

## CAMPANULACEAE

桔梗科 jie geng ke

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Herbs, lactiferous, perennial (often with rhizomes or caudices), less often annual, [or shrubs or trees outside of China]. Leaves estipulate, alternate (rarely opposite or whorled), simple, entire or variously toothed or dissected, petiolate or sessile. Flowers tetra-cyclic, perfect, with a specialized method of proterandrous secondary pollen presentation, resupinate in Lobelioideae, solitary in an axillary or less often terminal position, or aggregated into terminal or axillary inflorescences that appear racemose or paniculate (rarely capitate), pedicellate or rarely sessile; bracts leaflike or reduced, rarely absent; pedicels often bracteolate. Calyx synsepalous, adnate to ovary and forming a hypanthium (free in *Cyananthus*); lobes (3–)5(–10), valvate, sometimes with a reflexed appendage in each sinus, in some *Codonopsis*, inserted well below rim of hypanthium. Corolla sympetalous, actinomorphic or zygomorphic, most often some shade of blue or violet, or white; lobes (4 or)5(–10), valvate. Stamens equaling number of corolla lobes, antisepalous, distinct, coherent, or connate; anthers tetrasporangiate, dithecal, introrsely dehiscent by longitudinal slits, basifixed. Gynoecium syncarpous, 2–5(–10)-locular with axile placentation, [rarely 1-locular with parietal, basal, or apical placentation outside of China]; ovary at least partly inferior (superior in *Cyananthus*), sometimes crowned by an annular or tubular nectary; style solitary, pubescent with pollen-collecting hairs below apex; stigma typically with as many lobes as ovary locules. Fruit a capsule, commonly apically loculicidal or laterally poricidal, or a berry. Seeds usually small, numerous; embryo small, straight; endosperm copious, oily or rarely starchy.

Eighty-six genera and over 2,300 species: cosmopolitan; 16 genera (one endemic, two introduced) and 159 species (77 endemic, two introduced) in China.

Two of us (Lammers and Klein) do not agree with the separation of *Leptocodon* and *Campanumoea* from *Codonopsis* in this treatment. We consider that the single character used in each case, five lamellar glands alternate with the stamens in *Leptocodon* and baccate fruit in *Campanumoea*, is not sufficient to justify recognition of a distinct genus. We regard these two genera as embedded within *Codonopsis*, as was done by Lammers (in C. I. Peng, *Phytogeogr. Bot. Invent. Taiwan*, 43–61. 1992), Morris and Lammers (*Bot. Bull. Acad. Sin.* 38: 277–284. 1997), Lammers (in T. C. Huang, *Fl. Taiwan*, ed. 2, 4: 775–802. 1998), Lammers (in Kubitzki [Kadereit & Jeffrey], *Fam. Gen. Vasc. Pl.* 8: 26–56. 2007), and Lammers (*World Checkl. Bibliogr. Campanulaceae*. 262–273. 2007). On the other hand, one of us (Hong) notes that two characters distinguish *Leptocodon* from *Codonopsis*. One is the five lamellar glands and the other is the shape of the stigma segments, which are clavate in *Leptocodon* but orbicular-deltoid in *Codonopsis*. *Campanumoea* differs from *Codonopsis* not only in having baccate fruit but also in its pollen, which is shortly 5-colpate (vs. 5–8-long-colpate in the core group of *Codonopsis*). *Campanumoea* is not a very distinct genus, and it seems that it would be equally reasonable to sink it into *Codonopsis* or to separate it. However, if it were sunk, then it would also be reasonable to sink *Adenophora* into *Campanula* because the former genus differs from the latter only in having a nectar disk around the style.

*Pentaphragma* Wallich ex G. Don and *Sphenoclea* Gaertner were included in Campanulaceae in FRPS but are treated in this volume as Pentaphragmataceae and Sphenocleaceae, respectively. See the notes under those two families.

Hong De-yuan, Lian Yong-shan & Shen Lian-dai. 1983. Campanulaceae (Campanuloideae and Lobelioideae). *In*: Hong De-yuan, ed., *Fl. Reipubl. Popularis Sin.* 73(2): 1–173.

T. G. Lammers. 1998. Campanulaceae. *In*: Tseng-Chieng Huang, ed., *Fl. Taiwan*, ed. 2, 4: 775–802.

- 1a. Flowers resupinate at anthesis; odd (unpaired) calyx lobe in a ventral (anterior) position prior to resupination; corolla zygomorphic (sometimes only slightly so); stamens connate, forming an asymmetric tube; locules and stigmas 2 (Lobelioideae).
  - 2a. Corolla strongly zygomorphic, unilabiate or bilabiate, lobes  $\pm$  as long as tube or slightly shorter, tube cleft to base on dorsal surface; staminal column free from corolla, exerted from dorsal fissure of corolla ..... 15. *Lobelia*
  - 2b. Corolla scarcely zygomorphic, salverform, lobes less than 1/3 as long as tube, tube entire; staminal column adnate to corolla below middle, scarcely exerted from mouth of corolla ..... 16. *Hippobroma*
- 1b. Flowers oriented normally; odd (unpaired) sepal in a dorsal (posterior) position; corolla actinomorphic; stamens distinct or coherent into a symmetric tube at anthesis but eventually separating; locules and stigmas (2 or)3–6 (Campanuloideae).
  - 3a. Fruit a berry; ovary and fruit apically flat.
    - 4a. Herbs twining; calyx lobes ovate-deltoid or ovate-lanceolate, margin entire ..... 4. *Campanumoea*
    - 4b. Herbs erect; calyx lobes linear or linear-lanceolate, margin dentate, rarely entire ..... 5. *Cyclocodon*
  - 3b. Fruit a capsule; ovary and fruit apically conical.
    - 5a. Fruit dehiscent apically (i.e., above calyx lobes).
      - 6a. Calyx completely free from ovary, inserted below it; corolla and stamens inserted below ovary ..... 1. *Cyananthus*
      - 6b. Calyx tube adnate to ovary, forming a hypanthium (though lobes sometimes apparently inserted

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- at base or middle rather than its rim); corolla and stamens inserted on rim of hypanthium (i.e., atop ovary).
- 7a. Glands 5, alternate with stamens, orbicular, compressed; herbs twining ..... 2. *Leptocodon*
- 7b. Glands absent; herbs erect, climbing, or twining.
- 8a. Taproot greatly thickened, carrotlike or tuberous; flowers large, corolla 15–50 mm; stigmas ovoid or orbicular, ± as long as broad.
- 9a. Plants not malodorous; stems erect or ascending; locules 5, alternating with calyx lobes ... 7. *Platycodon*
- 9b. Plants often malodorous; stems often scandent, climbing, or twining; locules 3 ..... 3. *Codonopsis*
- 8b. Taproot fibrous or but scarcely thickened; flowers small, corolla 2–12 mm; stigmas filiform or linear, much longer than broad.
- 10a. Leaves pinnately lobed or parted; calyx lobes echinate; corolla lobes and stamens typically 4; pollen 4- or 5-colpate; seeds triquetrous ..... 6. *Echinocodon*
- 10b. Leaves entire or toothed; calyx lobes entire or toothed; corolla lobes and stamens typically 5; pollen 3-porate; seeds terete or compressed ..... 8. *Wahlenbergia*
- 5b. Fruit dehiscent laterally (i.e., below calyx lobes).
- 11a. Corolla rotate, lobed for 1/2 or more its length.
- 12a. Plants annual, roots fibrous; flowers both chasmogamous and cleistogamous, latter often predominating; corolla lobes cut for 1/2–3/4 their length, lanceolate ..... 13. *Triodanis*
- 12b. Plants perennial, root carrotlike; flowers all chasmogamous; corolla lobes divided to base, linear ..... 14. *Asyneuma*
- 11b. Corolla campanulate, lobed less than 2/5 its length.
- 13a. Flowers large, corolla typically 15–75 mm; fruit dehiscent via 2 or 3 definite pores in firm sclerenchymatous pericarp.
- 14a. Flowers without an obvious nectar disk ..... 9. *Campanula*
- 14b. Flowers with a conspicuous tubular (rarely annular) nectar disk ..... 10. *Adenophora*
- 13b. Flowers small, corolla 5–12 mm; fruit dehiscent irregularly via ruptures and tears of membranous or papery pericarp.
- 15a. Plants perennial via tuberiferous stolons; stems terete; flowers long pedicellate; seeds > 1.5 mm, testa finely striate ..... 11. *Peracarpa*
- 15b. Plants annual; flowers sessile; stems 3-winged; seeds < 1 mm, testa reticulate ..... 12. *Homocodon*

**1. CYANANTHUS** Wallich ex Benth in Royle, Ill. Bot. Himal. Mts. 1: 309. 1836,  
nom. cons., not Rafinesque (1815).

蓝钟花属 *lan zhong hua shu*

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

Herbs, annual or perennial, caudices of latter thick, lignified, covered with numerous scales, usually branched, stems thus caespitose. Leaves alternate, but sometimes 4 or 5 leaves aggregated below pedicel, appearing whorl-like. Flowers solitary, terminal on main stems and branches, rarely in a dichasium and dichasia aggregated on top of stem and branches, pedicellate. Calyx tubular or tubular-campanulate, 5- or rarely 4-lobed. Corolla tubular-campanulate, (3-)5-lobed. Stamens 5, often aggregated and surrounding ovary at upper part. Ovary superior, conical, mostly 5-locular, less frequently 4- or 3-locular. Fruit a capsule, loculicidal. Seeds numerous, brown-red or brown-black.

Eighteen species: Himalaya and the Hengduan Mountains; 17 species (nine endemic) in China.

- 1a. Plant annual, lacking a caudex (3. *C.* sect. *Annui*).
- 2a. Plants dwarf, less than 20 cm tall; flowers almost sessile, typically 4-merous; corolla usually less than 10 mm, rarely up to 15 mm ..... 17. *C. hookeri*
- 2b. Plants taller; flowers pedicellate, typically 5-merous; corolla usually more than 15 mm.
- 3a. Calyx covered with red-brown setae, base of setae swollen, black verrucose; calyx lobes obovate-oblong, broadest at middle or above middle; corolla pale yellow or white ..... 14. *C. lichiangensis*
- 3b. Calyx villous; calyx lobes sublinear or triangular, broadest below middle; corolla blue or blue-purple.
- 4a. Leaves glabrous or sparsely puberulent; flowers in dichasia, fascicled at top of stem; calyx lobes linear ..... 15. *C. fasciculatus*
- 4b. Leaves hairy; flowers solitary, terminal on top of stem and branches, rarely 3–5-fascicled; calyx lobes triangular ..... 16. *C. inflatus*
- 1b. Plant perennial with a robust caudex densely clothed in persistent and straw-colored scales.
- 5a. Calyx with brown-black setae, sometimes mixed with other hairs; corolla lobes suborbicular, broadly ovate, or oblong, as long as or slightly longer than broad (2. *C.* sect. *Cyananthus*).

- 6a. Calyx covered with brown-black and white setae; stems sparsely arachnoid.  
 7a. Leaf blade cordate to triangular-ovate, base cordate or rounded, margin obviously crenulate ..... 12. *C. cordifolius*  
 7b. Leaf blade linear-elliptic, base cuneate, margin entire or sinuous ..... 13. *C. sherriffii*
- 6b. Calyx covered with only brown-black setae; stems villous, scaberrulose, or sericeous.  
 8a. Leaves less than 11 mm ..... 11. *C. microphyllus*  
 8b. Leaves more than 10 mm.  
 9a. Leaf blade usually oblanceolate, spatulate, or obovate, margin with 3–9 obtuse lobes above middle ..... 8. *C. lobatus*  
 9b. Leaf blade elliptic or ovate-lanceolate, margin entire or sinuous-crenulate above middle.  
 10a. Leaves hispidulous on both surfaces; pedicels 12–32 mm; no leaves aggregated below pedicels ..... 9. *C. pedunculatus*  
 10b. Leaves adaxially glabrous, abaxially densely sericeous; pedicels 5–12 mm; several leaves aggregated below pedicels, whorl-like ..... 10. *C. sericeus*
- 5b. Calyx glabrous or covered with hairs other than brown-black setae; corolla lobes usually oblong, longer than broad (1. *C. sect. Stenolobi*).  
 11a. Flowers several on a stem in racemelike inflorescence; leaves ovate-lanceolate, abaxially densely sericeous; margin strongly recurved ..... 7. *C. longiflorus*  
 11b. Flowers solitary and terminal on a stem; leaves rhombic, flabellate, spatulate, or ovate, rarely lanceolate, rarely sericeous, margin spreading or slightly recurved.  
 12a. Leaves usually rhombic, flabellate, or spatulate, (2–)2.5–4.8(–5.5) mm, base usually truncate or broadly cuneate, obviously petiolate.  
 13a. Flowers 1.6–2.4 cm; leaves rhombic, base broadly cuneate ..... 1. *C. delavayi*  
 13b. Flowers 2.5–4.8 cm; leaves spatulate to rhombic, margins serrate to sinuous-crenulate, rarely entire ..... 2. *C. formosus*  
 12b. Leaves usually spatulate, elliptic, ovate, or obovate-lanceolate, (3–)4.5–16 mm, base cuneate or rounded, attenuate into shortly petiolate, or leaves sessile.  
 14a. Plants densely covered with long yellow-brown appressed hairs except corolla; scales on caudexes 10–15 × ca. 3 mm; corolla 3–4 cm, lobed to 1/3 ..... 4. *C. wardii*  
 14b. Plants glabrous or covered with other types of hairs than above, leaves adaxially white hirsute or white hispidulous; scales on caudexes much smaller; corolla 2–2.5(–3.8) cm, lobed to middle.  
 15a. Leaves spatulate, petiole short, narrowly winged, (0.5–)1.3–5 mm ..... 3. *C. macrocalyx*  
 15b. Leaves elliptic, ovate, narrowly ovate, or narrowly obovate, sessile or petiole extremely short, less than 1(–1.7) mm.  
 16a. Leaves shortly petiolate or sessile, elliptic, narrowly elliptic, or oblanceolate, base cuneate; flowers blue or blue-purple ..... 5. *C. incanus*  
 16b. Leaves sessile, broadly ovate or obovate-lanceolate, base rounded; flowers yellow or white ..... 6. *C. flavus*

**1. *Cyananthus* sect. *Stenolobi* (Franchet) Y. S. Lian in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 13. 1983.**

多年生组 duo nian sheng zu

*Cyananthus* [unranked] *Stenolobi* Franchet, J. Bot. (Morot) 1: 258. 1887.

Plants perennial. Caudex densely clothed in persistent and straw-colored scales. Leaves alternate. Flowers solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves. Calyx glabrous or covered with hairs other than brown-black setae, often ± swollen and saclike after anthesis. Corolla lobes usually oblong, longer than broad.

Seven species: Himalaya and the Hengduan Mountains; seven species (five endemic) in China.

**1. *Cyananthus delavayi* Franchet, J. Bot. (Morot) 1: 280. 1887.**

细叶蓝钟花 xi ye lan zhong hua

*Cyananthus barbatus* Franchet (1885), not Edgeworth (1846); *C. microrhombeus* C. Y. Wu; *C. microrhombeus* var. *leiocalyx* C. Y. Wu.

Caudexes branched; scales deltoid-lanceolate, ca. 2 × 1 mm. Stems caespitose, prostrate or ascending, slender, 7–20 cm, branched, white- or yellowish hispid, more densely so toward

apex. Leaves alternate; blade suborbicular, ovate, or deltoid, 2–5 × 1–7 mm, abaxially silvery sericeous, adaxially hispidulous, base cuneate, obtuse, rounded, or truncate, margin slightly recurved, entire, sinuous, or crenulate, apex rounded or obtuse; petiole 1–3 mm, white hispid. Flowers solitary, terminal on main stems and some branches, each subtended by a whorl-like aggregation of 3–5 leaves; pedicels 3–9 mm. Calyx brown hirsute or glabrescent; tube cylindrical at anthesis, 4.5–9 × 3.5–7 mm, base rounded or truncate, becoming enlarged in fruit; lobes narrowly triangular, 1.5–4 × 1–3 mm, both sides hirsute.

Corolla blue, tubular-campanulate, 1.8–3.4 cm, outside glabrous, inside densely villous at throat; lobes linear-oblong, 6–12 mm. Ovary 5-locular, subequal to calyx in length at anthesis; style extending to corolla throat; stigma 5-fid. Capsules conical, longer than calyx. Seeds brown, oblong or ellipsoid, ca. 1.8 × 0.3 mm. Fl. Sep.

• Grassy calcareous slopes, forests, forest margins; 1900–4000 m. SW Sichuan, N Yunnan.

**2. *Cyananthus formosus*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 172. 1912.

美丽蓝钟花 *mei li lan zhong hua*

*Cyananthus chungdienensis* C. Y. Wu.

Roots carrotlike, up to 10 mm wide. Caudexes robust, often branched; scales persistent, linear-lanceolate, 3.5–5 mm. Stems caespitose, prostrate to ascending, pale purple, slender, 5–25 cm, simple or with short branches. Leaves alternate, lowermost leaves scalelike; blade ovate or rhombic, 3–9 × 2–6 mm, abaxially densely white hirsute, adaxially sparsely white hirsute or glabrous, base obtuse or subtruncate, margin revolute, crenulately 3–5-lobed or -parted, rarely entire, apex truncate; petiole 2–7 mm. Flowers large, solitary and terminal on main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 3–5 mm. Calyx densely hirsute with long pale brown stiff hairs; tube cylindrical, 7–12 mm; lobes triangular or narrowly triangular, 4–6 × 2–3.5 mm, both sides hirsute, margins ciliate. Corolla dark blue or purple-blue, 2.5–4.8 cm, outside glabrous, inside densely villous at throat; lobes narrowly obovate or oblong, 1/3–1/2 as long as tube, apex with a tuft of hairs outside. Ovary 5-locular, nearly as long as calyx tube; style extended up to corolla throat; stigma 5-fid. Fl. Aug–Sep.

• Grassy slopes, forest glades, forest margins, scree; 2800–4600 m. SW Sichuan (Muli), NW Yunnan (Heqing, Lijiang, Zhongdian).

**3. *Cyananthus macrocalyx*** Franchet, J. Bot. (Morot) 1: 279. 1887.

大萼蓝钟花 *da e lan zhong hua*

Caudexes robust, lignified, branched, covered toward apex with persistent ovate-lanceolate scales; scales 2–6 mm. Stems caespitose, ascending, 5–20 cm, simple, sparsely white villous or glabrous. Leaves alternate, increasing in size toward apex; blade suborbicular, rhombic, or spatulate, 5–10 × 1–6 mm, abaxially densely white hirsute, adaxially sparsely hispidulous, base attenuate into petiole, margin revolute, entire, or sinuous-serrate, apex obtuse or acute; petiole 1–4 mm. Flowers solitary, terminal, subtended by a whorl-like aggregation of 4 or 5 flowers; pedicels 4–10 mm. Calyx yellow-green or purplish, brown hirsute, glabrescent, or glabrous, conspicuously veined; tube cylindrical at anthesis, 7–13 mm, basally subglobose in fruit; lobes triangular, both sides brown hirsute, or sometimes glabrous outside. Corolla yellow, sometimes purple- or red-veined, less frequently purple basally and yellow apically, tubular-campanulate, 2–3 cm, outside glabrous, inside densely villous at throat; lobes oblanceolate, ca. 2/3 as long as tube. Ovary extended up to throat. Capsules exerted above calyx. Seeds oblong, ca. 1.3 mm, smooth. Fl. Jul–Aug.

Alpine meadows, grassy slopes; 2500–5300 m. SE Gansu, S Qinghai, W Sichuan, SE Xizang, Yunnan [Bhutan, NE India (Assam, Sikkim), Myanmar, E Nepal].

- 1a. Leaf blade ovate to suborbicular, margin entire; calyx more than 11 mm ..... 3a. subsp. *macrocalyx*  
 1b. Leaf blade obovate-spatulate, margin crenulate; calyx less than 11 mm ..... 3b. subsp. *spathulifolius*

**3a. *Cyananthus macrocalyx* subsp. *macrocalyx***

大萼蓝钟花(原亚种) *da e lan zhong hua (yuan ya zhong)*

*Cyananthus incanus* J. D. Hooker & Thomson var. *leio-calyx* Franchet; *C. leio-calyx* (Franchet) Cowan; *C. leio-calyx* subsp. *lucidus* K. K. Shrestha; *C. macrocalyx* var. *flavopurpureus* C. Marquand; *C. macrocalyx* var. *pilosus* C. Marquand; *C. neurocalyx* C. Y. Wu; *C. pilosus* (C. Marquand) K. K. Shrestha.

Leaf blade ovate, broadly elliptic, or rhombic, margin entire or sparsely crenulate. Pedicel typically less than 5 mm. Calyx tube more than 11 mm.

• Alpine meadows, grassy slopes; 2500–5000 m. SE Gansu (Zhugqu), S Qinghai (Nangqên), W Sichuan, Yunnan.

**3b. *Cyananthus macrocalyx* subsp. *spathulifolius*** (Nannfeldt) K. K. Shrestha, Acta Phytotax. Sin. 35: 412. 1997.

匙叶蓝钟花 *chi ye lan zhong hua*

*Cyananthus spathulifolius* Nannfeldt, Acta Horti Gothob. 5: 30. 1930.

Leaf blade obovate, spatulate, elliptic, or narrowly elliptic, margin slightly crenulate or subentire. Pedicel 5–10 mm. Calyx tube usually less than 12 mm, rarely up to 16 mm.

Alpine meadows; 3000–5300 m. SE Xizang [Bhutan, NE India (Assam, Sikkim), Myanmar, E Nepal].

**4. *Cyananthus wardii*** C. Marquand, J. Linn. Soc., Bot. 48: 196. 1929.

棕毛蓝钟花 *zong mao lan zhong hua*

Roots ca. 5 mm in diam. Caudexes with 2 or 3 grades of branching, densely covered with persistent straw-colored scales; scales elliptic or spatulate, 10–15 × 2–4 mm. Stems several from each branch of caudex, caespitose, 10–18 cm, lower half with small, straw-colored, elliptic scales, sparsely yellow arachnoid. Leaves alternate, sessile or nearly so, increasing in size toward apex; blade elliptic or spatulate, 5–11 × 3–5 mm, both surfaces densely covered with brown-yellow arachnoid hairs, base cuneate, margin entire, apex rounded, acute, or obtuse. Flowers solitary and terminal, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 2–4 mm, covered with brown-yellow arachnoid hairs. Calyx densely covered with brown-yellow arachnoid hairs; tube cylindrical, 10–12 × 6–8 mm; lobes ovate or triangular, 1/3–1/2 as long as tube, apex acute or obtuse. Corolla tubular, 3–4 cm, outside glabrous but inside densely villous; lobes obovate, ca. 1/2 as long as tube, outside with a yellow villous tuft at apex. Stamens ca. 1/2 as long as corolla tube. Style slightly exceeding corolla tube, glabrous.

- 3400–5000 m. SE Xizang.

**5. *Cyananthus incanus*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 20. 1857.

灰毛蓝钟花 hui mao lan zhong hua

*Cyananthus dolichosceles* C. Marquand; *C. incanus* var. *decumbens* Y. S. Lian; *C. incanus* subsp. *orientalis* K. K. Shrestha; *C. incanus* var. *parvus* C. Marquand; *C. incanus* subsp. *petiolatus* (Franchet) D. Y. Hong & L. M. Ma; *C. neglectus* C. Marquand; *C. petiolatus* Franchet; *C. petiolatus* var. *pilifolius* (C. Y. Wu) Y. S. Lian; *C. pilifolius* C. Y. Wu; *C. pilifolius* f. *leiocalyx* C. Y. Wu; *C. pilifolius* var. *minor* C. Y. Wu; *C. pilifolius* var. *pallidocoeruleus* C. Y. Wu.

Caudexes robust, branched, with persistent scales toward apex; scales ovate or lanceolate, ca. 4 mm. Stems caespitose, simple or branched below, white villous. Leaves alternate, gradually increasing in size toward apex, shortly petiolate; blade elliptic, narrowly elliptic, or oblanceolate, 4–12 × 1.5–4 mm, both surfaces white hirsute, base cuneate or attenuate, margin revolute, subentire, or sinuous, apex obtuse or acute. Flowers solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 4–13 mm, hirsute. Calyx densely or sparsely hirsute with yellow-brown stiff hairs, rarely glabrous; tube narrowly ellipsoid, 5–10 mm; lobes triangular, 2–4 mm, inside densely white hirsute, margin long ciliate. Corolla dark blue or blue-purple, 25–38 mm, outside glabrous, inside densely villous at throat; lobes narrowly obovate or oblong, ca. 2/3 as long as tube. Ovary subequal to calyx tube in length at anthesis; style extended up to corolla throat. Capsule exerted beyond calyx, 5-loculicidal, 10–13 mm. Seeds pale brown, oblong. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, forest glades, grassy places at forest and thicket margins, alpine meadows; 2700–5300 m. S Qinghai, W Sichuan, E Xizang, NW Yunnan (Dêqên, Zhongdian) [Bhutan, NE India (Sikkim), Nepal].

**6. *Cyananthus flavus*** C. Marquand, Bull. Misc. Inform. Kew 1924: 247. 1924.

黄钟花 huang zhong hua

Roots carrot-shaped, up to 5 mm in diam. Caudexes robust, multibranched, covered with persistent scales toward apex; scales ovate, ca. 3 × 1 mm. Stems caespitose, ascending, 5.5–16 cm, simple or with short branches, densely white villous to subglabrous. Leaves alternate, gradually increasing in size toward apex, sessile or nearly so; blade elliptic, obovate-lanceolate, or broadly ovate, 5–16 × 3–8 mm, both surfaces gray-white hirsute or glabrous, base cuneate, margin entire or sometimes slightly sinuate, slightly recurved, apex acute, obtuse, or rounded. Flowers solitary and terminal, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicel 1–2 cm, usually glabrous, rarely sparsely hirsute. Calyx glabrous, except yellow hirsute inside lobes; tube broadly cylindrical, 8–12 mm, base rounded or truncate, enlarging in fruit; lobes triangular, 3–4 × ca. 3 mm. Corolla white or various shades of yellow, 2.5–3 cm, outside glabrous, inside densely white- or yellow villous at throat; lobes obovate-oblong or obovate-elliptic, 14–16 × 5–7

mm, apex often very sparsely brown villous. Capsule subequal to calyx in length; style exceeding corolla tube. Fl. Jul–Aug.

- Grassy slopes; 2700–3600 m. SW Sichuan, NE and NW Yunnan.

- 1a. Flowers yellow, pale yellow, or greenish yellow; leaves broadly ovate, apex typically obtuse or rounded ..... 6a. subsp. *flavus*
- 1b. Flowers white; leaves elliptic or obovate-lanceolate, apex typically acute ..... 6b. subsp. *montanus*

**6a. *Cyananthus flavus* subsp. *flavus***

黄钟花(原亚种) huang zhong hua (yuan ya zhong)

*Cyananthus flavus* var. *glaber* C. Y. Wu.

Leaves broadly ovate, apex obtuse. Flowers yellow, pale yellow, or greenish yellow.

- Grassy slopes; 3100–3600 m. NW Yunnan (Lijiang, Zhongdian).

**6b. *Cyananthus flavus* subsp. *montanus*** (C. Y. Wu) D. Y. Hong & L. M. Ma, Acta Phytotax. Sin. 29: 46. 1991.

白钟花 bai zhong hua

*Cyananthus montanus* C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 89. 1965, based on *Wahlenbergia mairei* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 285. 1913; *Atropanthe mairei* (H. Léveillé) H. Léveillé; *C. albiflorus* D. F. Chamberlain, nom. illeg. superfl.; *C. mairei* (H. Léveillé) Cowan (1938), not H. Léveillé (1916).

Leaves elliptic or obovate-lanceolate, apex acute. Flowers white.

- Grassy slopes; 2700–3400 m. SW Sichuan (Xichang, Zhaojue), NE Yunnan (Huize).

**7. *Cyananthus longiflorus*** Franchet, J. Bot. (Morot) 1: 280. 1887.

长花蓝钟花 chang hua lan zhong hua

*Cyananthus argenteus* C. Marquand; *C. obtusilobus* C. Marquand.

Caudexes robust, ± lignified, branched, with some scales toward apex; scales ovate, ca. 2 mm. Stems caespitose, erect, 4–22 cm tall, lignified toward base, densely gray-white lanate; branches very short. Leaves alternate; blade elliptic or ovate, 5–15 × 2–8 mm, abaxially densely silvery sericeous, adaxially sparsely puberulent or glabrescent, base cuneate, margin revolute, entire, apex acute or obtuse; petiole 2–4 mm. Flowers solitary, terminal on main stems and branches, subsessile, subtended by a whorl-like aggregation of 3–5 leaves. Calyx villous; tube cylindrical, 10–15 mm at anthesis; lobes triangular or lanceolate, 3–7 mm, pubescent throughout. Corolla blue-purple, tubular-campanulate, 3.5–5 cm, outside glabrous, inside densely villous at throat; lobes obovate-oblong, ca. 1/2 as long as to equaling tube, with a setose tuft at apex. Style almost extending up to corolla throat. Capsules slightly longer than calyx at maturity. Seeds oblong, ca. 1.3 mm. Fl. Jul–Sep.

- *Pinus* forests, dry slopes, sand dunes; 2800–4300 m. W Yunnan.

2. *Cyananthus* sect. *Cyananthus*

宽瓣组 kuan ban zu

Plants perennial. Caudex densely clothed in persistent and straw-colored scales. Calyx densely covered only with brown-black setae, or mixed with such hairs. Corolla lobes suborbicular, broadly ovate or oblong, as long as or slightly longer than broad.

Nine species: SW China, Himalaya; six species (two endemic) in China.

**8. *Cyananthus lobatus*** Wallich ex Benth in Royle, Ill. Bot. Himal. Mts. 1: 309. 1836.

裂叶蓝钟花 lie ye lan zhong hua

*Cyananthus lobatus* var. *farreri* C. Marquand.

Roots carrot-shaped, up to 1.3 cm in diam. Caudexes robust, branched, with persistent scales toward apex; scales ovate or lanceolate, ca. 4 mm. Stems caespitose, decumbent or ascending, 10–50 cm, simple or branched, sparsely villous toward apex. Leaves alternate, sessile or with petiole less than 5 mm; blade obovate, oblanceolate, spatulate, or rhombic, 7–35 × 5–18 mm, subleathery, abaxially villous, adaxially sparsely hispidulous or glabrescent, base cuneate, margin slightly revolute, 3–9-parted or -lobed toward apex. Flowers solitary, terminal on main stems and branches; pedicels 1–3 cm, brown hirsute. Calyx tube cylindrical, 0.3–1.5 cm, densely brown-red to brown-black hispid; lobes triangular to lanceolate, 1/4–1/2 as long as tube, both sides brown hispid. Corolla pale blue to blue-purple, tubular-campanulate, 3–5.5 cm, outside glabrous, inside densely villous at throat; lobes suborbicular, almost 1/2 as long as tube, apex with a tuft of short brown hairs in center. Ovary conical, subequal to calyx tube in length; style extending up to middle part of corolla; stigma large, 5-fid. Fl. Aug–Sep.

Grassy slopes, forests; 2800–4500 m. SE Xizang (Nyingchi, Yadong, Zayü), NW Yunnan (Bijiang, Gongshan, Weixi) [Bhutan, N India, N Myanmar, Nepal].

"*Cyananthus insignis*" (R. E. Grahame, Gard. Chron., ser. 3, 107: 10. 1940) belongs here but was not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

**9. *Cyananthus pedunculatus*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 434. 1881.

有梗蓝钟花 you geng lan zhong hua

Roots carrot-shaped, up to 1.2 cm in diam. Caudexes robust, branched, covered with persistent scales toward apex; scales straw-colored, elliptic to lanceolate. Stems caespitose, ascending or sprawling, 10–20 cm, usually simple, hispidulous. Leaves alternate, gradually increasing in size toward apex, subsessile; blade elliptic, ovate-lanceolate, lanceolate, or linear-lanceolate, 7–16 × 2–6 mm, both surfaces hispidulous, base rounded, obtuse, or cuneate, margin entire or shallowly sinuous above middle. Flowers solitary, terminal; pedicels 1.2–4 cm, brown- or black villous. Calyx densely brown-black hirsute; tube cylindrical, 9–15 × 5–10 mm; lobes lanceolate-triangular, 2/5–1/2 as long as tube. Corolla purple-blue, funnelform-campanulate, 2.5–4.5 cm, throat glabrous or sparsely villous; lobes suborbicular, ca. 1/2 as long as tube, apex with brown hirsute tuft. Ovary subequal to calyx in length; style extending up to corolla throat; stigma 5-fid. Fl. Aug–Sep.

Alpine scrub; 3600–4900 m. S Xizang (Yadong) [Bhutan, NE India, Nepal].

**10. *Cyananthus sericeus*** Y. S. Lian, Acta Phytotax. Sin. 17(3): 122. 1979.

绢毛蓝钟花 juan mao lan zhong hua

Caudexes robust, branched, densely covered with narrowly ovate or ovate-oblong persistent scales toward apex; scales 3–5 mm. Stems slender, 20–30 cm tall, densely sericeous when young, eventually glabrescent. Leaves alternate, those toward base scalelike, ca. 2 × 1 mm, sparsely villous; blade of middle and upper leaves narrowly elliptic, 8–12 × 2–4 mm, abaxially densely retrorsely and appressed sericeous, adaxially glabrous or sparsely hairy. Flowers solitary and terminal, subtended by a whorl-like aggregation of 3 or 4 leaves; pedicels 5–12 mm, brown- or black villous. Calyx densely brown- or black hirsute; tube cylindrical, 15–20 × 9–11 mm; lobes lanceolate-triangular, ca. 1/2 as long as tube, margin white villous. Corolla blue, with darker blue veins, 3.5–4 cm, glabrous; lobes broadly obovate, ca. 1/2 as long as tube. Ovary conical, slightly shorter than calyx. Style almost extending up to corolla throat. Fl. Sep.

• Rocky crevices; 3500–3600 m. SE Xizang (Cona).

**11. *Cyananthus microphyllus*** Edgeworth, Trans. Linn. Soc. London 20: 81. 1846.

小叶蓝钟花 xiao ye lan zhong hua

*Cyananthus linifolius* Wallich ex J. D. Hooker & Thomson, nom. illeg. superfl.; *C. nepalensis* Kitamura.

Caudexes robust, branched, densely covered with scales toward apex; scales elliptic to lanceolate, ca. 5 × 2 mm. Stems brownish red, slender, 5–25 cm, branched toward base, glabrous or sparsely puberulent. Leaves alternate, almost sessile; blade ovate, lanceolate, or linear-elliptic, 5–13 × 1.5–5 mm, abaxially sericeous, adaxially glabrous, base rounded to subcordate, margin revolute, entire, or sinuous, apex obtuse or acute. Flowers solitary and terminal; pedicels 3–10 mm, brown- or black setose. Calyx brown- or black setose; tube cylindrical, 7–10 mm, base truncate; lobes triangular, 1/2–2/3 as long as tube, both sides hairy. Corolla blue-purple or blue, cylindrical-campanulate, 1.8–2.8 cm, glabrous or brown- or black setose, densely white fimbriate villous inside; lobes obovate-oblong, subequal to tube in length. Ovary conical, nearly as long as calyx; style extending up to corolla throat. Seeds shiny brown, oblong, ca. 2 × 0.5–0.7 mm. Fl. Sep.

Mountain slopes; 3300–4300 m. S Xizang (Nyalam) [N India, Nepal].

Chinese plants are *Cyananthus microphyllus* subsp. *microphyllus*; *C. microphyllus* subsp. *williamsonii* K. K. Shrestha is known only from Nepal.

**12. *Cyananthus cordifolius*** Duthie, Bull. Misc. Inform. Kew 1912: 37. 1912.

心叶蓝钟花 xin ye lan zhong hua

Caudexes robust, branched. Stems decumbent, slender, 14–27 cm, sparsely arachnoid-villous, sterile-branched at middle. Leaves alternate, subsessile, those of main stem with blade cordate to triangular-ovate, 10–15 × 5–9 mm, abaxially sparsely villous, adaxially glabrous or sparsely puberulent, base cordate, obtuse, or rounded, margin serrate, apex acute or obtuse; leaves on sterile branches with blade much smaller, elliptic-ovate, almost entire, base rounded or rarely cordate. Flowers solitary and terminal; pedicels 5–18 mm, brown- or black setose. Calyx densely brown- or black setose; tube cylindrical, 11–16 × 5–8 mm, base truncate; lobes lanceolate-triangular, slightly shorter than tube, inside both black- and white villous. Corolla blue or pale blue, cylindrical-campanulate, 2.5–3.5 cm, densely villous at throat; lobes oblong, 12–15 × 5–6 mm. Ovary conical-ovoid, slightly shorter than calyx; style extending up to corolla throat. Fl. Aug.

Mountain thickets; 3000–4000 m. S Xizang (Gyirong) [NW India, Nepal].

**13. *Cyananthus sherriffii*** Cowan, New Fl. & Silva 10: 181. 1938.

杂毛蓝钟花 za mao lan zhong hua

Caudexes robust, somewhat lignified, branched, densely covered toward apex with persistent scales; scales oblong or lanceolate, up to 10 mm. Stems caespitose, dark brown, slender, 5–15 cm, sparsely arachnoid-pubescent. Leaves alternate, gradually increasing in size toward apex, sessile or shortly petiolate; blade linear or narrowly elliptic, 4–8 × 1–3 mm, abaxially silvery sericeous, adaxially sparsely arachnoid-villous along midvein. Flowers solitary, terminal on longer stems, subtended by a whorl-like aggregation of 4 or 5 leaves that are 8–12 × 2–3.5 mm; pedicels 5–8 mm. Calyx glaucous and densely brown- or black setose; tube cylindrical, 10–15 × 5–7 mm, base truncate; lobes triangular or lanceolate, ca. 1/3 as long as tube, both sides pubescent. Corolla blue or gray-blue, cylindrical-campanulate, ca. 2.5 cm, outside glabrous, inside villous at throat; lobes oblong, apex with a brown villous tuft. Ovary conical, nearly as long as calyx; style extending up to corolla throat; stigma 5-fid. Fl. Jul–Aug.

• Alpine meadows or thickets; 3200–5000 m. S Xizang (Lhünzê, Nangxian).

**3. *Cyananthus* sect. *Annui*** (Y. S. Lian) D. Y. Hong & L. M. Ma, Acta Phytotax. Sin. 29: 48. 1991.

蓝钟花组 lan zhong hua zu

*Cyananthus* subsect. *Annui* Y. S. Lian in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 183. 1983.

Plants annual, lacking a caudex. Calyx sometimes 4-lobed. Corolla sometimes 3- or 4-lobed. Ovary sometimes 3- or 4-locular.

Four species: Himalaya and the Hengduan Mountains; four species (two endemic) in China.

**14. *Cyananthus lichiangensis*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 109. 1913.

丽江蓝钟花 li jiang lan zhong hua

Stems caespitose, 10–30 cm tall, glabrous, simple or with slender branches. Leaves sparse, alternate; petiole 2–5 mm, villous; blade ovate or triangular, 5–13 × 5–11 mm, both surfaces hispidulous, base truncate or obtuse, margin revolute, entire, sinuous, or crenulate, apex obtuse. Flowers solitary, terminal on both main stems and branches, subtended by a whorl-like aggregation of 4 or 5 leaves; pedicels 2–5 mm, glabrous. Calyx with red-brown setae outside, base of setae swollen, often black verrucose; tube cylindrical, 8–10 × 6–9 mm; lobes obovate-oblong or obdeltoid, ca. 1/3 as long as tube, broadest part at or above middle, outside sparsely red-brown setose, inside appressed red-brown villous. Corolla pale or greenish yellow, sometimes blue- or purple striate, cylindrical-campanulate, ca. 2 × as long as calyx tube, outside glabrous, inside densely villous at throat; lobes oblong, 1/3–1/2 as long as tube, apex acute or obtuse. Ovary nearly as long as calyx tube; style extending up to corolla throat. Capsules exerted beyond calyx at maturity. Seeds oblong, ca. 1 × 0.5 mm, obtuse at both ends. Fl. Aug.

• Grassy slopes, grassy places at forest margins; 3000–4000 m. SW Sichuan, Xizang, N Yunnan (Dêqên, Lijiang, Zhenxiang).

**15. *Cyananthus fasciculatus*** C. Marquand, Bull. Misc. Inform. Kew 1924: 247. 1924.

束花蓝钟花 shu hua lan zhong hua

Stems 30–100 cm, branched, glabrous or sparsely villous; branches long and spreading. Leaves alternate, scattered; petiole slender, 5–10 mm, glabrous or sparsely villous; blade ovate or suborbicular, 4–16 × 4–15 mm, abaxially usually glabrous, adaxially sparsely hispidulous, base obtuse, truncate, or subcordate, apex rounded or obtuse. Flowers in dichasia, aggregated at top of main stems and branches, subtended by whorl-like aggregations of 4 or 5 leaves; pedicels 2–4 mm, slender, glabrous. Calyx moderately to densely brown setose; tube subcylindrical, broader toward rounded base, 5–8 × 3–5 mm; lobes usually 5 (some on lower branches with only 4), narrowly triangular, ciliate. Corolla pale blue, cylindrical-campanulate, 14–17 mm, outside glabrous, inside villous near throat; lobes (4 or) 5, obovate-oblong, ca. 5 × 1.5–3 mm. Ovary subequaling calyx tube; style exerted above corolla tube. Capsules exceeding calyx at maturity. Seeds ellipsoid, ca. 0.5 × 0.2 mm, both ends acute. Fl. Sep–Oct.

• Forests, thickets, grassy slopes; 2400–3500 m. W Sichuan, N Yunnan.

**16. *Cyananthus inflatus*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 21. 1857.

胀萼蓝钟花 zhang e lan zhong hua

*Cyananthus forrestii* Diels; *C. pseudoinflatus* P. C. Tsoong.

Stems erect or ascending, up to 80 cm, branched, sparsely villous or glabrous. Leaves alternate, sparse; petiole slender, 2–7 mm, villous; blade orbicular, ovate, or triangular, 5–15 × 3–10 mm, abaxially hirsute, adaxially hispidulous, base rounded, truncate, or obtuse, margin entire or obscurely crenulate, apex obtuse. Flowers usually solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves; pedicels 2–5 mm, slender, brown hirsute. Calyx densely brown hirsute outside; tube urceolate at anthesis, 7–12 mm, becoming conspicuously inflated after flowering; lobes 5, deltoid, 1/4–2/5 as long as tube, both sides brown hirsute. Corolla pale blue, cylindrical-campanulate, almost 2 × as long as calyx, outside glabrous, inside densely villous at throat; lobes 5, narrowly obovate, nearly 1/2 as long as tube. Ovary slightly shorter than calyx; style extending up to corolla throat. Capsules ovoid, exceeding calyx in height at maturity, 5-loculicidal. Seeds brown-red, ellipsoid, ca. 0.5 × 0.2 mm, obtuse at both ends. Fl. Aug–Sep.  $2n = 14$ .

Alpine meadows, grassy and shrubby slopes; 1900–4900 m. W Guizhou (Weining), W Sichuan, S Xizang, N Yunnan [Bhutan, N India, Myanmar, Nepal].

**17. *Cyananthus hookeri*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 435. 1881.

蓝钟花 lan zhong hua

*Cyananthus cronquistii* K. K. Shrestha; *C. hookeri* var. *densus* C. Marquand; *C. hookeri* var. *grandiflorus* C. Marquand; *C. hookeri* var. *hispidus* Franchet; *C. hookeri* var. *levicalyx* Y. S. Lian; *C. hookeri* var. *levicaulis* Franchet.

Stems usually caespitose, suberect or ascending, 4–20 cm, glabrous to rather densely villous; branches 1.5–10 cm. Leaves alternate; blade rhombic or ovate, 3–7 × 2–6 mm, abaxially sparsely to rather densely hirsute, adaxially sparsely to rather densely hispidulous, base obtuse or truncate, abruptly attenuate into petiole, margin crenate or sometimes entire, apex obtuse or subacute; petiole 1–4 mm. Flowers small, solitary, terminal on main stems and branches, subtended by a whorl-like aggregation of 3–5 leaves, almost sessile. Calyx densely hirsute outside with long stiff yellow-brown hairs, rarely subglabrous; tube ovoid, 3–8 mm; lobes (3 or)4(or 5), triangular, 1/3–1/2 as long as tube, both sides hirsute. Corolla purple-blue, cylindrical, 7–15 mm, outside glabrous, inside densely villous at throat; lobes usually (3 or)4(or 5), narrowly obovate or oblong, apex often with 3 or 4 brown-yellow villous hairs. Stamens 4. Style extending above corolla throat; stigma 4-fid. Capsules ovoid, exerted above calyx at maturity. Seeds narrowly ovoid, ca. 1.2 × 0.4 mm. Fl. Aug–Sep.

Thickets, grasslands; 2700–4500 m. SE Gansu (Tao He basin), S Qinghai (Tongren, Yushu), W Sichuan (W of Kangding and Lixian), E Xizang (E of Namling), N Yunnan [Bhutan, NE India (Sikkim), Nepal].

## 2. LEPTOCODON (J. D. Hooker & Thomson) Lemaire, Ill. Hort. 3. Misc. 49. 1856.

细钟花属 xi zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Codonopsis* subg. *Leptocodon* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, A. 1855.

Vines, perennial. Stems slender. Leaves alternate, but on branches often opposite or subopposite. Flowers solitary, outside axils, less frequently in axils, or opposite to leaves. Calyx 5-lobed, tube broadly obconical. Corolla tubular, 5-lobed. Stamens 5; filaments long, base slightly dilated, alternate with 5 free, lamellar glands. Ovary semi-inferior, with superior part narrowly conical, 3-locular; style long; stigma 3-fid, segments clavate. Capsule 3-loculicidal at superior part. Seeds numerous.

Two species: Bhutan, SW China, N India, N Myanmar, E Nepal; two species (one endemic) in China.

- 1a. Plants glabrous throughout except young leaves sparsely villous; calyx lobes linear-oblong, often reflexed, distant from each other, glabrous, base clawlike ..... 1. *L. gracilis*  
 1b. Plants ± hairy, rarely sparsely villous only on leaf margin; calyx lobes ovate to narrowly ovate, not reflexed, overlapping each other, at least villous on margin, base obtuse, truncate, or cordate, but not clawlike ..... 2. *L. hirsutus*

**1. *Leptocodon gracilis*** (J. D. Hooker & Thomson) Lemaire, Ill. Hort. 3: Misc. 49. 1856.

细钟花 xi zhong hua

*Codonopsis gracilis* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, A. 1855; *Campanumoea gracilis* (J. D. Hooker & Thomson) G. Nicholson.

Plants glabrous throughout except young leaves sparsely villous, odorless. Roots unknown. Stems long, slender, branched. Leaves alternate, rarely those on branchlets opposite, long petiolate; blade abaxially gray, adaxially green, ovate-orbicular, 0.9–2.5 × 0.9–2.5 cm, membranous, base truncate or obtuse, margin sinuate-crenate, apex obtuse. Flowers pendent; pedicels slender, 1–5 cm, straight or curved. Calyx glabrous;

tube 2–3 mm; lobes narrowly oblong, 5–8 × 1–2 mm, margin with 1 or 2 pairs of callose serratures. Corolla blue or purple, 2.8–3.5 cm; tube ca. 4 mm in diam.; limb 1–1.5 cm in diam.; lobes triangular, 4–5 mm. Filaments ca. 2 cm. Style ca. 2 cm. Inferior part of capsule semiglobose or obconic, 4–5 mm; superior part conical or ovoid, 8–10 mm. Seeds red-brown, linear-oblong, 1.5–1.8 mm, smooth. Fl. Aug–Oct.

Forests, thickets; 2000–2500 m. SW Sichuan (Huili, Muli, Yanbian), NW Yunnan [Bhutan, N India, N Myanmar, E Nepal].

**2. *Leptocodon hirsutus*** D. Y. Hong, Acta Phytotax. Sin. 18: 246. 1980.

毛细钟花 mao xi zhong hua

*Codonopsis hirsuta* (D. Y. Hong) K. E. Morris & Lammers

(1999), not (Handel-Mazzetti) D. Y. Hong & L. M. Ma (1992); *C. hongii* Lammers.

Plants malodorous. Roots slender, not thickened. Stems hirsute on young parts. Leaves on main stems alternate, those on branchlets almost opposite, all leaves long petiolate; blade abaxially villous, rarely extremely sparsely villous. Flowers subopposite to leaves. Calyx lobes ovate, overlapping each

other at anthesis, separated at fruiting, upright, 5–7 × 3–4 mm, hirsute on abaxial side and margin, base cordate or subtruncate, not clawlike, margin sinuate-crenate. Inferior part of capsule semiglobose, 8–10 mm in diam.; superior part conical, ca. 10 mm. Seeds ellipsoid, ca. 1 mm. Fl. Jul–Aug, fr. Oct–Nov.

- Mixed forests, thickets, grasslands; 2000–2700 m. SE Xizang (Bomi, Cona, Zayü), NW Yunnan (Gongshan, Weixi).

### 3. CODONOPSIS Wallich in Roxburgh, Fl. Ind. 2: 103. 1824.

党参属 dang shen shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Glosocomia* D. Don.

Herbs, perennial, often fetid. Roots thickened, carrot-shaped, fusiform, or tuberous, mostly fleshy, rarely lignified. Stems erect, ascending, climbing, procumbent, or twining. Leaves alternate, opposite, or fascicled (pseudovercillate). Flowers solitary, terminal on main stems and branches, sometimes opposite to leaves, rarely axillary. Calyx tube variously adnate to ovary, often 10-ribbed; lobes 5. Corolla epigynous, 5-lobed for less than 1/2 its length and campanulate, funnellform, or tubular, or 5-fid for more than 3/4 its length and rotate, various shades of purple and blue, yellow, green, or white. Stamens 5; filaments often dilated at base, glabrous or hairy, rarely alternating with lamellar glands; anthers basifixed, connective glabrous or setose. Ovary inferior or at least inferior to corolla, 3-locular; ovules numerous; style glabrous or hairy; stigma usually 3-fid, lobes broad. Fruit with persistent calyx, an ovoid or obconic loculicidal capsule. Seeds numerous, ellipsoid, oblong, or globose, winged or wingless, smooth, faintly striate, or reticulate; embryo straight, embedded in copious endosperm.

Forty-two species: C, E, and S Asia; 40 species (24 endemic) in China.

- 1a. Plants usually not fetid; fruit an obconic capsule, dehiscent apex relatively short; seed testa smooth or finely striate.
  - 2a. Corolla campanulate, lobed for less than 1/2 its length (2. *C.* subg. *Obconicapsula*) ..... 36. *C. dicentrifolia*
  - 2b. Corolla rotate, divided for more than 3/4 its length (3. *C.* subg. *Pseudocodonopsis*).
    - 3a. Stem erect or procumbent, scapiform; leaves rosulate ..... 37. *C. rosulata*
    - 3b. Stem twining or suberect; leaves opposite or alternate, not rosulate.
      - 4a. Stem usually more than 1 m, twining and leafy throughout ..... 39. *C. convolvulacea*
      - 4b. Stem usually less than 1 m, erect or twining only at apex; leaves mostly aggregated toward stem base.
        - 5a. Stem and adaxial surface of leaves hirsute; leaves ovate, serrate ..... 38. *C. hirsuta*
        - 5b. Stem and leaves glabrous; leaves linear, entire ..... 40. *C. graminifolia*
- 1b. Plants commonly fetid; fruit an ovoid capsule, dehiscent apex elongate; seeds reticulate (1. *C.* subg. *Codonopsis*).
  - 6a. Stem twining, leafy throughout, often over 1 m (*C.* sect. *Codonopsis*).
    - 7a. Leaves pseudovercillate, in fascicles of 3 or 4 at apex of lateral branches.
      - 8a. Roots usually fusiform; leaf apex acute; calyx lobes 2–3 cm; corolla 2.5–3.5 cm; seeds winged ..... 1. *C. lanceolata*
      - 8b. Roots tuberous; leaf apex obtuse; calyx lobes 1–1.5 cm; corolla 2–2.5 cm; seeds terete ..... 2. *C. ussuriensis*
    - 7b. Leaves alternate or opposite, not pseudovercillate.
      - 9a. Corolla tubular.
        - 10a. Leaves deeply incised, large serrate, base cordate to broadly cuneate ..... 14. *C. deltoidea*
        - 10b. Leaves shallowly incised, serrate, or subentire, base cuneate to rounded ..... 15. *C. tubulosa*
      - 9b. Corolla campanulate, globose-campanulate, or tubular-campanulate.
        - 11a. Calyx lobes linear to linear-lanceolate, well separated, 10–20 × 2–3 mm, length/width ratio > 5 ..... 8. *C. viridis*
        - 11b. Calyx lobes wider, proximate, length/width ratio < 3.
          - 12a. Calyx ± pubescent.
            - 13a. Leaves less than 3 × 3 cm; calyx tube hirsute, lobes ovate-orbicular or rhombic-ovate, dentate and hirsute; corolla globose-campanulate ..... 6. *C. subglobosa*
            - 13b. Leaves much more than 3 × 3 cm; calyx tube sparsely hairy, lobes narrowly oblong or lanceolate, subentire, densely puberulent; corolla broadly campanulate ..... 7. *C. affinis*
      - 12b. Calyx glabrous.
        - 14a. Lower leaves cordate, truncate, or rounded at base.
          - 15a. Stem almost simple; leaves subentire or slightly sinuous on margins ..... 3. *C. cordifolioidea*
          - 15b. Stem branched; leaves serrate on margins.

- 16a. Corolla large, more than  $1.5 \times 1.7$  cm, usually longer than calyx lobes ..... 4. *C. pilosula*  
 16b. Corolla small, less than  $1 \times 1.5$  cm, shorter than or subequal to calyx lobes ..... 5. *C. micrantha*
- 14b. Lower cauline leaves cuneate or rounded (occasionally cordate) at base.  
 17a. Stems and leaves glabrous; leaves entire.  
 18a. Leaves  $0.5\text{--}2 \times 0.5\text{--}1.5$  cm, apex acute or obtuse ..... 9. *C. farreri*  
 18b. Leaves  $6\text{--}7 \times 2\text{--}2.5$  cm, apex shortly acuminate ..... 10. *C. rotundifolia*
- 17b. Stems and leaves  $\pm$  hairy; leaves crenulate or serrate on margins.  
 19a. Calyx lobes ciliate, reflexed ..... 11. *C. henryi*  
 19b. Calyx lobes glabrous, not reflexed.  
 20a. Leaf blade  $3\text{--}15 \times 1\text{--}7$  cm, apex acuminate ..... 12. *C. levicalyx*  
 20b. Leaf blade up to  $2.3 \times 1.7$  cm, apex rounded or acute ..... 13. *C. kawakamii*
- 6b. Stems erect or ascending (sometimes climbing or procumbent but not twining), often scapiform, less than 1 m tall (*C. sect. Erectae*).  
 21a. Stems without branches like pinnate leaves and usually sterile.  
 22a. Corolla tubular or tubular-campanulate; filaments villous; stems mostly procumbent or climbing.  
 23a. Corolla 2–4 cm, yellow-green, base shaded brown-red, glabrous ..... 16. *C. benthamii*  
 23b. Corolla only ca. 1.7 cm, yellowish, with purple-blue spots, densely puberulent outside ..... 17. *C. pianmaensis*
- 22b. Corolla campanulate; filaments not villous; stems mostly erect or scapiform.  
 24a. Leaves located at lower part of stems, main stems scapiform.  
 25a. Petiole 2–7 cm, leaf blade  $2\text{--}13 \times 1.5\text{--}5$  cm; main stem with 1–4 flowers; calyx lobes  $5\text{--}7 \times$  ca. 3 mm, with sinus between them broad and obtuse; corolla less than 1.5 cm wide ..... 19. *C. subscaposa*  
 25b. Petiole less than 1 cm, leaf blade  $5\text{--}8 \times 1.5\text{--}3$  cm; main stem with 1 or 2 flowers; calyx lobes  $8\text{--}12 \times 4\text{--}6$  mm, with sinus between them narrow; corolla up to 3 cm wide ..... 20. *C. meleagris*
- 24b. Leaves evenly arranged on main stems, not scapiform.  
 26a. Leaves opposite; plants glabrous throughout ..... 21. *C. purpurea*  
 26b. Leaves alternate.  
 27a. Plants  $\pm$  hairy; corolla less than 2 cm ..... 18. *C. subsimplex*  
 27b. Plants glabrous; corolla more than 3.5 cm.  
 28a. Leaves lanceolate, 1.5–6.5 cm, entire; calyx lobes narrowly lanceolate,  $18\text{--}20 \times 2\text{--}3$  mm ..... 23. *C. gombalana*  
 28b. Leaves broadly lanceolate,  $5\text{--}14 \times 3\text{--}7$  cm, serrate; calyx lobes  $20\text{--}30 \times 6\text{--}10$  mm ..... 24. *C. chimiliensis*
- 21b. Stems with branches like pinnate leaves and usually sterile.  
 29a. Veins on leaves conspicuous, leaf margins revolute forming thick periphery.  
 30a. Corolla broadly tubular, ca. 1.2 cm; lower slender branches sometimes fertile ..... 35. *C. bhutanica*  
 30b. Corolla campanulate, more than 1.5 cm; lower slender branches sterile.  
 31a. Leaves subentire; flowers entirely glabrous.  
 32a. Leaves not more than  $1.8 \times 1.5$  cm, sparsely puberulent abaxially; corolla purple-green, with purple veins ..... 30. *C. alpina*  
 32b. Leaves up to  $3.2 \times 2.6$  cm, glabrous on both surfaces; corolla pale blue, with red-brown spots inside ..... 31. *C. cardiophylla*
- 31b. Leaves crenulate; flowers  $\pm$  hairy on some parts.  
 33a. Calyx lobes  $5\text{--}7 \times 2\text{--}3$  mm, with sinus between them broad and obtuse ..... 34. *C. chlorocodon*  
 33b. Calyx lobes more than 10 mm, with sinus between them narrow and acute.  
 34a. Corolla glabrous throughout; calyx tube mostly glabrous, lobes ovate or ovate-lanceolate, broadest at middle, hispidulous only at apex outside ..... 32. *C. viridiflora*  
 34b. Corolla villous inside; calyx tube mostly hairy, lobes narrowly triangular, broadest at base, mostly entirely hispidulous ..... 33. *C. tsinlingensis*
- 29b. Veins on leaves inconspicuous, leaf margins not revolute.  
 35a. Corolla tubular or tubular-campanulate, at least lower part tubular.  
 36a. Corolla tubular; connective setose ..... 25. *C. thalictrifolia*  
 36b. Corolla tubular-campanulate, lower half tubular but abruptly expanded at middle; connective glabrous ..... 26. *C. bulleyana*
- 35b. Corolla broadly campanulate.  
 37a. Plants white with dense white hairs; leaf blade less than  $1.5 \times 1$  cm ..... 28. *C. canescens*  
 37b. Plants green with sparse hairs; leaf blade usually larger.  
 38a. Calyx lobes  $15\text{--}20 \times 6\text{--}8$  mm, hairy only at apex; leaf blades  $1\text{--}5 \times 0.8\text{--}3.2$  cm ..... 22. *C. clematidea*  
 38b. Calyx lobes much smaller, hairy throughout; leaf blades mostly smaller.  
 39a. Corolla villous both inside and outside ..... 29. *C. argentea*  
 39b. Corolla glabrous or hairy only toward lobes outside ..... 27. *C. foetens*

1. *Codonopsis* subg. *Codonopsis*

党参亚属 dang shen ya shu

Plants fetid, often strongly so. Roots carrot-shaped, fusiform, or tuberous. Stems erect, ascending, climbing, procumbent, or twining. Corolla epigynous, 5-lobed for less than 1/2 its length and campanulate, funnelliform, or tubular. Fruit an ovoid loculicidal capsule or globose berry. Seed testa reticulate.

Thirty-seven species: Tajikistan to Russia (Far East), Japan, and Indonesia (Java); 35 species (21 endemic) in China.

Species nos. 1–15, with stem twining, leafy throughout, often over 1 m, are assigned to *Codonopsis* sect. *Codonopsis*. Species nos. 16–35, with stems erect or ascending, often scapiform, sometimes climbing or procumbent but never twining, less than 1 m tall, belong to *C.* sect. *Erectae* (Komarov) D. Y. Hong.

1. *Codonopsis lanceolata* (Siebold & Zuccarini) Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 46. 1879.

羊乳 yang ru

*Campanumoea lanceolata* Siebold & Zuccarini, Fl. Jap. 1: 174. 1841; *C. japonica* Siebold ex E. Morren; *Codonopsis bodinieri* H. Léveillé; *Glosocomia lanceolata* (Siebold & Zuccarini) Maximowicz.

Plants glabrous throughout or occasionally sparsely villous on stems and leaves. Caudexes subcylindrical. Roots usually fusiform-thickened, 10–20 × 1–6 cm. Stems twining, yellow-green but with purplish shade, more than 100 cm, often branched. Leaves on main stems alternate, lanceolate, ovate, or elliptic, 8–14 × 3–7 mm; usually leaves 2–4-fascicled on top of branchlets, subopposite or verticillate, petiole 1–5 mm; blade abaxially gray-green, adaxially green, ovate, narrowly ovate, or elliptic, 3–12 × 1.3–5.5 cm, abaxially rarely hirsute, veins obvious, base attenuate or sometimes rounded, margin usually entire or sparsely sinuate, occasionally revolute and hispid, apex acute or obtuse. Flowers solitary or paired on top of branchlets; pedicels 1–9 cm. Calyx adnate to ovary by half; tube hemispherical; lobes ovate or deltoid, 1–3 × 0.5–1 cm, entire, acute; sinus between calyx lobes acute or gradually becoming broader after anthesis. Corolla broadly campanulate, 2–4 × 2–3.5 cm, shallowly lobed; lobes yellow-green or milk-white, with purple spots, deltoid, 0.5–1 cm, revolute. Disk dark green, fleshy. Filaments subulate, slightly dilated at base, 4–6 mm; anthers 3–5 mm; ovary inferior. Capsule hemispherical at base, rostrate toward apex, 1.6–3.5 cm in diam. Seeds numerous, brown, winged, seed body oblong or ellipsoid. Fl. and fr. Jul–Aug.  $2n = 16$ .

Shrublands, broad-leaved forests; 200–1500 m. Anhui, Fujian, Hebei, Henan, Hubei, Hunan, Jiangsu, Shandong, Shanxi, Zhejiang [Japan, Korea, Russia (Far East)].

2. *Codonopsis ussuriensis* (Ruprecht & Maximowicz) Hemslley, J. Linn. Soc., Bot. 26: 6. 1889.

雀斑党参 que ban dang shen

*Glosocomia ussuriensis* Ruprecht & Maximowicz, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 223. 1857; *Codonopsis lanceolata* (Siebold & Zuccarini) Trautvetter var. *ussuriensis* (Ruprecht & Maximowicz) Trautvetter; *G. lanceolata* (Siebold & Zuccarini) Maximowicz var. *ussuriensis* (Ruprecht & Maximowicz) Regel.

Plants glabrous throughout, or stems and leaves sparsely villous. Roots gray-yellow, tuberous or oblong, 1–3 cm in diam.

Stems twining, green, white, or dark-purple, slender, glabrous or internodes sparsely villous. Leaves on main stems alternate, lanceolate or ovate, smaller, those on top of branches usually 3–5-fascicled, pseudoverticillate; petiole short; blade abaxially gray-green, adaxially green, elliptic, lanceolate, or oblong, 2–6 × 1–2.5 cm, abaxially glabrous or sparsely villous, adaxially glabrous, base attenuate, margin entire, occasionally revolute, apex acute or obtuse. Flowers solitary, terminal on slender branches; pedicels 2–5 cm; bracts single, small, lanceolate or narrowly ovate. Calyx tube adnate to ovary up to its middle, semiglobose; lobes narrowly lanceolate or ovate-deltoid, 10–20 × 6–8 mm, margin entire, apex acute. Corolla campanulate, 2–3 × 1.5–2.5 cm, shallowly lobed; lobes dark purple, deltoid, inside with remarkable black-purple stripes or black spots. Filaments 3–5 mm, slightly dilated at base; anthers 2–4 mm. Capsules hemispherical at base, rostrate toward apex, ca. 15 mm. Seeds numerous, dark brown, lucid, ovoid, wingless. Fl. Jul–Aug.  $2n = 16$ .

Ravines, moist meadows, mostly in sandy soil; ca. 800 m. E Heilongjiang, E Jilin [Japan, Korea, Russia (Far East)].

3. *Codonopsis cordifolioidea* P. C. Tsoong, Contr. Inst. Bot. Natl. Acad. Peiping 3: 93. 1935.

心叶党参 xin ye dang shen

Plants glabrous or subglabrous or only leaves sparsely shortly setose. Stems twining, more than 1 m, with a few very short branches. Leaves on main stems lax, alternate, ca. 10 cm distant between 2 leaves; petiole filiform, 5–9 cm; blade abaxially gray-green, adaxially green, broadly ovate, up to 10 × 7 cm, base subcordate, with a square sinus, subentire, apex shortly acuminate or acute; veins conspicuous, lateral veins from base; leaves on branches usually only 2 and opposite, petiole less than 1 cm, blade similar to those on main stems in shape, but sinus not square. Flowers solitary, opposite to leaves; pedicels 3–6 cm. Calyx tube adnate to ovary up to its middle, semiglobose; lobes deltoid-lanceolate, ca. 10 × 5–6 mm, margin entire, apex acuminate; sinus between calyx lobes narrow. Corolla campanulate, 1.7–1.8 × 1–1.2 cm, 5-lobed to middle; lobes dark blue, lanceolate-deltoid. Filaments dilated at base, ca. 5 mm; anthers ca. 5 mm. Capsule semiglobose in lower half, rostrate above, ca. 1.5 cm in diam. Seeds numerous, brown, ellipsoid, obscurely reticulate. Fl. and fr. Sep–Oct.

• Forests; 1700–2200 m. NW Yunnan (Fugong, Gongshan).

4. *Codonopsis pilosula* (Franchet) Nannfeldt, Acta Horti Gothob. 5: 29. 1930.

党参 dang shen

Roots carrot-shaped or fusiform-cylindrical, 15–30 × 1–3 cm, often branched. Stems twining, 1–2 m, glabrous, branched; lateral branches 15–30 cm; branchlets 1–5 cm, sterile or fertile. Leaves on main stems and branches alternate, those on branchlets opposite; petiole 0.5–2.5 cm, sparsely shortly setose; blade abaxially gray-green, adaxially green, ovate or narrowly ovate, 1–7.3 × 0.8–5 cm, abaxially sparsely or densely appressed hirsute or villous, rarely glabrous, base subcordate, rounded, or truncate, margin crenulate, apex obtuse or acute. Flowers solitary and terminal on branches, pedicellate. Calyx adnate to ovary up to middle; lobes broadly lanceolate or narrowly oblong, 10–23 × 6–8 mm, margin subentire or sinuate, apex obtuse or acute; sinus between calyx lobes narrow and pointed. Corolla yellow-green, with purple spots inside, broadly campanulate, 1.8–2.3 × 1.8–2.5 cm, shallowly lobed; lobes deltoid, apex acute. Filaments slightly dilated at base, ca. 5 mm; anthers elongate, 5–6 mm. Stigma white setose. Capsule hemispheric at base, conical toward apex, 1–2.4 cm. Seeds numerous, red-brown to dark brown, oblong to ellipsoid, ca. 1 mm, smooth. Fl. and fr. Jul–Oct.  $2n = 16$ .

Forests, thickets, meadows or scrub at forest margins; 900–3900 m. Chongqing, E Gansu, N Guizhou, Hebei, Heilongjiang, Henan, W Hubei, NW Hunan, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, NW Yunnan; one subspecies widely cultivated [Korea, Mongolia, Russia (Far East)].

- 1a. Calyx tube almost entirely free from ovary; ovary almost entirely superior to calyx ..... 4c. subsp. *tangshen*  
 1b. Calyx adnate to ovary up to middle or near middle; ovary half-inferior to calyx.  
 2a. Leaves glabrous or often hispidulous ..... 4a. subsp. *pilosula*  
 2b. Leaves usually hirsute ..... 4b. subsp. *handeliana*

#### 4a. *Codonopsis pilosula* subsp. *pilosula*

党参(原亚种) dang shen (yuan ya zhong)

*Campanumoea pilosula* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 72. 1883; *Codonopsis glaberrima* Nannfeldt; *C. microtubulosa* Z. T. Wang & G. J. Xu; *C. modesta* Nannfeldt; *C. pilosula* var. *glaberrima* (Nannfeldt) P. C. Tsoong; *C. pilosula* var. *modesta* (Nannfeldt) L. T. Shen; *C. pilosula* var. *volubilis* (Nannfeldt) L. T. Shen; *C. silvestris* Komarov; *C. volubilis* Nannfeldt.

Leaves 1–7.3 × 0.8–5 cm, glabrous or often hispidulous. Calyx lobes 1.4–1.8 cm. Corolla 1.7–2.3 cm.

Forests, thickets; 900–2900 m. E Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, N Sichuan (Heishui, Pingwu, Songpan) [Korea, Mongolia, Russia (Far East)].

4b. *Codonopsis pilosula* subsp. *handeliana* (Nannfeldt) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 532. 1992.

闪毛党参 shan mao dang shen

*Codonopsis handeliana* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1078. 1936; *C. pilosula* var. *handeliana* (Nannfeldt) L. T. Shen.

Leaves 1–3 × 0.8–2.5 cm, both surfaces usually hirsute. Calyx lobes 1.5–2 cm. Corolla 2–2.6 cm.

• Forests, thickets, meadows at forest margins; 2300–3900 m. W Sichuan, NW Yunnan.

4c. *Codonopsis pilosula* subsp. *tangshen* (Oliver) D. Y. Hong, Novon 20: 423. 2010.

川党参 chuan dang shen

*Codonopsis tangshen* Oliver, Hooker's Icon. Pl. 20: t. 1966. 1891.

Calyx nearly entirely free from ovary, inferior; tube nearly absent or only up to 1.5 mm. Ovary inferior only for corolla.

• Scrub at forest margins; 900–2300 m. Chongqing, N Guizhou, W Hubei, NW Hunan, SE Shaanxi, NE Sichuan; also cultivated on a large scale.

5. *Codonopsis micrantha* Chipp, J. Linn. Soc., Bot. 38: 382. 1908.

小花党参 xiao hua dang shen

*Campanumoea violifolia* H. Léveillé; *Melothria violifolia* H. Léveillé.

Roots narrowly cylindrical, 20–30 × 0.5–1 cm. Stems twining, yellow-green or green, more than 1 m, branched, sparsely villous or subglabrous. Leaves alternate, or opposite on branches; petiole 2–5 cm; blade gray-green abaxially, green adaxially, ovate to broadly ovate, 2–5.5 × 2.4–4 cm, abaxially sparsely villous, base cordate with a broad obtuse or subsquare sinus, margin crenate or serrate, apex obtuse or acute. Flowers axillary or opposite leaves; pedicels 1–2.5 cm, glabrous. Calyx tube semiglobose; lobes inserted at middle, triangular or lanceolate, 8–15 × 3.5–5.5 cm, glabrous or sparsely ciliate, apex acute, separated by narrow acute sinuses. Corolla white, campanulate, 7–8 × 6–9 mm, glabrous or ciliate; lobes triangular, equaling tube. Filaments slightly dilated at base, ca. 3 mm; anthers ca. 2 mm. Capsule semiglobose below, conical and rostrate above, 8–11 mm in diam., superior part very short, 2.5–3.5 mm. Seeds numerous, brown-yellow, ovoid, slightly compressed, ca. 1 × 0.5 mm, minutely foveolate. Fl. and fr. Jul–Oct.

• Mountain scrub, sunny forests; 1900–2600 m. SW Sichuan, N Yunnan.

6. *Codonopsis subglobosa* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 108. 1913.

球花党参 qiu hua dang shen

Roots fusiform, carrot-shaped or cylindrical, 12–50 × 1.5–8 cm. Stems twining, 2–4 m, branched, sparsely white hirsute. Leaves on main stem and branches alternate, those on branchlets subopposite; petiole 0.5–2 cm, sparsely white hirsute; blade abaxially gray-green, adaxially green, ovate, 0.5–3 × 0.5–2.5 cm, abaxially hirsute, adaxially hispidulous, base subcordate, truncate, or rounded, margin shallowly sinuate or crenulate, apex obtuse or acute. Flowers solitary, terminal on branchlets or opposite to leaves; pedicels 2.5–6 cm, hirsute. Calyx tube fully adnate to ovary, semiglobose, with 10 conspicuous sparsely white hirsute ribs; lobes rhombic, elliptic, or ovate, 9–13 × 4.5–

8 mm, conspicuously veined, abaxially white hirsute, margins serrate, separated by broad flat sinuses. Corolla pale yellow-green with dark red-purple on lobes and sometimes at base, globose-campanulate, 2–2.5 × 2.5–3.7 cm; lobes broadly triangular, ca. 1/2 as long to nearly as long as tube. Filaments slightly dilated; anthers ellipsoid, 4–6 mm. Capsule semiglobose below, conical and rostrate above, 14–15 × 15–18 mm. Seeds numerous, yellow-brown, ellipsoid or ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Stony mountain meadows, wooded limestone cliffs, scrub by streams; 2500–3700 m. W Sichuan, E Xizang, NW Yunnan (Dêqên, Lijiang).

**7. *Codonopsis affinis*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 12. 1857.

大叶党参 da ye dang shen

Roots much thickened, fusiform, branched. Stems twining, yellow-green or green, more than 2 m, branched, subglabrous or sparsely white hirsute. Leaves on main stems and major branches alternate, those on branchlets subopposite; petiole 1–6 cm, shortly white hirsute; blade abaxially gray-green, adaxially green, ovate or ovate-oblong, 2.5–15 × 1–9 cm, abaxially densely white hirsute, adaxially sparsely white hirsute, base deeply cordate to rounded, margin entire to shallowly crenate, apex shortly acuminate. Flowers solitary, terminal, or opposite leaves; pedicels 1–4 cm, hispidulous. Calyx tube adnate to whole ovary, semiglobose, obscurely 10-ribbed, hispidulous; lobes distant from each other, linear-oblong or linear-lanceolate, 8–17 × 2–3 mm, both surfaces white lanate, margin wavy, apex acute or ± obtuse; veins obscure. Corolla yellow-green at lower and middle parts, purple-red at upper part, broadly campanulate, ca. 2 × 2 cm, outside hirsute apically, shallowly 5-lobed; lobes triangular. Filaments slightly dilated at base; anthers ellipsoid, ca. 5 mm, glabrous. Capsule semiglobose or subglobose below, conical and rostrate above, 1.5–5 cm in diam., rostrum ca. 4 mm. Seeds numerous, yellow-brown, ellipsoid or ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

Forests; 2300–3200 m. S Xizang (Nyalam) [Bhutan, N India, N Myanmar, Nepal].

**8. *Codonopsis viridis*** Wallich in Roxburgh, Fl. Ind. 2: 103. 1824.

细萼党参 xi e dang shen

*Campanula viridis* (Wallich) Sprengel; *Codonopsis griffithii* C. B. Clarke; *C. viridis* var. *hirsuta* Chipp; *Glosocomia viridis* (Wallich) Ruprecht; *Wahlenbergia viridis* (Wallich) A. Candolle.

Roots unknown. Stems twining, more than 1 m, glabrous, branched. Leaves alternate; petiole 0.5–2 cm, puberulent; blade ovate to lanceolate, 2–10 × 1–6 cm, abaxially densely pubescent, adaxially hispidulous, base cordate to rounded, margin minutely serrate or subentire, apex acute to acuminate. Flowers axillary, almost opposite to leaves, forming cymes; pedicels 2.5–7 cm, glabrous at lower and middle part, pubescent at top. Calyx adnate to ovary up to middle part; tube semiglobose, 10-ribbed, glabrous or sparsely pubescent; lobes linear to linear-

lanceolate, 10–20 × 2–3 mm, both sides hispidulous entirely or only above, with 1 or 2 verrucose denticles on each side, sinus between calyx lobes broad and truncate. Corolla pale greenish white, flushed and spotted crimson, purple inside, or tube white, lobes deep purple, campanulate, 2–3.2 × 2–3 cm, pubescent less frequently, outside glabrous, lobed to 1/3; lobes deltoid, sometimes recurved. Filaments slightly dilated at base, ca. 6 mm, glabrous; anthers as long as filaments, glabrous. Capsules globose in inferior part, conical in superior part, 1–2 × 1.2–1.6 cm. Seeds brownish yellow, oblong, ca. 0.7 mm. Fl. Sep–Nov, fr. Oct–Nov.

Scrub on open slopes, forest margins; 1500–3000 m. SE Xizang (Cona) [Bhutan, N India, Nepal, Pakistan].

**9. *Codonopsis farreri*** J. Anthony, Notes Roy. Bot. Gard. Edinburgh 15: 181. 1926.

秃叶党参 tu ye dang shen

*Codonopsis farreri* var. *grandiflora* S. H. Huang.

Stems twining, 60–500 cm, branched. Leaves on main stems and major branches alternate or subopposite, those on branchlets opposite or pseudovericillate; petiole 0.7–1.5 cm; blade ovate, lanceolate, or elliptic, 0.5–3.5 × 0.5–1.5 cm, both surfaces glabrous, base cuneate or rounded, margin entire, apex acuminate, acute, or slightly obtuse. Flowers solitary, terminal; pedicels 4–5 cm. Calyx tube adnate to ovary only up to middle; lobes lanceolate or narrowly oblong, 2–2.8 × 0.3–0.6 cm, subentire, apex acute or slightly obtuse. Corolla pale green or greenish yellow, with brown-red or purple reticulate markings, campanulate, 3.3–5.8 × 3–5 cm; tube 2–3.5 cm; lobes deltoid, 1.2–1.8 × 1.2–2 cm, acute. Filaments slightly dilated at base, 6–13 mm; anthers elongate, 4–7 mm.

Alpine forests and thickets; 3600–4000 m. NW Yunnan (Bijiang, Fugong) [N Myanmar].

**10. *Codonopsis rotundifolia*** Benth in Royle, Ill. Bot. Himal. Mts. 1: 254. 1836.

长叶党参 chang ye dang shen

*Codonopsis longifolia* D. Y. Hong.

Plants twining, 1–1.8 m, glabrous throughout. Roots carrot-shaped, ca. 18 × 1 cm, not branched. Stems purple, branched. Leaves on main stems and major branches alternate, larger; petiole 0.5–2 cm; blade lanceolate or ovate-lanceolate, 5–7 × 0.8–2.5 cm, thin, base rounded to cuneate, margin entire, apex shortly acuminate; those on branchlets similar but much smaller. Flowers solitary, terminal; pedicels 6–13 cm. Calyx tube adnate to ovary up to middle, semiglobose; lobes broadly linear, 22–30 × 5–8 mm, margin entire, apex obtuse or acute. Corolla yellow-green with purple reticulate markings, 50–55 × 25–28 mm. Fl. and fr. Aug–Sep.

Mountain slopes; 3200–3700 m. S Xizang (Nyalam), NW Yunnan (Gongshan) [NW India, Kashmir, Nepal].

**11. *Codonopsis henryi*** Oliver, Hooker's Icon. Pl. 20: t. 1967. 1891.

川鄂党参 chuan e dang shen

Stems twining, more than 1 m; branches short, less than 3 cm, with 2–4 leaves, sterile or with terminal flowers, sparsely puberulent or glabrescent at internodes. Leaves on main stems alternate, those on branches subopposite; petiole 0.2–2 cm, puberulent; blade abaxially gray-green, adaxially green, ovate-lanceolate or lanceolate, 3–15 × 1–7 cm, abaxially appressed puberulent, adaxially puberulent, base decurrent or cuneate, margin conspicuously dentate, apex acuminate. Flowers solitary, terminal on branches; pedicels ca. 1 cm, puberulent. Calyx tube adnate to ovary up to middle, semiglobose, puberulent or gradually glabrescent; lobes distant from each other, triangular, 6–10 × 3–7 mm, apex acute, puberulent and ciliate, sinus between lobes broad and obtuse. Corolla campanulate or ± tubular-campanulate, 1.5–3 cm; lobes triangular, glabrous. Stamens glabrous; filaments slightly dilated at base, ca. 7 mm, glabrous; anthers ca. 5 mm. Capsule ca. 1.5 cm in diam. Fl. and fr. Jul–Sep.

• Forest margins, scrub; 2300–3800 m. Chongqing, W Hubei, N Sichuan.

**12. *Codonopsis levicalyx*** L. T. Shen, Acta Phytotax. Sin. 13(3): 55. 1975.

光萼党参 *guang e dang shen*

*Codonopsis levicalyx* var. *hirsuticalyx* L. T. Shen; *C. rotundifolia* Benth. var. *angustifolia* Nannfeldt.

Roots carrot-shaped, 10–35 × 0.5–1.4 cm. Stems twining, up to 2 m, branched, branches 15–30 cm, fertile or sterile, sparsely hirsute. Leaves on main stems alternate, those on branches opposite; petiole less than 10 mm; blade ovate or ovate-lanceolate, ca. 13 × 5 cm, abaxially sparsely or densely hirsute, adaxially sparsely hirsute, base cuneate or obtuse, margin crenulate or entire, apex acute or shortly acuminate. Flowers terminal on main stems or branches; pedicels glabrous, up to 10 cm. Calyx adnate to ovary up to middle; tube semiglobose, glabrous or sparsely hirsute; lobes ovate-triangular, 10–15 × ca. 6 mm, glabrous or hirsute, margin entire or crenulate, apex acute or obtuse, sinus between lobes narrow and pointed. Corolla yellow-green, with purple veins, campanulate, 1.8–2.5 × ca. 1.5 cm, glabrous; lobes deltoid, acute. Stamens glabrous; filaments slightly dilated at base, ca. 3 mm; anthers ca. 3 mm. Fl. Jul–Aug.

• Forests, scrub; 2300–3300 m. W Sichuan, SE Xizang.

A study conducted by D. Y. Hong after this treatment was finalized found *Codonopsis levicalyx* to comprise two species. The specimens from Sichuan belong to *C. henryi*, whereas those from SE Xizang represent a new species, which is to be published in 2011 or 2012.

**13. *Codonopsis kawakamii*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 165. 1911.

台湾党参 *tai wan dang shen*

Roots carrot-shaped. Main stems scrambling or twining, fertile, sparsely villous; branches sterile or fertile, with subopposite leaves. Leaves on main stems alternate, those on branches subopposite; petiole 5–18 mm, hirsute; blade ovate or deltoid, 7–23 × 5–17 mm, abaxially hispid, adaxially hispidulous, base rounded or truncate, rarely shallowly cordate, margin mostly entire or sinuous, or very obscurely crenate, apex acute or obtuse. Flowers solitary, terminal on main stems and some branches, slightly pendent; pedicels 1–2.5 cm, sparsely hispid.

Calyx tube adnate to ovary up to middle, hemispherical, glabrous or rarely sparsely hairy; lobes ovate to lanceolate, 5–9 × 3–5 mm, subentire, sparsely hispid, apex acute; sinus between calyx lobes narrow and acute at anthesis. Corolla greenish yellow or pale blue, tubular, 1.5–2 cm, subglabrous, shallowly lobed. Stamens glabrous; filaments slightly dilated at base, ca. 3 mm; anthers ca. 3 mm. Capsule 10–15 × 6–12 mm. Seeds brown, ellipsoid, ca. 1.5 mm. Fl. Aug–Sep, fr. Oct.

• Grassy slopes; 2500–3100 m. Taiwan (Nantou).

**14. *Codonopsis deltoidea*** Chipp, J. Linn. Soc., Bot. 38: 387. 1908.

三角叶党参 *san jiao ye dang shen*

Roots conical or cylindrical, 15–30 × 1–1.4 cm, ± branched. Stems twining, more than 1 m; branches and branchlets short, no more than 5 cm, leafy, sterile or with terminal flowers, sparsely villous or eventually glabrescent. Leaves alternate or opposite; petiole 1–8 cm, villous or hirsute; blade abaxially gray-green, adaxially green, deltoid or broadly ovate, 3–10 × 4–10 cm, both surfaces sparsely puberulent or hirsute, base shallowly cordate, truncate, or rounded, margin coarsely dentate, apex acuminate or acute. Flowers terminal on main stems, branches, and/or branchlets, solitary or sometimes in few-flowered cymes; pedicels 1–2 cm, villous. Calyx tube adnate to ovary up to middle, semiglobose or broadly obconic, 4–5 × 7–8 mm, glabrous; lobes ovate-lanceolate or triangular, 9–13 × 3–7 mm, margin denticulate, often white ciliate, apex acuminate or acute. Corolla pale yellow-green, with purple veins, tubular, 2–2.5 × 0.9–1.5 cm; lobes deltoid, ca. 1/3 as long as tube. Filaments slightly dilated at base, ca. 6 mm, glabrous; anthers ca. 3 mm. Capsules semiglobose below, broadly conical above. Seeds numerous, yellow-white, ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain forest margins, scrub; 1800–2800 m. W Sichuan (Emei Shan).

**15. *Codonopsis tubulosa*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 112. 1908.

管花党参 *guan hua dang shen*

*Codonopsis accrescenticalyx* H. Léveillé; *C. pilosa* Chipp.

Roots carrot-shaped, 10–20 × 0.5–2 cm, simple or branched below middle. Stems usually 1–3 m and twining, rarely ascending and 50–75 cm, branched; branches and branchlets both leafy, sterile or with a terminal flower, subglabrous or sparsely villous. Leaves opposite or tending to alternate at top of stems and branches; petiole short, 1–7 mm, puberulent; blade abaxially gray-green, adaxially green, lanceolate, ovate, or elliptic, 2.5–8 × 0.7–4 cm, abaxially sparsely or densely puberulent, adaxially hispidulous, base cuneate or rounded, margin crenate or subentire, apex acute or obtuse. Flowers terminal; pedicels 1–6 cm, villous. Calyx tube adnate to ovary up to middle, hemispheric, subglabrous to densely villous; lobes broadly ovate, 10–18 × 5.5–12 mm, ciliate, abaxially sparsely villous, adaxially glabrous, margins crenate or verrucose toothed, apex obtuse or acute. Corolla yellow-green, tubular, 2–3.7 × 0.5–1.6 cm, glabrous, shallowly lobed; lobes deltoid, acute at apex. Filaments dilated at base, ca. 10 mm, ciliate; anthers 3–5 mm. Capsule globose below, conical above.

Seeds brown-yellow, ovoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain scrub, grasslands; 1900–3000 m. W Guizhou (Nanyong, Panxian), S Sichuan, Yunnan (Dali, Lanping, Mengzi).

**16. *Codonopsis benthamii*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 14. 1857.

大萼党参 da e dang shen

*Codonopsis macrocalyx* Diels; *C. macrocalyx* var. *coerulescens* Handel-Mazzetti; *C. macrocalyx* var. *parviloba* J. Anthony.

Roots carrot-shaped or cylindrical, 20–30 × 1.5–2.5 cm. Stems erect, climbing, or ascending, up to 2 m, branched; branches and branchlets leafy, sterile or with a terminal flower, sparsely puberulent. Leaves alternate or those on branches subopposite; petiole 1–6 cm, sparsely villous; blade abaxially gray-white, adaxially green, broadly ovate, triangular-ovate, ovate, or ovate-lanceolate, 3–9 × 1.5–7 cm, abaxially sparsely or densely puberulent, adaxially sparsely puberulent, base truncate, cuneate, or rounded, margin irregularly pinnatifid to shallowly lobed, or dentate, crenate, or rarely subentire, apex acute or obtuse. Flowers terminal, long pedicellate; pedicels villous or occasionally subglabrous. Calyx tube adnate to ovary up to middle, 10-ribbed, glabrous or sparsely villous; lobes ovate or deltoid, 10–25 × 5–15 mm, both surfaces glabrous, margin crenulate, ciliate, apex acuminate, acute, or obtuse; sinus between lobes narrow and pointed. Corolla yellow-green, pale brown-red at base, tubular, 2–4 × 1.5–2 cm, glabrous, shallowly lobed; lobes triangular, apex acute. Stamens villous; filaments slightly dilated at base, 6–10 mm; anthers 5–6 mm. Capsule 1.2–1.6 cm in diam. Seeds brown-yellow, ovoid, wingless. Fl. and fr. Jul–Oct.

Grassy slopes, forest margins, scrub, by streams; 2800–3700 m. W Sichuan (Baoping, Muli), SE Xizang (Markam, Yadong, Zayü), NW Yunnan [Bhutan, NE India, N Myanmar, Nepal].

**17. *Codonopsis pianmaensis*** S. H. Huang, Acta Bot. Yunnan. 6: 393. 1984.

片马党参 pian ma dang shen

Stems decumbent or climbing, 80–120 cm, branched, subglabrous. Leaves alternate; petiole 0.8–3.5 cm; blade ovate-deltoid, 2–5.5 × 1.5–4 cm, abaxially sparsely or densely puberulent, adaxially sparsely puberulent, base cuneate or obtuse, margin irregularly serrate, apex acuminate; leaves on branches smaller. Flowers solitary and terminal; pedicels 1–6.5 cm. Calyx adnate to ovary up to middle, semiglobose, puberulent; lobes ovate-deltoid, ca. 12 × 8 mm, margin repand, apex acute; sinus between lobes acute. Corolla yellow, with purple-blue spots inside, tubular-campanulate, ca. 17 × 10 mm, outside densely puberulent; lobes triangular. Filaments dilated at base, ca. 7 mm, densely villous; anthers oblong, ca. 4.5 mm, abaxially densely puberulent. Ovary semi-inferior. Fl. Jul.

• Grassy slopes with shrubs; ca. 3500 m. W Yunnan (Lushui).

**18. *Codonopsis subsimplex*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 16. 1857.

藏南党参 zang nan dang shen

Roots carrot-shaped, 15–20 × 0.5–1.2 cm. Stems erect or ascending, 35–70 cm, few branched, subglabrous or sparsely white villous. Leaves on main stems alternate, those on branches subopposite; petiole 0.5–1.5 cm, sparsely white villous; blade broadly ovate, ovate, or subelliptic, 3–7 × 2–4.5 cm, abaxially hispidulous but hirsute along veins, adaxially hispidulous, base cordate, truncate, or rounded, margin sparsely crenulate, apex acute or obtuse. Calyx tube fully adnate to ovary; lobes triangular or ovate, 11–16 × 6–8.5 mm, margin dentate, sparsely ciliate, apex acute or obtuse; sinus between calyx lobes acute. Corolla pale yellow-green or pale blue, broadly campanulate, 1.5–2.3 × 1.5–2.5 cm, glabrous; lobes ovate-deltoid, ca. 1/3 as long as tube. Filaments slightly dilated at base, 2–3 mm; anthers ca. 5 mm. Capsules semiglobose below, broadly conical above, ca. 8 mm in diam., rostrum 4–6 mm. Seeds numerous, yellow, ellipsoid, ca. 1.5 mm, wingless. Fl. Jul–Aug, fr. Sep–Oct. 2n = 16.

Mountain forests or scrub; ca. 3100 m. S Xizang (Mainling, Yadong) [Bhutan, NE India, Nepal].

**19. *Codonopsis subscaposa*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 114. 1908.

抽葶党参 chou ting dang shen

Roots carrot-shaped, 15–20 × 0.5–1 cm. Stems erect, 40–100 cm, simple or sparingly branched, sparsely pubescent, eventually glabrescent. Leaves on main stems alternate, those on branches opposite; petiole 1–7(–10) cm, sparsely villous; blade abaxially gray-green, adaxially green, ovate, elliptic, narrowly elliptic, or lanceolate, 2–8(–13) × 1–3.8(–5) cm, abaxially glabrous or sparsely villous along veins, adaxially sparsely puberulent or glabrous, base rounded, obtuse, cuneate, or attenuate, margin dentate or crenate, apex acute or obtuse. Flowers terminal or axillary, often 1–4 at tops of stems and branches, long pedicellate. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed, sparsely villous; lobes triangular or narrowly elliptic, 5–8 × 2–3 mm, glabrous, margin serrulate or crenulate, apex acute. Corolla yellowish or greenish white with red-purple veins, or red-purple with yellowish spots, broadly campanulate, 1.5–3 × 2–4 cm, 5-fid to middle, both sides glabrous or sparsely villous at apex of lobes. Stamens glabrous; filaments dilated at base, 6–8 mm; anthers 4–5 mm. Capsule obconic at base, conical at apex, 14–15 mm. Seeds brown-yellow, ovoid, smooth. Fl. and fr. (Apr–)Jul–Oct.

• Grassy slopes, wet meadows, open woods; 2500–4200 m. W Sichuan, NW Yunnan (Zhongdian).

**20. *Codonopsis meleagris*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 172. 1912.

珠鸡斑党参 zhu ji ban dang shen

Roots carrot-shaped, 13–20 × 0.5–1.5 cm. Stems erect, simple or with elongate branches in lower part, 40–90 cm, sparsely hairy, eventually glabrescent. Leaves on main stems alternate, those on branches opposite, sessile or with short petiole less than 1 cm; blade abaxially gray-green, adaxially green, ovate, elliptic, or lanceolate, 4–8.5 × 1.5–3.5 cm, abaxially

densely hirsute, adaxially glabrous or sparsely hispidulous, base cuneate or attenuate, margin crenate, apex obtuse or rounded. Flowers terminal or axillary, long pedicellate. Calyx tube adnate to ovary up to top, semiglobose, 10-ribbed, glabrous or sparsely scaberulose; lobes ovate or ovate-triangular, 8–12 × 4–6 mm, glabrous, margins entire or sparsely serrulate, apex acute or obtuse. Corolla yellowish green with red-purple veins, or red-purple with yellowish green spots, broadly campanulate, 2.2–3(–4) × 2.4–3(–4) cm, both sides glabrous; lobes deltoid, ca. 1/2 as long as tube, often sparsely villous at apex. Stamens glabrous; filaments slightly dilated at base, ca. 7 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, ca. 10 × 8 mm. Seeds numerous, brown-yellow, ovoid, wingless. Fl. and fr. Jul–Oct.

• Grassy slopes, open forests; 3000–4000 m. NW Yunnan (Lijiang).

**21. *Codonopsis purpurea*** Wallich in Roxburgh, Fl. Ind. 2: 105. 1824.

紫花党参 *zi hua dang shen*

*Campanula purpurea* (Wallich) Sprengel; *Glosocomia purpurea* (Wallich) Ruprecht; *Wahlenbergia purpurea* (Wallich) A. Candolle.

Plants glabrous throughout. Roots fusiform or carrot-shaped. Stems erect or sprawling, 30–50 cm, few branched. Leaves opposite or those at top sometimes alternate; petiole 1–7 mm; blade ovate or lanceolate, 4–9 × 1.6–3.5 cm, base rounded or obtuse, margin subentire or sinuous, apex acute or acuminate. Flowers terminal or opposite leaves at top. Calyx tube adnate to ovary for its entire length, broadly obconic, 6–10 × 15–18 mm; lobes triangular, 10–20 × 6–9 mm, margin entire, apex acute or acuminate. Corolla dark red-purple, broadly campanulate or funnellform-campanulate, 2–3.4 × 2.4–4 cm; lobes triangular, equaling tube. Filaments slightly dilated, ca. 6 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, 1.5–2 cm in diam.; valves 5–8 mm. Seeds numerous, yellow, oblong, ca. 2 × 1 mm, narrowly winged. Fl. and fr. Sep–Oct.

Grassy slopes, scrub, epiphytic on trunks in forests; 2000–3300 m. S Xizang (Nyalam), W Yunnan (Jingdong) [N India, Nepal].

**22. *Codonopsis clematidea*** (Schrenk) C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 433. 1881.

新疆党参 *xin jiang dang shen*

*Wahlenbergia clematidea* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 38. 1841; *Codonopsis clematidea* var. *obtusata* (Chipp) Kitamura; *C. obtusata* (Chipp) Nannfeldt; *C. ovata* Bentham var. *cuspidata* Chipp; *C. ovata* var. *obtusata* Chipp; *C. ovata* var. *ramosissima* J. D. Hooker & Thomson; *Glosocomia clematidea* (Schrenk) Fischer ex Regel.

Roots carrot-shaped, 25–45 × 1–3 cm. Stems single or caespitose, erect or ascending, or slightly procumbent, 50–100 cm tall; branches slender, erect or slightly spreading, mostly at lower part but those at upper part usually fertile, hispidulous when young. Leaves on main stems smaller and alternate, those on branches opposite; petiole up to 2.5 cm, sparsely hispidulous; blade ovate, oblong, broadly lanceolate, or lanceolate, 1–

3.5(–5.2) × 0.8–2(–3.2) cm, abaxially densely hispidulous, adaxially sparsely or densely hispidulous, base slightly cordate or rounded, margin entire or occasionally crenulate or sinuate, apex acute. Flowers solitary, terminal on main stems and branches, long pedicellate; pedicels sparsely white hispidulous. Calyx tube adnate to ovary up to middle, hemispheric, 10-ribbed, glabrous or rarely sparsely white scaberulose; lobes ovate, elliptic, or lanceolate, 10–20 × 6–8 mm, glabrous or apex sparsely puberulent, margin entire, apex acute; sinus between calyx lobes narrow and pointed. Corolla pale blue with dark blue veins and purple spots inside, broadly campanulate, 1.7–2.6 cm, glabrous. Stamens glabrous; filaments slightly dilated at base, 5–6 mm; anthers oblong, 5–6 mm. Capsule semiglobose below, conical above, rostrum acute, 15–20 × 12–15 mm in total; persistent calyx lobes much enlarged, revolute. Seeds numerous, pale brown-yellow to brown, narrowly ellipsoid or oblong, terete, smooth. Fl. and fr. Jul–Oct. *2n* = 16.

Mountain forests, ravines, by streams; 1700–2500 m. Xinjiang, W Xizang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan].

**23. *Codonopsis gombalana*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 81. 1965.

贡山党参 *gong shan dang shen*

Roots carrot-shaped. Stems erect or ascending, 50–160 cm tall, branched at all parts, leafy, lower branches sterile, upper ones fertile. Leaves alternate; petiole slender, 4–17 mm; blade elliptic to narrowly lanceolate, 15–65 × 3–18 mm, both surfaces glabrous, base broadly cuneate to rounded, margin entire, apex acute or obtuse. Flowers solitary and terminal; pedicels 1–3 cm. Calyx tube almost entirely free from ovary or adnate to ovary up to middle, semiglobose, 10-ribbed; lobes linear-lanceolate, 18–20 × 2.5–3 mm, 3-veined, margin entire and slightly recurved, apex acuminate; sinus between lobes broad. Corolla yellow-green with purple veins, tubular-campanulate, ca. 4.5 × 4 cm, 5-lobed; lobes deltoid, ca. 1.6 × 1.6 cm, apex acute. Filaments slightly dilated at base, ca. 1.3 cm; anthers ca. 6 mm. Capsule semiglobose below, conical above; persistent calyx lobes very much enlarged, ca. 2 × as large as at anthesis. Seeds numerous, brown-yellow, subellipsoid, wingless, smooth. Fl. and fr. Jul–Oct.

• Mountain scrub, bamboo thickets; ca. 3600 m. NW Yunnan (Gongshan).

**24. *Codonopsis chimiliensis*** J. Anthony, Notes Roy. Bot. Gard. Edinburgh 15: 184. 1926.

滇缅党参 *dian mian dang shen*

Plants glabrous throughout. Stems erect, multi-branched, 60–90 cm. Leaves alternate; petiole 0.5–2 cm; blade ovate to ovate-lanceolate, 5–14 × 3–7 cm, base rounded, decurrent, margin crenulate, apex acute to shortly acuminate. Flowers solitary, terminal; pedicels 3–10 cm. Calyx entirely free from ovary; lobes oblong-lanceolate, 18–30 × 6–10 mm, margin entire, apex acute. Corolla pale creamy yellow, with pale purple veins, campanulate; tube 1.6–2 × 2.4–3 cm; lobes triangular, 1.2–1.5 × 0.8–1.2 cm, apex acute. Filaments filiform, ca. 8 mm.

• Grassy slopes; 3600–4300 m. W Yunnan (Bijiang).

The type specimen of this species was collected from the border between China and Myanmar.

**25. *Codonopsis thalictrifolia*** Wallich in Roxburgh, Fl. Ind. 2: 106. 1824.

唐松草党参 tang song cao dang shen

*Campanula thalictrifolia* (Wallich) Sprengel; *Codonopsis mollis* Chipp; *C. thalictrifolia* var. *mollis* (Chipp) L. T. Shen; *Glosocomia tenera* D. Don, nom. illeg. superfl.; *G. thalictrifolia* (Wallich) Wallich; *Wahlenbergia thalictrifolia* (Wallich) A. Candolle.

Roots carrot-shaped, 15–20 × 0.5–1 cm. Stems erect or ascending, main stems robust, fertile, 15–30 cm tall, glabrous or sparsely villous; branches sterile, slender, leafy, aggregated at base of main stems, 4–6 cm, villous. Leaves on main stems alternate, those on branches subopposite; petiole ca. 2 mm, white hirsute; blade ovate or suborbicular, 3–20 × 3–17 mm, both surfaces villous, base cordate or truncate, margin subentire or crenate, apex obtuse or acute. Flowers solitary, terminal on main stems, slightly pendent. Calyx tube adnate to ovary up to middle, hemispheric, 3–5 × 6–10 mm, glabrous or villous; lobes triangular or oblong, 6–7 × 2–3 mm, outside hairy, margin entire, apex acute or obtuse; sinus between lobes broad and obtuse. Corolla tubular-campanulate, 2–4.8 × 1.5–4.3 cm, shallowly lobed; lobes triangular, 2–4 × 7–9 mm, apex obtuse; tube pale blue, 18–23 × 6–9 mm, glabrous or occasionally sparsely villous. Filaments slightly dilated at base, ca. 1 cm; anthers ca. 3 mm, villous at connective. Capsule hemispherical at base, conical toward apex, rostrate. Seeds numerous, brown-yellow, ellipsoid, smooth. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, scrub; 3600–5300 m. C and S Xizang [NE India, Nepal].

**26. *Codonopsis bulleyana*** Forrest ex Diels, Notes Roy. Bot. Gard. Edinburgh 5: 171. 1912.

管钟党参 guan zhong dang shen

*Cyananthus mairei* H. Léveillé.

Roots carrot-shaped, 15 × 0.5 cm. Main stems erect or ascending, 25–55 cm tall, sparsely white villous; branches aggregated at lower part, leafy, sterile, 1–10 cm, densely villous. Leaves on main stems alternate, those on branches subopposite; petiole 1–2.5 mm, densely villous; blade cordate, broadly ovate, or ovate, 8–18 × 8–14 mm, white villous, base cordate or rounded, margin sinuous or obscurely crenate, or subentire, apex acute or obtuse. Flowers solitary, terminal on main stems, slightly pendent; pedicels 4–8 cm, glabrous or villous. Calyx tube adnate to ovary up to middle, hemispheric, sparsely villous; lobes deltoid or ovate, 8–10 mm, both sides sparsely hispidulous, margin somewhat sinuous, revolute, apex acute; sinus between lobes narrow and pointed, or broad and obtuse due to being revolute. Corolla pale blue but tube purplish, tubular-campanulate, 2.2–3 cm, shallowly lobed; lobes broad, margin and apex involute; tube 1–1.2 cm in diam.; limb 2–3.5 cm in diam. Stamens glabrous; filaments ca. 6 mm; anthers ca. 5 mm. Capsule hemispheric at base, conical toward apex, rostrate, 2–2.4 × 1–1.5 cm; persistent calyx lobes revolute. Seeds numerous, brown-yellow, ellipsoid, ca. 1.5 mm. Fl. Jul–Sep, fr. Sep–Oct.

• Grassy slopes, scrub; 3300–4200 m. SW Sichuan, SE Xizang, N Yunnan.

**27. *Codonopsis foetens*** J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 16. 1857.

臭党参 chou dang shen

Roots slender, 10–55 × 1–2 cm. Caudexes abundantly branched, and thus stems several to many from one caudex, caespitose. Main stems erect or ascending, 20–40 cm tall, villous; branches numerous, aggregated in lower part, 1–10 cm tall, usually sterile. Leaves on main stems alternate, those on branches opposite or subopposite; blade cordate or ovate, 5–30 × 5–24 mm, both surfaces variously pubescent, margin entire or nearly so, apex acute or obtuse; petiole 2–3 mm. Flowers solitary (rarely several), terminal on main stems and sometimes branches, ± pendent; pedicels 1–8 cm. Calyx tube adnate to ovary up to middle, semiglobose or hemispherical, glabrous or very sparsely white hispidulous; lobes ovate, ovate-oblong, or ovate-lanceolate, 7–20 × 2–7 mm, rather densely hispidulous, entire, recurved at margin, apex acute or obtuse. Corolla pale blue or pale purple with interior markings, campanulate or subglobose-campanulate, 2–4.5 × 2.5–3 cm; lobes suborbicular, 8–12 mm, apex obtuse or acute. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers 4–5 mm. Capsule obconical at inferior part, conical at superior part, ca. 2 × 1.5 cm. Seeds brown-yellow, ellipsoid or oblong, ca. 1 mm, smooth. Fl. Jul–Sep, fr. Sep–Oct.

Grassy slopes, alpine scrub, crevices, forests, meadows at forest margins on N-facing slopes; 3300–4600 m. SE Gansu, S Qinghai, W Sichuan, E and S Xizang, NW Yunnan [Bhutan, N India].

- 1a. Leaf blades 5–9 × 5–7 mm, very rarely up to 15 × 12 mm; margin of calyx lobes often recurved ..... 27a. subsp. *foetens*  
 1b. Leaf blades mostly 10–15 × 10–15 mm; margin of calyx lobes very rarely recurved ..... 27b. subsp. *nervosa*

**27a. *Codonopsis foetens* subsp. *foetens***

臭党参(原亚种) chou dang shen (yuan ya zhong)

Leaves on main stems alternate, mostly yellow scaly, only several upper ones green and ordinary, those on branches opposite or subopposite, all ordinary leaves with petiole 2–3 mm; blade cordate or cordate-ovate, 5–9 × ca. 5 mm, both surfaces rather densely white hispidulous, margin entire, apex obtuse. Calyx lobes ovate-oblong or ovate-lanceolate, ca. 8 × 4–5.5 mm, rather densely hispidulous, margin recurved, entire. Corolla pale blue or pale purple with dark purple veins, campanulate or broadly campanulate, 2–3 cm; lobes suborbicular, 8–12 mm, apex obtuse or acute. Fl. Jul–Sep, fr. Sep–Oct.

Alpine scrub, crevices; 3900–4600 m. S Xizang [Bhutan, N India].

**27b. *Codonopsis foetens* subsp. *nervosa*** (Chipp) D. Y. Hong, Novon 20: 422. 2010.

脉花党参 mai hua dang shen

*Codonopsis ovata* Benth var. *nervosa* Chipp, J. Linn. Soc., Bot. 38: 385. 1908; *C. macrantha* Nannfeldt; *C. nervosa* (Chipp) Nannfeldt; *C. nervosa* subsp. *macrantha* (Nannfeldt) D. Y. Hong & L. M. Ma; *C. nervosa* var. *macrantha* (Nannfeldt) L. T. Shen.

Leaves on main stems alternate, those on branches subopposite; petiole 2–3 mm, white villous; blade broadly cordate, cordate, or ovate, 1–3 × 1–2.4 cm, abaxially sparsely white hirsute, adaxially densely white hirsute, subentire, apex acute or obtuse. Flowers solitary, rarely several, terminal on main stems and branches, slightly pendent; pedicels 1–8 cm. Calyx lobes ovate or lanceolate, 7–20 × 2–7 mm, densely white hispidulous but usually more sparsely or even becoming glabrous toward base, margin entire, apex acute or obtuse. Corolla pale blue, often with red-purple spots at base inside, subglobose-campanulate, 2–4.5 × 2.5–3 cm, shallowly lobed; lobes obtuse, involute, villous at apex and along veins on abaxial side. Fl. Jul–Sep, fr. Sep–Oct.

• Grassy slopes, scrub, forests, meadows at forest margins on N-facing slopes; 3300–4500 m. SE Gansu, S Qinghai, W Sichuan, E Xizang, NW Yunnan.

**28. *Codonopsis canescens*** Nannfeldt, Svensk Bot. Tidskr. 34: 386. 1940.

灰毛党参 hui mao dang shen

Roots carrot-shaped, 20–30 × 1–2.5 cm. Main stems single or several from one root, erect or ascending, 25–85 cm tall, leafy in middle part; branches mostly aggregated in middle part, leafy, usually sterile, densely white villous. Leaves on main stems alternate, those on branches subopposite; petiole less than 2 mm; blade ovate, broadly ovate, or subcordate, 1–1.5 × 0.5–1.2 cm, both surfaces densely white hispidulous, margin entire, apex acute or obtuse. Flowers solitary, terminal on main stems and upper branches; pedicels 2–15 cm. Calyx tube adnate to ovary up to middle, hemispherical, 10-ribbed, densely white hispidulous; lobes ovate to lanceolate, 4–6 × 2–4 mm, densely white puberulent, entire; sinus between lobes broad and obtuse. Corolla pale blue or blue-white, with blue veins at base inside, broadly campanulate, 1.5–1.8 × 2–3 cm, shallowly lobed; lobes deltoid, villous at apex and on abaxial side. Stamens glabrous; filaments slightly dilated at base, 2–2.5 mm; anthers ca. 3 mm. Capsule hemispherical at base, conical toward apex, 0.8–1.5 cm. Seeds numerous, brown-yellow, ellipsoid or oblong, ca. 1 mm, smooth. Fl. Jun–Sep, fr. Sep–Oct.

• Grassy slopes, sunny or stony river terraces; 3000–4200 m. S Qinghai (Nangqên, Yushu), NW Sichuan, E Xizang (Gonjo, Jomda, Markam).

**29. *Codonopsis argentea*** P. C. Tsoong, Contr. Inst. Bot. Natl. Acad. Peiping 3: 92. 1935.

银背叶党参 yin bei ye dang shen

Roots not seen. Stems erect or ascending, ca. 30 cm tall; branches fertile, densely leafy, pale brown or yellow, lanate. Leaves on main stems alternate, those on branches subopposite; petiole absent or less than 3 mm; blade ovate or oblong-

ovate, 7–20 × 2–12 mm, abaxially white tomentose, adaxially appressed tomentose, base cordate, margin sinuous or subentire, slightly recurved, apex obtuse. Flowers terminal on main stems and branches, slightly pendent; pedicels brownish yellow, tomentose. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed; lobes triangular-ovate or ovate-lanceolate, ca. 8 × 4 mm, brownish yellow tomentose, subentire, recurved, apex acute or obtuse; sinus between calyx lobes broad and obtuse. Corolla pale blue, campanulate, ca. 2.2 × 2–2.5 cm, shallowly lobed; lobes rounded, setose on both sides, apex acute. Stamens glabrous; filaments slightly dilated at base, ca. 6 mm; anthers 4–5 mm. Fruit unknown.

• Exposed rocky slopes; 2000–2300 m. Guizhou (Fanjing Shan).

**30. *Codonopsis alpina*** Nannfeldt, Notes Roy. Bot. Gard. Edinburgh 16: 154. 1931.

高山党参 gao shan dang shen

*Codonopsis foetens* J. D. Hooker & Thomson var. *major* Handel-Mazzetti.

Roots carrot-shaped, 14–15 × 0.7–1 cm. Main stems erect or ascending, 15–25 cm, or even longer, glabrous or sparsely white hirsute; branches aggregated at lower part, leafy, sterile, sparsely white hirsute. Leaves on main stems sparse and alternate, those on branches subopposite, rarely alternate; petiole 4–6 mm, glabrous or sparsely hirsute; blade ovate, 1.2–1.8 × 0.6–1.5 cm, abaxially sparsely white hispidulous, adaxially glabrous or subglabrous, base cordate or rounded, margin sinuous or subentire, recurved, apex acute or obtuse. Flowers solitary, terminal on main stems; pedicels sparsely hirsute. Calyx tube adnate to ovary up to middle, obconical or semiglobose, 10-ribbed; lobes triangular, 8–12 × 5–7 mm, both sides glabrous, margin entire or sinuous, recurved, apex acute or obtuse; sinus between lobes obtuse. Corolla purple-green with purple veins, broadly campanulate, 2.5–3 × 2.5–3 cm, glabrous; lobes deltoid-orbicular, equaling tube. Stamens glabrous; filaments slightly dilated at base, 6–8 mm; anthers 4–5 mm. Fl. Aug.

• Alpine open stony grassy slopes; 4000–4300 m. SE Xizang (Markam, Zayü), NW Yunnan (Dêqên, Gongshan).

**31. *Codonopsis cardiophylla*** Diels ex Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 117. 1908.

光叶党参 guang ye dang shen

Roots carrot-shaped, 10–15 × 1–1.5 cm. Stems several from one caudex, ascending or suberect, 20–60 cm tall; branches 10–17 cm, very sparsely white hispidulous, glabrescent, those at lower part slender, sterile, those at upper part fertile. Lower and middle leaves subopposite but upper ones alternate; petiole 0.5–3 mm, glabrous or hirsute; blade ovate or lanceolate, 1–3 × 0.5–2.5 cm, abaxially sparsely hispidulous, adaxially subglabrous, base subcordate, truncate, or rounded, margin entire, recurved, apex obtuse. Flowers terminal on main stems and upper branches; pedicels sparsely hirsute, eventually glabrescent. Calyx tube adnate to ovary up to middle, semiglobose, 10-ribbed, glabrous; lobes triangular or

lanceolate, 9–12 × 4–5 mm, glabrous or hispidulous, margin entire, apex obtuse; sinus between lobes acute. Corolla pale blue, with red-purple or brown-red spots, broadly campanulate, 2–3.2 × 2.3–3 cm; lobes ovate, ca. 1/2 as long as tube, inside villous, apex acute. Stamens glabrous; filaments slightly dilated at base, 6–7 mm; anthers ca. 5 mm. Capsules semiglobose below, conical above, 8–10 mm in diam.; valves 5–7 mm. Seeds brown-yellow, ellipsoid, 1–1.5 × ca. 0.5 mm, wingless. Fl. and fr. Jul–Oct.

• Grassy slopes or cliffs; 2000–2900 m. W Hubei, S Shaanxi (Foping, Huaxian, Weinan), S Shanxi (Yuanqu).

**32. *Codonopsis viridiflora*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 496. 1882.

绿花党参 lǜ huā dāng shēn

*Codonopsis bicolor* Nannfeldt.

Roots carrot-shaped, 10–15 × 1–1.5 cm. Stems 1–3 from one caudex, suberect, 30–70 cm tall; branches at lower part, sparsely hirsute or subglabrous. Leaves on main stems alternate, tending smaller and bractlike, those on branches opposite or subopposite and thus branches like pinnate leaves; blade broadly ovate, ovate, or lanceolate, 1.5–3.5(–5) × 0.8–3 cm, both surfaces hispidulous, base slightly cordate or rounded, margin crenate or subentire, apex acute or obtuse. Flowers 1–3, terminal on main stems and branches; pedicels 6–15 cm, subglabrous or lower part sparsely hispidulous. Calyx tube adnate to ovary up to middle, hemispheric, 3–4 × 10–13 mm, 10-ribbed, glabrous; lobes ovate, lanceolate, or oblong 10–15 × 6–8 mm, sparsely hispidulous near apex or occasionally glabrous abaxially, ciliate, sparsely crenate at margin, apex acute or obtuse. Corolla yellow-green, purplish only at base, campanulate, 1.7–2.5 × 2–3 cm, glabrous throughout, lobed to half; lobes triangular, 8–10 × 9–11 mm. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers ca. 5 mm. Capsule ca. 1.5 cm in diam. Seeds numerous, brown-yellow, ellipsoid, wingless. Fl. and fr. Jul–Oct.

• Alpine meadows or forest margins; 3000–4000 m. SE Gansu, S Ningxia (Jingyuan), E Qinghai (Huangyuan), Shaanxi (Taibai Shan), W Sichuan, E Xizang (Jomda), NW Yunnan (Dêqên).

**33. *Codonopsis tsinlingensis*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 500. 1922.

秦岭党参 qín líng dāng shēn

Roots carrot-shaped, 10–20 × 0.6–3.5 cm. Stems several from one caudex, erect or ascending, 26–35 cm tall; branches slender, with leaves aggregated at top, white hirsute. Leaves on main stems alternate, those on branches subopposite; petiole less than 1 cm, white hirsute; blade ovate or broadly ovate, 1–2.6 × 0.6–1.8 cm, hispidulous, base rounded or cordate, margin crenulate to subentire, slightly revolute, apex acuminate, acute, or obtuse. Flowers solitary, terminal; pedicels 3–15 cm, densely hispid. Calyx tube adnate to ovary up to middle, hemispherical, 10-ribbed, hispid entirely or along ribs, rarely glabrous; lobes narrowly triangular, 8–10 × 4–6 mm, abaxially hispidulous, margin entire, revolute toward middle rib, apex acute. Corolla

pale purple, with purple spots inside, campanulate, 20–30 × 20–30 mm, 5-fid almost to middle, inside villous. Stamens glabrous; filaments slightly dilated at base, ca. 5 mm; anthers ca. 4 mm. Capsule hemispherical at base, conical toward apex. Seeds brown-yellow, ellipsoid. Fl. and fr. Jul–Oct.

• Alpine scrub, grassy slopes; 2700–3600 m. Shaanxi (Taibai Shan).

**34. *Codonopsis chlorocodon*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 82. 1965.

绿钟党参 lǜ zhōng dāng shēn

*Codonopsis viridiflora* Maximowicz var. *chlorocodon* (C. Y. Wu) S. H. Huang.

Roots carrot-shaped, up to 20 cm or longer. Stems erect, 60–100 cm tall, lower branches leafy, sterile, middle ones often absent, upper ones, if present, fertile but leafless. Leaves on main stems alternate, those on branches opposite, sessile or with petiole up to 1 cm; blade triangular, ovate, or lanceolate, 10–25 × 5–20 mm, glabrous or sparsely hispid, base shallowly cordate, rounded, or truncate, margin entire or crenate, revolute, apex acute. Flowers solitary, terminal on main stems, but upper branches often with 1 or 2 flowers. Calyx tube adnate to ovary up to middle, hemispheric, campanulate, or obconic, 10-ribbed; lobes distant from each other, narrowly triangular or lanceolate, 4–6 × 2–3 mm, margins entire or with denticles above, glabrous or very sparsely hispidulous at upper part. Corolla pale yellow-green, tubular-campanulate, 1.5–1.8 cm. Capsule ca. 1 cm in diam., obtuse or slightly cuneate at base. Seeds brown-yellow, ellipsoid, ca. 1.5 mm. Fl. Jun–Aug, fr. Sep.

• Sunny grassy slopes, open thickets; 2700–3700 m. W Sichuan, NW Yunnan (Dêqên).

**35. *Codonopsis bhutanica*** Ludlow, J. Roy. Hort. Soc. 97: 127. 1972.

西藏党参 xī zāng dāng shēn

*Codonopsis xizangensis* D. Y. Hong.

Roots carrot-shaped, up to 20 × 1.8 cm. Stems erect or procumbent, 20–50 cm, branches several to many at lower and middle part, slender. Leaves on main stems alternate, those on branches opposite or nearly so; all leaves sessile or with petiole up to 4 mm; blade cordate, 10–24 × 8–24 mm, glabrous or villous or sparsely hispidulous, margin recurved. Flowers solitary, terminal on main stems and sometimes on upper branches, and rarely also on some slender branches. Calyx tube adnate to ovary up to middle, glabrous; lobes narrowly ovate, 5–13 × 3–5 mm, hispidulous entirely or only at upper part, margins recurved to middle rib; sinus between lobes narrow and pointed. Corolla pale blue with dark blue at base, tubular, 12–15 mm, lobed to 1/3. Stamens glabrous. Capsule globose in inferior part, conical in superior part, 14–16 × 8–10 mm. Seeds ellipsoid, ca. 1 mm. Fl. Jul–Sep, fr. Sep–Oct.

Meadows, grassy slopes, thickets; 3700–4600 m. SE Xizang (Cona) [Bhutan, Nepal].

2. *Codonopsis* subg. *Obconicapsula* D. Y. Hong, Acta Phytotax. Sin. 18: 245. 1980.

锥果党参亚属 zhui guo dang shen ya shu

Plants usually not fetid. Roots tuberous, ovoid or ellipsoid. Stems erect. Corolla epigynous, 5-lobed for less than 1/2 its length, campanulate. Fruit an obconic loculicidal capsule. Seed testa smooth or faintly striate.

One species: SW China, NE India, Nepal.

36. *Codonopsis dicentrifolia* (C. B. Clarke) W. W. Smith, Rec. Bot. Surv. India 4: 388. 1913.

珠峰党参 zhu feng dang shen

*Wahlenbergia dicentrifolia* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 430. 1881; *Campanopsis dicentrifolia* (C. B. Clarke) Kuntze.

Plants glabrous throughout. Roots tuberous, subovoid or ellipsoid, ca. 6 × 3 cm. Stems erect, 40–50 cm tall, branched at upper part. Leaves mostly alternate, those on branches subopposite; petiole 2–5 mm; blade ovate or ovate-oblong, up to 3 × 1.5 cm, base cuneate or rounded, margin entire or sinuous,

sometimes slightly recurved, apex acute or obtuse. Flowers solitary, terminal on main stems and branches; pedicels 0.5–3 cm. Calyx tube adnate to ovary up to top, obconical, 5–7 × 7–10 mm; lobes sublinear, 7–10 × ca. 1 mm, margin entire, apex acuminate; sinus between lobes broad and obtuse. Corolla pale blue, campanulate, 2.5–3.5 × 2.5–3.5 cm, 5-fid to 1/3; lobes ovate, apex acute. Filaments slightly dilated, slender above, 3–4 mm; anthers 7–8 mm. Capsule broadly conical above, obconical or obdeltoid-conical below, obscurely 10-ribbed. Seeds elliptic, strongly compressed. Fl. and fr. Aug–Oct.

Broad-leaved forests on rocks; 2700–3300 m. S Xizang (N-facing slopes of Qomolangma Feng) [NE India, Nepal].

3. *Codonopsis* subg. *Pseudocodonopsis* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 102. 1908.

幅冠党参亚属 fu guan dang shen ya shu

Plants usually not fetid. Roots tuberous, ovoid or ellipsoid. Stems erect or twining. Corolla epigynous, 5-fid for more than 3/4 its length, rotate. Fruit an obconic loculicidal capsule. Seed testa smooth or faintly striate.

Four species: Himalaya and the Hengduan Mountains; four species (three endemic) in China.

37. *Codonopsis rosulata* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 157. 1921.

莲座状党参 lian zuo zhuang dang shen

Plants glabrous throughout. Roots globose or ovoid, 0.5–2.2 × 0.5–2.5 cm. Stems erect or ± decumbent, 10–40 cm tall, simple or with 2 or 3 branches. Basal leaves rosulate; blade ovate or broadly elliptic, 0.5–7 × 0.4–5.8 cm, base cordate, margin doubly crenate, apex rounded or obtuse; petiole 1–30 mm; cauline leaves lanceolate or linear-lanceolate, 1–15 × 0.5–8 mm, base rounded or cuneate, margin sinuous-crenate or subentire, apex acute or acuminate. Flowers solitary and terminal on main stems and branches; pedicels 4–15 cm. Calyx tube obconic, 4–8 × 4–6 mm; lobes lanceolate or ovate-lanceolate, 3–8 mm, margin entire, apex acute; sinus between lobes acute. Corolla blue-purple, rotate, 5-fid to near base; lobes ovate or broadly ovate, 7–14 × 5–9 mm, apex acute or obtuse. Filaments dilated at base; anthers oblong, 2.5–3 mm. Capsule obconical below, slightly truncate-obtuse above, ca. 12 × 6 mm, persistent style acute at base. Seeds numerous, brown-yellow, elliptic, compressed, wingless. Fl. and fr. Sep–Oct.

• Grassy slopes, margins of *Pinus* forests; 2600–3600 m. SW Sichuan, NW Yunnan.

38. *Codonopsis hirsuta* (Handel-Mazzetti) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 546. 1992.

毛叶鸡蛋参 mao ye ji dan shen

*Codonopsis limprichtii* Lingelsheim & Borza var. *hirsuta* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.

61: 169. 1924; *C. convolvulacea* Kurz var. *hirsuta* (Handel-Mazzetti) Nannfeldt.

Roots ovoid-globose, 1–2 cm in diam. Stems up to 1 m, decumbent below, twining only at upper part, hirsute at leafing section. Cauline leaves alternate, aggregated at lower part, sessile or with extremely short petiole ca. 2 mm; blade ovate or narrowly oblong, 1.5–5 × 0.3–1.6 cm, abaxially densely hirsute, adaxially glabrous, rarely sparsely hirsute, base cuneate or rounded, margin entire or sinuous-crenulate, often recurved toward lateral sides, apex acute or obtuse. Flowers solitary, terminal. Calyx glabrous; tube adnate to ovary up to top of ovary, obconical, 4–7 mm in diam.; lobes narrowly triangular-lanceolate, 6–18 × 2–6 mm, margin entire, apex acuminate or acute. Corolla pale blue or blue-purple, 5-divided to near base; lobes elliptic, 1–3.5 × 0.5–1.6 cm. Filaments dilated at base, villous on sides. Capsule broadly conical at superior part, obconical at inferior part. Seeds numerous, brown-yellow, smooth. Fl. Sep.

• Open thickets, sunny grassy slopes; 2400–3100 m. SW Sichuan (Huili, Muli, Yanyuan), NW Yunnan (Lijiang).

39. *Codonopsis convolvulacea* Kurz, J. Bot. 11: 195. 1873.

鸡蛋参 ji dan shen

Roots tuberous, ovoid-globose or ovoid, 2.5–5 × 1–1.5 cm. Stems twining, usually with a few branches, up to more than 1 m, glabrous. Leaves alternate or sometimes opposite, evenly distributed along stems; petiole absent or to 22 mm; blade linear-lanceolate to ovate or deltoid, 2–10 × 0.4–3.5 cm, base cuneate, rounded, truncate, or cordate, margin entire, sub-

entire, sinuous-crenate, or serrate, apex obtuse, acute, or acuminate. Flowers solitary, terminal on main stems and branches; pedicels 2–12 cm, glabrous. Calyx tube adnate to ovary up to top, obconical, 3–7 × 4–10 mm, glabrous, 10-ribbed; lobes narrowly triangular-lanceolate, 4–11 × 1–5 mm, glabrous, margin entire, apex acuminate or acute; sinus between lobes narrow, pointed or slightly obtuse. Corolla pale blue or blue-purple, rotate, 5-fid to near base; lobes elliptic, 1–3.5 × 0.6–1.2 cm, apex acute. Filaments slightly dilated and ciliate at base, 1–3 mm; anthers 4–5 mm. Superior part of capsule broadly conical, valves ca. 4 mm; inferior part obconical, 10–16 × ca. 8 mm. Seeds numerous, brown-yellow, oblong, ca. 1.5 mm, wingless. Fl. and fr. Jul–Oct.

Forests, open woods, forest margins, thickets, grassy slopes, pastures, meadows; 1000–4600 m. W Guizhou, SW Sichuan, S and SE Xizang, Yunnan [Bhutan, N Myanmar, Nepal].

Two of us (Lammers and Klein) do not agree with the broad treatment of *Codonopsis convolvulacea* adopted here, i.e., with *C. forrestii*, *C. grey-wilsonii*, and *C. vinciflora* treated as subspecies of *C. convolvulacea*, with *C. limprichtii*, *C. efilamentosa*, and *C. mairei* included in the synonymy of *C. convolvulacea* subsp. *forrestii*, and with *C. limprichtii* var. *pinifolia* included in the synonymy of *C. graminifolia*. Instead, based on our analysis of herbarium material including types, we recognize seven morphologically discrete entities. The nature of the differences distinguishing them suggests each is reproductively isolated from the others and so we treat them as species: *C. convolvulacea* (including *C. forrestii* var. *heterophylla*), *C. efilamentosa*, *C. forrestii* (including *C. forrestii* var. *hirsuta*), *C. grey-wilsonii*, *C. limprichtii* (including *C. graminifolia* and *C. limprichtii* var. *pinifolia*), *C. mairei* (including *C. retroserrata*), and *C. vinciflora*. We also recognize an eighth species, *C. macrophylla* Lammers & L. L. Klein, known only in cultivation but believed to be from Xizang. See Lammers and Klein (Bot. Stud. (Taipei) 51: 553–561. 2010). However, one of us (Hong) notes that the taxonomy of this complex has been extremely controversial in the past, with several different classifications having been proposed. Based on critical examination of all available specimens in BM, E, K, KUN, and PE and recent field observations in S and SE Xizang and NW Yunnan, the *C. convolvulacea* complex is found to be extremely variable, particularly in the length of the petioles and in the shape, texture, and margin of the leaf blades. Some characters, e.g., shape of leaf blade, are merely a polymorphism within populations, and the characters distinguishing *C. convolvulacea*, *C. forrestii*, *C. grey-wilsonii*, and *C. vinciflora* are variable within geographic regions but are not distinct.

- 1a. Leaf blade thinly membranous, margin usually serrate ..... 39c. subsp. *vinciflora*
- 1b. Leaf blade thickly papery, margin mostly entire, less often serrate.
  - 2a. Leaf blade mostly cordate (less often rounded) at base; corolla with a broad dark purple circle at base ..... 39d. subsp. *grey-wilsonii*
  - 2b. Leaf blade truncate to cuneate at base; corolla with a narrow dark purple circle at base or without a dark purple circle at base.
    - 3a. Leaf blade lanceolate to linear-lanceolate, base rounded to cuneate, margin entire; petiole no more than 3 mm ..... 39a. subsp. *convolvulacea*

- 3b. Leaf blade deltoid or ovate to linear-lanceolate, base cordate or truncate to cuneate, margin entire, subentire, sinuous-crenate, or serrate; petiole 3–22 mm ..... 39b. subsp. *forrestii*

### 39a. *Codonopsis convolvulacea* subsp. *convolvulacea*

鸡蛋参(原亚种) ji dan shen (yuan ya zhong)

Leaves subsessile or petiole no more than 3 mm; blade lanceolate to linear-lanceolate, 2–7 × 0.5–1.5 cm, papery, base rounded to cuneate, margin entire.

Thickets, grassy slopes; 1000–1800 m. S Yunnan [N Myanmar].

### 39b. *Codonopsis convolvulacea* subsp. *forrestii* (Diels) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 546. 1992.

珠子参 zhu zi shen

*Codonopsis forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 171. 1912; *C. convolvulacea* var. *efilamentosa* (W. W. Smith) L. T. Shen; *C. convolvulacea* var. *forrestii* (Diels) Ballard; *C. convolvulacea* var. *limprichtii* (Lingelsheim & Borza) J. Anthony; *C. efilamentosa* W. W. Smith; *C. forrestii* var. *hirsuta* P. C. Tsoong & L. T. Shen; *C. limprichtii* Lingelsheim & Borza; *C. mairei* H. Léveillé; *C. retroserrata* Z. T. Wang & G. J. Xu.

Leaves petiolate; petiole 3–22 mm; blade deltoid or ovate to linear-lanceolate, 2–10 × 0.4–3.5 cm, papery, base cordate or truncate to cuneate, margin entire, subentire, sinuous-crenate, or serrate.

Open woods, forest margins, thickets, meadows; 1800–3900 m. W Guizhou (Anshun), SW Sichuan, C and N Yunnan [N Myanmar].

### 39c. *Codonopsis convolvulacea* subsp. *vinciflora* (Komarov) D. Y. Hong, Fl. Xizang. 4: 582. 1985.

薄叶鸡蛋参 bao ye ji dan shen

*Codonopsis vinciflora* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 29: 103. 1908; *C. forrestii* var. *heterophylla* C. Y. Wu; *C. convolvulacea* var. *vinciflora* (Komarov) L. T. Shen.

Leaves shortly petiolate; petiole 3–12 mm; blade ovate-lanceolate to linear-lanceolate, 2–10 × 0.4–3 cm, thinly membranous, base truncate to cuneate, margin mostly serrate, rarely entire.

• Forests, thickets; 1800–4600 m. SW Sichuan, SE Xizang, NW Yunnan (Dêqên).

### 39d. *Codonopsis convolvulacea* subsp. *grey-wilsonii* (J. M. H. Shaw) D. Y. Hong, Novon 20: 421. 2010.

喜马拉雅鸡蛋参 xi ma la ya ji dan shen

*Codonopsis grey-wilsonii* J. M. H. Shaw, New Plantsman 3(2): 93. 1996, based on *C. nepalensis* Grey-Wilson, Plantsman 12(2): 99. 1990, not H. Hara (1978).

Leaf blades mostly cordate (less often rounded) at base.

Corolla often with a broad dark purple circle at base. Calyx tube and capsule rounded or obconic at base.

Forests, thickets; 2100–4000 m. S Xizang (Gyirong, Nyalam) [Bhutan, Nepal].

**40. *Codonopsis graminifolia*** H. Léveillé, Cat. Pl. Yun-Nan, 24. 1916.

松叶鸡蛋参 song ye ji dan shen

*Codonopsis convolvulacea* Kurz var. *pinifolia* (Handel-Mazzetti) Nannfeldt; *C. limprichtii* Lingelsheim & Borza var. *pinifolia* Handel-Mazzetti.

Plants glabrous throughout. Roots ovoid or oblong, 0.8–1.5 cm in diam. Stems decumbent below, twining only at upper part, sometimes suberect, up to 1 m, simple or branched. Cauline leaves alternate, usually aggregated at lower part, sessile, linear to linear-lanceolate, 2–10.5 × 0.1–1 cm, base cuneate, margin entire, often recurved toward lateral sides, apex acuminate. Flowers solitary, terminal. Calyx tube adnate to ovary up to top of ovary, obconical; lobes narrowly triangular, 4–10 × 2–

3 mm, entire. Corolla blue or purple, divided to near base; lobes elliptic, 8–26 × 4–12 mm. Filaments dilated at base, densely white villous on sides; anthers ca. 3 mm. Capsule obconical and ca. 6 mm in diam. at inferior part, broadly conical at superior part. Seeds numerous, brown-yellow. Fl. Jul–Sep, fr. Sep–Oct.

• *Pinus* forests, thickets, open grassy slopes; 1500–3300 m. W Guizhou (Weining), SW Sichuan, N Yunnan.

Two of us (Lammers and Klein) regard *Codonopsis graminifolia* and *C. limprichtii* var. *pinifolia* as synonyms of *C. limprichtii* because we can discern no way to distinguish *C. limprichtii* from the other two entities; see Lammers and Klein (Bot. Stud. (Taipei) 51: 553–561, 2010). However, one of us (Hong) notes that the description in the protologue of *C. limprichtii* (Lingelsheim & Borza, Repert. Spec. Nov. Regni Veg. 13: 391–392. 1914; "... *Folia ... inferiora ovalia, parce obtuse dentata, ad 3 cm longa, 2 cm lata, superiora lanceolata, integerrima, ad 5 cm longa et 1 cm lata, ...*") and the isotype, *H. W. Limpricht 851* (WU), represent a broader-leaved entity rather than the narrow-leaved plant described here as *C. graminifolia*. Therefore, *C. graminifolia* and *C. limprichtii* cannot be conspecific, and the latter is instead treated here in the synonymy of *C. convolvulacea* subsp. *forrestii*.

#### 4. CAMPANUMOEAE Blume, Bijdr. 726. 1826.

金钱豹属 jin qian bao shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

Herbs, perennial. Roots thickened, carrot-shaped. Stems voluble. Leaves opposite or alternate. Flowers solitary, axillary or almost opposite to leaves, or in cymes of 3, pedicellate, 4–7-merous. Calyx tube (hypanthium) adnate to ovary to different extents, or free from ovary. Corolla epigynous; tube obvious; limb 5(or 6)-lobed. Stamens 5; filaments glabrous or hairy. Ovary completely inferior, or inferior only to corolla but inferior, semi-inferior, or superior to calyx, 3–6-locular; style glabrous or hairy; stigma 3–6-fid. Berry globose, apically flat. Seeds numerous.

Two species: Bhutan, China, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam; two species in China.

1a. Leaves opposite; calyx nearly completely hypogynous but corolla epigynous ..... 1. *C. javanica*  
1b. Leaves alternate; both calyx and corolla epigynous ..... 2. *C. inflata*

**1. *Campanumoea javanica*** Blume, Bijdr. 727. 1826.

金钱豹 jin qian bao

Roots thickened. Stems twining, multi-branched, glabrous. Leaves opposite, rarely alternate, long petiolate; blade cordate or cordate-ovate, sometimes becoming trilobate, 2.6–8 × 2–7.5 cm, glabrous or abaxially sometimes sparsely villous, margin dentate or crenate, or rarely entire. Flowers axillary, glabrous throughout. Calyx free from ovary, cleft nearly to base; lobes lanceolate or ovate, rarely narrowly triangular, 8–20 mm. Corolla epigynous, white or yellow-green, purple or reddish inside, campanulate, cleft to middle. Stigma 4- or 5-fid; ovary and berry 5-locular. Berry violet or greenish white suffused with red, globose, 7–26 mm. Seeds irregular in shape, surface reticulate. Fl. and fr. May–Nov.

S Anhui, Fujian, SE Gansu, Guangdong, Guangxi, N and SW Guizhou, Hainan, W Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam].

1a. Corolla 15–30 mm; berry violet, 15–26 mm in diam. .... 1a. subsp. *javanica*

1b. Corolla 6–13 mm; berry greenish white suffused with red, 7–15 mm in diam. .... 1b. subsp. *japonica*

**1a. *Campanumoea javanica*** subsp. *javanica*

金钱豹(原亚种) jin qian bao (yuan ya zhong)

*Campanula javanica* (Blume) D. Dietrich; *Campanumoea cordata* (Hasskarl) Miquel; *C. labordei* H. Léveillé; *Codonopsis cordata* Hasskarl; *C. cordifolia* Komarov; *C. javanica* (Blume) J. D. Hooker & Thomson.

Leaf blade 3.5–8 × 2.2–7.5 cm. Calyx lobes lanceolate, 10–20 mm. Corolla 15–30 mm. Berry violet, 15–26 mm in diam.

Guangdong, Guangxi, SW Guizhou, Hainan, Taiwan, Yunnan [Bhutan, NE India, Indonesia, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam].

**1b. *Campanumoea javanica*** subsp. *japonica* (Makino) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 71. 1983.

小花金钱豹 xiao hua jin qian bao

*Campanumoea javanica* var. *japonica* Makino, Bot. Mag. (Tokyo) 22: 155. 1908; *C. japonica* Maximowicz (1868), not Siebold ex E. Morren (1863); *C. maximowiczii* Honda; *Codonopsis javanica* subsp. *japonica* (Makino) Lammers.

Leaf blade 2.6–8 × 2.2–6.5 cm. Calyx lobes ovate or lanceolate, or rarely narrowly triangular, 8–12(–17) mm. Corolla 6–13 mm. Berry greenish white suffused with red, 7–15 mm in diam.

S Anhui, Fujian, SE Gansu (Wenxian), N Guangdong (Huajji, Lianxian), Guangxi (Jiuwan Dashan), N Guizhou, W Hubei, Hunan, Jiangxi, Sichuan (E of Erlang Shan), Taiwan, Zhejiang [Japan].

**2. *Campanumoea inflata*** (J. D. Hooker & Thomson) C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 436. 1881.

藏南金钱豹 zang nan jin qian bao

*Codonopsis inflata* J. D. Hooker & Thomson, Ill. Himal. Pl. t. 16, C. 1855.

Plants voluble. Roots slightly thickened, branched. Stems almost glabrous. Leaves alternate; petiole 3–6 cm; blade ovate to ovate-lanceolate, 4–10 × 2–5 cm, abaxially glaucous, puberulent, adaxially glabrous or sparsely puberulent, base deeply cordate, margin entire or sinuate, apex acuminate. Flowers almost opposite to leaves, or in terminal and few-flowered cymes; pedicels 2–3 cm. Calyx adnate up to top of ovary; tube obdeltoid-conical, puberulent; lobes and corolla inserted at same position, ovate-triangular, ca. 1 cm, margin often recurved. Corolla pale yellow or pale green, but often purple at margin and veins, campanulate, 2.5–3 cm, cleft to 1/3. Filaments glabrous. Style glabrous; stigma 3-lobed; ovary 3-locular. Berry yellow-green, globose, 12–15 mm in diam. Seeds ovoid-globose, surface reticulate. Fl. and fr. Aug–Sep.

Broad-leaved forests, herb communities at forest margins; below 2500 m. SE Xizang (Médog) [Bhutan, NE India, E Nepal].

**5. CYCLOCODON** Griffith ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 17. 1857.

轮钟花属 lun zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Codonopsis* A. Candolle (1839), not Wallich (1824).

Herbs, (perennial or annual), erect or ascending. Stems mostly branched. Leaves opposite, rarely whorled. Flowers solitary, terminal or axillary, or in dichasium, perfect; bracteoles present, filiform or leaflike, or absent. Calyx partly adnate to or completely free from ovary, and thus epigynous or hypogynous for ovary; lobes 4–6, from subentire to branched. Corolla epigynous, tubular, 4–6-merous. Stamens 4–6; filaments dilated below, glabrous or ciliate at dilated part. Ovary inferior for corolla but from semi-inferior to superior for calyx, 3–6-locular; stigma 4–6-fid; ovules extremely numerous. Fruit a berry. Seeds extremely numerous, subglobose.

Three species: from the Himalaya to Japan (Ryukyu Islands), Philippines, and Papua New Guinea; three species in China.

- 1a. Flowers often 4-merous; calyx inserted on pedicel, distant from other floral parts by 1–4 mm, like involucrel bracts ..... 3. *C. parviflorus*
- 1b. Flowers usually 5- or 6-merous; calyx at least partly adnate to ovary.
  - 2a. Flowers all terminal; bracteoles often absent, rarely present and then stalked and ± leaflike; calyx lobes denticulate to subentire; filaments glabrous; berry often white, less often yellow or pale red ..... 2. *C. celebicus*
  - 2b. Flowers terminal and axillary; bracteoles present and filiform; calyx lobes branched; filaments hairy below; berry purple-black ..... 1. *C. lancifolius*

**1. *Cyclocodon lancifolius*** (Roxburgh) Kurz, Flora 55: 303. 1872.

轮钟花 lun zhong hua

*Campanula lancifolia* Roxburgh, Fl. Ind. 2: 96. 1824; *Campanumoea axillaris* Oliver; *C. lancifolia* (Roxburgh) Merrill; *C. truncata* (Wallich ex A. Candolle) Diels; *Codonopsis lancifolia* (Roxburgh) Moeliono; *C. truncata* Wallich ex A. Candolle; *Cyclocodon truncatus* (Wallich ex A. Candolle) J. D. Hooker & Thomson.

Herbs, (perennial or annual), erect or ascending, sometimes lignified at base, usually glabrous throughout. Stems up to 3 m tall, hollow; branches multiple, horizontal or pendulous. Leaves opposite, rarely in whorls of 3, shortly petiolate; blade ovate or ovate-lanceolate to lanceolate, 6–15 × 1–5 cm, margin serrate, dentate, or crenate, apex acuminate. Flowers usually solitary, terminal, or both terminal and axillary, sometimes in a cyme of 3; pedicels or peduncles 1–10 cm, with a pair of

filiform bracteoles at middle to top. Calyx adnate to ovary up to lower part of ovary; lobes (4 or)5(–7), filiform or linear, margins with ramiform teeth. Corolla white or pale red, tubular-campanulate, 7–12 mm, 5- or 6-cleft to middle; lobes ovate to ovate-triangular. Stamens 5 or 6; filaments equal to anthers in length, base dilated into lamellar part, margins villous-ciliate. Style glabrous or hairy; stigma (4 or)5- or 6-fid; ovary (4 or)5- or 6-locular. Berry purple-black when mature, globose, (4 or)5- or 6-locular, 5–10 mm in diam. Seeds extremely numerous, subglabrous. Fl. and fr. Jul–Nov.

Forests, thickets, grasslands; below 1500 m. Chongqing, S Fujian, Guangdong, Guangxi, Guizhou, Hainan, SW Hubei, S and W Hunan, S Jiangxi (Quannan), Sichuan, Taiwan, SE Yunnan [Bangladesh, Cambodia, NE India, Indonesia, Japan (including Ryukyu Islands), Laos, Philippines, Vietnam].

**2. *Cyclocodon celebicus*** (Blume) D. Y. Hong, Acta Phytotax. Sin. 36: 109. 1998.

小叶轮钟草 xiao ye lun zhong cao

*Campanumoea celebica* Blume, Bijdr. 727. 1826; *Campanula celebica* (Blume) D. Dietrich; *Codonopsis celebica* (Blume) Miquel; *C. lancifolia* (Roxburgh) Moeliono subsp. *celebica* (Blume) Moeliono; *Cyclocodon lancifolius* (Roxburgh) Kurz subsp. *celebicus* (Blume) K. E. Morris & Lammers.

Herbs, (perennial or annual?), without caudexes, nor rhizomes, erect, 1–2 m tall, sometimes lignified at base. Stems terete, branched, sparsely hispidulous or subglabrous. Leaves shortly petiolate; petiole up to 5 mm; blade ovate-lanceolate to lanceolate, 5–10 × 2–4 cm, those on branches smaller, glabrous or sparsely puberulent along veins on both surfaces, base usually rounded, margins serrate, teeth pointed at apex, blade apex acuminate. Flowers terminal, usually in a dichasium of 3; pedicels 8–20 mm, hispidulous, usually without bracteoles, rarely with stalked and ± leaflike bracteoles. Calyx adnate to ovary up to ca. 1/3 of ovary; tube glabrous; lobes mostly 5 or 6, linear to linear-elliptic, 3–10 × 1–3 mm, entire or with 2–4 pairs of serrate teeth. Corolla pale blue, campanulate, 7–10 mm, 5- or 6-lobed to middle. Stamens 5 or 6, glabrous; filaments slightly dilated below. Ovary globose; stigma 5- or 6-fid. Berry white, oblate, 5- or 6-locular, up to 8 × 12 mm. Seeds extremely numerous. Fl. and fr. Jul–Jan.

Grassy slopes, thickets, woodlands; 800–2600 m. SE Xizang (Bomi, Mêdog, Zayü), S and W Yunnan [Bangladesh, NE India (Darjeeling, Sikkim), Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam].

**3. *Cyclocodon parviflorus*** (Wallich ex A. Candolle) J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 18. 1857.

小花轮钟草 xiao hua lun zhong cao

*Codonopsis parviflora* Wallich ex A. Candolle, Monogr. Campan. 123. 1830; *Campanula punduana* D. Dietrich; *Campanumoea parviflora* (Wallich ex A. Candolle) Bentham ex C. B. Clarke.

Herbs, (perennial or annual?), erect, 1–2 m tall. Stems terete, branched, glabrous. Leaves shortly petiolate; petiole up to 6 mm; blade abaxially somewhat glaucous, lanceolate, 5–11 × 1.5–3 cm, those on branches smaller, both surfaces glabrous, base rounded or broadly cuneate, margin serrate, teeth apiculate at apex, blade apex acuminate. Flowers terminal, often in a dichasium of 3; pedicels 1–4 cm, glabrous, with or without a pair of leaflike or linear bracteoles. Calyx entirely free from ovary, and thus hypogynous, just below ovary or 1–4 mm distant from ovary, forming an anthophore; lobes usually 4, free from each other, linear, 3.5–8 mm, with 1–4 pairs of teeth. Corolla white, lobes equaling tube in length, 5–8 mm. Stamens 4; filaments subulate. Ovary globose or obovoid, 4-locular; stigma 4-fid. Fruit a globose berry, 4–6 mm. Seeds extremely numerous, light brown, orbicular or circular, compressed, reticulate. Fl. and fr. Sep–Jan.

Thickets, herb communities; below 1500 m. S and SW Yunnan [Bangladesh, Bhutan, NE India (Assam, Sikkim), Laos, Myanmar].

## 6. ECHINOCODON D. Y. Hong, Acta Phytotax. Sin. 22: 183. 1984.

刺萼参属 ci e shen shu

Hong Deyuan (洪德元); Thomas G. Lammers

Herbs, perennial. Roots slightly thickened, carrot-shaped. Leaves alternate, pinnatifid. Flowers solitary, terminal, or 2 or 3 in a cyme. Calyx 2–5 (often 4)-lobed; lobes with 2–4 spinose lobules. Corolla tubular, 3–5-cleft to middle. Stamens 3–5, mostly 4, free but connivent initially; filaments dilated at base, dilated part ciliate. Ovary almost entirely inferior, 3–5-locular; stigma lobes equal in number to ovary locules, linear, recurved; ovules numerous. Capsule globose, superior part conical, loculicidal, valves alternate with calyx lobes. Seeds numerous, ellipsoid, 3-ribbed, ribs obtuse.

- One species: China.

**1. *Echinocodon lobophyllus*** D. Y. Hong, Acta Phytotax. Sin. 22: 183. 1984.

刺萼参 ci e shen

Plants diffuse, glabrous throughout. Roots up to 5 mm in diam. Stems up to 40 cm, multi-branched. Leaves petiolate; petiole 5–10 mm; blade abaxially green-gray, adaxially green, elliptic, 5–20 × 3–15 mm, base narrowly cuneate, margin

pinnatifid nearly to middle vein or to middle, apex obtuse. Pedicels 1–5 cm. Calyx lobes ovate-lanceolate, 2–6 × 1–3 mm (lobules excluded). Corolla purple-blue, 3–4.5 mm. Stamens ca. 1.5 mm; anthers narrowly oblong, ca. 1 mm. Style ca. 1 mm; stigma segments linear, recurved. Capsule globose, 3–5 mm in diam., superior part conical, up to 2 mm. Seeds minute, ca. 0.3 mm. Fl. and fr. Jun–Jul.  $2n = 16^*$ .

- Herb communities in stony places; ca. 300 m. Hubei (Yunxi).

## 7. PLATYCODON A. Candolle, Monogr. Campan. 125. 1830.

桔梗属 jie geng shu

Hong Deyuan (洪德元); Laura L. Klein, Thomas G. Lammers

Herbs, perennial. Taproot thickened, carrotlike. Stems erect. Leaves cauline, 3- or 4-verticillate, opposite, or alternate, sessile or shortly petiolate. Flowers large, terminal, solitary, pedicellate. Calyx lobes 5, shorter than hypanthium. Corolla bowl-shaped; lobes 5, shorter than or equaling tube. Stamens 5, free; filaments dilated into a triangular base, dilated part ciliate; anthers longer than fila-

ments. Disk absent. Ovary semi-inferior, 5-locular, locules opposite calyx lobes; stigma 5-fid. Capsule 5-loculicidal at apex, valves with septa, opposite to calyx lobes. Seeds numerous, black or dark brown, large, terete, ellipsoid or oblong, longitudinally keeled.

One species: E Asia; widely cultivated elsewhere.

**1. *Platycodon grandiflorus*** (Jacquin) A. Candolle, Monogr. Campan. 125. 1830 [*“grandiflorum”*].

桔梗 jie geng

*Campanula grandiflora* Jacquin, Hort. Bot. Vindob. 3: 4. 1776; *C. glauca* Thunberg; *Platycodon autumnalis* Decaisne; *P. chinensis* Lindley & Paxton; *P. glaucus* (Thunberg) Nakai; *P. sinensis* Lemaire.

Stems 20–120 cm tall, usually glabrous, rarely densely puberulent, simple, rarely branched above. Leaf blade adaxially green, ovate, elliptic, or lanceolate, 2–7 × 0.5–3.5 cm, abaxially glabrous (rarely puberulent along veins) and glaucous, adaxi-

ally glabrous, base broadly cuneate or rounded, margin serrate, apex acute or acuminate. Hypanthium hemispherical, obovoid, or obconic, rarely campanulate, glaucous. Calyx lobes triangular or narrowly triangular, sometimes toothlike. Corolla blue or purple (rarely pink or white), 1.5–4.5 cm. Capsule globose, obconic, or obovoid, 0.7–2.5 × 0.7–1.5 cm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 18, 36$ .

Sunny herb communities, thickets, rarely in forests; below 2000 m. Anhui, Chongqing, Fujian, Guangdong, N Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, E Sichuan (west to Pingwu and Liangshan), SE Yunnan (Mengzi, Wenshan, Yanshan), Zhejiang [Japan, Korea, Russia (Far East, SE Siberia)]; widely cultivated elsewhere].

**8. WAHLENBERGIA** Schrader ex Roth, Nov. Pl. Sp. 399. 1821, nom. cons.

藍花參屬 lan hua shen shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Campanopsis* (R. Brown) Kuntze; *Campanula* sect. *Campanopsis* R. Brown; *Cephalostigma* A. Candolle; *Cervicina* Delile.

Herbs, perennial or annual, rarely subshrubs or shrubs. Leaves cauline and often basally rosulate, alternate or rarely opposite, usually sessile. Flowers small to medium-sized, sessile or pedicellate, terminal or axillary, solitary or in thyrses, panicles, or fascicles. Calyx lobes typically 5. Corolla blue or white, campanulate or funnelform, lobed, cleft, or divided; segments typically 5. Stamens typically 5; filaments free and distinct, dilated into a triangular base, dilated part ciliate; anthers coherent. Ovary inferior, 2- or 3(–5)-locular; stigma 2- or 3(–5)-fid, segments linear. Capsule loculicidal at apex. Seeds numerous or few.

About 260 species: mainly in S Hemisphere, particularly S Africa, extending north to W Europe, E and S Asia, and N South America; two species in China.

- 1a. Perennials; flowers solitary; pedicels 5–20 cm; corolla cleft for 2/3 its length; ovary and capsule 3-locular ..... 1. *W. marginata*
- 1b. Annuals; flowers numerous in a terminal panicle; pedicels 0.5–2 cm corolla divided nearly to base; ovary and capsule 2-locular ..... 2. *W. hookeri*

**1. *Wahlenbergia marginata*** (Thunberg) A. Candolle, Monogr. Campan. 143. 1830.

藍花參 lan hua shen

*Campanula marginata* Thunberg in Murray, Syst. Veg., ed. 14, 211. 1784; *Adenophora microsperma* Y. Y. Qian; *Campanopsis marginata* (Thunberg) Kuntze; *Wahlenbergia gracilis* (G. Forster) A. Candolle var. *miseria* Hemsley.

Herbs, perennial. Roots elongate, carrotlike. Stems erect or ascending, 10–40 cm, branched at base, glabrous or sparsely hirsute below. Leaves alternate, mostly on lower part of stem, lowermost sometimes caducous, sessile or with petiole up to 7 mm; blade spatulate, oblanceolate, elliptic, or linear, 10–40 × 2–8 mm, glabrous or sparsely hirsute, margin sinuate, sparsely serrulate, or entire. Pedicels erect, terminal and sometimes axillary, slender, up to 20 cm. Hypanthium obovoid or conic, glabrous. Calyx lobes triangular or subulate. Corolla blue, broadly campanulate, 3–12 mm, cleft for 1/3–2/3 its length; lobes obovate, oblong, or narrowly oblong. Capsule obconic, obovoid, or subglobose, 3–8 mm, 3-locular. Seeds yellow-brown or dark brown, oblong or ellipsoid, slightly compressed, 0.3–0.5 mm, smooth. Fl. and fr. Feb–May.  $2n = 36, 72$ .

Wastelands, fields, slopes, streams; lower elevations (to 2800 m in Yunnan). Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou,

Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan (including Ryukyu Islands), Korea, Laos, Malaysia, Myanmar, Nepal, Papua New Guinea, Philippines, Sri Lanka, Vietnam; naturalized in the Pacific islands (Hawaiian Islands) and North America].

**2. *Wahlenbergia hookeri*** (C. B. Clarke) Tuyn in Steenis, Fl. Males., Ser. 1, Spermat. 6: 114. 1960.

星花草 xing hua cao

*Cephalostigma hookeri* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 429. 1881.

Herbs, annual. Stems erect, 8–20 cm tall, sparsely villous, dichotomously branched. Leaves shortly petiolate; blade ovate or ovate-elliptic, ca. 2.5 × 1.2 cm, base and apex obtuse, margin denticulate. Cymes in large and lax panicles; bracts small; pedicels slender, up to 2 cm. Calyx ca. 1.5 mm; tube obconical; lobes triangular, ca. 0.5 mm. Corolla blue, 5-divided to near base; lobes spreading, starlike, linear-elliptic, 2–3 mm. Stamens ca. 1.5 mm. Style almost equal to corolla in length. Capsule subglobose, ca. 3 mm in diam., 2-locular. Seeds small, broadly ellipsoid, 3-ribbed. Fl. Nov.

Sunny slopes in moist ravines; 1300–1400 m. S Yunnan (Menghai) [E India, Indonesia (Java), N Thailand; Africa].

## 9. CAMPANULA Linnaeus, Sp. Pl. 1: 163. 1753.

风铃草属 feng ling cao shu

Hong Deyuan (洪德元); Thomas G. Lammers, Laura L. Klein

*Neocodon* Kolakovsky & Serdyukova.

Herbs, perennial, with long horizontal rhizomes or with short caudexes and thickened ± fleshy roots; less often annual. Basal leaves sometimes rosulate; cauline leaves all alternate. Flowers solitary and terminal, or in cymes; cymes paniculate or capitellate, later subtended by an involucre. Calyx adnate to ovary; lobes 5, sometimes with an appendage between lobes. Corolla campanulate, tubular-campanulate, or funnelform, sometimes subrotate, 5-lobed. Filaments dilated; anthers coherent or rarely connate. Disk absent. Ovary inferior, 3–5-locular. Capsules dehiscent by lateral, upper or lower pores, crowned by persistent calyx lobes. Seeds numerous, ellipsoid, smooth.

About 420 species: throughout the Arctic and N temperate regions, most abundant from the Mediterranean to the Caucasus; 22 species (11 endemic) in China.

- 1a. Capsule poricidal above middle; flowers solitary, terminal, or several terminal on main stems and branches; cauline leaves mostly toward base, upper cauline leaves sessile or nearly so, usually linear if present; basal leaves persistent at anthesis (2. *C.* subg. *Rapunculus*).
- 2a. Plants with horizontal rhizomes; stems simple; stems and leaves glabrous.
- 3a. Hypanthium narrowly cylindrical; calyx lobes filiform, longer than corolla ..... 21. *C. aristata*
- 3b. Hypanthium obovoid or obconic; calyx lobes subulate or narrowly triangular, shorter than corolla.
- 4a. Plants 20–50 cm tall; middle cauline leaves longer than 2 cm; calyx lobes 5–9 mm; corolla 15–20 mm, cleft for ca. 1/2 its length ..... 16. *C. stevenii*
- 4b. Plants 7–22 cm tall; middle cauline leaves shorter than 2 cm; calyx lobes 1.8–5 mm; corolla 4–11 mm, cleft for ca. 1/3 its length ..... 22. *C. immodesta*
- 2b. Plants without horizontal rhizomes; stems simple or branched; stems and leaves variously pubescent.
- 5a. Flowers pendent.
- 6a. Plants 20–50 cm tall; calyx lobes 1–5.5 mm; corolla lobes as long as tube ..... 17. *C. delavayi*
- 6b. Plants 6–33 cm tall; calyx lobes 3–12 mm; corolla lobes ca. 1/2 as long as tube ..... 18. *C. crenulata*
- 5b. Flowers erect.
- 7a. Basal leaves cordate-reniform; stems slender but not filiform, hairy, lower half with cordate to ovate-lanceolate leaves; capsule 4–8 mm ..... 19. *C. calcicola*
- 7b. Basal leaves cordate; stems filiform, glabrous or subglabrous, with mostly linear leaves; capsule 9–19 mm ..... 20. *C. chrysosplenifolia*
- 1b. Capsule poricidal toward base; stems with numerous flowers, solitary or in various types of inflorescences; leaves many and evenly distributed on stems; basal leaves usually wilted at anthesis (1. *C.* subg. *Campanula*).
- 8a. Appendages between calyx lobes present, reflexed, setose on margins.
- 9a. Annuals, ca. 6 cm tall; corolla 6–8 mm, green ..... 3. *C. gansuensis*
- 9b. Perennials, over 25 cm tall; corolla 9–65 mm, white, purple, or yellow.
- 10a. Corolla large, 3–6.5 cm, punctate ..... 1. *C. punctata*
- 10b. Corolla smaller, narrowly campanulate, less than 1.5 cm, not punctate ..... 2. *C. sibirica*
- 8b. Appendages between calyx lobes absent.
- 11a. Flowers in a head of 2 to several in axils of involucre bracts, several heads aggregated into a large compound head; leaf blades more than 4 cm, often up to 17 cm.
- 12a. Corolla lobes linear-lanceolate, longer than tube; plants ca. 10 cm tall ..... 6. *C. austroxinjiangensis*
- 12b. Corolla lobes ovate, shorter than tube; plants 14–130 cm tall.
- 13a. Lower cauline leaves long petiolate; calyx lobes subulate ..... 4. *C. glomerata*
- 13b. Lower cauline leaves shortly winged-petiolate; calyx lobes ligulate, rounded at apex ... 5. *C. glomeratoides*
- 11b. Flowers solitary or in a lax inflorescence; leaves usually much smaller, up to 6 cm.
- 14a. Leaves glabrous on both surfaces or hairy only on margins; corolla glabrous outside; calyx lobes linear or subulate, glabrous on both surfaces or sparsely ciliate.
- 15a. Leaves and calyx lobes hispidulous on margins; blades of cauline leaves obovate-elliptic or elliptic ..... 7. *C. nakaoi*
- 15b. Leaves and calyx lobes glabrous throughout; blades of cauline leaves linear ..... 8. *C. langsdorffiana*
- 14b. Leaves hairy on both surfaces; corolla ± hairy outside; calyx lobes hairy, narrowly triangular to subtriangular, rarely subulate-triangular (subulate only in *C. mekongensis*).
- 16a. Annual herbs; rosulate basal leaves sometimes present at anthesis; each branch with compound cymes ..... 14. *C. dimorphantha*

- 16b. Perennial herbs; basal leaves often absent at anthesis; branches with a single cyme or solitary flower.
- 17a. Cauline leaves, at least lower ones, long petiolate; petiole 5–12 cm ..... 9. *C. omeiensis*
- 17b. Cauline leaves sessile or shortly winged-petiolate.
- 18a. Calyx tube hairy only along veins; lateral branches with several flowers; calyx lobes subulate, sinus between lobes truncate-obtuse ..... 15. *C. mekongensis*
- 18b. Calyx tube densely hairy; lateral branches with a solitary flower or single simple inflorescence; calyx lobes subulate-triangular to deltoid, overlapping, or sinus acute.
- 19a. Calyx lobes deltoid, with a pair of large teeth; stems long and prostrate; cauline leaves of lower half of stem wilted at anthesis, rest of leaves pannose abaxially, sessile, suborbicular ..... 13. *C. yunnanensis*
- 19b. Calyx lobes subulate-triangular, rarely subdeltoid, with or without teeth; stems erect or diffuse; lower cauline leaves often present at anthesis; leaves sparsely hispid or densely pannose abaxially, elliptic, rhombic, or linear-elliptic.
- 20a. Style strongly exerted; anthers completely or partially connivent; corolla cleft more than halfway ..... 12. *C. chinensis*
- 20b. Style included; anthers completely free; corolla cleft down to middle.
- 21a. Calyx lobes narrowly triangular to subdeltoid, toothed or not; leaves often hispid, less frequently pannose abaxially; stems single or several from one caudex, erect or ascending ..... 10. *C. pallida*
- 21b. Calyx lobes subulate-triangular to narrowly triangular, rarely toothed; leaves densely pannose abaxially; stems usually numerous from one caudex, often diffuse, less often ascending ..... 11. *C. cana*

### 1. *Campanula* subg. *Campanula*

风铃草亚属 feng ling cao ya shu

Basal leaves absent or wilted at anthesis; cauline leaves evenly distributed on stems, upper ones sessile or not, often relatively broad. Flowers numerous, in cymes aggregated into raceme-, spike-, or headlike inflorescences. Capsule poricidal toward base.

About 275 species: throughout the Arctic and N temperate regions of the Old World, extending south into Macronesia, tropical E Africa, the Arabian Peninsula, India, Indochina, and east into the Aleutian Islands; 15 species (seven endemic) in China.

#### 1. *Campanula punctata* Lamarck, Encycl. 1: 586. 1785.

刺毛风铃草 ci mao feng ling cao

紫斑风铃草 zi ban feng ling cao

*Campanula nobilis* Lindley.

Plants perennial, setose throughout or rarely subglabrous. Rhizomes long, horizontal. Stems erect, robust, 20–100 cm tall, usually branched above. Basal leaves long petiolate; blade cordate or ovate; cauline leaves ovate, lanceolate, or triangular, base rounded or truncate, margin irregularly dentate, apex acute or acuminate; lower leaves winged-petiolate, upper ones sessile. Flowers terminal on top of main stems and branches, pendent. Calyx lobes narrowly triangular; reflexed appendages elliptic, triangular, ovate, or lanceolate. Corolla white, yellow, or pink, commonly purple- or red punctate, tubular-campanulate, 3–6.5 cm. Capsule broadly campanulate or obconic. Seeds gray-brown, oblong or elliptic, slightly compressed, ca. 1 mm, smooth. Fl. Jun–Sep, fr. Sep–Oct.  $2n = 34$ .

Forests, thickets, meadows; below 2300 m. E Gansu, Hebei, Heilongjiang, W Henan, W Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, NE Sichuan [Japan, Korea, Russia (Far East, Siberia); widely cultivated].

#### 2. *Campanula sibirica* Linnaeus, Sp. Pl. 1: 236. 1753.

Plants perennial. Roots thickened, carrot-shaped, sometimes lignified. Stems erect, purplish, cylindrical, 20–70 cm tall, multi-branched; branches upright, slender, white hirsute. Basal and lower cauline leaves 5–8 × 1–3 cm, white hirsute, with long winged petiole; blade oblong or elliptic, sparsely crenate; upper cauline leaves sessile, ± amplexicaul, linear-lanceolate, entire. Flowers pendent in narrow terminal panicles on main stems and branches; pedicels 2–8 mm, longer than linear bracts. Hypanthium glabrous, obconic; calyx lobes linear-subulate, 3–4 mm, nearly 1 mm wide at base, margin setose; reflexed appendages ovate-oblong or ovate-lanceolate, slightly shorter than hypanthium, margin setose. Corolla pale blue-purple, sometimes nearly white, narrowly campanulate, 9–12 mm, inside sparsely pubescent; lobes ovate-deltoid, 1/3–1/2 as long as tube. Style equal to or slightly shorter than corolla; stigma 3-fid. Capsule obconic, ca. 4 × 3 mm. Seeds elliptic, ca. 1 mm. Fl. May–Jul.  $2n = 34$ .

Dry forests or meadows. Xinjiang (Altay Shan, Tian Shan) [Kazakhstan, Russia (European part, W Siberia); SW Asia (Turkey), Europe].

*Campanula sibirica* is divided into ten subspecies; the Chinese

plants are *C. sibirica* subsp. *sibirica*, which is also found in Kazakhstan, Russia, and Europe.

**3. *Campanula gansuensis*** L. Z. Wang & D. Y. Hong, Bot. Bull. Acad. Sin. 41: 159. 2000.

甘肃风铃草 gan su feng ling cao

Plants annual. Roots slender. Stems slender, 5–6 cm tall, simple, ± hairy. Leaves 2 or 3, alternate; blade triangular-ovate or rhombic-ovate, ca. 10 × 5–6 mm, base attenuate, margin sparsely and irregularly serrate, apex obtuse; petiole winged, ca. 0.5 cm. Flowers solitary, terminal on branches, pendent. Calyx lobes narrowly triangular or linear-triangular; reflexed appendages ovate. Corolla green, tubular-campanulate, 6–8 mm; lobes ca. 1/2 as long as tube. Filaments free, dilated at base, hairy; anthers ca. 3 mm. Ovary hemispherical; style up to 4 mm. Fl. Jul.

- Thickets by streams; ca. 1100 m. Gansu (Huixian).

**4. *Campanula glomerata*** Linnaeus, Sp. Pl. 1: 235. 1753.

北疆风铃草 bei jiang feng ling cao

Plants perennial. Stems erect, 0.2–1.3 m tall. Basal leaves long petiolate; blade ovate-lanceolate or ovate, 6–15 × 2–7 cm, base cordate, margin serrulate, apex acute; cauline leaf blade elliptic, narrowly ovate, or ovate-lanceolate, 4–10 × 0.7–4 cm, base truncate, rounded, or cuneate, margin serrulate, apex acute or acuminate; lower ones long petiolate, upper ones sessile. Flowers sessile, aggregated into a terminal compound involucrate capitulum, sometimes with additional simple capitula sessile in upper and median leaf axils; involucre bracts ovate-deltoid, that of first-blooming central flower smallest. Hypanthium glabrous or puberulent; calyx lobes subulate or linear-triangular, 7–13 × 2–3 mm. Corolla purple, blue-purple, or blue (rarely white), tubular-campanulate, 1.5–2.5 cm; lobes equaling tube. Capsule subglobose or obovoid-conical, ca. 4.5 mm. Seeds oblong, compressed, 1–1.5 mm. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 30, 34, 90$ .

Meadows, subalpine meadows, thickets, grassy slopes; below 2600 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang [Japan (Kyushu), Kazakhstan, Korea, Mongolia, Russia (European part, Far East, Siberia); SW Asia (Turkey), Europe; widely cultivated; naturalized in North America].

Fifteen subspecies are recognized, three of which occur in China.

- 1a. Simple capitula present in leaf axils in addition to terminal compound capitulum; leaf blade 1.7–7 cm wide ..... 4b. subsp. *speciosa*
- 1b. Simple capitula rarely present in leaf axils, most flowers in terminal compound capitulum; leaf blade 1–3.5 cm wide.
  - 2a. Plants 20–85 cm tall; leaves 4–13 cm; stems and leaves subglabrous to sparsely white hirsute ..... 4a. subsp. *glomerata*
  - 2b. Plants 14–50 cm tall; leaves 5–8(–11) cm; stems and leaves glabrous or hirsute along main veins ..... 4c. subsp. *daqingshanica*

**4a. *Campanula glomerata*** subsp. *glomerata*

北疆风铃草(原亚种) bei jiang feng ling cao (yuan ya zhong)

Plants 20–85 cm tall. Stems simple, stems and leaves subglabrous to sparsely white hirsute. Leaves 4–13 × 1.5–3.5 cm.

Meadows, subalpine meadows; 1300–2600 m. Xinjiang (Tian Shan and northward) [Kazakhstan, Russia (European part, Siberia); Europe; widely cultivated; naturalized in North America].

**4b. *Campanula glomerata*** subsp. *speciosa* (Sprengel) Domin, Preslia 13: 222. 1936.

聚花风铃草 ju hua feng ling cao

*Campanula glomerata* var. *speciosa* Sprengel, Syst. Veg. 1: 731. 1824, based on *C. speciosa* Hornemann, Hort. Bot. Hafn. 2: 957. 1815, not Gilibert (1782), nor Pourret (1788); *C. cephalotes* Fischer ex Schrank; *C. glomerata* subsp. *cephalotes* (Fischer ex Schrank) D. Y. Hong; *C. glomerata* var. *dahurica* Fischer ex Ker Gawler; *C. glomerata* var. *grandiflora* Herder (1872), nom. illeg. superfl., not Kuntze (1867); *C. glomerata* var. *salviifolia* Komarov; *C. glomerata* f. *speciosa* (Sprengel) Voss.

Plants 40–130 cm tall. Stems sometimes branched above; stems and leaves subglabrous or sparsely white hirsute, or densely white villous. Capitula numerous, many simple capitula present besides terminal compound capitula.

Meadows, thickets. Heilongjiang, Jilin, E Liaoning, NE Nei Mongol (Dong Ujimqin) [Japan (Kyushu), Korea, Mongolia, Russia (Far East, SE Siberia); widely cultivated].

**4c. *Campanula glomerata*** subsp. *daqingshanica* D. Y. Hong & Y. Z. Zhao, Fl. Reipubl. Popularis Sin. 73(2): 184. 1983.

大青山风铃草 da qing shan feng ling cao

Plants 14–50 cm tall. Stems subglabrous or sparsely hirsute only along ribs, rarely entirely sparsely hirsute. Leaves 5–8(–11) × 1–2.8 cm, hirsute only along main veins. Capitula several, often aggregated into terminal compound capitula, simple capitula rarely present.

- Grassy slopes; 1400–2000 m. SE Nei Mongol (Daqing Shan, Manhan Shan).

**5. *Campanula glomeratoides*** D. Y. Hong, Acta Phytotax. Sin. 18: 247. 1980.

头花风铃草 tou hua feng ling cao

Plants ?annual, white hispid throughout. Rhizomes unknown. Stems erect, robust, ca. 60 cm tall. Basal leaves shortly petiolate, caducous, blade lanceolate; lower cauline leaves winged-petiolate, blade oblanceolate or linear-oblong; middle and upper cauline leaves sessile, blade lanceolate or ovate-lanceolate, up to 9 × 1 cm, margin dentate. Flowers sessile, 2 to several in sessile capitula aggregated into a terminal involucrate compound capitulum; involucre bracts ovate-lanceolate to orbicular, forming a series continuous with upper cauline leaves, 1 or 2 in capitula with several flowers, but absent in capitula with only 2 flowers. Hypanthium obovoid or obconic; lobes ligulate, ca. 4 mm, apex obtuse. Corolla blue,

tubular-campanulate, ca. 1.5 cm. Filaments ca. 3 mm; anthers ca. 4 mm. Style slightly longer than corolla. Fruit unknown. Fl. Jul.

- Meadows; ca. 2700 m. Xizang (Bomi).

**6. *Campanula austroxinjiangensis*** Y. K. Yang, J. K. Wu & J. Z. Li, *Acta Phytotax. Sin.* 30: 92. 1992.

新疆风铃草 nan jiang feng ling cao

Plants perennial, ca. 10 cm tall. Roots carrot-shaped. Stems single, simple, sparsely puberulent. Basal leaves rosulate, blade elliptic, petiole 1–1.2 cm, winged; cauline leaves shortly petiolate, blade ovate or elliptic, 1–2.2 × 1.1–1.5 cm, both surfaces ± puberulent, base slightly ovate or subrounded, margin obtusely serrate, apex obtuse or acute. Flowers sessile in terminal and axillary capitula of 3–5 (rarely 1 or 2), terminal ones sessile, axillary ones ± pedunculate, both bractless. Calyx lobes linear-lanceolate, 7–9 × 1–1.2 mm, with hooked hairs along midvein and margin. Corolla blue, tubular-campanulate, ca. 2.7 × 7 mm; lobes linear-lanceolate, 12–14 × 4–5 mm, equaling tube, acuminate at apex. Stamens 5 or rarely 4; filaments dilated at base, 1–1.5 × 1–1.5 mm; anthers 10–13 × 1–1.2 mm. Ovary ovoid, 1.5–2 mm in diam.; style ca. 1.5 cm, included. Fl. Jul.

- Grassy slopes; ca. 2300 m. Xinjiang (Hejing).

**7. *Campanula nakaoui*** Kitamura, *Acta Phytotax. Geobot.* 15: 108. 1954.

藏南风铃草 zang nan feng ling cao

Plants perennial. Rhizome slender and long. Stems ascending or erect, usually dark purple, less frequently straw-colored, up to 35 cm, angular when dry, subglabrous or sparsely retrorsely hispid, sometimes branched. Middle cauline leaves largest, obovate-elliptic or elliptic, 12–35 × 4–12 mm, apex obtuse; lower cauline leaves gradually attenuate into short petiole; upper cauline leaves sessile; all leaves sparsely serrate, hispidulous near margins or along veins. Flowers solitary, terminal, pendulous. Hypanthium obconic, densely hirsute or granulate-glandular; calyx lobes subulate, 5–7 × ca. 1.5 mm, both sides glabrous, margin serrate and hispidulous-ciliate. Corolla blue or blue-purple, broadly campanulate, 14–20 mm, glabrous; lobes equaling or slightly longer than tube. Style ca. 1 cm; stigma 3-lobed. Fl. Jul.

Margins of *Pinus griffithii* forests; 2800–3400 m. Xizang (Gyirong) [Nepal].

**8. *Campanula langsdorffiana*** (A. Candolle) Fischer ex Trautvetter & C. A. Meyer in Middendorff, *Reise Sibir.* 1 (2, Lfg. 3): 60. 1856.

石生风铃草 shi sheng feng ling cao

*Campanula linifolia* Linnaeus var. *langsdorffiana* A. Candolle, *Monogr. Campan.* 279. 1830; *C. chinganensis* A. I. Baranov; *C. rotundifolia* Linnaeus subsp. *langsdorffiana* (A. Candolle) Vodopianova; *C. rotundifolia* var. *langsdorffiana* (A. Candolle) Britton.

Plants perennial, 10–40 cm tall. Roots carrot-shaped or cylindrical, up to 2 cm in diam. Stems several to many from a

caudex, slender, branched or simple, glabrous or sometimes hirsutulous at base. Basal leaves (if present) ovate or elliptic, base cordate, petiolate; cauline leaves sessile, filiform or linear, 45–70 × 1–3 mm. Flowers solitary or several, terminal, ± pendent. Hypanthium glabrous (rarely hirsutulous), obconic, ribbed; calyx lobes linear or subulate, 4–10 mm, sometimes almost equal to corolla in length, reflexed after anthesis. Corolla pale blue, campanulate, 10–20 mm, glabrous; lobes ca. 1/2 as long to ± as long as tube. Style included. Capsule obconic or campanulate, 5–8 mm. Seeds brown, oblong or elliptic, slightly compressed, ca. 1 mm, smooth. Fl. Jun–Aug.  $2n = 34$ .

Usually on rocks in forests, also in alpine belts. Heilongjiang, Jilin, Liaoning [Russia (Far East, S Siberia)].

This species is vicarious with *Campanula rotundifolia* Linnaeus of Europe, from which it differs in having fewer flowers and longer reflexed calyx lobes.

**9. *Campanula omeiensis*** (Z. Y. Zhu) D. Y. Hong & Z. Yu Li in Z. Yu Li, *Pl. Mt. Emei*, 484. 2007.

峨眉风铃草 e mei feng ling cao

*Adenophora omeiensis* Z. Y. Zhu, *Bull. Sichuan School Medic. Mater.* 22(2): 29. 1990.

Plants perennial, 50–65 cm tall. Roots carrot-shaped, 5–15 mm in diam. Stems simple, sparsely hirsute. Basal and lower cauline leaves with petiole 5–12 cm; upper cauline leaves shortly petiolate to sessile, blade adaxially green, ovate-triangular or ovate-lanceolate, 2.5–3.5 × 1.2–1.8 cm, abaxially sparsely strigose or hispidulous, base subtruncate or cuneate, margin irregularly serrate, apex acuminate or acute. Panicles terminal, narrow, inflorescence branches reduced and sometimes with solitary flowers; bracts linear, strigose; pedicels slender, 5–15 mm, sparsely strigose. Hypanthium obovoid or obconic, sparsely strigose; calyx lobes lanceolate or linear-lanceolate, 5–8 × 1–1.8 mm, outside strigose, apex acuminate or acute. Corolla blue-purple or pale blue, campanulate, 1.5–2.3 cm, outside glabrous, inside white villous; lobes ovate-triangular, 6–8 × ca. 5 mm. Filaments white, base dilated; anthers linear. Style included; stigma 2- or 3-fid. Capsule subglobose, 3–5 mm. Seeds oblong or ovate-oblong, slightly compressed, ca. 1 mm. Fl. Jun–Jul, fr. Jul–Sep.

- About 600 m. Sichuan (Emei Shan).

**10. *Campanula pallida*** Wallich, *Asiat. Res.* 13: 375. 1820.

西南风铃草 xi nan feng ling cao

*Campanula colorata* Wallich; *C. colorata* var. *tibetica* J. D. Hooker & Thomson; *C. microcarpa* C. Y. Wu; *C. pallida* var. *tibetica* (J. D. Hooker & Thomson) H. Hara.

Plants perennial. Roots carrot-shaped, sometimes slightly thicker than stems. Stems single, sometimes 2 or rarely several from a single caudex, ascending or erect, up to 60 cm tall, hirsute. Lower leaves winged-petiolate, upper leaves sessile; blade elliptic, rhombic-elliptic, or oblong, 1–4 × 0.3–1.5 cm, abaxially densely hirsute or hispid only along veins, adaxially appressed hispid, margin denticulate or almost entire, apex acuminate, acute, or obtuse. Flowers pendent, terminal, sometimes

in cymes. Hypanthium obconic or campanulate, hispid; calyx lobes deltoid, narrowly triangular, or subulate, 2–8 mm, abaxially hispid (sometimes only along veins), margin entire or rarely serrulate. Corolla purple, blue-purple, or blue, tubular-campanulate, 4–15 mm; lobes ca. 1/2 as long to  $\pm$  as long as tube. Style less than 2/3 as long as corolla, included. Capsule obconic, obovoid, or globose. Seeds golden brown, oblong or elliptic, compressed. Fl. May–Sep.  $2n = 24, 28$ .

Grassy slopes, open woods; 1000–1400 m. W Guizhou, W Sichuan, S Xizang, Yunnan [Afghanistan, Bhutan, India, Laos, Myanmar, Nepal, Pakistan, Thailand].

Both chasmogamous and cleistogamous flowers are found in this species. In the latter, development of the corolla is arrested at an early stage; as a result, the calyx lobes are deltoid (vs. narrowly triangular or subulate) and much shorter than in the former. The capsules produced by cleistogamous flowers are globose (vs. obconic or obovoid) and much smaller than those from chasmogamous flowers. Individual plants may bear both types of flowers or, less commonly, only cleistogamous flowers; the type of *C. microcarpa* is a specimen of the latter.

**11. *Campanula cana*** Wallich in Roxburgh, Fl. Ind. 2: 101. 1824.

灰毛风铃草 hui mao feng ling cao

*Campanula aprica* Nannfeldt; *C. pasumensis* C. Marquand; *C. tortuosa* C. Y. Wu; *C. xylopoda* Jeffrey.

Plants perennial, densely white villous on all parts except corolla. Taproot thickened,  $\pm$  carrot-shaped, up to 8 mm in diam. Caudexes branched. Stems caespitose, usually diffuse, 15–30 cm. Leaves alternate, sessile or lower ones with petiole up to 5 mm; blade ovate, elliptic, oblanceolate, or linear-lanceolate, 4–25  $\times$  2–10 mm, base cuneate, margin subentire, crenulate, or serrate, apex obtuse or acute. Flowers several, in a terminal cyme; pedicels 0.5–3 cm, ebracteolate. Hypanthium obdeltoid to broadly obconical, 2–3  $\times$  2–3 mm at anthesis; calyx lobes subulate or narrowly triangular, 3–5  $\times$  1–2 mm, margin entire. Corolla blue, blue-purple, or violet, tubular-campanulate, 10–15 mm, outside villous; lobes 1/2–2/3 as long as tube. Stamens included. Style slightly exerted; stigma 3-fid. Capsule globose or obovoid-globose, 3–5  $\times$  3–4 mm, 10-ribbed, 3-poricidal at base. Seeds brownish yellow, shiny, elliptic, 0.5–0.6 mm, smooth. Fl. and fr. May–Nov.

Open rocky slopes, grassy slopes, thickets; 1000–3200 m. NW Guizhou (Xifeng), SW Sichuan, S Xizang, N Yunnan [Bhutan, N India, N Myanmar, Nepal].

**12. *Campanula chinensis*** D. Y. Hong, Acta Phytotax. Sin. 18: 247. 1980.

长柱风铃草 chang zhu feng ling cao

Plants perennial. Roots carrotlike. Stems caespitose, ascending, up to 35 cm, branched, hispid. Leaves winged-petiolate; blade elliptic or lanceolate, 1–3.5  $\times$  0.4–1.2 cm, abaxially densely villous, adaxially appressed hispid, base cuneate, margin entire or denticulate, apex obtuse, acute, or acuminate. Flowers terminal on main stems and branches, solitary or several in a cyme. Hypanthium obconic, densely villous; calyx lobes triangular, margin entire. Corolla blue or blue-purple, campanulate, 8–10 mm; lobes linear-oblong, slightly longer than

tube. Stamens exerted; anthers all connivent into a tube, or 2 and 3 respectively connivent into 2 groups. Style 13–15 mm, much exerted. Capsule globose, obovoid, or obconic. Seeds yellowish brown, oblong, ca. 0.5 mm. Fl. Jul–Sep, fr. Aug–Oct.

• Rocks, coniferous forests with dry and poor soil; 2400–3800 m. S Qinghai (Nangqên), SE Xizang (Markam), NW Yunnan (Dêqên, Gongshan).

**13. *Campanula yunnanensis*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 184. 1983.

云南风铃草 yun nan feng ling cao

Plants perennial. Roots  $\pm$  thickened, carrot-shaped, sometimes branched. Stems several from one caudex, almost entirely prostrate, 30–45 cm. Leaves withered during anthesis except uppermost, sessile; blade ovate to ovate-orbicular, 7–11 mm, abaxially densely tomentose, adaxially densely appressed hispid, margin crenate. Flowers terminal, erect or declined somewhat. Hypanthium gyroidal, densely hirsute; calyx lobes triangular, densely tomentose, margin with a pair of teeth. Corolla purple or blue-purple, tubular-campanulate, ca. 8 mm; lobes equaling tube. Style ca. 5 mm. Capsule obovoid-conical, 4–5  $\times$  3–4 mm. Seeds yellow-brown, elliptic, slightly compressed, ca. 0.5 mm, smooth. Fl. Oct–Dec.

• Rocks; 1900–2200 m. Yunnan.

**14. *Campanula dimorphantha*** Schweinfurth, Beitr. Fl. Aethiop. 140. 1867.

一年生风铃草 yi nian sheng feng ling cao

*Campanula benthamii* Wallich ex Kitamura; *C. canescens* Wallich ex A. Candolle (1830), not Roth (1827); *C. veronicifolia* Hance; *C. wallichii* Babu, nom. illeg. superfl.; *Cephalostigma spathulatum* Thwaites.

Plants annual. Stems erect, up to 45 cm tall, simple, or branched from base and thus caespitose, hispid. Basal leaves sometimes rosulate, shortly petiolate; blade spatulate or elliptic, withering early, base cuneate or attenuate, margin serrulate, apex acute. Cauline leaves winged-petiolate, 2–7 cm; blade spatulate, elliptic, or linear, base attenuate, margin serrulate or subentire, apex acute or acuminate. Cymes multiple, aggregated into a terminal panicle; pedicels unequal in length, those of upper flowers in a cyme longer. Hypanthium semiglobose to obconic, base acute; calyx lobes narrowly triangular, 3–5 mm. Corolla purple or blue-purple, campanulate, outside hispid, inside glabrous; lobes equaling tube. Style included. Capsules globose. Seeds yellow-brown, oblong or elliptic, compressed, ca. 0.3 mm, smooth. Fl. and fr. Mar–Apr.

Grassy slopes, roadsides; below 2000 m. Chongqing (Wushan), N Guangdong, Guizhou (Luodian), Shaanxi (Mianxian), Sichuan (Chengdu, Dujiangyan, Emei), Taiwan, Yunnan (Weishan) [Afghanistan, India, Laos, Myanmar, Nepal, Pakistan, Sri Lanka, Vietnam; Africa].

Cleistogamy may be the predominant reproductive strategy of this species, at least in China, as most specimens we examined had only cleistogamous flowers. The capsules produced by such flowers are of unequal size, with the apical flowers within a cyme producing larger capsules than the basal ones.

**15. *Campanula mekongensis*** Diels ex C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 58. 1965.

澜沧风铃草 lan cang feng ling cao

Plants perennial. Roots thickened, woody. Stems several from one caudex, ascending or erect, 20–30 cm tall, white villous. Leaves sessile; blade elliptic or spatulate, 1–3 × 0.5–1.2 cm, abaxially hirsute (sometimes only along veins), adaxially sparsely hirsute, base attenuate, margin entire, crenulate, or serrulate, apex obtuse. Flowers terminal, solitary or in cymes;

pedicels slender. Hypanthium obconic or campanulate, base cuneate, setose along veins; calyx lobes subulate, 2–4 mm, setose along veins, hirsute on margin; sinuses obtuse. Corolla blue or white, campanulate, ca. 8 mm; lobes somewhat longer than tube, outside sparsely villous. Style slightly shorter than corolla. Capsule obovoid or obovoid-obconic, 3–4 mm in diam. Seeds yellow, oblong, ca. 0.5 mm. Fl. Jan–Mar.

- Sandy herb communities, thickets by rivers, shaded rocks by streams; lower elevations. Guangxi (Tian'e), S Yunnan (Xishuangbanna).

**2. *Campanula* subg. *Rapunculus*** (Dumortier) Kharadze, Zametki Sist. Geogr. Rast. 32: 54. 1976.

基生叶风铃草亚属 ji sheng ye feng ling cao ya shu

*Campanula* sect. *Rapunculus* Dumortier, Fl. Belg. 58. 1827.

Basal leaves rosulate, persistent at anthesis; cauline leaves mostly toward base, upper ones sessile or nearly so, usually linear if present. Flowers solitary and terminal, or several terminal on main stems and branches. Capsule poricidal above middle.

About 140 species: throughout Arctic and N temperate regions, extending south into N Africa, Iran, India, China, N Mexico, and SE United States (Florida); seven species (four endemic) in China.

**16. *Campanula stevenii*** M. Bieberstein, Fl. Taur.-Caucas. 3: 138. 1819 [*“Steueni”*].

新疆风铃草 xin jiang feng ling cao

*Campanula simplex* Steven, Mém. Soc. Imp. Naturalistes Moscou 3: 255. 1812, not Lamarck ex Candolle (1805); *C. steveniana* Schultes; *Neocodon stevenii* (M. Bieberstein) Kolarovskiy & Serdyukova.

Plants perennial, glabrous throughout. Rhizomes elongated, exposed. Caudexes erect, often enveloped by remains of old leaves. Stems caespitose, erect, 20–50 cm tall. Basal leaves basally attenuate into a long petiole; blade spatulate or elliptic, margin sparsely denticulate; cauline leaves sessile, broadly linear, 2–6 cm. Flowers terminal, solitary or several. Calyx tube obconic, 3–7 mm; lobes subulate, 5–9 mm. Corolla purple, funnel-shaped, cleft to middle, 1.5–2 cm. Capsules narrowly obovoid, 12–16 × 6–10 mm. Seeds brown-yellow, elliptic, nearly 1 mm. Fl. Jun–Jul.

Shaded slopes, glades, dry grasslands; 1100–2500 m. N Xinjiang [Kyrgyzstan, Russia (European part, Far East, Siberia); SW Asia (Turkey), Europe].

Six subspecies are recognized; our plants are *Campanula stevenii* subsp. *albertii* (Trautvetter) Viktorov (Novosti Sist. Vyssh. Rast. 34: 231. 2002, “*albertii*”; *C. albertii* Trautvetter, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 83. 1879, “*albertii*”), endemic to N Xinjiang and Kyrgyzstan.

**17. *Campanula delavayi*** Franchet, J. Bot. (Morot) 9: 364. 1895.

丽江风铃草 li jiang feng ling cao

Plants perennial. Roots thickened, carrot-shaped, up to 1.8 cm in diam. Stems ascending, 20–50 cm tall, several from base, 2- to several branched, densely villous toward base. Basal leaves rosulate, long petiolate; blade ovate to orbicular, 1–4.8 × 0.6–3.8 cm, adaxially villous, base cordate, margin callose-

crenulate. Lower cauline leaves similar to basal. Middle and upper cauline leaves very small, often with a branch at axil; blade subulate. Flowers pendulous, terminal on main stems and branches, solitary or 2 or 3 in a cyme, glabrous. Hypanthium semi-ellipsoid or ovoid, base obtuse; calyx lobes subulate to narrowly triangular, 1–5.5 × ca. 1 mm, margin entire. Corolla blue or purple, broadly campanulate, 10–21 mm; lobes equaling tube. Style included. Capsule narrowly ovoid or ellipsoid, ca. 1 cm. Fl. Jul–Sep.

- Rocky slopes, *Pinus* forests; 3000–4000 m. NW Yunnan (Eryuan, Heqing, Lijiang).

**18. *Campanula crenulata*** Franchet, J. Bot. (Morot) 9: 365. 1895.

流石风铃草 liu shi feng ling cao

*Campanula nephrophylla* C. Y. Wu.

Plants perennial. Roots thickened, often carrotlike, ca. 5 mm in diam. Caudex enveloped by remains of old petioles. Stems 2–7, caespitose, ascending, 6–33 cm tall, simple or rarely branched, glabrous. Basal leaves several, often rosulate, long petiolate; blade orbicular, cordate, or ovate, 7–35 × 6–20 mm, usually glabrous, sometimes adaxially sparsely hispid, margin crenulate. Lower cauline leaves petiolate; blade spatulate, elliptic, or ovate, 1–3 cm, margin crenulate. Upper cauline leaves subsessile; blade linear, margin entire or callose-denticulate. Flowers solitary, terminal, pendent or horizontal, glabrous throughout. Hypanthium obconic or campanulate; calyx lobes subulate or narrowly triangular, 3–12 × 1–2 mm, margin callose-denticulate. Corolla blue, blue-purple, or dark purple-red, campanulate, 12–26 mm; lobes ca. 1/2 as long as tube. Style included. Capsule oblong to narrowly obovoid, 10–18 mm, ca. 5 mm in diam. Seeds yellowish brown, oblong to elliptic, slightly compressed. Fl. Jul–Sep.

- Rocks, grassy slopes; 2600–4200 m. SW Sichuan (Muli), NW Yunnan.

**19. *Campanula calcicola*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 12: 196. 1920.

灰岩风铃草 hui yan feng ling cao

Plants perennial. Roots thickened, carrot-shaped. Stems several, caespitose, ascending, 6–23 cm tall, villous, usually branched. Basal leaves long petiolate; blade ovate or orbicular, 5–24 × 6–27 mm, adaxially villous, base cordate or truncate, margin crenate or callose-denticulate, apex obtuse or rounded. Lower cauline leaves long petiolate; blade ovate or orbicular, 5–7 × 4–6 mm, base cordate or truncate, apex obtuse or rounded. Middle and upper cauline leaves petiolate or sessile; blade lanceolate or narrowly oblong, margin callose-dentate. Flowers terminal, often upright. Hypanthium obovoid or obconic, sparsely villous or sometimes glabrous, base rounded; lobes narrowly oblong to subulate-triangular, 2–6 mm, margin with 1–3 pairs of teeth. Corolla purple or blue-purple, broadly campanulate, 9–20 mm; lobes ca. 1/2 as long as tube. Capsule obovoid, ellipsoid, or subglobose, 4–8 mm. Seeds brown-yellow, oblong-elliptic, ca. 0.5 mm, 1-ribbed, smooth. Fl. and fr. Aug–Oct.

• Moist rocks; 2300–3900 m. SW Sichuan (Daocheng, Muli, Xiangcheng), NW Yunnan.

**20. *Campanula chrysosplenifolia*** Franchet, J. Bot. (Morot) 9: 364. 1895.

丝茎风铃草 si jing feng ling cao

*Campanula leucotricha* C. Y. Wu.

Plants perennial. Roots thickened, carrot-shaped. Stems caespitose, filiform but erect, 7–22 cm tall, often branched, glabrous. Basal leaves rosulate, long petiolate; blade ovate or orbicular, 6–17 × 5–15 mm, adaxially villous, base cordate, margin crenulate. Cauline leaves sessile or very shortly petiolate; blade ovate to linear, 5–15 × 0.2–1.5 mm, base cordate or truncate, margin crenate to serrate, sometimes callose-denticulate, apex acute or obtuse. Flowers mostly solitary (sometimes 2 or 3) and terminal, glabrous throughout. Hypanthium obovoid or narrowly obconic, base acute or obtuse; calyx lobes subulate or narrowly triangular, 4–9 × 0.5–1.5 mm, margin with 1–3 pairs of verrucose teeth or entire. Corolla blue, campanulate, 8–17 mm; lobes ovate, equaling to 1/2 as long as tube, apex acute to obtuse. Style included. Capsule narrowly obovoid, 9–19 mm. Seeds yellowish brown to brown, oblong, slightly compressed, ca. 1 mm, 1-ribbed. Fl. Sep.

• Rocks; 3000–4000 m. SW Sichuan (Muli, Yanyuan), NW Yunnan (Binchuan, Heqing).

**21. *Campanula aristata*** Wallich in Roxburgh, Fl. Ind. 2: 98. 1824.

钻裂风铃草 zuan lie feng ling cao

*Campanula aristata* var. *longisepala* C. Marquand; *C. cylindrica* (Pax & K. Hoffmann) Nannfeldt; *Wahlenbergia cylindrica* Pax & K. Hoffmann.

Plants perennial. Roots thickened, carrot-shaped. Stems usually caespitose, erect, 10–50 cm tall. Basal leaves long petiolate, glabrous; blade ovate or broadly elliptic. Lower and middle cauline leaves long petiolate, glabrous; blade lanceolate, elliptic, or linear. Middle and upper cauline leaves sessile, glabrous; blade linear, 1.5–7 cm, glabrous, margin entire or sparsely denticulate. Hypanthium very narrowly oblong, 0.5–1.5 cm; calyx lobes filiform, (3–)7–18(–25) mm, usually longer than corolla. Corolla blue or blue-purple, 7–15 mm; lobes ca. 1/2 as long as tube. Capsule clavate, attenuate at base, 20–40 mm. Seeds brown-yellow, elliptic, slightly compressed, ca. 0.7 mm, smooth. Fl. Jun–Aug, fr. Aug–Sep.

Alpine meadows or thickets; 3500–5000 m. S Gansu (Xiahe), E and S Qinghai, Shaanxi (Taibai Shan), NW and W Sichuan, Xizang (except NW), NW Yunnan (Dêqên) [Afghanistan, Bhutan, India, Nepal, Pakistan].

**22. *Campanula immodesta*** Lammers, Novon 8: 34. 1998.

藏滇风铃草 zang dian feng ling cao

*Campanula modesta* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 24. 1857, not Schott, Nyman & Kotschy (1854).

Plants perennial. Roots thickened, up to 7 mm in diam. Stems single or 2 to several and caespitose, erect or ascending, 7–22 cm. Basal leaves rosulate, long petiolate; blade orbicular or ovate, 5–15 × 4–8 mm, margin crenate or entire; petiole 5–45 mm. Lower cauline leaves long petiolate; blade linear or lanceolate. Middle and upper cauline leaves 1–3, sessile; blade linear or narrowly lanceolate, 5–20 mm, margin crenate. Flowers solitary, terminal, ± pendulous. Hypanthium obovoid, 2–10 mm, glabrous; calyx lobes subulate to narrowly triangular, 1.8–8 × 0.5–1 mm, usually shorter than corolla, entire. Corolla blue or purple-blue, campanulate, 4–11 mm; lobes deltoid, ca. 1/2 as long as tube. Capsule obovoid, 5.5–20 × 2.5–6 mm. Fl. Jul–Aug, fr. Aug–Sep.

Alpine meadows; 3400–4500 m. SW Sichuan (Muli), S Xizang, NW Yunnan (Dêqên, Weixi, Zhongdian) [Bhutan, N India, Nepal].

## 10. ADENOPHORA Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 165. 1823.

沙参属 sha shen shu

Hong Deyuan (洪德元), Ge Song (葛颂); Thomas G. Lammers, Laura L. Klein

Herbs, perennial. Roots usually thickened, various in shape, carrot-shaped, mostly fleshy. Caudexes often short, sometimes elongated and branched. Stems erect, less frequently ascending. Basal leaves often rosulate, usually long petiolate, cordate; cauline leaves mostly alternate, rarely opposite or verticillate. Flowers in a cyme; cymes sometimes reduced to a branch with 1 terminal flower and 1 to several bracts, sometimes glomerate into a panicle. Calyx epigynous, rarely semi-epigynous, tube various in shape; lobes 5, entire or dentate. Corolla always epigynous, campanulate, funnelform, or tubular, 5-lobed or 5-fid to middle. Stamens 5; filaments much dilated into a lamella at base; lamellae densely ciliate-villous, valvate, enveloping disk; anthers elongate. Disk usually

tubular, rarely annular. Ovary inferior, 3-locular; ovules numerous; style with pollen-receiving hairs; stigma 3-lobed, lobes narrow, recurved. Capsule 3-poricidal below persistent calyx lobes. Seeds numerous, ellipsoid, 1-angular.

Sixty-two species: E Asia, south to India and Vietnam, with one species extending into Europe and another endemic to Crimea; 38 species (23 endemic) in China.

- 1a. Cauline leaves all or mostly verticillate.
- 2a. Corolla small, less than 11 mm; calyx lobes filiform ..... 38. *A. tetraphylla*
- 2b. Corolla larger than 13 mm; calyx lobes lanceolate or subulate.
- 3a. Calyx lobes toothed; corolla tubular-campanulate, 18–25 mm; style slightly shorter than corolla ..... 33. *A. wulingshanica*
- 3b. Calyx lobes entire; corolla campanulate, 13–20 mm; style exserted or included.
- 4a. Cauline leaves partially verticillate; inflorescence branches not verticillate; calyx lobes lanceolate, 3–6 mm ..... 31. *A. pereskifolia*
- 4b. Cauline leaves all verticillate; inflorescence branches often verticillate; calyx lobes elliptic-lanceolate, 5–10 mm ..... 32. *A. divaricata*
- 1b. Cauline leaves all alternate.
- 5a. Cauline leaves (at least lower ones) petiolate, very rarely sessile.
- 6a. Calyx lobes toothed.
- 7a. Cauline leaves pinnatifid up to over half; capsule columnar, base rounded, only ca. 3 mm wide ..... 34. *A. lobophylla*
- 7b. Cauline leaves toothed; capsule ellipsoid, base obtuse, more than 3 mm wide.
- 8a. Cauline leaves with petioles 2–4 cm, cordate at base; disk ca. 0.7 mm high; style equal to corolla in length ..... 7. *A. cordifolia*
- 8b. Cauline leaves with petioles less than 2.5 cm, cuneate or shallowly cordate at base; disk 1.5–2.5 mm; style ± exserted.
- 9a. Inflorescence a pseudoraceme or narrow panicle, without secondary branches; calyx lobes with verrucose teeth, or even entire; leaves glabrous adaxially ..... 8. *A. liliifolia*
- 9b. Inflorescence a large panicle, with secondary branches; calyx lobes often with 1–4 pairs of long teeth, rarely verrucose teeth; leaves sparsely scaberulose adaxially ..... 20. *A. potaninii*
- 6b. Calyx lobes entire, usually ovate to lanceolate, rarely linear-lanceolate, (1–)1.5–4 mm wide.
- 10a. Cauline leaves all obviously petiolate, base cordate or rounded, not decurrent or shortly decurrent; calyx lobes obtuse at apex.
- 11a. Cauline leaves all cordate, papery; calyx tube (hypanthium) obconic at least at anthesis ..... 1. *A. trachelioides*
- 11b. Cauline leaves rounded or broadly cuneate, only some lower ones shallowly cordate, membranous; calyx tube obovoid or obovoid-conical ..... 2. *A. remotiflora*
- 10b. Cauline leaves only lower ones petiolate, upper ones sessile or shortly cuneate-petiolate; calyx lobes acute or acuminate at apex.
- 12a. Cauline leaves only 2, lower one cordate, upper one much smaller ..... 5. *A. brevidiscifera*
- 12b. Cauline leaves many, not cordate.
- 13a. Calyx tube globose, calyx lobes subulate-lanceolate, 8–14 mm; pedicels 1.5–3 cm ..... 6. *A. longipedicellata*
- 13b. Calyx tube obovoid or obconical, calyx lobes usually shorter; pedicels shorter.
- 14a. Corolla 1.5–2.7 cm, lobes 5–11 mm; calyx lobes ovate to linear-lanceolate, 1.5–4 mm wide ..... 3. *A. petiolata*
- 14b. Corolla less than 1.8 cm, lobes less than 5 mm; calyx lobes linear-lanceolate or subulate, 1–2 mm wide.
- 15a. Leaves usually sparsely hispidulous, 7–13 × 1.5–3 cm; calyx mostly hairy, occasionally glabrous, lobes 1–2 mm wide; corolla ca. 17 mm ..... 4. *A. rupincola*
- 15b. Leaves glabrous or hairy along veins, 3–8 cm; calyx glabrous, occasionally scaberulose; corolla 13–15 mm.
- 16a. Leaves often hairy on margins and along veins; calyx tube obovoid or obconic; inflorescence a narrow panicle or pseudoraceme ..... 8. *A. liliifolia*
- 16b. Leaves glabrous throughout; calyx tube usually globose, rarely obovoid-globose; inflorescence a panicle ..... 11. *A. sinensis*
- 5b. Cauline leaves sessile, only some individuals of some species (e.g., *A. stricta*) with lower cauline leaves very shortly winged-petiolate.
- 17a. Corolla small, less than 17 mm, constricted at throat and thus corolla urceolate; style strongly exserted, more than 1.5 × as long as corolla; disk narrowly tubular, 2–7 mm, less than 1 mm wide.
- 18a. Calyx lobes filiform, 3–20 mm, sometimes with 1 or 2 pairs of verrucose teeth at lower part ..... 37. *A. capillaris*
- 18b. Calyx lobes subulate, entire.
- 19a. Stems and leaves densely scaberulose; corolla 10–17 mm ..... 35. *A. stenanthina*
- 19b. Stems and leaves glabrous or villous; corolla 8–12 mm ..... 36. *A. liliifolioides*
- 17b. Corolla usually larger, campanulate; style slightly exserted or included, less than 1.5 × as long as corolla; disk not much longer than broad.

- 20a. Calyx lobes entire.
- 21a. Calyx scaberulose; calyx lobes subulate, broadest at base, 6–8 mm; style nearly as long as corolla ..... 10. *A. stricta*
- 21b. Calyx mostly glabrous, if hairy then corolla  $\pm$  constricted at throat; calyx lobes triangular-lanceolate to linear-lanceolate, 2–6 mm, if more than 6 mm then calyx tube never globose and glabrous; style obviously exserted or not.
- 22a. Calyx lobes very short, shorter than 2.5 mm.
- 23a. Cauline leaf blade linear, ca. 5 cm  $\times$  0.8 mm; corolla 18–19 mm ..... 14. *A. pinifolia*
- 23b. Cauline leaf blade linear to oblong, 1.5–4  $\times$  0.3–1 cm; corolla 12–14 mm ..... 15. *A. micrantha*
- 22b. Calyx lobes longer than 3 mm, broadest at middle.
- 24a. Calyx variously hairy; corolla shallowly lobed,  $\pm$  constricted at throat, lobes less than 1/4 as long as total length, often reflexed.
- 25a. Corolla throat slightly constricted, 9–15 mm wide; corolla lobes 4–6 mm ..... 12. *A. polyantha*
- 25b. Corolla throat strongly constricted, 4–7 mm wide; corolla lobes up to 3 mm ..... 13. *A. contracta*
- 24b. Calyx glabrous; corolla more deeply lobed, not constricted at throat, lobes more than 1/4 as long as total length.
- 26a. Calyx lobes elliptic, ca. 2 mm wide, middle part broadest, nearly 2  $\times$  as broad as base ..... 16. *A. palustris*
- 26b. Calyx lobes linear-lanceolate or subulate, base broadest or middle part broadest but not 2  $\times$  as broad as base.
- 27a. Calyx lobes subulate, base broadest.
- 28a. Disk broadly tubular, 3–8 mm, up to 3 mm wide; calyx lobes 5–10 mm; inflorescence a pseudoraceme ..... 17. *A. himalayana*
- 28b. Disk less than 1.5 mm; calyx lobes 3–5 mm; inflorescence a panicle, rarely a pseudoraceme.
- 29a. Cauline leaves ovate to lanceolate, 5–25 mm wide; corolla 12–21 mm ..... 18. *A. amurica*
- 29b. Cauline leaves mostly linear to linear-elliptic, less than 5 mm wide; corolla 10–13 mm ..... 23. *A. stenophylla*
- 27b. Calyx lobes linear-lanceolate, middle part broadest, or at least broadest part not at base.
- 30a. Corolla 16–28 mm, lobes 6–8 mm; leaves entire or sparsely serrate, 2–13 mm wide; style usually shorter than or nearly as long as corolla ..... 19. *A. gmelinii*
- 30b. Corolla 13–22 mm, lobes 4–6 mm; leaves always crenulate, 5–40 mm wide; calyx lobes 3–6 mm; style exserted or not.
- 31a. Style included or as long as corolla; leaves 2.5–7 cm; corolla lobes 4–6 mm ..... 9. *A. lamarckii*
- 31b. Style exserted; leaves 6–13 cm; corolla lobes ca. 4 mm ..... 31. *A. pereskiifolia*
- 20b. Calyx lobes toothed.
- 32a. Calyx lobes ovate-triangular, overlapping at lower part, recurved toward lateral side; capsule subglobose; style included ..... 21. *A. tricuspidata*
- 32b. Calyx lobes narrower, never overlapping, not recurved; capsule subglobose or not; style exserted or included.
- 33a. Cauline leaves aggregated at middle part of stems, glabrous, lanceolate or linear-elliptic ..... 22. *A. wilsonii*
- 33b. Cauline leaves evenly distributed or aggregated at lower part of stems, glabrous or hairy.
- 34a. Cauline leaves linear or linear-elliptic, less than 5 mm wide; calyx lobes subulate, 3–4 mm; corolla 10–13 mm ..... 23. *A. stenophylla*
- 34b. Cauline leaves wider; calyx lobes mostly larger; corolla mostly longer.
- 35a. Flowers solitary and terminal, or several in a pseudoraceme, very occasionally in a narrow panicle; corolla 2–3.4 cm, narrowly campanulate ..... 24. *A. elata*
- 35b. Flowers several to numerous, in a pseudoraceme or panicle; corolla rarely (except in *A. morrisonensis*) more than 2.4 cm, campanulate or broadly campanulate.
- 36a. Leaves mostly glabrous; stems mostly glabrous, or puberulent.
- 37a. Calyx lobes narrowly subulate, ca. 0.5 mm wide; style exserted 4–7 mm above corolla ..... 28. *A. hubeiensis*
- 37b. Calyx lobes 1–2 mm wide; style included, or slightly exserted, less than 4 mm above corolla.
- 38a. Corolla 28–35 mm; disk less than 1 mm ..... 29. *A. morrisonensis*
- 38b. Corolla much shorter; disk longer.
- 39a. Capsule ellipsoid or oblong, more than 3 mm in diam.; calyx lobes 5–7 mm ..... 8. *A. liliifolia*
- 39b. Capsule narrowly ellipsoid, ca. 3 mm in diam.; calyx lobes 2–4(–6) mm ..... 30. *A. ningxianica*
- 36b. Leaves  $\pm$  hairy; stems usually hairy.
- 40a. Leaves mostly aggregated at lower half of stems, upper ones absent or much smaller; calyx lobes 5–20 mm, obviously toothed.
- 41a. Calyx lobes 5–8(–10) mm, often gray; corolla lobed to middle or near middle; disk 0.5–1 mm ..... 26. *A. jasionifolia*
- 41b. Calyx lobes 8–20 mm, green; corolla lobed to 1/3; disk 1.2–3.5 mm ..... 27. *A. coelestis*

- 40b. Leaves evenly distributed; calyx lobes 3–7 mm.  
 42a. Cauline leaves with 2 to several large teeth on each side, puberulent on both surfaces; disk 1.5–3 mm ..... 20. *A. potaninii*  
 42b. Cauline leaves with numerous teeth, adaxially sparsely scaberulose, hispidulous, or glabrous, abaxially hirsute or hispidulous; disk less than 1.4 mm.  
 43a. Cauline leaves narrowly elliptic or lanceolate, 0.5–2.5 cm; style mostly as long as corolla ..... 18. *A. amurica*  
 43b. Cauline leaves ovate, 1.5–6.5 cm; style ± exserted ..... 25. *A. khasiana*

**1. *Adenophora trachelioides*** Maximowicz, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 186. 1859.

茅茛 ji ni

Stems single, 40–120 cm tall, up to 1 cm in diam., often ± zigzag-twisted, sometimes branched. Cauline leaves alternate; blade ovate or elliptic, 3–13 × 2–8.5 cm, base cordate, truncate, obtuse, or cuneate, margin serrate or doubly serrate, apex obtuse to shortly acuminate; petiole 1–6 cm, sometimes winged. Inflorescence branches mostly long and horizontally spreading, forming a large panicle, less frequently short, forming a narrow panicle. Hypanthium broadly obconic; calyx lobes elliptic or lanceolate 4–13 × 2–4 mm, margin entire (rarely ciliate). Corolla blue, blue-purple, or white, campanulate, 2–2.5 cm; lobes broadly elliptic, 5–7 mm wide, apex acute. Disk tubular, 2–3 mm. Style as long as corolla. Capsule ovoid-conical, ca. 7 × 5 mm. Seeds yellow-brown, black at both ends, narrowly oblong, slightly compressed, 0.8–1.5 mm. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34^*$ ,  $36^*$ .

• Mountain and hill slopes, grasslands, forest margins; below 2400 m. Anhui, Hebei, Jiangsu, Liaoning, Nei Mongol, Shandong, Zhejiang.

- 1a. Stems, leaves, calyx, and disk all glabrous ..... 1a. subsp. *trachelioides*  
 1b. Stems, leaves, calyx, and disk nearly always hairy ..... 1b. subsp. *giangsuensis*

**1a. *Adenophora trachelioides* subsp. *trachelioides***

茅茛(原亚种) ji ni (yuan ya zhong)

*Adenophora isabellae* Hemsley; *A. remotiflora* (Siebold & Zuccarini) Miquel var. *cordatifolia* (Debeaux) Zahlbruckner; *A. trachelioides* var. *cordatifolia* Debeaux; *A. trachelioides* f. *puberula* A. I. Baranov.

Stems, calyx, and disk always glabrous. Leaves occasionally sparsely hispidulous along veins.

• Mountain slopes, grasslands, forest margins; below 2400 m. Anhui (Huang Shan), Hebei, N Jiangsu, Liaoning, Nei Mongol (Ongniud Qi), Shandong, Zhejiang (Hangzhou, Tianmu Shan).

**1b. *Adenophora trachelioides* subsp. *giangsuensis*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

苏南茅茛 su nan ji ni

Stems and leaves usually densely white hirsute. Leaves often whitish green abaxially. Calyx and disk typically white hairy. Corolla pale purple.

• Hill slopes; lower elevations. S Jiangsu (Nanjing, Taihu, Zhenjiang).

**2. *Adenophora remotiflora*** (Siebold & Zuccarini) Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 193. 1866.

薄叶茅茛 bao ye ji ni

*Campanula remotiflora* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 180. 1846; *Adenophora remotiflora* f. *cordata* Komarov; *A. remotiflora* f. *longifolia* Komarov.

Stems single, 40–100 cm tall, glabrous, usually simple. Cauline leaves long petiolate; blade typically ovate to ovate-lanceolate, rarely ovate-orbicular, 5–13 × 2–7 cm, membranous, glabrous, base mostly truncate, rounded, or obtuse, rarely cordate, margin serrate or doubly serrate, apex usually acuminate; petiole up to 3 cm. Flowers often solitary on pedicels, less frequently in several-flowered cymes, forming a pseudoraceme or narrow panicle. Hypanthium obovoid or obovoid-obconic, glabrous; calyx lobes lanceolate, 7–12 × 1.5–2 mm, margin entire. Corolla blue, campanulate, 2–3.5 cm; lobes 7–12 mm. Disk cylindrical, 2.5–3 mm, ca. 1 mm in diam. Capsule obovoid, 5–8 × 4–7 mm. Seeds narrowly oblong, slightly curved, ca. 1 mm. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34$ ,  $36$ .

Forest margins, forests, meadows; below 1700 m. Heilongjiang (Ning'an, Shangzhi), Jilin (E of Fusong and Jiaohe), SE Liaoning (Benxi, Huanren, Kuandian) [Japan, Korea, Russia (Far East)].

**3. *Adenophora petiolata*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922.

秦岭沙参 qin ling sha shen

Stems 60–120 cm tall, simple, glabrous or sparsely white hispidulous. Cauline leaves usually long petiolate, very rarely almost sessile; blade ovate, 3–15 × 2–5 cm, abaxially glabrous or hispidulous along veins, adaxially sparsely puberulent or glabrous, base broadly cuneate or subtruncate, margin serrate, apex acute to acuminate; petiole winged, up to 8 cm. Inflorescence branches long and horizontally spreading, forming a large panicle, or extremely short, with only 2 or 3 flowers or even a single flower, and thus forming an extremely narrow panicle or even a pseudoraceme; inflorescence rachises and all floral parts glabrous, scaberulose, or puberulent. Hypanthium obconic or obovoid; calyx lobes ovate, ovate-lanceolate, or linear-lanceolate, 4–9 × 1.5–4 mm, overlapping at base or not. Corolla blue, pale blue, purple, or white, campanulate, 15–27 mm; lobes ovate-deltoid, 4–11 × 7–9 mm. Disk shortly tubular, (0.5–)1–2.5 mm, glabrous or hairy at apex. Style nearly as long as corolla. Capsule ovoid-ellipsoid or obovoid, 5–8 × 4–6 mm. Seeds yellow-brown, oblong, slightly compressed, 1–1.5 mm, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 34^*$ ,  $34+1B^*$ .

• Grassy slopes, mountain slopes, grasslands, forest margins, forests or roadsides on mountains; below 2300 m. S Anhui, Chongqing, W Fujian, Gansu, Guangdong, Guangxi, Guizhou, S Hebei, W Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Zhejiang.

- 1a. Calyx lobes ovate-lanceolate to linear-lanceolate, 1–2(–3) mm wide, never overlapping; disk glabrous; corolla 2–2.7 cm, lobes deltoid, 8–11 mm ..... 3a. subsp. *petiolata*
- 1b. Calyx lobes ovate to ovate-lanceolate, 1.5–4 mm wide, broadest at middle-lower part, usually ± overlapping; disk ± hairy, rarely glabrous; corolla 1.5–2 cm, lobes deltoid-ovate, 5–7 mm.
- 2a. Cauline leaves petiolate, at least lower ones obviously petiolate, petiole up to 2.5 cm; calyx lobes 2–4 mm wide; disk 1.5–2.5 mm, mostly hairy ..... 3b. subsp. *hunanensis*
- 2b. Cauline leaves subsessile or only lower ones shortly petiolate, petiole rarely up to 1.5 cm; calyx lobes 1.5–2.5 mm wide; disk (0.5–)1–1.5(–2) mm, mostly glabrous ..... 3c. subsp. *huadungensis*

### 3a. *Adenophora petiolata* subsp. *petiolata*

秦岭沙参(原亚种) qin ling sha shen (yuan ya zhong)

Cauline leaves all long petiolate. Inflorescence rachises and all floral parts glabrous. Calyx lobes 1.5–2(–3) mm wide, never overlapping. Corolla 2–2.7 cm; lobes deltoid, 8–11 mm.

• Forests or roadsides on mountains; (1000–)1700–2300 m. Gansu (Chengxian, Huating, Wenxian), W Henan (Lushi, Songxian), Shaanxi (Qin Ling), Shanxi (Puxian, Qinxian, Ruicheng).

### 3b. *Adenophora petiolata* subsp. *hunanensis* (Nannfeldt) D. Y. Hong & S. Ge, Novon 20: 427. 2010.

杏叶沙参 xing ye sha shen

*Adenophora hunanensis* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1070. 1936.

Cauline leaves mostly petiolate, or at least lower ones petiolate, rarely subsessile. Inflorescence rachises and floral parts often scaberulose. Calyx lobes 2–4 mm wide, ± overlapping at base. Disk 1.5–2.5 mm, mostly hairy. Corolla 1.5–2 cm; lobes 4–7 mm.

• Mountain slopes, grasslands, forest margins; below 2000 m. Chongqing, Guangdong (Liannan, Renhua, Ruyuan), Guangxi (Lingchuan, Xing'an, Yangshuo), Guizhou (Kaili), S Hebei (Cixian), W Henan, Hubei, Hunan, W Jiangxi, Shaanxi (S of Tongchuan), S Shanxi (Jincheng, Lingchuan, Yangcheng), Sichuan.

### 3c. *Adenophora petiolata* subsp. *huadungensis* (D. Y. Hong), D. Y. Hong & S. Ge, Novon 20: 427. 2010.

华东杏叶沙参 hua dong xing ye sha shen

*Adenophora hunanensis* subsp. *huadungensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

Cauline leaves subsessile, only lower ones shortly petiolate; petiole rarely up to 1.5 cm. Calyx lobes 1–2.5 mm wide, never overlapping. Disk (0.5–)1–1.5(–2) mm, mostly glabrous.

• Grassy slopes, forests; below 1900 m. S Anhui, W Fujian (Liancheng, Yong'an), Jiangsu (Liyang, Nanjing), E Jiangxi (including Lu Shan), Zhejiang (Longquan, Tianmu Shan).

### 4. *Adenophora rupincola* Hemsley, J. Linn. Soc., Bot. 26: 13. 1889.

多毛沙参 duo mao sha shen

*Adenophora pubescens* Hemsley.

Stems 70–150 cm tall, simple or with branches slender and upright, usually scaberulose, less often subglabrous. Lower cauline leaves petiolate, upper ones sessile; blade ovate-lanceolate to elliptic, 6–13 × 1.5–3 cm, both surfaces usually sparsely hispidulous, rarely almost glabrous, base attenuate, margin serrate, apex acuminate; petiole winged. Inflorescences with branches forming a panicle; inflorescence rachises, pedicels, and calyx rather densely puberulent or hispidulous, occasionally glabrous; pedicels short and stout, ca. 5 mm, or rarely elongate. Hypanthium obovoid or obconic; calyx lobes lanceolate to linear-lanceolate, 5–8 × 1–2 mm, very rarely reflexed. Corolla blue-purple or purple, campanulate, ca. 17 mm; lobes deltoid, ca. 5 mm. Disk annular to shortly tubular, 0.5–1.5 mm, glabrous. Style 2–2.2 cm, obviously exerted. Fl. Sep.

• Ravines, grassy slopes; below 1500 m. W Hubei, NW Hunan (Cili), Jiangxi, Sichuan.

### 5. *Adenophora brevidiscifera* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 184. 1983.

短花盘沙参 duan hua pan sha shen

Stems ascending, slender, ca. 35 cm tall, simple, densely hirsute below, glabrous above. Basal leaves long petiolate, hirsute; blade ovate, ca. 3 cm wide, abaxially sparsely hirsute along veins, adaxially hirsute, base cordate with sinus up to 4 cm deep, margin sinuate-crenate or serrate; petiole ca. 3 cm. Lowermost cauline leaf similar to basal leaves but slightly smaller; petiole ca. 2 cm. Upper cauline leaves only 2–4, less than 1 cm, linear, sessile. Cymes 2 or 3, lax, with only terminal flower; bracts filiform, minute; pedicels slender. Hypanthium obovoid, glabrous; calyx lobes subulate, 2–3 × ca. 0.5 mm, margin entire. Corolla narrowly campanulate, ca. 1.8 cm; lobes narrowly ovate-elliptic, equaling tube, ca. 4 mm wide, apex acute. Disk annular, less than 0.5 mm high. Style ca. 12 mm. Capsule oblong or obovoid, 5–7 × 3–4 mm. Fl. Aug–Sep, fr. Sep.

• Forests of *Pinus yunnanensis*; 2700–3000 m. SW Sichuan (Yanyuan).

*Adenophora brevidiscifera* resembles *A. jasionifolia*, from which it differs in having calyx lobes entire, the lower cauline leaves long petiolate and cordate, and disk shorter.

### 6. *Adenophora longipedicellata* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

湖北沙参 hu bei sha shen

Stems 1–3 m tall, simple or with slender branches up to 70 cm, glabrous. Basal leaves ovate, base cordate. Cauline leaves (at least lower ones) petiolate; blade ovate-elliptic or lanceolate, 7–12 × 2–5 cm, papery, glabrous or abaxially sparsely hispid along veins, base cuneate or obtuse, margin serrate or doubly serrate, apex acuminate. Inflorescences with slender and long branches, forming a large lax panicle, glabrous or puberulent; pedicels slender, 1–3 cm. Hypanthium subglobose or obovoid,

glabrous; calyx lobes subulate-lanceolate, 8–14 mm. Corolla white, purple, or pale blue, funnellform, 1.9–2.1 cm; lobes deltoid, 5–6 mm. Disk annular, ca. 1 mm or shorter, glabrous. Style ca. 2.1 cm, almost as long as or slightly longer than corolla. Fl. Aug–Oct.

• Meadows, scrub, cliffs; below 2400 m. Chongqing (Fengjie, Nanchuan), Guizhou (Xishui), W Hubei (Laifeng), WC Sichuan.

**7. *Adenophora cordifolia*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

心叶沙参 xin ye sha shen

Caudexes with horizontal branches and alternate membranous scales. Stems 1 or 2, erect, ca. 50 cm tall, simple, glabrous or retrorsely hirsute. Basal leaves unknown. Cauline leaf blade orbicular or ovate, 3–7 × 2–6 cm, both surfaces sparsely hispidulous or abaxially glabrous, base cordate with sinus 3–5 mm deep; petiole 2–4 cm, upper ones often shorter and sometimes ± decurrent. Inflorescences with short branches, forming a narrow panicle; pedicels less than 5 mm. Hypanthium obovoid, glabrous; calyx lobes linear-lanceolate, 3–7 × 1–1.5 mm, with 2 or 3 pairs of denticles up to 1 mm. Corolla purple, campanulate, 13–15 mm; lobes ovate-deltoid, ca. 1/2 as long as tube. Disk annular, 0.5–0.7 mm, glabrous. Style as long as corolla. Fl. Jul–Aug.

• Shaded and moist rock crevices; ca. 2100 m. Henan (Songxian, Tongbai, Yichuan).

**8. *Adenophora liliifolia*** (Linnaeus) A. Candolle, Monogr. Campan. 358. 1830.

新疆沙参 xin jiang sha shen

*Campanula liliifolia* Linnaeus, Sp. Pl. 1: 165. 1753; *C. alpini* Linnaeus.

Roots carrot-shaped, 8–10 × 1–2 cm. Stems 50–150 cm tall, simple or branched, glabrous. Cauline leaves sessile or shortly petiolate; blade lanceolate or ovate, 5–13 × 1–5 cm, both surfaces glabrous, rarely sparsely white hirsute abaxially, margin serrate, apex acute to shortly acuminate; petiole (if present) up to 6 mm. Inflorescence a narrow panicle with branches with up to 7 flowers, or rarely only several flowers forming a pseudoraceme; pedicels slender, up to 2.5 cm. Hypanthium obovoid or obconic, glabrous; lobes lanceolate, 5–7 × 1–1.5 mm, mostly reflexed from anthesis, margin usually with a pair of denticles or rarely entire. Corolla blue or pale blue, campanulate, 1.2–2.2 cm; lobes ovate, ca. 1/2 as long as tube, apex acute. Disk shortly tubular, 1.5–2.5 mm, glabrous. Style as long as corolla or slightly exserted. Fl. Jul–Aug.  $2n = 34, 102$ .

Forests, scrub. NW Xinjiang (Burqin, Korgas, Toli) [Kazakhstan, Russia (European part); Europe].

**9. *Adenophora lamarckii*** Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 168. 1823.

天山沙参 tian shan sha shen

*Adenophora liliifolia* (Linnaeus) A. Candolle var. *lamarckii* (Fischer) Krylov; *Campanula lamarckii* (Fischer) D. Dietrich.

Roots carrot-shaped, up to 2.5 cm in diam. Stems simple, 30–100 cm tall, glabrous, rarely white pubescent. Cauline leaves sessile; blade ovate-lanceolate, 2.5–7 × 0.5–3 cm, both surfaces glabrous, sometimes hispidulous abaxially, base cuneate, margin serrate, apex acute or acuminate. Flowers several in a pseudoraceme or inflorescences with short branches of 2–4 flowers, forming a narrow panicle; pedicels less than 1 cm. Hypanthium obovoid or obconic, glabrous; calyx lobes linear-lanceolate or subulate, 3–5 × 1–1.2 mm, widest at base or at lower part, margin usually entire. Corolla blue, funnellform-campanulate, 1.5–2.2 cm; lobes ovate, ca. 1/2 as long as tube, apex acute. Disk shortly tubular, 1–2.5 mm, glabrous. Style nearly as long as or slightly longer than corolla. Fl. Jul–Aug.  $2n = 34, 102$ .

Forests, forest margins. N Xinjiang (Fukang, Toli, Wenquan) [Kazakhstan, Korea, N Mongolia, Russia (S Siberia)].

**10. *Adenophora stricta*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 192. 1866.

沙参 sha shen

Stems 40–80 cm tall, simple, often hispidulous or villous, rarely glabrous. Basal leaves ovate, base cordate. Cauline leaves sessile (lower ones sometimes with extremely short, winged petiole); blade elliptic or narrowly ovate, 3–11 × 1.5–5 cm, sparsely hispidulous, hirsute, or subglabrous, base cuneate, apex acute or shortly acuminate. Flowers often in a pseudoraceme, or inflorescences with short branches and thus in an extremely narrow panicle, very occasionally with long branches and panicle ample; pedicels less than 5 mm. Hypanthium obovoid or obconic, puberulent, verrucose-hairy, or less often glabrous; calyx lobes typically subulate, less often linear-lanceolate, 6–8 × 1–1.5 mm, margin entire. Corolla blue or purple, broadly campanulate, 1.5–2.5 cm, glabrous or hirsute at least along veins outside; lobes deltoid-ovate, ca. 1/2 as long as tube. Disk shortly tubular, 1–2.5 mm, glabrous. Style usually slightly longer (rarely shorter) than corolla. Capsule ellipsoid-globose (very rarely ellipsoid), 6–10 mm. Seeds brown-yellow, slightly compressed, ca. 1.5 mm. Fl. Aug–Oct.  $2n = 34$ .

Meadows, forest margins, scrub, open mountain slopes, forests, among grasses, in rock crevices; below 3300 m. Anhui, Chongqing, Fujian, SE Gansu, Guangxi, Guizhou, SE and W Henan, W Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, NW and S Sichuan, Yunnan, Zhejiang [Korea; naturalized in Japan].

The diagnostic characters of the present species are cauline leaves sessile; inflorescences pseudoracemose or narrowly paniculate; pedicels short; calyx mostly hairy, and calyx lobes subulate and entire.

- 1a. Leaves glabrous or sparsely villous; stems hispidulous ..... 10c. subsp. *confusa*
- 1b. Leaves hispidulous; stems hispidulous, less frequently hirsute, rarely glabrous.
  - 2a. Corolla 2–2.5 cm; disk 1.8–2.5 mm ..... 10d. subsp. *aurita*
  - 2b. Corolla 1.5–2.3 cm; disk 1–1.8 mm.
    - 3a. Corolla nearly always hirsute, very rarely subglabrous outside ..... 10a. subsp. *stricta*

- 3b. Corolla glabrous or with a few hairs along veins at top outside ..... 10b. subsp. *sessilifolia*

**10a. *Adenophora stricta* subsp. *stricta***

沙参(原亚种) sha shen (yuan ya zhong)

*Adenophora argyi* H. Léveillé; *A. axilliflora* (Borbás) Borbás ex Prain; *A. rotundifolia* H. Léveillé; *A. sinensis* A. Candolle var. *pilosa* A. Candolle; *A. stricta* var. *nanjingensis* P. F. Tu & G. J. Xu; *A. stricta* var. *qinglongshanica* P. F. Tu & G. J. Xu; *Campanula axilliflora* Borbás.

Stems and leaves hispidulous. Calyx always and often densely hispidulous. Corolla densely or sparsely hirsute, rarely glabrous outside.  $2n = 34$ .

Among grasses, in rock crevices; lower to middle elevations. Anhui, Fujian (Chong'an), SE Henan (Xinxian), Hunan (Changsha, Yizhang), Jiangsu (Jurong, Nanjing), Jiangxi, Zhejiang (Cixi, Kaihua, Lin'an) [Korea; naturalized in Japan].

**10b. *Adenophora stricta* subsp. *sessilifolia*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

无柄沙参 wu bing sha shen

*Adenophora stricta* subsp. *henanica* P. F. Tu & G. J. Xu.

Stems and leaves hispidulous. Calyx mostly hispidulous or scaberulose, less frequently glabrous. Corolla usually glabrous or only with a few hairs along veins outside.

• Meadows or grassy places at forest margins; 600–2000 m. Chongqing, SE Gansu, Guangxi (Longsheng), Guizhou, W Henan, W Hubei (Shennongjia, Xingshan), W Hunan, S Shaanxi (S of Qin Ling), S Sichuan, NE Yunnan (Zhenxiong).

**10c. *Adenophora stricta* subsp. *confusa*** (Nannfeldt) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 105. 1983.

昆明沙参 kun ming sha shen

*Adenophora confusa* Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1068. 1936.

Stems and leaves glabrous or sparsely hirsute. Calyx usually glabrous.

• Open mountain slopes, forests; 1000–3200 m. Yunnan.

**10d. *Adenophora stricta* subsp. *aurita*** (Franchet) D. Y. Hong & S. Ge, Novon 20: 428. 2010.

川西沙参 chuan xi sha shen

*Adenophora aurita* Franchet, J. Bot. (Morot) 9: 366. 1895.

Calyx lobes 1–1.8 mm wide. Corolla 2–2.5 cm. Disk 1.8–2.5 mm.

• Meadows, forest margins, scrub; 2100–3300 m. NW Sichuan.

**11. *Adenophora sinensis*** A. Candolle, Monogr. Campan. 354. 1830.

中华沙参 zhong hua sha shen

*Adenophora polymorpha* Ledebour var. *sinensis* (A. Can-

dolle) Pampanini; *A. sinensis* var. *glabra* A. Candolle; *Campanula sinensis* (A. Candolle) D. Dietrich.

Stems single or several from one root, 20–100 cm tall, simple, glabrous or sparsely scaberulose. Basal leaves ovate-orbicular, base rounded. Cauline leaves petiolate, at least toward base; blade narrowly elliptic or narrowly lanceolate, 3–8 × 0.5–2 cm, both surfaces glabrous, base cuneate, margin serrate, apex obtuse to acuminate. Inflorescence branches often slender, forming a narrow panicle; pedicels slender, up to 3 cm. Hypanthium globose or obovoid, usually glabrous, less often sparsely scaberulose; calyx lobes linear-lanceolate, 5–7 × ca. 1 mm. Corolla purple or purple-blue, campanulate, 1.3–1.5 cm. Disk shortly cylindrical, 1–1.5 mm. Style 2–4 mm longer than corolla. Capsule broadly ellipsoid or globose, 6–7 × ca. 5 mm. Seeds brown-yellow, ellipsoid, ca. 1.8 mm. Fl. and fr. Aug–Oct.

• Grassy places or scrub by rivers or streams; below 1200 m. S Anhui (Qimen), Fujian (Jianning), N Guangdong (Liannan), Hunan (Xiangyin Shan), Jiangxi.

**12. *Adenophora polyantha*** Nakai, Bot. Mag. (Tokyo) 23: 188. 1909.

石沙参 shi sha shen

Stems single or several from one root, 20–100 cm tall, often simple, glabrous or hispidulous. Basal leaves reniform, base cordate, margin irregularly serrate. Cauline leaves sessile; blade ovate, lanceolate, or elliptic, occasionally linear-lanceolate, 2–10 × 0.5–2.5 cm, glabrous or hispidulous, margin serrate with teeth distant. Cymes with solitary flowers forming a pseudoraceme, or in a narrow panicle with short inflorescence branches; pedicels usually less than 1 cm. Hypanthium obconic, usually pubescent, rarely glabrous; calyx lobes triangular-lanceolate, 3.5–7 × 1–2 mm, margin entire. Corolla purple or dark blue, campanulate, slightly constricted at throat, 1.4–2.2 cm; lobes often reflexed, short, up to 1/4 as long as whole corolla. Disk tubular, (2–)2.5–4 mm, often sparsely puberulent. Style usually slightly exserted or sometimes as long as corolla. Capsule ovoid-ellipsoid, 5–12 × 4–7 mm. Seeds yellow-brown, ovoid-ellipsoid, slightly compressed, ca. 1.2 mm. Fl. Aug–Oct.  $2n = 34, 68$ .

Sunny grassy places; below 2000 m. Anhui, Gansu, Hebei, W Henan, Jiangsu, Liaoning, SE Nei Mongol, S Ningxia, Shaanxi, Shandong, Shanxi [NW Korea].

- 1a. Calyx lobes glabrous or sparsely hispidulous; capsule 5–7 mm; stems and leaves glabrous or puberulent ..... 12a. subsp. *polyantha*  
 1b. Calyx lobes hispidulous, rarely glabrous; capsule 6–12 mm; stems and leaves ± hispidulous ..... 12b. subsp. *scabricalyx*

**12a. *Adenophora polyantha* subsp. *polyantha***

石沙参(原亚种) shi sha shen (yuan ya zhong)

*Adenophora obovata* Kitamura; *A. polyantha* f. *densipila* Kitagawa; *A. polyantha* f. *eriocaulis* Kitagawa; *A. polyantha* var. *glabricalyx* Kitagawa.

Stems and leaves glabrous or puberulent. Calyx lobes

mostly glabrous or sparsely hispidulous. Capsule 5–7 mm.  $2n = 34$ . Fl. and fr. Aug–Oct.

Sunny grassy slopes; below 2000 m. E Liaoning [NW Korea].

**12b. *Adenophora polyantha* subsp. *scabricalyx*** (Kitagawa) J. Z. Qiu & D. Y. Hong, *Acta Phytotax. Sin.* 31: 39. 1993.

毛萼石沙参 mao e shi sha shen

*Adenophora polyantha* var. *scabricalyx* Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 112. 1935; *A. chanetii* (H. Léveillé) D. F. Chamberlain; *A. polyantha* var. *media* Nakai & Kitagawa; *A. scabridula* Nannfeldt; *A. scabridula* var. *viscida* P. C. Tsoong; *Campanula chanetii* H. Léveillé.

Stems and leaves ± hispidulous. Calyx lobes hispidulous, rarely glabrous. Capsule 6–12 mm. Fl. and fr. Aug–Oct.  $2n = 68^*$ .

• Sunny grasslands; below 1500 m. Anhui (Lu'an, Tongcheng), Gansu (Xifeng, Zhenyuan), Hebei, W Henan, Jiangsu (Changzhou, Xuyi), W Liaoning (Lingyuan), SE Nei Mongol, S Ningxia (Guyuan), Shaanxi (Huanglong Shan, Yijun), Shandong, Shanxi.

**13. *Adenophora contracta*** (Kitagawa) J. Z. Qiu & D. Y. Hong, *Acta Phytotax. Sin.* 28: 399. 1990.

缢花沙参 yi hua sha shen

*Adenophora polyantha* var. *contracta* Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 112. 1935; *A. kulunensis* Y. Z. Zhao; *A. urceolata* Y. Z. Zhao (2002), not C. Y. Wu (1965).

Stems 1–3 from a rootstock, 15–100 cm tall, glabrous to densely hispidulous. Basal leaves petiolate; blade reniform, base cordate, margin irregularly serrate. Cauline leaves sessile; blade ovate or lanceolate, sometimes linear-lanceolate, 1.5–8 × 0.5–3 cm, glabrous or sparsely hispidulous, margin serrate with teeth remote. Flowers in a pseudoraceme or with short branches forming a narrow panicle; pedicels usually less than 1 cm. Hypanthium obconic, densely or sparsely hispidulous, sometimes papillose, rarely glabrous; calyx lobes triangular-lanceolate, margin entire. Corolla purple or dark blue, campanulate, 1.2–2.2 cm, strongly constricted at throat (ratio of greatest in diam. to throat in diam. = 1.36); lobes only ca. 1/6 as long as tube, erect at first but later reflexed. Disk tubular, 2–4 mm, often puberulent. Style commonly exerted somewhat, less often equaling or shorter than corolla. Capsule obovoid, ca. 7 × 5 mm. Seeds ovoid-ellipsoid, ca. 1 mm. Fl. and fr. Aug–Oct.  $2n = 34^*$ .

• Open grassy slopes. W Liaoning, Nei Mongol.

**14. *Adenophora pinifolia*** Kitagawa in S. Tokunaga, Rep. First Sci. Exped. Manchoukuo 4(2): 110. 1935.

松叶沙参 song ye sha shen

Roots columnar. Stems erect, densely leafy. Cauline leaves sessile; blade linear, ca. 5 cm × 0.8 mm, slightly fleshy, margin entire, apex acute. Inflorescence a panicle. Hypanthium obconic, ca. 2.5 mm, glabrous; calyx lobes subulate, 1.5–2 mm, margin entire. Corolla campanulate, 18–19 mm; lobes 2–4 × 6–7 mm. Disk ca. 4.5 mm, glabrous. Style as long as corolla. Capsule obconic. Fl. Aug–Sep.  $2n = 34^*$ .

• Open grassy slopes. Liaoning (Dafangshen, Dalian, Heishan).

**15. *Adenophora micrantha*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983.

小花沙参 xiao hua sha shen

*Adenophora suolunensis* P. F. Tu & X. F. Zhao.

Stems few to several dozen from a single caudex, erect, 30–40 cm tall, often simple, densely retrorsely hispidulous. Cauline leaves sessile; blade linear to oblong, 1.5–4 × 0.3–1 cm, both surfaces sparsely scaberulose or subglabrous. Cymes with only a terminal flower or with several flowers, forming a narrow panicle; pedicels less than 1 cm. Hypanthium obconic, 1.5–2 mm, glabrous; calyx lobes narrowly triangular, 2–2.5 × 0.7–0.9 mm, margin entire. Corolla blue, tubular-campanulate, 12–14 mm; lobes ovate-deltoid, 3.5–4 mm. Stamens much shorter than corolla. Disk large tubular, 2.5–3 mm, sparsely villous at apex. Style ca. 16 mm, obviously exerted. Capsule ovoid-globose, ca. 4 × 3.5 mm. Fl. Jul–Aug.

• Grassy or stony slopes. E Nei Mongol.

**16. *Adenophora palustris*** Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 426. 1901.

沼沙参 zhao sha shen

Stems erect, ca. 1 m tall, simple, glabrous. Cauline leaves sessile; blade oblong or ovate-orbicular, 5–7 × 1.5–3 cm, papery, lucid, glabrous, base rounded or obtuse, margin crenate or irregularly serrate, apex acute or rounded. Flowers several in a compact pseudoraceme. Hypanthium glabrous; calyx lobes ovate-lanceolate, ca. 5.5 × 2 mm, nearly 2 × as broad at middle as at base, distinctly reticulate veined, margin entire, apex obtuse or acute. Corolla broadly campanulate, ca. 2 cm in diam. Disk ca. 4 × 1.5 mm, glabrous. Style slightly longer than corolla. Capsule obovoid, 7–8 × 4–6 mm. Fl. and fr. Aug.  $2n = 102$ .

E Jilin [Japan, N Korea].

**17. *Adenophora himalayana*** Feer, Bot. Jahrb. Syst. 14: 618. 1890.

喜马拉雅沙参 xi ma la ya sha shen

Roots often thickened, up to 1 cm in diam. Stems often several from one root, 15–60 cm tall, simple, glabrous, less often retrorsely hispidulous or sparsely retrorsely hirsute. Basal leaves petiolate; blade deltoid or ovate. Cauline leaves sessile or lower ones shortly petiolate; blade ovate, lanceolate, narrowly elliptic, or linear, 3–14 × 0.1–2.5 cm, glabrous, very rarely hairy, margin entire or sparsely serrate. Flowers solitary, or several in a pseudoraceme, never in a panicle. Hypanthium obconic or obovoid, glabrous; calyx lobes subulate, 5–10 × 1–1.5(–2) mm. Corolla blue or blue-purple, campanulate, 1.7–2.2 cm; lobes ovate-deltoid, 4–7 mm. Disk broadly tubular, 3–8 × 2–3 mm. Style nearly as long as or slightly longer than corolla. Capsule obovoid-oblong, 5–10 × 4–7 mm. Fl. Jul–Sep, fr. Aug–Sep.

Meadows or grassy places at forest margins, alpine meadows or scrub; (1200–)2500–4700 m. C and SE Gansu, E and S Qinghai, Shaanxi, NW Sichuan, Xinjiang, Xizang [N India, E Kazakhstan, Kyrgyzstan, Nepal, Tajikistan].

- 1a. Calyx lobes entire, very occasionally margin with verrucose denticles; leaves usually broadly linear, less often narrowly elliptic to ovate-lanceolate ..... 17a. subsp. *himalayana*
- 1b. Calyx lobes rarely entire, usually margin with verrucose denticles; leaves mostly ovate to ovate-lanceolate, up to 2.5 cm wide, rarely broadly linear ..... 17b. subsp. *alpina*

**17a. *Adenophora himalayana* subsp. *himalayana***

喜马拉雅沙参(原亚种) xi ma la ya sha shen (yuan ya zhong)

*Adenophora smithii* Nannfeldt; *A. smithii* f. *crispa* Nannfeldt.

Leaves usually broadly linear, rarely narrowly elliptic to ovate-lanceolate. Calyx lobes entire, very occasionally with verrucose denticles on margins. Disk 2–3 mm in diam. Style usually slightly exserted.

Alpine meadows or scrub; 3000–4700 m (1200–3000 m in Xinjiang). C Gansu, E and S Qinghai, NW Sichuan, Xinjiang (Tian Shan, Wujia, Yecheng), Xizang [N India, E Kazakhstan, Kyrgyzstan, Nepal, Tajikistan].

**17b. *Adenophora himalayana* subsp. *alpina* (Nannfeldt) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 132. 1983.**

高山沙参 gao shan sha shen

*Adenophora alpina* Nannfeldt, Acta Horti Gothob. 5: 14. 1930; *A. tsinlingensis* Pax & K. Hoffmann.

Leaves mostly ovate to ovate-lanceolate, up to 2.5 cm wide, less often broadly linear, abaxially often sparsely hispidulous. Calyx lobes often with verrucose denticles on margins, occasionally entire. Disk 1.5–2.5 mm in diam. Style often included.

Meadows or grassy places at forest margins; 2500–4200 m. SE Gansu (Lintao; Lianhua Shan), Shaanxi (Qin Ling), NW Sichuan (Pingwu, Shuajingsi, Songpan) [N India].

**18. *Adenophora amurica* C. X. Fu & M. Y. Liu, Bull. Bot. Res. North-East. Forest. Inst. 6: 159. 1986.**

阿穆尔沙参 a mu er sha shen

Stems 1–3 from a single root, erect, 35–105 cm tall, simple, densely retrorsely hirsute. Basal leaves long petiolate; blade ovate, base cordate. Cauline leaves sessile; blade narrowly ovate, lanceolate, or elliptic, 4–8 × 0.5–2.5 cm, abaxially densely retrorsely hirsute, adaxially glabrous or hispidulous along veins, margin serrate. Cymes with 1–5 flowers, in a narrow panicle or pseudoraceme; pedicels ca. 3 mm. Hypanthium ellipsoid, glabrous or hispidulous; calyx lobes narrowly lanceolate, 5–6 × 0.7–1.5 mm, margin entire or with 1 or 2 sometimes verrucose denticles. Corolla blue or blue-purple, campanulate, 1.2–2.1 cm; lobes broadly ovate-deltoid. Disk shortly tubular, 0.4–1.4 mm. Style as long as corolla. Capsule ellipsoid, 6–10 × 4–5.5 mm. Seeds brown-red, ellipsoid, slightly compressed, 1.4–1.9 mm. Fl. Jul–Aug, fr. Sep.  $2n = 68^*$ .

- Stony slopes. Heilongjiang (Da Hinggan Ling; Jingtao).

**19. *Adenophora gmelinii* (Biehler) Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 167. 1823.**

狭叶沙参 xia ye sha shen

Roots up to 40 cm. Stems single or several from one root, up to 80 cm tall, simple, usually glabrous, sometimes hispidulous. Basal leaf blade deltoid or rhombic-ovate, base shallowly cordate, margin crenate. Cauline leaves sessile; blade linear or less often lanceolate, 4–9 × 0.2–1.3 cm, glabrous, margin entire or serrate. Cymes single flowered, forming a pseudoraceme, or lower cymes several flowered, forming a very narrow panicle, or rarely with a solitary terminal flower. Hypanthium obovoid-oblong, glabrous or rarely scaberulose; calyx lobes linear-lanceolate, 4–10 × 1.5–2 mm. Corolla blue or pale purple, broadly campanulate, 1.6–2.8 cm; lobes ovate-triangular, 6–8 mm, less often deltoid and only ca. 4 mm. Disk cylindrical, 1.3–3.5 mm, glabrous or sparsely hairy. Style slightly shorter than, rarely as long as corolla. Capsule ellipsoid, 8–13 × 4–7 mm. Seeds yellow-brown, ellipsoid, ca. 1.8 mm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 34, 68$ .

Forests, thickets, communities of tall herbs, meadows, grassy slopes; below 2600 m. Hebei, Heilongjiang, W Jilin, Liaoning, E, N, and SE Nei Mongol, C and N Shanxi [Korea, E Mongolia, Russia (Far East, SE Siberia)].

- 1a. Plants (incl. hypanthium) often hispidulous; leaf blade broadly linear to ovate-lanceolate, adaxially scabrous, margin serrate; stems often single; flowers usually several ..... 19c. subsp. *nystroemii*
- 1b. Plants (incl. hypanthium) glabrous, sometimes stems hispidulous at base; leaf blade narrowly linear, narrowly ovate, deltoid-oblongate, or obovate, adaxially smooth, margin entire or serrate; stems several; flowers more numerous.
- 2a. Plants mostly more than 1 m tall, commonly puberulent only on lower part of stems and lower leaves; leaf blade mostly broadly linear to narrowly ovate, serrate; calyx lobes 5–12 × 1.3–3 mm ..... 19b. subsp. *hailinensis*
- 2b. Plants mostly less than 1 m tall, glabrous or sparsely puberulent at base of stems; leaf blade commonly narrowly linear and entire; calyx lobes 4.5–6 × 1–1.6 mm ..... 19a. subsp. *gmelinii*

**19a. *Adenophora gmelinii* subsp. *gmelinii***

狭叶沙参(原亚种) xia ye sha shen (yuan ya zhong)

*Campanula gmelinii* Biehler, Pl. Nov. Herb. Spreng. 14. 1807; *Adenophora biloba* Y. Z. Zhao; *A. borealis* D. Y. Hong & Y. Z. Zhao; *A. borealis* var. *oreophila* Y. Z. Zhao; *A. communis* Fischer var. *coronopifolia* (Fischer ex Schultes) Trautvetter; *A. communis* var. *gmelinii* (Biehler) Trautvetter; *A. coronopifolia*

(Fischer ex Schultes) Fischer; *A. coronopifolia* var. *erysimoides* (Vest ex Schultes) Steudel; *A. erysimoides* (Vest ex Schultes) Kitagawa; *A. gmelinii* var. *coronopifolia* (Fischer ex Schultes) Y. Z. Zhao; *A. gmelinii* var. *pachyphylla* (Kitagawa) Y. Z. Zhao; *A. gmelinii* var. *stylosa* A. Candolle; *A. pachyphylla* Kitagawa; *A. polyantha* Nakai var. *rhombica* Y. Z. Zhao; *A. polymorpha* Ledebour var. *coronopifolia* (Fischer ex Schultes) Trautvetter ex Herder; *A. polymorpha* var. *gmelinii* (Biehler) Trautvetter ex Herder; *A. wulingshanica* D. Y. Hong var. *alterna* Y. Z. Zhao; *Campanula coronopifolia* Fischer ex Schultes; *C. erysimoides* Vest ex Schultes; *C. fischeriana* Sprengel, nom. illeg. superfl.

Plants mostly less than 1 m tall, glabrous, sometimes sparsely puberulent at base of stems. Leaves usually linear and entire, less frequently lanceolate or lanceolate-ovate and serrate. Calyx lobes  $4.5\text{--}6 \times 1\text{--}1.6$  mm. Fl. Jul–Sep, fr. Aug–Oct.  $2n = 34^*$ , 68.

Meadows; below 1800 m. Hebei (Kangbao, Weichang, Zhangbei), Heilongjiang (Anda), W Jilin (W of Fuyu, Qian'an), Liaoning (Zhangwu), E, N, and SE Nei Mongol [Korea, E Mongolia, Russia (SE Siberia)].

**19b. *Adenophora gmelinii* subsp. *hailinensis*** J. Z. Qiu & D. Y. Hong, Acta Phytotax. Sin. 31: 38. 1993.

海林沙参 hai lin sha shen

Plants mostly more than 1 m tall. Stems sometimes puberulent at base. Leaves often puberulent, mostly broadly linear to narrowly ovate, margin serrate. Calyx lobes  $5\text{--}12 \times 1.3\text{--}3$  mm. Fl. and fr. Sep.  $2n = 68$ .

Communities of tall herbs, thickets, forests. Heilongjiang (Hailin, Huanan, Jiamusi) [Russia (Far East)].

**19c. *Adenophora gmelinii* subsp. *nystroemii*** J. Z. Qiu & D. Y. Hong, Acta Phytotax. Sin. 31: 38. 1993.

山西沙参 shan xi sha shen

Plants (including hypanthium) often hispidulous. Stems often single. Leaves broadly linear or ovate-lanceolate, adaxially scabrous, margin serrate. Flowers usually several. Fl. Jul–Sep, fr. Aug–Sep.  $2n = 34^*$ , 68\*.

• Grassy slopes, thickets; below 2600 m. Hebei (Neiqiu), SE Nei Mongol (Zhuozi), C and N Shanxi.

**20. *Adenophora potaninii*** Korshinsky, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 42(2): 39. 1894 [*“potanini”*].

泡沙参 pao sha shen

Stems often single, 30–100 cm tall, simple, usually densely, less often sparsely retrorsely hispidulous, very rarely subglabrous. Cauline leaves sessile or shortly petiolate; blade obovate, ovate-elliptic, or oblong (occasionally linear-elliptic or linear),  $2\text{--}7 \times 0.5\text{--}4$  cm, both surfaces hispidulous, base obtuse or cuneate, margin with 2 to several large teeth, apex obtuse, acute, or shortly acuminate. Inflorescences usually with branches at base, forming a panicle, sometimes with only several flowers glomerate into a pseudoraceme; pedicels less than 1 cm. Hypanthium obovoid or globose-obovoid, glabrous, base rounded or ± obtuse; calyx lobes triangular-subulate, 3–9 mm, margin with 1 or 2 pairs of long denticles. Corolla purple, blue,

or blue-purple, rarely white, campanulate, 1.5–2.5 cm; lobes ovate-deltoid, 5–8 mm. Disk tubular, 2–2.6(–3) mm, hairy at least at apex. Style nearly as long as or slightly longer than corolla. Capsule globose-ellipsoid or ellipsoid,  $7\text{--}11 \times 4\text{--}6$  mm. Seeds brown-yellow, ellipsoid, ca. 1.4 mm, 1-ribbed. Fl. Jul–Oct, fr. Oct–Nov.  $2n = 34^*$ , 102\*.

• Sunny grassy slopes, among grasses on shaded slopes, scrub, sparse woods, stony places or rock crevices, less often forests; below 3100 m. Gansu, Hebei, Henan, SW Liaoning, SE Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shanxi, W Sichuan.

- 1a. Cauline leaves sessile, lower ones rarely shortly petiolate ..... 20a. subsp. *potaninii*  
 1b. Cauline leaves usually petiolate, though sometimes very shortly so ..... 20b. subsp. *wawreana*

**20a. *Adenophora potaninii* subsp. *potaninii***

泡沙参(原亚种) pao sha shen (yuan ya zhong)

*Adenophora bockiana* Diels; *A. polydentata* P. F. Tu & G. J. Xu; *A. potaninii* var. *bockiana* (Diels) S. W. Liu.

Cauline leaves sessile, lower ones rarely shortly petiolate.

• Sunny grassy slopes, less often scrub or forests; 1000–3100 m. Gansu (E of Yongchang), Ningxia (Guyuan, Jingyuan), E Qinghai (Menyuan, Tongren, Xining), Shaanxi (Lüeyang, Mianxian, N part of province), SW Shanxi (W of Wuzhai, Xiaoyi, Yuncheng), W Sichuan.

**20b. *Adenophora potaninii* subsp. *wawreana*** (Zahlbruckner) S. Ge & D. Y. Hong, J. Syst. Evol. 48: 452. 2010.

多歧沙参 duo qi sha shen

*Adenophora wawreana* Zahlbruckner, Ann. K. K. Naturhist. Hofmus. 10 (Notizen): 56. 1895; *A. biformifolia* Y. Z. Zhao; *A. wawreana* f. *foliosa* Zahlbruckner; *A. wawreana* var. *lanceifolia* Y. Z. Zhao; *A. wawreana* f. *oligotricha* Kitagawa; *A. wawreana* f. *polytricha* Kitagawa.

Cauline leaves usually petiolate, though sometimes petiole very short; blades varying greatly, from linear to ovate, even on same individual.

• Among grasses on shaded slopes, scrub, sparse woods, mostly in stony places or rock crevices; below 2000 m. Hebei (N to Weichang), Henan (Song Shan), SW Liaoning, SE Nei Mongol (Hohhot, Liangcheng, Zhuozi), Shanxi (E of Jiaocheng, Wuzhai, Yuncheng).

**21. *Adenophora tricuspidata*** (Fischer ex Schultes) A. Candolle, Monogr. Campan. 355. 1830.

锯齿沙参 ju chi sha shen

*Campanula tricuspidata* Fischer ex Schultes, Syst. Veg. 5: 158. 1819; *Adenophora communis* Fischer var. *denticulata* (Fischer) Trautvetter; *A. denticulata* Fischer; *A. polymorpha* Ledebour var. *denticulata* (Fischer) Trautvetter ex Herder; *C. denticulata* (Fischer) Sprengel (1824), not Burchell (1822).

Stems single or sometimes 2 from one root, 70–100 cm tall, simple, glabrous. Cauline leaves sessile, glabrous; blade narrowly elliptic or ovate-elliptic,  $2.5\text{--}8 \times 0.6\text{--}2$  cm, base ob-

tuse or cuneate, margin serrate, apex acute. Inflorescence branches (cymes) extremely short, only 2–3 cm, with 2 to several flowers, several forming a narrow panicle; pedicels very short. Hypanthium globose-ovoid or globose-obconic, glabrous; calyx lobes often reflexed, ovate-deltoid, 3–6 × 1–2 mm, overlapping at base, margin with 2 or rarely 3 or 4 pairs of long denticles, apex acuminate. Corolla blue or purple-blue, broadly campanulate, 1–2 cm; lobes broadly ovate-deltoid, ca. 1/2 as long as tube, apex obtuse. Disk shortly tubular, 1–2 mm, glabrous. Style shorter than corolla. Capsule subglobose. Fl. Jul–Sep.  $2n = 34$ .

Wet meadows, forests of *Betula*, sunny grassy slopes. Heilongjiang (Luobei, Nenjiang, Yichun), N Nei Mongol (Xilin Gol Meng: Xi Ujimqin Qi) [Russia (Far East, S Siberia)].

**22. *Adenophora wilsonii*** Nannfeldt in Handel-Mazzetti, Symb. Sin. 7: 1075. 1936.

聚叶沙参 ju ye sha shen

Stems often 2 to several from one root, erect, 25–80 cm tall, simple or branched above, glabrous, densely leafy at middle during anthesis but basal leaves withered. Leaves shortly petiolate; blade linear-elliptic or lanceolate, 4–10 × 0.5–1.2 cm, thickly papery, both surfaces glabrous, base attenuate into petiole, margin serrate or crenate. Inflorescence a panicle with long or short branches; pedicels up to 1 cm. Hypanthium obovoid or obconic, sometimes subglobose, glabrous; calyx lobes subulate or linear-lanceolate, 5–7 × ca. 1 mm, with 1 or 2 pairs of verrucose denticles. Corolla purple or blue-purple, funnellform-campanulate, 1.5–2 cm; lobes ovate-deltoid, ca. 1/2 as long as tube. Disk annular or shortly tubular, less than 1.2 mm, glabrous. Style 2–2.5 mm, ca. 5 mm longer than corolla. Capsule globose-ellipsoid, 7–8 × 4–5 mm. Fl. Aug–Oct, fr. Sep–Oct.

• Thickets, rocks by streams; below 1600 m. Chongqing (Chengkou), Gansu (Kangxian, Wenxian), Guizhou (Renhuai), W Hubei (Hefeng, Shennongjia), Shaanxi (Nanzheng), Sichuan (Emei Shan, Jiange, Tianquan).

**23. *Adenophora stenophylla*** Hemsley, J. Linn. Soc., Bot. 26: 10. 1889.

扫帚沙参 sao zhou sha shen

*Adenophora mongolica* A. I. Baranov; *A. stenophylla* var. *denudata* Kitagawa.

Stems numerous from one root, 25–50 cm tall, often with slender branches, densely hispidulous or glabrous. Basal leaf blade ovate-orbicular, base rounded. Cauline leaves sessile; blade needlelike to linear-oblong, up to 6 × 0.5 cm, glabrous or hispidulous, margin entire or sparsely serrate. Inflorescence branches slender, erect, forming a narrow panicle, rarely only several flowers in a pseudoraceme; pedicels slender. Hypanthium obovoid-oblong, glabrous; calyx lobes subulate, 3–4 mm, margin entire or with 1 or 2 pairs of verrucose denticles. Corolla blue or purple-blue, campanulate, 8–13 mm; lobes ovate-triangular, 3–3.5 mm. Disk tubular, 1–1.5 mm, glabrous or sparsely puberulent. Style slightly shorter than corolla. Capsule ellipsoid, 4–8 × 2.3–5 mm. Seeds brown-yellow, ellipsoid, slightly compressed, ca. 1 mm. Fl. Jul–Sep, fr. Sep.  $2n = 34^*$ .

Dry grasslands. Heilongjiang (Anda), W Jilin, Nei Mongol (Jarud Qi) [Mongolia].

**24. *Adenophora elata*** Nannfeldt, Acta Horti Gothob. 5: 16. 1930.

狭长花沙参 xia chang hua sha shen

*Adenophora wutaiensis* Hurusawa.

Root carrotlike, 8–18 × 1.4–2.4 cm. Stems single, 20–120 cm tall, simple, glabrous or sometimes puberulent. Cauline leaves very rarely opposite, sessile or lower leaves sometimes with short winged petiole; blade broadly elliptic, elliptic, narrowly elliptic, lanceolate, or oblanceolate, 2–8 × 0.5–2.5 cm, glabrous, base rounded, obtuse, or cuneate, margin crenate or serrate, apex acute or less often acuminate. Flowers usually several in a pseudoraceme, sometimes solitary and terminal, or very rarely with short branches, forming a narrow panicle; pedicels usually less than 1 cm. Hypanthium narrowly obovoid or obconic, glabrous; calyx lobes narrowly triangular, 5–10 × 1–1.5 mm, margin with 1 or 2 pairs of denticles or entire. Corolla blue or purple-blue, narrowly campanulate or tubular-campanulate, less often campanulate, 2–3.5 cm; lobes deltoid, 5–10 mm. Disk tubular, 1.6–2.8 mm, glabrous. Style shorter than corolla. Capsule ellipsoid or oblong, 10–14 × 5–7 mm. Seeds yellow-brown, ellipsoid, ca. 1.5 mm. Fl. Jul–Sep, fr. Sep.  $2n = 68^*$ .

• Grassy slopes; 1700–3000 m. W Hebei, SE Nei Mongol (Zhuozi), Shanxi (Wutai Shan).

**25. *Adenophora khasiana*** (J. D. Hooker & Thomson) Oliver ex Collett & Hemsley, J. Linn. Soc., Bot. 28: 80. 1890.

云南沙参 yun nan sha shen

*Campanula khasiana* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 25. 1857; *Adenophora albescens* C. Y. Wu; *A. bulleyana* Diels; *A. bulleyana* var. *angustifolia* C. Y. Wu; *A. chionantha* C. Y. Wu; *A. dimorphophylla* C. Y. Wu; *A. diplostoma* Diels; *A. likiangensis* C. Y. Wu; *A. roseiflora* C. Y. Wu.

Root carrotlike, 7–8 × 1.5–1.6 cm. Stems often single or sometimes 2 from one root, up to 1 m tall, simple, usually hirsute. Cauline leaves sessile or shortly petiolate; blade ovate-orbicular, ovate, obovate, or elliptic, 3–9 × 1.5–6.5 cm, abaxially rather densely hirsute (sometimes only along veins), adaxially scaberulose, base cuneate, margin serrate or irregularly biserrate, apex acute or acuminate; petiole if present up to 2 cm. Inflorescence a narrow panicle with short branches or a pseudoraceme of several flowers; pedicels short. Hypanthium campanulate, glabrous or rather densely hispidulous; calyx lobes narrowly triangular, 5–7 × 1–1.5 mm, margin with 1–4 pairs of denticles. Corolla blue or pale blue, funnellform-campanulate, 1–2.4 cm; lobes ca. 1/2 as long as tube. Disk shortly tubular, less than 1 mm. Style slightly longer than corolla to obviously exerted. Fl. Aug–Oct.  $2n = 34$ .

Forests, scrub, grassy places; 1000–2800 m. SW Sichuan (Butuo, Muli, Puge), SE Xizang (Cona), Yunnan [Bhutan, NE India, N Myanmar].

**26. *Adenophora jasionifolia*** Franchet, J. Bot. (Morot) 9: 365. 1895.

甘孜沙参 gan zi sha shen

*Adenophora atuntzensis* C. Y. Wu; *A. forrestii* Diels; *A. forrestii* var. *handeliana* Nannfeldt; *A. forrestii* var. *intercedens* Pax & K. Hoffmann; *A. microcodon* C. Y. Wu; *A. pumila* P. C. Tsoong.

Root to 1 cm in diam. Caudexes sometimes with horizontal branches. Stems (1 or) 2 to several, leafy mostly in lower half, sparsely villous or rarely glabrous. Cauline leaves sessile or shortly winged-petiolate; blade ovate-orbicular, elliptic, lanceolate, or linear-lanceolate, 2–8 × 0.2–1.8 cm, both surfaces usually puberulent or rarely glabrous, base cuneate or attenuate, margin entire, crenulate, or serrate, apex acute or acuminate. Flowers terminal and solitary, or several in a pseudoraceme; pedicels short. Hypanthium obconic, base acute or sometimes obtuse, glabrous; calyx lobes narrowly triangular, 5–10 × 1.5–1.7 mm, margin with several verrucose denticles and sometimes sparsely ciliate. Corolla blue or purple-blue, bowl-shaped, 1.3–2.2 cm; lobes deltoid-orbicular, 1/2–2/3 as long as tube. Disk annular, 0.5–1 mm high. Style 13–15 mm, shorter or sometimes longer than corolla. Capsule ellipsoid, 8–11 × 5–6.5 mm. Seeds yellow-brown, ca. 1 mm. Fl. Jul–Sep, fr. Sep.  $2n = 34^*$ .

• Meadows, grassy places at forest margins; 3000–4700 m. W Sichuan, E Xizang (Gonjo, Jomda), NW Yunnan (Dêqên, Zhongdian).

**27. *Adenophora coelestis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 173. 1912.

天蓝沙参 tian lan sha shen

*Adenophora bulleyana* Diels var. *alba* C. Y. Wu; *A. coelestis* var. *stenophylla* Diels ex C. Y. Wu; *A. huangiae* C. Y. Wu; *A. megalantha* Diels; *A. ornata* Diels; *A. ornata* var. *alba* C. Y. Wu; *A. pachyrrhiza* Diels; *A. raphanorrhiza* C. Y. Wu.

Caudexes sometimes with horizontal branches. Stems 1 or 2 from a rootstock, usually 50–80 cm tall, simple, usually densely leafy in lower half, glabrous to rather densely hispid. Cauline leaves sessile or sometimes lower ones shortly petiolate; blade ovate-rhombic, obovate, ovate, or linear-lanceolate, 2–10 × 0.5–3 cm, abaxially often hispidulous along veins, adaxially sparsely hispidulous, margin irregularly serrate. Flowers in a pseudoraceme, or sometimes inflorescence with branches of 1 to several flowers at top; pedicels short. Hypanthium globose-obovoid or obovoid-obconic, glabrous; calyx lobes narrowly triangular, 8–20 × 1–1.5(–2) mm, margin with 1 to several pairs of denticles. Corolla blue or blue-purple, campanulate, 1.5–4 cm; lobes ovate-deltoid, 6–11 mm, ca. 1/2 as long as tube. Disk (1.2–)2–3(–3.5) mm, glabrous or sometimes hairy. Style shorter than corolla. Fl. Aug–Oct.  $2n = 102^*$ .

• Forests, forest margins, glades; 1200–4000 m. SW Sichuan, Yunnan.

**28. *Adenophora hubeiensis*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

鄂西沙参 e xi sha shen

Stems single, erect, 50–120 cm tall, simple, glabrous or

puberulent. Cauline leaves sessile or shortly petiolate; blade lanceolate or elliptic-lanceolate, 5–12 × 1.5–3 cm, both surfaces ± puberulent or sometimes glabrous, base cuneate or obtuse, margin serrate, apex acuminate. Inflorescence branches ascending, long, slender, forming a panicle; pedicels slender, up to 1.5 cm. Hypanthium obovoid or obovoid-ellipsoid, glabrous; calyx lobes subulate, 4–8 × ca. 0.5 mm, margin with 2 or 3 pairs of denticles. Corolla blue-purple or pale blue, campanulate, 13–18 mm; lobes ovate-deltoid, 4–5 mm. Disk tubular, 1.8–3.2 mm, glabrous. Style 20–22 mm, exserted by 4–7 mm. Capsule ellipsoid, 7–8 × 3–4 mm. Fl. Aug–Sep, fr. Sep–Oct.

• Grassy slopes, scrub, rocks in forests; 1900–2600 m. W Hubei (Shennongjia).

**29. *Adenophora morrisonensis*** Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 165. 1911.

台湾沙参 tai wan sha shen

Caudexes with horizontal branches bearing alternate membranous scales. Stems 1 to several from one root, 10–30 cm tall, simple, sometimes branched at middle, glabrous or sparsely hirsute. Basal leaf blade ovate-deltoid, base subtruncate. Cauline leaves sessile, lower ones with petiole up to 1 cm; blade linear-lanceolate or elliptic, 3–8 × 0.4–2.5 cm, both surfaces glabrous or sparsely puberulent, base cuneate, margin crenate or dentate, apex acuminate. Flowers 1 or 2 and terminal or more in a pseudoraceme, or several pseudoracemes forming a narrow panicle; pedicels elongate, 1.5–3 cm. Hypanthium obovoid or obconic, glabrous; calyx lobes subulate, 10–15 × 1–1.5 mm, margin with several pairs of denticles. Corolla blue-purple or light purple, campanulate, 2.8–3.5 cm; lobes deltoid, ca. 1/2 as long as tube. Disk annular, less than 1 mm high. Style shorter than corolla. Capsule ellipsoid, 10–16 × 6–7 mm. Seeds yellow-brown, ellipsoid, 1.2–1.5 mm, 1-ribbed. Fl. Jul–Nov, fr. Sep–Nov.  $2n = 34^*$ .

• Forest or thicket margins, shaded scree; 700–3500 m. Taiwan.

- 1a. Plants glabrous or sparsely pubescent; flowers in a pseudoraceme ..... 29a. subsp. *morrisonensis*
- 1b. Plants hirsute; flowers only  
1 or 2 ..... 29b. subsp. *uehatae*

**29a. *Adenophora morrisonensis* subsp. *morrisonensis***

台湾沙参(原亚种) tai wan sha shen (yuan ya zhong)

Plants glabrous or sparsely pubescent. Flowers several to many, in a pseudoraceme or narrow panicle.

• Forest or thicket margins; 700–3000 m. Taiwan.

**29b. *Adenophora morrisonensis* subsp. *uehatae*** (Yamamoto) Lammers, Bot. Bull. Acad. Sin. 33: 285. 1992.

玉山沙参 yu shan sha shen

*Adenophora uehatae* Yamamoto, J. Trop. Agric. Soc. Formosa 4: 484. 1932; *A. coelestis* Diels var. *uehatae* (Yamamoto) Masamune.

Plants hirsute. Flowers 1 or 2, terminal.

• Shaded scree; 3000–3500 m. Taiwan.

**30. *Adenophora ningxianica*** D. Y. Hong ex S. Ge & D. Y. Hong, *Novon* 9: 46. 1999.

宁夏沙参 ning xia sha shen

Stems several from one root, erect, 30–50 cm tall, simple, glabrous or less often scaberulose. Basal leaves cordate or obovate; cauline leaves alternate, sessile or with petiole extremely short and cuneate; blade usually lanceolate, less often ovate-lanceolate or linear, 2–5 × 0.2–1.8 cm, both surfaces glabrous, margin dentate or irregularly serrate. Flowers several in a pseudoraceme, or numerous in a large panicle due to having long inflorescence branches; pedicels slender, 0.5–1.5 cm. Calyx glabrous; tube obovoid or obovoid-conical; lobes subulate or subulate-lanceolate, 2–6 × ca. 1 mm, margin mostly with 1 pair of verrucose denticles, very rarely entire. Corolla blue or blue-purple, narrowly campanulate, 1.4–1.6 cm; lobes ovate-deltoid, ca. 3.5 mm. Disk tubular, 2–2.5 mm, glabrous. Style 1.6–1.8 cm, slightly longer than corolla. Capsule narrowly ellipsoid, ca. 8 × 3 mm. Seeds yellow, ellipsoid, ca. 2 mm. Fl. Jul–Aug, fr. Sep.

• Shaded slopes, scrub in ravines, rock crevices; 1600–2400 m. Gansu (?Lanzhou), Nei Mongol (Ih Ju Meng: Qianli Shan), Ningxia (Helan Shan).

**31. *Adenophora pereskiiifolia*** (Fischer ex Schultes) Fischer ex G. Don in Loudon, *Hort. Brit.* 75. 1830 [*“pereskiaefolia”*].

长白沙参 chang bai sha shen

*Campanula pereskiiifolia* Fischer ex Schultes, *Syst. Veg.* 5: 116. 1819 [*“pereskiaefolia”*]; *Adenophora communis* Fischer var. *latifolia* (Fischer) Trautvetter; *A. curvidens* Nakai; *A. latifolia* Fischer; *A. pereskiiifolia* subsp. *alternifolia* (P. Y. Fu ex Y. Z. Zhao) C. X. Fu & M. Y. Liu; *A. pereskiiifolia* var. *alternifolia* P. Y. Fu ex Y. Z. Zhao; *A. pereskiiifolia* var. *angustifolia* Y. Z. Zhao; *A. pereskiiifolia* var. *curvidens* (Nakai) Kitagawa; *A. pereskiiifolia* f. *puberula* Kitagawa; *A. pereskiiifolia* subsp. *subalpina* A. I. Baranov; *A. polyantha* Nakai subsp. *subalpina* (A. I. Baranov) Kitagawa; *A. polymorpha* Ledebour var. *latifolia* (Fischer) Trautvetter; *A. polymorpha* var. *pereskiiifolia* (Fischer ex Schultes) Makino.

Root carrot-shaped, 6–9 × 1.5–1.9 cm. Stems single, up to 1 m, simple, glabrous, less often retrorsely hispidulous. Cauline leaves (all or some) 3–5-verticillate or -subverticillate, rarely all alternate or nearly so, sessile or shortly petiolate; blade elliptic, ovate, lanceolate, or narrowly lanceolate, 3.5–16 × 0.6–4.2 cm, both surfaces glabrous, base cuneate or obtuse, margin coarsely serrate, apex acute or acuminate. Inflorescence pyramidal, with cymes alternate, short, and suberect, or flowers sometimes relatively few, forming a pseudoraceme. Hypanthium obovoid, obconic, or ellipsoid, glabrous or verrucose; calyx lobes lanceolate or narrowly triangular, 3–6 × 0.8–2 mm. Corolla blue-purple or blue, funnellform-campanulate, 1.3–2 cm; lobes deltoid or depressed triangular, 3–8 × 6–7.5 mm. Disk annular to shortly tubular, 0.5–1.5 mm. Style 1.5–2.4 cm, ± exserted. Capsule obovoid, ellipsoid, or subglobose, 6–8 × 4–5 mm. Seeds dark brown, glossy, ellipsoid, slightly compressed, 1.8–2 mm, smooth. Fl. Jul–Aug, fr. Aug–Sep.  $2n = 34, 68, 72$ .

Meadows, forest margins, grassy places in forests; below 1000 m. Heilongjiang, Jilin [Japan, Korea, E Mongolia, Russia (Far East, SE Siberia)].

**32. *Adenophora divaricata*** Franchet & Savatier, *Enum. Pl. Jap.* 2: 423. 1879.

展枝沙参 zhan zhi sha shen

*Adenophora divaricata* f. *angustifolia* A. I. Baranov; *A. divaricata* f. *manshurica* (Nakai) Kitagawa; *A. divaricata* var. *manshurica* (Nakai) Kitagawa; *A. manshurica* Nakai; *A. polymorpha* Ledebour var. *divaricata* (Franchet & Savatier) Makino.

Roots 1.5–3.5 cm in diam. Stems single, up to 1 m tall, simple, ± white villous, rarely glabrous. Cauline leaves 3–5-verticillate, sessile; blade rhombic, broadly elliptic, elliptic, elliptic-lanceolate, or lanceolate, 3.5–11 × 1.5–6 cm, both surfaces glabrous or hispidulous along veins, base obtuse or cuneate, margin coarsely serrate, apex obtuse, acute, or acuminate. Inflorescence branches (each with 1 to several cymes) usually verticillate, or sometimes some (rarely all) alternate, forming a large panicle; peduncles of inflorescence branches 2–10 cm; pedicels 0.5–1 cm, glabrous. Hypanthium obconic or obovoid-obconic, glabrous; calyx lobes lanceolate, elliptic-lanceolate, or linear-lanceolate, 5–10 × 1–2.5 mm, margin entire. Corolla blue or light purple, campanulate, 15–22 mm; lobes deltoid-orbicular, 1/3–2/3 as long as tube, both surfaces glabrous. Disk tubular, 1.8–2.5 mm. Style as long as corolla or slightly exserted. Capsule obovoid or broadly ellipsoid, 5–7 × 3–6 mm. Seeds golden brown, ellipsoid, 2–2.5 mm, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.  $2n = 34$ .

Forests, shrublands, grassy slopes; 400–1800 m. Hebei (Beijing, N of Yixian), Heilongjiang (E of Heihe), Jilin (E of Changchun, Jiutai), Liaoning, Shandong (Kunyu Shan), Shanxi (Wutai Shan) [Japan, Korea, Russia (Far East)].

**33. *Adenophora wulingshanica*** D. Y. Hong, *Fl. Reipubl. Popularis Sin.* 73(2): 187. 1983.

雾灵沙参 wu ling sha shen

*Adenophora elata* Nannfeldt f. *verticillata* Kitagawa.

Stems 1 or 2 from one root, 50–120 m tall, simple, glabrous or very sparsely hispidulous. Cauline leaves 3- or 4-verticillate or -subverticillate, shortly petiolate; blade ovate, elliptic, or elliptic-linear, 5–13 × 0.4–4.5 cm, both surfaces glabrous or sparsely hispidulous along veins, margin regularly or irregularly dentate or serrate. Inflorescence a panicle of cymes, branches sometimes almost verticillate; pedicels usually less than 1 cm. Hypanthium ellipsoid or obovoid-obconic, glabrous; calyx lobes filiform-subulate, 5–10 × less than 1 mm, margin with 1 or 2 pairs of denticles. Corolla blue or purple-blue, funnellform, 1.8–2.5 cm; lobes ovate-deltoid, 5–6 mm. Disk shortly tubular, 0.8–1.5 mm, glabrous. Style slightly shorter than corolla. Capsule oblong, ca. 10 × 4–5 mm. Seeds orange-yellow, ellipsoid, ca. 1.5 mm. Fl. Aug–Sep, fr. Sep–Oct.  $2n = 34^*$ .

• Thickets, grassy slopes, less often roadsides in forests, on limestone; 1200–1700 m. NE Beijing (Miyun).

**34. *Adenophora lobophylla*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983.

裂叶沙参 lie ye sha shen

Stems erect, 20–100 cm tall, simple, sparsely retrorsely hirsute. Cauline leaves all or only lower and middle leaves petiolate; blade ovate or ovate-lanceolate, 2–5 × 1–2 cm, abaxially hirsute along veins, adaxially sparsely puberulent, margin pinatifid or rarely only dentate-lobed; petiole 0.5–2.5 cm. Inflorescence with slender and ascending branches, forming a panicle, or several flowers in a pseudoraceme, rarely flowers solitary and terminal; pedicels slender, 5–20 mm. Hypanthium oblong or obovoid, base obtuse or rounded, glabrous; calyx lobes subulate, 3–4 × less than 1 mm, margin with 1 or 2 pairs of verrucose denticles, rarely ciliate. Corolla blue or purple-blue, campanulate, 11–17 mm; lobes ovate-deltoid, 4–6 mm. Disk tubular, 2–3 mm, sparsely puberulent above. Style nearly as long as or slightly longer than corolla. Capsule cylindrical, base rounded, 6–8 × ca. 3 mm. Seeds yellow, ellipsoid, ca. 0.8 mm. Fl. Jul–Oct, fr. Aug–Oct.  $2n = 34^*$ ,  $34+2B^*$ .

• Thickets, open woods, forest margins; 2000–3400 m. NW Sichuan (Barkam, Danba, Jinchuan).

**35. *Adenophora stenanthina*** (Ledebour) Kitagawa, Lin. Fl. Manshur. 418. 1939.

长柱沙参 chang zhu sha shen

Root carrotlike, up to 10 × 0.7–0.8 cm. Stems several, caespitose, 40–120 cm, sometimes branched above, usually finely scaberulose. Basal leaves petiolate; blade cordate or truncate at base, margin deeply and irregularly serrate. Cauline leaves sessile; blade filiform, linear, elliptic, lanceolate, or ovate, 2–10 × 0.1–2 cm, both surfaces scaberulose or subglabrous, margin entire or sparsely serrulate. Inflorescence a pseudoraceme or a panicle. Hypanthium obovoid, ellipsoid, or campanulate, glabrous; calyx lobes subulate or narrowly triangular, 1.5–5(–7) mm, margin entire or denticulate. Corolla pale to dark blue, blue-purple, or purple, subtubular or tubular-campanulate, 10–17 × 5–8 mm. Disk narrowly tubular, 4–7 mm, glabrous or villos. Style 1.8–2.2 cm. Capsule ellipsoid, 7–9 × 3–6 mm. Fl. Jul–Sep, fr. Aug–Sep.  $2n = 34$ .

Conifer forests, scrub, grasslands, grassy slopes, sandy places; below 4000 m. Gansu, Hebei, W Jilin, Nei Mongol, Ningxia, NE Qinghai, N Shaanxi, Shanxi [Mongolia, Russia (Far East, S Siberia)].

- 1a. Calyx lobes 1.5–3(–4) mm; corolla 10–13 mm, subtubular, lobes 1.5–3 mm; style 6–10 mm longer than corolla ..... 35a. subsp. *stenanthina*  
 1b. Calyx lobes 3–5(–7) mm; corolla 12–17 mm, tubular-campanulate, lobes 3–4.5 mm; style 3–7 mm longer than corolla ..... 35b. subsp. *sylvatica*

**35a. *Adenophora stenanthina*** subsp. *stenanthina*

长柱沙参(原亚种) chang zhu sha shen (yuan ya zhong)

*Campanula stenanthina* Ledebour, Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 5: 525. 1814; *Adenophora collina*

Kitagawa; *A. collina* f. *latifolia* Kitagawa; *A. coronata* (Ker Gawler) A. Candolle; *A. crispata* (Turczaninow ex Kitagawa) Kitagawa; *A. marsupiiiflora* (Schultes) Fischer; *A. marsupiiiflora* var. *crispata* Turczaninow ex Kitagawa; *A. marsupiiiflora* var. *jaluensis* Komarov; *A. polymorpha* Ledebour var. *marsupiiiflora* (Schultes) Franchet; *A. pratensis* Y. Z. Zhao; *A. stenanthina* var. *angustilanceifolia* Y. Z. Zhao; *A. stenanthina* var. *collina* (Kitagawa) Y. Z. Zhao; *A. stenanthina* f. *crispata* (Turczaninow ex Kitagawa) Kitagawa; *A. stenanthina* var. *crispata* (Turczaninow ex Kitagawa) Y. Z. Zhao; *A. verticillata* Pallas ex Fischer var. *marsupiiiflora* (Schultes) Trautvetter; *C. coronata* Ker Gawler; *C. marsupiiiflora* Schultes.

Leaves up to 12 mm wide. Calyx lobes 1.5–3 mm. Corolla subtubular, 10–13 mm, ± constricted at throat; lobes 1.5–3 mm. Style 6–10 mm longer than corolla. Disk glabrous or hairy. Capsule narrowly ellipsoid.

Grassy slopes, sandy places; below 1800 m. Gansu (Huining), Hebei (Kangbao, Longguan, Zhangbei), W Jilin (Zhenlai), Nei Mongol, Ningxia (Guyuan, Yanchi), N Shaanxi, Shanxi (N of Taigu) [Mongolia, Russia (Far East, S Siberia)].

**35b. *Adenophora stenanthina*** subsp. *sylvatica* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 187. 1983.

林沙参 lin sha shen

Leaves linear to ovate or oblong, up to 2 cm wide, entire or sparsely serrulate. Calyx lobes 3–5(–7) mm. Corolla tubular-campanulate, 12–17 mm; lobes 3–4.5 mm. Style only 3–7 mm longer than corolla. Disk all hairy. Capsule ellipsoid.

• Conifer forests, scrub, also among grasses; 2500–4000 m. Gansu (Qilian Shan, Tao He basin), NE Qinghai.

**36. *Adenophora liliifolioides*** Pax & K. Hoffmann, Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922.

川藏沙参 chuan zang sha shen

*Adenophora gracilis* Nannfeldt.

Stems often single, 30–100 cm tall, simple, usually hirsute, less often glabrous. Basal leaves long petiolate; blade ovate, base cordate, margin coarsely serrate. Cauline leaves sessile; blade ovate, lanceolate, elliptic, or linear, 2–11 × 0.4–3 cm, abaxially hispidulous but hirsute along major veins (or less often glabrous throughout), adaxially glabrous or hispidulous, base cuneate or attenuate, margin entire or sparsely serrate, apex acuminate. Inflorescence a narrow panicle with short branches, sometimes only several flowers in a pseudoraceme. Hypanthium ellipsoid, glabrous; calyx lobes narrowly triangular, 2–6 × 0.6–1 mm, margin entire or very rarely with verrucose denticles. Corolla blue, purple-blue, or pale purple, rarely white, subtubular or tubular-campanulate, 8–12 mm. Disk narrowly tubular, 3–6.5 mm, usually glabrous. Style 1.5–2 cm, remarkably exerted. Capsule ovoid or ellipsoid, 6–9 × 3–4 mm. Seeds brownish yellow, ellipsoid, 1.2–1.5 mm, finely striate, 1-ribbed. Fl. Jul–Sep, fr. Sep–Oct.

• Meadows, scrub, among debris; 2400–4600 m. SE Gansu (Lintao, Xiahe), Shaanxi (Qin Ling), NW Sichuan, NE Xizang.

**37. *Adenophora capillaris*** Hemsley, J. Linn. Soc., Bot. 26: 10. 1889.

丝裂沙参 si lie sha shen

Stems single, 0.5–1 m tall, glabrous or hirsute. Cauline leaves usually sessile; blade ovate-lanceolate, elliptic-lanceolate, or sometimes linear, 3–19 × 0.2–5 cm, glabrous or hirsute, margin entire or serrate (denticulate when narrow), apex acuminate. Inflorescence with long branches, forming a large and lax panicle, sometimes with short branches, forming a narrow panicle, less frequently only several flowers in a pseudoraceme; main axis and branches filiform. Hypanthium ellipsoid or sometimes ovoid; calyx lobes spreading or reflexed, filiform, (3–)6–14(–20) mm, margin entire or sometimes with 1 to several verrucose denticles below. Corolla pale blue, pale purple, or white, subtubular, tubular-funnelform, or urceolate, 10–18 mm; lobes narrowly triangular, 3–4 mm. Disk narrowly tubular, 2–5 mm, often glabrous. Style 15–25 mm, strongly exerted. Capsule globose, ellipsoid, or ovoid, 4–9 × 4–5 mm. Seeds brown, ellipsoid, 1–1.6 mm, 1-ribbed.

• Forests, forest margins, grasslands, grassy slopes; 1100–3600 m. Chongqing, Guizhou, Hebei, W Henan, W Hubei, SE Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, W Yunnan.

- 1a. Calyx lobes (2–)3–5(–7) mm, margin entire; capsule ovoid to ovoid-oblong ..... 37c. subsp. *paniculata*
- 1b. Calyx lobes (3–)6–14(–20) mm, margin sometimes lower part with 1 or 2 pairs of verrucose denticles; capsule globose, less often ovoid.
- 2a. Calyx lobes (3–)6–9 mm, rarely up to 20 mm, margin usually entire; corolla 10–14 mm, very rarely up to 17 mm; stems and leaves mostly glabrous ..... 37a. subsp. *capillaris*
- 2b. Calyx lobes (4–)9–14 mm, mostly with denticles; corolla 13–18 mm; stems and leaves mostly ± hirsute ..... 37b. subsp. *leptosepala*

**37a. *Adenophora capillaris* subsp. *capillaris***

丝裂沙参(原亚种) si lie sha shen (yuan ya zhong)

*Adenophora capillaris* var. *tenuifolia* Diels; *A. longisepala* P. C. Tsoong.

Stems and leaves usually glabrous. Inflorescence branches up to 27 cm. Calyx lobes usually (3–)6–9(–20) mm. Corolla 10–14(–17) mm. Capsule globose, ellipsoid, or ovoid. Fl. Jul–Oct, fr. Aug–Oct.

• Forests, forest margins, grasslands; 1400–2800 m. Chongqing, Guizhou (Bijie, Nayong), W Hubei, Shaanxi (S of Qin Ling), Sichuan (Butuo, E of Kangding, Yuexi).

**37b. *Adenophora capillaris* subsp. *leptosepala*** (Diels) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 136. 1983.

细萼沙参 xi e sha shen

*Adenophora leptosepala* Diels, Notes Roy. Bot. Gard.

Edinburgh 5: 175. 1912; *A. leptosepala* var. *linearifolia* C. Y. Wu; *A. urceolata* C. Y. Wu (1965), not Y. Z. Zhao (2002).

Stems and leaves usually hirsute. Calyx lobes (4–)9–14 mm, margin usually toothed. Corolla 13–18 mm. Capsule globose or ovoid. Fl. Jul–Oct, fr. Sep–Oct.

• Forests, forest margins, grasslands; 2000–3600 m. SW Sichuan (Muli), W Yunnan.

**37c. *Adenophora capillaris* subsp. *paniculata*** (Nannfeldt) D. Y. Hong & S. Ge, Novon 20: 426. 2010.

细叶沙参 xi ye sha shen

*Adenophora paniculata* Nannfeldt, Acta Horti Gothob. 5: 19. 1930; *A. paniculata* var. *dentata* Y. Z. Zhao; *A. paniculata* var. *petiolata* Y. Z. Zhao; *A. paniculata* var. *pilosa* Kitagawa; *A. paniculata* var. *psilosa* Kitagawa.

Stems glabrous or hirsute. Leaves from linear, lanceolate, or broadly elliptic, 0.2–7.5 cm wide, glabrous, sometimes adaxially sparsely hispidulous, abaxially sparsely hirsute. Calyx lobes (2–)3–5(–7) mm, margin entire. Corolla 10–14 mm. Capsule narrowly obovoid, ellipsoid, or oblong, 7–11 × 3–5 mm. Seeds 1.4–1.6 mm. Fl. Jun–Sep, fr. Aug–Oct.

• Grassy slopes; 1100–2800 m. Hebei (S of Longguan, Wuling Shan), W Henan, SE Nei Mongol (Daqing Shan, Tumd Qi, Xinghe), Shaanxi (Qin Ling), Shanxi.

**38. *Adenophora tetraphylla*** (Thunberg) Fischer, Mém. Soc. Imp. Naturalistes Moscou 6: 169. 1823.

轮叶沙参 lun ye sha shen

*Campanula tetraphylla* Thunberg in Murray, Syst. Veg., ed. 14, 211. 1784; *Adenophora obtusifolia* Merrill; *A. polymorpha* Ledebour var. *rhombofolia* H. Léveillé; *A. polymorpha* var. *verticillata* Franchet & Savatier; *A. radiatifolia* Nakai, nom. illeg. superfl.; *A. radiatifolia* var. *abbreviata* (H. Léveillé) Nakai; *A. radiatifolia* var. *rhombofolia* (H. Léveillé) Nakai; *A. tetraphylla* var. *integrifolia* Y. Z. Zhao; *A. triphylla* (Thunberg) A. Candolle; *A. triphylla* f. *linearis* (Hayata) Kitamura; *A. triphylla* var. *tetraphylla* (Thunberg) Makino; *A. verticillata* Fischer; *A. verticillata* var. *abbreviata* H. Léveillé; *A. verticillata* f. *linearis* (Hayata) Matsumura; *A. verticillata* var. *linearis* Hayata; *A. verticillata* f. *triphylla* (Thunberg) Makino; *A. verticillata* var. *triphylla* (Thunberg) Regel; *Campanula triphylla* Thunberg; *C. verticillata* Pallas (1773), not Hill (1765).

Root carrotlike, 7–16 × 1.5–1.8 cm. Stems up to 1.5 m tall, simple, glabrous, less often white hispidulous. Cauline leaves 3–6-verticillate, sessile or subsessile; blade broadly to narrowly elliptic, linear-lanceolate, or linear, 1.8–10 × 0.2–3.2 cm, both surfaces sparsely puberulent or glabrous, base cuneate or attenuate, margin serrate or serrulate, apex acuminate, acute, or obtuse. Inflorescence a narrow panicle with branches (cymes) mostly verticillate. Hypanthium obconic or campanulate, glabrous; calyx lobes subulate, linear, or linear-triangular, 1.5–4 mm, margin entire. Corolla blue to purple, tubular or narrowly funnelform, sometimes slightly constricted at throat, 7–10 mm; tube 2.5–7 mm in diam.; lobes deltoid, 1–2 mm. Disk narrowly tubular, 2–4 mm. Style 14–20 mm, strongly exerted. Capsule

obovoid or broadly obovoid, 5–8 × 3–6 mm. Seeds yellow-brown, oblong, slightly compressed, 1–1.5 mm. Fl. (Feb–)Mar–Nov, fr. May–Nov.  $2n = 34, 34+2B^*$ .

Grassy places, scrub; low elevations but up to 2000 m in south.

Anhui, Fujian, N Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan (Lushi, Xinyang), Hunan (Xinning, Yizhang), Jiangsu, Jiangxi, Jilin, Liaoning, E Nei Mongol, Shandong (Muping), Shanxi (Lingkong Shan), Sichuan (Ebian, Emei Shan), Taiwan, Yunnan (Yanshan), Zhejiang [Japan (including Ryukyu Islands), Korea, Laos, Russia (Far East, E Siberia), N Vietnam].

## 11. PERACARPA J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 26. 1857.

袋果草属 dai guo cao shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Perocarpa* Feer.

Plants perennial. Rhizomes elongate, with scales and buds. Leaves alternate. Flowers usually solitary, axillary, pedicellate. Calyx 5-lobed. Corolla funnelform-campanulate, 5-lobed to middle or slightly beyond. Stamens 5, free from corolla; filaments ciliate. Ovary inferior, 3-locular; style villous above; stigma 3-lobed, lobes recurved. Fruit a 2- or 3-locular irregularly dehiscent capsule. Seeds relatively few, ellipsoid, large, smooth.

One species: Bhutan, China, India, Japan, Korea, Myanmar, Nepal, Papua New Guinea, Philippines, Russia (Sakhalin), Thailand.

**1. *Perocarpa carnos*** (Wallich) J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 26. 1857.

袋果草 dai guo cao

*Campanula carnos* Wallich in Roxburgh, Fl. Ind. 2: 102. 1824; *C. circaeoides* F. Schmidt; *C. ovata* (D. Don) Sprengel; *Perocarpa carnos* var. *circaeoides* (F. Schmidt) Makino; *P. carnos* var. *formosana* H. Hara; *P. circaeoides* (F. Schmidt) Feer; *Wahlenbergia ovata* D. Don.

Plants delicate. Rhizomes creeping, prostrate, slender, branched. Stems erect or reclining, rarely prostrate, 4–25 cm tall, slender, fleshy, glabrous, unbranched or rarely few branched at base, sometimes rooting at nodes. Leaves crowded toward apex of stem, those toward base distant and smaller; blade abaxially green, sometimes suffused with purple, adaxially green, ovate to orbicular, 3–38 × 3–28 mm, membranous or papery, abaxially glabrous or rarely pubescent, adaxially glabrous or sparsely appressed hispidulous, base truncate, subcordate, or cordate, margin flat, crenulate, serrate, serrulate, sometimes cili-

ate, with gland at each sinus, apex rounded, obtuse, or acute, often mucronate; petiole 2–17 mm. Flowers solitary and axillary, rarely 2–4(–17) in a fascicle. Pedicels slender, ebracteolate, 2–70 mm. Hypanthium obconic or obovoid, glabrous; calyx lobes subulate, narrowly triangular, or triangular. Corolla white, blue-purple, or sometimes pale blue, funnelform-campanulate, 3–10 mm; lobes linear to elliptic. Capsule pendent, obovoid or broadly obovoid, rarely ellipsoid, 2.5–5.5 × 1.5–5 mm; pericarp thin, membranous, prominently veined, distended by mature seeds, eventually ruptured irregularly, mostly at base. Seeds 10–16 per capsule, brown, finely striate, oblong, narrowly oblong, ellipsoid, or fusiform, ca. 1.7 mm. Fl. Mar–May, fr. Apr–Nov.  $2n = 30$ .

Forests or moist rocks by streams; 1300–3800 m. Anhui (Jinzhai), Chongqing (Jinfo Shan), Guizhou (Kaili), Hubei (Shennongjia), S Jiangsu, Sichuan (Baoping, Ebian, Emei), Taiwan, S Xizang (Yadong), W Yunnan, Zhejiang (Hangzhou) [Bhutan, NE India, Japan, Korea (Cheju Do), N Myanmar, Nepal, Papua New Guinea, Philippines, Russia (Sakhalin), N Thailand].

## 12. HOMOCODON D. Y. Hong, Acta Phytotax. Sin. 18: 473. 1980.

同钟花属 tong zhong hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

Plants annual, prostrate. Stems longitudinally 3-winged. Leaves alternate. Flowers 1–3 on extremely short branches, sessile or shortly pedicellate. Calyx epigynous, 5-lobed, lobes dentate. Corolla epigynous, tubular-campanulate, 5-lobed. Stamens 5, free from corolla and free from each other; filaments slightly dilated and sparsely ciliate at base. Ovary inferior, 3-locular; stigma 3-fid; lobes linear, recurved. Fruit dry, irregularly dehiscent or irregularly poricidal in lower part. Seeds ellipsoid, not angular, shallowly reticulate.

Two species: Bhutan, China; two species (one endemic) in China.

These species have been included in *Heterocodon* Nuttall, but their flowers are on short branches, not solitary and opposite to leaves on main stems; and their seeds are terete and reticulate, not angular and smooth.

- 1a. Pedicels absent; corolla smaller, ca. 3.5 mm; style as long as corolla ..... 1. *H. brevipes*  
 1b. Pedicels ca. 6 mm; corolla 7–9 mm; style exerted ..... 2. *H. pedicellatus*

**1. *Homocodon brevipes*** (Hemsley) D. Y. Hong, *Acta Phytotax.* Sin. 18: 474. 1980.

同钟花 tong zhong hua

*Wahlenbergia brevipes* Hemsley, *Hooker's Icon. Pl.* 28: t. 2768. 1903; *Heterocodon brevipes* (Hemsley) Handel-Mazzetti & Nannfeldt; *W. monantha* H. J. P. Winkler ex H. Limpricht.

Stems up to 50 cm, slender, glabrous, longitudinally 3-winged, branches extremely short, with several leaves appearing in a fascicle. Petiole 2–9 mm; leaf blade paler green abaxially, deltoid, orbicular, or ovate, 7–12 × 7–12 mm, glabrous or appressed hispidulous, base truncate or rounded, sometimes cordate, margin serrate, teeth mucronate, blade apex acute. Flowers sessile, ca. 5 mm, single or 2 inserted at apex of short lateral branches. Hypanthium campanulate, 1–2 mm; calyx lobes narrowly triangular or subulate, 1–2 mm, with a pair of teeth. Corolla white, pale blue, or pale purple, 3–4 mm; lobes cleft to slightly over half its length, linear or oblong. Filaments ca. 1 mm; anthers elongate or lanceolate; style ciliate, exerted or equal to length of corolla. Fruit ovoid to globose, ca. 2.5 mm, pericarp thin. Seeds several, brown, ellipsoid, ca. 0.7 mm. Fl. and fr. Apr–Aug.

Forests, thickets, among grasses on slopes; 1000–2900 m. SW Guizhou, W Sichuan, Yunnan [Bhutan].

This species was recorded from Bhutan in *Fl. Bhutan* (2(3): 1380. 2001).

**2. *Homocodon pedicellatus*** D. Y. Hong & L. M. Ma, *Acta Phytotax.* Sin. 29: 268. 1991.

长梗同钟花 chang geng tong zhong hua

Stems slender, glabrous or retrorsely hispidulous, longitudinally 3-winged, almost all axils on main stem with a short branch, branches with several smaller leaves. Petiole 2–4 mm; leaf blade fan-shaped, 4–9 × 3–12 mm, glabrous or hispidulous, base truncate, margin dentate, teeth mucronate. Flowers solitary in axils of leaves on branches, 1–3 on each branch, glabrous throughout; pedicels up to 8 mm. Hypanthium obconical, 1.5–3 mm; calyx lobes triangular, ca. 2 mm, with a pair of teeth. Corolla blue, 7–9 mm; lobes linear or oblong, equaling length of tube. Filaments ca. 4.5 mm; anthers terete, ca. 2 mm. Style exerted; stigma 3-fid; lobes linear, recurved at anthesis. Fl. Jul.

• Ravines; 1400–1600 m. Sichuan (Luding: Hailuogou).

### 13. **TRIODANIS** Rafinesque, *New Fl. N. Amer.* 4: 67. 1838.

异檐花属 yi yan hua shu

Hong Deyuan (洪德元); Thomas G. Lammers

Herbs, annual. Roots fibrous. Stems erect or ascending, simple or branched below, ribbed. Leaves alternate, sessile, ovate, elliptic, lanceolate, or linear, entire or dentate. Flowers 1–3(–8) in an axillary cyme, sessile or subsessile; cleistogamous flowers in axils of lower leaves; normal flowers in axils of middle to upper leaves. Calyx 3- or 4(–6)-lobed, with lobes shorter in cleistogamous flowers, 5( or 6)-lobed in normal flowers. Corolla blue-purple or pale purple, rarely white, rotate, 5( or 6)-fid nearly to base; lobes lanceolate, apex acute or acuminate. Stamens 5( or 6), free; filaments dilated at base; anthers elongate, longer than filaments. Ovary inferior, (2 or)3-locular; ovules numerous; style upright, but reduced in cleistogamous flowers; stigma (2 or)3-fid, densely puberulent. Capsule subcylindrical or clavate, (2 or)3-poricidal at inferior part. Seeds numerous, globose to broadly ellipsoid, slightly compressed.

Six species: the Americas; one species (introduced) in China.

**1. *Triodanis perfoliata*** (Linnaeus) Nieuwland, *Amer. Midl. Naturalist* 3: 192. 1914.

穿叶异檐花 chuan ye yi yan hua

Stems erect or ascending, 15–60 cm tall, simple or branched, ribbed, glabrous or scabrous mostly on ribs. Leaves ovate, suborbicular, or elliptic, sometimes lanceolate toward apex, 0.6–2 cm, glabrous or shortly hispid on veins and margins, base clasping cordate, obtuse, broadly cuneate, or rounded, margin shallowly entire, crenate, serrate, or dentate, apex rounded, obtuse, or acute, sometimes acuminate. Flowers 1–3 in axil, sessile. Hypanthium campanulate, oblong, or obconic; calyx lobes of upper flowers (later ones) 5, rarely 4, rigid, triangular to lanceolate; lower flowers (earlier ones) smaller, with lobes 3 or 4, narrowly triangular, triangular, or lanceolate. Corolla bluish purple or rose-purple, rarely white, rotate, 8–10 mm; earlier flowers rudimentary. Capsule oblong, 4–10 mm, opening by lateral valves. Seeds light brown to brown, smooth. Fl. and fr. Apr–Jul. *2n* = 28, 56.

Naturalized on mountain slopes, by streams, among grasses, and

in cracks of concrete; 100–1000 m. Anhui, Fujian, Taiwan, Zhejiang [native to North and South America].

- 1a. Leaves ovate to orbicular, base cordate or amplexicaul, margins crenate or dentate; bracts as long as broad; capsule poricidal below middle ..... 1a. subsp. *perfoliata*
- 1b. Leaves ovate to elliptic, base usually rounded, slightly cordate or obtuse, not amplexicaul, margins subentire or shallowly crenate; bracts longer than wide; capsule poricidal above middle .... 1b. subsp. *biflora*

**1a. *Triodanis perfoliata* subsp. *perfoliata***

穿叶异檐花(原亚种) chuan ye yi yan hua (yuan ya zhong)

*Campanula perfoliata* Linnaeus, *Sp. Pl.* 1: 164. 1753; *Dysmicodon perfoliatus* (Linnaeus) Nuttall; *Legousia perfoliata* (Linnaeus) Britton; *Pentagonia perfoliata* (Linnaeus) Kuntze; *Prismatocarpus perfoliatus* (Linnaeus) Sweet; *Specularia perfoliata* (Linnaeus) A. Candolle.

Stems rather stiffly erect, 15–60 cm tall, simple or branched, sometimes especially on angles with spreading, bristlelike hairs of uneven length. Leaves broadly ovate to suborbicular, 1–2 cm, shortly hispid on veins and margins, base strongly cordate-clasping, margin rather shallowly crenate-dentate or sometimes entire, apex subacute or rounded. Flowers 1–3 in axil, sessile. Calyx lobes of upper flowers (later ones) 5, rarely 4, rigid, triangular-lanceolate, acuminate; lower flowers (earlier ones) smaller, with 3 or 4 shorter calyx lobes. Corolla blue or white, rotate, 8–20 mm wide; corolla on earlier flowers rudimentary. Capsule oblong to narrowly turbinate, 4–6 mm, tardily opening near middle. Seeds lenticular. Fl. and fr. Apr–Jul.  $2n = 56$ .

Naturalized on mountain slopes and by streams; 100–1000 m. Fujian (Chong'an, Jianning) [native to North America].

**1b. *Triodanis perfoliata* subsp. *biflora*** (Ruiz & Pavon) Lammers, *Novon* 16: 72. 2006.

异檐花 yi yan hua

*Campanula biflora* Ruiz & Pavon, *Fl. Peruv.* 2: 55. 1799; *Asyneuma anhuiense* B. A. Shen; *Legousia biflora* (Ruiz & Pavon) Britton; *Pentagonia biflora* (Ruiz & Pavon) Kuntze; *Specularia biflora* (Ruiz & Pavon) Fischer & C. A. Meyer; *Triodanis biflora* (Ruiz & Pavon) Greene; *T. perfoliata* var. *biflora* (Ruiz & Pavon) T. R. Bradley.

Plants glabrous or nearly so throughout except for scabrous angles of stems. Stems simple or branched, slender and often weak, 15–60 cm tall. Leaves ovate to ovate-elliptic or obovate-lanceolate, 6–20 mm, margin entire, or inconspicuously crenate-serrate with very short and broad teeth, base usually rounded, not amplexicaul. Earlier flowers with 3 or 4 ovate to lanceolate calyx lobes; later ones with 4 or 5 longer, lanceolate-subulate calyx lobes. Capsule oblong-cylindric, 6–10 mm, opening by valves close under calyx lobes. Fl. and fr. Apr–Jul.  $2n = 28, 56$ .

Naturalized among grasses and in cracks of concrete; 100–600 m. Anhui (Anqing), Fujian (Jiangle), Taiwan (Xinzhu), Zhejiang (Putuo) [native to North and South America].

#### 14. *ASYNEUMA* Grisebach & Schenk, *Arch. Naturgesch.* 18: 335. 1852.

牧根草属 mu gen cao shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Phyteuma* Linnaeus sect. *Podanthum* G. Don; *Podanthum* (G. Don) Boissier, nom. superfl.; *Trachanthelium* Kitaibel ex Schur.

Herbs, perennial. Roots carrot-shaped. Leaves alternate. Inflorescence elongate, spikelike or racemelike, comprising several axillary cymes, each composed of (1 or) 2–4 flowers and subtended by a bract; pedicels short, with a pair of linear bracteoles at base. Calyx 5-lobed; lobes linear (at least in Chinese species). Corolla 5-divided to base; lobes almost free, linear. Stamens 5; filaments dilated at base, margin densely ciliate. Ovary inferior, 3-locular; style nearly as long as corolla, hairy above; stigma 3-fid, segments linear, recurved. Capsule 3-poricidal above middle, 10-ribbed. Seeds ovoid, ellipsoid, or oblong, sometimes angular.

Thirty-three species: N Africa, temperate Asia, Europe; three species (one endemic) in China.

1a. Stems hirsute throughout; leaves white hirsute on both surfaces; calyx lobes often recurved after anthesis ..... 3. *A. chinense*

1b. Stems glabrous or sometimes sparsely hirsute only below; leaves glabrous or rarely sparsely hirsute along veins; calyx lobes not recurved.

2a. Style longer than corolla; capsule globose ..... 1. *A. japonicum*

2b. Style shorter than corolla; capsule obovoid-conical, base acute or acuminate ..... 2. *A. fulgens*

**1. *Asyneuma japonicum*** (Miquel) Briquet, *Candollea* 4: 335. 1931.

牧根草 mu gen cao

*Phyteuma japonicum* Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 2: 192. 1866; *Campanula japonica* (Miquel) Vatke.

Roots fleshy, up to 20 cm, up to 1.5 cm in diam., branched or not. Stems single, erect, more than 60 cm tall, simple or branched above, glabrous or very rarely sparsely hirsute toward base. Lower cauline leaves with petiole up to 4 cm; upper cauline leaves almost sessile; blade ovate, lanceolate, or elliptic from below toward apex, 3–12 × 1.4–5.5 cm, abaxially glabrous, adaxially sparsely puberulent, base cuneate or obtuse, margin serrate, apex acute to acuminate. Flowers glabrous except on filaments and style. Calyx tube globose or campanulate; lobes linear, 4–8 mm. Corolla purple-blue or blue-purple; lobes 8–14 mm. Style 9–15 mm. Capsule globose, base truncate or concave, ca. 5 mm in diam. Seeds yellow to brown, ovoid, ellipsoid, or oblong, ca. 1 mm. Fl. Jul–Aug, fr. Sep.  $2n = 28$ .

Forests, rarely meadows. Heilongjiang (Huachuan), Jilin (E of Jingyu), Liaoning [Japan, Korea, Russia (Far East)].

**2. *Asyneuma fulgens*** (Wallich) Briquet, *Candollea* 4: 334. 1931.

长果牧根草 chang guo mu gen cao

*Campanula fulgens* Wallich in Roxburgh, *Fl. Ind.* 2: 99. 1824.

Roots fleshy. Stems often single, erect, 30–100 cm tall, usually simple, branching rarely or more in response to damage, usually glabrous, sometimes sparsely hirsute below. Leaves all subsessile, or lower leaves with petiole up to 2 cm; blade ovate, lanceolate, or elliptic, 3.5–7 × 1–3 cm, abaxially usually glabrous, sometimes sparsely hispidulous along veins, adaxially glabrous or sparsely hispidulous. Cymes distantly separated from each other, sometimes gaps up to 10 cm. Calyx glabrous; tube obovoid to obconic, longer than broad; lobes 5–10 mm. Corolla blue or purple; lobes equal to calyx lobes in length or slightly longer. Style much shorter than corolla. Young capsule narrowly obovoid, 7–10 × 3–5 mm. Fl. Jul.

Grassy slopes, forest margins in ravines; 1800–3000 m. S Xizang (Gyirong, Yadong, Zayü) [Bhutan, India, Myanmar, Nepal, Sri Lanka].

**3. *Asyneuma chinense*** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 188. 1983.

球果牧根草 qiu guo mu gen cao

Roots fleshy. Stems single, erect, 20–100 cm tall, usually simple, ± hirsute. Leaves all subsessile, or lower cauline leaves with petiole up to 3.5 cm; blade ovate, lanceolate, or elliptic, 2–8 × 0.5–4 cm, both surfaces ± white hirsute, margin serrate or crenate, rarely callose-denticulate. Spikes with bract subtending

1–4 flowers; bract sometimes pubescent or rarely callose-denticulate. Calyx usually glabrous, less frequently hispidulous; tube globose or campanulate; lobes 7–10 mm, slightly longer than corolla, recurved after anthesis, rarely callose-denticulate. Corolla purple or blue. Style slightly shorter than corolla. Capsule globose, with 3 broad pores, 4–6 × 4–5 mm, base truncate or concave. Seeds brown-yellow, ovoid to oblong, slightly compressed, ca. 0.5 mm, with 1 rib. Fl. and fr. Jun–Sep (capsule mature in Apr in Guangxi).

• Grassy slopes, forest margins, forests; below 3000 m. Guangxi (Yangshuo), Guizhou, W Hubei, SW Sichuan, Yunnan.

## 15. *LOBELIA* Linnaeus, Sp. Pl. 2: 929. 1753.

半边莲属 ban bian lian shu

Hong Deyuan (洪德元); Thomas G. Lammers

*Cardinalis* Fabricius; *Dortmanna* Hill; *Laurentia* Adanson; *Rapuntium* Miller.

Herbs, but some species lignified at base, and even some species in Africa and Hawaiian Islands trees and shrubs. Leaves alternate, in 2 rows or spiral. Flowers solitary and axillary, or in terminal racemes, or in panicles of racemes, bisexual [some Australian species dioecious]; bracteoles present or absent. Flowers pedicellate, solitary and axillary or in terminal racemes (rarely secund or corymbose) or panicles. Calyx lobes entire or serrate, persistent, rarely auriculate. Corolla zygomorphic, rarely with a narrow nectar spur; dorsal side typically divided longitudinally to base or nearly so, sometimes laterally fenestrate; limb commonly bilabiate, dorsal lip 2-lobed, ventral lip 3-lobed, or rarely ventrally unilabiate. Stamens connate, enveloping style, exerted from corolla dorsally; all 5 anthers or just ventral pair barbate at apex (rarely all nude). Ovary inferior or semi-inferior, very rarely almost superior, 2-locular; stigma 2-fid; ovules numerous. Fruit an apically 2-valved capsule or a berry. Seeds numerous, oblong or 3-angled, sometimes winged, smooth, foveolate, striate, or verrucose.

About 414 species: mainly in tropics and subtropics, particularly tropical Africa and America, with a few species extending to temperate regions; 23 species (six endemic) in China.

Doubtful species: *Lobelia cavaleriei* H. Léveillé (Repert. Spec. Nov. Regni Veg. 9: 455. 1911). Type: Guizhou, *Cavalerie* 2989 (isotype, E). See Lammers (World Checkl. Bibliogr. Campanulaceae, Kew, 2007).

- 1a. Plants 0.02–0.5(–2) m tall; stems slender or rarely somewhat robust, herbaceous or rarely subshrubby toward base or throughout; flowers commonly entomophilous; corolla 1–20(–46) mm, commonly bilabiate or sub-bilabiate (if unilabiate then no more than 15 mm), lobes dimorphic or monomorphic; seed coat striate or reticulate.
- 2a. Plants low, stems commonly prostrate and seldom over 40 cm tall; corolla various shades of blue, purple, pink, or white, sub-bilabiate or unilabiate, lobes monomorphic; anther tube with a single elongate bristle or awn at apex of each ventral anther (sometimes also bearded with tufts of shorter filiform hairs, very rarely nude); seed coat commonly reticulate (1. *L.* sect. *Hypsela*).
- 3a. Leaves ovate or broadly ovate, commonly petiolate; corolla sub-bilabiate; fruit a berry ..... 1. *L. nummularia*
- 3b. Leaves elliptic-lanceolate to linear; corolla unilabiate; fruit a capsule ..... 2. *L. chinensis*
- 2b. Plants taller, stems erect, ascending, or decumbent, commonly over 40 cm (sometimes as much as 2 m) tall; corolla distinctly bilabiate, lobes dimorphic, dorsal pair much smaller and narrower than ventral 3 (that commonly form a trifold lip); anther tube bearded with tufts of filiform hairs at apex of at least ventral pair (rarely all nude); seed coat striate.
- 4a. Pedicels typically bibracteolate at base; corolla tube commonly fenestrate laterally; seeds terete or irregularly angular (2. *L.* sect. *Stenotium*).
- 5a. Stems winged; leaves adaxially sparsely puberulent; corolla small, only 3–5 mm ..... 3. *L. heyneana*
- 5b. Stems terete or angular, not winged; leaves glabrous or villous; corolla larger or also small ..... 4. *L. hainanensis*
- 4b. Pedicels typically bibracteolate at or below middle; corolla tube almost always entire laterally; seeds trigonous or compressed (3. *L.* sect. *Delostemon*).
- 6a. Stems prostrate, rooted at nodes; leaves 1–4 × 0.8–3 cm; petiole 3–12 mm ..... 5. *L. zeylanica*
- 6b. Stems erect, not rooted or rooted only at basal nodes; leaves smaller, subsessile.
- 7a. Stems and leaves glabrous; bracteoles linear-lanceolate ..... 6. *L. alsinoides*
- 7b. Stems and leaves villous; bracteoles absent or minute ..... 7. *L. terminalis*
- 1b. Plants (0.2–)1–9 m tall; stems robust and sometimes pachycaul, herbaceous, subshrubby, or woody; flowers often ornithophilous; corolla unilabiate or sub-bilabiate, rarely bilabiate, (12–)20–60(–103) mm, lobes monomorphic; seed coat reticulate or striate-reticulate, less often striate.

- 8a. Flowers solitary in upper leaf axils (rarely supplemented by a terminal raceme); corolla tube straight or nearly so; fruit a berry; seeds cuboidal or quadrate, subterete to slightly compressed (5. *L.* sect. *Speirema*).
- 9a. Plants rhizomatous; corolla 12–18 mm, tube 3–6 mm; filament tube 6.5–8 mm; anther tube cream-colored, dorsal anthers 6–8 mm, slightly shorter to slightly longer than filament tube ..... 23. *L. deleiensis*
- 9b. Plants lacking rhizomes; corolla (15–)18–26 mm, tube 6–13 mm; filament tube 8.5–12 mm; anther tube gray, dorsal anthers 4.8–7 mm, 2/5–3/4 as long as filament tube.
- 10a. Stems sparsely to densely puberulent toward apex; leaves sessile; uppermost 10–25 flowers often subtended by bracts only 1/10–1/4 as long as foliage leaves, thus forming a terminal raceme; pedicels densely puberulent; hypanthium pubescent along veins; calyx lobes narrowly triangular or triangular, 1.5–1.9 mm wide, erect; corolla greenish with purple spots on lip; anther tube 1.4–1.8 mm in diam., glabrous; trichomes at apex of ventral anthers 0.5–1 mm ..... 21. *L. fangiana*
- 10b. Stems glabrous (rarely sparsely scabrous); leaves petiolate; all flowers subtended by unreduced foliage leaves; pedicels glabrous; hypanthium glabrous; calyx lobes linear or linear-triangular, 0.5–1.4 mm wide, ascending, spreading, or recurved; corolla dark violet or purple to bluish lilac, lip often paler, or striped or blotched with white; anther tube 2–2.8 mm in diam., dorsal surface sparsely shortly pubescent at least toward apex; trichomes at apex of ventral anthers 1.2–2 mm ..... 22. *L. montana*
- 8b. Flowers in terminal racemes or panicles; corolla tube curved or arcuate; fruit a capsule; seeds ovoid, lenticular (4. *L.* sect. *Rhynchopetalum*).
- 11a. Leaves truncate, rounded, or obtuse at base; pedicels ebracteolate; calyx lobe margins revolute ..... 20. *L. sessilifolia*
- 11b. Leaves cuneate or attenuate at base; pedicels commonly bibracteolate; calyx lobe margins flat.
- 12a. Stems densely pubescent.
- 13a. Stems tomentose; leaves hispidulous; pedicels 5–12 mm, densely pannose; hypanthium densely pannose; corolla white or faintly tinged with blue or pink ..... 13. *L. clavata*
- 13b. Stems hispidulous or scaberulose; leaves glabrous adaxially and sometimes abaxially; pedicels 3–5 mm, hispidulous; hypanthium scaberulose; corolla purple-red or red-purple.
- 14a. Capsule 6–10 × 6–8 mm; raceme 10–25 cm, densely flowered ..... 19. *L. erectiuscula*
- 14b. Capsule 4–6 × 4–5 mm; raceme 20–50 cm, laxly flowered ..... 18. *L. davidii*
- 12b. Stems glabrous or sparsely pubescent.
- 15a. Corolla 11–20 mm.
- 16a. Leaves rounded and mucronate at apex; corolla glabrous ..... 16. *L. colorata*
- 16b. Leaves acuminate (sometimes acute or obtuse) at apex; corolla pubescent at least internally.
- 17a. Leaves 12–31 cm, attenuate at base; corolla white, sometimes suffused with pale blue or pink; anther tube densely white hirsute in sutures; flowering Jan–May ..... 10. *L. pyramidalis*
- 17b. Leaves 6–12(–15) cm, cuneate at base; corolla purple-red, reddish, or blue-purple; anther tube sparingly pubescent on back; flowering Aug–Oct.
- 18a. Stems and leaves glabrous; pedicels 3–5 mm; calyx lobes 13–21 × < 1 mm, entire ..... 8. *L. melliana*
- 18b. Stems sparsely pubescent; leaves densely white hirsute; pedicels 5–13 mm; calyx lobes 6–14 × 1–1.5 mm, denticulate ..... 9. *L. pleotricha*
- 15b. Corolla 20–35 mm.
- 19a. Bracteoles leaflike, denticulate, 6–12 × 1–2 mm, at summit of pedicel ..... 15. *L. foliiformis*
- 19b. Bracteoles subulate, entire, 1–2 × ca. 0.2 mm, near middle of pedicel.
- 20a. Leaves 3.5–7 cm, obtuse or acute at apex ..... 17. *L. taliensis*
- 20b. Leaves (6–)10–35 cm, acuminate at apex.
- 21a. Raceme lax; hypanthium hemispheric ..... 14. *L. iteophylla*
- 21b. Raceme dense; hypanthium campanulate, oblong, or obconic.
- 22a. Leaves glabrous abaxially; hypanthium glabrous; calyx lobes entire ..... 11. *L. seguinii*
- 22b. Leaves sparsely hispidulous abaxially; hypanthium scaberulose; calyx lobes denticulate ..... 12. *L. doniana*

### 1. *Lobelia* sect. *Hypsela* (C. Presl) Lammers, **comb. nov.**

半边莲组 ban bian lian zu

Basionym: *Hypsela* C. Presl, Prodr. Monogr. Lobel. 45. 1836; *Pratia* Gaudichaud-Beaupré.

Plants perennial or less often annual, 2–40 cm tall; a few species dioecious. Stems commonly prostrate, radicant, or caespitose, rarely decumbent or ascending, slender, herbaceous. Leaves commonly small, petiolate or rarely sessile; blade typically not much longer than wide, variously rounded at apex and base, margin coarsely toothed or shallowly lobed. Flowers typically solitary in axils of upper leaves. Corolla sub-bilabiate (unilabiate in *Lobelia chinensis*), blue, purple, magenta, pink, or white, 2–12(–15) mm; lobes typically monomorphic. Anthers with a single long bristle on apex of each ventral anther, often also bearded with tufts of shorter filiform hairs, very rarely all nude. Fruit a capsule or fleshy berry. Seeds ovoid to oblong, terete (rarely slightly compressed); testa reticulate.

Forty-three species: amphi-Pacific, largely in the S Hemisphere; two species in China.

**1. *Lobelia nummularia*** Lamarck, Encycl. 3: 589. 1792.

铜锤玉带草 tong chui yu dai cao

*Lobelia begoniifolia* Wallich; *L. horsfieldiana* Miquel; *L. javanica* Thunberg; *L. obliqua* Buchanan-Hamilton ex D. Don; *Pratia begoniifolia* (Wallich) Lindley; *P. nummularia* (Lamarck) A. Brown & Ascherson; *P. wollastonii* S. Moore.

Herbs, perennial. Stems prostrate, 12–55 cm, villous, rarely glabrous, simple or branched at base, nodes rooted. Leaves alternate, petiolate; petiole 2–14 mm, puberulent; blade orbicular, reniform, or ovate, 0.7–2.6 × 0.5–2.7 cm, both surfaces glabrous or puberulent, base obliquely cordate or rarely truncate, margin serrate or crenulate, apex acute, obtuse, or rounded. Flowers solitary and axillary; pedicels 0.7–3.5 cm, glabrous. Hypanthium narrowly ellipsoid or urceolate, 2–4 × 2–3 mm, glabrous or villous; calyx lobes linear-triangular, 2.5–6 mm, margin with 2 or 3 pairs of denticles. Corolla purple-red, pale purple, pink, green, or yellow-white, 6–10 mm; tube glabrous or rarely ciliate outside, villous inside; limb 2-lipped; upper 2 lobes linear-triangular; lower 3 lobes lanceolate. Stamens connate above middle; filament tube glabrous; anther tube 1–1.5 mm, back villous; lower 2 anthers barbate at apex. Fruit a berry, purple-red, ellipsoid or globose, 0.7–1.5 cm. Seeds sub-orbicular, slightly compressed, reticulate. Fl. and fr. all year round.

By fields, roadsides, wet places on hills, grassy slopes, open woods; lower elevations. Hubei, Hunan, Guangxi, Taiwan, Xizang [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**2. *Lobelia chinensis*** Loureiro, Fl. Cochinch. 2: 514. 1790.

半边莲 ban bian lian

*Lobelia caespitosa* Blume; *L. campanuloides* Thunberg; *L. chinensis* var. *albiflora* (F. E. Wimmer) F. E. Wimmer; *L. radicans* Thunberg; *L. radicans* var. *albiflora* F. E. Wimmer; *Pratia thunbergii* G. Don.

Herbs, perennial. Stems decumbent, slender, 6–30 cm tall, glabrous, lower nodes rooted. Leaves alternate, sessile or petiole to 1 mm; blade narrowly elliptic, elliptic, or lanceolate, 7–26 × 1.5–7 mm, glabrous, base rounded, obtuse, or broadly cuneate, margin entire or obviously serrate at upper part, apex acute or acuminate. Flowers usually solitary, axillary at upper leaves of branches; pedicels slender, 1.2–2.5(–3.5) cm; bracteoles 2 at base, ca. 1 mm, glabrous, or absent. Hypanthium narrowly obconical, base attenuate, not well distinguished from pedicel, 3–5 mm, glabrous; calyx lobes lanceolate, ± as long as tube, margin entire or with a pair of denticles. Corolla rose, white, or bluish, 10–15 mm, divided to base at back, white villous below throat; lobes all spreading in a plane on anterior side; lateral 2 lobes lanceolate or oblanceolate, longer than others, central 3 elliptic. Filament tube 6–8 mm, connate above middle, glabrous; anther tube 2–2.5 mm, back glabrous or sparsely villous. Capsule obconic, 6–7 mm. Seeds broadly elliptic, compressed, pitted. Fl. and fr. May–Oct.

By paddy fields, streams, among wet grasses. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bangladesh, Cambodia, India, Japan (including Ryukyu Islands), Korea, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam].

**2. *Lobelia* sect. *Stenotium*** (C. Presl) Lammers, **comb. nov.**

卵叶半边莲组 luan ye ban bian lian zu

Basionym: *Rapuntium* sect. *Stenotium* C. Presl, Prodr. Monogr. Lobel. 11. 1836.

Plants annual or perennial, 2–50(–90) cm tall. Stems slender, herbaceous or subshrubby, prostrate, decumbent, ascending, or erect, sometimes rhizomatous or stoloniferous, terete to sharply 3- or 4-angled or -winged. Leaves sessile or petiolate. Flowers solitary in axils of upper leaves or these reduced in size, creating a terminal sometimes secund raceme (rarely spiciform or corymbose); pedicels often ebracteolate. Corolla bilabiate, various shades of blue, purple, pink, or white, 3–20(–24) mm; lobes strongly dimorphic, spreading, sometimes with a pair of gibbositities on ventral lip at mouth of tube. Anthers bearded with tufts of filiform hairs at apex of ventral pair. Fruit a capsule or rarely baccate. Seeds ovoid to oblong, terete or somewhat compressed; testa striate.

About 145 species: throughout most of the range of the genus; two species (one endemic) in China.

**3. *Lobelia heyneana*** Schultes, Syst. Veg. 5: 50. 1819.

翅茎半边莲 chi jing ban bian lian

*Lobelia trialata* Buchanan-Hamilton ex D. Don; *L. trialata* var. *asiatica* Chiovenda.

Herbs, annual, 10–50(–60) cm tall. Stems erect, 3-angular, winged, glabrous, branched. Leaves alternate; petiole 1–4 mm, winged; blade broadly deltoid-ovate, 0.8–2.5 × 0.4–2.5 cm, upper ones smaller and more narrow, abaxially glabrous, adaxially sparsely puberulent, base truncate or shallowly cordate, often decurrent, apex rounded or acute. Flowers solitary, axillary at leaflike bracts, often forming a raceme; bracts narrowly elliptic, shorter than pedicels; pedicels 1–1.5(–2) cm, slender,

with 2 bracteoles at base; bracteoles subulate, less than 1 mm, often caducous. Hypanthium campanulate, 1–2 mm, glabrous; calyx lobes longer than hypanthium at anthesis, but shorter than tube after anthesis, subulate, 2–3 mm, entire. Corolla pale purple, 3–5 mm, inside sparsely puberulent; limb 2-lipped, upper lobes erect, linear, less than 1 mm; lower lobes spreading, elliptic to suborbicular, ca. 2 mm. Stamens connate into tube above middle of filaments; anther tube ca. 1 mm, lower 2 anthers barbate at top. Capsule oblong or obovoid-oblong, 4–5 × 2–4 mm. Seeds pale red-brown, ellipsoid, slightly compressed, smooth. Fl. and fr. Jan–Dec.

Moist places; 500–2700 m. Taiwan, Yunnan [Bhutan, India, Indonesia, Laos, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Africa].

**4. *Lobelia hainanensis*** F. E. Wimmer, Ann. Naturhist. Mus. Wien 56: 348. 1948.

海南半边莲 hai nan ban bian lian

Stems 4-angular, ascending or erect, up to 20 cm tall, glabrous. Leaves alternate, denser at upper part of stems, sessile; blade oblong or elliptic, ca. 15 × 7 mm, glabrous, base cuneate, margin cartilaginous-crenulate, apex obtuse. Flowers solitary, axillary at leaves; pedicels ca. 12 mm, glabrous, ± as long as leaves. Hypanthium broadly top-shaped, ca. 2 × 2 mm;

calyx lobes sublinear, ca. 3 mm, glabrous, margin entire, apex acute. Corolla 2-lipped, blue, ca. 1 cm, glabrous; upper lobes spatulate, shorter than lower ones; lower lobes obovate, ca. 4 × 2 mm, base with a pale black spot, apex rounded, mucronate. Filament tube ca. 5 mm, glabrous; anther tube gray-brown and black striate, ca. 2 mm, back puberulent at apex; lower 2 anthers barbate at top.

• Hainan.

No specimens have been examined by us, but based on the original description, we judge it to be distinct from its allies.

**3. *Lobelia* sect. *Delostemon*** (F. E. Wimmer) Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15: 356. 1995.

翅茎半边莲组 chi jing ban bian lian zu

*Lobelia* subsect. *Delostemon* F. E. Wimmer, Ann. Naturhist. Mus. Wien 56: 359. 1948.

Plants perennial or annual, 6–60 cm tall. Stems slender, herbaceous or sometimes subshrubby, prostrate, decumbent, ascending, or erect, simple to branched, sometimes stoloniferous, caespitose, or radican. Leaves sessile or petiolate. Flowers solitary in axils of upper leaves or these much reduced, creating a terminal sometimes secund raceme; pedicels bibracteolate at or below middle. Corolla bilabiate, typically some shade of blue or purple, less often pink or white, 5–20(–32) mm; lobes strongly dimorphic, spreading. Anthers bearded with tufts of filiform hairs at apex on all 5 (those on ventral pair sometimes longer). Fruit a capsule. Seeds ovoid to oblong, trigonous or lenticular; testa striate.

Forty-four species: S Hemisphere, north to Senegal, Ethiopia, India, Japan, Colombia, and Hispaniola; three species in China.

**5. *Lobelia zeylanica*** Linnaeus, Sp. Pl. 2: 932. 1753.

卵叶半边莲 luan ye ban bian lian

*Lobelia affinis* Wallich ex G. Don (1834), not Mirbel (1805); *L. affinis* var. *lobbiana* (J. D. Hooker & Thomson) C. B. Clarke; *L. barbata* Warburg (1891), not Cavanilles (1800); *L. hirta* Linnaeus; *L. lobbiana* J. D. Hooker & Thomson; *L. subcuneata* Miquel; *L. succulenta* Blume; *L. succulenta* var. *lobbiana* (J. D. Hooker & Thomson) F. E. Wimmer; *L. zeylanica* var. *hirta* (Linnaeus) Martyn; *L. zeylanica* var. *lobbiana* (J. D. Hooker & Thomson) Y. S. Lian.

Herbs, succulent. Stems prostrate, 4-angular, 20–60 cm, glabrous or puberulent, laxly branched, lower nodes rooted. Leaves spirally alternate; petiole 3–12 mm, puberulent; blade broadly deltoid-ovate or ovate, 1–5.4 × 0.8–3 cm, abaxially sparsely scaberulose along veins, adaxially glabrescent, base truncate, shallowly cordate, or broadly cuneate, margin serrulate, apex acute or obtuse. Flowers solitary and axillary; pedicels 0.5–2.8 cm, sparsely puberulent, bracteoles 2 at base, 1–2 mm, sometimes caducous. Calyx campanulate, 2–5 mm, puberulent; lobes linear, narrowly triangular, or narrowly oblong, 3–7 × 0.5–1 mm, ciliate. Corolla 2-lipped, purple, pale purple, or white, 5–15 mm, posterior side divided to base, lobes of upper lip obovate-oblong, those of lower lip broadly elliptic, abaxially sparsely villous along middle ribs. Filaments connate into a tube at 2/3; anther tube 1–1.8 mm, abaxially puberulent, anthers all barbate at top. Ovary inferior. Capsule broadly ellipsoid, obovoid, or oblong, 4–7 × 2–4 mm, obviously veined. Seeds 3-angular, red-brown. Fl. and fr. whole year round.

By water and streams in ravines; below 1500(–2000) m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

**6. *Lobelia alsinoides*** Lamarck, Dict. Bot. 3: 588. 1791.

短柄半边莲 duan bing ban bian lian

Herbs, annual, 10–30 cm tall. Stems succulent, decumbent to ascending, laxly branched, glabrous, angular. Leaves alternate, sparse; petiole 1–3 mm, glabrous; blade suborbicular, broadly ovate, elliptic, or lanceolate, 7–14 × 4–6 mm, both surfaces scabrous but glabrous, base cuneate or broadly cuneate, margin crenate or crenulate, apex rounded, obtuse, acute, or acuminate. Flowers axillary at leaflike bracts forming a lax raceme; pedicels (1–)2–2.7 cm, slender, glabrous; base with 2 lanceolate bracteoles ca. 3 mm. Hypanthium funnellform-campanulate, 2–3 mm, glabrous; calyx lobes linear or subulate, slightly longer than tube at anthesis, but shorter than tube in fruit, glabrous, entire. Corolla 2-lipped, pale blue or white, 4–8 mm; upper lobes erect, oblong-oblancheolate; lower lobes spreading, oblong-elliptic. Stamens connate above middle of filaments; filament tube glabrous; anther tube 1–1.5 mm, back glabrous, anthers all barbate at top. Capsule oblong or ovoid, 4–5 × 3–4 mm. Seeds numerous, 3-angular, dark brown. Fl. and fr. Jan–Dec.

Paddy fields, by water or among wet grasses in forests, wet places; below 800 m. Guangdong, Guangxi, Hainan, Taiwan, Xizang, Yunnan [Bangladesh, India, Japan (including Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

Two subspecies are recognized.

- 1a. Leaves suborbicular, ± as long as broad, margin serrate ..... 6a. subsp. *alsinoides*
- 1b. Leaves ovate to ovate-lanceolate, longer than broad, margin less prominently toothed ..... 6b. subsp. *hancei*

**6a. *Lobelia alsinoides* subsp. *alsinoides***

短柄半边莲(原亚种) duan bing ban bian lian (yuan ya zhong)

*Lobelia stipularis* Roth ex Schultes; *L. trigona* Roxburgh.

Leaves suborbicular, ± as long as broad, margin serrate.

Wet places; lower elevations. Hainan [Bangladesh, India, Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

**6b. *Lobelia alsinoides* subsp. *hancei* (H. Hara) Lammers, Bot. Bull. Acad. Sin. 33: 286. 1992.**

假半边莲 jia ban bian lian

*Lobelia hancei* H. Hara, J. Jap. Bot. 17: 23. 1941; *L. alsinoides* var. *cantonensis* (F. E. Wimmer ex Danguy) F. E. Wimmer; *L. chinensis* Loureiro var. *cantonensis* F. E. Wimmer ex Danguy.

Leaves ovate or lanceolate, 7–14 × 4–6 mm, longer than broad, margin less prominently toothed.

Paddy fields, by water or among wet grasses in forests; below 800 m. Guangdong, Guangxi, Taiwan, Xizang, Yunnan [Japan (including Ryukyu Islands)].

**7. *Lobelia terminalis* C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 424. 1881.**

顶花半边莲 ding hua ban bian lian

*Lobelia thorelii* F. E. Wimmer.

Herbs, annual, slender. Stems ascending or erect, 10–20(–40) cm tall, branched, angular but wingless, puberulent. Leaves spirally and laxly arranged; petiole 1–3 mm, hairy; blade suborbicular to elliptic, 6–10(–15) × 6–10 mm, both surfaces puberulent, base truncate, subcordate, or rounded, margin subentire for lower several, but obviously serrate for rest, apex rounded. Flowers solitary, axillary at upper leaflike bracts, forming a lax raceme or corymb; bracts ovate-lanceolate, margin serrate, hairy; pedicels slender, 1.5–4 cm, sparsely puberulent; bracteoles 2, persistent or caducous. Hypanthium obovoid or semiglobose, ca. 2 mm, puberulent; calyx lobes linear-subulate, 2–3 × ca. 0.5 mm, entire. Corolla 2-lipped, pale purple, 4–5(–8) mm; tube 2-divided to base at back, glabrous; upper lobes erect, oblong-linear, lower lobes oblong, slightly shorter than upper ones. Stamens connate into a tube above middle of filaments; filament tube glabrous; anther tube ca. 1 mm, back sparsely villous, apex shortly barbate. Capsule obovoid, 4–5 × ca. 3 mm, sparsely puberulent. Seeds numerous, brown-yellow, 3-angular. Fl. Nov.

Wet places in forests; 200–900 m. S Yunnan [India, Laos, Thailand, Vietnam].

**4. *Lobelia* sect. *Rhynchopetalum* (Fresenius) Benth in Benth & J. D. Hooker, Gen. Pl. 2: 552. 1876.**

山梗菜组 shan geng cai zu

*Rhynchopetalum* Fresenius, Flora 21: 603. 1838.

Plants perennial or pliestesial, shrubs, treelets, or trees, 0.5–9 m tall. Stems robust, typically pachycaul, herbaceous, subshrubby, or woody, prostrate, decumbent, ascending, or erect, simple, often apically rosulate. Leaves sessile (very rarely petiolate). Flowers in a terminal raceme or panicle. Corolla sub-bilabiate or unilabiate, various shades of blue, purple, red, yellow, green, or white, (12–) 22–50 mm; tube curved or arcuate; lobes spreading or deflexed, as long as tube or longer. Anthers bearded with tufts of filiform hairs at apex of ventral pair or all anthers nude at apex. Fruit a capsule. Seeds ovoid, lenticular, commonly winged; testa striate-reticulate.

Sixty-one species: tropical Africa, SE Asia, South America (SE Brazil); 13 species (four endemic) in China.

**8. *Lobelia melliana* F. E. Wimmer, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 61: 111. 1924.**

线萼山梗菜 xian e shan geng cai

Herbs, perennial, 80–150 cm tall. Stems glabrous, simple or branched. Leaves alternate, subsessile or shortly petiolate, ± falcate-ovate to falcate-lanceolate, 6–15 × 1.5–4 cm, thinly papery, glabrous, base broadly cuneate, margin ciliate-denticulate, apex caudate-acuminate. Racemes terminal, 15–40 cm, lax, lower bracts conformable with leaves, upper ones narrowed to linear, longer than flowers, margin ciliate-denticulate; pedicels compressed, 3–5 mm, with 2 subulate bracteoles at middle. Hypanthium semiellipsoid, 3–4 mm, glabrous; calyx lobes filiform, 13–21 × less than 1 mm, margin entire, spreading at fruiting. Corolla reddish, 12–17 mm; limb 2-lipped; upper lobes ascending, linear-lanceolate, as long as tube, inside villous; lower ones lanceolate-elliptic, ca. 2/3 as long as tube, inside densely villous, spreading. Stamens densely villous at base, connate into tube above base; filament tube glabrous; anther tube ca. 4 mm, back sparsely villous, only lower anthers barbate at top. Capsule erect, subglobose, 5–6 mm wide, glabrous. Seeds

oblong, slightly compressed, ca. 0.6 mm, foveolate. Fl. and fr. Aug–Oct.

● Ravines, roadsides, by streams or wet places in forests; below 1000 m. Fujian, Guangdong, Hubei (Badong, Zigui), Hunan (Yizhang), Jiangsu (Suzhou), S and W Jiangxi, Zhejiang (Longquan).

**9. *Lobelia pleotricha* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 170. 1912.**

毛萼山梗菜 mao e shan geng cai

*Lobelia davidii* Franchet var. *handelii* (F. E. Wimmer) F. E. Wimmer; *L. davidii* var. *pleotricha* (Diels) F. E. Wimmer; *L. handelii* F. E. Wimmer; *L. pleotricha* var. *cacumiflora* Y. S. Lian; *L. pleotricha* var. *handelii* (F. E. Wimmer) C. Y. Wu.

Herbs, perennial, 60–80 cm tall. Stem dark red, sparsely pubescent. Leaves alternate; lower leaves petiolate; petiole 2–3 cm, narrowly winged; upper leaves sessile or shortly petiolate; blade elliptic-lanceolate, 6–12 × 2–3.5 cm, both surfaces densely white hirsute, base cuneate, margin sinuate or irregularly crenate, apex acuminate. Racemes terminal, 10–30 cm; bracts leaflike, lower ones much longer, but upper ones some-

times shorter than flowers; pedicels 5–13 mm, densely white hirsute. Hypanthium shortly oblong, 4–6 × 4–6 mm, densely white hirsute; calyx lobes linear-lanceolate, 6–14 × 1–1.5 mm, reflexed at fruiting, densely white hirsute, margin glandular-denticulate. Corolla purple-red to blue-purple, ca. 2 cm, lobes hairy along midrib and ciliate; upper lobes ascending, linear; lower lobes spreading, ovate-lanceolate. Filament tube glabrous or sparsely puberulent; anther tube ca. 5 mm, back sparsely pubescent; lower 2 anthers barbate at top. Capsule shortly columnar, 7–8 × 5–6 mm, base truncate, concave. Seeds ellipsoid, slightly compressed. Fl. and fr. Aug–Oct.

Grassy slopes, thickets, margins of bamboo forests; 2000–3600 m. Xizang (Médog), W Yunnan [N Myanmar].

**10. *Lobelia pyramidalis*** Wallich, *Asiat. Res.* 13: 376. 1820.

塔花山梗菜 ta hua shan geng cai

*Lobelia pyramidalis* var. *wallichiana* (C. Presl) Steudel; *L. wallichiana* (C. Presl) J. D. Hooker & Thomson; *Rapuntium wallichianum* C. Presl.

Herbs, shrubby, 0.4–3 m tall. Stems glabrous. Leaves alternate, subleathery, sessile or shortly petiolate; basal leaves spatulate; lower ones oblong, up to 25 cm; middle and upper ones narrowly elliptic or narrowly oblong, 12–31 × 1–4 cm, both surfaces glabrous, base attenuate, margin serrulate, apex acuminate. Racemes terminal, paniculate; flowers dense, oriented toward one side. Pedicels 0.6–2.4 cm, arched, bibracteolate or sometimes ebracteolate; bracts linear, often shorter than flowers, entire. Hypanthium campanulate or broadly ellipsoid (rarely obconic), length slightly greater than width, 2–4 × 2–4 mm, glabrous; calyx lobes subulate or linear-triangular, 8–16 × 1–1.8 mm, margin entire. Corolla white, rose, or bluish, 1.1–2.1 cm, outside glabrous, inside tube densely villous, nearly 2-lipped; lobes of upper lip linear, ca. 2/3 as long as total length of corolla; those of lower lip elliptic or lanceolate, ca. 1/3 as long as total length of corolla. Stamens connate into tube above base; filament tube glabrous; anther tube ca. 5 mm, densely villous along sutures, lower 2 anthers barbate at top. Capsule subglobose, obovate, or broadly ovoid, 3.5–6.5 mm in diam., glabrous, often pendulous. Seeds elliptic, obviously compressed, margin pale in color. Fl. Jan–May.

Grassy slopes, scrub, roadsides; 1200–2500 m. W Guangxi, SW Guizhou, Xizang (?Lhasa), Yunnan [Bhutan, N India, N Myanmar, Nepal, N Thailand].

**11. *Lobelia seguinii*** H. Léveillé & Vaniot, *Repert. Spec. Nov. Regni Veg.* 12: 186. 1913 [*“seguini”*].

西南山梗菜 xi nan shan geng cai

*Lobelia seguinii* f. *brevispala* F. E. Wimmer; *L. seguinii* f. *longispala* F. E. Wimmer.

Herbs, subshrubby, 0.9–2.5(–5) m tall. Stems much branched, glabrous. Leaves alternate, thickly papery, lower leaves long petiolate, blade narrowly oblong, up to 25 cm; middle and upper ones sessile or shortly petiolate, lanceolate or elliptic (rarely oblanceolate), 6–35 × 0.6–6 cm, both surfaces glabrous, base attenuate or cuneate, margin serrulate, apex acuminate. Racemes terminal, paniculate, densely flowered; flow-

ers oriented to one side; lower bracts linear-lanceolate, longer than flowers, margin denticulate; upper ones lanceolate or linear, shorter than flowers, entire or serrulate; pedicels 3–16 mm, slightly compressed, curved backward, with 2 linear bracteoles. Hypanthium campanulate, oblong, or obconic, 3–8 mm, glabrous; calyx lobes subulate, linear, or linear-triangular, (8–)16–20(–27) × 0.9–2.5 mm, glabrous, entire (rarely with 1 or 2 teeth per side). Corolla purple-red, purple-blue, pale blue, or pinkish, 2–3(–3.5) cm, inside densely villous below throat; upper lobes ascending or spreading, linear, 0.8–1.3 mm wide, ca. 2/3 as long as total length of corolla; lower ones spreading, lanceolate, ca. 1/2 as long as total length of corolla. Stamens connate into tube; filament tube nearly as long as corolla tube, glabrous except at base; anther tube 4.5–7 mm, glabrous or base with several tufts of short hairs, lower 2 anthers barbate at top. Capsule pendent, oblong or ellipsoid, 10–16 × 5–9 mm, glabrous. Seeds ellipsoid, finely striate. Fl. and fr. Aug–Oct.

Grassy slopes, forest margins, roadsides; 500–3000 m. Chongqing (Fengjie, Wushan, Wuxi), W Guangxi, Guizhou (Anlong, Ceheng), Hubei (Badong, Zigui), SW Sichuan, Taiwan, Yunnan [N Thailand, N Vietnam].

**12. *Lobelia doniana*** Skottsberg, *Acta Horti Gothob.* 4: 19. 1928.

微齿山梗菜 wei chi shan geng cai

*Lobelia seguinii* H. Léveillé & Vaniot var. *doniana* (Skottsberg) F. E. Wimmer.

Herbs, perennial, 0.3–2.4 m tall. Stems erect, up to 1.5 cm in diam., branched above, glabrous or variously shortly pubescent above. Cauline leaves alternate, at least lower ones petiolate; petiole cuneate-winged, up to 3 cm; blade elliptic to linear-elliptic, 6–33 × 1–6 cm, abaxially sparsely hispidulous, adaxially glabrous or sparsely minutely pubescent, base cuneate, margin serrulate, apex acuminate. Racemes terminal, paniculate; lower bracts leaflike, gradually smaller up stems; pedicels 3–15 mm, usually bibracteolate, densely hispidulous. Hypanthium campanulate, oblong, or obconic, scaberulose; calyx lobes linear or linear-triangular, 7–22 mm, with (1–)4–7 teeth on each side. Corolla bilabiate, purple, purple-red, rose-purple, or blue-purple, 20–31 mm, outside scaberulose below, inside villous; upper 2 lobes linear, slightly longer than lower 3. Filaments connate above base, filament tube glabrous or sparsely shortly pubescent; anther tube glabrous or white hirsute only at base; lower 2 anthers barbate at top. Capsule oblong or ellipsoid, 8–16 × 4–9 mm. Seeds ellipsoid, finely striate. Fl. and fr. Sep–Nov.

Grassy slopes, forest margins, glades; (800–)1400–3200 m. Xizang (Nyalam), Yunnan [Bhutan, N India, N Myanmar, Nepal].

This species is very similar to *Lobelia seguinii*, differing primarily in its increased pubescence and toothed calyx lobes.

**13. *Lobelia clavata*** F. E. Wimmer, *Repert. Spec. Nov. Regni Veg.* 38: 78. 1935.

密毛山梗菜 mi mao shan geng cai

Herbs, subshrubby, 0.5–3.7 m. Stems terete, fistulose, tomentose. Cauline leaves alternate, sessile; blade oblanceolate or oblong (uppermost often narrowly elliptic or lanceolate), 7–33

× 2.2–8.4 cm, thickly papery, both surfaces hispidulous, base cuneate or attenuate into a petioid base, margin serrulate or crenulate, apex acuminate, acute, or obtuse. Racemes densely paniculate; flowers oriented toward one side, erect; bracts lanceolate, narrowly elliptic, narrowly oblong, or linear, 10–30 mm, shortly panose; pedicels 5–12 mm, terete, panose, twisted toward posterior side, usually bibracteolate near base (rarely at middle). Hypanthium campanulate or hemispherical, 3–6.5 × 3–6 mm, densely panose, base rounded or truncate (rarely obtuse); calyx lobes linear-triangular, 7–16 × 0.7–2.5 mm, margin entire or with 1–4 denticles per side. Corolla subbilabiate, white (rarely tinged pale pink or pale blue), 2–3.4 cm, outside shortly panose, inside villous; upper lobes linear, ca. 2/3 as long as total length of corolla; lower lobes wider, ca. 1/3 as long as total length of corolla. Stamens connate into tube above base; filament tube densely puberulent; anther tube 5–7.5 mm, densely villous along sutures; lower 2 anthers barbate at top. Capsule pendulous, subovoid or broadly ellipsoid, 6–13 × 5–9 mm, densely puberulent. Seeds elliptic, compressed, finely striate, margin pale in color. Fl. and fr. Nov–Apr.

Grassy slopes, forests, roadsides; 700–1800 m. SW Guizhou (Anlong), S Yunnan [NE India, Laos, N Myanmar, N Thailand, Vietnam].

This species is closely related to *Lobelia rosea* Wallich of the Himalaya, which differs in its narrowly elliptic leaves only 2–3.5 cm wide; typically ebracteolate pedicels; pink, pale rose, or mauve corolla; and shorter staminal column (filament tube 10–15 mm, anther tube 3–5 mm).

**14. *Lobelia iteophylla*** C. Y. Wu, Rep. Yunnan Trop. Subtrop. Fl. Res. Rep. 1: 93. 1965.

柳叶山梗菜 liu ye shan geng cai

Herbs, perennial, up to 85 cm tall. Stems erect, often purplish, terete, simple, glabrous, lower part often leafless. Cauline leaves alternate, sessile; blade linear-lanceolate, 6.5–11 × 1.3–1.6 cm, both surfaces glabrous, base cuneate, margin glandular-serrate, apex acuminate. Racemes lax; flowers almost oriented toward one side; bracts conformable to leaves, 2.5–5.5 × 0.5–1 cm, longer than flowers; pedicels 5–10 mm, straight, puberulent; bracteoles 2, subulate. Hypanthium semiglobose, 2.5–4 mm, glabrous or sparsely puberulent; calyx lobes linear-lanceolate, 11–15 × 1.5–2 mm, glabrous, margin glandular-denticulate. Corolla nearly 2-lipped, purple-blue, 17–25 mm, glabrous; upper 2 lobes ascending, ca. 13 mm; lower lobes spreading, narrowly oblong, ca. 8 mm, acute. Stamens connate into tube; filament tube ca. 12 mm, glabrous; anther tube gray-blue, 5–6 mm, back sparsely setulose; lower 2 anthers barbate at top. Fl. and fr. Sep–Oct.

• Forests, forest margins and grassy slopes by streams; 800–2500 m. Yunnan.

**15. *Lobelia foliiformis*** T. J. Zhang & D. Y. Hong, Acta Phytotax. Sin. 30: 155. 1992.

苞叶山梗菜 bao ye shan geng cai

Subshrubs, 1–2 m tall, branched, glabrous. Cauline leaves sessile or shortly petiolate; blade oblong to broadly lanceolate, up to 25 × 3.5 cm, papery, abaxially often puberulent, adaxially

glabrous or sparsely puberulent, base cuneate, margin glandular-serrate, apex acuminate. Racemes terminal, densely flowered, 5–20 cm, often pendulous; bracts linear-lanceolate, usually entire; pedicels ca. 5 mm, with 2 bracteoles at top; bracteoles leaflike, 6–12 × ca. 1 mm, margin glandular-denticulate. Hypanthium obconic, ca. 6 × 4 mm, glabrous to puberulent; calyx lobes erect or spreading, linear, 12–16 mm, usually denticulate. Corolla blue-purple or purple-red, 20–30 cm, puberulent; upper 2 lobes ca. 17 mm; lower 3 lobes ovate-lanceolate, ca. 8 mm. Filaments 12–15 mm, puberulent below; anther tube gray-blue, ca. 5 mm, back densely setulose; lower 2 anthers sparsely barbate at top. Capsule oblong, ca. 12 × 8–10 mm. Seeds dark brown, ellipsoid. Fl. and fr. Aug.

• Sunny slopes; 2300–3000 m. Yunnan (Dali).

**16. *Lobelia colorata*** Wallich, Pl. Asiat. Rar. 2: 42. 1831.

狭叶山梗菜 xia ye shan geng cai

*Lobelia colorata* var. *baculus* F. E. Wimmer; *L. colorata* var. *dsolinhoensis* F. E. Wimmer; *L. colorata* subsp. *guizhouensis* T. J. Zhang & D. Y. Hong; *L. palustris* Kerr.

Herbs, perennial, 30–100 cm tall. Stems erect, terete, simple, glabrous or puberulent near axils. Cauline leaves alternate, subsessile or winged-petiolate; blade obovate-oblong to linear-lanceolate, 3.5–11 × 0.5–3 cm, glabrous, base cuneate, apex rounded but mucronate. Racemes terminal, 15–30 cm, lax; flowers oriented toward one side; bracts lanceolate to linear, shorter or longer than flowers; pedicels 4–7 mm, glabrous or sparsely setulose, with 2 bracteoles at or below middle. Hypanthium semiellipsoid, 2–4 mm, glabrous or puberulent; calyx lobes linear, 5–12 × ca. 1 mm, margin with 2–4 pairs of glandular denticles. Corolla nearly 2-lipped, purple-blue or blue, rarely white, 12–20 mm, glabrous; upper 2 lobes linear, 11–15 mm; lower ones ovate-oblong, 4–8 mm. Filament tube glabrous, 7–11 mm; anther tube 5–6 mm, glabrous or sparsely villous; lower 2 anthers barbate at top. Capsule ovoid-globose, ca. 6 × 4–6 mm. Seeds ellipsoid, slightly compressed. Fl. and fr. Sep–Oct.

Thickets in ravines, moist meadows; 1000–3000 m. Guizhou, Yunnan [NE India, N Thailand].

"*Lobelia purpurascens*" (Wallich, Numer. List, no. 1307. 1829) belongs here but is a nomen nudum and was therefore not validly published (*Vienna Code*, Art. 32.1(d)).

**17. *Lobelia taliensis*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 170. 1912.

大理山梗菜 da li shan geng cai

*Lobelia colorata* Wallich subsp. *taliensis* (Diels) T. J. Zhang & D. Y. Hong; *L. fossarum* F. E. Wimmer; *L. hybrida* C. Y. Wu (1965), not Voss (1894).

Herbs, perennial, 50–120 cm tall. Rhizomes short. Stems erect, often purplish, terete, simple or few branched, glabrous. Basal leaves petiolate; petiole narrowly winged; blade spatulate, up to 8 cm; cauline leaves sessile or shortly petiolate, blade obovate-oblong to obovate-lanceolate or elliptic, 3.5–7 × 1.5–2(–3) cm, papery, both surfaces glabrous, base cuneate, margin

with glandular denticles, apex obtuse or acute. Racemes terminal, lax, one-side-oriented; bracts similar to leaves, sessile; pedicels compressed, 4–7 mm, puberulent; bracteoles 2 at middle of pedicels. Hypanthium oblong, 3–4 mm, puberulent; calyx lobes linear-lanceolate, 9–12 × ca. 1 mm, margin glandular-denticulate or also ciliate. Corolla pale blue or rose, 24–30 mm; lobes of upper lip slightly ascending, linear, ca. 15 mm, back sparsely villous along midvein; lobes of lower lip spreading, oblong-lanceolate, ca. 8 mm. Filament tube ca. 11 mm, glabrous; anther tube ca. 6 mm, back sparsely villous at apex, lower 2 anthers barbate at top. Capsule oblong, ca. 6 × 4 mm. Seeds ellipsoid. Fl. and fr. Aug–Oct.

• Grassy slopes; 1600–2600 m. Hunan, NW Yunnan (Dali, Heqing, Yangbi).

**18. *Lobelia davidii*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 82. 1883 [*“davidii”*].

江南山梗菜 jiang nan shan geng cai

*Lobelia davidii* var. *dolichothyrsa* (Diels) F. E. Wimmer; *L. davidii* var. *glaberrima* F. E. Wimmer; *L. davidii* var. *kwangsiensis* (F. E. Wimmer) Y. S. Lian; *L. davidii* var. *sichuanensis* Y. S. Lian; *L. dolichothyrsa* Diels; *L. kwangsiensis* F. E. Wimmer; *L. oligantha* C. Y. Wu; *L. tibetica* W. L. Zheng.

Herbs, perennial, up to 180 cm. Stems erect, simple or branched, usually densely hispidulous or scaberulose. Leaves alternate, lower leaves usually petiolate; petiole winged, up to 4 cm; blade ovate-elliptic to linear-lanceolate, up to 17 × 7 cm, abaxially glabrous or hispidulous, adaxially glabrous, base cuneate, apex acuminate. Racemes terminal, 20–50 cm, inflorescence rachises glabrous to densely hispidulous; bracts ovate-lanceolate to lanceolate, longer than flowers; pedicels 3–5 mm, usually hispidulous, with 1 or 2 minute bracteoles near base. Hypanthium obovoid, ca. 4 mm, rounded at base, sparsely to densely scaberulose; calyx lobes linear-lanceolate, 5–12 × 1–1.5 mm, margin denticulate. Corolla nearly 2-lipped, purple-red or red-purple, 1.1–2.8 cm; upper lobes linear; lower lobes narrowly elliptic or lanceolate-elliptic, glabrous or puberulent, villous below throat. Stamens connate above base; filament tube glabrous or puberulent near anthers; lower 2 anthers barbate at top. Capsule globose, 6–10 in diam. Seeds yellow-brown, slightly compressed, one side thicker than other. Fl. and fr. Aug–Oct.

Forest margins, by streams; below 4000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, S Xizang (Cona, Yadong), Yunnan, Zhejiang [Bhutan, N India, Myanmar, Nepal].

**19. *Lobelia erectiuscula*** H. Hara, J. Jap. Bot. 40: 328. 1965.

直立山梗菜 zhi li shan geng cai

*Lobelia erecta* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 28. 1857, not de Vriese (1845).

**5. *Lobelia* sect. *Speirema*** (J. D. Hooker & Thomson) Lammers, J. Bot. Res. Inst. Texas 4: 161. 2010.

紫锤草组 zi chui cao zu

*Speirema* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 27. 1857.

Plants perennial, 0.3–2 m tall. Stems herbaceous or subshrubby. Flowers solitary in axils of little-reduced or unreduced leaves (rarely supplemented by a terminal 10–25-flowered raceme); pedicels ascending, spreading, sigmoid, or incurved, 1/10–3/4 as long

Perennials, erect, 50–80 cm tall. Stems simple, densely hispidulous. Leaves alternate, lower leaves narrowly elliptic or elliptic-lanceolate, 5–13 × 3–4 cm, base cuneate, margin crenate or irregularly doubly serrate, apex acute or acuminate; petiole 2–6 cm; middle and upper leaves elliptic or ovate, 4–8 × 3–4 cm, base broadly cuneate or rounded, margin obscurely serrate, apex acute; petiole 0.5–1.5 cm, winged. Flowers in a raceme, raceme 10–25 cm; pedicels 2–3 mm, densely hispidulous; bracts leaflike, narrowly elliptic or lanceolate to linear-elliptic, lower ones longer than but upper ones shorter than corolla. Hypanthium subglobose, ca. 5 mm, scaberulose; calyx lobes linear-lanceolate, 6–8 × 1.5–2 mm, ciliate and denticulate. Corolla purple-blue, 13–19 cm. Filament tube villous at top; 2 anterior anthers barbate at top, other 3 glabrous. Capsule globose-cylindric, 9–12 × 6–8 mm. Seeds pale brown, ellipsoid. Fl. Aug–Sep, fr. Sep.

*Quercus* or mixed forests; 3000–4000 m. SE Xizang (Cona) [NE India (Sikkim), N Myanmar, Nepal].

**20. *Lobelia sessilifolia*** Lambert, Trans. Linn. Soc. London 10: 260. 1811.

山梗菜 shan geng cai

*Lobelia camtschatica* Pallas ex Sprengel, nom. illeg. superfl.; *L. salicifolia* Fischer ex Trautvetter (1883), not Sweet (1818); *L. saligna* Fischer.

Herbs, perennial, 20–170 cm tall. Stems simple, glabrous. Leaves alternate, larger at middle part of stem, thickly papery, sessile; blade lanceolate, narrowly oblong, or narrowly elliptic, 1.8–9 × 0.2–2.2 cm, both surfaces glabrous, base rounded, truncate, obtuse, or cuneate, margin serrulate, apex acute or acuminate. Racemes terminal, 8–35-flowered, glabrous; bracts leaflike, lanceolate or narrowly elliptic, shorter than flowers but longer than pedicels; pedicels 5–24 mm, ebracteolate. Hypanthium campanulate, hemispheric, ellipsoid, obovoid, or obconic, 3–7 mm, glabrous; calyx lobes subulate or narrowly triangular, 4.5–12 × 1–3 mm, glabrous, margin entire, revolute. Corolla blue-purple or violet, 2.5–3.7 cm, 2-lipped, outside glabrous, inside villous; upper 2 lobes ascending, spatulate, 10–20 × 1.5–4 mm, equaling or longer than corolla tube; lower lobes elliptic, 10–21 × 2.3–6.5 mm, nearly as long as corolla tube, densely long ciliate. Stamens connate above base; filament tube glabrous; anther tube 4–6 mm, glabrous or villous along upper sutures toward apex; lower 2 anthers barbate at top. Capsule obovoid, broadly ellipsoid, or globose, 7–15 × 5–11.5 mm. Seeds brown-red, oblong or ellipsoid, 1.3–2 mm, terete but winged on one side, finely striate. Fl. and fr. Jul–Oct.

Wet meadows; sea level up to 3400 m. Anhui (Jixi), N Guangxi, Heilongjiang, Hunan (Anjiang), Jilin, Liaoning, Shandong, Sichuan, NW Yunnan, Zhejiang [Japan, Korea, Russia (Far East, Siberia)].

as subtending leaf or bract, commonly ebracteolate. Corolla sub-bilabiate with 2 dorsal lobes and a trifid ventral lip. Anther tube 0.4–1.25 × as long as filament tube; ventral anthers bearded at apex with tufts of white filiform hairs. Fruit a berry, black-purple to violet or greenish, globose or obovoid. Seeds numerous, amber-colored or tan, broadly ellipsoid, subterete to slightly compressed or sometimes angular, small; testa striate-reticulate.

Five species: SE Asia, from NE India to Java; three species (one endemic) in China.

**21. *Lobelia fangiana*** (F. E. Wimmer) S. Y. Hu, J. Arnold *Arbor.* 61: 90. 1980.

峨嵋紫锤草 e mei zi chui cao

*Pratia fangiana* F. E. Wimmer, *Repert. Spec. Nov. Regni Veg.* 38: 3. 1935; *Lobelia omeiensis* F. E. Wimmer.

Herbs, perennial, up to 1.5 m tall, simple. Stems erect, terete, sparsely to densely puberulent toward apex. Leaves sessile; blade elliptic, narrowly elliptic, narrowly oblong, or lanceolate, 5.5–16 × 1.2–3 cm, both surfaces glabrous, base cuneate, margin glandular-serrulate or -crenulate, apex acuminate. Flowers solitary in axils of little-reduced or unreduced leaves, and uppermost 10–25 often aggregated into a terminal raceme; pedicels 12–38 mm, densely puberulent. Hypanthium obconic or campanulate, 3–5(–7) mm, puberulent on veins or sometimes glabrous; calyx lobes erect, narrowly triangular or triangular, 3–7 mm, glabrous, margin entire or with 1–3 teeth per side. Corolla red-purple or greenish with lip purple spotted, 18–23 mm, both sides sparsely pubescent; dorsal lobes linear or linear-triangular; ventral lobes lanceolate, acuminate. Filament tube glabrous, ca. 2 × as long as anther tube; anther tube gray, 5–6 mm, glabrous; ventral anthers barbate at apex with white hairs ca. 1 mm or smaller. Berry dry, globose or obovoid, 7–17 mm. Seeds amber-colored, dull, broadly ellipsoid, 0.6–0.7 × 0.3–0.4 mm, subterete. Fl. and fr. Aug–Sep.

• Grassy slopes, forests, moist thickets on slopes and riverbanks; 1700–3000 m. SC Sichuan.

**22. *Lobelia montana*** Reinwardt ex Blume, *Bijdr.* 728. 1826.

山紫锤草 shan zi chui cao

*Lobelia brevisepala* (Y. S. Lian) Lammers; *L. reflexisepala* Lammers; *L. wardii* C. E. C. Fischer; *Pratia brevisepala* Y. S. Lian; *P. montana* (Reinwardt ex Blume) Hasskarl; *P. reflexa* Y. S. Lian; *P. wardii* (C. E. C. Fischer) F. E. Wimmer; *Speirema montanum* (Reinwardt ex Blume) J. D. Hooker & Thomson.

Herbs, perennial, up to 2 m tall. Stems erect, arching, or sprawling, terete, commonly branched from base and sometimes above, upper internodes zigzag, glabrous (rarely sparsely scabrous, or puberulent when young). Leaves petiolate; blade elliptic, ovate, or lanceolate, 3.5–13 × 1.2–4.6 cm, papery, glabrous (rarely puberulent when young, or sparsely scabrous on midrib), base cuneate, obtuse, or rounded, margin glandular-serrulate, -denticulate, or -crenulate, apex caudate or sometimes merely acuminate; petiole 0.3–1.3 cm. Flowers solitary and

axillary; pedicels slender, 24–55 mm, glabrous. Hypanthium globose or campanulate (rarely obconic), 3–6 mm, glabrous; calyx lobes spreading, recurved, or rarely reflexed, linear-triangular or linear, 2–14 mm, margin entire. Corolla dark violet to bluish lilac, lip often paler, or striped, margined, or blotched with white, 15–26 mm, outside glabrous, inside villous; dorsal lobes linear; ventral lobes elliptic, apex caudate. Filament tube glabrous, up to 2.5 × as long as anther tube; anther tube light gray, 4.8–7 mm, dorsal surface sparsely shortly pubescent at least toward apex; lower 2 anthers barbate at apex with tufts of white hairs up to 2 mm. Berry violet to black-purple, globose, 6–15 mm. Seeds amber-colored, shiny, broadly ellipsoid, slightly compressed, 0.5–0.8 × 0.3–0.5 mm. Fl. Jul–Nov, fr. Aug–Apr.

Moist ravines, glades, meadows, scrub, forest margins; 1000–4000 m. Xizang, SE Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Vietnam].

**23. *Lobelia deleiensis*** C. E. C. Fischer, *Bull. Misc. Inform. Kew* 1940: 297. 1941.

滇紫锤草 dian zi chui cao

*Pratia montana* (Reinwardt ex Blume) Hasskarl var. *deleiensis* (C. E. C. Fischer) F. E. Wimmer.

Herbs, rhizomatous, up to 2 m tall. Stems erect or arching, often branched from base and sometimes above, glabrous. Leaves petiolate; blade elliptic or lanceolate, 6–14 × 1.4–4.2 cm, papery or somewhat leathery, both surfaces glabrous, base cuneate to obtuse, margin glandular-serrulate, -crenulate, or -denticulate, apex caudate; petiole 0.3–1.8 cm. Flowers solitary and axillary; pedicels slender, 1.6–4.5 cm. Hypanthium campanulate or obovoid, 4–7 mm, glabrous; calyx lobes spreading or recurved, linear or linear-triangular, 5–17 mm, glabrous, entire. Corolla cream-colored or greenish with purple or blue markings on lip, 1.2–1.8 cm, outside glabrous, inside pubescent; dorsal lobes linear or linear-spatulate; ventral lobes narrowly elliptic, apex caudate. Filament tube glabrous or sparsely pubescent, ± equaling anther tube; anther tube cream-colored, 6–8 mm, glabrous or sparsely shortly pubescent toward apex; ventral anthers bearded at apex with tufts of white hairs up to 2 mm. Berry greenish, globose, 8–11 mm. Seeds tan, dull, broadly ellipsoid, slightly compressed, ca. 0.6 × 0.4 mm. Fl. Jul–Nov, fr. Aug–Apr.

Evergreen broad-leaved forests; 1500–2400 m. SW Yunnan [NE India].

## 16. HIPPOBROMA G. Don, *Gen. Hist.* 3: 698, 717. 1834.

马醉草属 ma zui cao shu

Hong Deyuan (洪德元); Laura L. Klein, Thomas G. Lammers

Herbs, perennial. Roots coarse, thickened, fascicled. Leaves alternate, margin repand-dentate or repand-serrate, sometimes

merely sinuate, teeth apiculate. Flowers large, fragrant, solitary, axillary; pedicels with 2 filiform bracteoles at base. Corolla salverform, white; tube entire; lobes monomorphic. Filament tube adnate to corolla; all anthers with apical tufts of stiff hairs; anther tube scarcely exerted. Fruit pendent, capsular, 2-locular, apically dehiscent by 2 valves.  $2n = 28$ .

One species: native to Jamaica; widely introduced and naturalized in tropics and subtropics, including China.

**1. *Hippobroma longiflora*** (Linnaeus) G. Don, Gen. Hist. 3: 717. 1834.

马醉草 ma zui cao

*Lobelia longiflora* Linnaeus, Sp. Pl. 2: 930. 1753; *Isotoma longiflora* (Linnaeus) C. Presl; *Laurentia longiflora* (Linnaeus) Petermann; *Solenopsis longiflora* (Linnaeus) M. R. Almeida.

Stems erect, 9–35 cm tall, simple or branching at base, glabrous or increasingly villous toward apex. Leaves sessile or shortly petiolate; blade 7–16 × 1–3.7 cm, oblanceolate or elliptic, glabrous or sometimes sparsely villous, base attenuate, apex

acute or acuminate. Pedicels 3–10 mm, densely villous. Corolla white; tube 6.5–10 cm, villous, entire; lobes elliptic, narrowly elliptic, or linear, 1.8–2.5 cm. Hypanthium campanulate, obconic, or ellipsoid, 6–9 mm, densely villous; calyx lobes linear, 8–19 mm, villous, margin denticulate. Anther tube ca. 7 mm. Capsule obconic, campanulate, broadly ellipsoid, or obovoid, 11–15 × 8–12 mm, densely villous. Seeds light brown to red-brown, broadly ellipsoid, terete or slightly compressed, ca. 0.7 mm, reticulate.  $2n = 28$ .

Guangdong, Taiwan [native to Jamaica; widely introduced and naturalized in tropics and subtropics].