7b. var. *centrasiaticus*

7a. *Arthraxon hispidus* var. *hispidus*

芨草(原变种) jin cao (yuan bian zhong)

Phalaris hispida Thunberg, Syst. Veg., ed 14, 104. 1784; *Alectoridia quartiniana* A. Richard; *Andropogon micans* (Nees) Steudel; *Arthraxon ciliaris* P. Beauvois; *A. ciliaris* var. *cryp-*

tatherus Hackel; *A. ciliaris* var. *hookeri* Hackel; *A. cryptatherus* (Hackel) Koidzumi; *A. cuspidatus* Hochstetter ex A. Richard var. *micans* (Nees) Hackel; *A. hispidus* Humboldt & Bonpland ex Willdenow subsp. *langsдорffii* (Thunberg) Tzvelev; *A. hispidus* var. *cryptatherus* (Hackel) Honda; *A. hispidus* var. *muticus* (Honda) Ohwi; *A. hookeri* (Hackel) Henrard; *A. langsдорffii* (Trinius) Hochstetter ex Roshevitz; *A. micans* (Nees) Hochstetter; *A. okamotoi* Ohwi; *A. pauciflorus* Honda; *A. pauciflorus* var. *muticus* Honda; *A. quartinianus* (A. Richard) Nash; *Batratherum micans* Nees; *Digitaria hispida* (Thunberg) Sprengel; *Lasiolytrum hispidum* (Thunberg) Steudel; *Pleuroplitis langsдорffii* Trinius; *P. langsдорffii* var. *chinensis* Regel.

Leaf blades ovate, glabrous or abaxial surface occasionally puberulous, lower 1/3 of margins pectinate with tubercle-based bristle; awn variable, well developed or reduced. Fl. and fr. Sep–Nov.

Streamsides, damp meadows, among crops, other moist places; 100–2300 m. Anhui, Fujian, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Nei Mongol, Ningxia, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Nepal, New Guinea, Pakistan, Philippines, Russia (Far East), Sri Lanka, Tajikistan, Thailand, Uzbekistan; Africa, SW Asia (Caucasus, Oman), Australia].

7b. *Arthraxon hispidus* var. *centrasiaticus* (Grisebach) Honda, Bot. Mag. (Tokyo) 39: 278. 1925.

中亚蔞草 zhong ya jin cao

Pleuroplitis centrasiatica Grisebach in Ledebour, Fl. Ross. 4: 477. 1853; *Arthraxon centrasiaticus* (Grisebach) Gamajouva; *A. ciliaris* P. Beauvois var. *centrasiaticus* (Grisebach) Hackel; *A. hispidus* (Thunberg) Makino subsp. *centrasiaticus* (Grisebach) Tzvelev; *Pleuroplitis langsдорffii* Trinius var. *centrasiatica* (Grisebach) Regel.

Leaf blades lanceolate, 1–3 cm, sparsely hispid on both surfaces, margins pectinate with tubercle-based bristles for most of length from base; awn well developed, long exserted. Fl. and fr. Aug–Sep.

Moist places. C, E, and N China [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; C and SW Asia].

This is a primarily C Asian variant, now adventive elsewhere.

8. *Arthraxon multinervis* S. L. Chen & Y. X. Jin, Bull. Bot. Res., Harbin 13: 102. 1993 [*"multinervus"*].

多脉蔞草 duo mai jin cao

Annual. Culms robust, decumbent at base, 30–60 cm tall. Leaf sheaths densely hispid with tubercle-based hairs, margin densely ciliate; leaf blades narrowly ovate, 4–7 cm × 12–18 mm, glabrous on both surfaces, base cordate, margins pectinate-spinose, apex slenderly acuminate. Racemes 2–7, 3–4 cm; rachis internodes 2/3–3/4 length of sessile spikelets, pilose. Sessile spikelet 4–4.5 mm; lower glume lanceolate, weakly convex, margins not inflexed, 9–11-veined, veins scabrid or tuberculate-hairy, apex acuminate; upper glume shorter than lower, apex acuminate; awn 1.5–4 mm, included or rarely slightly exserted; palea absent. Anthers 2, ca. 0.8 mm. Pedicelled spikelet absent, pedicel ca. 0.4 mm. Fl. and fr. Oct–Dec.

• Mountain slopes; 1200 m. Guizhou.

This is a rather robust segregate from the polymorphic species *Arthraxon hispidus*.

9. *Arthraxon submuticus* (Nees ex Steudel) Hochstetter, Flora 39: 188. 1856.

无芒蔞草 wu mang jin cao

Andropogon submuticus Nees ex Steudel, Syn. Pl. Glumac. 1: 382. 1854; *Arthraxon ciliaris* P. Beauvois subsp. *submuticus* (Nees ex Steudel) Hackel; *Batratherum submuticum* (Nees ex Steudel) W. Watson.

Annual, loosely tufted. Culms decumbent, moderately branched, 10–30 cm tall. Leaf sheaths shorter than internodes, densely tuberculate-hispid to glabrous, margin tuberculate-ciliate; leaf blades ovate, 2–6 cm × 5–20 mm, hispid with scattered hairs or glabrous, base amplexicaul, margins densely pectinate-setose, apex sharply acuminate; ligule ca. 2 mm. Racemes 3–10, 2–4(–8) cm, pale green or purplish; rachis internodes ca. 3/4 length of sessile spikelets, glabrous. Sessile spikelet 2.8–4.2 mm; lower glume narrowly elliptic, herbaceous, convex, margins not inflexed, 6–8-veined, veins strongly scabrid, apex subacute; upper glume subequal to lower glume, scabrid along keel, apex acute; upper lemma lanceolate, acute; awn rudimentary, shorter than lemma, not exserted; palea present, small. Anthers 3, 1.5–2 mm. Pedicelled spikelet absent; pedicel up to 2 mm at raceme apex, glabrous.

River banks, moist places; 1600–2100 m. Yunnan [NW India, Nepal].

This species is similar to awnless forms of *Arthraxon hispidus*, but has a slightly plumper sessile spikelet with a broader apex, as well as three longer anthers.

10. *Arthraxon nudus* (Nees ex Steudel) Hochstetter, Flora 39: 188. 1856.

光轴蔞草 guang zhou jin cao

Andropogon nudus Nees ex Steudel, Syn. Pl. Glumac. 1: 383. 1854; *Arthraxon ciliaris* P. Beauvois subsp. *nudus* (Nees ex Steudel) Hackel; *A. hispidus* (Thunberg) Makino var. *nudus* (Nees ex Steudel) Ohwi.

Annual. Culms rather stiff, decumbent, ascending to 50 cm. Leaf sheaths glabrous or tuberculate-hispid; leaf blades narrowly ovate, 2–8 cm × 5–20 mm, glabrous on both surfaces, base amplexicaul, margins scabrid or pectinate-setose at base, apex sharply acuminate to caudate; ligule 2–3 mm. Racemes very slender, 3–9, often rebranched and hence up to 20, 2–8 cm, suberect when young, stiffly divergent at maturity; rachis internodes 4/5 as long to equaling spikelets, glabrous. Sessile spikelet 3–4.5 mm; lower glume linear-lanceolate, leathery, strongly convex, margins not inflexed, back minutely granular, obscurely 6–7-veined below middle, veins scabrid above middle, apex acute; upper glume with acute apex; awn 5.7–9 mm. Anthers 3, 0.4–1 mm. Pedicelled spikelet absent; pedicel 1–2 mm, glabrous.

Swamps, shady places, roadsides; 1200–1300 m. Yunnan [India, Malaysia, Myanmar, Thailand; SW Asia (Oman)].

When anthers are absent, *Arthraxon nudus* is best distinguished from *A. hispidus* by its very slender racemes of narrow spikelets spaced

almost their own distance apart. The racemes finally spread divaricately as they disarticulate.

11. *Arthraxon lancifolius* (Trinius) Hochstetter, *Flora* 39: 188. 1856.

小叶荩草 xiao ye jin cao

Andropogon lancifolius Trinius, *Mém. Acad. Imp. Sci. St.-Petersbourg*, Sér. 6, Sci. Math. 2: 271. 1833; *Arthraxon microphyllus* (Trinius) Hochstetter var. *lancifolius* (Trinius) Hackel; *A. mollis* (Nees) Duthie; *A. schimperi* (Hochstetter ex A. Richard) Hochstetter; *Batrachium lancifolium* (Trinius) W. Watson; *B. molle* Nees; *Lucaea schimperi* (Hochstetter ex A. Richard) Steudel; *Pleuroplitis lancifolia* (Trinius) Regel; *Psilopogon schimperi* Hochstetter ex A. Richard.

Annual, delicate. Culms loosely tufted, very slender, decumbent, much branched, up to 30 cm long, glabrous or pubescent. Leaf sheaths loose, margin ciliate; leaf blades elliptic to narrowly ovate, thin, flaccid, 0.5–4 cm × 2–9 mm, puberulent to densely pubescent, often with scattered tubercle-based hairs, base cordate, basal margins pectinate-setose, apex setaceously acuminate; ligule 0.7–1.5 mm. Racemes 2–9, 1–2.5 cm; rachis internodes 1/2 length of sessile spikelets, margins silky ciliate, hairs increasing to 1.5–2.5 mm at apex. Sessile spikelet 2–3.3 mm; lower glume linear, strongly convex, margins not inflexed, veins indistinct in lower part, scaberrulous toward apex, apex finely 2-toothed; upper glume extended into 0.5–1.5 mm apical mucro; awn 4–8 mm; palea absent. Anthers 2, 0.5–0.7 mm. Pedicelled spikelet usually present at least at raceme apex, lanceolate, 1.5–2.5 mm, sterile, usually composed of 2 empty glumes. Fl. and fr. Sep–Nov. $2n = 18, 36$.

Damp rocky places on mountain slopes. Guizhou, Sichuan, Yun-

nan [Bhutan, India, Indonesia, Myanmar, Nepal, New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, SW Asia (S Arabia)].

Young inflorescences should be examined for pedicelled spikelets, as these may be present only at the tips of the racemes and soon disarticulate.

12. *Arthraxon microphyllus* (Trinius) Hochstetter, *Flora* 39: 188. 1856.

小荩草 xiao jin cao

Andropogon microphyllus Trinius, *Mém. Acad. Imp. Sci. St.-Petersbourg*, Sér. 6, Sci. Math. 2: 275. 1833; *A. lancifolius* Trinius var. *microphyllus* (Trinius) Kuntze; *A. sikkimensis* Bor; *Pleuroplitis microphylla* (Trinius) Regel.

Ephemeral, delicate. Culms solitary or loosely tufted, very slender, 10–25 cm tall, glabrous. Leaf sheaths glabrous to hispid; leaf blades lanceolate to ovate, 0.5–1.5 cm × ca. 5 mm, tuberculate-hispid on both surfaces, base rounded, margins tuberculate-setose, apex acuminate; ligule 1.5–2 mm. Racemes 1–3, 1–2.5 cm; rachis internodes 2/3 length of sessile spikelets, margins ciliate, hairs increasing to 1–1.3 mm at apex. Sessile spikelet 3–4 mm; lower glume elliptic or lanceolate, shallowly convex or almost flat, margins not inflexed, strongly 6- or 7-veined with deep grooves between, veins smooth except below apex, apex emarginate; upper glume with acute apex; awn 8–10.5 mm; palea absent. Anthers 2, 0.6–0.8 mm. Pedicelled spikelet present throughout, linear, 2–3.5 mm, male or sterile and reduced to 2 empty glumes. Fl. and fr. Sep–Nov. $2n = 18$.

Dry mountain slopes; 2000–3000 m. Yunnan [Bhutan, NE India, Nepal, N Thailand].

209. *SCHIZACHYRIUM* Nees, *Fl. Bras. Enum. Pl.* 2: 331. 1829.

裂稈草属 lie fu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial or annual. Leaf blades linear or oblong-linear; ligule membranous. Inflorescence a solitary slender fragile raceme, racemes axillary, supported by a spatheole; rachis internodes and pedicels filiform to clavate, glabrous to ciliate or villous, apex cupular with scarious lobed rim; spikelets of a pair dissimilar. Sessile spikelet dorsally compressed or squeezed between internode and pedicel; callus obconical, obtuse, shortly bearded, inserted into internode apex; lower glume papery to leathery, convex, linear to lanceolate, flanks inflexed, often 2-keeled, usually wingless, intercarinal veins several, sometimes faint; upper glume boat-shaped, cuspidate to mucronate; lower floret reduced to a hyaline lemma; upper lemma hyaline, deeply 2-lobed, awned from sinus; awn geniculate, column glabrous. Stamens 3. Caryopsis linear. Pedicelled spikelet male or barren, usually smaller than sessile, sometimes much reduced.

About 60 species: throughout the tropics and subtropics; four species in China.

Schizachyrium is closely related to *Andropogon*, differing mainly by its single racemes. The convex lemma of the sessile spikelet and scarious, cupular internode apex are additional features characteristic of *Schizachyrium*.

1a. Perennial; leaf blades 5–50 cm.

2a. Racemes 3–9 cm; sessile spikelet linear, 5–8 mm 1. *S. sanguineum*

2b. Racemes 1–4 cm; sessile spikelet lanceolate-oblong, 3.6–6 mm 2. *S. delavayi*

1b. Annual; leaf blades 1.5–8 cm.

3a. Sessile spikelet 2.5–4 mm; leaf blades (1–)2–7 mm wide, apex obtuse 3. *S. brevifolium*

3b. Sessile spikelet 6–7 mm; leaf blades 1–2 mm wide, apex subacute 4. *S. fragile*

1. *Schizachyrium sanguineum* (Retzius) Alston in Trimen, Handb. Fl. Ceylon 6: 334. 1931.

红裂稈草 hong lie fu cao

Rottboellia sanguinea Retzius, Observ. Bot. 3: 25. 1783; *Andropogon hirtiflorus* (Nees) Kunth; *A. sanguineus* (Retzius) Merrill; *Schizachyrium hirtiflorum* Nees.

Perennial, tussocky, whole plant often reddish brown. Culms erect, hard, 50–120 cm tall, 2–4 mm in diam., simple or branched, glabrous. Leaf sheaths keeled, glabrous; leaf blades linear, flat, 5–20 × 0.1–0.5 cm, glabrous, margins scabrid, apex acute; ligule ca. 1 mm. Raceme very slender, erect, distant, 3–9 cm, dark purplish red, finally long exserted from spatheole; rachis internodes and pedicels linear-clavate, equaling or slightly shorter than sessile spikelet, glabrous or white-ciliate. Sessile spikelet 5–8 mm; lower glume linear, leathery, convex with inflexed margins, keeled from below middle to apex, back scabrid, veins obscure, keels very narrowly winged toward apex, apex 2-toothed; upper lemma 2-lobed to near base; awn 1–2 cm. Pedicelled spikelet lanceolate, reduced to 1 or 2 glumes, 2.8–4 mm, lower glume with awn up to 3 mm. Fl. and fr. Jul–Dec.

Dry hillsides; near sea level to 3600 m. Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangxi, Sichuan, Xizang, Yunnan [India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Africa, America, Australia].

This grass is widely distributed in tropical and warmer, subtropical parts of the world.

2. *Schizachyrium delavayi* (Hackel) Bor, Indian Forest Rec., Bot. 1: 95. 1938.

旱茅 han mao

Andropogon delavayi Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 404. 1889; *A. bootanensis* J. D. Hooker; *Eremopogon delavayi* (Hackel) A. Camus; *Schizachyrium bootanense* (J. D. Hooker) A. Camus.

Perennial from a knotty rootstock. Culms loosely tufted, erect, wiry, 40–150 cm tall, upper internodes keeled, hirsute along keel, nodes glabrous. Leaf sheaths glabrous or thinly hirsute near mouth; leaf blades linear, 20–50 × 0.2–0.5 mm, glabrous or abaxial surface hirsute, apex finely acuminate; ligule truncate, 0.5–1 mm, margin ciliate. Raceme 1–4 cm, purplish; spatheole narrow, glabrous or sparsely hirsute; rachis internodes and pedicels filiform, ca. 2/3 length of sessile spikelet, white-ciliate. Sessile spikelet 3.6–6 mm; callus obtuse, ca. 0.5 mm; lower glume narrowly lanceolate-oblong, leathery, glossy, back convex to almost flat, minutely asperulous, 5-veined, flanks keeled and narrowly winged above middle, wings ciliate, apex erose; upper lemma 2-lobed in upper 1/4–1/3; awn 0.6–1 cm. Pedicelled spikelet male or barren, 4–5.3 mm, elliptic-oblong, papery, flat, back 3-veined, margins keeled and ciliate above middle, apex acute. Fl. and fr. Jun–Nov.

Dry mountainsides, dry open forests; 1200–3400 m. Guangxi, Guizhou, Hunan, Sichuan, Xizang, Yunnan [Bhutan, India (Naga Hills, Sikkim), N Myanmar, Nepal].

This grass has been placed in *Eremopogon* (a synonym of *Dichanthium*), but differs from that genus in its keeled lower glume and the absence of homogenous spikelet pairs.

3. *Schizachyrium brevifolium* (Swartz) Nees ex Buse in Miquel, Pl. Jungh. 3: 359. 1854.

裂稈草 lie fu cao

Andropogon brevifolius Swartz, Prodr. 26. 1788; *Pollinia brevifolia* (Swartz) Sprengel.

Annual. Culms delicate, erect or trailing, 10–70 cm long, copiously branched, glabrous. Leaves cauline; leaf sheaths keeled, glabrous; leaf blades yellowish green becoming reddish brown, oblong-linear, flat or folded, 1.5–4 × (0.1–)0.2–0.7 cm, glabrous, base subrounded, apex obtuse; ligule 0.5–0.8 mm, lacerate. Raceme slender, 1–2 cm, enclosed at base by spatheole, borne along most of culm length, usually several flexuous peduncles arising from each leaf axil; rachis internodes and pedicels inflated upward, ca. 3/4 length of sessile spikelet, glabrous to villous. Sessile spikelet 2.5–4 mm; lower glume linear-lanceolate, subleathery, back flat, glabrous to thinly pilose, indistinctly 4–5-veined, flanks keeled toward apex, keels wingless, apex minutely 2-toothed; upper lemma 2-lobed to near base; awn 0.7–1 cm. Pedicelled spikelet reduced to 1 or 2 glumes, up to 0.5 mm, lower glume with 3–5 mm awn. Fl. and fr. Jul–Dec.

Open grassy banks, field margins, weedy places, sometimes gregarious; below 2000 m. Anhui, Fujian, Guangdong, Guizhou, Hainan, Hebei, Henan, Hubei, Jiangsu, Shandong, Sichuan, Taiwan, Xizang, Zhejiang [Bangladesh, Bhutan, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam; Africa, America, SW Asia (Oman)].

This is a slender, weedy annual, occurring widely in warm parts of the world. The whole plant turns reddish brown at maturity. The delicate, branching habit, with very obtuse leaf blades, is distinctive.

4. *Schizachyrium fragile* (R. Brown) A. Camus, Ann. Soc. Linn. Lyon, n.s., 70: 87. 1924.

斜须裂稈草 xie xu lie fu cao

Andropogon fragilis R. Brown, Prodr. 202. 1810; *A. brevifolius* Swartz var. *fragilis* (R. Brown) Hackel; *A. fragilis* var. *sinensis* Rendle; *A. obliquiberbis* Hackel; *Schizachyrium fragile* var. *sinense* (Rendle) Jansen; *S. obliquiberbe* (Hackel) A. Camus; *Eulalia simplex* Hosokawa.

Annual. Culms tufted, wiry, erect or geniculate, 15–60 cm tall, sparingly branched, glabrous. Leaves mainly basal; leaf sheaths lightly keeled, glabrous or a few hairs at mouth; leaf blades linear, usually folded, 4–8 × 0.1–0.2 cm, glabrous, apex acute or subacute; ligule 0.2–0.5 mm. Raceme 4–8 cm, enclosed at base by spatheole; rachis internodes and pedicels columnar, broadened distally, slightly shorter than sessile spikelet, a dense band of white ca. 3 mm hairs from lower part of one margin slanting obliquely across upper part of internode, then transversely across apex to top of other margin, pedicel often similarly obliquely bearded. Sessile spikelet 6–7 mm; lower glume linear-lanceolate, 2-keeled throughout, subleathery and white-villous below middle, membranous and glabrous above, keels winged for most of length but broadest on membranous

part, apex narrow, keels minutely extended; upper lemma 2-lobed to near base; awn 1–1.5 cm. Pedicelled spikelet reduced to 1 or 2 glumes, 1.5–3.5 mm, ciliate on both margins, lower glume with ca. 3 mm awn. Fl. and fr. Aug–Dec.

Hillsides; below 1000 m. S Anhui, Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Taiwan [Indonesia; Australia, Pacific Islands].

This species is similar to *Schizachyrium exile* (Hochstetter) Pilger, from India and Africa, which is another slender annual with reddish racemes and conspicuous, contrasting, white hairs. However, *S. exile* has rachis internodes villous on the back and glabrous near the apex, and the lower glume of the sessile spikelet is wingless. The dense beard curling across the rachis internode from one side to the other in *S. fragile* is curious and quite distinctive.

210. ANDROPOGON Linnaeus, Sp. Pl. 2: 1045. 1753.

须芒草属 xu mang cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, not aromatic; ligule scarious or reduced to a line of hairs. Inflorescence simple or compound; racemes fragile, usually paired, occasionally digitate or single, terminal on the culm or axillary and gathered into a spathate compound panicle; spikelets of a pair dissimilar; raceme bases not deflexed, without homogamous spikelets (present in *A. munroi*); rachis internodes filiform to linear or clavate, sometimes inflated, ciliate on margins. Sessile spikelet usually dorsally compressed; callus short, obtuse, shortly bearded, inserted into internode apex; lower glume membranous to leathery, 2-keeled, lanceolate, flat to concave with lateral keels, these sometimes narrowly winged, with or without intercarinal veins, or linear with dorsal keels and a deep veinless median groove; upper glume awned or awnless; lower floret reduced to a hyaline lemma; upper lemma hyaline, 2-lobed, awned from sinus; awn geniculate, column glabrous or puberulous. Stamens 1–3. Pedicelled spikelet variable, large to much reduced, male or barren. $x = 10$.

About 100 species: tropical and warm-temperate regions of both hemispheres, especially Africa and America; two species in China.

- 1a. Upper glume awned; pedicelled spikelet 2-awned 1. *A. chinensis*
 1b. Upper glume awnless; pedicelled spikelet awnless 2. *A. munroi*

1. *Andropogon chinensis* (Nees) Merrill, Philipp. J. Sci. 12: 101. 1917.

华须芒草 hua xu mang cao

Homoeatherum chinense Nees in Lindley, Nat. Syst. Bot., ed. 2., 448. 1836; *Andropogon apricus* Trinius var. *chinensis* (Nees) Hackel; *A. ascinodis* C. B. Clarke.

Perennial. Culms tufted, 40–100 cm tall. Leaf sheaths glabrous or pilose; leaf blades linear, flat or involute when dry, 8–25 × 0.2–0.3 cm, both surfaces pilose or abaxial surface glabrous; ligule 1–2.5 mm. Inflorescence a scanty spathate compound panicle; spatheoles linear; racemes paired, 1.5–3(–5) cm, exserted from spatheole; peduncle puberulous; rachis internodes and pedicels cuneate, margins ciliate with 1–3 mm hairs, tips cupular, obliquely toothed. Sessile spikelet linear, ca. 5 mm; lower glume deeply concave between dorsal keels, glabrous, apex acute or 2-toothed; upper glume awned, awn 6–10 mm; upper lemma 2-lobed; awn 2–3 cm. Anthers ca. 3 mm. Pedicelled spikelet oblong-lanceolate, 3.5–4.5 mm, 2-awned; awn of lower glume 4–10 mm, awn of upper glume much shorter. Fl. and fr. Aug–Dec.

Open grassy hillsides; below 800 m. Guangdong, Guangxi, Hainan, Sichuan, Yunnan [Cambodia, India, Laos, Myanmar, Thailand, Vietnam; Africa, SW Asia (Yemen)].

2. *Andropogon munroi* C. B. Clarke, J. Linn. Soc., Bot. 25: 87. 1889.

西藏须芒草 xi zang xu mang cao

Andropogon gyirongensis L. Liu; *A. hookeri* Munro ex Hackel; *A. tristis* Nees ex Hackel; *A. yunnanensis* Hackel; *Cymbopogon hookeri* (Munro ex Hackel) Stapf ex Bor; *C. tibeticus* Bor.

Perennial from tough rootstock, rhizomatous; basal sheaths crowded, pale yellow, papery, strongly keeled. Culms tufted, 30–100 cm tall. Leaf sheaths glabrous; leaf blades narrowly linear, flat or folded, tough, 15–25 × 0.2–0.4 cm, scaberulous, often with scattered long tubercle-based hairs especially on adaxial surface, midrib white, apex finely acuminate; ligule 1.5–4 mm. Inflorescence a sparse spathate panicle, spathate clusters few, often purplish; spatheoles very slender, terete, 2.5–4 cm; racemes paired or frequently branching, then subdigitate along a short axis, 2–4 cm, finally reflexing, lowest spikelet pair homogamous; peduncle glabrous or pilose; rachis internodes and pedicels slender, ciliate, tips cupular, irregularly toothed. Sessile spikelet narrowly oblong, 4.5–6.5 mm; lower glume leathery, deeply to shallowly concave, keels rounded below middle, sharp and scabrid above, glabrous or puberulous in groove, veinless or 1-veined above groove, apex 2-toothed; upper glume awnless; upper lemma 2-lobed, lobes filiform; awn 1–1.6 cm. Pedicelled spikelet 4.5–6 mm, awnless. Fl. and fr. Jun–Nov.

Mountainsides, dry open places in scrub; 2000–4500 m. Sichuan, S Xizang, Yunnan (Yongsheng, Ninglang) [Bhutan, N India, Nepal, Pakistan].

This species lies on the boundary between *Andropogon* and *Cymbopogon* and is sometimes placed in the latter genus on account of its reflexing racemes and homogamous spikelets. However, the slender, unequal raceme bases and frequently subdigitate, longer racemes are typical of *Andropogon*. As far as is known, the leaf blades do not contain aromatic oils. The yellowish, strongly keeled basal sheaths are characteristic of this species.

Robust specimens, often with several racemes per spathe, a hairy peduncle, and shallowly grooved sessile spikelets, have been separated as *Andropogon tristis*. However, there are many intermediates, which make a division into two species impracticable.

211. CYMBOPOGON Sprengel, Pl. Min. Cogn. Pug. 2: 14. 1815.

香茅属 *xiang mao shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial, rarely annual. Culms often tall, robust. Leaf blades aromatic, filiform to broadly linear; ligule scarious. Inflorescence a dense spathate compound panicle, each ultimate spatheole subtending a pair of short racemes on a short peduncle; spatheoles boat-shaped; each raceme borne on a short, flattened raceme base, often deflexed at maturity, lower raceme with one basal pair of homogamous spikelets below the fertile pairs; rachis internodes and pedicels linear, white-ciliate on margins, sometimes pedicel of homogamous pair swollen and fused to adjacent internode. Sessile spikelet dorsally compressed; callus obtuse, shortly bearded, inserted into internode apex; lower glume papery, flat or concave, sometimes grooved or wrinkled, 2-keeled, keels lateral, often winged above middle, with or without intercarinal veins; upper glume boat-shaped, awnless; lower floret reduced to a hyaline lemma; upper lemma narrowly oblong, usually 2-lobed to near middle, lobes slender, ciliate, awned from sinus, occasionally subentire and awnless; awn geniculate, sometimes weakly, short, glabrous. Pedicelled spikelet male or sterile, narrowly lanceolate, awnless. $x = 10, 20, 40, 60$.

About 70 species: tropics and subtropics of Africa, Asia, and Australia, predominantly in Asia; introduced in tropical America; 24 species (seven endemic, up to five introduced) in China.

Cymbopogon, with its inserted callus but frequently deflexed raceme bases, provides a link between *Andropogon* and *Hyparrhenia*, although its aromatic leaves distinguish it from both these genera. Many of the species are both variable and intergrading, based on inconstant characters, leading to much taxonomic difficulty. Specimens showing intermediate or extreme characteristics are common.

Several species are cultivated commercially for the aromatic oils that are distilled from their leaves. The oils are often lemon scented and are used as perfume. Some species are also used medicinally and in cooking. Oil of citronella is used as an insect repellent.

- 1a. Rachis internodes and pedicels villous on margins and back with long silky hairs surrounding and obscuring spikelets 1. *C. jwarancusa*
- 1b. Rachis internodes and pedicels ciliate on margins, back glabrous or pubescent, hairs shorter than spikelets.
 - 2a. Lower glume of sessile spikelet flat with a slitlike median groove below middle (appearing as a line or keel on inside).
 - 3a. Pedicel of homogamous spikelet pair linear to slightly cuneate, not fused to adjacent rachis internode 2. *C. mekongensis*
 - 3b. Pedicel of homogamous spikelet pair swollen, barrel-shaped, fused to adjacent rachis internode at base.
 - 4a. Culms up to 1 m; leaf blades 0.5–1 cm wide, base rounded 3. *C. annamensis*
 - 4b. Culms up to 3 m; leaf blades 1–3 cm wide, base cordate, often amplexicaul 4. *C. martini*
 - 2b. Lower glume of sessile spikelet almost flat to deeply concave, the depression uniformly rounded.
 - 5a. Homogamous spikelet pair reduced or absent; pedicelled spikelet small, reduced to barren glumes.
 - 6a. Racemes not deflexing at maturity; spatheoles narrowly lanceolate, 2–2.5 cm 5. *C. liangshanensis*
 - 6b. Racemes deflexing at maturity; spatheoles linear, 1.2–1.5 cm 6. *C. minor*
 - 5b. Homogamous spikelet pair well developed; pedicelled spikelet well developed, often staminate.
 - 7a. Lower glume of sessile spikelet with keels rounded in lower half, wingless or almost so.
 - 8a. Raceme bases slender, unequal; racemes often more than 2 per spatheole 2. *Andropogon munroi* (see p. 623)
 - 8b. Raceme bases flat, subequal; racemes always paired.
 - 9a. Lower glume of sessile spikelet deeply concave, depression with a prominent swelling at base 7. *C. gidarba*
 - 9b. Lower glume of sessile spikelet shallowly concave to almost flat, without a swelling at base 8. *C. pospischilii*
 - 7b. Lower glume of sessile spikelet with keels sharp throughout, narrowly to broadly winged.
 - 10a. Sessile spikelet awnless or with short awn included within spikelet; cultivated plants.
 - 11a. Sessile spikelet 5–6 mm; lower glume linear-lanceolate, ca. 0.7 mm wide 9. *C. citratus*
 - 11b. Sessile spikelet 3–5 mm; lower glume elliptic-oblong, 1–1.2 mm wide.
 - 12a. Inflorescence densely congested; leaf blades tough, scabrid, drooping for 1/3 of their length 10. *C. nardus*
 - 12b. Inflorescence lax, branches spreading; leaf blades softer, smooth, drooping for 2/3 of their length 11. *C. winterianus*
 - 10b. Sessile spikelet with exserted geniculate awn; wild plants (*C. flexuosus* also cultivated).
 - 13a. Culms slender to moderately robust, up to 1.5 m tall, 2–5 mm in diam.; spathate panicle 1–3-times branched.
 - 14a. Sessile spikelet (6–)7–8 mm; leaf blades filiform, 1.5–3 mm wide 12. *C. distans*
 - 14b. Sessile spikelet 3.5–6.3 mm; leaf blades linear, 2–7 mm wide.
 - 15a. Lower glume of sessile spikelet 5–7-veined between keels, obviously transversely wrinkled 13. *C. nervosus*

- 15b. Lower glume of sessile spikelet 2–5-veined between keels; smooth or slightly wrinkled.
- 16a. Old basal leaf sheaths curling, reddish brown or orange inside; racemes 1–2 cm.
- 17a. Racemes 1–1.5 cm; sessile spikelet narrowly lanceolate-oblong, 3.5–4.5 mm, wings on keels 0.15–0.25 mm; awn 7–10 mm 14. *C. tortilis*
- 17b. Racemes 1.5–2 cm; sessile spikelet narrowly obovate, 4.5–6 mm, wings on keels 0.25–0.45 mm wide; awn 10–12 mm 15. *C. goeringii*
- 16b. Old basal leaf sheaths neither noticeably curling nor reddish inside; racemes 1.7–3 cm.
- 18a. Racemes 2–3 cm; sessile spikelet ca. 6×1.3 mm 16. *C. tungmaiensis*
- 18b. Racemes 1.7–2 cm; sessile spikelet ca. 5×1 mm 17. *C. fibrosus*
- 13b. Culms robust, up to 3 m tall, 5–10 mm in diam.; spathate panicle repeatedly branched.
- 19a. Sessile spikelet 5–9 mm (if less than 5.5 mm, lower glume clearly concave).
- 20a. Sessile spikelet 5–6 mm; lower glume clearly concave in lower 2/3, not wrinkled; wings on keels 0.15–0.35 mm 18. *C. pendulus*
- 20b. Sessile spikelet 5.5–9 mm; lower glume flat or slightly concave, transversely wrinkled; wings on keels 0.3–0.5 mm.
- 21a. Compound panicle very large, open, drooping; racemes 3–4 cm, yellow-green; sessile spikelet 7–9 mm 19. *C. xichangensis*
- 21b. Compound panicle narrow, erect, subdense; racemes 2–2.5 cm, purple; sessile spikelet 5.5–7 mm 20. *C. traninhensis*
- 19b. Sessile spikelet 3.5–5.5 mm.
- 22a. Racemes 1–1.3 cm; sessile spikelet 3.5–4 mm; lower glume 0–2-veined between keels; awn 6–8 mm 21. *C. microstachys*
- 22b. Racemes 1–2.5 cm; sessile spikelet 4–5 mm; lower glume 3–7-veined between keels; awn 8–12 mm.
- 23a. Panicle effuse, grayish green, branches with raceme clusters long, lax, drooping; lower glume of sessile spikelet obscurely 3-veined between keels, narrowly winged (wings 0.1 mm or less) 22. *C. flexuosus*
- 23b. Panicle not effuse, often purplish, branches with raceme clusters dense, erect; lower glume of sessile spikelet distinctly 5(–7)-veined between keels, winged (wings more than 0.1 mm).
- 24a. Leaf blades 0.7–1 cm wide; leaf sheath auricles up to 0.6 mm 23. *C. khasianus*
- 24b. Leaf blades ca. 1.6 cm wide; leaf sheath auricles ca. 10 mm 24. *C. auritus*

1. *Cymbopogon jwarancusa* (Jones) Schultes, Mant. 2: 458. 1824.

辣薄荷草 *la bo he cao*

Perennial, shortly rhizomatous; old basal sheaths papery, ribbonlike, often spirally curling. Culms densely tufted, moderately robust to wiry, 0.2–1.5 cm tall, lower internodes short, crowded. Leaf sheaths smooth, glabrous, congested and overlapping at base; leaf blades glaucous, involute or flat, 20–50 \times 0.1–0.5 cm, glabrous, apex filiform; ligule 0.5–4 mm. Spathate compound panicle narrow, 10–40 cm; spatheoles in dense woolly clusters, straw-colored or becoming purplish, 1–2 cm; racemes 1–1.8(–2.2) cm; rachis internodes and pedicels ca. 2 mm, densely white-villous, hairs as long as spikelets; pedicel of homogamous pair not swollen. Sessile spikelet narrowly lanceolate, 4.5–5.5 mm; lower glume thin, concave, glabrous, sharply 2-keeled, keels scabrid upward, not winged, 0(–3)-veined between keels; upper lemma 2-lobed; awn almost straight, column and limb weakly differentiated, 0.5–1 cm. Pedicelled spikelet 5–6 mm. Fl. and fr. Mar–May and Jul–Aug. $2n = 20$.

Mountain slopes, dry valleys. SW Sichuan, Xizang, Yunnan (Yuanmou) [Afghanistan, Bhutan, N India, Nepal, Pakistan; SW Asia (Iran, Iraq, Oman)].

- 1a. Culms up to 150 cm tall; ligule 0.5–1 mm 1a. subsp. *jwarancusa*
- 1b. Culms 20–40 cm tall; ligule (1)–2–4 mm 1b. subsp. *olivieri*

1a. *Cymbopogon jwarancusa* subsp. *jwarancusa*

辣薄荷草(原亚种) *la bo he cao* (yuan ya zhong)

Andropogon jwarancusa Jones, *Asiat. Res.* 4: 109. 1795.

Culms up to 150 cm tall; old basal leaf sheaths often spirally curling; ligule 0.5–1 mm.

Grassy slopes, dry valleys; below 1400 m. SW Sichuan, Xizang, Yunnan (Yuanmou) [Afghanistan, Bhutan, N India, Nepal, Pakistan; SW Asia (Iran)].

This subspecies is used medicinally.

1b. *Cymbopogon jwarancusa* subsp. *olivieri* (Boissier) Soenarko, Reinwardtia 9: 307. 1977.

西亚香茅 *xi ya xiang mao*

Andropogon olivieri Boissier, *Diagn. Pl. Orient.*, ser. 1, 5: 76. 1844; *A. ariani* Edgeworth; *Cymbopogon ariani* (Edgeworth) Aitchison; *C. ladakhensis* B. K. Gupta.

Culms 20–40 cm tall; old basal sheaths only infrequently curling; ligule (1–)2–4 mm.

Mountain slopes, dry valleys; 2900–3500 m. W Xizang, Yunnan (Yuanmou) [Afghanistan, NW India, Pakistan; SW Asia (Iran, Iraq, Oman)].

This taxon is somewhat smaller than subsp. *jwarancusa*, and its distribution extends further westward from Pakistan. The basal parts are required for a positive identification. It has been confused in the past with *Cymbopogon schoenanthus* (Linnaeus) Sprengel, from Africa and Arabia, which has a swollen lowermost pedicel fused to the adjacent internode.

2. *Cymbopogon mekongensis* A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 563. 1920.

青香茅 qing xiang mao

Perennial. Culms densely tufted, wiry, 30–80 cm tall. Leaf sheaths glabrous; leaf blades linear, glaucous, 10–25 × 0.2–0.6 cm, glabrous, base narrowly rounded, apex filiform; ligule 0.7–3 mm. Spathate compound panicle narrow, 10–30 cm, spathes densely clustered; spatheoles reddish brown, 1.4–2 cm; racemes reddish brown, 0.7–1.4 cm; rachis internodes and pedicels ca. 1.5 mm, ciliate on margins; pedicel of homogamous pair linear to columnar, not or only very slightly swollen, not fused to internode. Sessile spikelet oblanceolate, 3–4.3 mm; lower glume flat, deeply grooved below middle (appearing as a line or keel on inside), keels broadly winged above middle, veinless or obscurely 2-veined between keels; upper lemma deeply 2-lobed; awn 1.1–1.5 cm. Pedicelled spikelet 3–4 mm. Fl. and fr. Jul–Sep.

Roadsides, hill slopes. Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan, Yunnan, Zhejiang [Laos, Thailand, Vietnam].

Cymbopogon mekongensis is very close to *C. caesius* (Nees ex Hooker & Arnott) Stapf, which occurs down the eastern side of Africa through Arabia to Pakistan and in S India and Sri Lanka. *Cymbopogon caesius* differs by the markedly swollen, barrel-shaped pedicel of the homogamous spikelet pair, which is fused to the swollen adjacent internode. It also tends to have greenish yellow rather than reddish inflorescences.

3. *Cymbopogon annamensis* (A. Camus) A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 563. 1920.

圆基香茅 yuan ji xiang mao

Cymbopogon martini (Roxburgh) Will. Watson var. *annamensis* A. Camus, Bull. Mus. Natl. Hist. Nat. 25: 670. 1919; *C. bassacensis* A. Camus.

Perennial. Culms tufted, wiry, up to 1 m tall. Leaf sheaths glabrous; leaf blades linear or linear-lanceolate, glaucous, 10–30 × 0.5–1 cm, glabrous, margin scabrid, base rounded, apex filiform; ligule 0.5–1.5 mm. Spathate panicle narrow, lax, 6–20 cm; spatheoles reddish brown, 2–2.5 cm; racemes reddish brown to purplish, 1.5–2 cm; rachis internodes and pedicels white-ciliate on margins; pedicel of homogamous pair swollen, barrel-shaped or broadly columnar, shiny, fused to internode at base. Sessile spikelet oblanceolate, 3.6–4.5 mm; lower glume flat, deeply grooved below middle (appearing as a line or keel on inside), keels winged above middle, veinless or obscurely 2-

veined between keels; upper lemma deeply 2-lobed; awn ca. 1.6 cm. Pedicelled spikelet 3.5–4 mm.

Open forests, forest margins. Yunnan [Laos, Thailand, Vietnam].

This species is taken here in a broad sense to include all slender, narrow-leaved specimens from S China and Indochina with a flat, grooved, winged sessile spikelet and a swollen lowermost pedicel. The differences from *Cymbopogon caesius* (Nees ex Hooker & Arnott) Stapf, from E Africa to India, are very slight. *Cymbopogon caesius* tends to have a longer ligule, to 4 mm, and paler inflorescences. Likewise, *C. annamensis* hardly differs from *C. mekongensis*, except in the swollen lowermost pedicel.

4. *Cymbopogon martini* (Roxburgh) Will. Watson in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 392. 1882.

鲁沙香茅 lu sha xiang mao

Andropogon martini Roxburgh, Fl. Ind. 1: 280. 1820; *A. schoenanthus* Linnaeus var. *martini* (Roxburgh) J. D. Hooker.

Perennial from a short woody rootstock. Culms tufted, up to 3 m tall, lower nodes often swollen, mealy. Leaf sheaths glabrous; leaf blades lanceolate, usually glaucous below, dark green above, up to 50 × 2–3 cm, glabrous, base cordate, often amplexicaul, apex filiform; ligule 2–4 mm. Spathate panicle narrow, dense, erect, 20–30 cm; spatheoles green becoming reddish, 2–4 cm; racemes 1.5–2 cm; rachis internodes and pedicels ciliate on margins, back sometimes pubescent; pedicel of homogamous pair swollen, barrel-shaped, shiny, fused to internode at base. Sessile spikelet oblong, 3.5–4.5 mm; lower glume flat, deeply grooved below middle (appearing as a line or keel on inside), keels winged above middle, veinless or 2-veined between keels; upper lemma 2-lobed; awn 1.4–1.8 cm. Pedicelled spikelet 3.5–4 mm. Fl. and fr. Jul–Oct. 2n = 20, 40.

Grassy slopes; ca. 1000 m. Sichuan, Yunnan [native to India].

This grass is native to India, but is cultivated elsewhere in the tropics for its oils. Two forms can be distinguished in the field, each with a different oil content, but the habit differences are not evident in herbarium material. The cultivar ‘Motia’ yields palmerosa oil and ‘Sofia’ yields ginger-grass oil.

The name “*Cymbopogon lanceifolium* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 194. 1997) was not validly published because no Latin description was provided. It appears to be based on a specimen of *C. martini* with a rather lax panicle.

5. *Cymbopogon liangshanensis* L. Liu ex S. M. Phillips & H. Peng, Novon 15: 471. 2005.

凉山香茅 liang shan xiang mao

Perennial. Culms solitary or in small tufts, slender, 50–110 cm tall. Leaf sheaths glabrous; leaf blades linear, glaucous, 20–30 × 0.3–0.5 cm, slightly scaberulous, glabrous, lower blades narrowed almost to midrib toward base; ligule 1.5–2.5 mm. Spathate panicle open, 30–40 cm, branches slender, laxly ascending; spatheoles narrowly lanceolate, greenish brown, 2–2.5 cm; racemes green, 1.5–1.8 cm, raceme bases linear, not deflexing; homogamous pair reduced, vestigial or often absent; rachis internodes and pedicels slenderly linear, margins ciliate with ca. 0.5 mm hairs increasing to 1.5 mm at apex, apices expanded,

cupular, scarious, toothed. Sessile spikelet narrowly elliptic-oblong, 3.7–4 mm; lower glume shallowly concave below middle, sharply keeled, keels scabrid, wingless, 2–4-veined between keels above middle; upper lemma 2-lobed; awn 1.3–1.5 cm. Pedicelled spikelet narrow, 2–3 mm, reduced to the glumes, lower glume enclosing a much smaller upper glume. Fl. and fr. Jul–Sep.

- Mountain slopes. SW Sichuan.

This species resembles *Andropogon* in its non-deflexing racemes and the lack of an obvious homogamous spikelet pair, although this is usually present as a vestige. It is not known whether the leaves are aromatic. The enlarged, toothed, cupular tips to the raceme bases, raceme internodes, and pedicels are a distinctive character of this species.

6. *Cymbopogon minor* B. S. Sun & R. Zhang ex S. M. Phillips & H. Peng, *Novon* 15: 473. 2005.

细小香茅 xi xiao xiang mao

Perennial. Culms tufted, wiry, 60–70 cm tall. Leaf sheaths glabrous; leaf blades narrowly linear, pale green, ca. 20 × 0.1–0.2 cm, smooth, glabrous, narrowed toward base; ligule 1.3–2 mm. Spathate panicle moderately dense, up to 30 cm; spatheoles linear, reddish, 1.2–1.5 cm; racemes green, deflexed at maturity, homogamous pair reduced to 1 short narrow spikelet; rachis internodes and pedicels slenderly linear, margins ciliate with ca. 0.7 mm hairs increasing to 2–3 mm at apex, internode apex expanded, cupular, scarious, toothed. Sessile spikelet narrowly oblong, 3.8–4 mm; lower glume herbaceous, shallowly concave below middle, a short tuft of callus hairs in base of concavity, lightly keeled below middle, sharply keeled above, keels scabrid, wingless, 2–4-veined between keels above middle; upper lemma 2-lobed; awn 1.2–1.3 cm. Pedicelled spikelet narrow, 0.5–2.5 mm, reduced to the empty lower glume. Fr. Oct.

- Roadsides in grasslands; ca. 900 m. NE Yunnan.

This species is known only from the type. It shares with *Cymbopogon liangshanensis* the unusual character, not otherwise seen in Chinese species, of reduced homogamous and pedicelled spikelets.

7. *Cymbopogon gidarba* (Buchanan-Hamilton ex Steudel) A. Camus var. ***burmanicus*** Bor, *J. Bombay Nat. Hist. Soc.* 52: 157. 1954.

缅甸浅囊香茅 mian dian qian nang xiang mao

Perennial. Culms tufted, slender, 50–100 cm tall. Leaf sheaths glabrous; leaf blades linear, flat or folded, 18–30 × 0.2–0.5 cm, abaxial surface glabrous, adaxial surface scabrid-puberulous, sometimes with long scattered hairs, base straight, apex finely acuminate; ligule 1–2 mm. Spathate panicle sparsely branched, very lax, 15–30 cm; spatheoles linear, tightly convolute, 2–3 cm; peduncle exerted up to 1.5 cm from near spatheole apex; racemes pinkish gray, ca. 2 cm; rachis internodes and pedicels stoutly cuneate, margins shortly but densely ciliate or woolly, back pubescent or subglabrous; pedicel of homogamous pair and lowest internode swollen. Sessile spikelet narrowly lanceolate, 4–4.5 mm; lower glume deeply concave in lower 2/3, channel puberulous with a prominent swelling at base, keels rounded alongside channel, sharp and scabrid

above, wingless, 2–3-veined between keels; upper lemma 2-lobed; awn 1–1.3 cm. Pedicelled spikelet 4–5 mm.

Grassy hillsides; 1000–2200 m. Yunnan (Kaiyang) [Myanmar].

In Myanmar this grass occurs on calcareous clay soils.

Cymbopogon gidarba var. *gidarba* occurs on uplands in India. It has a narrower, more contracted compound panicle and shorter, 2–2.5 mm, narrowly elliptic spatheoles, with the peduncle not or only very shortly exerted from near the middle of the spatheole. The spikelets are also slightly smaller, with the sessile spikelet 3.2–4 mm.

8. *Cymbopogon pospischilii* (K. Schumann) C. E. Hubbard, *Kew Bull.* [4] 1949: 175. 1949.

喜马拉雅香茅 xi ma la ya xiang mao

Andropogon pospischilii K. Schumann, *Bot. Jahrb. Syst.* 24: 328. 1897; *A. nardus* var. *stracheyi* J. D. Hooker; *Cymbopogon stracheyi* (J. D. Hooker) Raizada & S. K. Jain.

Perennial. Culms densely tufted, wiry, erect or geniculate, 60–100 cm tall. Leaf sheaths glabrous; leaf blades narrow, folded or involute, glaucous, 15–30 × 0.2–0.3 cm, glabrous, scabrid, apex filiform; ligule ca. 1–2 mm. Spathate panicle open, 15–25 cm, raceme pairs few; spatheoles 2–3 cm; racemes 1.5–2 cm; rachis internodes and pedicels ciliate on margins, glabrous on back; pedicel of homogamous pair not swollen, oblong, free from adjacent internode. Sessile spikelet narrowly lanceolate-oblong, 4.5–6 mm; lower glume papery, concave or almost flat below middle, keels rounded below middle, sharp and scabrid above, wingless or almost so, 3–5-veined between keels above middle; upper lemma 2-lobed; awn 1.4–1.8 cm. Pedicelled spikelet 4.5–6 mm. Fl. and fr. Jul–Dec. *2n* = 20, 40.

Mountain slopes, mixed forests, valleys; 1600–3000 m. Xizang, Yunnan [NW India, Nepal, Pakistan; Africa, SW Asia (S Arabia)].

9. *Cymbopogon citratus* (Candolle) Stapf, *Bull. Misc. Inform. Kew* 1906: 357. 1906.

香茅 xiang mao

Andropogon citratus Candolle, *Cat. Pl. Horti Monsp.* 78. 1813.

Perennial, shortly rhizomatous. Culms tufted, robust, up to 2 m tall, ca. 4 mm in diam., farinose below nodes. Leaf sheaths glabrous, greenish inside; leaf blades glaucous, 30–90 × 0.5–2 cm, both surfaces scabrid, base gradually narrowed, apex long acuminate; ligule ca. 1 mm. Spathate compound panicle large, lax, up to 50 cm, drooping, branches slender; spatheoles reddish or yellowish brown, 1.5–2 cm; racemes 1.5–2 cm; rachis internodes and pedicels 2.5–4 mm, loosely villous on margins; pedicel of homogamous pair not swollen. Sessile spikelet linear-lanceolate, 5–6 × ca. 0.7 mm; lower glume flat or slightly concave toward base, sharply 2-keeled, keels wingless, scabrid, veinless between keels; upper lemma narrow, entire and awnless, or slightly 2-lobed with ca. 0.2 mm mucro. Pedicelled spikelet 4–5 mm. Fl. and fr. summer. *2n* = 40.

Commonly cultivated. Fujian, Guangdong, Guizhou, Hainan, Hubei, Taiwan, Yunnan, Zhejiang [origin unknown; cultivated in tropical Asia and elsewhere].

This species (Lemon Grass), known only from cultivation, is

grown on a large scale in parts of tropical Asia and South America for the lemon-scented oil extracted from its leaves. The oil is used for both medicinal and culinary purposes. Flowers are seldom produced.

10. *Cymbopogon nardus* (Linnaeus) Rendle in Hiern, Cat. Afr. Pl. 2: 155. 1899.

亚香茅 ya xiang mao

Andropogon nardus Linnaeus, Sp. Pl. 2: 1046. 1753.

Perennial from a stout rootstock. Culms tufted, robust, up to 2.5 m tall, 1–2 cm in diam. Leaf sheaths reddish purple at base, smooth, glabrous; leaf blades dark green or dark brown when dry, drooping for 1/3 of their length, 30–100 × 1–2 cm, glabrous, abaxial surface scabrid, adaxial surface smooth, base narrow, apex long acuminate; ligule 2–3 mm. Spathate panicle large, narrow, congested, interrupted, 60–90 cm; spatheoles reddish brown, 1.2–2.5 cm; racemes 1–1.5 cm; rachis internodes and pedicels ciliate on margins; pedicel of homogamous pair not swollen. Sessile spikelet oblong-lanceolate, 3–4.5 × 1–1.2 mm; lower glume flat or slightly concave, reddish brown or purplish upward, sharply 2-keeled, keels narrowly winged, obscurely 0–3-veined between keels; upper lemma linear, entire or slightly 2-lobed, mucronate or very shortly awned. Pedicelled spikelet 3.5–7 mm. Fl. and fr. Nov–Apr. $2n = 40$.

Commonly cultivated. Fujian, Guangdong, Hainan, Taiwan, Yunnan [native to S India and Sri Lanka; introduced elsewhere as a crop plant].

This species yields citronella oil.

11. *Cymbopogon winterianus* Jowitt ex Bor, Oesterr. Bot. Z. 112: 185. 1965.

枫茅 feng mao

Perennial from a shallowly rooted rhizome. Culms tufted, robust, up to 2 m or more tall. Leaf sheaths glabrous, reddish inside; leaf blades relatively thin, drooping for 2/3 of their length, 40–80(–100) × 1–1.5(–2.5) cm, abaxial surface glaucous, adaxial surface light green, margins scabrid, base narrow, apex long acuminate; ligule 2–3 mm. Spathate compound panicle large, lax, up to 50 cm, much branched, main axis zig-zag, finally nodding; spatheoles reddish brown, 1.2–2.5 cm; racemes 1.5–2.5 cm; rachis internodes and pedicels softly ciliate on margins; pedicel of homogamous pair not swollen. Sessile spikelet elliptic-lanceolate, 4–5 × ca. 1 mm; lower glume flat or slightly concave, sharply 2-keeled, keels narrowly winged, 3-veined between keels; upper lemma very shortly 2-lobed, awn short or absent, not exerted from spikelet. Pedicelled spikelet 3.5–5 mm. $2n = 20, 40$.

Commonly cultivated. Guangdong, Hainan, Sichuan, Yunnan [origin unknown; cultivated mainly in Indonesia].

This species, known only from cultivation, produces citronella oil of a higher quality than that from *Cymbopogon nardus*.

12. *Cymbopogon distans* (Nees ex Steudel) Will. Watson in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 392. 1882.

芸香草 yun xiang cao

Andropogon distans Nees ex Steudel, Syn. Pl. Glumac. 1: 387. 1854; *A. nardus* Linnaeus var. *distans* (Nees ex Steudel) Hackel.

Perennial, shortly rhizomatous with age; basal sheaths closely overlapping in tight bundles, not curling. Culms densely tufted, erect or ascending, tinged purple, 50–100 cm tall, nodes glabrous. Leaf sheaths glabrous; leaf blades narrowly linear to filiform, flexuous, 10–50 × 0.15–0.3 cm, glaucous, glabrous, margins scabrid; ligule 2–3 mm. Spathate compound panicle narrow, open, 15–30 cm, usually simple, rarely with second tier of branching, raceme pairs few; spatheoles gray-green, 2–3.5 cm; racemes 2–3.5 cm; rachis internodes and pedicels 2–3 mm, margins densely ciliate with white soft hairs up to 3 mm; pedicel of homogamous pair not swollen. Sessile spikelet linear-lanceolate, (6–)7–8 × 0.8–1.2 mm; lower glume flat or shallowly concave in lower part with 1–2 transverse wrinkles, sharply 2-keeled throughout, keels wingless or narrowly winged, wings 0.15–0.25 mm, 2–4-veined between keels in upper part, apex long acuminate, 2-toothed; upper lemma 2-lobed; awn 1.5–2 cm. Pedicelled spikelet 5–9 mm. Fl. and fr. Jun–Oct. $2n = 20, 40$.

Mountain slopes, valleys, open grassy places; 2000–3500 m. S Gansu, Guizhou, Shaanxi, Sichuan, Xizang, Yunnan [NW India, Nepal, Pakistan].

Aromatic oils are extracted from this species for medicinal and industrial purposes.

13. *Cymbopogon nervosus* B. S. Sun, J. Yunnan Univ. 21: 95. 1999.

多脉香茅 duo mai xiang mao

Perennial, shortly rhizomatous; basal sheaths papery, pale brown, slightly curling. Culms tufted, 50–120 cm tall, 2–3 mm in diam., nodes glabrous. Leaf sheaths glabrous; leaf blades linear, 10–20 × 0.4–0.7 cm, glabrous, margins scabrid, base rounded, apex acuminate to a setaceous point; ligule 1–3 mm. Spathate compound panicle narrow, lax, 20–30 cm, 1–3 tiers of branching; spatheoles green or tinged purple, 3–3.5 cm; racemes greenish or dark purple, 2.5–3.3 cm; rachis internodes and pedicels ca. 3.5 mm, margins ciliate; pedicel of homogamous pair not swollen. Sessile spikelet narrowly obovate, 5.8–6.5 × 1.5–1.7 mm; lower glume flat or shallowly concave in lower part, transversely wrinkled, sharply 2-keeled throughout, keels winged above middle, wings 0.25–0.4 mm, 5–7-veined between keels; upper lemma 2-lobed; awn ca. 1.5 mm. Pedicelled spikelet 6–6.3 mm. Fl. Aug.

• Mountain slopes; ca. 2500 m. Yunnan.

There is very little besides the lack of red coloration in the basal sheaths and a more wrinkled sessile spikelet to distinguish this taxon from *Cymbopogon goeringii*. It occurs at higher elevations.

14. *Cymbopogon tortilis* (J. Presl) A. Camus, Rev. Bot. Appl. Agric. Colon. 5: 206. 1925.

扭鞘香茅 niu qiao xiang mao

Anthistiria tortilis J. Presl in C. Presl, Reliq. Haenk. 1: 347. 1830; *Andropogon hamatulus* Hooker & Arnott; *A. nardus* Linnaeus subsp. *hamatulus* (Hooker & Arnott) Hackel; *Cymbopogon hamatulus* (Hooker & Arnott) A. Camus; *C. jinshaensis* R. Zhang & C. H. Li; *C. nardus* (Linnaeus) Rendle subsp. *hamatulus* (Hooker & Arnott) Rendle.

Perennial from a short rootstock; basal sheaths reddish brown inside, lax, curling when dry. Culms tufted, slender, 50–150 cm tall, 2–4 mm in diam., nodes glabrous or pubescent, often farinose. Leaf sheaths smooth, glabrous, leaf blades linear, 25–60 × 0.2–0.7 cm, glabrous, margins scabrid, base gradually narrowed, apex finely acuminate; ligule 2–3(–6) mm. Spathate compound panicle narrow or somewhat spreading, 20–35 cm, 2–3 tiers of branching; spatheoles reddish brown, 1.2–1.5 cm; racemes 1–1.5 cm; rachis internodes and pedicels 1.5–2 mm, margins ciliate; pedicel of homogamous pair not swollen. Sessile spikelet narrowly lanceolate-oblong, 3.5–4.5 × 0.9–1.2 mm; lower glume flat, smooth or slightly wrinkled, sharply 2-keeled throughout, keels narrowly winged above middle, wings 0.15–0.25 mm wide, (2–)3(–5)-veined between keels; upper lemma 2-lobed; awn 0.7–1 cm. Pedicelled spikelet 3–3.5 mm. Fl. and fr. Jul–Oct. $2n = 20$.

Grassy places on light dry soils; below 600 m. S Anhui, Fujian, Guangdong, Guizhou, Hainan, Taiwan, Yunnan, Zhejiang [Philippines, Vietnam].

15. *Cymbopogon goeringii* (Steudel) A. Camus, Rev. Bot. Appl. Agric. Colon. 1: 286. 1921.

橘草 ju cao

Andropogon goeringii Steudel, Flora 29: 22. 1846; *A. nardus* Linnaeus var. *goeringii* (Steudel) Hackel; *Cymbopogon goeringii* var. *hongkongensis* Soenarko; *C. nardus* (Linnaeus) Rendle var. *goeringii* (Steudel) Rendle; *C. tortilis* (J. Presl) A. Camus subsp. *goeringii* (Steudel) Koyama; *C. tortilis* var. *goeringii* (Steudel) Handel-Mazzetti.

Perennial; basal sheaths orange inside, lax, curling when dry. Culms tufted, slender, 50–100 cm tall, 1–2.5 mm in diam., nodes glabrous or puberulous, often farinose. Leaf sheaths smooth, glabrous; leaf blades linear, 15–40 × 0.3–0.5 cm, glabrous, margins scabrid, base gradually narrowed, apex finely acuminate; ligule 1–3(–4.5) mm. Spathate compound panicle narrow, 15–30 cm, 2 tiers of branching; spatheoles 1.5–2.2 cm; racemes often purplish, (1.3–)1.5–2 cm, rachis internodes and pedicels 2–3.5 mm, margins ciliate; pedicel of homogamous pair not swollen. Sessile spikelet narrowly obovate, 4.5–6 × 1.2–1.7 mm; lower glume flat or slightly concave toward base, smooth or slightly wrinkled, sharply 2-keeled throughout, keels broadly winged above middle, wings 0.25–0.45 mm wide, (1–)3–5-veined between keels; upper lemma 2-lobed; awn (0.8–)1–2 cm. Pedicelled spikelet 4–6.5 mm. Fl. and fr. Jul–Oct. $2n = 20$.

Grassy slopes, roadsides; below 1500 m. Anhui, Fujian, Guizhou, Hebei, Henan, Hong Kong, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan, Yunnan, Zhejiang [Japan, S Korea].

Cymbopogon goeringii and *C. tortilis* form an intergrading complex, and the former species is sometimes treated at infraspecific rank under the latter. *Cymbopogon goeringii* tends to have a slightly more northern distribution and can usually be distinguished by its longer racemes of larger, often purplish spikelets.

A local variant in Hong Kong has racemes, spikelets, and awns at the lower end of the size range, perhaps due to introgression from *Cymbopogon tortilis*, but has the obovate lower glume and broadly winged keels of *C. goeringii*. It has been distinguished as var. *hongkongensis*, but scarcely merits separate status.

The name “*Cymbopogon eugenolatus* L. Liu” (Fl. Reipubl. Popularis Sin. 10(2): 206. 1997) has been applied to another variant with intermediate measurements, but was not validly published because no Latin description was provided. The specimen on which it was based has not been seen.

16. *Cymbopogon tungmaiensis* L. Liu, Fl. Xizang. 5: 331. 1987.

通麦香茅 tong mai xiang mao

Perennial. Culms densely tufted, erect, 1–1.5 m tall, 2–7 mm in diam., nodes glabrous. Leaf sheaths glabrous; leaf blades narrowly linear, 20–40 × 0.2–0.3(–0.6) cm, adaxial surface scabrid, abaxial surface scabrid, puberulous at narrow base; ligule 1–2 mm. Spathate compound panicle 20–50 cm, simple or with second tier of branching; spatheoles 2–5 cm; racemes 2–3 cm, base swollen. Sessile spikelet elliptic, ca. 6 × 1.3 mm; lower glume concave along midline, keels winged above middle, wings 0.2–0.5 mm wide, margins scabrid, 2–4-veined between keels; upper lemma awned; awn ca. 1.5 cm. Pedicelled spikelet ca. 0.6 cm. Fl. and fr. Jul–Oct.

• Valleys; 2000–2500 m. SW Sichuan, Xizang (Tungmai), NW Yunnan.

This species is known only from the type, which has not been seen.

17. *Cymbopogon fibrosus* B. S. Sun, J. Yunnan Univ. 21: 95. 1999.

纤鞘香茅 xian qiao xiang mao

Perennial; old basal sheaths fibrous. Culms tufted, 0.5–1 m tall, 3–4 mm in diam., nodes glabrous. Leaf sheaths glabrous; leaf blades narrowly linear, flat or folded, 50–70 × 0.3–0.5 cm, scabrid, base narrowed to midrib, apex filiform; ligule 2–3 mm. Spathate compound panicle ca. 30 cm, slightly dense, 2–3 tiers of branching; spatheoles 2.5–2.8 cm; racemes green, 1.7–2 cm; rachis internodes and pedicels ciliate along margins with 0.5–1.5 mm hairs; pedicel of homogamous pair not swollen. Sessile spikelet oblong-lanceolate, 4.8–5.3 × 1–1.1 mm; lower glume concave in lower half, smooth or slightly transversely wrinkled, sharply 2-keeled throughout, keels winged above middle, wings 0.15–0.2 mm wide, 2–3-veined between keels; upper lemma awned; awn ca. 10 mm. Pedicelled spikelet 4.7–5 mm. Fl. Oct.

• Mountain slopes. SW Sichuan, SE Yunnan.

18. *Cymbopogon pendulus* (Nees ex Steudel) Will. Watson in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 392. 1882.

垂序香茅 chui xu xiang mao

Andropogon pendulus Nees ex Steudel, Syn. Pl. Glumac. 1: 388. 1854.

Perennial from short rhizome. Culms tufted, robust, up to 3 m tall, 8–12 mm in diam., nodes glabrous. Leaf sheaths glabrous, auricles to 3 mm at mouth; leaf blades linear, glaucous, up to 100 × 0.7–1.5 cm, glabrous, margins scabrid, base gradually narrowed, apex filiform; ligule ca. 2 mm. Spathate compound panicle rather lax, decompound, yellowish tinged pale red, up to 1 m, branches drooping, clusters of racemes

dense; spatheoles pale reddish brown, 2–3 cm; racemes 1.5–2.2 cm; rachis internodes and pedicels densely ciliate; pedicel of homogamous pair not swollen. Sessile spikelet narrowly oblong, 5–6 × 1–1.4 mm; lower glume concave in lower 2/3, not wrinkled, sharply 2-keeled throughout, keels narrowly winged above middle, wings 0.15–0.35 mm, obscurely 2–4-veined between keels toward apex, midvein often absent; upper lemma awned; awn 1–1.7 cm. Pedicelled spikelet 5–6 mm.

Stream banks. Yunnan [Bhutan, NE India, Nepal].

This species has a lemon scent. Outside China it occurs on dry, grassy hillsides below 2000 m. It intergrades with *Cymbopogon flexuosus* and *C. khasianus*, but can usually be recognized by the relatively long, narrow, channeled lower glume of the sessile spikelet.

19. *Cymbopogon xichangensis* R. S. Zhang & B. S. Sun, J. Pl. Res. Environm. 2(2): 40. Fig. 2. 1993.

西昌香茅 xi chang xiang mao

Perennial. Culms tufted, robust, up to 2.5 m tall, 3–5 mm in diam., nodes glabrous. Leaf sheaths glabrous; leaf blades linear, up to 60 × 0.5–1.2 cm; ligule ca. 1.5 mm. Spathate compound panicle very large, open, 80–180 cm, branches lax, drooping, spathes not densely clustered; spatheoles reddish at maturity; racemes 3–4 cm; rachis internodes and pedicels ciliate on margins; pedicel of homogamous pair not swollen. Sessile spikelet elliptic, 7–9 mm; lower glume flat, sharply 2-keeled throughout, keels broadly winged above middle, 2–5-veined between keels; upper lemma awned; awn ca. 1.2 cm. Pedicelled spikelet linear-lanceolate. Fl. and fr. Sep.

• Grasslands; ca. 2000 m. Sichuan (Xichang).

20. *Cymbopogon traninhensis* (A. Camus) Soenarko, Reinwardtia 9: 347. 1977.

横香茅 heng xiang mao

Cymbopogon confertiflorus (Steudel) Stapf var. *traninhensis* A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 565. 1920; *C. khasianus* (Munro ex Hackel) Stapf ex Bor var. *nagensis* Bor.

Perennial. Culms tufted, 1.5–2 cm tall, ca. 5 mm in diam., nodes glabrous or pubescent. Leaf sheaths glabrous or pubescent at base above node; leaf blades linear, up to 75 × 1–1.3 cm, abaxial surface bearded at sheath junction, otherwise glabrous, margins scabrid, base gradually narrowed, apex finely acuminate; ligule 3–6 mm. Spathate compound panicle narrow, erect or slightly spreading, usually purplish, ca. 50 cm or more, branched several times, spathes in lax clusters; spatheoles 1–2 cm; racemes 2–2.5 cm; rachis internodes and pedicels ciliate on margins; pedicel of homogamous pair not swollen. Sessile spikelet narrowly obovate, 5.5–7 × 1–1.5 mm; lower glume flat or shallowly concave below middle, frequently pubescent in depression, often transversely wrinkled, sharply 2-keeled throughout, keels winged above middle, wings 0.3–0.5 mm wide, 2–5-veined between keels; upper lemma awned; awn 1–2 cm. Pedicelled spikelet 5–5.5 mm.

Dry rocky or grassy hill slopes. Yunnan [NE India, Laos, Myanmar, N Thailand].

This species is very close to *Cymbopogon khasianus*, with the erect, purplish compound panicle typical of that species, but has slightly

longer, more broadly winged spikelets.

21. *Cymbopogon microstachys* (J.D. Hooker) Soenarko, Reinwardtia 9: 364. 1977.

细穗香茅 xi sui xiang mao

Andropogon nardus Linnaeus var. *microstachys* J. D. Hooker, Fl. Brit. India 7: 207. 1896 [“1897”]; *Cymbopogon flexuosus* (Nees ex Steudel) Will. Watson var. *microstachys* (J. D. Hooker) Bor.

Perennial from a stout rootstock. Culms fairly slender to robust, 1.5–2 m tall, up to 1 cm in diam., nodes glabrous. Leaf sheaths glabrous, shortly auriculate; leaf blades linear, glaucous, 40–75 × 1–1.2 cm, glabrous, scabrid, base narrowed nearly to midrib on lower blades, apex finely acuminate; ligule 5–6 mm. Spathate compound panicle narrow or somewhat spreading, decompound, yellowish green or tinged purplish, up to 60 cm or more, branches lax, raceme pairs not densely clustered; spatheoles narrowly elliptic, 1–1.5 cm; racemes 1–1.3 cm; rachis internodes and pedicels pilose on margins; pedicel of homogamous pair not swollen. Sessile spikelet narrowly lanceolate-oblong, 3.5–4 × ca. 0.8 mm; lower glume flat or shallowly concave below middle, frequently slightly transversely wrinkled, sharply 2-keeled throughout, keels scarcely winged, wings not more than 0.1 mm wide, obscurely 1–3-veined between keels or veinless; upper lemma awned; awn 0.6–0.8 cm. Pedicelled spikelet 3–4 mm. Fl. and fr. Aug–Oct. $2n = 30$.

Rocky hill slopes, forest margins; ca. 1200 m. S Yunnan [India, Myanmar, Thailand].

This species is part of the complex centered around *Cymbopogon khasianus* and is distinguished mainly by its small racemes and spikelet parts.

22. *Cymbopogon flexuosus* (Nees ex Steudel) Will. Watson in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 392. 1882.

曲序香茅 qu xu xiang mao

Andropogon flexuosus Nees ex Steudel, Syn. Pl. Glumac. 1: 388. 1854; *A. nardus* Linnaeus var. *flexuosus* (Nees ex Steudel) Hackel.

Perennial from a short stout rhizome. Culms robust, up to 3 m tall, 1–2 cm in diam., nodes glabrous or pubescent. Leaf sheaths glabrous, auricles often present; leaf blades linear, up to 100 × 1.5 cm, scabrid, abaxial surface tomentose at sheath junction, adaxial surface pilose at base, otherwise glabrous, base gradually narrowed, apex filiform; ligule 2–5 mm. Spathate compound panicle very large, lax, decompound, grayish green, up to 60 cm or more, nodes bearded, branches numerous, drooping; spatheoles 1–2 cm; racemes 1–1.7 cm; rachis internodes and pedicels ciliate on margins; pedicel of homogamous pair not usually swollen. Sessile spikelet narrowly elliptic-oblong, 4–4.5 × 0.8–1 mm; lower glume flat or shallowly concave, usually slightly transversely wrinkled, sharply 2-keeled throughout, keels narrowly winged, wings 0.1 mm wide or less, obscurely 3-veined between keels; upper lemma awned; awn 0.8–1 cm. Pedicelled spikelet 3.5–4 mm. Fl. and fr. summer to autumn. $2n = 20, 40$.

Grassy slopes; below 1000 m. SW Yunnan [probably native to In-

dia; naturalized in Indonesia, Malaysia, Myanmar, Nepal, and Thailand].

This grass is cultivated in tropical regions for "oil of lemon grass." It is thought to be native to India, but is now widely naturalized in Indonesia and elsewhere. It is usually easily recognizable by its very large compound panicle of drooping branches, with numerous short, deflexed racemes of small, narrowly winged spikelets. In Bhutan and NE India the branches are looser with more widely spaced raceme pairs than usual, approaching *Cymbopogon pendulus* in habit. This form has been recognized as *C. flexuosus* var. *sikkimensis* Bor.

23. *Cymbopogon khasianus* (Munro ex Hackel) Stapf ex Bor, Indian Forest Rec., Bot. 1: 92. 1938.

卡西香茅 ka xi xiang mao

Andropogon nardus Linnaeus var. *khasianus* Munro ex Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 603. 1889.

Perennial from a stout rootstock. Culms fairly slender to robust, up to 2 m tall, 3–6 mm in diam., nodes purple, glabrous, or puberulous to tomentose with creamy hairs. Leaf sheaths glabrous or basal part above node pubescent, auricles to 6 mm at mouth; leaf blades linear, slightly glaucous or sometimes purplish, 40–60 × 0.7–1 cm, abaxial surface usually tomentose at sheath junction, otherwise glabrous, base gradually narrowed, apex filiform; ligule 1.5–4 mm. Spathate compound panicle narrow, erect, decompound, often purplish, ca. 50 cm or more, much branched, spathate compound clusters dense; spatheoles 1.2–2 cm; racemes 1.2–1.5(–2) cm; rachis internodes and pedicels ciliate on margins, hairs ca. 1.5 mm; pedicel of homogamous pair not swollen. Sessile spikelet elliptic-oblong, 4–5 × 0.9–1.2 mm; lower glume flat or shallowly concave below middle, occasionally puberulous in depression, often transversely wrinkled, sharply 2-keeled throughout, keels winged above middle, wings 0.1–0.3 mm wide, (2–)5(–7)-veined between keels; upper

lemma awned; awn 0.8–1.1 cm. Pedicelled spikelet 3–5 mm. Fl. and fr. Sep–Nov. $2n = 60$.

Hill slopes, forest margins; 800–2000 m. Guangxi, Yunnan [Bhutan, India, Myanmar, N Thailand].

This is a variable species intergrading with several related species, including *Cymbopogon flexuosus*, *C. microstachys*, and *C. pendulus*. *Cymbopogon khasianus* can be recognized by its erect, often purplish compound panicle and sessile spikelets with a wrinkled, winged, several-veined lower glume. The wing width and number of veins can vary even within the same panicle.

24. *Cymbopogon auritus* B. S. Sun, J. Yunnan Univ. 21: 95. 1999.

长耳香茅 chang er xiang mao

Perennial. Culms robust, ca. 1.2 m tall, ca. 6 mm in diam., nodes pubescent. Leaf sheaths glabrous, auriculate, auricles broadly lanceolate, ca. 10 mm; leaf blades linear-lanceolate, papery, ca. 50 × 1.6 cm, smooth, glabrous, abaxial surface glaucous, pubescent at sheath junction, adaxial surface green, base gradually narrowed, apex finely acuminate; ligule 6–7 mm. Spathate compound panicle ca. 50 cm, open, branches elongate, erect or drooping, spathes not clustered; spatheoles light reddish, 1.8–2 cm; racemes yellow-green, 1.3–1.8 cm; rachis internodes and pedicels ca. 3 mm, ciliate on margins; pedicel of homogamous pair not swollen. Sessile spikelet narrowly elliptic, ca. 5 × 1.3 mm; lower glume shallowly concave below middle, transversely wrinkled, sharply 2-keeled throughout, keels winged above middle, wings 0.15–0.3 mm wide, 4–6-veined between keels; upper lemma awned; awn 0.9–1 cm. Pedicelled spikelet 4–4.5 mm. Fl. Jun.

• Grassy slopes; ca. 1000 m. W Yunnan.

This taxon is closely related to *Cymbopogon khasianus*, but has broader leaf blades and longer sheath auricles.

212. *HYPARRHENIA* Andersson ex Fournier, Mexic. Pl. 2: 51, 67. 1886.

苞茅属 bao mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial, infrequently annual. Culms usually tufted, often tall and robust. Leaf blades not aromatic, linear, midvein distinct, apex acuminate; ligule scarious. Inflorescence a compound spathate panicle, each ultimate spatheole subtending a peduncle bearing a pair of short racemes; spatheoles linear to ovate, often brightly colored; peduncle shorter or longer than spatheole, often bearded; raceme pairs 2- to many-awned, often reflexed at maturity. Each raceme of a pair supported on a short stalk ("raceme base") arising from the peduncle apex (termed "upper" and "lower" raceme base), these subequal or the upper longer, terete or flattened. Racemes with 0–2 pairs of homogamous spikelets below the fertile pairs, these resembling the pedicelled spikelets; pedicels and internodes slender. Sessile spikelet dorsally compressed or subterete; callus obtuse to pungent, bearded, its apex exposed; lower glume lanceolate to linear, leathery, convex, glabrous to villous, flanks rounded, incurving, keeled only near apex; upper glume boat-shaped, 3-veined, awnless; lower floret reduced to a hyaline lemma; upper lemma stipiform, 2-toothed, awned between the teeth; awn geniculate with hairy column. Pedicelled spikelet male or barren, narrowly lanceolate, slightly longer than the sessile, acute to aristulate.

Sixty-four species: mainly in Africa, a few species extending to other tropical regions; five species in China.

As a genus *Hyparrhenia* is easy to recognize, with its short, paired racemes grouped in a spathate panicle, exposed callus tip below the sessile spikelet, and hairy awns. Identification of the species depends on a careful inspection of the details of the pairs of racemes ("raceme pairs"). Homogamous spikelets are pairs of male or barren spikelets, generally resembling the pedicelled spikelets, often found at the base of one or both racemes. Their number and position are relatively stable within a species and provide a useful aid to identification.

1a. Racemes not reflexed at maturity; raceme bases terete, slender, clearly unequal.

2a. Awns 2(–4) per raceme pair; spikelets white-hairy 1. *H. filipendula*

2b. Awns 6–13 per raceme pair; spikelets brown or golden-hairy 2. *H. yunnanensis*

1b. Racemes reflexed at maturity; raceme bases subequal or unequal.

3a. Raceme with narrow, oblong, purple 1–3 mm scale at base; 1 homogamous spikelet pair at base of lower raceme only 3. *H. newtonii*

3b. Raceme without linear scale at base.

4a. Spatheoles linear, 4–7 cm; 1 homogamous spikelet pair at base of each raceme 4. *H. griffithii*

4b. Spatheoles lanceolate, 2–4.5 cm; 2 homogamous spikelet pairs at base of each raceme 5. *H. diplandra*

1. *Hyparrhenia filipendula* (Hochstetter) Stapf var. ***pilosa*** (Hochstetter) Stapf in Prain, Fl. Trop. Africa 9: 324. 1919.

毛穗苞茅 mao sui bao mao

Andropogon filipendulus Hochstetter var. *pilosus* Hochstetter, Flora 29: 115. 1846.

Perennial. Culms loosely tufted, slender, 1–2 m tall, branching. Leaf sheaths glabrous; leaf blades tough, 15–40 × 0.3–0.6 cm, glabrous, margins scabrid; ligule ca. 2 mm. Spathate panicle with many slender spatheoles in crowded fascicles from each spathe; spatheoles very narrowly linear, 4–6 × 0.1–0.3 cm, becoming reddish; peduncle filiform, flexuously exerted near spatheole tip, glabrous or thinly white bearded. Racemes 2(–4)-awned per pair, awns often twisted together, not reflexed at maturity; raceme bases very unequal, glabrous, the upper filiform, 5–8 mm; 1 pair of homogamous spikelets at base of lower raceme, 2 pairs at base of upper raceme. Sessile spikelet oblong-lanceolate, 5–6 mm; callus pungent, 2–3 mm, white bearded; lower glume linear-oblong, pubescent to villous with white hairs; awn 3–5 cm, the column hirsute with brown 0.7–1.2 mm hairs. Pedicelled spikelet 5–6.5 mm, tipped with a 1–5 mm bristle. Fl. and fr. Jul–Dec.

Hill slopes, grassy places, thickets; 900–1600 m. Yunnan [Indonesia, New Guinea, Philippines, Sri Lanka; Africa, Australia].

Hyparrhenia filipendula may be recognized by the combination of a slender, delicate habit, 2-awned raceme pairs, an elongate, filiform upper raceme base bearing 2 homogamous spikelet pairs, a pungent callus, and a hirsute awn.

Hyparrhenia filipendula var. *filipendula* is distinguished by the glabrous lower glume of the sessile spikelet. In Africa both varieties are common and may grow together, but in Asia nearly all specimens belong to var. *pilosa*.

2. *Hyparrhenia yunnanensis* B. S. Sun, J. Yunnan Univ. 21: 95. 1999.

泰国苞茅 tai guo bao mao

Hyparrhenia rufa (Nees) Stapf var. *siamensis* Clayton.

Perennial. Culms erect, slender to robust, 1–3 m tall. Leaf sheaths glabrous; leaf blades 30–60 × 0.2–0.8 cm, glabrous, margins scabrid; ligule subrounded, ca. 2 mm. Spathate panicle variable, lax or contracted; spatheoles linear-lanceolate, 3–5 × 0.3–0.5 cm, finally reddish and rolled; peduncle shorter or longer than spatheole, usually flexuously exerted at least on panicle periphery, glabrous or white bearded. Racemes 6–7-awned per pair, rufous, not reflexed at maturity; raceme bases unequal, terete, glabrous, upper 3–5 mm; 1 pair of homogamous spikelets at base of lower raceme, 1–2 pairs at base of upper raceme. Sessile spikelet 4–5 mm; callus narrowly cuneate, 1–1.2 mm, densely white or golden bearded; lower glume oblong-lanceolate, brownish, glossy, typically with scanty stiff rufous hairs,

but sometimes glabrous or pubescent; awn 2–3 cm, the column pubescent with stiff brown hairs. Pedicelled spikelet 3–5 mm, acute.

Hill slopes; 800–1200 m. Yunnan [Myanmar, Thailand].

This taxon is a uniform, local segregate from the gene pool of the extremely variable, African species *Hyparrhenia rufa* (Nees) Stapf. *Hyparrhenia rufa* s.s. has been introduced to warm parts of America and elsewhere as a pasture grass and is recorded from Yunnan. It has 7–14 awns per raceme pair, a shorter (0.2–0.8 mm) callus, and a slightly shorter sessile spikelet.

Hyparrhenia yunnanensis can be distinguished from the other species in China (except *H. griffithii*) by its long, slender upper raceme base, which may sometimes be partially connate with the shorter lower raceme base. The brown color of the spikelet hairs is also distinctive, although it may sometimes be rather pale.

3. *Hyparrhenia newtonii* (Hackel) Stapf in Prain, Fl. Trop. Africa 9: 363. 1919.

苞茅 bao mao

Andropogon newtonii Hackel, Bol. Soc. Brot. 3: 137. 1885; *A. lecomtei* Franchet; *Hyparrhenia lecomtei* (Franchet) Stapf.

Perennial. Culms tufted, erect or geniculate at base, 50–200 cm tall, glabrous or pilose just below nodes. Basal leaf sheaths tomentose or glabrous; leaf blades 20–60 × 0.2–0.6 cm, pilose on both surfaces or adaxial surface glabrous, margins scabrid; ligule reddish brown, truncate, 0.5–2 mm. Spathate panicle narrow, 30–40 cm; spatheoles narrowly lanceolate, 2–4 cm, reddish brown; peduncle slightly shorter than spatheole, setose with yellow or creamy hairs. Racemes 2–4-awned per pair, purple, reflexed at maturity; raceme bases unequal, stiffly setose, upper 1.5–3 mm, prolonged into a 1–3 mm, lanceolate, purple appendage below the lowest spikelet pair; 1 pair of homogamous spikelets at base of lower raceme only. Sessile spikelet 4–6 mm, purplish; callus 1.5–2 mm, acute to pungent, bearded; lower glume narrowly oblong, glabrous; awn 2–4 cm, column with short brown hairs. Pedicelled spikelet 5–10 mm, tipped with a 1–5 mm bristle.

Hill slopes; 600–1200 m. Guangdong, Guangxi [Indonesia, Thailand, Vietnam; Africa, Madagascar].

This species has a distinctively colored panicle, with purple spikelets and yellowish hairs. Asian material identified as *Hyparrhenia bracteata* (Willdenow) Stapf belongs here. True *H. bracteata* is restricted to Africa.

4. *Hyparrhenia griffithii* Bor, Indian Forest Rec., Bot. 1: 92. 1938.

大穗苞茅 da sui bao mao

Perennial. Culms erect, 1–2 m tall. Leaf sheaths pilose along margin and mouth, becoming glabrescent; leaf blades up

to $40 \times 0.4\text{--}0.8$ cm, white pilose near base on adaxial surface; ligule ca. 3 mm. Spathate panicle lax, narrow; spatheoles linear, 4–7 cm, inrolled, brown; peduncle 2/3 as long to slightly longer than spatheole, flexuous, white setose. Racemes 5–10-awned per pair, white hairy, loose, reflexed at maturity; raceme bases unequal, terete, glabrous, the upper filiform, 3.5–8 mm; 1 pair of homogamous spikelets at base of both lower and upper raceme of pair. Sessile spikelet 6–7 mm; callus pungent, 1.5–2 mm, white bearded; lower glume lanceolate, brownish to dark violet, white hirsute; awn 4–6 cm, the column pubescent with brown 0.4–0.6 mm hairs. Pedicelled spikelet 6–8 mm, villous, tipped with a 1–4 mm bristle.

Usually in forest understory; ca. 700 m. SW Yunnan (Gengma) [NE India, N Myanmar; Africa].

This species resembles *Hyparrhenia filipendula* in its white-hairy racemes, long, slender upper raceme base, and long awns. It can be distinguished by the sparser panicle, strongly reflexing racemes at maturity, and the greater number of awns per raceme pair.

5. *Hyparrhenia diplandra* (Hackel) Stapf in Prain, Fl. Trop. Africa 9: 368. 1919.

短梗苞茅 duan geng bao mao

Andropogon diplandrus Hackel, Flora 68: 123. 1855;

Cymbopogon eberhardtii A. Camus; *Hyparrhenia eberhardtii* (A. Camus) Hitchcock.

Perennial. Culms tufted, coarse, 1–2 m tall, sometimes glaucous. Leaf sheaths glabrous; leaf blades $30\text{--}60 \times 0.3\text{--}0.6$ cm, glabrous or hirsute at base, margins scabrid; ligule reddish brown, ca. 2 mm. Spathate panicle loose, narrow; spatheoles narrowly lanceolate, 3–5 cm, brownish red; peduncle scarcely exerted from spatheole, glabrous or shortly bearded. Racemes 4–8-awned per pair, reflexed at maturity; raceme bases subequal, flattened, short, broadly oblong, glabrous on outer face, upper 1.5–3 mm; usually 2 pairs of homogamous spikelets at base of both lower and upper raceme of pair; homogamous spikelets scabrid-pectinate on upper keels. Sessile spikelet 6–8 mm; callus 1–1.5 mm, sharply acute, white bearded; lower glume lanceolate, glabrous or pilose; awn 2.5–4.5 cm, column with white or brown 0.2–0.5 mm hairs. Pedicelled spikelet 6–7.5 mm, acute or tipped with a mucro up to 1.5 mm. Fl. and fr. Aug–Nov.

Hill slopes, thickets; 100–200 m. Guangdong, Guangxi, Hainan, Yunnan [Indonesia, Thailand, Vietnam; tropical Africa].

This species can be recognized by its short, flat raceme bases and the pectinately margined homogamous spikelets, which form an involucre at the base of the raceme pair.

213. THEMEDA Forsskål, Fl. Aegypt.-Arab. 178. 1775.

菅属 jian shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Anthistiria Linnaeus f.

Perennial or annual, often coarse. Culms tufted. Leaf sheaths keeled; leaf blades linear; ligule short, membranous or papery. Inflorescence a leafy compound panicle composed of short racemes; each raceme on a short peduncle subtended by a sheathing spatheole, loosely arranged or gathered into fan-shaped spathate fascicles. Raceme comprising 2 pairs of large sessile homogamous spikelets at base forming an involucre, with 1–2(–5) fertile pairs above and a terminal triad, these usually deciduous, rarely raceme shed as a whole; internodes and pedicels linear. Sessile spikelet subterete or dorsally compressed; callus mostly acute to pungent, sometimes obtuse, bearded; lower glume usually leathery, margins rounded, incurving, keeled only near apex, obtuse; upper glume awnless; lower floret reduced to a hyaline lemma; upper lemma stipitiform, entire, passing into a geniculate awn with pubescent column, occasionally awnless. Pedicelled spikelet mostly larger than sessile, narrowly lanceolate, resembling homogamous; callus slender, pedicel-like; true pedicel reduced. $x = 10$.

Twenty-seven species: tropical and subtropical regions of the Old World, mainly in Asia; 13 species (four endemic) in China.

The number of spikelets in a raceme refers to the total of homogamous, sessile, and pedicelled spikelets. Hence racemes with seven spikelets (division 1a of the key) have only one fertile sessile spikelet and one awn. Racemes with more than one awn have more than seven spikelets.

Most species of this genus are used for forage when young.

- 1a. Raceme with 7 spikelets; homogamous spikelets all at same level; racemes congested in dense fascicles.
 - 2a. Homogamous spikelets 7–14 mm 1. *T. triandra*
 - 2b. Homogamous spikelets 4–6 mm.
 - 3a. Involucral spikelets densely hairy with soft hairs; awn poorly developed, ca. 4 mm 2. *T. minor*
 - 3b. Involucral spikelets conspicuously setose with a few long bristles from large tubercles; awn well developed, 3–4.5 cm.
 - 4a. Fascicles of racemes from upper leaf axils; sessile spikelet pubescent toward apex 3. *T. quadrivalvis*
 - 4b. Fascicles of racemes from all leaf axils; sessile spikelet pubescent throughout 4. *T. helferi*
 - 1b. Raceme with (7 or) 9–17 spikelets; homogamous spikelets at slightly different levels; racemes loosely arranged.
 - 5a. Homogamous spikelets pubescent, thinly hispid or glabrous.
 - 6a. Culms slender, 20–60 cm; racemes few 5. *T. hookeri*
 - 6b. Culms robust, 1–3.5 m; racemes numerous.
 - 7a. Sessile spikelet awnless or with awn less than 1 cm 7. *T. villosa*

- 7b. Sessile spikelet with 2–8 cm awn.
 8a. Culms and leaves hirsute 8. *T. trichiata*
 8b. Culms and leaves glabrous 9. *T. caudata*
- 5b. Homogamous spikelets setose with tubercle-based bristles.
 9a. Sessile spikelet awnless or with awn less than 1 cm.
 10a. Homogamous spikelets 0.5–0.8 cm; culms slender 6. *T. anathera*
 10b. Homogamous spikelets 1–4 cm; culms robust 10. *T. intermedia*
- 9b. Sessile spikelet awned.
 11a. Raceme with 13–17 spikelets; homogamous spikelets 2.5–4 cm 11. *T. unica*
 11b. Raceme with 7–9 spikelets; homogamous spikelets 1–1.5 cm.
 12a. Glumes of homogamous and pedicelled spikelets with golden hairs; lower glume of sessile spikelet convex 12. *T. arundinacea*
 12b. Glumes of homogamous and pedicelled spikelets with long soft white hairs; lower glume of sessile spikelet with shallow median groove 13. *T. yunnanensis*

1. *Themeda triandra* Forsskål, Fl. Aegypt.-Arab. 178. 1775.

黄背草 huang bei cao

Anthistiria japonica Willdenow; *Themeda barbinodis* B. S. Sun & S. Wang; *T. japonica* (Willdenow) Tanaka; *T. triandra* var. *japonica* (Willdenow) Makino.

Perennial from a knotty rootstock. Culms tussocky, yellowish, usually farinose near nodes, 0.5–1.5 m tall. Leaf sheaths usually hispid with tubercle-based hairs; leaf blades 10–50 × 0.4–0.8 cm, glabrous or pilose, finely acuminate; ligule 1–2 mm, truncate, ciliate. Compound panicle lax, open, with spaced, often nodding spathate fascicles; spathes and spatheoles narrowly lanceolate, glabrous or thinly to densely tuberculate-hispid, innermost 2–3.5 cm. Raceme composed of a triad of 1 sessile and 2 pedicelled spikelets above the involucre of 2 homogamous pairs. Homogamous spikelets all sessile, arising at same level, staminate, both glumes present, 7–14 mm, oblong-lanceolate with lateral scarious wings, glabrous or hispid with tubercle-based hairs. Sessile spikelet 5–7 mm; callus 1.5–3 mm, pungent, brown bearded; lower glume dorsally rounded, dark brown, glossy, hispidulous in upper 1/3, smooth below; awn 3.7–7 cm. Pedicelled spikelet 7–12 mm, male or barren. Fl. and fr. Jun–Dec. $2n = 20, 40, 50, 60, 70, 80$.

Dry mountain slopes, roadsides, forest margins; 100–3000 m. Anhui, Fujian, Guizhou, Hainan, Hebei, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia].

This is a highly polymorphic, predominantly apomictic species with a wide range of chromosome numbers.

The name *Themeda arguens* (Linnaeus) Hackel has been misapplied to this species in Yunnan. True *T. arguens* is not yet known from China. It occurs from Thailand and Vietnam to Australia, and can be distinguished by its reddish culms, very large, spathate fascicles with awns 7–9 cm, and longer callus 3–4 mm. It also differs from *T. triandra* by its glabrous leaf sheaths, blunter leaf blades, and homogamous spikelets consisting only of the lower glume.

2. *Themeda minor* L. Liu, Fl. Xizang. 5: 343. 1987.

小菅草 xiao jian cao

Perennial, with short scaly rhizomes. Culms slender, stiff, 30–50 cm, many-noded, branching. Leaf sheaths softly pilose on margins; leaf blades 3–8 × 0.1–0.2 cm, pilose with tubercle-

based hairs, densely long-pilose at narrowed base, margins scabrid; ligule ca. 1 mm, ciliate. Compound panicle narrow, erect, spathate fascicles arising singly on 1.5–2 cm branches from upper leaf axils; spathes ca. 1.5 cm. Raceme composed of a triad of 1 sessile and 2 pedicelled spikelets above the involucre of 2 homogamous pairs. Homogamous spikelets 4–5 mm, densely hirsute with whitish, tubercle-based soft hairs. Sessile spikelet ca. 4 mm; callus bearded; lower glume dorsally compressed, pallid, puberulous, acute; awn poorly developed, ca. 4 mm. Pedicelled spikelet ca. 5 mm, staminate, densely white-hirsute, hairs ca. 3 mm. Fl. and fr. Jun–Sep.

• Mountain slopes, under rather open thickets; ca. 2000 m. SE Xizang (Zayü).

3. *Themeda quadrivalvis* (Linnaeus) Kuntze, Revis. Gen. Pl. 793. 1891.

中华菅 zhong hua jian

Andropogon quadrivalvis Linnaeus in Murray, Syst. Veg., ed. 13, 758. 1774; *Themeda chinensis* (A. Camus) S. L. Chen & T. D. Zhuang; *T. ciliata* (Linnaeus f.) Hackel subsp. *chinensis* A. Camus; *T. echinata* Keng; *T. yuanmounensis* S. L. Chen & T. D. Zhuang.

Annual. Culms moderately robust, erect or geniculate at base, ca. 1 m tall. Leaf sheaths glabrous or with tubercle-based bristles at mouth; leaf blades flat or folded, up to 30 × 0.3–0.9 cm, glabrous, abruptly acute to acuminate; ligule ca. 3 mm. Compound panicle large, dense; spathes and spatheoles lanceolate-caudate, glabrous, innermost 1.3–1.7 cm. Raceme composed of a triad of 1 sessile and 2 pedicelled spikelets above the involucre of 2 homogamous pairs. Homogamous spikelets all sessile, arising at same level, barren, both glumes present, 4.5–6 mm, lanceolate, stiffly setose in upper half with 3–4 mm, tubercle-based bristles. Sessile spikelet 4–4.5 mm; callus 0.8–1 mm, subacute, brown bearded; lower glume dorsally rounded, dark brown at maturity, pubescent, often thinly or glabrous on lower back; awn 3.5–4 cm. Pedicelled spikelet 4–6 mm, barren. Fl. and fr. Jun–Dec.

Dry hill slopes; 400–2000 m. Guangdong, Guangxi, Guizhou, Hainan, Yunnan [India, Indonesia, Myanmar, Nepal, Thailand, Vietnam; Australia].

This species has dense fascicles of racemes similar to those of *Themeda triandra*, but with smaller spikelet parts and conspicuously

setose homogamous spikelets with long, patent bristles from very large tubercles. It can also generally be separated by its annual habit.

4. *Themeda helferi* Munro ex Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 665. 1889.

无茎菅 wu jing jian

Themeda acaulis B. S. Sun & S. Wang; *T. ciliata* (Linnaeus f.) Hackel subsp. *helferi* (Munro ex Hackel) A. Camus; *T. quadrivalvis* (Linnaeus) Kuntze var. *helferi* (Munro ex Hackel) Bor.

Annual. Culms very slender, solitary or in small loose tufts, up to 30 cm tall. Leaf sheaths shorter than internodes, glabrous; leaf blades flat or folded, 5–10 × 0.2–0.4 cm, a few tubercle-based bristles on lower margins, otherwise glabrous, acute; ligule ca. 1 mm, truncate, ciliolate. Spathate fascicles arising from all leaf axils from base to apex of culm, fascicles congregated on slender 1–3-noded branches; spathes and spatheoles narrowly lanceolate-caudate, glabrous, innermost ca. 2 cm. Raceme composed of a triad of 1 sessile and 2 pedicelled spikelets above the involucre of 2 homogamous pairs. Homogamous spikelets all sessile, arising at same level, male with both glumes present, 4–5 mm, narrowly lanceolate, stiffly setose in upper half with ca. 3 mm, tubercle-based bristles, upper keels scabrid. Sessile spikelet ca. 4 mm; callus 0.5–1 mm, obtuse, brown bearded; lower glume dorsally slightly flattened, pubescent throughout; awn 3.5–4.5 cm. Pedicelled spikelet 5–6 mm, barren.

Stream banks; ca. 600 m. Yunnan (Longling, Zhenkang) [Myanmar (Tenasserim)].

This slender, annual species is remarkable in that fascicles of racemes are borne all the way down to the base of the plant, so that the whole culm in effect forms the compound inflorescence. It appears to be rare and fairly localized in its distribution.

5. *Themeda hookeri* (Grisebach) A. Camus, Bull. Mus. Natl. Hist. Nat. 26: 425. 1920.

西南菅草 xi nan jian cao

Anthistiria hookeri Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 91. 1868.

Perennial, with slender rhizomes. Culms very slender, decumbent at base, 20–60 cm tall. Leaf sheaths glabrous; leaf blades 3–13 × 0.2–0.5 cm, scabrid, glabrous or thinly hispid with long, fine, tubercle-based hairs, apex filiform; ligule ca. 0.5 mm, ciliolate. Compound panicle sparse, composed of single racemes arising from upper leaf axils, usually subtended only by a spatheole without accompanying spathes; spatheoles linear, 3–6 cm, glabrous; peduncle glabrous. Raceme composed of 1–2 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at different levels, staminate, 12–18 mm, lanceolate with narrow lateral wings, glabrous or thinly hispid. Sessile spikelet 4.5–5.5 mm; callus ca. 1.5 mm, narrowly cuneate; lower glume pallid, dorsally compressed, shortly pubescent especially near apex or subglabrous; awn 2.5–4 cm, weakly geniculate. Pedicelled spikelet 10–11 mm. Fl. and fr. Jun–Nov.

Mountain slopes, rocky places, in the open or in shade; 1100–3400 m. Guizhou, Sichuan, Xizang, Yunnan [India (Sikkim), Nepal].

This slender, upland species is recognizable by its few racemes, which usually arise singly from the upper leaf axils instead of being gathered into spathate clusters.

6. *Themeda anathera* (Nees ex Steudel) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 669. 1889.

瘤菅 liu jian

Anthistiria anathera Nees ex Steudel, Syn. Pl. Glumac. 1: 402. 1854; *Androscepia anathera* (Nees ex Steudel) Andersson; *A. anathera* var. *glabrescens* Andersson; *A. anathera* var. *hirsuta* Andersson; *Themeda anathera* var. *glabrescens* (Andersson) Hackel; *T. anathera* var. *hirsuta* (Andersson) Hackel.

Perennial, with rhizomes. Culms densely tufted, slender, erect or ascending, 30–120 cm tall. Leaf sheaths glabrous or loosely hairy; leaf blades narrow, 4–20 × 0.2–0.4 cm, scabrid, setose with scattered, long, tubercle-based hairs, apex filiform; ligule ca. 2 mm, margin ciliate. Compound panicle loose, open, branches ascending, bearing up to 5 small spathate racemes; spatheoles linear, 1–2 cm, glabrous; peduncle glabrous. Raceme composed of 1–3 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at different levels, male or barren, 5–8 mm, lanceolate, sparsely to densely setose with tubercle-based bristles or sometimes glabrous. Sessile spikelet 5–7 mm; callus ca. 1 mm, obtuse; lower glume firmly herbaceous to subleathery, lightly dorsally compressed, puberulous or subglabrous to tuberculate-hairy; upper lemma narrowly lanceolate, awnless (rarely with reduced ca. 1 cm awn). Pedicelled spikelet 6–8 mm. Fl. and fr. Aug–Oct.

Mountain slopes, usually in forests; 1500–3000 m. Xizang [Afghanistan, N India, Nepal, Pakistan].

This is a slender, Himalayan species similar to *Themeda hookeri*, but with a more western distribution. It has a more densely tufted habit than *T. hookeri* and can easily be distinguished by its more numerous, awnless, usually setose racemes of smaller spikelets.

7. *Themeda villosa* (Poiret) A. Camus in Lecomte, Fl. Indo-Chine 7: 364. 1922.

菅 jian

Anthistiria villosa Poiret, Encycl. Suppl. 1: 396. 1812 [“1810”]; *A. gigantea* Cavanilles subsp. *villosa* (Poiret) J. D. Hooker; *A. mutica* Steudel; *Pseudanthistiria emeinica* S. L. Chen & T. D. Zhuang; *Themeda gigantea* (Cavanilles) Hackel subsp. *villosa* (Poiret) Hackel; *T. gigantea* var. *villosa* (Poiret) Hackel.

Perennial. Culms tufted, stout, 2–3.5 m tall, 1–2 cm in diam. Leaf sheaths glabrous, basal sheaths strongly compressed; leaf blades ca. 100 × 0.7–1.5 cm, scabrid, gradually narrowed to the thick white midrib toward base, acuminate; ligule ca. 1 mm, ciliate. Compound panicle up to 1 m with many drooping branches, branches bearing several spathes, each spathe subtending a further spathe and usually a single spatheole with raceme; spatheoles 2–3.5 cm, minutely hispidulous; peduncle pilose at apex. Raceme composed of (1–)2 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at slightly

different levels, male or barren, 10–15 mm, narrowly lanceolate, wingless, shortly pubescent. Sessile spikelet 7–8 mm; callus 1–2 mm, acute; lower glume oblong-lanceolate, dorsally compressed with shallow central groove, densely brown strigose; upper lemma lanceolate, midvein produced into mucro or poorly developed short awn. Pedicelled spikelet 10–15 mm. Fl. and fr. Aug–Jan.

Hill slopes, forest margins, disturbed moist grassy places; 300–2500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangxi, Sichuan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, NE India, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka (introduced), Thailand].

This is a giant grass with stout culms and a large, spathate panicle lacking prominent, geniculate awns. The name *Pseudanthistiria emeinnica* is based on a few anomalous specimens from Sichuan (Emei Shan) in which one or both of the homogamous spikelet pairs have been replaced by a normal spikelet pair.

8. *Themeda trichiata* S. L. Chen & T. D. Zhuang, Bull. Bot. Res., Harbin 9(2): 58. 1989.

毛菅 mao jian

Perennial. Culms tufted, stout, ca. 1.5 m tall, 0.7 mm or more in diam., loosely hirsute especially below nodes. Leaf sheaths glabrous or hirsute along margins, hirsute on back near blade; leaf blades 40–80 × 0.4–0.6 cm, abaxial surface hirsute, contracted at base, acuminate; ligule ca. 1.5 mm, margin lacerate. Compound panicle open, branches pilose, spathes hirsute at least on margins, each subtending a further spathe and up to 3 spatheoles with racemes; spatheoles 2.5–3 cm, glabrous; peduncle villous at apex. Raceme composed of 1 spikelet pair and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at slightly different levels, one pair subsessile, barren, the other pair staminate, 12–15 mm, narrowly lanceolate, minutely puberulous. Sessile spikelet dorsally compressed, 7–7.5 mm; callus ca. 2 mm, acute; lower glume oblong-lanceolate, slightly flattened, densely brown strigose; upper lemma stipitiform; awn 2–4.5 cm. Pedicelled spikelet 12–15 mm. Fl. and fr. Aug–Dec.

• Dry mountain slopes. Guangxi, Hainan, Yunnan.

This species is very close to *Themeda caudata*, but has hairs on the leaves and culms, and shorter, more slender awns.

9. *Themeda caudata* (Nees) A. Camus in Lecomte, Fl. Indo-Chine 7: 364. 1922.

苞子草 bao zi cao

Anthistiria caudata Nees in Hooker & Arnott, Bot. Beechey Voy. 245. 1838; *A. gigantea* Cavanilles subsp. *caudata* (Nees) J. D. Hooker; *Themeda gigantea* (Cavanilles) Hackel subsp. *caudata* (Nees) Hackel.

Perennial. Culms tufted, robust, 1–3 m tall, 0.5–1 cm in diam. Leaf sheaths glabrous, basal sheaths strongly compressed; leaf blades 20–80 × 0.5–1 cm, scabrid, midvein distinct, narrowed to subrounded at base, acuminate; ligule subrounded, ca. 1 mm, ciliate. Compound panicle large, much branched, branches bearing several spathes, each spathe subtending a further spathe and up to 3 spatheoles with racemes;

spatheoles 2.5–5 cm, minutely scaberulous-puberulous; peduncle pilose at apex. Raceme composed of 1(–2) spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at slightly different levels, 12–15 mm, linear-lanceolate, wingless, minutely scaberulous-puberulous. Sessile spikelet 6–7.5 mm; callus 2–3 mm, acuminate; lower glume dorsally compressed, oblong-lanceolate, densely golden strigose; upper lemma stipitiform; awn 4–8 cm. Pedicelled spikelet 12–15 mm, male or barren. Fl. and fr. Jul–Dec.

Dry hillsides, forest margins; 400–2500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

The name “*Themeda gigantea* var. *caudata* (Nees) Keng” (Fl. Ill. Pl. Prim. Sin. Gram. 845. 1959) belongs here, but was not validly published because no Latin description was provided.

10. *Themeda intermedia* (Hackel) Bor, Indian Forest Rec., Bot. 1: 96. 1938.

居中菅 ju zhong jian

Themeda gigantea (Cavanilles) Hackel subsp. *intermedia* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 675. 1889.

Perennial. Culms tufted, stout, 1.5–5 m tall, 0.8–1.5 cm in diam. Leaf sheaths glabrous; leaf blades up to 100 × 0.6–1.5 cm, narrowed toward base, scabrid, acuminate; ligule ca. 1 mm. Compound panicle large with many drooping branches, each branch bearing several spathes subtending 1–3 spatheoles; spatheoles 2–3 cm, glabrous; peduncle villous at apex. Raceme composed of 0–2 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at slightly different levels, male or barren, 11–14 mm, narrowly oblong-lanceolate, hirsute with long, golden or pallid tubercle-based hairs, acuminate. Sessile spikelet ca. 7 mm; callus 1.5–2 mm, narrowly cuneate; lower glume oblong-lanceolate, dorsally compressed, densely strigose with brown hairs; upper lemma lanceolate, awn absent or less than 1 cm. Pedicelled spikelet 10.5–14 mm.

Light forest shade; ca. 700 m. SW Yunnan (Gengma) [Bhutan, N India, Myanmar].

This is probably just an awnless, small-spiculate form from the *Themeda arundinacea* gene pool or a product of introgression from *T. villosa*.

11. *Themeda unica* S. L. Chen & T. D. Zhuang, Bull. Bot. Res., Harbin 9(2): 56. 1989.

浙皖菅 zhe wan jian

Perennial. Culms erect or geniculate at base, 1–2.5 m tall, 4–10 mm in diam., farinaceous near nodes when young. Leaf sheaths loosely hispid with tubercle-based hairs; leaf blades 30–60 × 0.4–1 cm, glabrous or adaxial surface with tubercle-based setae near base; ligule 2–7 mm. Compound panicle elongate, 3–4-noded, 1–3 solitary spathate racemes arising directly from nodes; spatheoles 4–9 cm, glabrous; peduncle 4–7 cm, glabrous. Raceme composed of 3–5 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogam-

ous spikelets arising at slightly different levels, staminate, 25–40 cm, lanceolate, margins with stiff white tubercle-based hairs, acuminate. Sessile spikelet 7–10 mm; callus ca. 2.5 mm, acute; lower glume elliptic-oblong, densely strigose with brown hairs, awn 2–4 cm. Pedicelled spikelet ca. 20 mm. Fl. and fr. Aug–Oct.

- Hill slopes, roadsides; 200–1000 m. Anhui, Zhejiang.

12. *Themeda arundinacea* (Roxburgh) A. Camus in Lecomte, Fl. Indo-Chine 17: 363. 1922.

韦营 wei jian

Anthistiria arundinacea Roxburgh, Fl. Ind. 1: 256. 1820; *A. subsericans* Nees ex Steudel; *Cymbopogon arundinaceus* (Roxburgh) Schultes; *Themeda gigantea* (Cavanilles) Hackel subsp. *arundinacea* (Roxburgh) Hackel; *T. gigantea* var. *subsericans* (Nees ex Steudel) Hackel; *T. subsericans* (Nees ex Steudel) Ridley.

Perennial. Culms tufted, reedlike, stout, up to 6 m tall, 1–1.5 cm in diam. Leaf sheaths glabrous; leaf blades 50–100 × 1–1.5 cm, scabrid, gradually narrowed to the thick white midrib toward base, acuminate; ligule 1–2 mm. Compound panicle large with many drooping branches, each branch bearing spathes subtending 2–3 spatheoles; spatheoles 2–3.5 cm, glabrous; peduncle pubescent at apex. Raceme composed of 0–2 spikelet pairs and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at slightly different levels, male or barren, 12–20 mm, linear-lanceolate, densely hispid with long, golden, tubercle-based hairs, finely acuminate. Sessile spikelet 7–9.5 mm; callus 2–3.5 mm, narrowly cuneate; lower glume oblong-lanceolate, densely strigose with golden or brown hairs, hairs usually deciduous; awn 4–9 cm. Pedicelled spikelet 13–20 mm. Fl. and fr. Sep–Apr.

- Mountain slopes, valley grasslands; 700–2000 m. Guangxi, Gui-

zhou, Yunnan [Bangladesh, Bhutan, N India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Thailand, Vietnam].

Themeda arundinacea belongs to a group of giant *Themeda* species with stout, solid, reedlike culms and large, drooping panicles, also including *T. caudata*, *T. intermedia*, *T. trichiata*, and *T. villosa*. Most were treated in old literature at infraspecific rank under *T. gigantea* (Cavanilles) Hackel, which name is now applied only to a form endemic in the Philippines with awnless racemes of small, hairy spikelets. The species of this complex probably intergrade, and variation is not well understood.

Smaller forms of *Themeda arundinacea* with culms to 3 m tall, shorter spikelets, and shorter, weaker awns (3–4.5 cm) are sometimes separated as *T. subsericans*.

13. *Themeda yunnanensis* S. L. Chen & T. D. Zhuang, Bull. Bot. Res., Harbin 9(2): 58. 1989.

云南营 yun nan jian

Perennial. Culms slender, erect, up to 1 m tall. Leaf sheaths glabrous; leaf blades 15–30 × 0.3–0.5 cm, glabrous, margins scabrid, acuminate; ligule lacerate. Compound panicle loose, each branch bearing a few spathes subtending 1 or more spatheoles; spatheoles 3–6 cm, glabrous; peduncles glabrous. Raceme composed of 1 spikelet pair and a terminal triad above the involucre of 2 homogamous pairs. Homogamous spikelets arising at different levels, staminate, ca. 15 mm, lanceolate, villous with white long soft tubercle-based hairs, acuminate. Sessile spikelet ca. 7 mm, pallid; callus ca. 2.5 mm, narrowly cuneate; lower glume subleathery, densely pubescent with yellowish white soft hairs, back with shallow median groove; awn 3–6 cm. Pedicelled spikelet ca. 15 mm, villous. Fl. and fr. Sep–Nov.

- Dry mountain slopes; 600–1900 m. Yunnan.

Themeda yunnanensis resembles the Indian species *T. mooneyi* Bor in its slender habit and softly white-hairy homogamous spikelets, but the latter species has glabrous sessile spikelets (except for short prickles at the apex) and glabrous pedicelled spikelets.

214. *HETEROPOGON* Persoon, Syn. Pl. 2: 533. 1807.

黄茅属 huang mao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial or annual. Culms tufted. Leaf sheaths usually keeled; leaf blades linear; ligule membranous, sometimes with ciliate fringe. Inflorescence of solitary racemes, these terminal or axillary and loosely aggregated into a spathate panicle; peduncle included to long-exserted. Racemes linear, dense, spikelets imbricate, 1 to several pairs of homogamous spikelets at base of raceme below fertile pairs, fragile between fertile pairs; internodes and pedicels reduced to short oblique stumps obscured by hairs from backside of sessile spikelet callus. Homogamous spikelets herbaceous, flat, lanceolate-oblong. Sessile spikelet subterete; callus long, pungent, bearded; lower glume leathery, obtuse; upper glume awnless; lower floret reduced to a hyaline lemma; upper lemma stipitiform, entire, passing into a stout geniculate awn with hairy column. Pedicelled spikelet larger than sessile, resembling homogamous spikelets, awnless; callus slender, pedicel-like; true pedicel reduced to a stump.

- Six species: throughout the tropics and subtropics; three species in China.

- 1a. Annual; leaf sheaths with rows of glands along veins 1. *H. melanocarpus*
- 1b. Perennial; leaf sheaths without glands.
- 2a. Culms up to 1 m tall; raceme 3–7 cm (excluding awns); 3–10(–12) pairs of homogamous spikelets 2. *H. contortus*
- 2b. Culms 1–3 m tall; raceme 8–15 cm (excluding awns); 12–15 pairs of homogamous spikelets 3. *H. triticeus*

1. *Heteropogon melanocarpus* (Elliott) Benth, J. Linn. Soc., Bot. 19: 71. 1881.

黑果黄茅 hei guo huang mao

Andropogon melanocarpus Elliott, Sketch Bot. S. Carolina 1: 146. 1816 [“1821”]; *A. polystictus* Steudel; *Cymbopogon melanocarpus* (Elliott) Sprengel; *Heteropogon acuminatus* Tri-

nus; *H. polystictus* (Steudel) Hochstetter; *H. roylei* Nees ex Steudel.

Annual. Culms robust, erect, usually solitary, 0.5–2 cm tall, supported by stilt roots. Leaf sheaths spotted with rows of glands along veins, long soft hairs at mouth; leaf blades flat, 10–40 × 0.5–1 cm, pilose, apex acuminate; ligule lacerate. Inflorescence of racemes gathered into a copious spathate panicle; spatheoles linear-lanceolate, glandular; peduncle ca. 1/2 spatheole length, scarcely exerted. Racemes 2–4 cm (excluding awns), 3–8-awned, 1–3 pairs of green homogamous spikelets below the awned fertile pairs. Sessile spikelet 6–8 mm, blackish brown; callus 3–4.5 mm, sharply pungent, brown bearded; lower glume narrowly oblong, densely pilose with soft brown hairs; awn 6–9 cm, stout, column blackish when mature, hirtellous. Pedicelled spikelet 15–25 mm, lower glume light green, oblong-lanceolate, laterally asymmetrically winged, glabrous, pitted with glands and transversely puckered along midvein, lanceolate-caudate. Fl. and fr. Jun–Nov.

Mountain slopes; 1000–1500 m. Yunnan [India; Africa, tropical and subtropical America, SW Asia].

This species is immediately recognizable by the large, caudate pedicelled spikelets with a conspicuous, median, glandular band.

2. *Heteropogon contortus* (Linnaeus) P. Beauvois ex Roemer & Schultes, Syst. Veg. 2: 836. 1817.

黄茅 huang mao

Andropogon contortus Linnaeus, Sp. Pl. 2: 1045. 1753; *Heteropogon fertilis* B. S. Sun & S. Wang.

Perennial. Culms slender, tufted, usually geniculate at base, 20–100 cm tall. Leaf sheaths keeled; leaf blades flat or folded, 10–20 × 0.3–0.6 cm, scabrid or adaxial surface pilose at base, apex obtuse or shortly acute to apiculate; ligule ciliate along margin. Inflorescence terminal or racemes gathered into a scanty panicle; spatheoles linear, tightly rolled around peduncle; peduncles mostly long-exserted. Racemes 3–7 cm (excluding awns), narrowly cylindrical, 7–12-awned, (1–)3–10(–12) pairs of flat green homogamous spikelets below the awned fertile pairs. Sessile spikelet 5–7 mm, dark brown; callus 2–3 mm, fiercely pungent, brown bearded; lower glume linear becoming cylindrical at maturity, sometimes hispidulous between veins; awn 6–10 cm, dark brown, column white-hirtellous, tips of successive awns often twisting together. Pedicelled spikelet 6–11 mm, lower glume oblong-lanceolate, greenish, laterally asymmetrically winged, glabrous or sparsely to densely pilose or tuberculate-hispid or white setose. Fl. and fr. Apr–Dec. $2n = 20, 40, 44, 50, 60, 80$.

Dry hillsides, roadsides, grassy places, in the open or light shade; 400–4500 m. Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [tropics and subtropics of the world, extending to Mediterranean and other warm-temperate areas].

The narrowly cylindrical racemes of overlapping, green spikelets with stout, brown, intertwining awns emerging from the upper part are very characteristic of this species. It is a very widespread and extremely polymorphic species, varying in habit, hairiness of the spikelets, and also physiologically in response to differing rainfall regimes. It is apomictic and includes a range of chromosome numbers. The name *Heteropogon fertilis* has been applied to an atypical, stunted specimen lacking homogamous spikelet pairs at the base of the raceme. It was described from Yunnan, but similar forms with only a single homogamous spikelet pair are known from Hong Kong and elsewhere.

This species provides good forage when young, but the needle-sharp spikelet calluses can cause damage to livestock when mature. The leaves and stems are utilized in papermaking.

3. *Heteropogon triticeus* (R. Brown) Stapf ex Craib, Bull. Misc. Inform. Kew 1912: 432. 1912.

麦黄茅 mai huang mao

Andropogon triticeus R. Brown, Prodr. 201. 1810; *A. ischyranthus* Steudel; *A. lianatherus* Steudel; *A. segaenensis* Steudel; *Heteropogon ischyranthus* (Steudel) Miquel; *H. lianatherus* (Steudel) Miquel; *Sorghum triticeum* (R. Brown) Kuntze.

Perennial from a tough rootstock. Culms stout, erect, hard, 1–3 m tall. Leaf sheaths keeled and flabellate at plant base, glabrous to hispidulous; leaf blades flat, stiff, 30–60 × 0.4–0.8 cm, glabrous to hirsute, apex acuminate; ligule very short, truncate, lacerate. Inflorescence a terminal raceme, sometimes with a few axillary racemes below it. Racemes 8–15 cm (excluding awns), 5–11-awned, 12–15 pairs of flat green homogamous spikelets below awned fertile pairs. Sessile spikelet 6–10 mm, dark brown at maturity; callus ca. 6 mm, pungent, densely brown bearded; lower glume linear-oblong, brown puberulous or pubescent, deeply grooved on either side of midvein; awn 9–16 cm, brown, column shortly pubescent. Pedicelled spikelet 15–20 mm, lower glume oblong-lanceolate, green, laterally asymmetrically winged, glabrous. Fl. and fr. Oct–Mar.

Mountain slopes. Hainan [S India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

This is a tall, robust grass with racemes of large, overlapping homogamous and pedicelled spikelets with very long awns emerging from the upper part.

215. **PSEUDANTHISTIRIA** (Hackel) J. D. Hooker, Fl. Brit. India 7: 219. 1896 [“1897”].

假铁秆草属 jia tie gan cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Andropogon sect. *Pseudanthistiria* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 400. 1889.

Annuals. Culms slender, usually decumbent at base or trailing. Leaf sheaths shorter than internodes; leaf blades linear to lanceolate; ligule membranous, short, truncate. Inflorescence a leafy compound panicle, composed of several axillary fascicles of short racemes, each individual raceme subtended by a sheathing spatheole, fascicle supported by a spathe at apex of a flexuous peduncle.

Racemes fragile, comprising 1–3 spikelet pairs and a terminal triad of 1 sessile and 2 pedicelled spikelets, without homogamous spikelet pairs at base; internodes and pedicels linear, short. Sessile spikelet dorsally compressed; callus small, obtuse; lower glume papery to cartilaginous, dorsally subconvex to concave, margins rounded and inrolled, apex truncate; upper glume awnless; lower lemma reduced or absent; upper lemma stipitiform, entire, passing into a geniculate glabrous awn. Pedicelled spikelet larger than sessile, acute; callus narrowly oblong.

Three species: India to Thailand; one species (probably introduced) in China.

1. *Pseudanthistiria heteroclita* (Roxburgh) J. D. Hooker, Fl. Brit. India 7: 219. 1896 [“1897”].

假铁秆草 *jia tie gan cao*

Anthistiria heteroclita Roxburgh, Fl. Ind. 1: 253. 1820; *Andropogon heteroclitus* (Roxburgh) Nees; *Hypogynium heteroclitum* (Roxburgh) Roberty; *Pseudanthistiria hispida* J. D. Hooker; *Sorghum heteroclitum* (Roxburgh) Kuntze.

Culms slender, geniculate at base, 30–50 cm tall. Leaf sheaths glabrous or hispid near margins; leaf blades linear, 8–15 × 0.3–0.5 cm, veins distinct, hispid with tuberculate-based hairs on both surfaces, base subrounded, apex acuminate. Compound panicle 10–30 cm; spatheoles lanceolate, 7–12 mm, setose near

margins, the hairs arising from conspicuous, sometimes dark-colored tubercles, apex finely acuminate. Racemes with 1–2 spikelet pairs and a terminal triad. Sessile spikelet linear-oblong, 3–4.5 mm; lower glume firmly membranous, shallowly convex, scaberulous or puberulous toward apex varying to appressed-pubescent throughout; upper lemma longer than glumes; awn 2–3 cm, column pubescent. Pedicelled spikelet lanceolate, 4.5–5.5 mm, lower glume loosely setose with tuberculate-based hairs near apex. Fl. and fr. Sep–Dec.

Open hillsides, disturbed places. Hong Kong [India].

This species has apparently been collected only once in China, by Hance in Hong Kong in 1862, and was probably a chance introduction.

216. **PHACELURUS** Grisebach, Spic. Fl. Rumel. 2: 423. 1846.

束尾草属 *shu wei cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Thysia Stapf.

Perennial. Culms often robust. Leaf blades linear or rarely terete; ligule membranous. Inflorescence terminal, racemes usually subdigitate, rarely spread along an elongate axis or solitary. Racemes ± flattened, bearing paired spikelets, horizontally articulated, often rather tardily disarticulating; rachis internodes inflated to clavate, glabrous, base truncate, sometimes with a central peg. Sessile spikelet flat, convex or concave across back; lower glume lanceolate to ovate, membranous to leathery, smooth, marginally 2-keeled or rounded; upper glume boat-shaped; lower floret male or barren, with or without palea; upper floret bisexual, with entire awnless lemma. Pedicelled spikelet resembling sessile but usually smaller and slightly laterally compressed; pedicel free, resembling adjacent rachis internode.

Ten species: Old World tropics, extending northward to SE Europe; three species (one endemic) in China.

Phacelurus resembles *Ischaemum* in its stout rachis internodes and pedicels and in its male lower floret, and the two genera are probably closely related. *Phacelurus* differs mainly by the absence of awns.

1a. Racemes borne on a long central axis; lower glume of sessile spikelet narrowly winged 1. *P. zea*
1b. Racemes subdigitate; lower glume of sessile spikelet wingless.

2a. Sessile spikelet linear-lanceolate, concave, 8–10 mm; pedicelled spikelet well developed; pedicel cuneate, widened upward; leaves usually glabrous 2. *P. latifolius*

2b. Sessile spikelet ovate-oblong, flat, 6–7 mm; pedicelled spikelet usually reduced; pedicel narrowly oblong, straight; leaves often tuberculate-hispid 3. *P. trichophyllus*

1. *Phacelurus zea* (C. B. Clarke) Clayton, Kew Bull. 33: 177. 1978.

黍束尾草 *shu shu wei cao*

Rottboellia zea C. B. Clarke, J. Linn. Soc., Bot. 25: 86. 1889; *R. thyrsoides* Hackel; *Thysia thyrsoides* (Hackel) A. Camus; *Thysia zea* (C. B. Clarke) Stapf.

Perennial, forming large clumps. Culms stout, up to 2 m or more tall, ca. 10 mm in diam., simple or rarely branched, nodes bearded. Leaf sheaths keeled, glabrous; leaf blades linear-lanceolate, rather stiff, tough, 30–60 × 1–2 cm, hairy near ligule on adaxial surface, margins ciliate near base; ligule 1–2 mm, margin ciliate. Inflorescence a large ovate-oblong panicle, 25–40

cm, with many racemes arranged in whorls. Lower racemes pedunculate, up to 10 cm; rachis internodes broadly cuneate, angled, ribbed, finely scaberulous. Sessile spikelet 3.5–4 mm; lower glume ovate, papery, flat on back, marginally 2-keeled, keels narrowly winged, wings scabrid-hispidulous, apex obtuse; upper glume lanceolate, acute; lower floret sterile, palea absent; upper floret with palea as long as lemma, 2 styles arising separately from ovary apex, not elongate. Pedicelled spikelet similar to sessile but slightly smaller; pedicel resembling internode but shorter. Fl. and fr. autumn.

Grassy hill slopes; 300–1000 m. Guangxi, Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

Rottboellia zea (February 1889) has priority over *R. thyrsoides*

(April 1889), as was acknowledged by Hackel (in A. Candolle & C. Candolle, Monogr. Phan. 6: 690. 1889).

This species is anomalous in the genus because of its elongate inflorescence of many whorled racemes.

2. *Phacelurus latifolius* (Steudel) Ohwi, Acta Phytotax. Geobot. 4: 59. 1935.

束尾草 shu wei cao

Rottboellia latifolia Steudel, Flora 29: 21. 1846; *Phacelurus angustifolius* (Debeaux) Nakai; *P. latifolius* var. *angustifolius* (Debeaux) Kitagawa; *P. latifolius* var. *monostachys* Keng ex S. L. Chen; *Rottboellia latifolia* var. *angustifolia* Debeaux.

Perennial, robust, with spreading, stout, scaly rhizomes. Culms tufted at nodes of rhizomes, erect, 1–2 m tall, 3–10 mm in diam., many-noded. Leaf sheaths smooth, glabrous, usually longer than internodes and overlapping; leaf blades linear-lanceolate, tough, 10–40 × 1.5–3 cm, glabrous or sparsely appressed-pilose, base rounded, margins scaberrulous, apex attenuate; ligule rounded, 0.5–3 mm. Inflorescence of (1–)3–10 racemes, digitate or shortly racemose. Racemes up to 20 cm, stiffly suberect, often white-powdery; rachis internodes stoutly oblong-cuneate, sharply 3-angled, equaling or slightly shorter than pedicels. Sessile spikelet 8–10 mm, as long as internode; callus glabrous; lower glume linear-lanceolate, leathery, back concave, margins keeled, keels scabrid; upper glume spinulose on keel toward apex; lower floret staminate, palea present; upper lemma and palea subequal, styles connate, elongate, continued into a long feathery stigma 2-branched toward its apex. Pedicelled spikelet well developed, slightly laterally compressed, weakly curved; pedicel resembling internode. Fl. and fr. autumn.

Coastal salt marshes, river banks, irrigation channels on saline soils, forming colonies; below 1400 m. Anhui, Fujian, Hebei, Jiangsu, Liaoning, Shandong, Zhejiang [Japan, Korea].

3. *Phacelurus trichophyllus* S. L. Zhong, J. S. W. Agric. Coll. 1982(4): 78. 1982.

毛叶束尾草 mao ye shu wei cao

Phacelurus latifolius (Steudel) Ohwi var. *trichophyllus* (S. L. Zhong) B. S. Sun & Z. H. Hu; *Rhytachne anisonodis* B. S. Sun; *R. lijiangensis* B. S. Sun.

Perennial, shortly rhizomatous. Culms erect, 1–2 m tall, 3–4 mm in diam., many-noded, branching in upper part. Leaf sheaths hispid with short, tubercle-based hairs or glabrous, usually longer than internodes; leaf blades lanceolate, papery, 10–20 × 1–2.5 cm, sparsely hispid with short, scattered, tubercle-based hairs, base rounded, margins serrulate, apex acuminate; ligule 0.5–1 mm. Inflorescence of 1–6 subdigitate racemes. Racemes up to 15 cm or more, stiffly suberect, spikelets normally paired, occasionally triads of 2 sessile and 1 pedicelled present; rachis internodes columnar, laterally sharply keeled, back rounded or obtusely keeled, lowest internode elongate, much exceeding sessile spikelet, successive internodes shorter. Sessile spikelet 6–7 mm; callus shortly pilose; lower glume lanceolate to ovate, leathery, back flat or slightly convex, obscurely ribbed, margins incurved, ciliate, keeled and scabrid below apex; upper glume scabrid on keel toward apex; lower floret staminate, palea present; upper lemma and palea subequal, 2 styles arising separately from ovary apex, not elongate. Pedicelled spikelet variable, resembling sessile spikelet but slightly smaller or much reduced; pedicel stoutly oblong, straight. Fl. and fr. Aug–Oct.

• Ditches, moist meadows, river bank thickets, on damp sandy soils; 1100–2000 m. Sichuan, Yunnan.

This grass occurs at generally higher altitudes than *Phacelurus latifolius*. The pedicelled spikelet varies from well developed to much reduced, even in adjacent spikelet pairs on the same raceme.

Two specimens with solitary racemes have been described as new species in *Rhytachne*. That genus is not known in Asia and can usually be distinguished from *Phacelurus* by a much more delicate habit, cylindrical racemes, and a frequently foliaceous pedicel. The occasional occurrence of spikelet triads in this species is reminiscent of *Mnesithea*. However, it is excluded from that genus by its well-developed male lower floret, and also from *Rottboellia* by its free pedicel.

217. HEMARTHRIA R. Brown, Prodr. 207. 1810.

牛鞭草属 niu bian cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, rarely annual. Culms usually prostrate and rooting at lower nodes. Leaf blades linear, flat; ligule narrow, membranous, margin ciliate. Inflorescence composed of single axillary racemes; racemes solitary or in groups in upper leaf axils, dorsiventral, articulation line usually oblique but racemes tough, not or very tardily disarticulating; rachis internodes thickened, oblong-angular, adnate to adjacent pedicel. Sessile spikelet appressed to hollow in rachis, dorsally compressed (terete in *H. sibirica*); callus obtuse to cuneate, rarely truncate; lower glume narrowly elliptic, rigidly herbaceous to leathery, smooth, marginally 2-keeled, indistinctly winged above, obtuse to caudate or rarely 2-cleft; upper glume sometimes adnate to internode, mucronate or awned; lower floret barren, without palea; upper floret bisexual, with entire awnless lemma. Pedicelled spikelet similar to sessile, but base truncate and lacking callus; pedicel similar to adnate rachis internode, junction marked by a line. $x = 9, 10$.

Fourteen species: tropical and subtropical regions of the Old World; introduced in America; six species (one endemic) in China.

This is a genus of aquatic or semi-aquatic grasses concentrated in SE Asia. At first sight it is difficult to distinguish the sessile and pedicelled spikelets because they look very similar and, since the pedicel is fused to the rachis internode, both spikelets are in effect sessile. However, the sessile spikelet of a pair can be distinguished by its basal callus, which normally has an oblique articulation line beneath it. The strongly bilateral racemes have all the sessile spikelets on one side and all the pedicelled spikelets on the other.

- 1a. Sessile spikelets 8–15 mm 1. *H. longiflora*
 1b. Sessile spikelets less than 8 mm.
 2a. Lower glume of sessile spikelet evenly narrowed to acuminate apex; upper glume of pedicelled spikelet caudate-aristate.
 3a. Leaf blades 3–8 mm wide; lower glume of sessile spikelet leathery; lower glume of pedicelled spikelet distally smooth along margins 2. *H. vaginata*
 3b. Leaf blades 1–2 mm wide; lower glume of sessile spikelet papery; lower glume of pedicelled spikelet distally scabrid along margins 3. *H. humilis*
 2b. Lower glume of sessile spikelet with rounded apex, usually with subapical constriction; upper glume of pedicelled spikelet acute to acuminate.
 4a. Racemes subterete; articulations of rachis transverse; callus short, truncate 4. *H. sibirica*
 4b. Racemes dorso-ventrally compressed; articulations of rachis oblique; callus triangular.
 5a. Sessile spikelet 3–5 mm; lower glume margins distally smooth; leaf blades rounded at base 5. *H. compressa*
 5b. Sessile spikelet 5–7 mm; lower glume margins distally scabrid; leaf blades subcordate at base 6. *H. altissima*

1. *Hemarthria longiflora* (J. D. Hooker) A. Camus in Le-comte, Fl. Indo-Chine 7: 380. 1922.

长花牛鞭草 chang hua niu bian cao

Rottboellia longiflora J. D. Hooker, Fl. Brit. India 7: 154. 1896 [“1897”]; *R. longiflora* var. *tonkinensis* (A. Camus) A. Camus; *R. tonkinensis* A. Camus.

Perennial. Culms loosely tufted, erect from decumbent base, 30–80 cm tall, 2–4 mm in diam., glabrous, spongy, nodes usually pubescent. Leaf sheaths loose, sub-compressed, indistinctly keeled; leaf blades linear-lanceolate, 6–15 × 0.5–0.8 cm, slightly flaccid, glabrous, base subcordate; ligule 0.8–2 mm. Racemes solitary or fascicled, 10–15 cm, stout, articulation line oblique, disarticulating tardily. Sessile spikelet twice as long as adjacent internode, 8–15 mm; callus triangular, 0.1–0.6 mm; lower glume lanceolate, back flat, margins scabrid, apex acuminate-caudate to awnlike; upper glume not adnate to rachis, 10–12 mm, acuminate-caudate; lower floret 3–7 mm; upper floret ca. 4 mm, palea very short. Pedicelled spikelet 8–20 mm, lower glume caudate-aristate, upper glume narrowly acuminate. Fl. and fr. Jul–Oct.

Ponds, ditches, other wet places; below 1000 m. Hainan, Yunnan [Bangladesh, NE India, Malaysia, Myanmar, Thailand, Vietnam].

2. *Hemarthria vaginata* Buse in Miquel, Pl. Jungh. 3: 14. Feb 1854 [preprint]; 3: 354. Aug 1854.

具鞘牛鞭草 ju qiao niu bian cao

Hemarthria protensa Nees ex Steudel; *Manisuris protensa* (Nees ex Steudel) Hitchcock; *Rottboellia protensa* (Nees ex Steudel) Hackel; *R. vaginata* (Buse) Backer.

Perennial. Culms loosely tufted, stout, ascending or sometimes decumbent and rooting from lower nodes, 20–80 cm tall, nodes conspicuous, dark, glabrous or pilose. Leaf sheaths rather loose, compressed, keeled, longer than internodes; leaf blades linear, 1–20 × 0.3–0.8 cm, soft, glabrous, base subcordate; ligule 0.5–2 mm. Racemes solitary or fascicled, 6–18 cm, articulation line oblique, not disarticulating. Sessile spikelet somewhat longer than adjacent internode, 6–11 mm; callus acute, 1.5–4 mm; lower glume narrowly lanceolate, leathery, flat on back, smooth, evenly tapering to an acuminate, usually minutely emarginate apex; upper glume adnate to rachis, 5–7 mm, acuminate-aristate; lower floret 3–5 mm; upper floret ca. 3 mm,

palea linear, ca. 2 mm; anthers 1.2–1.3 mm. Pedicelled spikelet 7–12 mm, lower glume smooth on upper edges, long-acuminate, upper glume caudate-aristate. Fl. and fr. autumn. $2n = 54$.

Field margins, open wet places; below 500 m. Guangdong, Guangxi, S Yunnan [Bangladesh, Bhutan, NE India, Indonesia, Myanmar, Nepal, Thailand, Vietnam].

3. *Hemarthria humilis* Keng, Sunyatsenia 1: 128. 1933.

小牛鞭草 xiao niu bian cao

Perennial. Culms tufted, slender, erect or geniculate ascending but not rooting from lower nodes, 14–18 cm tall, nodes inconspicuous, glabrous. Leaf sheaths loose, compressed, keeled, longer than internodes; leaf blades narrowly linear, 1–6 × 0.1–0.2 cm, glabrous; ligule ca. 0.5 mm. Racemes solitary or several per node, 5–10 cm, articulation line oblique, not disarticulating. Sessile spikelet longer than adjacent internode, or lower ones shorter, 3–7.5 mm; callus obscure; lower glume lanceolate, papery, flat on back, smooth, evenly tapering to an acuminate or shortly caudate, sometimes minutely emarginate apex; upper glume adnate to rachis, 4–7.5 mm, long acuminate; lower floret 2–3 mm; upper floret 1.7–2.8 mm; anthers 0.7–0.8 mm. Pedicelled spikelet 7–12 mm, lower glume scabrid on upper edges, long-acuminate, upper glume caudate-aristate. Fl. May.

• Open marshes. Guangdong.

This species is known only from the type gathering. It has been included in *Hemarthria vaginata*, but *H. humilis* is a more slender plant and, besides the key characters, also differs in its inconspicuous culm nodes, shorter lemmas, and shorter anthers.

4. *Hemarthria sibirica* (Gandoger) Ohwi, Bull. Tokyo Sci. Mus. 18: 1. 1947.

牛鞭草 niu bian cao

Rottboellia sibirica Gandoger, Bull. Soc. Bot. France 66: 302. 1920 [“1919”]; *Hemarthria compressa* (Linnaeus f.) R. Brown var. *japonica* (Hackel) Y. N. Lee; *H. japonica* (Hackel) Roshevitz; *Rottboellia compressa* Linnaeus f. var. *japonica* Hackel; *R. japonica* (Hackel) Honda.

Perennial, with long creeping rhizomes. Culms usually solitary at rhizome nodes, erect, 1(–1.5) m tall, ca. 3 mm in diam., branched mainly above middle, nodes conspicuous, dark,

glabrous. Leaf sheaths loose, compressed, lightly keeled, shorter to longer than internodes; leaf blades linear, 15–30(–40) × 0.4–0.8 cm, rather stiff, glabrous, narrowed or subcordate at base, apex acuminate; ligule 0.5–1.5 mm. Racemes solitary or fascicled, subterete, 6–10 cm, fairly stout, articulation line horizontal, disarticulating at maturity. Sessile spikelet slightly longer than adjacent internode, 5–8 mm; callus truncate, 0.4–0.8 mm; lower glume narrowly lanceolate, leathery, flat to subconvex on back, subapically slightly constricted, obtuse to emarginate; upper glume adnate to rachis, 4–7 mm, acute; lower floret 3.4–5.2 mm; upper floret 3.4–4.3 mm. Pedicelled spikelet 5.3–9.4 mm, both glumes slenderly acuminate. Fl. and fr. Jul–Oct. $2n = 18$.

Damp places, sandy beaches. Anhui, Guangdong, Guangxi, Guizhou, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shandong, Zhejiang [Japan, Korea, Pakistan, Russia (E Siberia)].

This is the only species in China with terete racemes, a transverse articulation line, and a truncate callus beneath the sessile spikelet. The racemes disarticulate at maturity more readily than those of the other species. In spikelet characters it is similar to *Hemarthria altissima*.

5. *Hemarthria compressa* (Linnaeus f.) R. Brown, Prodr. 207. 1810.

扁穗牛鞭草 *bian sui niu bian cao*

Rottboellia compressa Linnaeus f., Suppl. Pl. 114. 1782 [“1781”]; *Hemarthria coromandelina* Steudel, nom. illeg. superfl.; *H. glabra* (Roxburgh) Blatter & McCann; *H. laxa* Nees ex Steudel; *Manisuris compressa* (Linnaeus f.) Kuntze; *Rottboellia glabra* Roxburgh.

Perennial. Culms decumbent to long-stoloniferous, rooting at lower nodes, up to 1 m or more, much branched from base, nodes conspicuous, dark, glabrous. Leaf sheaths loose, compressed, keeled, glabrous or hairy along mouth, often shorter than internodes; leaf blades linear, 2–15 × 0.2–0.5 cm, base rounded, apex subacute; ligule 0.3–1 mm. Racemes solitary or few per node, lightly compressed, 2–10 cm, articulation line oblique, tardily disarticulating. Sessile spikelet slightly longer than adjacent internode, 3–5 mm; callus broadly triangular, 0.5–1 mm; lower glume narrowly oblong, leathery, flat or subconvex on back, abruptly constricted into obtuse or emarginate apex; upper glume adnate to rachis, equaling lower glume, thin,

acute; lower floret 2.4–3.3 mm; upper floret 2–3.2 mm, palea small, rarely absent. Pedicelled spikelet 2.4–5 mm, lower glume narrowly obtuse, upper glume acuminate-caudate. Fl. and fr. Jul–Sep. $2n = 18, 27, 36$.

Marshes, wet places, coasts; below 2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Nei Mongol, Shaanxi, Sichuan, Taiwan, Yunnan [Afghanistan, Bangladesh, Bhutan, India, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam; SW Asia (Iraq)].

Hemarthria compressa is not completely distinct from *H. altissima*, but is generally a more slender plant with smaller spikelets.

6. *Hemarthria altissima* (Poir.) Stapf & C. E. Hubbard, Bull. Misc. Inform. Kew 1934: 109. 1934.

大牛鞭草 *da niu bian cao*

Rottboellia altissima Poir., Voy. Barbarie 2: 105. 1789; *Hemarthria compressa* (Linnaeus f.) R. Brown var. *altissima* (Poir.) Maire; *H. compressa* var. *fasciculata* (Hackel) Keng; *Rottboellia compressa* Linnaeus f. var. *fasciculata* Hackel; *R. fasciculata* Lamarck, nom. illeg. superfl.

Perennial, or sometimes annual. Culms loosely tufted to decumbent or stoloniferous, rooting at lower nodes, ascending up to 1.6 m tall, nodes glabrous. Leaf sheaths loose, compressed, keeled, usually shorter than internodes, glabrous except near mouth; leaf blades linear, 5–25 × 0.3–0.6 cm, acute; ligule ca. 0.3 mm. Racemes solitary or several per node, 5–10 cm, semicylindrical, articulation line oblique, tardily disarticulating. Sessile spikelet longer than adjacent internode, 5–7 mm; callus triangular, 0.8–2 mm; lower glume elliptic-oblong, leathery, flat on back, often with subapical constriction, apex obtuse to emarginate; upper glume papery, adnate to rachis, 4–7 mm, apex obtuse to acute; lower floret 3.5–5.2 mm; upper floret 3.2–4.6 mm. Pedicelled spikelet narrowly lanceolate, lower glume acute, upper glume acuminate. $2n = 20, 36$.

In or near water, damp places; 700–1900 m. Anhui, Beijing, Guizhou, Heilongjiang, Henan, Hubei, Shandong, Yunnan, Zhejiang [India, Indonesia, Myanmar, Thailand, Vietnam; Africa, SW Asia, Mediterranean region; introduced in America and New Zealand].

Hemarthria altissima occurs naturally mainly from the Mediterranean region through Africa, but there are scattered records from Asia and it is now widely naturalized in warm parts of America.

218. MNESITHEA Kunth, Révis. Gramin. 1: 153. 1829.

毛俭草属 *mao jian cao shu*

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Coelorachis Brongniart.

Perennial, rarely annual. Culms robust, tufted, often branched. Leaf blades linear, flat; ligule short, membranous. Inflorescence of racemes, these usually axillary and aggregated into a spathate compound panicle, rarely terminal. Racemes cylindrical or flattened, fragile, horizontally articulated; rachis internodes clavate to pyriform, base truncate with central peg, spikelets paired, one sessile, the other pedicelled or occasionally in triplets of 2 sessile and 1 pedicelled. Sessile spikelet closely appressed or sunk in hollow in rachis, usually longer than adjacent internode; lower glume papery to leathery, ± flat, smooth or sculptured, marginally 2-keeled, keels winged at least at apex; lower floret barren, with or without a small palea; upper floret with entire awnless lemma. Pedicelled spikelet varying from well developed to rudimentary or absent; pedicel oblong, clavate or leaflike, free or partially or fully adnate to rachis internode. $x = 9$.

About 30 species; throughout the tropics; four species in China.

Mnesithea has been defined in the past by the presence of 2 sessile spikelets separated by a pedicel at each rachis node, but this character is now known to be variable. Furthermore, paired sessile spikelets also occur sporadically in the racemes of species that normally have single sessile spikelets.

Coelorachis has traditionally been separated on the basis of a free pedicel and presence of a pedicelled spikelet, but both these characters are untenable. The pedicel in *Mnesithea khasiana* is often almost completely fused to the rachis joint and may occasionally be fused in other species too. The pedicelled spikelet varies across the genus from well developed to a minute vestige, and its absence in traditional *Mnesithea* is just the final step.

The definition of the genera around *Mnesithea*, and how many species should be included within it, are still open to doubt and may change with future research.

- 1a. Racemes borne singly, terminal or from the upper leaf axils; sessile spikelets sometimes paired.
 - 2a. Leaves and culms densely pubescent; sessile spikelet ornamented; base of rachis joint ciliate 1. *M. mollicoma*
 - 2b. Leaves and culms glabrous; sessile spikelet smooth (rarely pitted); base of rachis joint glabrous 2. *M. laevis*
- 1b. Racemes several to many from the upper leaf axils; sessile spikelets always single.
 - 3a. Pedicel free from rachis internode; racemes few, laxly spreading from leaf axils 3. *M. striata*
 - 3b. Pedicel adnate to rachis internode except toward apex; racemes many in crowded fascicles from leaf axils 4. *M. khasiana*

1. *Mnesithea mollicoma* (Hance) A. Camus, Bull. Mus. Natl. Hist. Nat. 25: 57. 1919.

毛俭草 mao jian cao

Rottboellia mollicoma Hance, J. Bot. 9: 134. 1871; *Coelorachis mollicoma* (Hance) Bor; *Mnesithea pubescens* Ridley.

Perennial. Culms erect, 60–85 cm, softly pilose. Leaf sheaths densely pilose or with caducous tubercle-based hairs; leaf blades linear-lanceolate, 10–60 × 0.5–2 cm, tapering to base and apex, softly pubescent; ligule 1–2 mm, glabrous or ciliate. Racemes solitary in the upper leaf axils, cylindrical, ca. 12 cm × ca. 2.5 mm, sessile spikelets paired at each node and separated by a pedicel, or occasionally only one sessile spikelet present; rachis internodes strongly clavate, marked with dark lines between the veins on narrow lower portion, base shortly bearded. Sessile spikelet 3–4 mm; lower glume obliquely ovate, with 6–8, prominent, riblike veins separated by deep slits, slits interrupted by tubercle-based hairs along their length, margins narrowly winged toward apex; upper glume keeled toward apex, keel winged; lower floret reduced; upper lemma and palea subequal. Pedicel free, linear, flattened, pilose, bearing a vestigial 0.5–1 mm spikelet. Fl. and fr. Jul–Nov.

Grassy hill slopes; 100–500 m. Guangdong, Guangxi, Hainan [Indonesia, Malaysia, Thailand, Vietnam].

Mnesithea mollicoma is the only grass in China to have racemes usually with 2 sessile spikelets separated by a pedicel at each rachis node, although sometimes plants occur with some or all raceme segments bearing only 1 sessile spikelet. The species is also well marked by its softly hairy vegetative parts and ornamented sessile spikelet.

2. *Mnesithea laevis* (Retzius) Kunth, Révis. Gramin. 1: 154. 1829.

假蛇尾草 jia she wei cao

Perennial. Culms tufted, erect, slender, 15–70 cm tall, usually unbranched. Leaf sheaths glabrous, often keeled; leaf blades linear, 8–25 × 0.1–0.4 cm, glabrous, apex abruptly acute; ligule 0.5–1 mm, glabrous. Racemes solitary, either terminal or also axillary, cylindrical, 5–10 cm × ca. 1.5 mm, sessile spikelets paired at each joint and separated by a pedicel, or triads present only at raceme base, or whole raceme with single sessile spikelets; rachis internodes clavate, 3.5–4 mm. Sessile spike-

let 3–5 mm; lower glume oblong, smooth, or slightly sunken between lower part of veins, or ribbed throughout, rarely pitted, margins not winged, apex obtuse; upper glume boat-shaped, membranous, equal to lower glume; lower lemma slightly shorter than glumes, palea absent; upper lemma ca. 2.5 mm. Pedicelled spikelet minute or absent; pedicel linear, adnate to rachis internode, when paired sessile spikelets present the pedicel between them often adnate only at apex.

Meadows, grassy hill slopes; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [India, Indonesia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Pacific Islands (Polynesia)].

No specimens are known from China with paired sessile spikelets. There is some geographic division between forms that regularly have only a single sessile spikelet on each raceme segment and those with a pair. Forms from India to W Indonesia usually have paired sessile spikelets, whereas those from east of this area have single sessile spikelets. However, specimens from the west occasionally have few or no paired spikelets and are then indistinguishable from the eastern form. There is also much variation in the degree of fusion of the pedicel with the rachis internode.

- 1a. Lower glume of sessile spikelet smooth 2a. var. *laevis*
- 1b. Lower glume of sessile spikelet pitted
 - between veins 2b. var. *chenii*

2a. *Mnesithea laevis* var. *laevis*

假蛇尾草(原变种) jia she wei cao (yuan bian zhong)

Rottboellia laevis Retzius, Observ. Bot. 3: 11. 1783; *Heteropholis cochinchinensis* (Loureiro) Clayton; *Mnesithea laevis* var. *cochinchinensis* (Loureiro) de Koning & Sosef; *Ophiuros cochinchinensis* (Loureiro) Merrill; *O. laevis* (Retzius) Benth; *O. monostachyus* J. Presl & C. Presl; *Phleum cochinchinense* Loureiro; *Thaumastochloa cochinchinensis* (Loureiro) C. E. Hubbard.

Culms 20–70 cm tall. Sessile spikelet 3–4 mm; lower glume ± smooth. Fl. and fr. autumn.

Grassy hill slopes, field margins; 100–1000 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan [India, Indonesia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; Pacific Islands (Polynesia)].

2b. *Mnesithea laevis* var. *chenii* (Hsu) de Koning & Sosef, Blumea 31: 286. 1986.

縛颖假蛇尾草 zhuan ying jia she wei cao

Thaumastochloa chenii Hsu, Taiwania 16: 216. 1971; *Heteropholis cochinchinensis* var. *chenii* (Hsu) de Koning & Sosef; *Ophiuros shimadanus* Ohwi & Odashima; *Thaumastochloa shimadana* (Ohwi & Odashima) Ohwi & Odashima.

Culms 15–30 cm tall. Sessile spikelet 3.5–5 mm; lower glume sunken and pitted between ribs. Fl. and fr. autumn.

- By the sea. S Taiwan.

This is a local variant with pitted sessile spikelets. Traces of pits also occur on some specimens of the species from Hong Kong.

3. *Mnesithea striata* (Nees ex Steudel) de Koning & Sosef, Blumea 31: 292. 1986.

空轴茅 kong zhou mao

Perennial, coarse. Culms robust, 1.5–3 m tall, glabrous or densely pilose. Leaf sheaths glabrous or tuberculate-hispid, upper sheaths spathiform; leaf blades linear-lanceolate, 30–60(–120) × 1–3(–5) cm, glabrous to densely pilose, margins stiffly ciliate, apex acuminate; ligule 2–3 mm, glabrous or ciliate. Inflorescence large, loose and spreading, 2–3-noded spathate branches bearing the racemes arising from the upper leaf axils; racemes cylindrical, long pedunculate; rachis internodes strongly clavate, striate, glabrous. Sessile spikelet 4–4.2 mm; lower glume narrowly ovate, slightly asymmetrical, with 5–7 deep slits interrupted by tubercles especially in lower part, or sometimes smooth, contracted to an acute winged apex; upper glume keeled; lower floret usually barren, lemma ca. 4 mm, palea slightly shorter; upper floret as long as lower lemma. Pedicelled spikelet reduced or rudimentary, ca. 1.5 mm; pedicel flattened, narrowly oblong with 2 submarginal green veins, glabrous, free. Fl. and fr. Jul–Oct.

Hillside grasslands, thickets, forest margins; below 1300 m. S Yunnan [India, Myanmar, Thailand].

- 1a. Culms and leaf blades glabrous 3a. var. *striata*
1b. Culms and leaf blades pilose 3b. var. *pubescens*

3a. *Mnesithea striata* var. *striata*

空轴茅(原变种) kong zhou mao (yuan bian zhong)

Rottboellia striata Nees ex Steudel, Syn. Pl. Glumac. 1: 361. 1854; *Coelorachis striata* (Nees ex Steudel) A. Camus.

Culms and peduncles glabrous. Leaf sheaths glabrous except for ciliate margins, leaf blades glabrous.

Grassy hill slopes; 600–900 m. S Yunnan [India, Myanmar, Thailand].

3b. *Mnesithea striata* var. *pubescens* (Hackel) S. M. Phillips & S. L. Chen, Novon 15: 470. 2005.

毛秆空轴茅 mao gan kong zhou mao

Rottboellia striata var. *pubescens* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 302. 1889; *Coelorachis striata* var. *pubescens* (Hackel) Bor.

Culms and peduncles pubescent above. Leaf sheaths with tubercle-based hairs; leaf blades densely pubescent.

Open forests, grassy hill slopes; 600–1200 m. SW Yunnan [NE India].

4. *Mnesithea khasiana* (Hackel) de Koning & Sosef, Blumea 31: 291. 1986.

密穗空轴茅 mi sui kong zhou mao

Rottboellia striata Nees ex Steudel subsp. *khasiana* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 302. 1889; *Coelorachis khasiana* (Hackel) Stapf ex Bor.

Perennial, coarse. Culms robust, 2–3 m tall, glabrous, much branched upward. Leaf sheaths glabrous, upper sheaths with very reduced blade; leaf blades narrowly lanceolate, 40–100(–130) × 2–3(–4) cm, glabrous or scattered tuberculate-pilose on upper surface, apex setaceous acuminate; ligule 2–3 mm, glabrous. Inflorescence large, composed of fascicles of many racemes on spathate branches from the upper leaf axils; racemes cylindrical, long pedunculate; rachis internodes clavate, glabrous. Sessile spikelet 3.5–4 mm; lower glume lanceolate-oblong, smooth or with 2–5 shallow tuberculate grooves, contracted to an apiculate, broadly winged apex; upper glume ca. 3.5 mm, keeled; lower floret barren, lemma ca. 3 mm; upper floret lemma ca. 3 mm, palea shorter. Pedicelled spikelet variable, usually more than 2 mm, sometimes as long as and resembling sessile spikelet; pedicel flattened, oblong with 2 submarginal green veins, glabrous, adnate to adjacent rachis internode except toward apex. Fl. and fr. Jul–Oct.

Open woodlands, damp places; 900–1300 m. SW Yunnan [NE India, Myanmar].

219. *ROTTBOELLIA* Linnaeus f., Suppl. Pl. 114. 1782 [“1781”], nom. cons., not *Rottboellia* Scopoli (1777), nom. rej.

筒轴茅属 tong zhou mao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annual. Culms robust. Leaf blades linear, flat; ligule membranous. Inflorescence of single axillary racemes; racemes cylindrical, fragile, transversely articulated; rachis internodes stout, flattened or semi-cylindrical, deeply cupped at apex, truncate at base with a prominent central peg broadened into a flared elaiosome. Sessile spikelet sunk within rachis; lower glume ovate-oblong, leathery, shallowly convex, marginally 2-keeled, apex obtuse or acute, narrowly winged; upper glume boat-shaped; lower floret staminate, palea present; upper floret with entire awnless lemma. Pedicelled spikelet tightly erect, as long as or shorter than sessile spikelet, herbaceous; pedicel broad, of similar texture to, and partly or wholly adnate to adjacent rachis internode.

Five species: Old World tropics; introduced in the Caribbean region; two species (one endemic) in China.

- 1a. Sessile spikelet ovate, 5–6 mm, pallid; lower glume of sessile spikelet scaberulous on back; leaf sheaths hispid 1. *R. cochinchinensis*
 1b. Sessile spikelet oblong-lanceolate, 7–10 mm, dull green; lower glume of sessile spikelet smooth on back; leaf sheaths ± glabrous 2. *R. laevispica*

1. *Rottboellia cochinchinensis* (Loureiro) Clayton, Kew Bull. 35: 817. 1981.

筒轴茅 tong zhou mao

Stegosia cochinchinensis Loureiro, Fl. Cochinch. 51. 1790; *Rottboellia exaltata* Linnaeus f. (1781), not (Linnaeus) Linnaeus f. (1779).

Coarse annual. Culms stout, 1–3 m tall, 5–10 mm in diam., supported below by stilt roots, branched in upper part. Leaf sheaths tuberculate-hispid with stiff irritant hairs or sometimes glabrescent; leaf blades linear-lanceolate, 20–50 × 0.5–2.5 cm, glabrous or adaxial surface hispidulous, very scabrid along margins, midrib broad, white, apex acuminate; ligule a ciliate membrane, ca. 1 mm. Racemes yellow and green, 6–15 × 0.25–0.4 cm, stiff, terminating in a green tail of reduced spikelets; rachis internodes 4–6 mm, rounded on back, slightly longer than adjacent pedicel. Sessile spikelet pale yellow, 5–6 mm; lower glume ovate, minutely scaberulous on back, keeled only toward entire or very minutely 2–3-toothed apex; lower lemma as long as upper lemma. Pedicelled spikelet green, variable, 3–5 mm, narrowly ovate, herbaceous. Fl. and fr. Jul–Oct.

Sunny or moderately shady localities, roadsides, hill thickets, dry cultivated fields, grasslands; below 1900 m. Fujian, Guangdong, Guang-

xi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan, Zhejiang [throughout the Old World tropics; introduced to the Caribbean].

2. *Rottboellia laevispica* Keng, J. Wash. Acad. Sci. 21: 157. 1931.

光穗筒轴茅 guang sui tong zhou mao

Mnesithea laevispica (Keng) de Koning & Sosef.

Annual. Culms slender, up to 1 m tall, 3–5 mm in diam., usually geniculate at base and rooting at lower nodes. Leaf sheaths smooth or papillate; leaf blades linear-lanceolate, flaccid, 15–40 × 0.8–1.6 cm, glabrous, midrib white, margins scabrid, apex acuminate; ligule a ciliate membrane, 0.5–1 mm. Racemes dull greenish brown, up to 20 × 0.3–0.5 cm, terminating in a tail of reduced spikelets; rachis internodes 9–10 mm, rounded on back, equaling or slightly longer than sessile spikelet and adjacent pedicel. Sessile spikelet dull green, 7–10 mm; lower glume oblong-lanceolate, smooth on back, keels scaberulous above middle and narrowly winged at apex; lower lemma as long as upper lemma. Pedicelled spikelet usually reduced to two 1–3.5 mm glumes. Fl. and fr. Jul–Oct.

• Shaded forests on mountain slopes. Anhui, Jiangsu.

220. *EREMOCHLOA* Buse in Miquel, Pl. Jungh. 357. 1854.

蜈蚣草属 wu gong cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Perennial, tufted, stoloniferous or rhizomatous. Leaves mostly basal, leaf blades linear, flat or folded; ligule short, membranous. Inflorescence a single terminal raceme; raceme strongly flattened, spikelets overlapping along one side, disarticulating very tardily; rachis internodes narrowly clavate, nodes ciliate (in China), base truncate, sometimes with a low central peg. Sessile spikelet longer than rachis internode; lower glume elliptic-ovate to oblong, papery to leathery, 5–9-veined, marginally 2-keeled, keels pectinately spiny, often winged at apex; upper glume 3-veined, keeled along midvein, otherwise almost flat, often narrowly winged on lower keel; lower floret staminate, palea present; upper floret bisexual, upper lemma entire, awnless. Pedicelled spikelet absent or represented by a small bristle; pedicel free from and longer than adjacent internode, subulate to narrowly ovoid or leaflike.

Eleven species: India to SE Asia and Australia; five species in China.

This genus is easily recognizable by its distinctive inflorescence. The solitary, terminal, 1-sided raceme of closely overlapping spikelets does not break up readily into segments, and most species have spikelets with conspicuous, long spines along their margins.

- 1a. Plant with elongate stolons or rhizomes; lower glume broadly winged at apex.
 2a. Keels with very short inconspicuous spines 1. *E. ophiuroides*
 2b. Keels with long conspicuous spines 2. *E. muricata*
 1b. Plant tufted; lower glume narrowly winged or wingless.
 3a. Lower glume of sessile spikelet usually wingless, often pubescent on back 3. *E. ciliaris*
 3b. Lower glume of sessile spikelet narrowly winged toward apex, glabrous on back.
 4a. Longest spines of lower glume shorter than glume width, usually ca. 1 mm; nodes of rachis obviously hairy; leaf blades hairy on basal margins, apex subacute 4. *E. bimaculata*
 4b. Longest spines of lower glume equaling or longer than glume width, 1.5–2.5 mm; nodes of rachis minutely hairy; leaf blades glabrous, apex cuspidate 5. *E. zeylanica*

1. *Eremochloa ophiuroides* (Munro) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 261. 1889.

假俭草 jia jian cao

Ischaemum ophiuroides Munro, Proc. Amer. Acad. Arts 4: 363. 1860; *Eremochloa ophiuroides* var. *longifolia* Hayata.

Perennial, stoloniferous, mat-forming. Culms decumbent,

rooting and branching, flowering shoots 15–30 cm tall. Leaf sheaths keeled, overlapping at base, hairy at mouth; leaf blades flat, (1–)3–10 × 0.2–0.4 cm, usually glabrous, apex obtuse; ligule 0.2–5 mm, margin ciliate. Raceme erect or slightly curved, 4–6 cm; rachis internodes narrowly oblong-clavate, glabrous, ca. 2.5 mm. Sessile spikelet 3.5–4 mm; lower glume oblong, ± leathery, shiny, glabrous, 5–7-veined, marginal spines very inconspicuous, short along incurving lower keels or reduced to knobs, apex acute but appearing broadly truncate because of flanking membranous wings. Pedicelled spikelet vestigial or absent; pedicel ± leaflike, ellipsoid-subulate. Fl. and fr. Jun–Oct. $2n = 18$.

Moist meadows, hillsides, especially on clay soils; 200–1200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Vietnam].

This species is occasionally used as a lawn grass in warm regions, especially in the SE United States (Centipede Grass).

2. *Eremochloa muricata* (Retzius) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 262. 1889.

瘤糙假俭草 liu cao jia jian cao

Aegilops muricata Retzius, Observ. Bot. 2: 27. 1781; *Eremochloa truncata* W. C. Wu.

Perennial with slender spreading rhizomes. Culms decumbent, branching, up to 70 cm tall. Leaf sheaths glabrous; leaf blades flat or folded, 2–20 × 0.2–0.7 cm, glabrous or pilose, margins sometimes setose at base, apex acute or cuspidate; ligule 0.1–1 mm, margin ciliate. Raceme straight or almost so, 5–12 cm; rachis internodes oblong-clavate, glabrous, 2.5–4 mm. Sessile spikelet 4.5–5 mm; lower glume ovate or ovate-oblong, glabrous, 5–7-veined, marginal spines straight, often flattened toward base, longest 1–1.5 mm, shorter than glume width, apex acute, flanked by large, fanlike wings. Pedicelled spikelet absent; pedicel ± leaflike, obliquely obovoid.

Damp places. Guangdong (Guangzhou) [S India, Myanmar, Sri Lanka, Thailand; N Australia].

3. *Eremochloa ciliaris* (Linnaeus) Merrill, Philipp. J. Sci. 1 (Suppl. 5): 331. 1906.

蜈蚣草 wu gong cao

Nardus ciliaris Linnaeus, Sp. Pl. 1: 53. 1753; *Eremochloa leersioides* (Munro) Hackel; *Ischaemum leersioides* Munro.

Perennial, densely tufted. Culms erect, slender, 20–60 cm tall, usually pubescent. Leaves crowded at base of culm, overlapping; leaf sheaths keeled, glabrous or pubescent; leaf blades folded, 3–15 × 0.1–0.4 cm, glabrous or pubescent, apex acute; ligule 0.5–1 mm. Raceme falcately curved, 2–5 cm; rachis internodes narrowly oblong, slightly expanded upward, puberulous to thinly hirsute, 1.8–2.5 mm. Sessile spikelet 3.5–4 mm; lower glume oblong-ovate, firmly papery, pubescent on back or subglabrous, 7-veined, marginal spines longer than glume

width, longest 1.5–5 mm, apex abruptly acute, usually wingless. Pedicelled spikelet absent; pedicel narrowly ellipsoid, ending in short point. Fl. and fr. Jul–Oct.

Dry grassy hillsides, meadows on sandy soils, roadsides; 300–2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Cambodia, Indonesia, Laos, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam; Australia (N Queensland)].

4. *Eremochloa bimaculata* Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 265. 1889.

西南马陆草 xi nan ma lu cao

Perennial, compactly tufted from a tough rootstock. Culms erect, slender, unbranched, 30–60 cm tall, glabrous. Leaves crowded at base of culm, overlapping; leaf sheaths keeled, glabrous except margins near blade; leaf blades flat or folded, 3–10 × 0.2–0.3 cm, glabrous except for basal margins, abruptly narrowed to subacute apex; ligule ca. 1 mm. Raceme gently curved, 3–6 cm; rachis internodes oblong-clavate, glabrous, 2.2–2.6 mm; nodes obviously hairy, hairs ca. 0.2 mm. Sessile spikelet 4–4.6 mm; lower glume ovate-oblong, papery, shiny, glabrous, 6–7-veined, marginal spines shorter than glume width, longest 1–1.5 mm, apex acute, flanked by narrow wings. Pedicelled spikelet vestigial; pedicel narrowly leaflike, tipped by a short spine.

Grassy hill slopes, thickets; 1000–1800 m. W Guizhou, Hubei, Sichuan, Yunnan [Cambodia, Myanmar, New Guinea, Thailand, Vietnam; Australia].

Eremochloa ophiuroides (Munro) Hackel var. *longispicula* W. C. Wu (S. W. China J. Agric. Sci. 6(2): 36. 1985), described from Guangdong (Guangzhou), may belong here. The type has not been seen.

5. *Eremochloa zeylanica* (Hackel ex Trimen) Hackel in A. Candolle & C. Candolle, Monogr. Phan. 6: 263. 1889.

马陆草 ma lu cao

Ischaemum zeylanicum Hackel ex Trimen, Syst. Cat. Pl. Ceylon 107. 1885.

Perennial, tufted. Culms erect, slender, branching, 20–60 cm tall. Leaves mostly basal, slightly overlapping; leaf sheaths glabrous, keeled; leaf blades flat or folded, (1–)3–10 × 0.1–0.5 cm, glabrous, apex rounded, cuspidate; ligule 0.3–0.6 mm, ciliate or glabrous. Raceme erect or curved, 3–6 cm; rachis internodes clavate, 2–3 mm; nodes minutely hairy, hairs ca. 0.1 mm. Sessile spikelet 4–5 mm; lower glume elliptic-ovate, papery, glabrous, inconspicuously veined, marginal spines terete, equaling or much longer than glume width, 1.5–2.5 mm, apex acute, flanked by narrow wings. Pedicelled spikelet a very small rudiment; pedicel subulate.

Herbage of hill slopes; 800–1500 m. W Guangxi, SE Yunnan [Sri Lanka].

A few specimens from China have the long spikelet spines of this species, which is otherwise known only from Sri Lanka.

221. **HACHELOCHLOA** Kuntze, Revis. Gen. Pl. 2: 776. 1891.

球穗草属 qiu sui cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annual. Leaf blades flat, linear or linear-lanceolate; ligule a short ciliate membrane. Inflorescence of single axillary racemes aggregated into a spathate compound panicle, peduncle enclosed within spatheole; racemes flattened, dorsiventral, bearing paired spikelets, fragile, obliquely articulated; rachis internodes stoutly oblong, adnate to adjacent pedicel, together forming a cavity, base obliquely truncate with central peg. Sessile spikelet much broader than internode; lower glume brittle, hemispherical, rugose, pitted to honeycombed, wingless, narrowed into a stipelike base; upper glume shorter and narrower, sunk into cavity of rachis; lower floret barren, without a palea; upper floret with entire awnless lemma. Pedicelled spikelet readily disarticulating, narrowly ovate, herbaceous, smooth, narrowly winged; pedicel oblong, adnate to adjacent rachis internode, junction with internode marked by a line. $x = 7$.

Two species: one pantropical, the other confined to Asia; two species in China.

This genus is readily recognizable by its unique, globose, reticulately wrinkled sessile spikelets. The caryopsis is unusual, as the embryo extends along its whole length. It is placed in *Mnesithea* by some authors, but differs from that genus also by its annual habit and different basic chromosome number.

1a. Sessile spikelets 1–1.5 mm, shallowly pitted, ribs between pits broad, rounded; racemes to 1.5 cm 1. *H. granularis*

1b. Sessile spikelets 2–2.5 mm, deeply honeycombed, ribs between pits narrow, sharp; racemes more than 2 cm 2. *H. porifera*

1. Hackelochloa granularis (Linnaeus) Kuntze, Revis. Gen. Pl. 2: 776. 1891.

球穗草 qiu sui cao

Cenchrus granularis Linnaeus, Mant. Pl. 2: 575. 1771; *Manisuris granularis* (Linnaeus) Linnaeus f.; *Mnesithea granularis* (Linnaeus) de Koning & Sosef; *Rottboellia granularis* (Linnaeus) Roberty.

Annual. Culms tufted, erect, up to 60 cm tall, branched from base. Leaf sheaths loose, slightly inflated, keeled; leaf blades linear-lanceolate, 5–20 × 0.4–1 cm, coarsely hispid, base subamplexicaul, apex subacute; ligule ca. 1 mm. Racemes 0.7–1.5(–2) cm; peduncle often pubescent; rachis internodes 1–1.5(–2) mm. Sessile spikelet 1–1.5 mm, usually cream-colored at maturity; lower glume hemispherical, coarsely reticulate-rugose, pits shallow and separated by broad rounded ribs, the whole surface finely granular; upper glume hyaline below, thickening upward toward the crested apex; lower lemma hyaline; upper lemma hyaline, ca. 1.1 mm, upper palea as long. Pedicelled spikelet 1.5–2.5 mm, glumes with prominent green veins and whitish wings. Fl. and fr. Jun–Oct. $2n = 14$.

Arable land, open grassy places; 100–1000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan, Zhejiang [throughout the tropics].

2. Hackelochloa porifera (Hackel) D. Rhind, Grasses Burma, 77. 1945.

穿孔球穗草 chuan kong qiu sui cao

Manisuris porifera Hackel, Oesterr. Bot. Z. 41: 48. 1891.

Annual. Culms erect, 0.6–1.5 m tall, sparsely branched, often stilt-rooted. Leaf sheaths with rather rigid tubercle-based hairs; leaf blades linear-lanceolate, 5–25 × 0.5–1.5 cm, tuberculate-hispid on both surfaces; ligule 1–2 mm. Racemes 2–3 cm; peduncle glabrous or sparingly puberulent; rachis internodes ca. 2 mm. Sessile spikelets 2–2.5 mm, brown at maturity; lower glume obovate, ridged or honeycombed, upper part deeply honeycombed with sharp, narrow ribs, smooth and slightly narrowed toward base; upper glume papery. Pedicelled spikelet 3 mm or more, glumes winged. Fl. and fr. Jul–Nov.

Disturbed places; 100–800 m. S Yunnan [India, Myanmar, Vietnam].

222. OPHIUROS C. F. Gaertner, Suppl. Carp. 3. 1805.

蛇尾草属 she wei cao shu

Sun Bixing (孙必兴 Sun Bi-sin); Sylvia M. Phillips

Annual or perennial. Culms robust. Leaf blades linear, flat; ligule membranous. Inflorescence of many single racemes aggregated into a spathate compound panicle; racemes cylindrical, fragile, transversely or slightly obliquely articulated, spikelets borne alternately on opposite sides of rachis; rachis internodes stout, semi-cylindrical, base with central peg, apex hollow. Sessile spikelet sunk into hollow in rachis; lower glume oblong, leathery, broadly convex, smooth, areolate or latticelike; marginally 2-keeled, with or without narrow wings toward apex; lower floret male with a palea; upper floret hyaline with entire awnless lemma. Pedicelled spikelet absent; pedicel linear, adnate to adjacent internode, sometimes barely distinguishable from it.

Four species: NE tropical Africa, tropical Asia, Australia; one species in China.

1. Ophiuros exaltatus (Linnaeus) Kuntze, Revis. Gen. Pl. 2: 780. 1891.

蛇尾草 she wei cao

Aegilops exaltata Linnaeus, Mant. Pl. 2: 575. 1771; *Mnesithea exaltata* (Linnaeus) Skeels; *Ophiuros corymbosus* (Linnaeus f.) Gaertner; *Rottboellia corymbosa* Linnaeus f.

Perennial. Culms often bulbously swollen at base, erect, 1–2 m tall, 4–6 mm in diam., simple or branched. Leaf sheaths

with tubercle-based hairs or glabrous, margins densely ciliate with rather rigid tubercle-based hairs; leaf blades broadly linear, 30–60 × 0.5–2.5 cm, midrib broad and white, margins pectinate, base rounded or subcordate, apex long-acuminate; ligule 1–2 mm, glabrous. Racemes often fastigiate clustered, slender, 0.5–1.5 cm, base enclosed by a spatheole; rachis very fragile, internodes ca. 3 mm, obliquely articulated. Sessile spikelet 2–3 mm; lower glume ovate-oblong, smooth or areolate on back, sometimes also tuberculate, wingless, apex subacute; up-

per glume equal to lower glume, boat-shaped. Pedicelled spikelet completely absent; pedicel obscure, free at extreme apex. Fl. and fr. Jun–Oct.

Grassy hillsides; below 900 m. Fujian, Guangdong, Guangxi, Hainan, Yunnan [India, Laos, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

223. *COIX* Linnaeus, Sp. Pl. 2: 972. 1753.

薏苡属 *yi yi shu*

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual or perennial. Culms robust, erect or decumbent, sometimes floating, usually solid. Leaves cauline; leaf blades large, usually broad, flat; ligule membranous. Inflorescences many, fascicled in the upper leaf axils, each subtended by a globose or elongated, bony or sometimes softer modified involucre spatheole (“utricle”); each inflorescence comprising 2 racemes, a female sessile raceme enclosed within the utricle, and a pedunculate male raceme subtended by a prophyll and exerted from the apical pore of the utricle. Female raceme of 1 sessile fertile spikelet accompanied by 2 free stout pedicels, sometimes bearing vestigial spikelets. Female spikelet: lower glume broad, infolding spikelet, membranous with cartilaginous beak; upper glume narrower, keeled; lower floret reduced to a broad hyaline lemma; upper floret with hyaline lemma and palea; lodicules absent; stigmas 2, elongate, exerted from utricle. Male raceme deciduous at maturity, composed of imbricate spikelets borne in pairs or triads, 1(–2) sessile and 1 pedicelled, pedicelled spikelet often reduced in triads. Male spikelets: glumes subequal, herbaceous; lower glume flat on back, margins keeled, keels winged upward, wings with obvious branching veins; upper glume boat-shaped; both florets staminate, lemma and palea hyaline. Caryopsis orbicular, ventrally furrowed, enclosed in utricle.

Four species: tropical Asia; two species in China.

- 1a. Annual, culms tufted; leaf blades 1.5–7 cm wide, acute; male spikelets mostly paired (except terminal triad) 1. *C. lacryma-jobi*
 1b. Perennial, culms often decumbent and rooting at base; leaf blades 0.3–2.5 cm wide, slenderly acuminate; male spikelets in triads 2. *C. aquatica*

1. *Coix lacryma-jobi* Linnaeus, Sp. Pl. 2: 972. 1753.

薏苡 *yi yi*

Annual. Culms erect, robust, 1–3 m tall, more than 10-noded, branched. Leaves cauline; leaf sheaths shorter than internodes, glabrous; leaf blades linear-lanceolate, usually glabrous, 10–40 × 1.5–7 cm, midvein stout, base subrounded or cordate, margins scabrous, apex acute; ligule 0.6–1.2 mm. Male raceme 1.5–4 cm, spikelets in pairs with terminal triad; utricle ovoid to cylindrical, usually bony, shiny, 7–11 × 6–10 mm, white, bluish or gray-brown, sometimes with apical beak. Male spikelets oblong-ovate, 6–9 mm; glumes many-veined, lower glume winged on keels, wings 0.4–0.8 mm wide, wing margin ciliate; anthers 4–5 mm. Fl. and fr. Jun–Dec. $2n = 20$.

Streams, marshy valleys, moist fields, by houses, often cultivated. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

This species is now widely cultivated in tropical and subtropical regions of the world (Job’s Tears). There are many variants, of which the following are the most distinct.

- 1a. Utricle cylindrical or bottle-shaped, much longer than broad 1b. var. *stenocarpa*
 1b. Utricle spherical to ovoid.
 2a. Utricle soft, striate 1d. var. *ma-yuen*
 2b. Utricle bony, polished.
 3a. Utricle ovoid, 7–11 mm long 1a. var. *lacryma-jobi*
 3b. Utricle globose, 4–5 mm in diam. 1c. var. *puellarum*

1a. *Coix lacryma-jobi* var. *lacryma-jobi*

薏苡(原变种) *yi yi (yuan bian zhong)*

Coix arundinacea Lamarck; *C. lacryma* Linnaeus, nom. illeg. superfl.; *C. lacryma-jobi* var. *maxima* Makino; *Lithagrostis lacryma-jobi* (Linnaeus) Gaertner.

Utricle beadlike, ovoid, bony, glossy, not beaked, 7–11 × 6–10 mm. Fl. and fr. Jun–Oct.

Streams, marshy valleys, moist fields, by houses. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [India, Indonesia, Laos, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

This is widely cultivated in tropical regions for the hard, beadlike utricles. There are many races with utricles in different shapes and colors, used for necklaces and other decorative purposes.

1b. *Coix lacryma-jobi* var. *stenocarpa* (Oliver) Stapf in J. D. Hooker, Fl. Brit. India 7: 100. 1896 [“1897”].

窄果薏苡 *zhai guo yi yi*

Coix lacryma var. *stenocarpa* Oliver, Hooker’s Icon. Pl. 18: t. 1764. 1888; *C. lacryma-jobi* var. *tubulosa* K. Schumann & Lauterbach; *C. stenocarpa* (Oliver) Balansa; *C. tubulosa* Hackel.

Utricle narrowly cylindrical, bony, glossy, white, bluish or brown, 7–15 × 2–3 mm. Fl. and fr. Oct–Dec.

Cultivated. Yunnan [NE India, Indonesia, Myanmar, New Guinea, Philippines, Vietnam].

This variety is grown in gardens for the ornamental, elongate utricles, which are used for beads.

1c. *Coix lacryma-jobi* var. *puellarum* (Balansa) A. Camus in Lecomte, Fl. Indo-Chine 7(5): 220. 1922.

小珠薏苡 xiao zhu yi yi

Coix puellarum Balansa, J. Bot. (Morot) 4: 77. 1890.

Utricle globose, very hard, bony, white or bluish, 4–5 mm in diam., not beaked.

Moist valley forests; ca. 1400 m. Hainan, Xizang, Yunnan [NE India, Myanmar, Thailand, Vietnam].

This is a form distinguished by its small, globose utricles.

1d. *Coix lacryma-jobi* var. *ma-yuen* (Romanet du Caillaud) Stapf in J. D. Hooker, Fl. Brit. India 7: 100. 1896 [“1897”].

薏米 yi mi

Coix ma-yuen Romanet du Caillaud, Bull. Soc. Natl. Acclim. France, Sér. 2, 8: 442. 1881; *Coix chinensis* Todaro ex Balansa; *C. chinensis* var. *formosana* (Ohwi) L. Liu; *C. lacryma-jobi* subsp. *ma-yuen* (Romanet du Caillaud) T. Koyama; *C. lacryma-jobi* var. *formosana* Ohwi; *C. lacryma-jobi* var. *frumentacea* Makino.

Utricle thin, longitudinally striate, pale or dark brown, elliptical to subglobose, constricted to an apical beak, 8–12 × 4–9 mm, brittle and easily broken. Caryopsis white or yellow, oblong, 5–8 × 4–6 mm, rich in starch. Fl. and fr. Jul–Dec.

Roadsides, valleys, often cultivated; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Hebei, Henan, Hubei, Jiangsu, Jiangxi, Liaoning, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

This form with softer utricles is used as a food grain and for medicine. It also provides good forage.

2. *Coix aquatica* Roxburgh, Fl. Ind., 3: 571. 1832.

水生薏苡 shui sheng yi yi

Coix gigantea Roxburgh (1832), not Koenig (1788); *C. gigantea* subsp. *aquatica* (Roxburgh) Bhattacharya; *C. gigantea* var. *aquatica* (Roxburgh) Watt; *C. lingulata* Hackel.

Perennial, aquatic. Culms creeping and rooting from nodes at base, sometimes floating, up to 30 m long, ca. 1 cm in diam., flowering stems up to 2 m tall, more than 10-noded. Leaf sheaths smooth, glabrous or upper sheaths tuberculate-hispid; leaf blades narrowly to broadly linear, up to 100 × (0.3–)1–2.5 cm, hispid with tubercle-based hairs on both surfaces or almost glabrous, midvein stout, base rounded, margins scabrous, apex slenderly acuminate; ligule ca. 1 mm, margin ciliate. Male raceme 2.5–7 cm, drooping, spikelets mostly in triads, closely imbricate; utricle ovoid, longer than broad, bony, shiny, 10–14 × 5–7 mm, white or pale brown, sometimes with a median transverse line, apex occasionally extended into a green blade. Male spikelets broadly elliptic, 8–12 mm; glumes many-veined, lower glume winged on keels, wing (0.4–)0.7–1.2(–1.5) mm wide, margin ciliate; anthers 4–5.5 mm. Fl. and fr. Aug–Nov. $2n = 10, 20, 40$.

Lakes, streams, marshy borders, open water; 500–1800 m. Guangdong, Guangxi, Yunnan [Bangladesh, Bhutan, India, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam].

All forms of the variable, perennial, aquatic *Coix* are included here in a single species. Some forms with a supposedly non-creeping habit have been separated as *C. gigantea* Roxburgh (1832), but this name is a later homonym of *C. gigantea* Koenig (1788), a different grass now placed in *Chionachne*. It is, in any case, very uncertain whether this difference in habit, which is usually impossible to determine in herbarium specimens often lacking the basal parts, is real or simply a response to the environment.

This species covers a range of chromosome levels. A form with very narrow leaf blades is the basis of *Coix lingulata*. Similar narrow-leaved specimens have been shown to have a chromosome number of $2n = 10$. The utricle apex is sometimes extended into a leaflike, green blade. The occurrence of this feature is sporadic, and it can vary from a minute vestige to a blade ca. 3 cm or more long, even on the same plant. The leaf blades are often spotted with tubercles, which appear to be glandular and carry a short bristle-hair. These tubercle-hairs vary from dense to very sparse. The male spikelets are tightly packed into a cone-like raceme, and are on average broader with broader marginal wings than in *C. lacryma-jobi*, but there is much variation.

224. **CHIONACHNE** R. Brown in J. J. Bennett & R. Brown, Pl. Jav. Rar. 15, 18. 1838.

葫芦草属 hu lu cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Sclerachne R. Brown.

Perennial or annual. Leaf blades linear; ligule membranous. Inflorescences axillary, of single racemes, each usually supported by a spatheole, often gathered into a spathate compound panicle; racemes bearing pairs of unisexual awnless spikelets, female and male spikelets separated into different zones, female pairs below male pairs, axis fragile between female pairs. Rachis internode and pedicel fused along one margin; callus truncate with central knob. Female zone: sessile spikelet dorsally compressed; lower glume leathery to bony, enveloping spikelet, body smooth or transversely constricted, flanks usually winged above; lower floret sterile, palea usually absent; upper floret pistillate, palea present; pedicelled spikelet reduced to vestigial. Male zone: spikelet pair similar, both or only sessile staminate; lower glume herbaceous, elliptic-oblong.

Nine species: India and Sri Lanka through SE Asia to the Philippines and Australia; one species in China.

1. *Chionachne massiei* Balansa, J. Bot. (Morot) 4: 78. 1890 [“*massii*”].

葫芦草 hu lu cao

Polytoca massiei (Balansa) Schenck ex Henrard [“*massii*”].

Annual. Culms loosely tufted, up to 50 cm tall, much branched, nodes bearded. Leaf sheaths papery, keeled, loose,

slightly inflated, sparsely hairy; leaf blades narrowly lanceolate, flat or folded, thin, ca. $9-30 \times 0.8-1.4$ cm, glabrous or sparsely hairy with tubercle-based hairs, margins smooth or scabrous, apex acuminate; ligule 0.5–1.5 mm. Racemes in spatulate clusters of 2–4, each 2–8 cm; peduncles funnel-shaped with deep cupular apex straight across rim. Female sessile spikelets 1–3, 7–10 mm; lower glume hard, rounded, with 2 conspicuous transverse constrictions, lower margins abutting internode, abruptly contracted above into keeled, broadly winged beak; pedicelled spikelet rudimentary, comprising only a 1.5–4 mm

lower glume. Male spikelet pairs 1–2 on short internodes, encircled by uppermost female spikelet; male sessile and pedicelled spikelets 2.5–5 mm.

Meadows. Hainan [Laos, Thailand, N Vietnam].

This species is very similar to *Chionachne punctata* (R. Brown) Jannink (*Sclerachne punctata* R. Brown), from Indonesia, and the two have been confused. *Chionachne punctata* is a taller plant with longer leaf blades and also differs in having peduncles with an oblique, apical rim and an asperulous sessile lower glume with more broadly overlapping margins.

225. POLYTOCA R. Brown in J. J. Bennett & R. Brown, Pl. Jav. Rar. 20. 1838.

多裔草属 duo yi cao shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennial. Leaf blades broadly linear; ligule membranous. Inflorescences terminal and axillary, racemes subdigitate or axillary racemes sometimes solitary, spatulate; racemes bearing pairs of unisexual awnless spikelets, female and male spikelets separated into different zones, axis fragile, especially in female zone; lateral racemes of digitate cluster entirely staminate, terminal raceme and solitary axillary racemes mixed, usually sterile spikelet pairs at base, then a zone with female sessile and sterile pedicelled spikelets, distally both spikelets of a pair staminate, uppermost spikelet pairs sterile. Rachis internode and pedicel fused along one margin, flat, ciliate; callus truncate with central knob. Female zone: spikelet pair dissimilar; sessile spikelet dorsally compressed; lower glume leathery, enveloping whole spikelet, glume body oblong, flanks rounded, abruptly contracted into keeled winged apical beak; lower floret sterile, reduced to a lemma; upper floret pistillate, palea present, stigma single, elongate; pedicelled spikelet much longer than sessile, sterile, comprising only a herbaceous, many-veined lower glume. Male zone: spikelet pair similar, both staminate; lower glume lanceolate, papery, winged above middle; both florets male with paleas.

One species: NE India to Indonesia, New Guinea, and the Philippines, including S China.

1. *Polytoca digitata* (Linnaeus f.) Druce, Rep. Bot. Exch. Club. 4: 641. 1917.

多裔草 duo yi cao

Apluda digitata Linnaeus f., Suppl. Pl. 434. 1782 [“1781”]; *Coix heteroclita* Roxburgh; *Polytoca bracteata* R. Brown; *P. heteroclita* (Roxburgh) Koorders.

Perennial from short stout rhizome. Culms erect, up to 3 m tall, 4–8 mm in diam., branched, 6–10-noded, nodes densely bearded with upwardly pointing hairs. Leaf sheaths glabrous or setose with tubercle-based hairs; leaf blades cauline, up to $80 \times 1-4$ cm, abaxial surface glaucous, glabrous or setulose, margins serrate, apex acuminate; ligule 2–5 mm. Racemes 2–4, 4–12

cm. Female zone: sessile spikelet 8–11 mm; lower glume short-hairy on back, longer hair tufts laterally at base of beak, beak ca. 3 mm, wings ca. 1 mm wide; lodicules absent; pedicelled spikelet 15–20 mm, asymmetrical, broadly winged on one side. Male zone: spikelets oblong-lanceolate, 8–10 mm; lower glume symmetrically winged on margins above middle, wing 0.5–1 mm wide. Fl. and fr. Jul–Sep.

Hill slopes, grasslands, roadsides. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, NE India, Indonesia, Malaysia, Myanmar, New Guinea, Philippines, Thailand, Vietnam].

The zonation of the mixed-sex racemes is obvious, with the tough, yellowish female spikelets, which often have the long stigmas exerted, located below the more slender, green male portion.

226. ZEA Linnaeus, Sp. Pl. 2: 971. 1753.

玉蜀黍属 yu shu shu shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Annual. Culms robust, often tall with stilt roots, solid. Leaf blades large, broadly linear; ligule membranous. Inflorescences terminal and axillary, spikelets unisexual, separated into male and female inflorescences, not disarticulating at maturity, spikelets of a pair alike. Female inflorescence axillary, enclosed in enveloping foliaceous sheaths; spikelets all sessile in many longitudinal rows, partially sunk in the thickened, almost woody axis, glumes and lemmas chaffy, awnless, lower floret sterile; styles single, very long, silky, pendulous from inflorescence apex. Male inflorescence terminal, of many digitate or paniculate racemes; one spikelet of a pair subsessile, the other on a slender pedicel, papery, awnless, both florets staminate. Mature caryopses plump, much larger than spikelet scales, very variable in shape and color. $x = 5$.

Five species: four wild species in Central America; one species cultivated in all warm parts of the world, including China.

1. *Zea mays* Linnaeus, Sp. Pl. 2: 971. 1753.

玉蜀黍 yu shu shu

Culms erect, 1–4 m tall. Leaf sheaths with transverse vein-

lets; leaf blades $50-90 \times 3-12$ cm, glabrous or with tubercle-based hairs, margins scabrid, midvein stout; ligule ca. 2 mm. Female inflorescence a cylindrical “cob,” with 16–30 rows of spikelets; glumes equal, veinless, margins ciliate; florets hya-

line. Male inflorescence a “tassel” of many digitate racemes; spikelets 9–14 mm, unequally pedicellate, one pedicel 1–2 mm, the other 2–4 mm; glumes subequal, membranous, lower ca. 10-veined, margins ciliate, upper 7-veined; lower lemma and palea hyaline, subequal; upper lemma smaller than lower. Anthers orange, ca. 5 mm. Fl. and fr. summer–autumn. $2n = 20, 40, 80$.

Widely cultivated in China [originating in America; widely cultivated elsewhere].

This plant (maize, corn) was first domesticated in Central America about 7000 years ago and is now the third most important crop in the world. The many cultivars are grown for cereal or forage, and it is also an important source of oil, syrup, and alcohol.