

MORINACEAE

刺参科 ci shen ke

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Herbs, perennial, caudexes usually covered with remnants of old leaf bases. Leaves opposite or verticillate; petioles often amplexicaul at base, forming a sheath. Flowers hermaphroditic, zygomorphic, in verticillasters or subcapitate to capitate heads. Involucel (epicalyx) of 4 fused bracteoles, with several to numerous spiny teeth or setae, 12-veined. Calyx fissured along ventral side, or 2-lipped. Corolla tubular; limb 5-lobed, scarcely to markedly 2-lipped. Stamens 4, all fertile, or 2 fertile plus 2 staminodes; anthers introrse, 2-celled, opening longitudinally. Ovary of 3 carpels, inferior, 1-locular, 6-veined, adnate to calyx tube; style 1, slender; stigma simple; ovules solitary, pendulous. Fruit an achene, enclosed in involucel and surmounted with persistent calyx.

Two genera and ca. 13 species: SE Europe to the Himalaya and SW China; two genera and ten species (four endemic) in China.

Hsing Chi-hua. 1986. *Morina*. In: Lu An-ming & Chen Shu-kun, eds., Fl. Reipubl. Popularis Sin. 73(1): 48–56.

- 1a. Fertile stamens 4; calyx limb oblique; fertile stems always coming from below rosettes; plants not thistlelike 1. *Acanthocalyx*
- 1b. Fertile stamens 2; calyx limb 2-lipped; fertile stems not from below rosettes; plants thistlelike 2. *Morina*

1. ACANTHOCALYX (Candolle) Tieghem, Ann. Sci. Nat., Bot., sér. 9, 10: 199. 1909.

刺续断属 ci xu duan shu

Morina sect. *Acanthocalyx* Candolle, Prodr. 4: 645. 1830.

Taproots fleshy, branching. Caudexes short, woody, often covered with remnants of old leaf bases. Flowering stems emerging below rosettes, usually with 2 bilateral lines of hairs on internodes. Cauline leaves opposite; petioles joined, forming a sheath. Inflorescences subcapitate, often with 1 or more whorls of flowers below primary head; involucral bracts free, connate or sheathing at base; flowers sessile; involucels campanulate, very fragile and papery at anthesis, enlarging and becoming ± leathery in fruit, persistent, with several to numerous teeth. Calyx tubular, oblique at mouth, with a ventral fissure, often with 2 lateral and 3 posterior subspinose teeth. Corolla tubular, somewhat swollen below limb, with 2 posterior and 3 anterior spreading lobes. Stamens 4, ± equal, inserted just below swollen part of corolla tube. Style equal to or exceeding corolla tube in length; stigma disk-shaped; ovary 1-loculed; ovule pendulous. Achenes smooth or rugose, apex somewhat cup-shaped.

Two species: Himalaya and the Hengduan Mountains; two species in China.

- 1a. Corolla pink or purple; leaf blade elliptic, lanceolate, or linear-lanceolate; calyx 7–15 mm 1. *A. nepalensis*
- 1b. Corolla white or yellowish white; leaf blade linear or linear-lanceolate; calyx 4–7 mm 2. *A. alba*

1. *Acanthocalyx nepalensis* (D. Don) M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 12. 1984.

刺续断 ci xu duan

Fertile stems 1–3, 10–50 cm tall, sparsely pubescent above. Rosulate leaves lanceolate or linear-lanceolate, less frequently linear, 10–25 × 0.5–2.6 cm, both surfaces glabrous, base attenuate, sheathing, margins usually setose or spinose, apex acute to acuminate. Cauline leaves 2–4-paired, elliptic to linear-lanceolate, reduced above; lowermost pair often reduced, subovate or spatulate, spineless; uppermost pair densely spiny at base, overlapping but not sheathing. Inflorescence capitate, sometimes with 1 or 2 separate clusters of flowers below primary head; involucral bracts ovate, spinose, concave or folded; involucels sessile, tubular-campanulate, 8–10 mm, outside sparsely villous, apex truncate, villous, with 15 or more irregular spines. Calyx tubular, green below, purple above, or entirely purple, 7–15 mm; tube ca. 1/2 as long as total length of calyx; fissure large, edges villous and dentate-spiny; spines usually 5, irregularly arranged. Corolla pink or purple, slightly zygomorphic,

straight or slightly curved; tube 10–25 × 1.5–3 mm, villous; lobes 5, obcordate, 3–4 mm. Stamens 4, included; filaments sparsely villous, inserted at corolla throat. Style longer than stamens. Achenes columnar, 4–6 mm, glabrous or puberulent. Fl. Jun–Aug, fr. Jul–Sep.

Grassy slopes, alpine meadows; 2800–4200 m. W Sichuan, S and SE Xizang, N Yunnan [Bhutan, N India, Nepal].

- 1a. Ovary and achene usually glabrous 1a. subsp. *nepalensis*
- 1b. Ovary and achene usually puberulent 1b. subsp. *delavayi*

1a. *Acanthocalyx nepalensis* subsp. *nepalensis*

刺续断(原亚种) ci xu duan (yuan ya zhong)

Morina nepalensis D. Don, Prodr. Fl. Nepal. 161. 1825; *M. betonicoides* Benthams; *M. nana* Wallich ex Benthams.

Ovary and achene usually glabrous.

Grassy slopes; 2800–4200 m. S Xizang [Bhutan, N India, Nepal].

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1b. *Acanthocalyx nepalensis* subsp. *delavayi* (Franchet) D. Y. Hong, *Novon* 20: 418. 2010.

大花刺参 da hua ci shen

Morina delavayi Franchet, *Bull. Soc. Bot. France* 32: 8. 1885; *Acanthocalyx delavayi* (Franchet) M. J. Cannon; *Barleria crotalaria* H. Léveillé; *M. bulleyana* Forrest & Diels; *M. nepalensis* subsp. *delavayi* (Franchet) D. Y. Hong & L. M. Ma; *M. nepalensis* var. *delavayi* (Franchet) C. H. Hsing.

Ovary and achene usually puberulent.

Alpine meadows; 3000–4200 m. W Sichuan, SE Xizang, N Yunnan [India (Sikkim)].

2. *Acanthocalyx alba* (Handel-Mazzetti) M. J. Cannon, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 12(1): 14. 1984.

白花刺参断 bai hua ci xu duan

Morina alba Handel-Mazzetti, *Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 62: 68. 1925; *M. leucoblephara* Handel-Mazzetti; *M. nepalensis* D. Don var. *alba* (Handel-Mazzetti) Y. C. Tang ex C. H. Hsing.

Caudex covered with remnants of old leaf bases. Fertile

stems 1–3, 10–40 cm tall. Rosulate leaves linear or linear-lanceolate, 10–20 × 0.5–1 cm, both surfaces glabrous, base attenuate, margins entire. Leaves on flowering stems 2–4-paired, similar to rosulate leaves but shorter; petioles folded, sheathing; lowermost pair often much smaller, subovate, usually spineless, with sheaths nearly as long as or longer than blades; uppermost pair of leaves densely spiny and much broader at base. Inflorescences capitellate, sometimes with 1 or 2 separate flower clusters below primary head; involucre bracts ovate, spinose, concave or folded; involucels sessile, tubular-campanulate, 4–7 mm, apex truncate, villous, with 12–16 irregular spines. Calyx green, tubular, 5–8 mm; tube 1–2.5 mm; limb usually with 2 lateral and 3 posterior teeth, margins villous. Corolla white, yellowish, or yellowish green; tube markedly curved, 12–20 mm, densely puberulent above; limb 5-lobed; lobes obcordate, ca. 3 mm. Filaments inserted at corolla throat. Style longer than stamens. Achenes columnar, 4–6 mm, glabrous to densely puberulent. Fl. Jun–Aug, fr. Jul–Sep.

Subalpine or alpine meadows, forests; 2500–4100 m. SE Gansu (Tao He basin), S Qinghai, W Sichuan, SE Xizang, NW Yunnan [N India].

2. MORINA Linnaeus, *Sp. Pl.* 1: 28. 1753.

刺参属 ci shen shu

Asaphes Sprengel (1827), not Candolle (1825); *Cryptothladia* (Bunge) M. J. Cannon; *Morina* sect. *Cryptothladia* Bunge.

Roots usually thickened, branched. Caudex short, woody, usually covered with remnants of leaf bases. Leaves in whorls of 3 or 4(–6), rarely 2, opposite, linear to oblong-lanceolate, entire to pinnatifid, spinose. Inflorescence of several verticillasters, each subtended by a whorl of leaflike bracts. Flowers sessile or shortly pedicellate, enveloped in an involucel; involucels campanulate, with 8–16 spiny teeth, 2 significantly longer than others. Calyx tube oblique, campanulate; limb 2-lipped, lips 2- or 3-lobed or emarginate. Corolla tube elongate; limb spreading, 2-lipped; upper lip 2-lobed, lower one 3-lobed. Fertile stamens 2, inserted at corolla throat; staminodes 2, at base of corolla tube, cordate. Nectary 1, anterior, at base of corolla tube, 3-lobed. Ovary inferior, 1-loculed, enveloped in an involucel; style usually longer than stamens; stigma disklike; ovule single, pendulous. Achenes rugose, columnar, slightly or markedly obliquely truncate.

About ten species: from the Balkans to C Asia and E Himalaya; eight species (four endemic) in China.

Cannon and Cannon (*Bull. Brit. Mus. (Nat. Hist.), Bot.* 12(1): 1–35. 1984) treated *Cryptothladia* at the rank of genus, separating it from *Morina*. Hong (*Novon* 20: 418–419. 2010) has explained why this taxon would be better merged into the genus *Morina*.

Cannon and Cannon (loc. cit.: 18) stated that *Morina parviflora* Karelin & Kirilov (*Cryptothladia parviflora* (Karelin & Kirilov) M. J. Cannon) occurred on the border of Kazakhstan with China (Dzungarian Alatau). However, we have not seen any specimens that could be identified as this species.

- 1a. Involucral bracts connate, forming shallow cups; involucel teeth much shorter than tube (1/2 or less as long as tube) 6. *M. polyphylla*
- 1b. Involucral bracts free; involucel teeth at least 2/3 as long as tube.
- 2a. Leaves with petioles 4–8 cm; leaf margins spinose, rarely sinuate-dentate.
- 3a. Involucral bracts acuminate at apex, spinose along whole margins; calyx lips 2-lobed, lobes lanceolate, 5–6 mm; middle and upper cauline leaves petiolate 1. *M. chlorantha*
- 3b. Involucral bracts acute or rounded at apex, spinose only at base; calyx emarginate; middle and upper cauline leaves subsessile 2. *M. bracteata*
- 2b. Leaves sessile or subsessile; leaf margins mostly lobed, less frequently entire.
- 4a. Leaves entire or slightly toothed; flowers in 20 or more closely packed whorls of 8–12 5. *M. ludlowii*
- 4b. Leaves lobed; flowers in fewer, usually interrupted, whorls.
- 5a. Corolla 2–3 cm, greatly exceeding calyx, obviously 5-lobed; staminodes inserted at middle part of corolla tube.
- 6a. Involucral bracts broadly ovate or orbicular, ca. as long as wide (excluding pointed apex); calyx covered by involucral bracts 7. *M. longifolia*

- 6b. Involucral bracts broadly ovate-lanceolate, much longer than wide; calyx exposed 8. *M. coulteriana*
 5b. Corolla less than 1 cm, almost hidden by calyx, weakly lobed with 2 or 4 major lobes;
 staminodes inserted at base of corolla tube.
 7a. Calyx lobes 4, ovate, apex rounded; leaves shallowly lobed 3. *M. chinensis*
 7b. Calyx lobes 4–6, narrowly ovate or ovate-lanceolate, apex usually spinose; leaves cleft
 almost to midvein 4. *M. kokonorica*

1. *Morina chlorantha* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 208. 1912.

绿花刺参 lǜ huā cǐ shēn

Cryptothladia chlorantha (Diels) M. J. Cannon; *Morina chlorantha* var. *subintegra* Pax & K. Hoffmann ex H. Limpricht.

Caudexes robust, base covered with brown fibrous remnants of leaves. Stems 20–70 cm tall. Basal leaves rosulate; petiole 5–7 cm; blade lanceolate to ovate-lanceolate, 15–35 × 2–2.5 cm, base decurrent, apex acuminate, margin spinose, rarely sinuate-dentate, tooth margin spinose. Cauline leaves similar but smaller, in 2 or 3 whorls of 4, rarely opposite, gradually becoming sessile upward, glabrous. Inflorescence of 6–8 whorls, compact but separated after anthesis; each whorl with 4 involucral bracts, these narrowly ovate, 2.5–3 cm, glabrous, base densely spinose, margins spinose, apex acuminate; involuclers tubular, 1.2–1.5 cm, stalked, outside pubescent, apex ca. 10-spinose. Calyx green, 8–10 mm, both sides pubescent, 2-lipped, each lip 2-lobed; lobes lanceolate, 5–6 mm, long ciliate, apex obtuse or 2-spinose at apex. Corolla green-yellow, slightly shorter than calyx, 7–9 mm, outside villous; limb 2-lipped; lobes 5. Stamens inserted at upper part of corolla tube; filaments short, villous; staminodes subsessile, inserted at base of corolla tube. Gynoecium included, slightly longer than stamens; stigma capitate, slightly compressed. Achenes purple-brown, oblong, ca. 5 mm, angular and furrowed, apex obliquely truncate. Fl. May–Aug, fr. Aug–Sep.

• Grassy slopes, forest margins; 2800–4000 m. W Sichuan, NW Yunnan (Lijiang, Zhongdian).

2. *Morina bracteata* C. Y. Cheng & H. B. Chen, Acta Phytotax. Sin. 29: 190. 1991.

宽苞刺参 kuan bao cǐ shēn

Roots elongate, branched. Caudexes short, covered with black-brown fibrous remnants of old leaves. Stems ca. 45 cm tall, glabrous below, villous above. Basal leaves rosulate; petiole 4–8 cm; leaf blade elliptic or obovate-elliptic, 9–12 × 2.5–3 cm, both surfaces glabrous, base attenuate to petiole, margin spinulose only at base, apex acute; cauline leaves similar, in whorls of 4, sessile or shortly petiolate. Inflorescence of 6 or 7 whorls, lower whorls often separate from each other, upper ones compact, each whorl with 4 involucral bracts; involucral bracts ovate, 2.5–3.5 cm, glabrous or white villous at base, spinulose only along lower margins, apex acute or rounded; involuclers tubular-campanulate, 1–1.5 cm, white villous outside, apex with 10–12 spines; spines unequal in length, 6 or 7 longer, 2–3 mm. Calyx campanulate, ca. 9 mm, villous, 2-lobed; lobes 4.5–5 mm, apex emarginate, rounded. Corolla shorter than calyx, pale green, tubular, 5–6 mm, villous outside; limb slightly 2-lipped; lobes 5, subequal. Fertile stamens in-

serted at upper part of corolla tube; filaments short, barbate; staminodes inserted at base of corolla tube. Style slightly longer than stamens; stigma capitate. Achenes brown, obovoid-oblong, 6–6.5 × 3–3.5 mm, tuberculate-rugose, apex obliquely truncate. Fl. and fr. Aug.

• Slopes; ca. 3200 m. Sichuan (Butuo).

3. *Morina chinensis* Y. Y. Pai, Repert. Spec. Nov. Regni Veg. 44: 122. 1938.

刺参 cǐ shēn

Cryptothladia chinensis (Y. Y. Pai) M. J. Cannon; *Morina lorifolia* C. Y. Cheng & H. B. Chen.

Roots robust, usually unbranched. Caudexes short, simple or branched, covered with old, nearly complete leaf bases. Fertile stems 15–70 cm tall, glabrous and purple below, purplish and white villous above. Leaves on sterile stems 6–8, linear-lanceolate, 10–25 × 1–2 cm, glabrous, midvein marked, base decurrent and amplexicaul, apex acuminate, margin irregularly and shallowly lobed; lobes subtriangular, with 3–9 rigid spines. Cauline leaves in 2 or 3 whorls of 4–6 leaves, similar to those on sterile stems but shorter, 5–15 cm, gradually smaller upward, margins of lobes spinose. Inflorescence of 6–9 whorls of up to 20 flowers each, compact at anthesis but separated in fruit; involucral bracts 4, leaflike, narrowly ovate, 2.5–3.5 cm, margins densely spiny, apex acuminate; involuclers hidden in involucral bracts, campanulate, 1–1.4 cm, sparsely villous outside, apex truncate, margin with 10 unequal spines to 6 mm. Calyx exerted ca. 3 mm above involucler, 2-lipped, 6–10 mm, each lip 2-lobed; lobes rounded, veins prominent, outside glabrous, inside lanate, base barbate. Corolla pale green, shorter than calyx, 6–7 mm; limb 2-lipped, upper lip 2-lobed, lower lip 3-lobed, sparsely villous. Stamens adnate to upper part of corolla tube; staminodes inserted at base of corolla tube; anthers included. Style slightly longer than stamens; stigma capitate. Achenes brown, oblong, 2–3 mm, rugose, apex obliquely truncate, with persistent calyx, hidden in involuclers. Fl. Jul–Aug, fr. Sep.

• Alpine meadows with shrubs; 2800–4300 m. SE Gansu, Nei Mongol (Helan Shan), Qinghai, NW Sichuan, Xizang (Qamdo).

4. *Morina kokonorica* K. S. Hao, Repert. Spec. Nov. Regni Veg. 40: 215. 1936.

青海刺参 qing hai cǐ shēn

Cryptothladia kokonorica (K. S. Hao) M. J. Cannon.

Roots robust, ca. 40 cm, up to 3 cm in diam., simple or remotely branched. Caudexes usually branched, covered with brown-black remnants of old leaves. Stems usually caespitose, 20–70 cm tall, simple or 2- or 3-branched, ridged and glabrous below, villous above. Leaves on sterile shoots 5 or 6, rosulate, linear-lanceolate, 7–20 × 1–1.5 cm, both surfaces glabrous, base

decurent into petiole, margin coarsely and irregularly pinnatifid, with triangular, spinose lobes, apex acuminate. Leaves on fertile stems similar, in 2 or 3 whorls of 4, narrowly lanceolate, base amplexicaul, smaller upward. Inflorescence of up to 8 whorls of 16–20 flowers, compact in bud, but separated after anthesis, each with 4 involucre bracts, these narrowly ovate, 2–3 cm, margin yellow spinose, apex acuminate; involucels campanulate, hidden in bracts, 1.2–1.5 cm, prominently veined, stalked, margin with more than 10 unequal spines up to 7 mm. Calyx cup-shaped, 8–15 mm, exerted ca. 3 mm above involucre bracts, outside glabrous, inside villous, base barbate, 2-segmented, each segment 2- or 3-lobed; lobes lanceolate, apex often spinose. Corolla pale green, 6–8 mm, included in calyx, outside glabrous; limb 2-lipped, 5-lobed. Stamens inserted at upper part of corolla tube; filaments short, villous; staminodes inserted at base of corolla tube, subsessile. Style included, slightly longer than stamens; stigma capitate. Achenes brown, columnar, 6–7 mm, smooth, angular, apex obliquely truncate. Fl. Jun–Aug, fr. Aug–Sep.

• Stony slopes, meadows, flood plains; 3000–4500 m. S Gansu, Qinghai, W Sichuan, E and S Xizang (west to Burang, north to Bainogoin, Sogxian).

5. *Morina ludlowii* (M. J. Cannon) D. Y. Hong, *Novon* 20: 418. 2010.

藏南刺参 zang nan ci shen

Cryptothladia ludlowii M. J. Cannon, *Bull. Brit. Mus. (Nat. Hist.)*, Bot. 12: 22. 1984.

Caudexes thickly covered with fibrous remnants of leaf bases. Stems up to 50 cm tall. Basal and lower cauline leaves in whorls of 3 or 4, narrowly elliptic, 5–9 × 1–2 cm, adaxially pubescent, connate basally, forming a loose sheath, margins entire or remotely toothed, ciliate, spinose; upper cauline leaves similar, uppermost whorl often barely connate. Inflorescence short initially, 2–3 cm, elongating rapidly, terete, or slightly grooved, densely covered with whitish, mostly retrorse hairs. Flowers in 20 or more closely packed whorls of 8–12; involucre bracts leaflike, regularly decussate, lowermost whorl similar to leaves but smaller, usually 3-lobed; lobes irregularly spinose-dentate, acute or cuspidate; central lobe larger, often reddish or deeply colored; involucels tubular-campanulate, 4–6 mm, ca. 2 mm wide at base, laminate, becoming larger and rigid in fruit, villous, often with stalked or sessile glands, 4–12-dentate, one tooth often larger. Calyx tube tubular-campanulate, 2.5–4 mm at anthesis; limb 2-fid; lobes shallowly divided; lobules rounded to apiculate, outside glabrous, inside villous and glandular. Corolla included, ± tubular, outside glabrous, 4-lobed; posterior lobe ± fimbriate; anterior lobe entire, exceeding posterior, inside hispid; lateral 2 lobes very small. Stamens inserted at middle part of corolla tube; filaments short, with a tuft of hairs below anthers; staminodes at base of corolla tube, shortly stalked. Style slightly shorter than corolla tube; stigma disk-shaped. Achenes subglobose, 3–5 mm, abaxially with a shallow furrow, apex slightly obliquely truncate, obtusely pointed, somewhat rugose. Fl. May–Aug, fr. Aug–Sep.

Thickets, stony hillsides; 3700–4300 m. S Xizang (Cona) [Bhutan, NE India].

6. *Morina polyphylla* Wallich ex Candolle, *Prodr.* 4: 644. 1830.

多叶刺参 duo ye ci shen

Cryptothladia polyphylla (Wallich ex Candolle) M. J. Cannon.

Roots ± lignified, up to 2 cm in diam. Caudexes thickly covered with brown fibrous remnants of old leaves, up to 3 cm in diam. Flowering stems to 50 cm tall, terete, or furrowed, glabrous below, white hairy above, often purple. Leaves on sterile shoots rosulate; petiole long and narrow; blade linear to linear-lanceolate, up to 40 × 1.5–4 cm, pinnatifid; segments usually 3–5-fid; lobules spinose apically, glabrous or sparsely pubescent; cauline leaves on flowering shoots in whorls of (3 or)4–6, similar but smaller. Inflorescence 8–10 cm, compact, of many whorls; involucre bracts (3 or)4–6 per whorl, connate basally, forming a cup-shaped structure, apex linear or linear-lanceolate, with lateral spines and tapering into a robust spine; involucels cylindrical, 6–13 mm, toothed, usually pilose, rarely subglabrous, with many sessile and a few stalked glands, teeth usually 8–10, apex tapered to a terminal bristle or spine, 1 or 2 longer than others. Calyx tubular or campanulate, 7–12 mm; tube 4–5 mm, usually densely pilose and glandular inside; limb 2-lobed; lobes spreading, white or lavender, deeply divided, 4 lobules apically rounded or spinose. Corolla pink or white, ca. as long as involucel, subtubular; limb 4-lobed. Stamens inserted at middle of corolla tube; staminodes inserted at base of corolla tube. Style ca. as long as corolla tube; stigma disk-shaped. Achenes 4.8–5.5 × 2.8–3 mm, plano-convex, obliquely truncate, surmounted with persistent and enlarged calyx. Fl. May–Jul, fr. Aug–Sep.

Grassy slopes, alpine meadows, rarely forests; 2600–4700 m. S Xizang (Yadong) [Bhutan, N India (Sikkim), Nepal].

7. *Morina longifolia* Wallich ex Candolle, *Prodr.* 4: 644. 1830.

长叶刺参 chang ye ci shen

Caudexes often covered with fibrous remnants of old leaves. Stems up to 80 cm tall. Leaves on sterile shoots rosulate, rosulate leaves and lower cauline leaves with petioles fused, forming sheaths 2.5–4.5 cm; blade linear to linear-lanceolate, up to 40 × 4 cm, both surfaces glabrous, margin regularly lobed, each lobe with 4 or 5 spinose teeth; upper cauline leaves similar, smaller, usually 3 per whorl, sheaths up to 8 mm, or petioles barely connate. Flowering stems erect, to 90 cm, glabrous, slightly ridged to terete below, pubescent to villous above. Inflorescence of (4–)7–9(–11) whorls, pedicellate or sessile; upper whorls confluent at anthesis, separating in fruit; involucre bracts broadly ovate to orbicular, bases markedly overlapping, adaxially sparsely hairy, abaxially villous, margin often with numerous short spiny teeth and ciliate, apex spinose; involucels tubular, 7–10 × 2.5–4 mm, glandular pubescent, spines 5–13. Flowers pedicellate. Calyx glabrous, or with short adpressed hairs on tips; lobes shallowly bifid; lobules rounded or rarely slightly apiculate; tube 4.5–6 × 2.5–4 mm at anthesis. Corolla white, becoming pink to deep red; tube 20–30 × 1–2 mm, with many glandular and a few simple hairs outside; limb 2-lipped; lobes of lower lip ± spreading, central lobe ca. 7 × 3 mm, upper lip ± spreading. Stamens inserted at throat of corolla; filaments 1–3 mm, with a tuft of hairs below anthers; stami-

nodes minute, inserted 2–3.5 mm below mouth of corolla under anterior lip. Style slightly longer than stamens; stigma disk-shaped. Achenes rugose on abaxial side, with a deep furrow and prominent longitudinal veins on adaxial side, apex slightly obliquely truncate and crenulate. Fl. Jun–Sep, fr. Sep–Oct. $2n = 16, 34$.

Grassy slopes, thickets; 3000–4300 m. S Xizang (Gyirong) [Bhutan, India, ?Nepal, Pakistan].

8. *Morina coulteriana* Royle, Ill. Bot. Himal. Mts. 1: 245. 1835.

黄花刺参 huang hua ci shen

Caudexes woody, often covered with remnants of old leaf bases. Sterile shoots dwarf; fertile shoots up to 1 m tall or more, ridged and glabrous below, sparsely villous and purple above. Leaves on sterile shoots rosulate, 20–25 × ca. 2.5 cm, glabrous, pinnatilobate, with spiny, simple or compound teeth; petioles fusing to form a deep sheath 8–15 mm; lower cauline leaves similar, in whorls of 3 or 4 (or 5); upper cauline leaves also

similar but smaller. Inflorescence of 6–8 whorls of numerous flowers; lower 3–5 whorls separate, upper 3 or 4 confluent; involucre bracts 3 or 4 per whorl, broadly ovate-lanceolate, up to 8 × 2 cm, spiny, prominently net-veined, upper bracts smaller; involucels subcylindrical, villous, 4–9 × 2.5–4 mm, with 9–12 teeth. Calyx glabrous to villous, with a large tuft of hairs at base, tubular-campanulate, 3–6.5 × 2–4 mm; limb 2-lipped; lips deeply bifid, apex acute or apiculate, often spinose. Corolla yellow or greenish yellow; tube villous, 25–30 × 1–2 mm; limb 2-lipped; upper lip 2-lobed, lower one 3-lobed, median lobe of lower lip 5.5–10 × 3.5–6 mm. Stamens with filaments 2–3 mm, with a tuft of hairs below anthers; staminodes minute, cordiform. Style slightly longer than stamens; stigma disk-shaped. Achenes convex on adaxial side, rugose on abaxial side, with very deep longitudinal furrows. Fl. Jun–Aug, fr. Aug–Sep.

Grassy or shrubby slopes; 3000–3700 m. S Xinjiang, SE Xizang (Mainling) [Afghanistan, NW India, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].