

DIPSACACEAE

川续断科 chuan xu duan ke

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Herbs, mostly perennial, less frequently annual or biennial, very rarely subshrubs. Leaves opposite, or sometimes whorled, simple, entire or toothed, pinnatifid to pinnatisect. Inflorescences of compact cymes forming a terminal, involucre head, or diffuse and paniculiform (*Triplostegia*). Flowers bisexual, nearly always subtended by 1 or 2 cupular, apically toothed or subtire involucre (epicalyx); receptacle hairy or naked. Calyx usually small, cupular, or 4- or 5-segmented, or with up to 10 teeth or setae. Corolla sympetalous, 5(or 4)-lobed, ± irregular. Stamens 4, rarely 2 or 3, inserted at summit of corolla tube; anthers 4-sporangiate, opening by longitudinal slits. Gynoecium of 2 carpels, but 1 carpel obsolete; ovary inferior, 1-loculed; ovule solitary, apical, pendulous; style slender; stigma entire or 2-fid. Fruit an achene, enclosed by involucre and crowned by persistent calyx.

Ten genera and ca. 250 species: Africa, Asia, Europe; four genera and 17 species (four endemic) in China.

He Shi-yuan, Hsing Chi-hua & Yin Tsu-tang. 1986. Dipsacaceae. *In*: Lu An-ming & Chen Shu-kun, eds., *Fl. Reipubl. Popularis Sin.* 73(1): 44–84.

- 1a. Inflorescence paniculiform 1. *Triplostegia*
1b. Inflorescence a compact head.
2a. Plants spiny; flowers uniform; involucre usually without an evident crown 4. *Dipsacus*
2b. Plants without spines; flowers usually dimorphic, corolla of marginal flowers larger and 2-lipped; involucre usually with a crown.
3a. Leaves usually all basal; calyx segments 8 or more, plumose or setose, shedding 2. *Pteroccephalus*
3b. Leaves mostly cauline; calyx segments 5, setose, persistent 3. *Scabiosa*

1. TRIPLOSTEGIA Wallich ex Candolle, Prodr. 4: 642. 1830.

双参属 shuang shen shu

Herbs, perennial, erect. Taproots fusiform. Rhizomes horizontal. Basal leaves dense, rosulate; leaf blade serrate or pinnatifid; cauline leaves decussate, otherwise similar. Inflorescence paniculiform, flowers in remote, terminal, simple or compound dichasia, all parts densely white villous and glandular hairy; bracts linear; involucre 2, urceolate, outer involucre 4-lobed, outer surface glandular pubescent, inner involucre 8-ribbed. Flowers nearly actinomorphic. Calyx reduced, 4-lobed. Corolla tubular-funnelform, 5-lobed; lobes subequal, imbricate in bud. Stamens 4, equal in length, alternate with corolla lobes; anthers introrse, versatile. Style solitary; stigma capitate. Achenes enveloped in urceolate involucre. Seeds subglobose, acute at both ends, smooth, with 2 obscure angles; endosperm copious; embryo small.

Two species: from India and Nepal northward to Gansu, southward to Malaysia, and eastward to Taiwan; two species in China.

Triplostegia pinifolia H. Léveillé and *T. mairei* H. Léveillé have been identified respectively as *Sedum fastigiatum* J. D. Hooker & Thomson (Crassulaceae) and *Chrysosplenium macrophyllum* Oliver (Saxifragaceae) by L. A. Lauener (Notes Roy. Bot. Gard. Edinburgh 30: 284, 290. 1970).

- 1a. Corolla 3–5 mm; involucre hooked at apex; leaf blade ovate-lanceolate, petiolate 1. *T. glandulifera*
1b. Corolla 7–12 mm; involucre not hooked at apex; leaf blade obovate to obovate-lanceolate, sessile 2. *T. grandiflora*

1. *Triplostegia glandulifera* Wallich ex Candolle, Prodr. 4: 642. 1830.

双参 shuang shen

Hoeckia aschersoniana Engler & Graebner; *Triplostegia repens* Hemsley.

Herbs, perennial, erect, 15–40 cm tall. Taproots 2-forked, brown, nearly fusiform, 30–50 × 2–3 mm, slightly fleshy. Rhizomes elongate, 4-angular, nodes 4–6, internodes 0.5–2 cm, nodes rooted. Stems angular, glabrous or sparsely puberulent, glandular hairy above. Leaves opposite, petiolate; petiole 1–3 cm; leaf blade obovate-lanceolate, 2–6 × 1.5–4 cm, pinnatifid,

more deeply so at base, abaxially puberulent on veins, adaxially sparsely puberulent, ultimately glabrescent, margin irregularly lobed or serrate; upper leaves smaller, lobed, sessile. Inflorescences paniculiform; bracts 2–4 mm, midvein prominent, margin sparsely ciliate; pedicels ca. 1 mm; outer involucre 4-lobed; lobes lanceolate, 1.5–2 mm, abaxially densely covered with purple glandular hairs; inner involucre urceolate, ca. 1.5 mm, 8-ribbed, apex constricted into limb; limb 8-toothed or 8-dentate. Corolla white or rose, funnelform, 3–5 mm; lobes obtuse. Stamens slightly exerted; filaments ca. 5 mm; anthers white. Style slightly longer than stamens. Achenes enveloped by involucre; involucre 3–4 mm in fruit, glandular hairy, 4-lobed; lobes long acuminate, hooked. Fl. and fr. Jul–Oct. $2n = 18$.

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Forests, grassy slopes, meadows, by streams; 1500–4000 m. Chongqing, SE Gansu (Xigu), Hubei (Enshi, Jianshi), Shaanxi (Yangxian), W Sichuan, Taiwan (Yushan), SE Xizang, NW Yunnan [Bhutan, India, Malaysia (peninsular), Myanmar, Nepal].

2. *Triplostegia grandiflora* Gagnepain, Bull. Soc. Bot. France 47: 333. 1901.

大花双参 da hua shuang shen

Triplostegia delavayi Franchet ex Diels.

Herbs, perennial, erect, 20–45 cm tall. Taproots often dichotomous, nearly fusiform, 30–40 × ca. 5 mm, slightly fleshy. Rhizomes short, nodes 2–4, internodes ca. 1 cm. Stems solitary, simple, slightly 4-angular, white villous, sometimes glandular hairy above. Leaves opposite, sessile, slightly amplexicaul, obovate to obovate-lanceolate, 3–8 cm, both surfaces villous, base cuneate, apex rounded, pinnatifid or pinnatilobate; terminal lobe

largest, all lobes serrate; upper leaves gradually smaller and becoming bractlike. Inflorescence branches elongate, densely white villous and glandular hairy; bracts leaflike to linear, 5–20 mm, 1-veined, white villous and glandular hairy, margin shallowly serrate or entire, apex obtuse; pedicels 2–3 mm; outer involucler 4-lobed; lobes lanceolate, 2–3 mm, densely covered with black glandular hairs, apex acute; inner involucler ovoid, 8-ribbed; limb 5-dentate, teeth acute at base, hirsute. Calyx reduced. Corolla whitish rose, funnellform, nearly actinomorphic, 1–1.2 cm, outside sparsely puberulent, 5-lobed; lobes ca. 1/3 as long as total length of corolla, apex obtuse. Stamens slightly exerted; anthers yellow, introrse. Ovary enveloped by urceolate involucler; style shorter than stamens; stigma capitate. Achenes enveloped in involuclers; lobes not hooked. Fl. and fr. Jul–Oct.

Forests, forest margins, grassy slopes; 2000–3000 m. SW Sichuan, N Yunnan [Bhutan].

2. **PTEROCEPHALUS** Vaillant ex Adanson, Fam. Pl. 2: 152, 595. 1763.

翼首花属 yi shou hua shu

Herbs, perennial or annual, or sometimes subshrubs. Leaves basal, rosulate, entire, pinnatifid to pinnatisect. Capitula solitary, terminal; involucler of 2, rarely 3 whorls of 4–6 involucler bracts; receptacles covered with hirsute hairs or bracts; involucler 1, 4–8-ribbed, apex obscurely dentate, or corona-like, or membranous and dentate. Calyx segmented and 8–24-setose or pinnate. Corolla 4- or 5-lobed, that of central flowers nearly actinomorphic, that of marginal flowers nearly 2-lipped; upper lip with 1 lobe, entire or 2-lobed; lower lip usually 3-lobed. Stamens 4, rarely 2 or 3, inserted at upper part of corolla, exerted. Ovary inferior, enveloped by involuclers. Achenes smooth or ribbed. Seeds with a large, straight embryo and scanty endosperm.

About 25 species: from the Mediterranean to C Asia and tropical Africa; two species (one endemic) in China.

- 1a. Leaves spatulate or linear-spatulate, entire or narrowly segmented; inflorescences globose in fruit; involucler bracts of outer layer narrowly ovate; persistent calyx segmented into 20 pinnate hairs; corolla 5-lobed, obovoid, 4–5 mm 1. *P. hookeri*
- 1b. Leaves oblong-lanceolate or oblanceolate, pinnatifid to bipinnatisect; inflorescences compressed globose in fruit; involucler bracts of outer layer lanceolate; persistent calyx segmented into 8 brown setae; corolla 4-lobed 2. *P. bretschneideri*

1. *Pterocephalus hookeri* (C. B. Clarke) E. Pritzl, Bot. Jahrb. Syst. 29: 601. 1901.

匙叶翼首花 chi ye yi shou hua

Scabiosa hookeri C. B. Clarke in J. D. Hooker, Fl. Brit. India 3: 218. 1881; *Pterocephalodes hookeri* (C. B. Clarke) V. Mayer & Ehrendorfer; *Pterocephalus batangensis* Pax ex K. Hoffmann.

Herbs, perennial, 10–50 cm tall, white villous throughout. Taproots robust, columnar, 8–15 × 1.5–3.5 cm, lignified. Leaves all basal, rosulate, oblanceolate, 5–18 × 1–2.5 cm, base attenuate into winged petiole, margin entire, remotely and coarsely serrate, or pinnatifid, apex obtuse or acute; segments in 3–5 pairs, obliquely ovate or lanceolate, 1–2 cm; terminal lobe larger, lanceolate, abaxially white, midvein conspicuous, adaxially green, white puberulent. Scapes 10–40 cm, 2–4 mm in diam., white villous, more densely so near inflorescences. Capitula solitary, terminal, erect or slightly pendulous, globose, 3–4 cm in diam.; involucler bracts 2- or 3-layered, narrowly ovate to ovate-lanceolate, 12–18 × 5–7 mm, pilose, margin ciliate, apex acute; bracts linear-oblanceolate, 1–1.2 cm, base clawed, densely white villous, midvein conspicuous; involuclers tubular,

4–5 × ca. 1.5 mm, outside white hirsute, attenuate toward base, sinuate-dentate, apex slightly spreading. Calyx segmented to base into 20 soft pinnate hairs. Corolla yellowish white to pale purple, tubular-funnelform, 1–1.2 cm, outside rather densely villous, shallowly 5-lobed; lobes obtuse, ca. 3.5 mm. Stamens 4; anthers dark purple, ca. 3 mm. Ovary enveloped in involucler; style ca. 1.5 cm, strongly exerted; stigma pale brown, compressed globose. Achenes pale brown, obovoid, 3–5 mm, longitudinally 8-ribbed, sparsely adpressed hairy; pinnate hairs of persistent calyx ca. 1 cm, white. Fl. and fr. Jul–Oct.

Grassy slopes, meadows, by fields; 1800–4800 m. S Qinghai, W Sichuan, Xizang, N Yunnan [Bhutan, India, Nepal].

2. *Pterocephalus bretschneideri* (Batalin) Pritzl ex Diels, Bot. Jahrb. Syst. 29: 601. 1901.

裂叶翼首花 lie ye yi shou hua

Scabiosa bretschneideri Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 184. 1895; *Pterocephalodes bretschneideri* (Batalin) V. Mayer & Ehrendorfer.

Herbs, perennial, 8–40 cm tall. Taproots columnar, 3–20 mm in diam. Leaves basal, rosulate; petiole 3–10 cm; leaf blade

oblong to oblanceolate, 5–20 cm, pinnatifid to bipinnatisect; segments linear, both surfaces glabrous or puberulent. Scapes white puberulent, more densely so near inflorescence. Capitula solitary, terminal, oblate, 2.5–3 cm in diam.; involucre bracts 2-layered, 10–14, broadly linear, outside white puberulent; receptacles disklike, densely white hairy; bracts brown, linear-lanceolate, 4–6 mm, pubescent, apex acuminate; involucels ellipsoid-obovoid, 4–5 mm, 8-ribbed, densely white hirsute, membranous at apex, dentate. Calyx segmented into 8 brown setae, setae 1–1.2 cm, hispidulous above. Corolla pale rose to

purple-red, tubular, 12–15 mm; tube 7–10 mm, densely white villous; limb with 4 obtuse lobes, slightly 2-lipped; upper lip slightly larger, ca. 2.5 mm; 3 lobes of lower lip ca. 2 mm, with several brown veins. Stamens 4, inserted at upper part of corolla; filaments ca. 5 mm, obviously exerted. Stigma capitate. Achenes ellipsoid, ca. 4 mm, apex tapering into a rostrum, 8-veined, sparsely villous; persistent calyx 8-setose. Fl. Jul–Aug, fr. Sep–Oct.

• Mountainous rocky crevices, grassy slopes in forests; 1600–3400 m. W Sichuan, SE Xizang (Nangxian), N Yunnan.

3. SCABIOSA Linnaeus, Sp. Pl. 1: 98. 1753.

藍盆花屬 lan pen hua shu

Asterocephalus Zinn.

Herbs, biennial or perennial, sometimes subshrubs due to lignification at base, rarely annual. Leaves opposite; cauline leaves amplexicaul; leaf blade pinnatipartite or pinnatisect, rarely entire. Capitula terminal, oblate-globose, ovoid, or ovoid-conical, long pedunculate; involucre bracts leaflike, in 1 or 2 series; receptacles conical to semiglobose, sometimes columnar; bracts linear-lanceolate, 1-veined, back often carinate; involucel (epicalyx) 1, broadly funnelform or angular-columnar, 8-ribbed in fruit, furrowed in entire length, or furrowed only above and rounded at base, often fissured into 2–8 pits apically, top becoming a membranous, campanulate or rotate crown, 16–30-veined, margin dentate. Calyx stalked, disklike, 5-segmented into radial setae. Corolla usually dimorphic, tubular, blue, purple, purple-red, yellow, or white, 4- or 5-lobed; that of marginal ray flowers usually larger, 2-lipped; upper lip usually 2-lobed, shorter; lower lip 3-lobed, elongated and raylike; that of central flowers usually tubular; lobes subequal in length. Stamens 4, exerted. Ovary enveloped in involucels; style slender; stigma peltate or capitate. Achenes enveloped in involucels, crowned with persistent setose calyx. Seeds with a large, straight embryo and scanty endosperm.

About 100 species: S and W Africa, Asia, Europe, mainly in the Mediterranean; six species (one endemic) in China.

- 1a. Annuals; capitula ca. 5 mm in diam. at anthesis; calyx setae up to 1 cm 3. *S. olivieri*
 1b. Perennials; capitula over 30 mm in diam. at anthesis; calyx setae shorter.
 2a. Involucels subcylindrical, not angular below, furrowed or pitted above.
 3a. Basal leaf blades lanceolate or elliptic, entire 1. *S. alpestris*
 3b. Basal leaf blades pinnatifid; leaf segments 1.5–3 mm wide 2. *S. austroaltaica*
 2b. Involucels 8-ribbed, or with 4 obvious and 4 obscure ribs.
 4a. Corolla yellow; involucels obviously 8-ribbed 4. *S. ochroleuca*
 4b. Corolla blue or purple; involucels 8-ribbed, but only 4 ribs marked, while others obscure.
 5a. Leaves pinnatifid to pinnatisect; segments linear or lanceolate 5. *S. comosa*
 5b. Leaves linear-lanceolate, margins serrate or lacerate 6. *S. lacerifolia*

1. *Scabiosa alpestris* Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 536. 1842.

高山藍盆花 gao shan lan pen hua

Trochocephalus alpestris (Karelin & Kirilov) A. Löve & D. Löve.

Herbs, perennial. Caudexes lignified, 2–5-branched, outside brown-black. Stems 20–50 cm tall, nodes 2–4, usually pubescent, occasionally glabrous. Basal leaves and first pair of lower cauline leaves petiolate; petioles 5–7 cm; leaf blade lanceolate, 5–8 × 0.5–1.1 cm, glabrous or sparsely puberulent, base attenuate into petiole, margin usually entire, ciliate, hairs white, apex acuminate. Cauline leaves in 1–3 pairs, second and third pairs pinnatisect; lateral segments linear-lanceolate; terminal lobe larger, lanceolate, 4–7 × 0.6–0.8 cm; all segments pubescent below, margins ciliate. Peduncles ca. 10 cm; capitula 3–6 cm in diam. at anthesis, globose and ca. 3 cm in diam. in fruit; involucre bracts linear-lanceolate, 1.2–1.5 cm, densely white hirsute; involucels 8–10 mm, rounded and sparsely white pilose

below, with 8 pits above, crown membranous, 5–6 mm, 16–18-veined, margin sinuous-dentate. Calyx 5-setose, setae brown, radial, 1–3 mm, longer than crown. Corolla pale purple or purple-red, outside lanate; limb ± lipped, 5-lobed; lobes unequal in size. Anthers yellow. Style purple-red; stigma capitate, exerted. Fl. May–Aug, fr. Aug–Sep.

Alpine meadows; 3000–3200 m. Xinjiang (Huocheng, Wuqia, Zhaosu) [Kazakhstan, Kyrgyzstan].

2. *Scabiosa austroaltaica* Bobrov in Schischkin & Bobrov, Fl. URSS 24: 457. 1957 [*“austro-altaica”*].

阿尔泰藍盆花 a er tai lan pen hua

Lomelosia austroaltaica (Bobrov) Soják; *Scabiosa xinjiangensis* Y. K. Yang, G. J. Liu & J. K. Wu.

Subshrubs, 20–60 cm tall. Caudexes robust, lignified, several branched. Stems erect, nodes 1–4, densely puberulent. Leaves mostly basal; basal leaves petiolate; petiole 1–2.5 cm; leaf blade oblong, 3–10 × 0.7–3 cm, pinnatifid; segments linear-

lanceolate, incised, pubescent. Cauline leaves smaller, 2- or 3-paired, sessile, sparsely puberulent, \pm setose at axils of veins, pinnatisect; segments lanceolate, $5-20 \times 1.5-3$ mm. Capitula 2–3 cm in diam. at anthesis, globose and $1.5-2$ cm in diam. in fruit; involucre bracts narrowly ovate, $1/3-1/2$ as long as marginal ray flowers, sparsely puberulent, apex acuminate; bracts linear-lanceolate, upper $1/3$ carinate, lower part linear, sparsely villous; involucels $3-4$ mm, above with 8 pits, base densely white hirsute, crown $2-3$ mm wide. Calyx 5-setose. Corolla blue-purple, outside adpressed puberulent. Fl. Jun–Jul, fr. Aug.

Grassy slopes; ca. 1200 m. Xinjiang [E Kazakhstan].

3. *Scabiosa olivieri* Coulter, Mém. Dipsac. 36. 1823.

小花蓝盆花 xiao hua lan pen hua

Lomelosia olivieri (Coulter) Greuter & Burdet; *Scabiosa olivieri* var. *longinvolucra* Y. K. Yang, N. R. Cui & Y. Hazit; *Trochocephalus olivieri* (Coulter) A. Löve & D. Löve.

Herbs, annual, 10–38 cm tall. Taproots solitary, 40–50 \times 3–4 mm. Stems terete, slender, branched from base and dichotomous from lower middle part, white puberulent. Leaves opposite, sessile; leaf blade oblong or linear-lanceolate, $20-50 \times 3-10$ mm, both surfaces densely villous, margin often entire, not segmented, or with 1 or 2 pairs of leaflets, sometimes pinnatifid. Peduncles 3–10 cm, slender, sparsely villous; capitula globose, 3–5 mm in diam. at anthesis, flowers 5–15, strongly dimorphic; involucre bracts 3–5, oblong-ovate or ovate-orbicular, $2-3 \times 1.5-2$ mm, shorter than flowers, rather densely villous, apex acuminate; involucels broadly funnelform, ca. 2 mm, base white hispidulous, upper half 8-pitted; crown spreading, 3–6 mm wide, membranous, with 20–24 ribs, outside sparsely villous along ribs. Calyx radially 5-setose, shortly stalked, brown, setae sometimes to 1 cm, $4-5 \times$ as long as involucel crown. Corolla pale purple or white, outside puberulent. Achenes white hairy. Fl. May–Jun, fr. Jun–Jul. $2n = 18$.

Sandy places, deserts of plains. N Xinjiang (Manas He basin, Ürümqi) [from E Mediterranean to C Asia and India].

4. *Scabiosa ochroleuca* Linnaeus, Sp. Pl. 1: 101. 1753.

黄盆花 huang pen hua

Herbs, perennial. Caudexes columnar, often multi-branched, brown. Stems caespitose or solitary, erect, 25–80 cm tall, shallowly furrowed, white villous above. Basal leaves petiolate; petiole 1–5 cm; leaf blade pinnatifid, 5–10 cm, with 2–4 pairs of segments, or undivided. Cauline leaves 2–5-paired, subsessile or shortly petiolate; leaf blade 4–10 cm, abaxially densely pubescent, adaxially white villous, pinnatifid to pinnatisect or bipinnatisect, segments unequal in length; ultimate segments lanceolate or linear-lanceolate, $1.5-2$ mm wide, 1-veined, apex acuminate. Peduncles 18–30 cm, white villous; capitula solitary, terminal, oblate-spheroidal, $2-2.5$ cm in diam. at anthesis, becoming oblong, ca. 1.5 cm in fruit; involucre bracts linear-lanceolate, both surfaces sparsely pubescent, apex acuminate; bracts oblanceolate, sparsely puberulent, apex acute; involucels funnelform, 3–4 mm, 8-ribbed and 8-furrowed, sparsely white villous on ribs and sparsely puberulent in furrows, crown $1.5-2$ mm wide, outside sparsely puberulent, edges

dentate. Calyx lobes 5, brown-yellow, ca. 4 mm, setose. Corolla yellow or white, 7–10 mm; marginal ray flowers subequal to central ones in size. Corolla tube 6–7 mm, outside densely white villous; lobes 5, unequal in size, middle one of lower lip to 3 mm, others $1.5-2 \times$ ca. 1.5 mm. Stamens 4, inserted at middle part of corolla tube, exerted. Achenes yellowish, ellipsoid, ca. 2.5 mm, setae up to 7 mm; receptacles visible after achenes shed, fusiform, $10-15 \times$ ca. 4 mm, densely puberulent. Fl. Jul–Aug, fr. Aug–Sep. $2n = 16$.

Meadows, grasslands, grassy slopes: 1300–2200 m. NW Xinjiang [Kazakhstan, Mongolia, Russia (Siberia); C Europe].

5. *Scabiosa comosa* Fischer ex Roemer & Schultes, Syst. Veg. 3: 84. 1818.

蓝盆花 lan pen hua

Scabiosa austromongolica Hurusawa; *S. comosa* var. *lachnophylla* (Kitagawa) Kitagawa; *S. fischeri* A. Candolle; *S. fischeri* f. *brevisetata* Handel-Mazzetti; *S. hairalensis* Nakai; *S. henanensis* Y. K. Yang & J. K. Wu; *S. hopeiensis* Nakai; *S. japonica* Miquel var. *acutiloba* H. Hara; *S. japonica* subsp. *tshiliensis* (Grüning) Hurusawa; *S. japonica* var. *tshiliensis* (Grüning) Hurusawa; *S. lachnophylla* Kitagawa; *S. liaoningensis* Y. K. Yang & J. K. Wu; *S. mansenensis* Nakai; *S. superba* Grüning; *S. superba* f. *elatior* Grüning; *S. superba* f. *nana* Grüning; *S. togashiana* Hurusawa; *S. tshiliensis* Grüning; *S. tshiliensis* var. *brevisetata* Hurusawa; *S. tshiliensis* var. *longisetata* Hurusawa; *S. tshiliensis* var. *superba* (Grüning) S. Y. He; *Trochocephalus comosus* (Fischer ex Roemer & Schultes) A. Löve & D. Löve.

Herbs, perennial, 30–80 cm tall. Roots simple or 2- or 3-branched, $12-25 \times 0.3-0.5$ cm. Stems erect, angular, internodes 6–12 cm, with adpressed, white puberulent hairs, more densely so at base and below inflorescences. Basal leaves rosulate, petiolate; petiole 3–10 cm; leaf blade narrowly elliptic to oblong, $6-10 \times 1-2$ cm, both surfaces sparsely white pubescent, pinnatisect, rarely dentate-lobed; segments linear, 1–1.5 mm wide, often wilted at anthesis. Cauline leaves opposite, amplexicaul, forming a short sheath, sessile or with petiole 1–1.2 cm; leaf blade oblong, $8-15 \times 4-5$ cm, pinnatisect or bipinnatisect; segments linear, 1–4 mm wide, both surfaces glabrous or sparsely white puberulent, apex acuminate. Peduncles 10–25 cm, tomentulose, hairs white; capitula 1 or 3, oblate-globose, $2.5-4(-7)$ cm in diam. at anthesis, globose and 1–1.5 cm in diam. in fruit; involucre bracts 6–14, lanceolate, $10-12(-28) \times 1-3$ mm, glabrous or sparsely pubescent; involucels yellowish, obconical, $2.5-5$ mm (excluding crown), ca. 1.7 mm wide, 8-ribbed, but only 4 marked, ribs densely white hirsute, with 8 pits at apex, crown ca. 1.2 mm, 18–20-veined, densely white villous on veins, edges dentate. Calyx 5-divided; segments needlelike, $2.5-3$ mm, sparsely hispidulous. Corolla pale blue or light purple, outside densely puberulent, those of central flowers tubular, 4–10 mm; limb 5-lobed; lobes equal in length; those of marginal ray flowers 2-lipped, to 2 cm; upper lip 2-lobed; lower lip 3-lobed, longer; middle lobe up to 1 cm. Style ca. 1 cm, exerted; stigma capitate. Achenes oblong, with 5 brown veins and persistent calyx setae. Fl. Jul–Aug, fr. Sep. $2n = 16, 18$.

Sandy dunes, dry mountain slopes, steppes; 300–1600(–3000) m. E Gansu, Hebei, W Henan, Heilongjiang, Jilin, Liaoning, Nei Mongol,

S Ningxia (Guyuan), N Shaanxi, Shanxi [Korea, Mongolia, Russia (Far East, Siberia)].

6. *Scabiosa lacerifolia* Hayata, Bot. Mag. (Tokyo) 20: 16. 1906.

台湾蓝盆花 tai wan lan pen hua

Herbs, perennial, glabrous or puberulent. Stems erect, 10–20 cm tall, sparsely branched. Leaves sessile, semiamplexicaul; leaf blade linear-lanceolate, pinnatisect or lacerate, segments irregularly dentate; basal leaves 5–12 × 5–6 cm. Cauline leaves opposite, 4–5 cm, apex acute. Peduncles 5–6 cm or even

longer; capitula terminal, oblate-globose, 3.5–4 cm in diam.; involucre bracts 3-whorled, lanceolate; outermost ones ca. 1.5 cm; inner ones shorter; bracts spatulate, ca. 5 mm; involucels 4-ribbed, with 8 pits at apex, crown membranous, 4-lobed; lobes obtuse. Calyx 5-setose, radial. Corolla blue-purple; marginal ray flowers usually larger, corolla ca. 1.8 cm, 5-lobed, 2-lipped. Stamens 4, all fertile. Style filiform. Achenes surrounded by involucels, and crowned with persistent involucels and calyx setae, obovoid, 3–3.5 mm; setae ca. 1 mm.

- Grassy slopes, rocky ridges; 2000–3600 m. Taiwan.

4. DIPSACUS Linnaeus, Sp. Pl. 1: 97. 1753.

川续断属 chuan xu duan shu

Herbs, biennial or perennial. Stems erect, angulate and sulcate, usually echinulate or hispid along ridges. Basal leaves long petiolate, entire, 3-cleft, or pinnatifid, usually dentate or lobed. Cauline leaves opposite, sessile or petiolate, usually 3–5-lobed, sometimes pinnatifid or entire, both surfaces usually hispid, but glabrous or papillate-echinulate in some species. Capitula terminal, oblong, globose, or ovoid-globose; involucre bracts erect or spreading, leaflike, 1- or 2-layered, rostrate; involucels 4–8-ribbed, adnate to ovary; flowers bisexual. Calyx actinomorphic, shallowly disciform, 4-lobed, white pubescent. Corolla tubular, 4-lobed; lobes unequal in size. Stamens 4, inserted at corolla tube, alternate with corolla lobes. Gynoecium of 2 carpels; ovary inferior, enveloped by involucel; ovule solitary, pendulous, anatropous; style filiform; stigma oblique or lateral. Achenes surmounted with persistent calyx, enveloped by leathery involucel. Seed coat membranous; embryo imbedded in endosperm.

About 20 species: N Africa, Asia, Europe; seven species (two endemic) in China.

- 1a. Stems glabrous; bract rostra 1.5–3 mm 1. *D. azureus*
 1b. Stems ± spiny; bract rostra 3–11 mm.
 2a. Heads oblong-spherical, 2.5–7 × 2–4.9 cm; bract rostra 5–11 mm; corolla tube 3.5–5 mm.
 3a. Corolla black-purple, tube ca. 3.5 mm; bract rostra ca. 5 mm 4. *D. atratus*
 3b. Corolla white or yellowish, tube 3.5–5 mm; bract rostra 5–11 mm.
 4a. Segments of cauline leaves 1–3-paired; heads 2–3.5 cm in diam.; leaves glabrous abaxially 2. *D. inermis*
 4b. Segments of cauline leaves more than 3-paired; heads usually 3.5–4.9 cm in diam.; leaves spiny abaxially 3. *D. chinensis*
 2b. Heads spherical, 1.5–3 × 1.5–3.2 cm; bract rostra 3–5 mm; corolla tube 2–2.5 mm.
 5a. Corolla black-purple 6. *D. atropurpureus*
 5b. Corolla white, yellow, or pink.
 6a. Corolla white or yellow; plant perennial; roots fleshy and fusiform 5. *D. asper*
 6b. Corolla pink; plant biennial; roots ± lignified, not fleshy 7. *D. japonicus*

1. *Dipsacus azureus* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 53. 1841.

天蓝续断 tian lan xu duan

Cephalaria beijiangensis Y. K. Yang, J. K. Wu & A. Sayit; *C. dipsacoides* Karelina & Kirilov; *Dipsacus dipsacoides* (Karelina & Kirilov) V. I. Bochantsev; *D. xinjiangensis* Y. K. Yang, J. K. Wu & T. Abdulla.

Herbs, perennial, 0.6–1.5 m tall. Stems glabrous, nearly spineless. Basal leaves long petiolate, undivided; cauline leaves opposite, ca. 6-paired, glabrous, sessile or petiole up to 10 cm; leaf blade 6–26 × 3–10 cm, pinnatifid to pinnatisect; terminal segment lanceolate, margin coarsely serrate; lateral segments 4–7-paired, lanceolate to elliptic, 1.2–7 × 1–3 mm. Heads 3 or 4, subspherical; terminal one 2–2.5 × 3–4.5 cm; peduncles 30–60 cm, glabrous or pubescent above; involucre bracts 2-layered; 5 or 6 in outer layer, ovate; 7–9 in inner layer, elliptic or lanceolate; bracts obovate-lanceolate or oblanceolate, 5–14 × 4–5 mm, rostra 1.5–3 mm; involucels 4-ribbed, 3–4 mm. Calyx disciform, 0.5–1 mm; lobes irregular. Corolla purple-blue, funnel-

form, 8–15 mm, outside villous; lobes elliptic or oblong, 3–4 × 1.5–2.5 mm. Stamens exerted. Style strongly exerted; stigma clavate. Achenes 4-angular, ca. 3.5 mm, totally enveloped in involucel. Fl. and fr. Aug–Sep.

1900–2000 m. Xinjiang (Huocheng, Tekes) [Kazakhstan, Kyrgyzstan].

2. *Dipsacus inermis* Wallich, Fl. Ind. 1: 367. 1820.

藏续断 zang xu duan

Cephalaria cachemirica Decaisne; *Dipsacus inermis* var. *mitis* (D. Don) Y. Nasir; *D. mitis* D. Don; *D. strictus* D. Don; *Virga inermis* (Wallich) Holub.

Herbs, perennial, 0.5–2 m tall. Taproots clavate, up to 3.5 cm in diam. Stems branched, usually 6-ridged, ridges sparsely spiny. Basal leaves rosulate, often wilted at anthesis, long petiolate; leaf blade elliptic, 5–13 × ca. 3.5 cm, undivided, margin serrate, or 3- or 5-segmented; terminal segment much larger; cauline leaves subsessile or with petiole up to 7 cm; leaf blade

broadly lanceolate, 10–22 × 3.5–7 cm, trifid or pinnatifid; lateral segments in 2 or 3 pairs; terminal segment larger, ovate, all segments yellowish hirsute on both surfaces, margins serrate. Capitula 1 or 3, 2–3.5 cm in diam. at anthesis and in fruit; peduncles up to 40 cm; involucre bracts linear, white hirsute; bracts lanceolate or obovate-lanceolate, 14–20 mm at anthesis, rostrum 5–9 mm, setose and hirsute; involucels ovoid-columnar, 5–8 mm. Corolla white or yellowish, funnelliform, 11–15 mm; tube 3.5–4 mm; lobes unequal. Stamens exserted. Style strongly exserted. Achenes narrowly ellipsoid, ca. 4.5 × 1.5 mm, 4-angular, glabrous. Fl. Jul–Aug, fr. Aug–Oct.

Forests, grassy slopes, by streams; 2100–3900 m. Xizang (Nyalam), Yunnan [Afghanistan, Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan].

3. *Dipsacus chinensis* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 377. 1894.

大头续断 da tou xu duan

Dipsacus lijiangensis Ai & H. B. Chen [*“lijiangensis”*].

Herbs, perennial, up to 2 m tall. Taproots robust, up to 2 cm in diam. Stems branched, 8-ridged, ridges sparsely spiny. Cauline leaves opposite, lowermost leaves with petiole up to 5 cm, uppermost leaves subsessile; leaf blade broadly lanceolate, up to 25 × 7 cm, lyrate; terminal segment much larger than lateral ones; lateral segments 3–8-paired, both surfaces setose. Heads solitary or 3, globose or oblong, 3.5–4.9 cm in diam.; peduncles up to 25 cm; involucre bracts linear, setose; bracts lanceolate or obovate-lanceolate, 14–15 mm, rostrum 5–11 mm, spiny and pilose; involucels ovoid-columnar, 5–8 mm. Corolla 9–14 mm; tube 3.5–5 mm; lobes unequal. Stamens exserted. Style exserted. Achenes cuneate, 4-angular, ca. 6 × 1.5 mm, densely pubescent, apex exposed. Fl. Jul–Aug, fr. Sep–Oct.

• Forests, grassy slopes, by streams; 2100–3900 m. W Sichuan, SE Xizang, NW Yunnan (Dèqǎn, Lijiang, Zhongdian).

4. *Dipsacus atratus* J. D. Hooker & Thomson ex C. B. Clarke, Fl. Brit. India 3: 218. 1881.

紫花续断 zi hua xu duan

Virga atrata (J. D. Hooker & Thomson ex C. B. Clarke) Holub.

Herbs, perennial, ca. 1 m tall. Stems branched, ridged, retrorsely spiny, up to 1 cm in diam. Basal leaves and lower cauline leaves wilted at anthesis; upper cauline leaves sessile, 10–15 × 4–5 cm, both surfaces hispid, pinnatisect; terminal segment much larger than lateral ones, elliptic, apex acuminate; lateral segments 2–4-paired; all segments large serrate on margins. Heads globose, 3–3.5 cm at anthesis; peduncles to 40 cm; involucre bracts 5 or 6, ovate-elliptic, undivided, abaxially hirsute; bracts obovate, 9–11 mm; rostrum triangular, ca. 5 mm; base ca. 2 mm wide, spiny-hirsute on 2 lateral sides; involucels ca. 3 mm, glabrous, 4-ribbed and 4-dentate, with 4 minute teeth and 4 obscure ribs between large teeth and ribs. Calyx shallowly cup-shaped, 4-lobed, ca. 1 mm, edges spiny-hirsute. Corolla black-purple, funnelliform, ca. 1.1 cm, base narrowly tubular, ca. 3.5 mm. Stamens exserted. Fl. Sep.

Forests on southern slopes; ca. 3600 m. S Xizang (Cona) [Bhutan, N India, Nepal].

5. *Dipsacus asper* Wallich ex C. B. Clarke, Fl. Brit. India 3: 218. 1881.

川续断 chuan xu duan

Dipsacus asperoides C. Y. Cheng & Ai; *D. asperoides* var. *emeiensis* Z. T. Yin; *D. cyanocapitatus* C. Y. Cheng & Ai; *D. daliensis* Ai; *D. daliensis* var. *multifidus* H. B. Chen; *D. enshiensis* C. Y. Cheng & Ai; *D. kangdingensis* Ai & F. X. Feng; *D. simaoensis* Y. Y. Qian; *D. yulongensis* Ai & L. J. Yang.

Herbs, perennial, up to 2 m tall. Taproots simple or branched, fusiform, up to 1.2 cm in diam., fleshy. Stems erect, branched, 4–8-ridged, ridges sparsely covered with retrorse spines. Basal leaves rosulate; petiole up to 25 cm; leaf blade pinnatisect, rarely entire, 15–25 × 5–20 cm, adaxially white setose, or papillate-setose, abaxially densely setose along veins; segments 5–9; terminal segment largest, up to 15 × 9 cm; lateral ones usually obovate or spatulate; lower cauline leaves similarly long petiolate, leaf blade entire, but mostly pinnatifid, with 5–9 segments; terminal segment lanceolate, up to 11 × 5 cm, margin sparsely large serrate, apex acuminate; upper cauline leaves shorter petiolate, lanceolate, undivided or 3-segmented. Heads globose, 1.5–3.2 cm in diam.; peduncles up to 50 cm; involucre bracts 5–7, leaflike, lanceolate or linear, hispid; bracts obovate, 7–11 mm, hispidulous, rostrate, rostrum 3–5 mm, setose; involucels 4-ribbed, obovoid-columnar, 5–8 mm, white puberulent, apex 8-dentate. Calyx 4-ribbed, disk-shaped, ca. 1 mm, undivided or 4-lobed, outside hispidulous. Corolla yellowish or white, funnelliform, 9–11 mm; tube ca. 2.5 mm; lobes unequal, outside puberulent. Stamens exserted; anthers purple. Achenes obovoid-columnar, ca. 4 mm. Fl. Jul–Sep, fr. Sep–Nov. $2n = 18$.

Margins of forests, thickets, among herbs, by streams, roadsides; 1500–3700 m. Chongqing, N Guangdong (Lianxian), N and W Guangxi (Longsheng, Napo, Xing'an), Guizhou, W Hubei (Xingshan), Sichuan, S Xizang (Cona, Nyalam), Yunnan [India, Myanmar].

6. *Dipsacus atropurpureus* C. Y. Cheng & Z. T. Yin, Acta Phytotax. Sin. 23: 302. 1985.

深紫续断 shen zi xu duan

Dipsacus fulingensis C. Y. Cheng & Ai.

Herbs, perennial, 1–1.8 m tall. Taproots columnar, slightly fleshy. Stems erect, 6–8-ridged, ridges sparsely covered with retrorse spines. Basal leaves rosulate; petiole up to 30 cm; leaf blade broadly lanceolate, 10–18 × 6–12 cm, pinnatifid or pinnatisect; segments 5–7; terminal segment larger, oblong or broadly ovate, 6–12 × 4–8 cm; lateral ones smaller downward, lanceolate to ovate; all segments abaxially glabrous, adaxially puberulent or glabrous. Lower and middle cauline leaves shorter petiolate; leaf blade pinnatisect; terminal segment larger; lateral segments 2- or 3-paired, ovate to lanceolate; upper cauline leaves undivided or 3-segmented, segments lanceolate, both surfaces glabrous, sometimes adaxially sparsely white puberulent, margins entire. Heads globose, 2–2.5 cm in diam.; peduncles up to 30 cm; involucre bracts 7 or 8, leaflike, lanceolate,

white puberulent; bracts oblong-obovate, 6–8 mm, rostrum 1–3 mm, glabrous, sparsely setose, or villous basally; involuclers obovoid-columnar; limb 4-lobed; lobes acute at apex. Calyx disk-shaped, 4-angular, outside glabrous, inside and apex villous. Corolla black-purple; tube 6–7 mm, base narrowly tubular, 1–1.5 mm; limb with one larger lobe. Stamens strongly exserted. Achenes pale brown, 2.5–4 mm, 4-angular, cuneate. Fl. Jul–Sep, fr. Sep–Nov.

• Among herbs by streams, grassy slopes by fields. Chongqing (Fuling, Nanchuan, Qianjiang).

Dipsacus atropurpureus differs from *D. asper* only in having a black-purple corolla (vs. yellowish or white) and a shorter rostrum (1–2 vs. 3–5 mm). Although accepted as separate species here, the two may be conspecific. Field observations and population sampling are needed to clarify this issue.

7. *Dipsacus japonicus* Miquel, Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch., ser. 2, 2: 83. 1868.

日本续断 ri ben xu duan

Dipsacus lushanensis C. Y. Cheng & Ai; *D. tianmuensis* C. Y. Cheng & Z. T. Yin.

Herbs, biennial or perennial?, up to 1.5 m tall. Roots not fleshy. Stems often branched, 4–6-ridged, with retrorse spines on ridges. Basal leaves rosulate, long petiolate; leaf blade narrowly elliptic, pinnatisect or undivided. Cauline leaves opposite, long petiolate to subsessile; leaf blade elliptic-ovate to elliptic, 8–25 × 3–10 cm, abaxially spiny-hispid, adaxially hispidulous, pinnatisect or pinnatifid, rarely undivided; segments 2- or 3-paired; terminal lobe much larger. Capitula terminal, globose, 1.5–3.2 cm at anthesis and in fruit; involucler bracts linear, spiny-hispid; bracts obovate, 9–11 × 4–5 mm, hispidulous, rostrum 3–5 mm, lateral sides spiny-hispid; involuclers 4-ribbed, 5–6 mm, white villous, 8-dentate at apex. Calyx cup-shaped, ca. 1 mm, 4-lobed, white villous. Corolla pink, purple-red, or purplish, 5–8 mm, outside villous. Stamens slightly exserted. Achenes oblong-cuneate, 4-angular, ca. 6 mm, glabrous. Fl. Aug–Sep, fr. Sep–Nov.

Grassy slopes, roadsides; below 2600 m. Anhui (Qingyang, Shucheng), Chongqing (Chengkou, Wushan, Wuxi), E Gansu (Pingliang, Yuzhong), Hebei, Henan, Hubei (Xianfeng), Hunan (Cili), Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, N Sichuan (Barkam, Songpan), W Zhejiang [Japan, Korea].