

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 × 1.7 cm, usually longer than calyx lobes 4. *C. pilosula*
 - 16b. Corolla small, less than 1 × 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 0.5–2 × 0.5–1.5 cm, apex acute or obtuse 9. *C. farreri*
 - 18b. Leaves 6–7 × 2–2.5 cm, apex shortly acuminate 10. *C. rotundifolia*
 - 17b. Stems and leaves ± hairy; leaves crenulate or serrate on margins.

- 19a. Calyx lobes ciliate, reflexed 11. *C. henryi*
 19b. Calyx lobes glabrous, not reflexed.
 20a. Leaf blade 3–15 × 1–7 cm, apex acuminate 12. *C. levicalyx*
 20b. Leaf blade up to 2.3 × 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 2–13 × 1.5–5 cm; main stem with 1–4 flowers; calyx lobes 5–7 × 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 5–8 × 1.5–3 cm; main stem with 1 or 2 flowers; calyx lobes 8–12 × 4–6 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 ± 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, 18–20 × 2–3 mm 23. *C. gombalana*
 28b. Leaves broadly lanceolate, 5–14 × 3–7 cm, serrate; calyx lobes 20–30 × 6–10 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 × 1.5 cm, sparsely puberulent abaxially; corolla purple-green, with purple veins 30. *C. alpina*
 32b. Leaves up to 3.2 × 2.6 cm, glabrous on both surfaces; corolla pale blue, with red-brown spots inside 31. *C. cardiophylla*
- 31b. Leaves crenulate; flowers ± hairy on some parts.
 33a. Calyx lobes 5–7 × 2–3 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 × 1 cm 28. *C. canescens*
 37b. Plants green with sparse hairs; leaf blade usually larger.
 38a. Calyx lobes 15–20 × 6–8 mm, hairy only at apex; leaf blades 1–5 × 0.8–3.2 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, funnelform, 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) Hemsley, *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 ob-

tuse 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 pseudovercillate; 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 (Nanyang, 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. *coe-*

rulescens 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 trian-

gular 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* Benth 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 Bentham 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, semiglo-

bosc, 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 dǎng 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 (Dèqên).

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

秦岭党参 qín líng dǎng 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 dǎng 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 (Dèqên).

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

西藏党参 xī zāng dǎng 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, subentire, 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*.

