

SCROPHULARIACEAE

玄参科 xuan shen ke

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Herbs, sometimes shrubs, rarely trees; mostly autotrophic, less often hemiparasitic or parasitic. Stipules absent. Leaves alternate, opposite, whorled, or basally opposite and apically alternate, simple or sometimes pinnately dissected. Inflorescences racemes, spikes, or thyrsoid panicles, determinate or indeterminate, or flowers solitary. Flowers perfect, usually zygomorphic, rarely actinomorphic. Calyx often persistent, (2–)4- or 5-lobed or -parted, variously connate. Corolla sympetalous; limb (3 or)4- or 5-lobed, often 2-lipped. Stamens mostly 4, didynamous, sometimes 1 or 2 staminodes present, less often 2 or 5 stamens; anther locules 1 or 2, equal or subequal, free or ± confluent. Nectary often present at base of ovary, ringlike, cupular, or reduced to a gland. Ovary superior, 2-loculed, rarely apically 1-loculed; ovules numerous, rarely 2 per locule, on axile placentas, anatropous or hemitropous. Style simple; stigma capitate, 2-lobed, or 2-lamellate. Fruit a capsule, septicidal, loculicidal, or septifragal, sometimes opening by pores or irregularly dehiscent, rarely a berry. Seeds minute or rarely conspicuous, sometimes winged; testa often reticulate; hilum lateral or ventral; endosperm fleshy or absent; embryo straight or curved.

About 220 genera and 4500 species: cosmopolitan; 61 genera (seven endemic) and 681 species (415 endemic) throughout China but with a greater concentration in SW China.

Tsoong Puchiu & Yang Hanbi, eds. 1979. Scrophulariaceae (1). Fl. Reipubl. Popularis Sin. 67(2): 1–431. Tsoong Puchiu, ed. 1963. Scrophulariaceae (2). Fl. Reipubl. Popularis Sin. 68: 1–449.

- 1a. Trees or shrubs; calyx leathery; stems and leaves often stellate hairy when young.
- 2a. Corolla tube long, both lips equal in length 3. *Paulownia*
- 2b. Corolla tube short, upper lip much longer than lower.
- 3a. Capsule septicidal; calyx irregularly 3- or 4-lobed 4. *Wightia*
- 3b. Capsule loculicidal; calyx regularly 2- or 5-lobed 2. *Brandisia*
- 1b. Herbs, sometimes woody at base; calyx herbaceous or membranous; stems and leaves without stellate hairs.
- 4a. Leaves abaxially glandular punctate.
- 5a. Aquatic or marsh herbs 15. *Limnophila*
- 5b. Terrestrial herbs.
- 6a. Corolla tube inconspicuous; stamens subequal 8. *Scoparia*
- 6b. Corolla tubular; stamens didynamous 14. *Adenosma*
- 4b. Leaves not glandular punctate.
- 7a. Corolla base spurred, lower lip convex and dilated toward upper lip in center, almost sealing throat, making corolla personate 27. *Linaria*
- 7b. Corolla neither spurred nor personate.
- 8a. Fruit berrylike.
- 9a. Leaves uniform; fruit indehiscent 16. *Lancea*
- 9b. Leaves dimorphic; fruit dehiscent 32. *Hemiphragma*
- 8b. Fruit capsular or drupaceous (*Lagotis*).
- 10a. Plants much branched, diffusely cushionlike; leaves less than 5 mm 25. *Microcarpaea*
- 10b. Plants erect to creeping, never cushionlike; leaves usually longer than 5 mm.
- 11a. Plants sometimes floating; stolons creeping; leaves and flowers in a basal tuft 26. *Limosella*
- 11b. Plants aquatic or terrestrial, never floating; stems creeping and also ± erect; leaves and flowers never in a basal tuft.
- 12a. Sepals free, 4 or 5, imbricate, unequal in width.
- 13a. Outermost sepals not cordate; anther locules parallel; stigma dilated, capitate, or 2-lobed; capsule loculicidal or 4-valved 9. *Bacopa*
- 13b. Outermost sepals cordate; anther locules divaricate; stigma 2-lamellate; capsule septicidal 17. *Picria*
- 12b. Sepals connate to almost free, not imbricate at least after flowering, ± equal in width.
- 14a. Pedicel curling after flowering; seeds densely peltate hairy 33. *Ellisiophyllum*

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- 14b. Pedicel not curling after flowering; seeds glabrous.
- 15a. Staminode 1, in center of corolla upper lip; anther locules confluent, reniform and transverse; filaments apically dilated.
- 16a. Plants more than 10 cm tall; flowers in cymes, rarely axillary, never fascicled; pedicel conspicuous; corolla tube short and thick 5. *Scrophularia*
- 16b. Plants less than 10 cm tall; flowers solitary or fascicled in axils; pedicel inconspicuous; corolla tube elongated.
- 17a. Flowers in fascicles; corolla conspicuously 2-lipped; petiole short 6. *Oreosolen*
- 17b. Flowers solitary; corolla obscurely 2-lipped, subactinomorphic; petiole ca. 2 × as long as leaf blade 7. *Nathaliella*
- 15b. Staminoles 2 if present, anterior; anthers not transverse (except in some *Gratiola* and *Verbascum*); filaments not dilated.
- 18a. Corolla rotate, almost without a tube.
- 19a. Leaves alternate; flowers 5-merous; filaments woolly 1. *Verbascum*
- 19b. Leaves opposite or whorled; corolla 4-merous; filaments glabrous 38. *Veronica*
- 18b. Corolla not rotate, if sometimes subtrotate then stamens only 2 and tube conspicuous.
- 20a. Stamens 2, staminodes absent; corolla (3 or)4-lobed, actinomorphic or slightly zygomorphic, if 2-lipped, then lower lip often 1- or 2-lobed.
- 21a. Calyx parted to base on lower side, spathe-like or sometimes also 2-lobed adaxially; leaves mostly basal; fruit drupaceous, indehiscent 39. *Lagotis*
- 21b. Calyx 4- or 5-lobed; leaves on stem; fruit a capsule.
- 22a. Calyx lobes 5, subequal in length; stamens ± exerted; stigma small, weakly dilated
..... 35. *Veronicastrum*
- 22b. Calyx lobes 4 or if 5 then upper one much smaller than other lobes; stamens included in corolla; stigma capitate or clavate.
- 23a. Corolla limb conspicuously 2-lipped with strongly reflexed lower lip, tube conspicuous; leaves alternate 36. *Scrofella*
- 23b. Corolla limb weakly 2-lipped, often subtrotate, tube usually weakly developed; leaves opposite, whorled, or alternate.
- 24a. Racemes terminal, long and densely spicate; bracts small and narrow; capsule subglobose, slightly compressed; corolla with conspicuous tube and slightly 2-lipped limb; stems mostly more than 30 cm tall 37. *Pseudolysimachion*
- 24b. Racemes axillary or terminal, usually short and lax, if raceme terminal then lower bracts similar to leaves; capsule usually strongly compressed; corolla mostly with short tube and subtrotate limb; stems mostly less than 25 cm tall 38. *Veronica*
- 20b. Stamens 4 or if 2, then 2 staminodes present abaxially; corolla conspicuously 2-lipped,
lower lip 3-lobed, upper 2-lobed or entire, or 5-lobed and subactinomorphic (corolla 4-lobed in *Neopicrorhiza* but then basal leaves rosulate).
- 25a. Leaves basal and rosulate; rhizomes stout; inflorescences spicate 34. *Neopicrorhiza*
- 25b. Leaves on stems and also basal (*Triaenophora* scapose but leaves very large); rhizomes slender if present; inflorescences mostly racemose.
- 26a. Upper corolla lip ± galeate or rostrate; anther locules mucronate or base spurred.
- 27a. Leaves alternate; upper corolla lip rostrate, conspicuously longer than lower lip; anther locules unequal in length or free, or anthers 1-loculed.
- 28a. Anther locules 2, unequal in length; calyx unequally 4-lobed, parted to middle medianly, more shallowly laterally; corolla lower lip lobes patent 47. *Castilleja*
- 28b. Anther essentially 1-loculed; calyx subequally 4-lobed; corolla lower lip shallowly saccate 48. *Triphysaria*
- 27b. Leaves opposite; upper corolla lip galeate, ± as long as lower lip; anther locules equal
in length, connivent.

- 29a. Calyx upper side parted to middle, lower side and laterally shallowly parted, strongly inflated and utriculate in fruit; seeds compressed, often winged; branches and leaves subappressed to main stem 55. *Rhinanthus*
- 29b. Calyx equally parted or more deeply parted medianly, not inflated in fruit; seeds not compressed; branches and leaves spreading.
- 30a. Capsule 1–4-seeded; seeds large and smooth; bracts dentate to setose dentate, rarely entire; upper corolla lip densely bearded at margin 49. *Melampyrum*
- 30b. Capsule with numerous seeds; seeds small and sculptured; bracts often entire; upper corolla lip not bearded at margin.
- 31a. Bracteoles 2 below calyx.
- 32a. Basal leaves well developed.
- 33a. Calyx ovoid, conspicuously 5-ribbed; leaves entire or dentate; stems often winged, rarely terete 58. *Pterygiella*
- 33b. Calyx tubular, conspicuously 10-ribbed; leaves pinnatifid; stems terete 59. *Siphonostegia*
- 32b. Basal leaves scalelike.
- 34a. Capsule regularly loculicidally dehiscent; sinuses between calyx lobes often 1–3-toothed; corolla yellow, more than 2.5 cm 60. *Cymbaria*
- 34b. Capsule loculicidally dehiscent on 1 side (only 1 locule dehiscent); sinuses between calyx lobes toothless; corolla pale purple or white, less than 2 cm 61. *Monochasma*
- 31b. Bracteoles absent.
- 35a. Calyx 4-lobed; capsule apex obtuse.
- 36a. Inflorescence a racemose panicle 52. *Omphalotrix*
- 36b. Inflorescence a spike.
- 37a. Bracts often larger than leaves; margin of upper corolla lip revolute 51. *Euphrasia*
- 37b. Bracts smaller than leaves; margin of upper corolla lip straight 54. *Odontites*
- 35b. Calyx 5-lobed; capsule apex tapered or truncate.
- 38a. Leaves palmatisect; capsule emarginate; upper corolla lip slightly arching forward, obscurely galeate, parted to middle 53. *Pseudobartsia*
- 38b. Leaves pinnatisect, pinnatifid, or serrate; capsule apex tapered; upper corolla lip conspicuously galeate, entire or shallowly 2-lobed.
- 39a. Calyx equally parted; leaves pinnatisect 50. *Phtheirospermum*
- 39b. Calyx more deeply parted on lower side; leaves serrate, pinnatifid, or pinnatisect.
- 40a. Calyx 5-lobed; corolla upper lip revolute, not extending into a beak; leaves serrate 56. *Xizangia*
- 40b. Calyx 2–5-lobed; corolla upper lip galeate and often extending into a narrow beak; leaves pinnatifid to pinnatisect 57. *Pedicularis*
- 26b. Upper corolla lip straight or revolute, never galeate; anther locules rarely mucronate, base often obtuse.
- 41a. Bracteoles 2; corolla subactinomorphic or 2-lipped in *Rehmannia* and *Gratiola*.
- 42a. Corolla salverform; fertile anthers with 1 locule aborted.
- 43a. Corolla tube straight; inflorescences spicate, flowers crowded; lower leaves broad and dentate, upper narrow and entire; hemiparasitic 45. *Buchnera*
- 43b. Corolla tube apically curved; inflorescences laxly spicate; all leaves narrow, entire, rarely dentate, sometimes reduced to scales; parasitic 46. *Striga*
- 42b. Corolla not salverform; fertile anthers 2-loculed.
- 44a. Calyx spathe-like, deeply parted on lower side, entire or 3–5-toothed 41. *Centranthera*

- 44b. Calyx campanulate, equally 5-lobed.
- 45a. Corolla (3.5–)5–7 cm; calyx 1.5–3 cm 30. *Rehmannia*
- 45b. Corolla less than 1 cm; calyx less than 0.5 cm.
- 46a. Fertile anthers 2.
- 47a. Plants less than 25 cm tall; anthers 2-loculed; flowers solitary in leaf axils 10. *Gratiola*
- 47b. Plants more than 25 cm tall; anthers with 1 locule aborted; flowers in racemes 44. *Sopubia*
- 46b. Fertile anthers 4.
- 48a. Calyx covering corolla tube, inflated after flowering; corolla subcampanulate; at least lower leaves opposite, 3-veined 42. *Alectra*
- 48b. Calyx covering ca. 1/2 of corolla tube, not inflated; corolla tubular; leaves alternate, 1-veined 40. *Petitmenginia*
- 41b. Bracteoles absent; corolla conspicuously 2-lipped.
- 49a. Calyx 3- or 5-winged or conspicuously 3- or 5-angular, toothed.
- 50a. Calyx broadly 3-winged, 3-toothed 18. *Legazpia*
- 50b. Calyx 5-winged or 5-angled, 5-toothed.
- 51a. Calyx not inflated in fruit, mouth not truncate; filaments often appendiculate.
- 52a. Calyx 5-angular, actinomorphic; capsule septum persistent 19. *Lindernia*
- 52b. Calyx 5-winged, rarely conspicuously 5-angular, ± 2-lipped; capsule septum not persistent 20. *Torenia*
- 51b. Calyx inflated, bladderlike in fruit, mouth truncate or obliquely truncate; filaments not appendiculate.
- 53a. Flowers solitary in leaf axils, ebracteate; slender and weak herbs 21. *Mimulus*
- 53b. Flowers in cymes, usually bracteate; large and erect herbs, woody at base 22. *Cyrtandromoea*
- 49b. Calyx neither winged nor conspicuously angular, parted into 5 conspicuous lobes, lobes sometimes secondarily lobed.
- 54a. Fertile stamens 2, staminodes 2; aquatic or marsh herbs.
- 55a. Leaves petiolate, dentate; capsule cylindrical 19. *Lindernia*
- 55b. Leaves sessile and entire; capsule ovoid-globose or globose.
- 56a. Calyx parted to slightly beyond middle; stems succulent; filaments straight at apex; anthers glabrous 11. *Dopatrium*
- 56b. Calyx parted almost to base; stems not succulent; filaments twisted; anthers hairy 12. *Deinostema*
- 54b. Fertile stamens 4; terrestrial herbs (some species of *Mimulicalyx* and *Lindernia* aquatic or marsh herbs).
- 57a. Corolla more than 3 cm; petiole long; stem leaves alternate or absent.
- 58a. Leaves woolly; stem leaves absent; calyx 5-lobed, each lobe 3-parted and hastate 31. *Triaenophora*
- 58b. Leaves glandular hairy; stem leaves present; calyx irregularly toothed or lobes entire.
- 59a. Calyx tube present; corolla lips nearly equal in length 30. *Rehmannia*
- 59b. Calyx parted almost to base; upper corolla lip short, middle lobe of lower lip longest 29. *Digitalis*
- 57b. Corolla less than 3 cm; petiole usually short; at least lower stem leaves opposite.

- 60a. Stems scaly near base, much branched and broomlike; leaves few, sessile, linear or scalelike, alternate apically on stem; xerophytic 24. *Dodartia*
- 60b. None with above combination of characters; mesophytic or helophytic.
 - 61a. Stems quadrangular; lower corolla lip outer in bud, enveloping upper one.
 - 62a. Calyx 5-ribbed; seeds numerous 28. *Mimulicalyx*
 - 62b. Calyx 10-ribbed; seeds 2 per locule 43. *Leptorhabdos*
 - 61b. Stems terete (quadrangular in *Mazus lanceifolius*); upper corolla lip outer in bud, enveloping lower one.
 - 63a. Calyx parted almost to base, sometimes less so; capsule often elongated; filaments often appendiculate 19. *Lindernia*
 - 63b. Calyx parted to about middle; capsule short; filaments not appendiculate.
 - 64a. Stems and leaves glandular hairy; stem leaves opposite; anther locules separated by a stalked connective 13. *Lindenbergia*
 - 64b. Stems and leaves glabrous or eglandular villous; basal leaves usually well developed, sometimes rosulate, upper stem leaves often alternate; anther locules apically connivent 23. *Mazus*

1. VERBASCUM Linnaeus, Sp. Pl. 1: 177. 1753.

毛蕊花属 mao rui hua shu

Celsia Linnaeus.

Herbs, annual, biennial, or perennial. Leaves usually simple, alternate, basally rosulate. Inflorescences terminal, spicate, racemose, or paniculate. Calyx 5-lobed. Corolla usually yellow, rarely purple or white; tube short; limb rotate; lobes 5, subequal, radiate. Stamens 4 or 5; filaments usually woolly; anthers 1-loculed, confluent, anterior anthers linear-oblong or \pm reniform, posterior anthers reniform or transverse. Ovary 2-loculed. Capsule septical. Seeds numerous, conically cylindrical, 6–8-ribbed.

About 300 species: Asia, Europe; six species in China.

1a. Flowers solitary at each node; plants glandular or eglandular hairy.

2a. Corolla purple; capsule with bulging veins 1. *V. phoeniceum*

2b. Corolla yellow; capsule without bulging veins.

3a. Calyx 5–6 mm; stamens 5 2. *V. blattaria*

3b. Calyx 3–4.5 mm; stamens 4 3. *V. chinense*

1b. Flowers 2 to several at each node; plants stellate hairy.

4a. Inflorescences spicate 4. *V. thapsus*

4b. Inflorescences paniculate.

5a. Plants sparsely stellate hairy; stem leaves adaxially green 5. *V. chaixii*

5b. Plants densely stellate hairy; stem leaves adaxially not green 6. *V. songaricum*

1. *Verbascum phoeniceum* Linnaeus, Sp. Pl. 1: 178. 1753.

紫毛蕊花 zi mao rui hua

Perennials. Stems 30–100 cm, sometimes branched above middle. Leaves mostly basal; petiole to 3 cm; leaf blade ovate to oblong, 4–10 cm, glabrous or puberulent, base subrounded to broadly cuneate, margin coarsely crenate to shallowly undulate. Stem leaves small and sessile when present. Raceme simple or branched. Rachises, bracts, pedicels, and calyces glandular pilose. Flowers solitary at each node. Pedicel to 1.5 cm. Calyx 4–6 mm; lobes elliptic. Corolla purple, ca. 2.5 cm in diam. Stamens 5; filaments purple woolly; anthers reniform. Capsule ovoid, ca. 6 mm, longer than persistent calyx, apically sparsely glandular-pilose, veins bulging and reticulate. Fl. May–Jun, fr. Jun–Aug.

Grassy areas on mountain slopes; 1600–1800 m. N Xinjiang [Russia; Europe].

2. *Verbascum blattaria* Linnaeus, Sp. Pl. 1: 178. 1753.

毛瓣毛蕊花 mao ban mao rui hua

Annuals or biennials. Stems unbranched, sparsely glandular hairy above. Basal leaves sessile or basally attenuate as if petiolate; leaf blade oblong, to 10 \times 4 cm, margin obtusely serrate to basally pinnately lobed. Stem leaves gradually decreasing in size upward and becoming bracteal; leaf blade oblong-lanceolate, margin irregularly and shallowly toothed. Raceme somewhat branched, to 50 cm. Rachises, pedicels, and calyces glandular pilose. Flowers solitary at each node. Pedicel 5–10 mm. Calyx 5–6 mm; lobes oblong-lanceolate. Corolla yellow; upper lobes 3, woolly at base. Stamens 5; filaments purple woolly; anthers of

anterior 2 stamens ± decurrent at base. Capsule ovoid, 7–8 mm, longer than persistent calyx, apically sparsely glandular pilose, apex short beaked. Fl. May–Jun, fr. Jul–Aug.

Grassland along rivers, trailsides; low elevations. N Xinjiang [Russia; Europe].

3. *Verbascum chinense* (Linnaeus) Santapau, Fl. Purandhar 90. 1958.

琴叶毛蕊花 qin ye mao rui hua

Scrophularia chinensis Linnaeus, Mant. Pl. 2: 250.

1771; *Celsia coromandeliana* Vahl; *Verbascum coromandelianum* (Vahl) Kuntze; *V. sinense* H.

Léveillé & Giraud.

Annuals or biennials. Stems 50–100 cm, branched apically, sparsely glandular pilose. Petiole of basal and lower stem leaves 3–8 mm; leaf blade pandurate, 5–8 cm; lobes 3–5, terminal lobe ovate, elliptic, or oblong, margin serrate distally, usually double serrate or lobed proximally. Other stem leaves short petiolate or sessile; leaf blade ovate, elliptic, or ovate-triangular. Raceme to 20 cm, simple or branched. Rachises, bracts, pedicels, and calyces glandular pilose. Flowers solitary at each node. Pedicel to 5 mm, elongating to 1 cm in fruit. Calyx 3–4.5 mm; lobes elliptic-oblong. Corolla yellow, ca. 1 cm in diam. Stamens 4, didynamous; filaments woolly; anthers reniform. Capsule ovoid, 6–7 mm longer than persistent calyx, glandular. Fl. and fr. Mar–Aug.

Sandy areas along rivers; 100–1300 m. Guangxi, Sichuan, Yunnan [Afghanistan, Cambodia, India, Kashmir, Laos, Pakistan, Sri Lanka, Thailand].

4. *Verbascum thapsus* Linnaeus, Sp. Pl. 1: 177. 1753.

毛蕊花 mao rui hua

Biennials to 1.5 m tall, densely with grayish yellow stellate hairs. Basal and lower stem leaves petiolate; leaf blade oblanceolate-oblong, to 15 × 6 cm, margin crenate. Other stem leaves gradually decreasing in size upward, sessile, oblong to ovate-oblong, base decurrent into wings. Spicate panicle cylindric, to 30 × 2 cm, dense. Flowers usually few fascicled. Pedicel short. Calyx ca. 7 mm; lobes lanceolate. Corolla yellow, 1–2 cm in diam. Stamens 5; filaments of anterior 2 stamens glabrous and of posterior 3 pubescent; anther lobes divergent at base. Capsule ovoid, as long as persistent calyx. Fl. Jun–Aug, fr. Jul–Oct.

Grassy areas on mountain slopes, along rivers; 1400–3200 m. Jiangsu, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Asia and Europe, naturalized throughout the Northern Hemisphere].

5. *Verbascum chaixii* Villars subsp. **orientale** (M. Bieberstein) Hayek, Repert. Spec. Nov. Regni Veg. Beih. 30(2): 127. 1929.

东方毛蕊花 dong fang mao rui hua

Verbascum orientale M. Bieberstein, Fl. Taur.-Caucas. 1: 160. 1808.

Perennials, to 1.2 m tall. Stems white-stellate hairy.

Petiole of basal leaves 5–25 cm; leaf blade oblong-ovate, 20–30 × 4–12 cm, margin obtusely crenate, apex obtuse to ± acute. Petiole of lower stem leaves to 7 cm below, decreasing in size to sessile upward; leaf blade oblong-lanceolate, 10–18 × 4–5 cm, abaxially densely pubescent, adaxially sparsely pilose to subglabrous and green, margin irregularly obtusely toothed. Panicles to 30 cm. Flowers 2–7-fascicled. Pedicel unequal in length, 1–15 mm, densely stellate pilose. Calyx 4–5 mm, densely stellate pilose; lobes lanceolate to ovate-lanceolate. Corolla yellow, 2–2.5 cm in diam., stellate pilose outside. Stamens 5; filaments with purple hairs; anthers reniform. Capsule ovoid, slightly longer than persistent calyx, densely stellate pilose. Fl. and fr. Jun–Aug.

Grassy areas in mountain valleys, gravelly places in river valleys; 1200–1900 m. Xinjiang [Kazakstan, Kyrgyzstan, Russia].

Verbascum chaixii subsp. *chaixii* grows in Europe.

6. *Verbascum songaricum* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 26. 1841.

准噶尔毛蕊花 zhun ga er mao rui hua

Perennials, to 1.5 m tall, densely with grayish stellate hairs. Petiole of basal leaves to 10 cm; leaf blade oblong to oblanceolate, ca. 25 × 8 cm, densely grayish pubescent on both surfaces, base tapering, margin shallowly crenate. Stem leaves sessile, lanceolate to oblong, base of lower leaves broadly cuneate and of upper leaves subcordate. Panicles to 40 cm. Flowers 2–7-fascicled. Pedicel to 6 mm. Calyx and corolla densely grayish stellate hairy outside. Calyx ca. 6 mm; lobes lanceolate. Corolla yellow, 1.5–2 cm in diam. Stamens 5; filaments white woolly hairy; anthers reniform. Capsule globose-ovoid to ellipsoid-ovoid, nearly as long as persistent calyx, densely stellate hairy. Fl. Jun, fr. Aug.

Grassy or wet areas beside fields; 400–600 m. Xinjiang (Tacheng Xian) [Kazakstan, Russia (Siberia), Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

2. **BRANDISIA** J. D. Hooker & Thomson, J. Linn. Soc., Bot. 8: 11. 1864.

来江藤属 lai jiang teng shu

Shrubs, erect or scandent, occasionally parasitic, usually stellate tomentose. Leaves opposite, rarely subopposite; petiole short; leaf blade margin entire or denticulate. Flowers axillary, solitary, paired, or in racemes. Bracteoles 2, inserted on pedicels. Calyx campanulate, rarely cylindric-ovate, outside stellate hairy, regular or somewhat 2-lipped; lobes 2 or 5. Corolla tube somewhat incurved; limb 2-lipped; lower lip as long as or shorter than upper lip, 3-lobed,

patent; upper lip 2-lobed, concave. Stamens 4, didynamous, somewhat exerted or included, inserted at base of corolla tube; filaments glabrous; anther locules 2, orbicular, pilose; staminode absent. Ovary ovoid, hairy, 2-loculed; ovules numerous, linear-oblong. Style elongated; stigma simple. Capsule ovoid to ovoid-globose, loculicidal. Seeds linear; seed coat reticulate, membranous winged.

About 11 species: mountainous areas of subtropical E Asia; eight species in China.

- 1a. Stellate hairs early glabrescent; corolla lower lip ca. 1/2 as long as upper lip, inside pubescent; inflorescences distinctly racemose.
- 2a. Racemes mostly borne on lateral branches, to 20 cm or longer; bracts large; leaf blade ovate-orbicular to ovate-lanceolate, margin serrulate, apex acute 7. *B. racemosa*
- 2b. Racemes borne on main stem, 5–6 cm; bracts small; leaf blade narrowly lanceolate, margin entire, apex narrowly acuminate 8. *B. cauliflora*
- 1b. Stellate hairs persisting (late glabrescent in *B. glabrescens* var. *glabrescens*); corolla lower lip as long as or slightly shorter than upper lip; inflorescences solitary or paired flowers, rarely subracemose.
- 3a. Calyx obscurely veined; corolla more than 3 × as long as calyx 6. *B. rosea*
- 3b. Calyx conspicuously veined; corolla less than 3 × as long as calyx.
- 4a. Calyx lobes irregular, 2-lipped 5. *B. kwangsiensis*
- 4b. Calyx lobes regular, not 2-lipped.
- 5a. Calyx tubular-ovoid, length greater than width, apex not gaping 4. *B. glabrescens*
- 5b. Calyx broadly campanulate, length and width ± equal, apex gaping.
- 6a. Calyx tube 5-veined 3. *B. discolor*
- 6b. Calyx tube 10-veined.
- 7a. Tomentum dull yellow; leaf blade ovate-lanceolate; calyx lobe length equal or less than width; corolla orange-red 1. *B. hancei*
- 7b. Tomentum gray-brown; leaf blade ovate, rarely ovate-oblong; calyx lobe length more than width; corolla yellow 2. *B. swinglei*

1. *Brandisia hancei* J. D. Hooker, Fl. Brit. India 4: 257. 1884.

来江藤 lai jiang teng

Brandisia laetevirens Rehder.

Shrubs, 2–3 m tall, dull yellow stellate tomentose. Branches glabrescent. Petiole to 5 mm; leaf blade ovate-lanceolate, 3–10 × 2–3.5 cm, dull yellow stellate tomentose, adaxially glabrescent, base subcordate, margin entire or rarely serrate, apex acute and apiculate. Flowers axillary, solitary. Pedicel to 1 cm. Bracteoles lanceolate, inserted above middle of pedicel. Calyx broadly campanulate, ca. 1 × 1 cm, outside dull yellow stellate tomentose, inside densely sericeous, 10-veined; lobes 5, ca. 1/3 of calyx length, broadly ovate to triangular-ovate, apex acute. Corolla orange-red, ca. 2 cm, outside stellate tomentose; lower lip lobes ligulate; upper lip lobes triangular. Stamens ± as long as upper lip. Ovary and style stellate pilose. Capsule ovoid-globose, stellate pilose, apex beaked. Fl. Nov–Feb, fr. Mar–Apr.

• Forests or forest edges; 500–2600 m. Guangdong, Guangxi, Guizhou, Hubei, Shaanxi, Sichuan, Yunnan.

2. *Brandisia swinglei* Merrill, Philipp. J. Sci. 13: 157. 1918.

岭南来江藤 ling nan lai jiang teng

Shrubs, erect to somewhat scandent, to 2 m tall, densely gray-brown stellate tomentose. Branches glabrescent. Petiole to 8 mm; leaf blade ovate, rarely ovate-oblong, 3–11 × 1–5.5 cm, densely gray-brown stellate tomentose, adaxially glabrescent, becoming black when dry, base broadly cuneate to subcordate, margin entire or irregularly sparsely serrate, apex acute to caudate-

acute. Flowers solitary or sometimes paired. Pedicel to 8 mm. Bracteoles gray stellate tomentose, inserted at pedicel apex. Calyx campanulate, to 1.5 cm, gray stellate tomentose, inside sericeous, outside 10-veined; lobes 5, ca. 1/2 of calyx length, narrowly triangular-ovate, apex acuminate and apiculate. Corolla yellow, ca. 2.5 cm, gray-brown stellate tomentose except for tube base; lateral lobes of lower lip oblong-ovate, smaller than middle lobe; upper lobes obliquely ovate. Stamens included. Ovary base and style stellate tomentose. Capsule shorter than calyx. Seeds ca. 4.5 mm. Fl. Jun–Nov, fr. Dec–Jun.

• Mountain slopes; 500–1000 m. Guangdong, Guangxi, Hunan.

3. *Brandisia discolor* J. D. Hooker & Thomson, J. Linn. Soc., Bot. 8: 11. 1864.

异色来江藤 yi se lai jiang teng

Shrubs, ± scandent, densely tawny stellate tomentose. Branches glabrescent. Petiole ca. 6 mm; leaf blade ovate-lanceolate to narrowly lanceolate, to 9 × 2 cm, dark dirty brown when dry, abaxially glabrescent, base cuneate to subrounded, margin entire, apex acute. Flowers solitary. Pedicel 1–1.4 cm. Bracteoles linear, inserted at middle of pedicel. Calyx campanulate, 6–8 mm, purple-brown sericeous-villous within, 5-veined; lobes 5, ca. 3 mm, apex acute. Corolla dirty yellow to pale purple-brown, ca. 2 cm, outside densely yellow-brown stellate pubescent; lower lip lobes ovate-orbicular, middle lobe larger than lateral lobes; upper lip to 8 mm, apex retuse. Ovary and style densely

stellate tomentose. Capsule ovoid-globose, ca. 1.2 cm, stellate tomentose, apex acute. Fl. Nov–Feb.

Forests or along trails; ca. 1500 m. S Yunnan [India, Laos, Myanmar, Thailand, Vietnam].

4. *Brandisia glabrescens* Rehder in Sargent, Pl. Wilson. 1: 574. 1913.

退毛来江藤 *tui mao lai jiang teng*

Shrubs, semi-scandent, to 2 m tall, densely yellow-brown tomentose hairy, glabrescent. Petiole to 9 mm; leaf blade ovate-oblong to lanceolate, 3–14 × 1–5.5 cm, papery, adaxially dark brown when dry, base cuneate to subrounded, margin entire or serrulate, apex acute.

Flowers solitary or paired. Pedicel ca. 1 cm. Bracteoles inserted at pedicel apex. Calyx tubular-ovoid, 1–2 cm, longer than wide, outside finely stellate hairy, inside pilose, veins 10; lobes 5, ca. 1/4 of calyx length, broadly ovate, apex acute. Corolla yellow, 2–3 cm, outside densely stellate tomentose, inside glabrous; upper lip apex truncate. Stamens and style ± as long as corolla. Ovary densely stellate tomentose. Capsule stellate tomentose. Fl. Jul–Aug.

Forests, rice fields. S Yunnan [Vietnam].

1a. Leaves abaxially glabrous or sparsely

stellate along veins 4a. var. *glabrescens*

1b. Leaves abaxially persistent stellate 4b. var. *hypochrysa*

4a. *Brandisia glabrescens* var. *glabrescens*

退毛来江藤(原变种) *tui mao lai jiang teng* (yuan bian zhong)

Leaves abaxially glabrous or sparsely stellate along veins. Fl. Jul–Aug.

Forests, rice fields; 1400–2300 m. S Yunnan [Vietnam].

4b. *Brandisia glabrescens* var. *hypochrysa* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 394. 1979.

退毛来江藤黄背变种 *tui mao lai jiang teng huang bei bian zhong*

Leaves abaxially with persistent yellowish brown stellate tomentum.

• Yunnan (Mengzi Xian).

5. *Brandisia kwangsiensis* H. L. Li, J. Arnold Arbor. 28: 133. 1947.

广西来江藤 *guang xi lai jiang teng*

Shrubs, scandent, ca. 1 m tall, whole plant tawny stellate, branches and leaves adaxially glabrescent. Petiole 3–9 mm, tomentose; leaf blade ovate-oblong, 3–11 × 1–4 cm, leathery, base cuneate to rounded, margin entire, apex acute and apiculate. Flowers solitary or paired. Pedicel to 9 mm. Bracteoles long petiolate, lanceolate, tawny stellate tomentose. Calyx campanulate, ca. 1 cm, 2-lipped, parted to 1/3–1/2 of length, outside tawny stellate tomentose, inside sericeous-villous, outside 10-veined; lower and upper lips 2- or 3-lobed or rarely entire. Corolla purple-red, to 2.8 cm, outside densely stellate tomentose except base of tube, somewhat bow-curved; lower lip lobes subequal; upper lip deeply parted into broadly ovate lobes. Stamens ±

didynamous. Ovary densely stellate tomentose. Capsule ovoid-globose, ca. 1 cm, included in calyx, densely stellate tomentose. Fl. Jul–Nov.

• Thickets, forests; 900–2700 m. Guangxi, Guizhou, Yunnan.

6. *Brandisia rosea* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 10. 1918.

红花来江藤 *hong hua lai jiang teng*

Shrubs, ca. 1 m tall, brownish gray stellate tomentose, branches and leaves adaxially glabrescent. Petiole ca. 6 mm; leaf blade ovate-orbicular to oblong-lanceolate, to 14 × 4.5 cm, ca. 2 × 1–2.5 cm on branchlets, abaxially sparsely brown-gray tomentose, adaxially black when dry, base cuneate, margin entire, apex acute. Flowers solitary or subracemose at apex of branchlets. Pedicels, bracteoles, and calyces brown-gray stellate tomentose. Pedicel ca. 1 cm. Bracteoles linear, caducous, near pedicel base. Calyx campanulate, 5–7 mm, inside hairy, veins inconspicuous; lobes 2, ca. 1/2 of calyx length, apex 2-lobed or entire. Corolla rose, yellow-red, or yellow; tube cylindrical, to 2 cm or more, outside stellate tomentose; lower lip lobes ovate-orbicular; upper lip deeply lobed. Stamens and style slightly shorter than upper lip. Capsule ± compressed, ovoid-globose, ca. 1.5 cm, apex acute. Fl. Jul–Nov.

Forests on mountain slopes, thickets; 2000–3000 m. SW Sichuan, Xizang, NW Yunnan [Bhutan, India].

1a. Corolla rose to yellowish red 6a. var. *rosea*

1b. Corolla yellow 6b. var. *flava*

6a. *Brandisia rosea* var. *rosea*

红花来江藤(原变种) *hong hua lai jiang teng* (yuan bian zhong)

Corolla rose to yellowish red. Fl. Jul–Nov.

Forests on mountain slopes, thickets; 2000–3000 m. SW Sichuan, NW Yunnan [Bhutan].

6b. *Brandisia rosea* var. *flava* C. E. C. Fischer, Bull. Misc. Inform. Kew 1934: 93. 1934.

红花来江藤黄花变种 *hong hua lai jiang teng huang hua bian zhong*

Corolla yellow. Fl. Jul–Oct.

Forests; ca. 2500 m. Xizang, Yunnan [India].

7. *Brandisia racemosa* Hemsley, Bull. Misc. Inform. Kew 1895: 114. 1895.

总花来江藤 *zong hua lai jiang teng*

Shrubs, scandent. Young branches brown stellate tomentose, glabrescent. Petiole ca. 5 mm, glabrous or sparsely hairy; leaf blade ovate-orbicular to ovate-lanceolate, 2–6 × 1–2.5 cm, glabrous or abaxially sparsely hairy on veins, black when dry, base rounded to broadly cuneate, margin serrulate, apex acute. Racemes terminal, rarely lateral, to 20 cm or longer, brown stellate hairy when young, glabrescent. Flowers paired at nodes. Bracteoles caducous. Calyx campanulate, 5–7 mm, outside glabrous, inside pilose; lobes 5, semiorbicular-triangular. Corolla scarlet, ca.

2.5 cm, outside pubescent, inside densely pilose; lower lip 3-lobed, lateral 2 lobes obliquely ovate, margin ciliate, part of upper margin adnate to upper lip, middle lobe triangular ovate and margin not ciliate; upper lip longer than lower lip, margin brown pilose, apex slightly concave and retuse. Stamens and style slightly shorter than upper lip. Ovary sparsely pilose. Capsule ovoid, glabrous. Fl. Aug–Nov.

• Thickets; below 2800 m. Guizhou, Yunnan.

8. *Brandisia cauliflora* P. C. Tsoong & L. T. Lu, Fl. Reipubl. Popularis Sin. 67(2): 394. 1979.

茎花来江藤 jing hua lai jiang teng

Shrubs, scandent. Branches light to dark brown. Petiole 5–8 mm, glabrous; leaf blade narrowly lanceolate, 5–10 × 1–2.5 cm, glabrescent, adaxially black when dry, base cuneate, margin entire, apex narrowly acuminate.

Racemes borne on main stem, 5–6 cm; bracts petiolate, small, herbaceous, deciduous after flowering. Pedicels and calyces glabrous. Flowers paired at nodes. Pedicel 5–8 mm. Bracteoles petiolate, lanceolate, inserted at pedicel apex. Calyx campanulate, 5–6 mm; lobes 5, triangular, apex acute. Corolla bright red. Capsule ovoid, glabrous, apex acute. Fl. Jun–Jul, fr. autumn.

• Forests in low mountains. SW Guangxi.

3. PAULOWNIA Siebold & Zuccarini, Fl. Jap. 1: 25. 1835.

泡桐属 pao tong shu

Trees, deciduous, evergreen in tropics. Bark smooth with conspicuous lenticels when young, longitudinally splitting with age. Branches opposite, without terminal buds. Leaves opposite, occasionally 3 in a whorl; petiole long; leaf blade entire or shallowly 3–5-lobed, margin undulate and often serrate when young. Inflorescences a large pyramidal to cylindrical thyse. Cymes (1–)3–5(–8)-flowered, pedunculate or not. Calyx campanulate or obconical, hairy; lobes 5, subequal, upper 1 enlarged. Corolla purple or white, funnellform-campanulate to tubular-funnelform; tube base constricted and slightly curved; limb 2-lipped; lower lip elongated and 3-lobed; upper lip yellow, 2-lobed. Stamens 4, didynamous; filaments included, twisted near base; anthers divergent. Ovary 2-loculed. Style nearly as long as stamens. Capsule loculicidal, 2-valved or incompletely 4-valved; pericarp thin or thick and woody. Seeds small, numerous, membranous winged; endosperm sparse.

Seven species: mostly in China with one species extending to Laos and Vietnam; six species in China.

Because of the extensive cultivation of most species, it is often difficult to determine the precise wild distribution.

- 1a. Cymes without a peduncle or peduncle much shorter than pedicels; inflorescences broadly conical, to 1 m; lateral branches of inflorescences more than 1/2 of rachis length.
 - 2a. Cymes peduncle to 6–7 mm, terminal cyme with inconspicuous peduncle; calyx lobed to 1/3–2/5 of its length 7. *P. ×taiwaniana*
 - 2b. Cymes, except for ones borne on lower branches, without peduncle; calyx lobed to 1/2 or more of its length.
 - 3a. Calyx lobes strongly reflexed in fruit; corolla pale violet to blue-purple, 3–5 cm; young leaves viscid-glandular; capsule ovoid 5. *P. kawakamii*
 - 3b. Calyx lobes adnate to base of fruit; corolla white with purple striae to purple, 5.5–7.5 cm; young leaves stellate tomentose; capsule ellipsoid, or ovoid-ellipsoid 6. *P. fargesii*
- 1b. Cymes with a conspicuous peduncle or peduncle nearly as long as pedicels; inflorescences pyramidal, narrowly conical, or cylindrical, to 0.5 m; lateral branches of inflorescences to 1/2 of rachis length.
 - 4a. Capsule oblong to oblong-ellipsoid, 6–10 cm; pericarp woody, 3–6 mm; inflorescences subcylindric; corolla ventral plaits inconspicuous; calyx 2–2.5 cm 4. *P. fortunei*
 - 4b. Capsule ovoid, ovoid-ellipsoid, or ellipsoid, 3–5.5 cm; pericarp not woody, to 3 mm; inflorescences pyramidal or narrowly conical; corolla ventral plaits conspicuous; calyx to 2 cm.
 - 5a. Capsule viscid-glandular hairy; calyx lobes as long as or longer than tube, not glabrescent 1. *P. tomentosa*
 - 5b. Capsule pubescent when young; calyx lobes shorter than tube, partly glabrescent.
 - 6a. Corolla funnellform-campanulate, apically 4–5 cm in diam.; leaves as long as wide, or slightly longer than wide; capsule ovoid, rarely ovoid-ellipsoid 2. *P. elongata*
 - 6b. Corolla narrowly tubular-funnelform, apically less than 3.5 cm; leaves length ca. 2 × width; capsule ellipsoid 3. *P. catalpifolia*

1. *Paulownia tomentosa* (Thunberg) Steudel, Nomencl. Bot. 毛泡桐 mao pao tong

2: 278. 1841.

Trees, to 20 m tall; crown broad, umbelliform. Bark brown-gray. Twigs conspicuously lenticellate, viscid glandular when young. Leaf blade cordate, ca. 40 cm, abaxially densely to sparsely hairy, adaxially sparsely hairy, apex acute. Thyrses pyramidal to narrowly conical, to 50 cm; cymes 3- or 4-flowered; peduncle 1–2 cm, nearly as long as pedicels. Calyx shallowly campanulate, ca. 1.5 cm, outside tomentose; lobes to 1/2 or more calyx length, ovate-oblong. Corolla purple, funnellform-campanulate, 5–7.5 cm, ridged ventrally, outside glandular, inside glabrous; limb ca. 4.5 cm in diam. Stamens to 2.5 cm. Ovary ovoid, glandular. Style shorter than stamens. Capsule ovoid, 3–4.5 cm, densely viscid-glandular hairy; pericarp ca. 1 mm; persistent calyx lobes flat. Seeds 2.5–4 mm including wing. Fl. Apr–May, fr. Aug–Sep.

• Cultivated or wild; below 1800 m. Anhui, Gansu, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Liaoning, Shaanxi, Shandong, Shanxi, N Sichuan [cultivated in North America, Europe, Japan, and Korea].

1a. Leaves abaxially densely hairy . 1a. var. *tomentosa*

1b. Leaves abaxially sparsely hairy when young 1b. var. *tsinlingensis*

1a. *Paulownia tomentosa* var. *tomentosa*

毛泡桐(原变种) mao pao tong (yuan bian zhong)

Bignonia tomentosa Thunberg in Murray, Syst. Veg. ed. 14, 563. 1784; *Incarvillea tomentosa* (Thunberg) Sprengel; *Paulownia grandifolia* Hort. ex Wettstein; *P. imperialis* Siebold & Zuccarini; *P. imperialis* var. *lanata* Dode; *P. recurva* Rehder; *P. lilacina* Sprague; *P. tomentosa* var. *japonica* Elwes; *P. tomentosa* var. *lanata* (Dode) C. K. Schneider.

Leaf blade base cordate, abaxial surface densely hairy when mature. Fl. Apr–May, fr. Aug–Sep.

• Usually cultivated; below 1800 m. Anhui, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Liaoning, Shaanxi, Shandong, Shanxi [cultivated in North America, Europe, Japan, and Korea].

1b. *Paulownia tomentosa* var. *tsinlingensis* (Pai) Gong Tong, Acta Phytotax. Sin. 14(2): 43. 1976.

光泡桐 guang pao tong

Paulownia fortunei (Seemann) Hemsley var.

tsinlingensis Pai, Contr. Inst. Bot. Natl. Acad. Peiping 3: 59. 1935; *P. glabrata* Rehder; *P. shensiensis* Pai.

Leaf blade base rounded to shallowly cordate, abaxial surface glabrous or sparsely hairy when mature. Fr. Aug–Sep.

• Cultivated or wild; below 1700 m. Gansu, Henan, Hubei, Shaanxi, Shandong, Shanxi, N Sichuan.

2. *Paulownia elongata* S. Y. Hu, Quart. J. Taiwan Mus. 12: 41. 1959.

兰考泡桐 lan kao pao tong

Trees, to more than 10 m tall; crown broadly conical; many parts stellate tomentose. Young branches brown, with convex lenticels. Leaf blade often ovate-cordate, to 34 cm, abaxially densely sessile dendroid hairy, adaxially glabrescent, base cordate to subrounded,

margin usually entire, sometimes irregularly angled or lobed, apex gradually attenuate and acute. Thyrses pyramidal to narrowly conical, ca. 30 cm; cymes 3–5-flowered; peduncle 0.8–2 cm, almost as long as pedicels. Calyx obconical 1.6–2 cm; tube glabrescent; lobes 5, to 1/3 of calyx length. Corolla purple to pinkish white, funnellform-campanulate, 7–9.5 × 4–5 cm, slightly curved, ridged ventrally, outside glandular and stellate hairy, inside glabrous and purple spotted; limb 4–5 cm in diam. Stamens to 2.5 cm. Ovary and style glandular; style 3–3.5 cm. Capsule ovoid, rarely ovoid-ellipsoid, 3.5–5 cm, stellate tomentose; persistent calyx disc-shaped; beak 4–5 mm; pericarp 1–2.5 mm. Seeds 4–5 mm including wing. Fl. Apr–May, fr. autumn.

• Wild or cultivated; low elevations. Anhui, Hebei, Henan, Hubei, Jiangsu, Shaanxi, Shandong, Shanxi.

3. *Paulownia catalpifolia* T. Gong ex D. Y. Hong, Novon 7: 366. 1998.

楸叶泡桐 qiu ye pao tong

Trees; crown large and high. Trunk straight. Leaves often narrowly ovate-cordate, ca. 2 × as long as wide, abaxially densely stellate tomentose, adaxially glabrous, margin entire or undulate and angled, apex acuminate. Thyrses pyramidal or narrowly conical, usually less than 35 cm; cyme peduncle nearly as long as pedicels. Calyx shallowly campanulate, less than 2 cm, glabrescent after flowering; lobes 1/3–2/5 of calyx length, triangular to ovate. Corolla light purple, narrowly tubular-funnelform, 7–8 cm, less than 3.5 cm wide, ridged ventrally, inside with dense purple small spots, base curved forward; throat ca. 1.5 cm, apically less than 3.5 cm in diam. Capsule ellipsoid, 4.5–5.5 cm, stellate hairy when young; pericarp to 3 mm. Fl. Apr, fr. Jul–Aug.

• Low elevations. Shandong (Zou Xian).

Paulownia catalpifolia has been described from Shandong and is also cultivated in Hebei, Henan, Shandong, and Shanxi (Gong Tong, Acta Phytotax. Sin. 14(2): 41. 1976). A natural hybrid between *P. catalpifolia* and *P. tomentosa*, *Paulownia × henanensis* C. Y. Zhang & Y. H. Zhao, has been reported from Henan (Acta Phytotax. Sin. 33: 503. 1995).

4. *Paulownia fortunei* (Seemann) Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 180. 1890.

白花泡桐 bai hua pao tong

Campsis fortunei Seemann, J. Bot. 5: 373. 1867;

Paulownia duclouxii Dode; *P. meridionalis* Dode; *P. mikado* T. Itô.

Trees, to 30 m tall; crown conical; young shoots, inflorescences, and fruit yellowish brown stellate tomentose. Trunk straight, ca. 2 m d.b.h.; bark gray-brown. Petiole ca. 12 cm, glabrous; leaf blade narrowly ovate-cordate, occasionally ovate-cordate, to 20 cm, 2-parted on new shoots, abaxially stellate hairy or glandular, tomentose when mature, and rarely sparsely hairy or glabrous, adaxially glabrous. Thyrses narrow and long, subcylindric, ca. 25 cm; cymes 3–8-flowered; peduncle

± as long as pedicels. Pedicel glabrous. Calyx obconical, 2–2.5 cm; lobes 1/4–1/3 of calyx length, ovate to triangular-ovate, narrowly triangular in fruit. Corolla white, purple, or light purple, tubular-funnelform, 8–12 cm; tube enlarged gradually, slightly bent forward, ventrally weakly ridged, outside stellate pilose. Stamens 3–3.5 cm, sparsely glandular hairy. Ovary glandular, occasionally stellate hairy. Capsule oblong to oblong-ellipsoid, 6–10 cm; beak to 6 cm; pericarp woody, 3–6 mm thick; persistent calyx 3–6 mm, woody. Seeds 6–10 mm including wing. Fl. Mar–Apr, fr. Jul–Aug.

Wild or cultivated. Mountain slopes, forests, mountain valleys, wastelands; below 2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Laos, Vietnam].

Paulownia fortunei has been recently introduced to Hebei, Henan, Shaanxi, and Shandong.

5. *Paulownia kawakamii* T. Itô, Icon. Pl. Japon. 1(4): 1. 1912.

台湾泡桐 tai wan pao tong

Paulownia rehderiana Handel-Mazzetti; *P. thyrsoides* Rehder; *P. viscosa* Handel-Mazzetti.

Trees, 6–12 m tall; crown umbellate. Trunk short. Young shoot brown-gray, conspicuously lenticellate. Leaf blade cordate, to 8 cm, viscid-glandular hairy, margin entire or 3–5-lobed or angled, apex acute. Thyrses broadly conical, to 1 m; cymes often 3-flowered, yellow-brown tomentose; peduncle absent or less than 1.2 cm. Pedicel to 1.2 cm. Calyx conspicuously ridged, tomentose; lobes longer than 1/2 of calyx length, narrowly ovate, conspicuously green margined, apex acute. Corolla pale violet to blue-purple, subcampanulate, 3–5 × 3–4 cm, outside glandular hairy. Stamens 1–1.5 cm. Ovary glandular. Style ca. 1.4 cm. Capsule ovoid, 2.5–4 cm, apex short beaked; pericarp less than 1 mm; persistent calyx radiate, lobes often strongly reflexed. Seeds oblong, 3–4 mm including wing. Fl. Apr–May, fr. Aug–Sep.

• Scrub, forests, wastelands; 200–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Taiwan, Zhejiang.

6. *Paulownia fargesii* Franchet, Bull. Mus. Hist. Nat. (Paris) 2: 280. 1896.

川泡桐 chuan pao tong

Trees, to 20 m tall; crown conical. Trunk conspicuous. Twigs purple-brown to brown-gray, with round convex lenticels, stellate tomentose, glabrescent. Petiole to 11 cm; leaf blade ovate to ovate-cordate, to 20 cm or longer, abaxially moderately to densely tomentose or subglabrous, adaxially sparsely pubescent, hairs short branched and stalked, margin entire or undulate, apex narrowly acuminate and apiculate. Thyrses broadly conical, to 1 m; cymes sessile or subsessile, 3–5-flowered. Pedicel less than 1 cm. Calyx obconical, to 2 cm, stellate tomentose; lobes to 1/2 of calyx length. Corolla white with purple striations to wholly purple, subcampanulate, 5.5–7.5 cm, glandular pubescent. Stamens 2–2.5 cm. Ovary glandular. Style ca. 3 cm. Capsule ellipsoid to ovoid-ellipsoid, 3–4 cm, viscid glandular when young; pericarp thin; persistent calyx adnate or ± spreading, often not reflexed. Seeds oblong, 5–6 mm including wing. Fl. Apr–May, fr. Aug–Sep.

Wild or cultivated. Forests, mountain slopes; 1200–3000 m. Guizhou, Hubei, Hunan, Sichuan, Yunnan [Vietnam].

7. *Paulownia ×taiwaniana* T. W. Hu & H. J. Chang, Taiwania 20: 166. 1975.

南方泡桐 nan fang pao tong

Paulownia australis Gong Tong.

Trees; crown umbellate. Trunk to 5 m. Branches spreading. Leaf blade ovate-cordate, abaxially densely viscid hairy or stellate tomentose, margin entire or undulate and angled, apex acute. Thyrses broadly conical, to 80 cm; cymes with peduncle 6–7 mm, terminal cyme subsessile. Calyx glabrescent or not after flowering; lobes 1/3–2/5 of calyx length. Corolla purple, ventrally whitish and with 2 conspicuous longitudinal folds, tubular-campanulate, 5–7.5 cm. Capsule ellipsoid, ca. 4 cm, stellate hairy when young; pericarp to 2 mm. Fl. Mar–Apr, fr. Jul–Aug.

• Secondary forests; below 1200 m. Fujian, Guangdong, Hunan, Taiwan, Zhejiang.

Paulownia ×taiwaniana appears to be intermediate between *P. kawakamii* and *P. fortunei*, and it is most likely a hybrid between these two species.

4. WIGHTIA Wallich, Pl. Asiat. Rar. 1: 71. 1830.

美丽桐属 mei li tong shu

Trees, semiepiphytic pseudovines, or parasitic shrubs, deciduous. Young branches pithed. Leaves opposite, leathery, abaxially sometimes glandular at vein axils, margin entire. Inflorescences of lateral thyrses or racemes; cymes 3–9-flowered. Calyx campanulate, thick, irregularly 3- or 4-lobed or apex truncate. Corolla tube short, incurved; limb 2-lipped; lower lip 3-lobed, spreading; upper lip 2-lobed, erect, exceeding lower lip. Stamens didynamous, hairy, inserted near tube base, exerted; anthers basifixed, oblong-sagittate, base 2-lobed, locules parallel and ± confluent at apex; staminodes absent. Styles elongated, apex incurved; stigma inconspicuous. Capsule 2-valved, septicial; valves margin involute, separating from placental column. Seeds numerous, linear, membranous winged.

Two species: Bhutan, China, Indonesia, Myanmar, Nepal, Sikkim, Vietnam; one species in China.

1. **Wightia speciosissima** (D. Don) Merrill, J. Arnold Arbor. 19: 67. 1938.

美丽桐 mei li tong

Gmelina speciosissima D. Don, Prodr. Fl. Nepal. 104. 1825; *Wightia alpinii* Craib; *W. elliptica* Merrill; *W. gigantea* Wallich; *W. lacei* Craib.

Trees or semiepiphytic pseudovines, to 15 m tall. Bark grayish white. Branches somewhat pendulous, brown, lenticellate, stellate hairy when young. Petiole terete, ca. 2 cm, adaxially grooved; leaf blade often oblong to elliptic, to 30 × 15 cm, abaxially sparsely gray-yellow stellate pilose, adaxially glabrous, base cuneate to rounded, apex acute. Thyrses more than 30 cm, narrow,

sparsely rusty stellate hairy; cymes often 3-flowered; peduncle to 1 cm. Pedicel short. Bracteoles 2, small. Calyx to 8 mm, outside stellate hairy; lobes orbicular to broadly ovate. Corolla reddish, to 3.5 cm; tube ± compressed, distally gradually enlarged, outside stellate hairy. Stamens 4; filaments glabrous. Ovary ovoid-globose, glabrous, obscurely 6-striate. Capsule oblong-ovoid to narrowly ellipsoid, ca. 4 cm. Seeds narrowly winged. Fl. Sep–Oct.

Forests, beside rice fields, rocks; below 2500 m. C to S Yunnan [Bhutan, India, Myanmar, Nepal, Sikkim, Thailand, Vietnam].

5. SCROPHULARIA Linnaeus, Sp. Pl. 2: 619. 1753.

玄参属 xuan shen shu

Herbs, perennial or suffrutescent, rarely annual. Leaves opposite or rarely upper ones alternate. Cymes axillary or terminal and solitary, or inflorescences lateral thyrses, racemose, spicate, or subcapitate, usually pedunculate. Calyx 5-lobed. Corolla usually 2-lipped; lower lip shorter than upper lip, 3-lobed, middle lobe flattened forward, lateral lobes suberect; upper lip 2-lobed, lobes suberect. Stamens 4, somewhat didynamous, included to exserted, adnate to corolla tube; anther locules confluent; staminode 1, small. Disc present. Style as long as or longer than ovary, slightly shorter in *S. urticifolia*; stigma often small. Capsule septicidal. Seeds numerous.

About 200 species: temperate Asia, Europe (mostly Mediterranean), North America; 36 species in China.

1a. Leaf veins not reticulate; stems woody, much branched at base as if tufted.

2a. Calyx lobes at anthesis without conspicuous membranous margin; capsule narrowly ovoid 1. *S. dentata*

2b. Calyx lobes at anthesis with conspicuous membranous margin; capsule subglobose.

3a. Calyx lobe margin broadly membranous; leaf blade often apically toothed or coarsely serrate to pinnately parted, basally pinnately parted to pinnatisect 2. *S. kiriloviana*

3b. Calyx lobe margin narrowly membranous; leaf blade ± toothed to lobed, rarely basally 1- or 2-segmented 3. *S. incisa*

1b. Leaf veins reticulate; stems herbaceous, sometimes basally woody in *S. nankinensis* and *S. alaschanica*, solitary or few tufted.

4a. Cymes subcapitate or inflorescences in a terminal raceme or spike.

5a. Calyx lobes acute to short acuminate at apex.

6a. Corolla campanulate, hairy inside 32. *S. delavayi*

6b. Corolla not campanulate, glabrous inside.

7a. Inflorescences very short, with 1 to few cymes; plants usually less than 15 cm . 33. *S. chasmophila*

7b. Inflorescences long, with many cymes; plants usually more than 15 cm.

8a. Corolla 5–6 mm; leaf base cordate; calyx 3–4 mm 34. *S. pauciflora*

8b. Corolla 8–10 mm; leaf base broadly cuneate, obtuse, or subcordate; calyx 4–5 mm.

9a. Lower stem nodes without scalelike leaves; lower part of stem at anthesis becoming hard

and not easily compressed; style ca. 3.5 mm 35. *S. spicata*

9b. Lower stem nodes with scalelike leaves; lower part of stem at anthesis soft and

easily compressed; style less than 3 mm 36. *S. mapienensis*

5b. Calyx lobes obtuse to truncate or ± toothed at apex.

10a. Lateral roots fusiform or clavate enlarged 25. *S. buergeriana*

10b. Lateral roots neither fusiform nor enlarged.

11a. Upper corolla lip entire or retuse 26. *S. moellendorffii*

11b. Upper corolla lip deeply 2-lobed.

12a. Inflorescences more than 2 cm; plants usually more than 20 cm tall.

13a. Corolla ca. 8 mm, tube enlarged, subglobose 30. *S. henryi*

13b. Corolla 10–15 mm, tube hardly enlarged, not subglobose and bent forward 31. *S. alaschanica*

12b. Inflorescences to 2 cm; plants usually less than 20 cm tall.

- 14a. Corolla 7–9 mm; style 4–5 mm; inflorescences surpassing upper leaves;
 calyx
 ca. 3 mm 27. *S. hypsophila*
- 14b. Corolla ca. 15 mm; style 8.5–11 mm; inflorescences not surpassing upper
 leaves;
 calyx 4–6 mm.
- 15a. Stems sparsely pilose apically 28. *S. przewalskii*
- 15b. Stems glandular hairy throughout 29. *S. lhasaensis*
- 4b. Cymes solitary from upper leaf axils (sometimes 1-flowered) or in a terminal panicle.
- 16a. Lateral roots fusiform.
- 17a. Calyx lobe apex acute to acuminate.
- 18a. Leaf margin regularly serrate 6. *S. kakudensis*
- 18b. Leaf margin double serrate 7. *S. yoshimurae*
- 17b. Calyx lobe apex obtuse to rounded.
- 19a. Corolla brown-purple; calyx lobes suborbicular; leaves to 30 cm 4. *S. ningpoensis*
- 19b. Corolla yellow-green; calyx lobes oblong to ovate; leaves 5–11 cm 5. *S. lijiangensis*
- 16b. Lateral roots not fusiform.
- 20a. Annual, mostly with fibrous roots or primary root poorly developed 9. *S. nankinensis*
- 20b. Perennial, often rhizomatous.
- 21a. Rhizomes often with small globose nodules.
- 22a. Corolla ca. 2 mm 10. *S. souliei*
- 22b. Corolla 8–10 mm.
- 23a. Corolla subcampanulate, upper lip almost as long as lower lip; calyx ca. 3
 mm
 11. *S. aequilabris*
- 23b. Corolla conspicuously labiate, upper lip much longer than lower lip; calyx
 4–5 mm 12. *S. kansuensis*
- 21b. Rhizomes without small globose nodules.
- 24a. Stems conspicuously winged.
- 25a. Calyx lobes ovate, apex acute to subacute, margin not membranous;
 stamens much exserted; capsule 7–8 mm 13. *S. elatior*
- 25b. Calyx lobes broadly ovate, apex nearly rounded, margin broadly
 membranous; stamens shorter than corolla; capsule 5–6 mm 14. *S. umbrosa*
- 24b. Stems wingless or slightly ribbed.
- 26a. Flowers ca. 3 mm; filaments exserted from corolla 15. *S. heucheriflora*
- 26b. Flowers more than 5 mm; filaments shorter than corolla.
- 27a. Cymes with large and foliaceous bracts.
- 28a. Corolla 1.5–1.8 cm; style ca. 8 mm, ca. 2 × as long as ovary 16. *S. stylosa*
- 28b. Corolla 0.6–1.2 cm; style 2–6 mm, slightly longer or shorter than
 ovary.
- 29a. Leaves coarsely serrate, base cuneate to narrowly attenuate;
 plants less than 30 cm tall 8. *S. formosana*
- 29b. Leaves usually double serrate, base broadly cuneate to
 cordate; plants more than 30 cm tall.
- 30a. Peduncles and pedicels glabrous; corolla 6–7 mm,
 green
 17. *S. urticifolia*
- 30b. Peduncles and pedicels glandular pilose; corolla 7–12
 mm, purple or purple-red.
- 31a. Leaves ovate to ovate-orbicular, base cordate to
 rounded; stems and leaves often hairy 18. *S. fargesii*
- 31b. Leaves ovate to ovate-lanceolate, base truncate to
 rounded; stems and leaves glabrous, rarely lower
 stem pubescent 7. *S. yoshimurae*
- 27b. Cymes with small bracts.
- 32a. Calyx lobes acute.

- 33a. Racemes 8–15 cm, 8–25-flowered, in 1-flowered cymes
22. *S. taihangshanensis*
- 33b. Racemes mostly short in cymes of 3 to many flowers (*S. macrocarpa* often with cymes reduced to a single flower).
- 34a. Inflorescences racemose or narrowly paniculate, ca. 5 cm; cymes often 1-flowered, rarely 3-flowered; capsule
1.1–1.4 cm 23. *S. macrocarpa*
- 34b. Inflorescences paniculate (corymbose before spreading),
to 15 cm; lower cymes 3–5-flowered; capsule ca. 1 cm
..... 24. *S. diploidonta*
- 32b. Calyx lobe apex obtuse (sometimes acute in *S. mandarinorum*).
- 35a. Staminode ± fanlike to transversely oblong, width greater than length 19. *S. modesta*
- 35b. Staminode subrotund to obcordate, width equal or subequal to length.
- 36a. Plants usually 1 m; leaves 8–10 pairs; calyx 2–3 mm
..... 20. *S. mandarinorum*
- 36b. Plants 0.3–0.4 m, rarely to 0.8 m; leaves 4 or 5 pairs; calyx ca. 4.5 mm 21. *S. yunnanensis*

1. *Scrophularia dentata* Royle ex Benth, Scroph. Ind. 19. 1835.

齿叶玄参 chi ye xuan shen

Herbs, suffrutescent, 20–40 cm tall, multibranched from a woody base as if tufted, whole plant generally black when dry. Stems subterete, glabrous or puberulent. Leaves subsessile or short petiolate; leaf blade narrowly oblong to ovate-oblong, 1.5–5 cm, base attenuate to cuneate, margin shallowly toothed, pinnately parted, pinnatisect, or rarely entire; pinnule basally sparsely and shallowly toothed. Panicles terminal, lax, narrow, 5–20 cm; cymes 1–3-flowered; peduncle sparsely glandular puberulent. Pedicel sparsely glandular puberulent. Calyx ca. 2 mm; lobes rotund to rotund-elliptic, glabrous, margin membranous, conspicuous only in fruit. Corolla purple-red, ca. 6 mm; tube globose-terete, ca. 4 mm; lower lip ca. 1/2 as long as upper lip; upper lip transversely rounded. Stamens ± as long as corolla; staminode suboblong. Ovary ca. 2 mm. Style ca. 2.5 × as long as ovary. Capsule narrowly ovoid, 5–8 mm including beak. Fl. May–Oct, fr. Aug–Nov.

Floodplains, grassland, mountain slopes, forests; 4000–6000 m. Xizang [India, Pakistan].

2. *Scrophularia kiriloviana* Schischkin, Fl. URSS 22: 306. 1955.

裂叶玄参 lie ye xuan shen

Herbs, suffrutescent, 30–50 cm tall, multibranched from a woody base as if tufted. Stems subterete, glabrous. Petiole 0.3–2 cm; leaf blade ovate-elliptic to ovate-oblong, 3–10 cm, margin basally pinnately parted to pinnatisect, apically toothed or serrate to pinnately parted; lobes serrate, rarely all coarsely serrate. Panicles terminal, lax, narrow, rarely axillary, 10–30 cm; cymes

3–7-flowered; rachises and pedicels sparsely glandular hairy. Calyx ca. 2.5 mm; lobes rotund, margin conspicuously membranous. Corolla purple-red, 5–7 mm; tube subglobose, 3.5–4 mm; lower lip ca. 1/2 as long as upper lip; upper lip lobes rotund. Stamens ± as long as corolla lower lip; staminode oblong to narrowly oblong. Ovary ca. 1.5 mm. Style ca. 4 mm. Capsule subglobose. Fl. May–Jul, fr. Jul–Aug.

Edge of forests, shady places in mountains, along streams, crevices or sandy places; 700–2100 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan].

3. *Scrophularia incisa* Weinmann, Bot. Gart. Dorpat. 136. 1810.

砾玄参 li xuan shen

Scrophularia canescens Bongard var. *glabrata* Franchet; *S. cretacea* Fischer ex Sprengel var. *glabrata* (Franchet) Stiefelhagen.

Herbs, suffrutescent, 20–70 cm tall, multibranched from a woody base as if tufted. Stems subterete, apically glabrous or glandular puberulent. Leaves short petiolate; leaf blade narrowly oblong to ovate-elliptic, 1–5 cm, base cuneate to attenuate, usually glabrous, margin shallowly toothed to lobed and basally rarely 1- or 2-parted, apex acute to obtuse. Panicles terminal, 10–35 cm, narrow, lax; cymes 1–7-flowered; peduncle glandular puberulent. Pedicel glandular puberulent. Calyx ca. 2 mm, glabrous or basally glandular puberulent; lobes rotund, margin narrowly membranous. Corolla rosy to dark purple-red, 5–6 mm; tube globose-cylindric, ca. 1/2 as long as corolla; lobes of lower lip ca. 1/2 as long as those of upper lip. Stamens as long as corolla; staminode oblong. Ovary ca. 1.5 mm. Style ca.

3 × as long as ovary. Capsule globose-ovoid, ca. 6 mm including beak. Fl. Jun–Aug, fr. Aug–Sep.

Gravelly floodplains, grassland in wet mountain valleys; 600–2600 m. Gansu, Nei Mongol, Ningxia, Qinghai [Kazakhstan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan, Uzbekistan].

4. *Scrophularia ningpoensis* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 178. 1890.

玄参 xuan shen

Scrophularia microdonta Franchet; *S. silvestrii* Bonati & Pampanini.

Herbs, to 1.5 m tall. Lateral roots few, fusiform to conical. Stems quadrangular, lightly grooved to nearly winged, glabrous or white crisped hairy. Leaves opposite, sometimes apically alternate; petiole to 4.5 cm; leaf blade below mostly ovate, upper ones ovate-lanceolate to lanceolate, to 30 × 19 cm, base cuneate, rounded, or subcordate, margin serrulate and rarely irregularly double serrate. Thyrses to 50 cm, largely lax; cymes terminal and axillary, often 2–4-flowered, rarely a terminal cyme less than 10 cm. Pedicel 0.3–3 cm, glandular hairy. Calyx 2–3 mm; lobes suborbicular, rounded, margin submembranous. Corolla brown-purple, 8–9 mm; tube subglobose; lower lip lobes subovate, middle lobe shorter than lateral lobes. Stamens slightly shorter than lower lip; staminode large and globose. Style ca. 3 mm. Capsule ovoid, 8–9 mm. Fl. Jun–Oct, fr. Sep–Nov.

• Bamboo forests, along streams, thickets, tall grasses; below 1700 m. Anhui, Fujian, Guangdong, Guizhou, N Hebei, Henan, Jiangsu, Jiangxi, S Shaanxi, Shanxi, Sichuan, Zhejiang.

Used medicinally.

5. *Scrophularia lijiangensis* T. Yamazaki, J. Jap. Bot. 65: 342. 1990.

丽江玄参 li jiang xuan shen

Herbs, erect, 40–80 cm tall. Lateral roots fusiform. Stems quadrangular, glabrous. Leaves opposite; petiole 1.5–3 cm, glabrous; leaf blade ovate, 5–11 × 2.5–5 cm, base truncate to cuneate, margin ± regularly serrate and often double serrate, apex acute; midrib abaxially raised; lateral veins 3 or 4 on each side of midrib. Thyrses terminal, narrow, 5–10 × ca. 2 cm; cymes 1–5-flowered; peduncle 3–5 mm, often glandular pubescent; bracts linear-lanceolate, 2–4 mm, glabrous, margin entire. Pedicel 0.5–1.5 cm, erect, sparsely glandular pilose. Calyx campanulate, glabrous; lobes oblong to ovate, ca. 3 × 1.5–2 mm, apex obtuse to rounded. Corolla yellow-green, ca. 5 mm, glabrous; tube ca. 3 mm; lower lip ca. 1 mm, lobes orbicular and ca. 1 mm in diam.; upper lip fanlike, ca. 2 mm, lobes orbicular and ca. 1.5 mm in diam. Stamens included; filaments glandular pilose; staminode fanlike. Style ca. 3 mm; stigma capitate. Capsule ovoid, ca. 5 × 3 mm. Fl. and fr. Aug–Sep.

• 2600–2800 m. Yunnan (Lijiang Naxizu Zizhixian, Eryuan Xian).

6. *Scrophularia kakudensis* Franchet, Bull. Soc. Bot. France 26: 87. 1879.

丹东玄参 dan dong xuan shen

Scrophularia kakudensis var. *latisepala* (Kitagawa) Kitagawa; *S. latisepala* Kitagawa.

Herbs, to 1 m tall, unbranched or apically branched. Lateral roots fusiform. Stems quadrangular, grooved, white pilose, pith white. Petiole to 4 cm; leaf blade ovate to narrowly ovate, 5–12 cm, abaxially glabrous or pubescent on veins, base rounded, subtruncate, or subcordate, margin regularly serrate. Thyrses to 30 cm; cymes terminal or axillary; peduncle and pedicels glandular hairy. Calyx ca. 4.5 mm; lobes ovate-elliptic to broadly ovate, apex acute. Corolla outside green, inside purplish brown, 7–8 mm; tube globose-cylindric; lower lip ca. 1.5 mm; upper lip ca. 3.5 mm, lobes rotund and with overlapping margins. Stamens ca. 1.5 mm; filaments compressed; staminode fanlike, ca. 1.5 mm. Ovary 2–2.5 mm. Style slightly longer than ovary. Capsule broadly ovoid, 7–9 mm. Fl. Jul–Aug, fr. Sep–Oct.

Scrub on mountain slopes. Liaoning (Dandong Shi, Xiuyan Xian) [Japan, Korea].

7. *Scrophularia yoshimurae* T. Yamazaki, J. Jap. Bot. 23: 86. 1949.

双锯叶玄参 shuang ju ye xuan shen

Perennials, 40–120 cm tall, usually branched. Roots often fusiform. Stems quadrangular, mostly glabrous, rarely basally pubescent. Leaves all green; petiole 0.5–2.5 cm; leaf blade ovate to ovate-lanceolate, glabrous, 5–14 × 2–5 cm, base truncate, rounded, or cuneate, margin double serrate, apex acute to acuminate. Thyrses terminal, lax, large; cymes terminal and axillary, 2–9-flowered; peduncle glandular pilose. Pedicel 0.8–2 cm, glandular pilose. Calyx 3–5 mm; lobes ovate, apex obtuse to acute. Corolla purplish, urceolate, 7–12 mm; tube cylindric, 4–5 mm; lower lip ca. 1.5 mm; upper lip 3.5–4 mm, lobes rounded. Stamens ca. 1.5 mm longer than corolla tube; filaments white glandular; staminode obovate. Ovary glabrous. Style 3–5 mm. Capsule globose, 6–8 × 6–7 mm, apex pointed.

• Edge of forests, trailsides, open stream banks; 600–2900 m. Taiwan.

8. *Scrophularia formosana* H. L. Li, Quart. J. Taiwan Mus. 3: 68. 1950.

台湾玄参 tai wan xuan shen

Perennials, erect, 20–30 cm tall, branched. Stems flexible, ± quadrangular, glabrescent. Petiole 0.5–1 cm, slightly winged, glabrescent; leaf blade oblong-ovate, 2.5–4 × 1–2 cm, glabrous, base cuneate to narrowly attenuate, margin coarsely serrate, usually basally entire, apex acuminate. Peduncle 2–3 cm; bracts large, foliaceous. Cymes axillary, ± lax, many flowered. Pedicel 5–10 mm, glabrous. Calyx ca. 3 mm; lobes ca. 1/2 of calyx length, triangular-ovate, glabrous, apex acute to acuminate. Corolla yellow, 8–10 mm, glabrous; tube cylindric, ca. 6 mm; lateral and middle lobes of lower lip erect, rounded, ca. 3 mm; upper lip 3–4 mm, slightly 2-lobed. Stamens included; filaments basally

hairy. Ovary glabrous. Style ca. 6 mm, glabrous. Fruit unknown.

• Taiwan (Taidong Xian).

9. *Scrophularia nankinensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 394. 1979.
南京玄参 nan jing xuan shen

Annuals, to 50 cm tall, simple or occasionally branched. Roots filiform or primary root poorly developed. Stems basally woody. Leaves opposite, alternate upward; petiole ca. 6 mm; leaf blade ovate to rhomboid-ovate, base broadly cuneate to subcordate, margin irregularly and coarsely few serrate. Cymes axillary, 1-flowered, rarely 2- or 3-flowered below. Pedicel to 1.5 cm, sparsely glandular hairy. Calyx ca. 3 mm; lobes ovate-lanceolate to narrowly ovate, apex acute. Corolla red, ca. 6.5 mm; lower lip lobes similar to each other; upper lip slightly longer than lower lip, lobes broadly rounded and with overlapping margins. Stamens \pm as long as lower lip; staminode rounded. Ovary ovoid. Style ca. 2.5 mm, slightly shorter than ovary. Fruit unknown. Fl. Apr–May.

• Low elevations. Jiangsu (Nanjing Shi).

10. *Scrophularia souliei* Franchet, Bull. Soc. Bot. France 47: 15. 1900.
小花玄参 xiao hua xuan shen

Herbs, slender, 3–20 cm tall. Rhizomes slender, ca. 5 mm in diam., often with globose nodules. Stems erect or \pm bent and ascending, pilose. Leaf blade ovate to triangular-ovate, rarely oblong-ovate, abaxially pilose on veins, adaxially appressed white hairy, base cuneate to truncate, margin irregularly and obtusely coarsely toothed. Thyrses terminal, narrow, lax; cymes mostly 3-flowered, opposite; peduncle slender, to 1.7 cm. Pedicel ca. 2 mm, glandular hairy. Calyx \pm hooded, ca. 1 mm; lobes triangular-ovate. Corolla green, ca. 2 mm; tube globose; throat brownish; lower lip conspicuously shorter than upper lip, with much smaller lobes; upper lip lobes orbicular, margins not overlapping. Stamens included; staminode subglobose to reniform. Ovary ca. 0.7 mm. Style slightly longer than ovary. Capsule narrowly ovoid, 4–5 mm. Fl. and fr. Jun–Jul.

• Grassland on mountain slopes; ca. 3700 m. S Gansu, E Qinghai, W Sichuan.

11. *Scrophularia aequilabris* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 394. 1979.
等唇玄参 deng chun xuan shen

Herbs, slender, to 20 cm tall, unbranched. Rhizomes slender, sometimes with small globose nodules. Stems hollow, narrowly winged, striate. Leaves on lower nodes scalelike, otherwise leaf blade broadly ovate, 0.2–3 cm, adaxially glabrous or sparsely pubescent, base truncate to subcordate, margin with few irregular large teeth or double toothed. Cymes mostly from upper leaf axils, 1-flowered, rarely 2-flowered. Pedicel slender, more than 2.5 cm, puberulent to subglabrous. Calyx ca. 3 mm; lobes ovate-oblong, apex subobtusate to

acute. Corolla white, subcampanulate, ca. 8 mm; lower lip lobes narrow; upper lip almost as long as lower lip, lobes broadly rounded, with overlapping margins. Stamens slightly longer than corolla tube; staminode small, narrowly spatulate. Ovary 1.5–2 mm. Style 5–6 mm. Fruit unknown. Fl. Jun–Jul.

• Forests; 3300–3900 m. W Sichuan.

12. *Scrophularia kansuensis* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 381. 1894.

甘肃玄参 gan su xuan shen

Herbs, 5–40 cm tall. Rhizomes slender, ca. 5 mm in diam, usually with small globose nodules. Stems hollow, erect, subquadrangular, glandular hairy. Petiole to 2 cm; leaf blade ovate, 1–3 cm, abaxially densely hairy, adaxially glabrous or sparsely hairy, base rounded to subcordate, margin subentire to irregularly coarsely toothed. Cymes 1- or 2-flowered, solitary in upper axils or in a subterminal and narrow inflorescence; peduncle 1–2.5 cm, glandular hairy. Pedicel shorter than peduncle, glandular hairy. Calyx 4–5 mm, glandular hairy; lobes oblong-ovate to ovate-lanceolate, apex obtuse to acute. Corolla greenish white, ca. 1 cm; tube subglobose; lower lip lobes rotund; upper lip conspicuously longer than lower lip, lobes obovate. Stamens shorter than lower lip; staminode subglobose. Ovary slightly shorter than style. Style 4–5 mm. Capsule ovoid, ca. 8 mm. Fl. and fr. May–Aug.

• Grassland on mountain slopes, fields; 2300–4500 m. SE Gansu, Qinghai (Tongde Xian), N Sichuan.

13. *Scrophularia elatior* Bentham, Scroph. Ind. 18. 1835.

高玄参 gao xuan shen

Scrophularia petitmenginii Bonati.

Herbs, to 2 m tall, often branched. Lateral roots with nodules to 2.6 cm in diam. Rhizomes with fibrous roots. Stems quadrangular, conspicuously winged, pith white. Petiole to 10 cm, conspicuously winged; leaf blade ovate to lanceolate, 5–25 cm, base cuneate, orbicular, or rarely shallowly cordate, margin serrate to double serrate. Thyrses terminal, to 30 cm; cymes 5–8-flowered; peduncle to 5 mm, glandular hairy. Pedicel glandular hairy. Calyx ca. 3 mm; lobes ovate, margin not membranous, apex acute to subacute. Corolla green, ca. 6 mm; lower lip with narrow middle lobe; upper lip slightly longer than lower, lobes orbicular, ca. 1 mm, with overlapping margins. Stamens ca. 2 \times as long as corolla, exserted; staminode fanlike to obovate, slightly longer than upper lip, sometimes absent. Ovary ca. 2.8 mm. Style ca. 7 mm. Capsule globose-ovoid, 7–8 mm including short beak. Fl. Jul–Sep, fr. Sep–Nov.

Forests, wet grassland; 2000–3000 m. S Xinjiang, Yunnan [Nepal, Sikkim].

14. *Scrophularia umbrosa* Dumortier, Fl. Belg. 37. 1827.

翅茎玄参 chi jing xuan shen

Herbs, erect, 50–130 cm tall, glabrous except for glandular hairs on pedicels. Stems quadrangular, to 8

mm in diam., narrowly winged, white pithed or hollow with age. Petiole to 5 cm, narrowly winged; leaf blade ovate to ovate-lanceolate, 7–10 cm, base rounded to subcordate, margin shallowly serrate. Thyrses terminal, to 20 cm; cymes numerous. Pedicel to 1 cm. Calyx 2–3 mm; lobes broadly ovate, margin broadly membranous, apex nearly rounded. Corolla green, purplish yellow, or brown, 4–6 mm; tube subglobose; lower lip middle lobe somewhat narrow; upper lip slightly longer than lower lip, lobes ± semiorbicular, with overlapping margins. Stamens almost as long as lower lip; staminode reniform. Ovary ca. 2 mm. Style ca. 2 mm. Capsule ovoid-globose, 5–6 mm. Fl. Jun–Aug, fr. Jul–Sep.

Forests, along streams; 900–1700 m. N Xinjiang [Russia; Europe].

15. *Scrophularia heucheriflora* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 25. 1841.

新疆玄参 xin jiang xuan shen

Herbs, to 8 cm tall. Stems subquadrangular, white hairy, apically glandular hairy, pith white. Leaves scalelike on lower nodes. Petiole to 5 cm, densely white hairy; leaf blade mostly triangular-ovate, to 13 × 9 cm, abaxially with short white hairs, base cordate to rarely broadly cuneate, margin irregularly triangular-serrate. Thyrses narrowly conical, to 30 cm, less than 3.5 cm wide, densely glandular hairy; peduncle less than 1 cm. Pedicel ca. 5 mm. Calyx ca. 2.5 mm; lobes linear-oblong, margin submembranous. Corolla ca. 3 mm, slightly longer than calyx; upper lip slightly longer than lower lip; lobes orbicular. Stamens ca. 5 mm, exerted from corolla; staminode large, ligulate. Ovary ca. 1 mm. Style to 5 mm. Capsule ovoid-globose, ca. 6 mm including beak, veins conspicuously reticulate. Fl. and fr. May–Jun.

Below 900 m. N Xinjiang [Kazakstan, Kyrgyzstan, Tajikistan, Uzbekistan].

16. *Scrophularia stylosa* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 394. 1979.

长柱玄参 chang zhu xuan shen

Stems to 60 cm tall, simple or apically short branched. Stems densely glandular hairy, hollow. Leaves lower 2 pairs smaller than others; petiole to 4 cm, narrowly winged; leaf blade narrowly to broadly ovate, to 9 × 9.5 cm, thin, abaxially grayish white, adaxially green, base broadly cuneate to subcordate, margin toothed to rarely shallowly crenate-toothed. Cymes axillary, 1–3-flowered; peduncle slender, ca. 1.5 cm, glandular hairy; bracts large, foliaceous. Pedicel slender, to 2.5 cm, glandular hairy. Calyx 4–5 mm, glandular pubescent; lobes lanceolate-ovate to lanceolate, apex acute. Corolla light yellow, 1.5–1.8 cm; tube 0.9–1.1 cm; lower lip lobes orbicular, middle lobe larger than other lobes; upper lip ca. 1.5 mm longer than lower lip, lobes rotund, with overlapping margins. Stamens slightly shorter than lower lip; staminode obcordate, ca. 0.5 mm. Ovary ca. 3 mm. Style ca. 8 mm. Capsule narrowly ovoid, 0.9–1.1 cm including beak. Fl. Jun, fr. Jul–Sep.

• On rocks; 2000–3000 m. Shaanxi (Foping Xian).

17. *Scrophularia urticifolia* Wallich ex Bentham, Scroph. Ind. 18. 1835.

荨麻玄参 qian ma xuan shen

Scrophularia forrestii Diels.

Herbs, to 1 m tall. Stems quadrangular, pith white. Leaves 3–5 pairs; petiole 2–4 cm or to 7 cm below; leaf blade broadly ovate, ovate-elliptic, or oblong, 6–9 × 4–6 cm, base subcordate to rounded, margin coarsely double serrate. Thyrses large and spreading, terminal on lateral branches, to 30 cm; peduncle glabrous; bracts large and foliaceous, gradually decreasing in size toward inflorescences apex. Pedicel glabrous. Calyx ca. 3 mm; lobes elliptic, apex obtuse. Corolla light green, 6–7 mm; tube 3–4 mm; lower lip lobes subequal; upper lip ca. 2 mm longer than lower lip, lobes with overlapping margins. Stamens ± as long as lower lip; staminode subglobose. Ovary ca. 2 mm. Style slightly shorter than ovary. Fruit unknown. Fl. Apr–May.

Grassland of mountain slopes, scrub; 2700–2800 m. S Xizang, W Yunnan [Bhutan, India (Darjeeling), Nepal, Sikkim].

18. *Scrophularia fargesii* Franchet, Bull. Soc. Bot. France 47: 12. 1900.

长梗玄参 chang geng xuan shen

Scrophularia franchetiana P. C. Tsoong; *S. wilsonii* Bonati.

Perennials, more than 60 cm tall. Roots stout, ± fleshy. Stems obscurely quadrangular, hollow, glabrous, white pilose, or glandular pilose. Leaves opposite; petiole to 5 cm, narrowly winged; leaf blade ovate to ovate-orbicular, 5–9 cm, thin, abaxially puberulent on veins, adaxially glabrous or sparsely hairy, base rounded, cordate-truncate, or rarely broadly cuneate, margin unequally double serrate. Cymes axillary or terminal, 1–3-flowered, rarely 5-flowered; peduncle slender, more than 3 cm. Pedicel slender, more than 3 cm, glandular pilose; bracts large, foliaceous. Calyx ca. 5 mm; lobes narrowly ovate to orbicular-ovate, apex obtuse to acute, margin membranous and more conspicuous in fruit. Corolla purple-red, 1–1.2 cm; tube ovoid-globose; lower lip lobes rounded, middle lobe smaller than other lobes; upper lip 2–3 mm longer than lower lip, lobes 1.5–2 mm, with overlapping margins. Stamens slightly shorter than lower lip; staminode subglobose. Ovary slightly shorter than style. Style 3–4 mm. Capsule narrowly ovoid, 9–10 mm. Fl. Jun–Jul, fr. Aug.

• Grassland, scrub; 2000–3300 m. Hubei (Shennongjia Linqiu), Sichuan.

Scrophularia maximowiczii Gorschikova is reported from NE China (Bot. Mater. Gerb. Inst. Komarova Akad. Nauk SSSR 14: 444. 1951) and is similar to *S. fargesii* but differs by having lanceolate calyx lobes with acute apices. The authors have not seen any specimens of this species.

19. *Scrophularia modesta* Kitagawa, Rep. Exped. Manchoukuo sect. IV, 2: 28. 1935.

山西玄参 shan xi xuan shen

Herbs, to 60 cm tall. Stems densely glandular hairy, white pithed or sometimes hollow. Leaves ovate, ovate-oblong, or oblong-lanceolate, to 9 × 5 cm, pubescent, base often asymmetrical and rounded, subtruncate, subcordate, or rarely broadly cuneate, margin variously toothed. Thyrses terminal or sometimes on lateral branches, to 30 cm; cymes widely spaced, 3–7-flowered; peduncle to 1.5 cm, glandular hairy; bracts small. Pedicel usually 4(–10) mm, glandular hairy. Calyx ca. 4 mm, subglabrous; lobes ovate, apex obtuse. Corolla green to yellow-green, ca. 8 mm; tube oblong-globose, ca. 4 mm; lower lip middle lobe slightly shorter than lateral lobes; upper lip ca. 1 mm longer than lower lip, lobes ovate, with overlapping margins. Stamens slightly shorter than lower lip; staminode ± fanlike to transversely oblong, wider than long. Ovary ca. 2.5 mm. Style 3–4 mm. Capsule ovoid, 5–9 mm. Fl. May–Jul, fr. Jul–Sep.

• Grassland along rivers, under forests; 1100–2300 m. Hebei, Shaanxi, Shanxi.

Scrophularia modesta is similar to *S. mandarinorum* and *S. yunnanensis* which together form a natural group. T. Yamazaki (J. Jap. Bot. 23: 83. 1949) treated *S. modesta* as a synonym of *S.*

moellendorffii Maximowicz. Although these two species are superficially similar, the flower morphology is quite different.

20. *Scrophularia mandarinorum* Franchet, Bull. Soc. Bot. France 47: 13. 1900.

单齿玄参 dan chi xuan shen

Scrophularia duclouxii Stiefelhagen & Bonati; *S. stiefelhagenii* Bonati.

Herbs, to 1 m tall. Stems glandular, hairy or basally subglabrous, pith white. Leaves ca. 8–10 pairs; petiole to 2.5 cm, narrowly winged, glandular hairy or glabrous; leaf blade ovate to ovate-lanceolate, glabrous, puberulent, or pilose, base broadly cuneate, rounded, or subcordate, margin regularly to somewhat irregularly serrate or rarely double serrate. Thyrses narrow, ca. 20 cm; peduncle 0.5–1.5 cm, glandular hairy; bracts small. Pedicel 0.5–1.5 cm, glandular hairy. Calyx 2–3 mm; lobes ovate-lanceolate to lanceolate-oblong, apex obtuse to acute. Corolla 5–8 mm; tube 3–5 mm; upper lip 1–1.5 mm longer than lower lip; lobes orbicular, with overlapping margins, lateral lobes wider than long, middle lobe smaller than lateral lobes. Stamens as long as or slightly shorter than lower lobes; staminode small, subglobose, ± as wide as long. Ovary ca. 2 mm. Style ca. 2 mm. Capsule ovoid, 6–7 mm including beak. Fl. Jul–Aug, fr. Aug–Oct.

• Forests, grassland on mountain slopes, riverbanks; 1800–3800 m. SW to W Sichuan, S to SE Xizang, NW Yunnan.

21. *Scrophularia yunnanensis* Franchet, Bull. Soc. Bot. France 47: 12. 1900.

云南玄参 yun nan xuan shen

Herbs, slender, 30–40(–80) cm tall. Rhizomes slender. Stems glandular hairy. Leaves often crowded below, ca. 4 or 5 pairs, increasing in size upward; petiole to 3.5 cm, narrowly winged, pilose; leaf blade elliptic-ovate to

oblong-obovate, to 8 × 5 cm, sparsely white hairy on both surfaces or only on veins abaxially, base subcordate, truncate, or broadly cuneate, margin undulate and double serrate. Thyrses terminal, narrow, 8–20 cm; cymes 2–5-flowered; peduncle ca. 2 cm, glandular hairy; bracts small. Pedicel ca. 2 cm, glandular hairy. Calyx ca. 4.5 mm; lobes ovate-orbicular, apex obtuse-rounded. Corolla green, 7–10 mm; tube subglobose; lower lip middle lobes smaller than lateral lobes; upper lip lobes orbicular, with overlapping margins. Stamens as long as or slightly longer than lower lip; staminode obcordate to subglobose, ± as wide as long. Ovary ca. 2 mm. Style to 3 mm. Capsule narrowly ovoid, ca. 8 mm. Fl. May–Aug, fr. Aug–Sep.

• Rocky grassland; 3000–3700 m. SW Sichuan, NW Yunnan.

22. *Scrophularia taihangshanensis* C. S. Zhu & H. W. Yang, Acta Phytotax. Sin. 35: 76. 1997.

太行山玄参 tai hang shan xuan shen

Perennials, 20–45 cm tall. Stems, peduncles, bracts, pedicels, and calyces pilose and glandular pubescent. Stems quadrangular. Petiole 4–6 cm. Basal leaf blade ovate to ovate-deltoid, 3.5–5 × (2.5–)3–4.5 cm, puberulent, base subcordate, margin double dentate or lobed and lobes dentate, apex acute to obtuse. Stem leaf blades 5–8 × 3.5–5 cm, puberulent, base cordate, rounded, or broadly cuneate, margin double dentate or lobed and lobes dentate, apex acute to obtuse. Thyrses terminal, racemose, 8–15 cm, (8–)10–25-flowered; rachis zig-zag; bracts linear, small. Pedicel 1–2 cm. Calyx 6–8 mm; lobes parted to near base, lanceolate, apex acute. Corolla yellow-green, 6–8 mm; tube 4–5 × 2–2.5 mm; upper lip 0.5–1 mm longer than lower lip, lobes obovate-oblong, 2–2.5 × ca. 1.5 mm. Stamens ± as long as corolla; staminode oblong. Capsule ovoid, 4–5 mm including beak. Seeds oblong, 0.4–0.5 × ca. 0.3 mm, angular. Fl. and fr. Jul–Aug.

• Edge of forests; ca. 900 m. Henan (Qinyang Xian).

23. *Scrophularia macrocarpa* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 395. 1979.

大果玄参 da guo xuan shen

Perennials, 15–35 cm tall. Roots ± stout, ca. 2 cm in diam. Stems hollow. Basal leaves 3 or 4 pairs, scalelike. Stem leaves petiole flattened, narrowly winged, to 6 cm; leaf blade ovate, broadly ovate, or triangular-ovate, to 9.5 cm, adaxially glabrous or puberulent, base cuneate to shallowly cordate, margin double serrate. Thyrses terminal, racemose or narrowly paniculate, ca. 5 cm; cymes 1(–3)-flowered; peduncle glandular hairy; bracts small. Pedicel glandular hairy. Calyx 5–6 cm; lobes ovate-lanceolate, apex acute. Corolla yellow-green, ca. 9 cm; tube subglobose, ca. 6 mm; lower lip lobes rounded; upper lip ca. 2.5 mm longer than lower lip, lobes orbicular, with overlapping margins. Stamens slightly shorter than lower lip; staminode obovate,

small. Style as long as ovary or slightly longer. Capsule ovoid, 1–1.4 cm. Fl. May, fr. Jun.

• Forests; 3000–3600 m. SW Sichuan, Yunnan (Luquan Xian).

24. *Scrophularia diplodonta* Franchet, Bull. Soc. Bot. France 47: 14. 1900.

重齿玄参 chong chi xuan shen

Scrophularia crenatosepala H. L. Li; *S. diplodonta* var. *tsanchanensis* Franchet.

Perennials, to 70 cm tall. Roots stout. Stems hollow, striate, sometimes apically quadrangular. Basal leaves scalelike. Stem leaves petiole narrowly winged, to 2 cm; leaf blade lanceolate to ovate, 5–10 cm, papery, base cuneate to subcordate, margin serrate or double serrate.

Thyrses terminal, corymbose at first, paniculate later, ca. 15 × 7 cm, lower cymes 3–5-flowered; peduncle to 2 cm; bracts small. Pedicel to 1.5 cm, glandular and eglandular puberulent. Calyx ca. 5 mm; lobes subequal, narrowly ovate to ovate-lanceolate, margin entire or irregularly crenate, apex acute. Corolla whitish green, ca. 1 cm; tube globose, ca. 5 mm; lower lip lobes oblong to oblong-ovate; upper lip ca. 2.5 mm longer than lower lip, lobes obovate, with overlapping margins. Stamens almost as long as lower lips; staminode obovate to obtriangular-cordate. Ovary ca. 2 mm. Style slightly longer than ovary. Capsule ca. 1 cm. Fl. May–Jun, fr. Jul–Aug.

• Grassland on mountain slopes, mixed forests; 3000–3600 m. NW Yunnan.

25. *Scrophularia buergeriana* Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 116. 1865.

北玄参 bei xuan shen

Herbs, to 1.5 m tall. Lateral roots fusiform, inflated. Rhizomes with fleshy nodules. Herbage glabrous, sparsely hairy, or white villous. Stems narrowly winged, pith white. Petiole to 5.5 cm; leaf blade ovate to elliptic-ovate, 5–12 cm, base broadly cuneate to truncate, margin acutely serrate. Thyrses spicate, to 50 cm, less than 2 cm wide; cymes all alternate or lower ones subopposite; peduncle less than 5 mm, sparsely glandular hairy. Pedicel less than 5 mm, sparsely glandular hairy. Calyx ca. 2 mm; lobes ovate-elliptic to broadly ovate, apex obtuse to rounded. Corolla yellow-green, 5–6 mm; lower lip lobes rounded to obtuse; upper lip ca. 1.5 mm longer than lower lip, lobes rounded to obtuse, with overlapping margins. Stamens almost as long as lower lip; staminode obovate. Ovary ca. 1.5 mm. Style ca. 3 mm. Capsule ovoid, 4–6 mm. Fl. Jul, fr. Aug–Sep.

Wild or cultivated. Lower mountain slopes, wet grassland; 200–1500 m. Gansu (Huating Xian), Hebei, Henan, Jilin, Liaoning, Shaanxi (Taibai Shan), Shandong, Shanxi (Xia Xian) [Japan, Korea].

Scrophularia amgunensis F. Schmidt and *S. mandchurica* Maximowicz have been reported from NE China (P. Y. Fu, ed. Clavis Plantarum Chinae Boreali-Orientalis, ed. 2, 602. 1995), but these reports may actually be *S. buergeriana*.

- 1a. Stems, petioles, and abaxial surface of leaf blades glabrous or sparsely hairy 25a. var. *buergeriana*
1b. Stems, petioles, and abaxial surface of leaf blades white villous 25b. var. *tsinglingensis*

25a. *Scrophularia buergeriana* var. *buergeriana*
北玄参(原变种) bei xuan shen (yuan bian zhong)

Scrophularia oldhami Oliver.

Stems, petioles, and abaxial surface of leaf blades glabrous or sparsely hairy. Fl. Jul, fr. Aug–Sep.

Lower mountain slopes, wet grassland; 200–1100 m. Hebei, Henan, Jilin, Liaoning, Shandong [Japan, Korea].

Used medicinally.

25b. *Scrophularia buergeriana* var. *tsinglingensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 395. 1979.

北秦岭玄参 bei qin ling xuan shen

Stem, petiole, and abaxial surface of leaf blades with white villous multicellular hairs. Fl. Jul–Aug.

• Grassland along rivers, cultivated in Taibai Shan area; 1000–1500 m. Gansu (Huating Xian), Shaanxi (Taibai Shan), Shanxi (Xia Xian). Used medicinally.

26. *Scrophularia moellendorffii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 501. 1880.

华北玄参 hua bei xuan shen

Perennials, to 60 cm tall. Stems subterete, narrowly winged, hollow, often glandular hairy apically. Leaves on lower nodes scalelike. Stem leaves petiole 0.5–2.5 cm; leaf blade ovate, oblong-ovate, or rarely oblong-lanceolate, to 10 cm, base broadly cuneate to occasionally subtruncate, margin often coarsely irregularly double toothed. Thyrses terminal; cymes opposite or whorled; lower whorls ca. 4 cm distant from each other; peduncle short, densely glandular hairy. Flowers crowded. Pedicel short, densely glandular hairy. Calyx oblique, less than 3 mm; lobes ovate. Corolla yellow, ca. 7 mm, outside sparsely glandular puberulent; tube subglobose; lower lip lobes orbicular, middle lobe smaller than other lobes; upper lip ca. 2 mm longer than lower lip, margin entire or retuse. Stamens ± as long as corolla tube; staminode small. Ovary ca. 2 mm, 1/3–1/2 as long as style. Style slender. Capsule ovoid, ca. 7 mm. Fl. Jul, fr. Jul–Aug.

• Among shady rocks, mountain tops; 1500–2000 m. Shanxi (Taihang Shan).

27. *Scrophularia hypsophila* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 238. 1925.

高山玄参 gao shan xuan shen

Herbs, to 25 cm tall. Rhizomes elongated, woody. Stems mostly fascicled, apically slightly curved, hollow. Basal leaves scalelike. Stem leaves petiole 3–4 mm, narrowly winged; leaf blade ovate to elliptic-ovate, to 3.5 cm, glabrous, base broadly cuneate to rounded, margin coarsely and irregularly double serrate. Thyrses surpassing upper leaves, capitate, to 2 cm; cymes often 1-flowered. Calyx ca. 3 mm, deeply lobed; lobes subequal, subovate to oblong, margin 2- or 3-toothed, apex obtuse to truncate. Corolla yellow, 7–9 mm; tube

subglobose, somewhat inflated, 4–5 mm; lower lip lobes unequal; upper lip 1–2 mm longer than lower lip, lobe margins not overlapping. Stamens \pm as long as lower lip; staminode apex narrow to semiorbicular. Ovary ca. 2 mm. Style 4–5 mm. Capsule subglobose, 6–7 mm in diam. Fl. Jul–Sep, fr. Sep.

• Alpine grassland, sandy mountain slopes; 3000–4100 m. NW Yunnan.

28. *Scrophularia przewalskii* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 382. 1894.

青海玄参 qing hai xuan shen

Perennials, 8–30 cm tall. Rhizomes to 5 mm in diam.

Stems 1–3, often branched from middle or apically, sparsely pilose apically. Leaves on lower nodes scalelike. Stem leaves petiole to 1.5 cm, sparsely pubescent; leaf blade ovate, 1–4 \times 0.8–3 cm, abaxially sparsely pubescent, margin dentate, serrate, or crenulate. Thyrses terminal on main stems and not surpassing upper leaves, or also on lateral branches, less than 2 cm; cymes (1–)3-flowered; peduncle glandular hairy.

Pedicel glandular hairy, ca. 3 mm at anthesis, to 7 mm in fruit. Calyx lobes ovate-oblong, 4–6 \times 2.5–3.5 mm, glandular, apex rounded. Corolla yellow, ca. 1.5 cm; upper lip ca. 2.5 mm longer than lower lip, lobes rounded, ca. 5 mm wide. Stamens \pm as long as lower lip. Style ca. 1.1 cm. Capsule globose, ca. 7 \times 6 mm. Fl. Jun–Aug, fr. Aug–Sep.

Sunny and rocky slopes; 4100–4600 m. SE Qinghai [Sikkim].

29. *Scrophularia lhasaensis* D. Y. Hong, Novon 6: 372. 1996.

拉萨玄参 la sa xuan shen

Perennials, ca. 15 cm tall, glandular hairy throughout except on corollas, stamens, and pistils. Rhizomes ca. 9 mm in diam. Stems several, cespitose, branched apically and branches usually sterile. Leaves on lower nodes 1 or 2; petiole 2–3 mm; leaf blade scalelike. Stem leaves sessile, ovate to ovate-orbicular, 1.7–4.5 \times 1–2.5 cm, base rounded to subtruncate, margin entire or rarely weakly serrate. Thyrses terminal, very short; cymes 4-flowered, in pairs; peduncle ca. 1.2 cm. Pedicel 2–3 mm. Calyx ca. 5 mm, parted almost to base; lobes linear-oblong, apex obtuse. Corolla green-yellow, urceolate, ca. 1.1 cm, glabrous; lower lip ca. 2 mm, upper lip ca. 3.8 mm, lobes not overlapping and ca. 5 mm wide. Stamens slightly exerted, glabrous; staminode clavate. Ovary ovoid, apex gradually tapering. Style ca. 8.5 mm, glabrous. Fl. Jun–Aug.

• Rocky terrain; ca. 4600 m. C Xizang.

30. *Scrophularia henryi* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 178. 1890.

鄂西玄参 e xi xuan shen

Scrophularia henryi var. *glabrescens* Hemsley.

Perennials, to 40 cm tall. Stems 1 or 2, subquadrangular, hollow, apically puberulent to lanose when young, glabrescent. Petiole 1–2 cm; leaf blade ovate to elliptic, 4–6 cm, abaxially glabrous or puberulent, base obtuse,

margin serrate or occasionally \pm double serrate. Thyrses terminal, spikelike, 4–10 cm, capitate; cymes opposite or whorled; lower whorls 2–5 cm apart; peduncle short; rachis, peduncle, and pedicel densely puberulent. Calyx ca. 4 mm; lobes ovate-orbicular. Corolla yellow-green, ca. 8 mm; tube subglobose, ca. 4 mm; lower lip middle lobe smaller than lateral lobes; upper lip ca. 2 mm longer than lower lip, lobes obovate, with overlapping margins. Stamens slightly shorter than lower lip; staminode ca. 0.5 mm, obovate. Ovary ca. 3 mm. Style ca. 4 mm. Capsule globose-ovoid, ca. 8 mm. Fl. Jun–Jul, fr. Jul–Aug.

• Mountain slopes, on rocks; 2700–3100 m. W Hubei (Shennongjia Linqu).

31. *Scrophularia alaschanica* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 380. 1894.

贺兰山玄参 he lan shan xuan shen

Perennials, to 40 cm tall. Roots to 5 mm in diam. Stems hollow or basally \pm woody, glandular hairy. Basal leaves scalelike. Upper leaves petiole to 1.3 cm, narrowly winged; leaf blade ovate-elliptic to ovate-lanceolate, 3–8 \times 3–5 cm, margin coarsely and irregularly double serrate. Thyrses short spicate or subcapitate, 2–8 cm, with 2–4 nodes; cymes opposite; peduncle short. Pedicel short. Calyx 4–5 mm, densely glandular hairy; lobes broadly oblong to broadly elliptic, apex obtuse to rounded. Corolla yellow, 1–1.5 cm, outside glandular hairy; tube slightly inflated, bent forward; upper lip ca. 2.5 mm longer than lower lip, lobes orbicular, with overlapping margins. Staminode linear-cuneate. Style 2 \times or more as long as ovary. Capsule broadly ovoid, ca. 1 cm. Fl. May–Jun, fr. Jul–Aug.

• Crevices along streams, grassland of mountain slopes; 2200–2500 m. Ningxia.

32. *Scrophularia delavayi* Franchet, Bull. Soc. Bot. France 47: 15. 1900.

大花玄参 da hua xuan shen

Scrophularia campanulata H. L. Li; *S. muliensis* H. L. Li.

Perennials, to 45 cm tall. Rhizomes apically to 1.2 cm in diam. Stems fascicled, hollow, sparsely hairy. Basal leaves scalelike. Upper leaves petiole to 4 cm, flattened, narrowly winged; leaf blade ovate to ovate-rhomboid, 2.5–7 cm, usually glabrous, base broadly cuneate to subtruncate, margin incised and double serrate. Thyrses subcapitate or subspicate, 3–10 cm, 1–3-whorled, glandular hairy; cymes 1–3-flowered. Pedicel to 1 cm. Calyx 5–7 mm, oblique, somewhat 2-lipped; lobes acute. Corolla yellow, 0.9–1.5 cm, outside glabrous; tube subcampanulate, ca. 6 mm, inside villous; lower lip middle lobe narrow, ligulate; upper lip longer than lower lip, inside villous, lobes orbicular, with overlapping margins. Stamens ca. 1/2 length of lower lip; staminode rounded to subreniform. Ovary ca. 3 mm. Style at least 2 \times as long as ovary. Capsule narrowly ovoid, ca. 7 mm. Fl. May–Jul, fr. Aug.

• Grassland on mountain slopes, moist areas in scrub, rocky crevices; 3100–3800 m. SW Sichuan, N Yunnan.

33. *Scrophularia chasmophila* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 181. 1921.

岩隙玄参 *yan xi xuan shen*

Herbs, to 10 cm tall. Roots to 15 cm. Stems soft and bent. Basal leaves scalelike. Upper leaves petiole 0.5–1.5 cm, often winged; leaf blade subrhomboid-ovate, 1.3–2.7 × 1–2.2 cm, abaxially hairy, adaxially densely strigose, base broadly cuneate, margin serrate or coarsely serrate, rarely subentire and hairy, veins hairy. Peduncle to 5 mm. Thyrses terminal, cymose, short. Pedicel ca. 7 mm, glandular pilose. Calyx 5–7 mm, somewhat oblique, glandular hairy; lobes unequal, apex often acute. Corolla greenish yellow, 1.5–2.2 cm, glabrous; lower lip lobes ca. 3 mm, middle lobe smallest; upper lobes ca. 5 mm longer than lower lobes, orbicular, with overlapping margins. Stamens shorter than upper lip; staminode linear, clavate, or obovoid. Ovary ca. 2 mm. Style 4–5 × as long as ovary. Capsule 1–1.1 cm, including beak. Fl. Jun–Jul, fr. Jul.

• Stony grassland, among rocks; 3500–4600 m. SW Sichuan, Xizang (Nyingchi Xian), NW Yunnan.

1a. Corolla to 1.5 cm; staminode linear or clavate; leaves sparsely serrate or subentire 33a. subsp. *chasmophila*

1b. Corolla 1.8–2.2 cm; staminode obovoid; leaves usually coarsely dentate 33b. subsp. *xizangensis*

33a. *Scrophularia chasmophila* subsp. *chasmophila*

岩隙玄参(原亚种) *yan xi xuan shen (yuan ya zhong)*

Scrophularia nana H. L. Li; *S. rockii* H. L. Li.

Leaves to 1.8 × 1.6 cm, sparsely serrate or subentire.

Corolla to 1.5 cm. Staminode linear or clavate. Fl. Jun–Jul, fr. Jul.

• Stony grassland; 3500–4500 m. SW Sichuan, NW Yunnan.

33b. *Scrophularia chasmophila* subsp. *xizangensis* D. Y. Hong, Novon 6: 374. 1996.

西藏岩隙玄参 *xi zang yan xi xuan shen*

Leaves 1.3–2.7 × 1–2.2 cm, conspicuously and coarsely dentate. Corolla 1.8–2.2 cm. Staminode obovoid.

• Among rocks; 4000–4600 m. Xizang (Nyingchi Xian).

34. *Scrophularia pauciflora* Bentham, Scroph. Ind. 17. 1835.

轮花玄参 *lun hua xuan shen*

Herbs, erect, to 1 m tall, branched, blackish when dry. Stems subquadrangular, pith white. Petiole ca. 5 cm, decurrent on stem and becoming winglike ribs, glandular hairy; leaf blade cordate-ovate, to 10 cm, short hairy on veins when young, margin coarsely double serrate. Thyrses often terminal, narrowly spicate, to 20 cm; cymes opposite, widely spaced, usually 4-flowered; peduncle short, glandular hairy. Flowers crowded. Pedicel short, glandular hairy. Calyx 3–4 mm; lobes ovate-lanceolate, glandular hairy, apex acute. Corolla 5–6 mm, glabrous; lower lip middle lobe smaller than lateral lobes; upper lip slightly longer than

lower lip. Stamens slightly shorter than lower lip; staminode small or absent. Ovary ovoid, ca. 1.5 mm. Style ± as long as ovary. Capsule ovoid, 6–8 mm.

Along streams, sandy and wet places; 2000–3500 m. Xizang (Yadong Xian) [Bhutan, India (Darjeeling), Nepal, Sikkim].

35. *Scrophularia spicata* Franchet, Bull. Soc. Bot. France 47: 14. 1900.

穗花玄参 *sui hua xuan shen*

Perennials, 0.5–1.5 m tall. Roots fibrous, apically with inflated nodules. Rhizomes perpendicular downward. Stems quadrangular, narrowly winged, basally sparsely villous, apically glandular pubescent, pith white; lower stem hard and not easily compressed at anthesis. Petiole to 5 cm, flattened, narrowly winged; leaf blade oblong-ovate to lanceolate, ca. 10 × 4 cm, base broadly cuneate to subcordate-truncate, margin crenate to serrate.

Thyrses terminal, narrowly spicate, to 50 cm; cymes opposite or subopposite, to 20 pairs, widely spaced, compound, many flowered; peduncle short, densely glandular hairy. Pedicel short, densely glandular hairy.

Calyx 4–5 mm; lobes ovate-lanceolate, apex acute.

Corolla green to yellow green, 8–10 mm, glabrous;

middle lobe of lower lip smallest; upper lip 1.5–2 mm

longer than lower lip, lobes ovate, with overlapping

margins. Stamens shorter than upper lip; staminode

obovate to subrounded. Style ca. 3.5 mm, slightly

longer than ovary. Capsule narrowly ovoid to ovoid, to

8 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine grassland, scrub, valleys; 2800–3300 m. NW Yunnan.

36. *Scrophularia mapienensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 395. 1979.

马边玄参 *ma bian xuan shen*

Perennials, to 80 cm tall. Lateral roots slender.

Rhizomes stout, to 3 cm in diam. Stems erect, hollow; lower stems soft and easily compressed at anthesis.

Leaves on basal nodes scalelike, sparsely hairy. Petiole of other leaves less than 2 cm, broadly flattened, basally

comose; leaf blade lanceolate-oblong to ovate, 3–7 cm,

abaxially often hairy on veins, adaxially sparsely

pubescent, base cuneate to obtuse, margin irregularly

serrate or double serrate. Thyrses capitate or spicate, to

8 cm in fruit; cymes opposite, widely spaced, often to 4

pairs; peduncle glandular hairy. Pedicel glandular hairy.

Calyx 4–5 mm; lobes ovate, glabrous to densely

glandular hairy, apex acute. Corolla yellow-white or

purple, ca. 9 mm, outside glabrous to glandular hairy,

inside glabrous; tube somewhat inflated, ca. 5 mm;

lower lip lobes small; upper lip ca. 2 mm longer than

lower lip, lobes with overlapping margins. Stamens as

long as corolla tube; staminode varying in shape. Ovary

2–3 mm. Style nearly as long as ovary. Capsule

narrowly ovoid, 1–1.3 cm. Fl. Jun–Jul, fr. Aug–Oct.

• Under scrub, grassland on mountain slopes; 2900–3900 m. SW Sichuan, NE Yunnan.

6. OREOSOLEN J. D. Hooker, Fl. Brit. India 4: 318. 1884.

藏玄参属 zang xuan shen shu

Herbs, perennial, small. Rhizomes with scalelike leaves. Leaves opposite, appressed to ground, palmately 5–9-veined. Flowers several, axillary, clustered into a dense head. Pedicel short. Bracteoles 2. Calyx 5-lobed almost to base. Corolla narrowly tubular; limb conspicuously 2-lipped; lower lip 3-lobed; upper lip 2-lobed and longer than lower lip. Stamens 4, included or slightly exerted; staminode 1. Capsule septicidal. Seeds ellipsoid; seed coat reticulate.

One species: Himalayas and Qinghai-Xizang Plateau.

1. *Oreosolen wattii* J. D. Hooker, Fl. Brit. India 4: 318. 1884.

藏玄参 zang xuan shen

Oreosolen unguiculatus Hemsley.

Plants entirely with glandular hairs. Roots thick. Lower leaves scalelike; upper ones crowded and rosulate; petiole short, broad, flattened; leaf blade cordate to ovate, 2–8 cm, thick, margin irregularly dentate; veins adaxially strongly impressed. Inflorescences less than 5

cm tall. Calyx lobes linear-lanceolate. Corolla yellow, 1.5–2.5 cm; lower lip lobes obovate-orbicular; upper lip lobes ovate-orbicular. Filaments thick, apically dilated; anthers 1-loculed, transverse; staminode needlelike, adnate to center of upper corolla lip. Capsule ovoid-globose, to 8 mm, apex tapered. Seeds dark brown, ca. 2 mm. Fl. Jun, fr. Aug.

Alpine meadows; 3000–5100 m. S Qinghai, Xizang [Bhutan, Nepal, Sikkim].

7. NATHALIELLA B. Fedtschenko, Bot. Zhurn. S.S.S.R. 17: 327. 1932.

石玄参属 shi xuan shen shu

Herbs, perennial, small, acaulescent. Leaves basal, rosulate, distinctly petiolate. Flowers solitary, axillary. Pedicel short. Calyx 5-lobed. Corolla limb obscurely 2-lipped, subactinomorphic; lower lip 3-lobed; upper lip 2-lobed. Stamens 4, all fertile, ± didynamous, 2 anterior slightly longer than 2 posterior; anther locules basally divergent; staminode 1. Ovary many ovuled. Style filiform; stigma flat-dilated. Capsule 2-valved.

One species: China, Kyrgyzstan.

1. *Nathaliella alaica* B. Fedtschenko, Bot. Zhurn. S.S.S.R. 17: 327. 1932.

石玄参 shi xuan shen

Oreosolen alaicus (B. Fedtschenko) Pavlov.

Roots thick, vertical. Caudex densely with remains of old leaves and white bristly hairs. Petiole ca. 2 × as long as leaf blade; leaf blade broadly ovate, 1–1.5 × 0.5–1 cm, base cuneate, margin entire and short

ciliolate, apex obtuse. Pedicel short. Calyx 4–5 mm; lobes short, apex obtuse. Corolla purple-red, ca. 1.5 cm; tube cylindrical, throat slightly dilated. Stamens inserted basally in corolla tube and adherent for ca. 1/2 of its length; filaments filiform, glabrous. Capsule ovoid, 5–10 × 3–4 mm, glabrous. Fl. Jun, fr. Aug.

Sunny stony slopes; 1500–1600 m. S Xinjiang (Hejing Xian) [Kyrgyzstan]

8. SCOPARIA Linnaeus, Sp. Pl. 1: 116. 1753.

野甘草属 ye gan cao shu

Herbs many branched or subshrubs. Leaves opposite or whorled, generally glandular punctate, margin entire or toothed. Flowers 1–3 per node. Pedicel slender. Calyx 4- or 5-lobed; lobes imbricate, ovate to lanceolate. Corolla nearly regular; tube inconspicuous; limb subrotate, densely hairy at throat; lobes 4, imbricate. Stamens 4, subequal; anther locules distinct, parallel or divergent. Ovary globose; ovules numerous. Style apically ± enlarged. Capsule ovoid to globose, septicidal and secondarily loculicidal; valves thin, margin involute. Seeds many, small, foveolate.

About 20 species: mostly from tropical America; one species in China.

1. *Scoparia dulcis* Linnaeus, Sp. Pl. 1: 116. 1753.

野甘草 ye gan cao

Herbs or suffrutescent subshrub, erect, to 1 m tall. Branches ribbed to narrowly winged, puberulent at nodes. Leaves petiolate; leaf blade rhomboid-ovate to rhomboid-lanceolate, to 3.6 × 1.5 cm, glabrous, glandular punctate, base cuneate, margin toothed above middle, sometimes slightly double serrate, or subentire, apex obtuse. Flowers usually axillary, (1 or)2 per node.

Pedicel 5–10 mm, glabrous. Bracteoles absent. Calyx lobed to base; lobes 4, ovate-oblong, ca. 2 mm, margin ciliate, apex obtuse. Corolla white, ca. 4 mm. in diam.; tube densely hairy at throat; lobes 2–3 mm, margin erose-denticulate, apex obtuse; upper lobe slightly larger than others. Stamens exerted. Style erect; stigma truncate to 2-parted. Capsule 2–3 cm in diam., columella persistent.

Waste places, beside trails, occasionally on mountain slopes; below 1400 m. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [throughout

tropics and subtropics].

9. BACOPA Aublet, Hist. Pl. Guiane 1: 128. 1775.

假马齿苋属 *jia ma chi xian shu*

Bramia Lamarck; *Herpestis* C. F. Gaertner; *Mella* Vandelli; *Sinobacopa* D. Y. Hong.

Herbs, erect or creeping. Leaves opposite. Flowers solitary, axillary or in terminal racemes. Bracteoles 1 or 2 or absent. Sepals (4 or)5, entirely free, imbricate, upper 1 largest, lower 2 next large, lateral 2 innermost and narrowest. Corolla tube tubular; limb patent, conspicuously or obscurely 2-lipped; lower lip 3-lobed; upper lip 2-lobed. Stamens 4, didynamous or equal in length, very rarely 5; anther locules parallel, free. Stigma dilated, capitate or 2-lobed. Capsule ovoid or globose, 2-grooved, 4-valved. Seeds numerous, minute.

About 60 species: tropics and subtropics, mainly in America; three species in China.

1a. Stems erect; pedicel ca. 0.2 cm 1. *B. floribunda*

1b. Stems creeping; pedicel 0.5–3.5 cm.

2a. Bracteoles 2, just below calyx; stamens didynamous; lower and upper sepals ovate-lanceolate 2. *B. monnieri*

2b. Bracteoles absent; stamens equal in length; lower and upper sepals linear-elliptic 3. *B. repens*

1. *Bacopa floribunda* (R. Brown) Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 77. 1895.

麦花草 *mai hua cao*

Herpestis floribunda R. Brown, Prodr. 442. 1810;

Mella floribunda (R. Brown) Pennell.

Annuals. Roots fibrous. Stems erect, 15–40 cm, sometimes apically branched, basally glabrous, apically sparsely scabrous. Leaves sessile, linear to linear-elliptic, 1–5 cm, glabrous, margin entire or few serrate.

Flowers axillary or sometimes in terminal racemes. Pedicel ca. 2 mm. Bracteoles 2, filiform, below calyx.

Sepals scabrous, ciliate, abaxially yellow glandular punctate; upper sepal orbicular, ca. 6 mm; lower 2 sepals ovate; lateral 2 sepals ovate to lanceolate.

Corolla white, as long as calyx. Stamens didynamous. Stigma 2-lobed. Capsule ovoid, enveloped in inflated calyx. Seeds black, ellipsoid-conical, ca. 0.3 mm; seed coat reticulate. Fl. Aug–Nov.

Paddy fields, wet places; low elevations. Guangxi, Fujian (Fuqing Xian), Hainan [India, Indonesia, Laos, W Malaysia, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

2. *Bacopa monnieri* (Linnaeus) Pennell, Proc. Acad. Nat. Sci. Philadelphia 98: 94. 1946.

假马齿苋 *jia ma chi xian*

Lysimachia monnieri Linnaeus, Cent. Pl. II 9. 1756;

Bacopa monnieri (Linnaeus) Wettstein; *Gratiola monnieri* (Linnaeus) Linnaeus.

Stems creeping, rooting at nodes, ± succulent, glabrous. Leaves sessile, oblong-oblancheolate, 0.8–2 cm × 3–6 mm, margin entire or rarely dentate, apex rounded. Flowers axillary. Pedicel 0.5–3.5 cm. Bracteoles 2, linear, below calyx. Sepals 5, ca. 5 mm; lower and upper sepals ovate-lanceolate; lateral 2 sepals lanceolate to linear. Corolla blue, purple, or white, 8–10 mm, obscurely 2-lipped. Stamens didynamous. Stigma

capitate. Capsule narrowly ovoid, enveloped in persistent calyx, apex acute. Seeds yellow-brown, ellipsoid, truncate at one end, longitudinally striate. Fl. May–Oct.

By water, wet places, sandy beaches; below 1100 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [widespread in tropics and subtropics].

For a discussion on the nomenclature of the species, see Philcox (Kew Bull. 33: 679–680. 1979).

3. *Bacopa repens* (Swartz) Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 76. 1891.

田玄参 *tian xuan shen*

Gratiola repens Swartz, Prodr. 14. 1788; *Sinobacopa aquatica* D. Y. Hong.

Annuals. Stems creeping and rooting at nodes at least basally, branched, 12–20 cm, internodes 3–6 cm, succulent. Leaves sessile, obovate to obovate-lanceolate, 1.2–2.5 × 0.7–1.3 cm, smaller on branches, margin entire; veins 9 or 10, parallel. Flowers axillary, pendulous. Pedicel 1–2 cm. Bracteoles absent. Sepals (4 or)5, 3–4 mm, margin ciliate, apex obtuse; lower and upper sepals linear-elliptic, 5-veined; lateral 2 sepals linear, 1-veined. Corolla white, almost as long as sepals; lobes obovate, apex rounded; upper lip lobed to middle, lobes narrowly obovate, apex rounded. Stamens equal, ca. 1.2 mm, inserted at throat; filaments as long as anthers; anthers ± sagittate. Stigma 2-parted; lobes reflexed. Capsule globose, ca. 1.7 mm in diam. Seeds columnar-oblong, ca. 0.5 mm; seed coat reticulate. Fl. Aug–Sep.

Paddy fields; low elevations. Fujian (Fuzhou Shi), Guangdong (Guangzhou Shi), Hainan (Lingshui Xian) [North and South America].

10. GRATIOLA Linnaeus, Sp. Pl. 1: 17. 1753.

水八角属 *shui ba jiao shu*

Herbs, perennial or annual, erect or prostrate, succulent, glabrous or glandular hairy. Leaves opposite, sessile, margin entire or serrate. Flowers axillary, solitary. Pedicel short or long, filiform. Bracteoles 2, foliaceous, near calyx. Calyx deeply 5-lobed; lobes narrow, subequal, ± imbricate. Corolla 2-lipped to nearly so, lips spreading; lower lip 3-lobed; upper lip entire to 2-lobed. Stamens 2, inserted on upper side of corolla tube, included; anther locules distinct, parallel, transverse or erect; staminodes 2 and included, or absent. Style filamentous; stigma 2-lamellate, included. Capsule ovoid to globose, septifragal, 4-valved; valves separating from placental axis, apex acute. Seeds numerous; seed coat striate and transversely reticulate.

About 25 species: mostly temperate and tropics; three species in China.

- 1a. Leaf blade apex obtuse; staminodes absent; capsule ovoid, 2.5–3 mm in diam. 2. *G. griffithii*
1b. Leaf blade apex acute to apiculate; staminodes 2; capsule globose, 4–5 mm in diam.
2a. Flowers pedicellate, pedicel 0.7–1.5 cm; corolla 1–1.3 cm 3. *G. officinalis*
2b. Flowers sessile or subsessile; corolla 0.5–0.7 cm 1. *G. japonica*

1. *Gratiola japonica* Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 117. 1866.

水八角 shui ba jiao

Annuals, glabrous. Rhizomes slender, long. Stems 8–25 cm tall, erect or ascending. Leaves narrowly elliptic to lanceolate, 7–23 × 2–7 mm, base semiamplexicaul, margin entire, apex apiculate; veins 3, inconspicuous. Flowers sessile or subsessile. Bracteoles linear-lanceolate, 4–4.5 mm, herbaceous. Calyx 3–4 mm; lobes linear-lanceolate to oblong-lanceolate, margin membranous. Corolla white or yellowish, 5–7 mm, ± 2-lipped; tube cylindrical, 4–4.5 mm; limb shorter than tube; lower lip lobes obovate, sometimes concave; upper lip apex obtuse to concave. Filaments ca. 0.6 mm; staminodes 2, short, clavate, inserted at base of lower lip. Stigma 2-lobed. Capsule dark brown, globose, 4–5 mm in diam. Seeds slender, long. Fl. and fr. May–Jul.

Fields, beside water; low elevations. Heilongjiang, Jiangsu, Jiangxi, Jilin, Liaoning, Yunnan [Japan, Korea, E Russia].

2. *Gratiola griffithii* J. D. Hooker, Fl. Brit. India 4: 273. 1885.

黄花水八角 huang hua shui ba jiao

Herbs, prostrate. Roots fibrous. Stems succulent, much branched from base. Branches 10–13 cm, stout. Leaves elliptic-oblong, 1.5–2 × 0.5–1.1 cm, abaxially with

small black spots, base amplexicaul, apex obtuse; main veins 3. Pedicel ca. 1 mm. Bracteoles ovate. Calyx ca. 3.5 mm; lobes lanceolate, persistent. Corolla yellow to whitish, ca. 6 mm, ± constricted at middle; tube ca. 3 mm; limb ca. 3 mm; upper lip irregularly toothed. Stamens included; filaments ca. 1.5 mm; staminodes absent. Ovary ovoid, ca. 1.5 mm. Style ca. 1.8 mm; stigma enlarged. Capsule 2.5–3 mm in diam., apex apiculate.

Moist places; low elevations. Guangdong [tropics and subtropics].

3. *Gratiola officinalis* Linnaeus, Sp. Pl. 1: 17. 1753.

新疆水八角 xin jiang shui ba jiao

Perennials, erect, ca. 20 cm tall, glabrous throughout. Rhizomes short, horizontal. Stems terete, branched. Leaves sessile, oblanceolate, lanceolate, or linear, 1.5–4 cm × 2–8 cm, narrower on branches, margin sparsely and minutely serrate, apex acute. Pedicel slender, 0.7–1.5 cm. Bracteoles linear. Calyx lobes subulate, 3–4 mm. Corolla 1–1.3 cm; tube cylindrical, 6.5–9 mm; lower lobes slightly notched; upper lip lobes suborbicular, slightly notched. Filaments 5–5.5 mm; staminodes 2, anterior, filiform. Capsule globose, ca. 5 × 4 mm. Fl. Jun–Oct.

Marshes. N Xinjiang [Asia, Europe].

11. DOPATRIUM Buchanan-Hamilton ex Bentham in Lindley, Bot. Reg. 21: ad t. 1770. no. 46. 1835.

虻眼属 meng yan shu

Herbs, annual, slender and weak, erect or sometimes decumbent, ± succulent. Leaves opposite, succulent, sometimes scalelike. Flowers axillary, solitary. Bracteoles absent. Corolla tube much longer than calyx, distally inflated; limbs 2-lipped; lower lip 3-lobed; upper lip 2-lobed, conspicuously shorter than lower lip. Stamens 2, inserted on upper side of corolla tube; filaments filiform; anther locules distinct, equal, parallel; staminodes 2, small, inserted on anterior side, margin entire. Style short; stigma 2-lamellate, clavate, or capitate. Ovary 2-loculed; ovules numerous in each locule. Capsule loculicidal; valves entire or apex shallowly 2-lobed. Seeds small, numerous.

About 10 species: tropics of Africa, Asia, Australia, and Oceania; one species in China.

1. *Dopatrium junceum* (Roxburgh) Buchanan-Hamilton ex Bentham in Lindley, Bot. Reg. 21: ad t. 1770. no. 46. 1835.

虻眼 meng yan

Gratiola juncea Roxburgh, Pl. Coromandel 2: 16. 1798.

Annuals, to 50 cm tall. Roots fibrous. Stems succulent, erect, much branched from base; branches slender, longitudinally striate, glabrous. Leaves sometimes scalelike, gradually decreasing in size upward, sessile, lanceolate to subspatulate-lanceolate, to 2 cm, base amplexicaul and generally narrowly attenuate, margin

entire, apex acute to ± obtuse; veins inconspicuous. Pedicel slender, to 1 cm. Calyx campanulate, ca. 2 mm, parted to slightly beyond middle; lobes 5, apex obtuse. Corolla white, rose, or pale purple, ca. 2 × as long as calyx; lower lip lobes spreading flat; upper lip erect,

short. Stamens glabrous. Capsule globose, ca. 2 mm in diam. Seeds ovoid-oblong; seed coat reticulate.

Rice fields, wet places; below 1800 m. Guangdong, Guangxi, Henan, Jiangsu, Jiangxi, S Shanxi, Taiwan, Yunnan [Bhutan, India, Indonesia, Japan, Malaysia, Philippines, Thailand, Vietnam; Australia, Oceania].

12. DEINOSTEMA T. Yamazaki, J. Jap. Bot. 28: 131. 1953.

泽番椒属 *ze fan jiao shu*

Herbs. Leaves opposite, sessile. Flowers solitary, axillary. Bracteoles absent. Calyx 5-lobed almost to base; lobes valvate in bud. Corolla conspicuously 2-lipped; lower lip 3(or 4)-lobed, patent; upper lip 2-lobed, shorter than lower lip. Fertile stamens 2, posterior; filaments apically distorted; anthers hairy; staminodes 2, posterior, almost completely reduced. Capsule septifragal. Seeds ellipsoid; seed coat reticulate.

Two species: Japan, Korea, Russia; both in China.

- 1a. Leaves linear, to 1 mm wide; pedicel to 4 mm 1. *D. violacea*
1b. Leaves ovate to ovate-orbicular, more than 3 mm wide; pedicel more than 6 mm 2. *D. adenocaula*

1. *Deinostema violacea* (Maximowicz) T. Yamazaki, J. Jap. Bot. 28: 132. 1953.

泽番椒 *ze fan jiao*

Gratiola violacea Maximowicz, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 9: 407. 1874.

Annuals. Stems slender, ca. 20 cm tall, glabrous. Leaves linear-subulate, to 10 × 1 mm, margin entire. Pedicel to 4 mm. Calyx 3–5 mm in fruit; lobes subulate. Capsule ovoid-ellipsoid, ca. 2 mm. Seeds yellow-brown, ca. 0.5 mm.

Swamps. Heilongjiang, Jiangsu (Jurong Xian), Jilin, Liaoning [Japan, Korea, Russia (Far East)].

2. *Deinostema adenocaula* (Maximowicz) T. Yamazaki, J. Jap. Bot. 28: 132. 1953.

有腺泽番椒 *you xian ze fan jiao*

Gratiola adenocaula Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 513. 1888.

Annuals. Stems 7–15 cm tall, simple or basally branched, ± succulent, basally subglabrous, apically sparsely capitate glandular. Leaves ovate-orbicular to ovate, 5–10 × 3–8 mm, smaller on branches, glabrous, base subamplexicaul, margin entire, apex acute to obtuse; veins 5–9, conspicuous or inconspicuous. Pedicel mostly straight, slender, 0.6–1.5 cm, capitate glandular. Calyx 2–2.5 mm, glabrous; lobes linear-lanceolate. Corolla blue, ca. 5 mm, middle lobe of lower lip 2-lobed. Style short. Capsule ovoid, as long as or slightly shorter than calyx, at first 2-loculicidal and later 4-valved. Seeds ellipsoid, reticulate. Fl. Aug.

Abandoned rice fields. Guizhou (Jiangkou Xian), Taiwan [Japan, Korea].

13. LINDENBERGIA Lehmann in Link & Otto, Icon. Pl. Rar. 95. 1828.

钟萼草属 *zhong e cao shu*

Herbs, annual or perennial, basally woody, erect or decumbent, much branched, hairy, rooting from lower nodes. Leaves opposite or upper alternate. Flowers solitary or in terminal spikes or racemes; bracts foliaceous. Bracteoles absent. Calyx campanulate, 5-lobed, parted to ca. middle, hairy. Corolla 2-lipped; tube tubular, often puberulent; lower lip large, 3-lobed, often plicate; upper lip short, wide, apex truncate, subemarginate, or 2-lobed. Stamens 4, didynamous, included, inserted below middle of corolla tube; filaments usually glabrous; anther locules distinct, connective often forming a stalk. Ovary hairy or glabrous. Stigma not lobed. Capsule generally enclosed by persistent calyx, 2-grooved, loculicidal; valves entire, separating from placental column; style persistent. Seeds numerous, minute.

12 species: tropical and subtropical Africa and Asia; three species in China.

The genus occurs mostly in India with few species in tropical Africa and Malaysia. There are possibly five species in China, but we have been unable to confirm the presence of *Lindenbergia macrostachya* Benth and *L. griffithii* J. D. Hooker.

1a. Ovary and capsule glabrous or sparsely pilose; flowers in dense spicate racemes; calyx lobes acute 3. *L. philippensis*

1b. Ovary and capsule densely pilose; flowers solitary in leaf axils or in lax spikes; calyx lobes obtuse, sometimes apiculate.

2a. Calyx 4–5 mm; corolla 0.8–0.9 cm; flowers solitary in leaf axils; leaf blade to 6 cm 1. *L. muraria*

2b. Calyx 7–8 mm; corolla to 3 cm; flowers in lax spikes; leaf blade to 20 cm 2. *L. grandiflora*

1. *Lindenbergia muraria* (Roxburgh ex D. Don) Brühl, J. Dept. Sci. Calcutta Univ. 2: 26. 1920.

野地钟萼草 *ye di zhong e cao*

Stemodia muraria Roxburgh ex D. Don, Prodr. Fl. Nepal 89. 1825.

Annuals, 10–40 cm tall, pilose to subglabrous. Primary root undeveloped, lateral roots numerous and fibrous. Stems terete, simple or often branched, straight or ascending. Petiole slender, hairy; leaf blade ovate, 2.5–6 cm, thin, submembranous, pilose or eventually glabrescent, base cuneate, middle and distal margin crenulate, apex acute to obtuse. Flowers solitary in leaf axils. Pedicel 1–5 mm, hairy. Calyx 4–5 mm, densely hairy; tube membranous, somewhat white; lobes equal, oblong-ovate, apex obtuse to apiculate. Corolla yellow, 8–9 mm; tube slightly longer than calyx, hairy; limb subglabrous; lower lip conspicuously plicate, lobes oblong-ovate, subequal, and apically obtuse; upper lip truncate, emarginate. Anthers orbicular, stalked. Ovary and style densely long ciliate. Stigma globose, glabrous. Capsule ovoid-globose, ca. 5 mm, densely hairy, apex acuminate. Seeds yellow, 0.5–0.7 mm. Fl. Jul–Sep, fr. Oct.

Trailsides, along rivers, dry mountain slopes; 800–2500 m. Guangdong, Guangxi, Guizhou, Hubei, Sichuan, Xizang, Yunnan [Afghanistan, Kashmir, Myanmar, Pakistan, Thailand, Vietnam].

2. *Lindenbergia grandiflora* (Buchanan-Hamilton ex D. Don) Bentham, Scroph. Ind. 22. 1835.

大花钟萼草 da hua zhong e cao

Stemodia grandiflora Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 89. 1825.

Annuals, ± scandent, much branched, densely pilose. Branches slender, flexuous, 15–80 cm. Leaves opposite; petiole to 7 cm; leaf blade ovate, to 20 cm below, noticeably decreasing in size upward, margin undulate and serrate; lateral veins 6–10 on each side of midrib. Inflorescences spicate, lax, to 25 cm. Flowers subsessile, solitary from bract axils. Calyx 7–8 mm, glandular

hairy; lobes equal, spreading flat, orbicular, apex obtuse. Corolla golden yellow, to 3 cm; tube 2–3 × as long as calyx, sparsely hairy; throat with 2 oblong red-punctate plaits; lower lip broader than wide, to 2.5 cm, lateral lobes oblong, middle lobe smaller than other lobes, orbicular, and emarginate; upper lip short and orbicular, emarginate. Filaments hairy below middle. Ovary sericeous. Capsule ovoid, apex exerted from persistent calyx. Seeds ca. 0.5 mm.

S Xizang [Bhutan, India (Darjeeling), Nepal, Sikkim].

3. *Lindenbergia philippensis* (Chamisso & Schlechtendal) Bentham in A. de Candolle, Prodr. 10: 377. 1846.

钟萼草 zhong e cao

Stemodia philippensis Chamisso & Schlechtendal, Linnaea 3: 5. 1828; *Lindenbergia melvillei* S. Moore; *L. philippensis* var. *ramosissima* Bonati.

Perennials, to 1 m tall, stout, erect, straight, much branched, glandular hairy. Stems terete. Petiole 6–12 mm; leaf blade ovate to ovate-lanceolate, papery, 2–8 cm, base cuneate, margin serrate, apex acute to acuminate. Inflorescences terminal, spicate-racemose, dense, 6–20 cm; bracts narrowly lanceolate, shorter than calyx. Flowers subsessile. Calyx 5–6 mm, conspicuously 5-veined; lobes subulate-triangular, as long as tube, apex acute. Corolla yellow, outside with purple patches, sparsely hairy; tube ca. 2 × as long as calyx; lower lip long, conspicuously plicate; upper lip apically subtruncate, sometimes emarginate. Anthers long stalked. Style basally and apically hairy. Capsule narrowly ovoid, 5–6 mm, densely brown hirsute apically. Seeds yellow, ca. 0.5 mm, scabrous. Fl. and fr. Nov–Mar.

Dry mountain sides, rocky crevices; 1200–2600 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Yunnan [Cambodia, India, Laos, Myanmar, Philippines, Thailand, Vietnam].

14. ADENOSMA R. Brown, Prodr. 442. 1810.

毛射香属 mao she xiang shu

Herbs, erect or creeping, blackened when dry, villous with eglandular hairs, some with glandular hairs, frequently aromatic. Leaves opposite; leaf blade glandular punctate, margin serrate. Flowers short pedicellate or sessile, in racemes, spikes, or heads, sometimes solitary in axils of apical leaves. Bracteoles 2. Calyx deeply 5-lobed; upper lobe usually large. Corolla tubular; limb 2-lipped; lower lip spreading flat, 3(or 4)-lobed; upper lip erect, emarginate or entire. Stamens 4, didynamous, included; anther locules separate, short stipitate. Style entire or 2-lobed, apex dilated. Capsule ovoid to ellipsoid, septifragal, 4-valved, apex ± beaked. Seeds numerous, minute; seed coat reticulate.

About 15 species: S and SE Asia, China, Pacific Islands; four species in China.

1a. Flowers many, in globose or cylindrical spikes 1. *A. indianum*

1b. Flowers solitary in leaf axils, or in terminal racemes.

2a. Stems decumbent or creeping 2. *A. javanicum*

2b. Stems erect, sometimes basally slightly curved to decumbent.

3a. Plants 30–100 cm tall; corolla 9–28 mm, upper lip lobes entire or emarginate 3. *A. glutinosum*

3b. Plants 3–35 cm tall; corolla ca. 4.5 mm, upper lip lobes deeply emarginate or notched .. 4. *A. retusilobum*

1. Adenosma indianum (Loureiro) Merrill, Trans. Amer. Philos. Soc., n.s. 24(2): 351. 1935.

球花毛射香 qiu hua mao she xiang

Manulea indiana Loureiro, Fl. Cochinch. 2: 386. 1790;
Adenosma capitatum (Benth) Benth ex Hance;
Pterostigma capitatum Benth.

Annuals, 19–60(–100 or more) cm tall, densely hairy. Stems erect, branched. Petiole 2–6 mm; leaf blade ovate to narrowly elliptic, 1.5–4.5 × 0.5–1.2 cm, densely glandular hairy, abaxially villous along veins and brown when dry, adaxially villous and blackish when dry, margin serrate, apex obtuse. Inflorescences globose to cylindrical spicate, 0.7–2 × 0.7–1.1 cm, dense; bracts narrowly ovate, forming an involucre at base of spikes. Flowers sessile. Bracteoles linear, 3–4 mm. Calyx 4–5 mm; lobes narrowly ovate to oblong-lanceolate, 2–3 mm, apex acuminate. Corolla pale purple to dark blue, ca. 6 mm; throat hairy; lower lip lobes equal, suborbicular, ca. 1 × 1–1.2 mm; upper lip retuse to 2-lobed. Anterior anthers with 1 locule fertile; posterior anthers with both locules fertile. Ovary narrowly ovoid. Capsule ovoid, ca. 3 mm, 2-grooved. Seeds yellow. Fl. and fr. Sep–Nov.

Barren lands, dry mountain sides, along streams, fields; low elevations. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sikkim, Thailand, Vietnam].

Used medicinally.

The SE Asian *Adenosma microcephalum* J. D. Hooker is similar to *A. indianum*, differing only by the spikes which are not involucre. *Adenosma microcephalum* has been reported from Guangdong (Loufushan), but because we have not seen any specimens of this species, it is not included.

2. Adenosma javanicum (Blume) Koorders, Exkurs.-Fl. Java 3: 175. 1912.

卵花毛射香 luan hua mao she xiang

Herpestis javanica Blume, Bijdr. 748. 1826; *Adenosma ovatum* (Wallich ex Benth) J. D. Hooker; *Herpestis ovata* Wallich ex Benth.

Stems purplish, quadrangular, decumbent or creeping, rooting from lower nodes, much branched. Petiole 2–4 mm; leaf blade ovate, 0.6–2.5 × 0.4–1.5 cm, abaxially densely with black glands, hispidulous along veins, brown when dry, adaxially sparsely hispidulous and black when dry, base broadly cuneate, margin crenate, apex obtuse. Flowers solitary in leaf axils. Pedicel 1–2 mm. Bracteoles linear, ca. 2 mm, adnate to base of calyx tube. Calyx lobes unequal; outer 3 lobes ovate, 4–7 × 2–4 mm, margin ciliate, veins evident; inner 2 lobes linear-lanceolate, ca. 4 mm. Corolla pale red, ca. 7 mm, inside hispidulous; lower lip lobes subequal, oblong, ca. 2 mm; upper lip white, narrowly elliptic, ca. 3 mm. Anterior anthers with 1 locule fertile; posterior anthers

with both locules fertile. Ovary oblong-ovoid. Stigma subglobose. Capsule narrowly ovoid, ca. 5 mm, included in persistent calyx. Seeds ovoid to oblong, ribbed. Fl. and fr. Mar–Apr.

Scrub on lower mountain slopes; low elevations. Hainan [Cambodia, India, Indonesia, Laos, Malaysia, New Guinea, Philippines, Thailand, Vietnam].

3. Adenosma glutinosum (Linnaeus) Druce, Bot. Soc. Exch. Club Brit. Isles 3: 413. 1914.

毛射香 mao she xiang

Gerardia glutinosa Linnaeus, Sp. Pl. 2: 611. 1753;
Adenosma caeruleum R. Brown; *A. glutinosum* var.
caeruleum (R. Brown) P. C. Tsoong; *Digitalis sinensis*
Loureiro; *Pterostigma grandiflorum* Benth.

Herbs, 30–100 cm tall. Stems erect, densely villous with eglandular and glandular hairs. Petiole 3–10(–15) mm; leaf blade lanceolate-ovate to broadly ovate, 2–10 × 1–5 cm, abaxially villous and densely yellow punctate glandular, adaxially villous especially along midrib; base cuneate, truncate, or subcordate, margin irregularly serrate and sometimes double serrate, apex acute, midrib concave. Flowers axillary and solitary or in dense racemes apically on stems and branches; bracts small. Pedicel 0.5–1.5 cm, to 2 cm in fruit. Bracteoles linear, 5–9 mm, adnate to base of calyx. Calyx 0.7–1.3 cm; lobes entire, narrowly lanceolate. Corolla purple-red to violet, 0.9–2.8 cm; lower lip 3(or 4)-lobed; upper lip ovate-orbicular, apex truncate to emarginate. Anterior anthers with 1 locule fertile; posterior anthers with both locules fertile. Style gradually widening and narrowly winged. Capsule ovoid, 5–9.5 × 3–6 mm, 2-grooved, apex beaked. Seeds brown to dark brown. Fl. and fr. Jul–Oct.

Mountain slopes, wet places under sparse forests; 300–2000 m. Fujian, Guangxi, Hainan, Jiangxi, Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Thailand, Vietnam; Australia, Oceania].

Used medicinally.

4. Adenosma retusilobum P. C. Tsoong & T. L. Chin, Fl. Reipubl. Popularis Sin. 67(2): 396. 1979.

凹裂毛射香 ao lie mao she xiang

Herbs, 3–10(–35) cm tall. Stems slender, base slightly curved to decumbent, apically sparsely branched. Leaves petiolate; leaf blade ovate to ovate-orbicular, 0.3–2 cm, abaxially densely yellow glandular, adaxially white hairy, base broadly cuneate to subcordate, margin irregularly crenate except for base. Racemes terminal, villous; bracts foliaceous, decreasing in size upward. Pedicel ca. 1 mm. Bracteoles linear, slightly shorter than calyx. Calyx lobes linear-lanceolate, ca. 3 mm, somewhat unequal, hairy. Corolla pale purple, ca. 4.5 mm; lower lip slightly shorter than upper lip; upper lip ovate-oblong, ca. 2 mm, ± arched, lobes suboblong and apically deeply notched. Anterior and posterior anthers

with only 1 locule fertile. Cap-sule ovoid, ca. 2 mm. Fl. and fr. Aug–Nov. Used medicinally.

• Fields, along streams; 600–800 m. Guangxi, Yunnan.

15. LIMNOPHILA R. Brown, Prodr. 442. 1810.

石龙尾属 shi long wei shu

Herbs, annual or perennial, in marshy areas or aquatic, often aromatic when bruised, with transparent dots. Stems erect, prostrate, or creeping, simple or much branched. Submerged leaves in aquatic species whorled, pinnately parted to capillary-multiparted, glabrous. Aerial leaves opposite to whorled, sessile or petiolate; leaf blade lanceolate or pinnately divided, glandular punctate, margin entire to serrate, if leaf undivided then veins pinnate or parallel. Flowers axillary and solitary or in axillary or terminal spikes or racemes, sessile or pedicellate. Bracteoles 2 or absent. Calyx tubular; lobes subequal or upper lobe larger than others. Corolla tubular or funnellform, 2-lipped; lower lip 3-lobed; upper lip entire or 2-lobed. Stamens 4, included, didynamous; anther locules stipitate. Ovary glabrous. Stigma 2-lamellate. Capsule included within calyx, septicidal. Seeds minute, numerous.

About 40 species: tropical to subtropical Africa, Asia, Australia, and Pacific Islands; ten species in China.

1a. Plants with both submerged and aerial leaves.

2a. Aerial leaves undivided, 3–5-veined 4. *L. heterophylla*

2b. Aerial leaves divided, 1–3-veined.

3a. Pedicel often as long as calyx or longer; bracteoles 1.5–3.5 mm; corolla 1–1.4 cm 3. *L. indica*

3b. Pedicel lacking or rarely to 1.5 mm; bracteoles absent or to 1.5 mm; corolla less than 1 cm.

4a. Stems and calyx glandular hairy; calyx ca. 2 mm; corolla ca. 4 mm 2. *L. borealis*

4b. Stems and calyx eglandular hairy; calyx 4–6 mm; corolla 6–10 mm 1. *L. sessiliflora*

1b. Plants with aerial leaves only.

5a. Leaf veins parallel 5. *L. connata*

5b. Leaf veins pinnate or only midrib conspicuous.

6a. Calyx smooth or with 5 raised veins in fruit; bracteoles lacking 6. *L. rugosa*

6b. Calyx with numerous raised veins in fruit; bracteoles present.

7a. Fruiting pedicel recurved 10. *L. erecta*

7b. Fruiting pedicel not recurved.

8a. Pedicel 5–20 mm 7. *L. aromatica*

8b. Pedicel 0.5–5 mm.

9a. Pedicel 3–5 mm, villous to subglabrous; corolla 1–1.5 cm 8. *L. chinensis*

9b. Pedicel 0.5–3 mm, hispidulous; corolla 0.5–1 cm 9. *L. repens*

1. *Limnophila sessiliflora* (Vahl) Blume, Bijdr. 749. 1826.
石龙尾 shi long wei

Hottonia sessiliflora Vahl, Symb. Bot. 2: 35. 1791;
Ambulia sessiliflora (Vahl) Baillon ex Wettstein; *L. taoyuanensis* Yang & Yen.

Perennials, amphibious. Submerged stems slender, long, glabrous or subglabrous. Aerial stems 6–40 cm, simple or sparsely branched, eglandular hairy, rarely subglabrous. Submerged leaves 0.5–3.5 cm, multiparted; segments flattened or capillary. Aerial leaves whorled; leaf blade elliptic-lanceolate, 5–18 × 3–4 mm, glabrous, densely glandular punctate, margin crenate to lobed; veins 1–3. Flowers sessile or rarely with a pedicel to 1.5 mm, solitary in axils of submerged and aerial leaves. Bracteoles absent or rarely present and to 1.5 mm. Calyx 4–6 mm, eglandular hairy, without raised veins in fruit; lobes 2–4 mm, ovate, apex narrowly acuminate. Corolla purple-blue to reddish, 6–10 mm. Capsule compressed, subglobose. Fl. and fr. Jul–Jan.

Ponds, swamps, rice fields, wet places along streams; below 1900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangsu, Jiangxi, Liaoning, Sichuan, Taiwan, Yunnan, Zhejiang

[Bhutan, India, Indonesia (Java), Japan, Korea, Malaysia, Myanmar, Nepal, Sikkim, Sri Lanka, Vietnam].

Limnophila trichophylla (Komarov) Komarov has been reported from NE China and Taiwan. From illustrations and the original description, the species is similar to *L. sessiliflora*, but we have not seen any specimens. The same is true for the recently described *L. taoyuanensis* (Bot. Bull. Acad. Sinica 38: 285–295. 1997).

2. *Limnophila borealis* Y. Z. Zhao & Ma f., Acta Sci. Nat. Univ. Intramagol. 21: 137. 1990.

北方石龙尾 bei fang shi long wei

Perennials, amphibious. Stems slender, long, glandular. Submerged leaves whorled; leaf blade bipinnately segmented; segments capillary. Aerial leaves pinnately lobed; leaf blade 0.5–3 cm, glabrous, densely glandular; vein 1. Flowers in axil of each leaf, solitary, sessile at first, then pedicel elongating to 2–6 mm in fruit, densely glandular. Bracteoles absent. Calyx narrowly campanulate, ca. 2 mm, outside densely glandular; lobes triangular-lanceolate, ca. 1 mm, apex acute. Corolla reddish, funnellform, ca. 4 mm. Capsule subglobose, ± compressed, ca. 3 mm; persistent calyx

as long as capsule. Seeds black-brown, oblong, ca. 0.4 mm. Fl. and fr. Jul–Sep.

•Rice fields; low elevations. Nei Mongol (Hinggan Meng).

3. *Limmophila indica* (Linnaeus) Druce, Bot. Soc. Exch. Club Brit. Isles 3: 420. 1914.

有梗石龙尾 you geng shi long wei

Hottonia indica Linnaeus, Sp. Pl. ed. 2, 208. 1762;

Limmophila gratiolooides R. Brown.

Perennials, amphibious. Submerged stems much branched, glabrous. Aerial stems to 15 cm, simple or branched, glabrous, with stalked or sessile glands to nearly smooth. Submerged leaves whorled, 1.5–2.5 cm, pinnatisect; segments flattened to capillary. Aerial leaves usually whorled, pinnately lobed, 0.4–2 cm, sometimes few opposite and crenate. Flowers axillary from aerial leaves, solitary. Pedicel slender, 2–10 mm, usually longer than bract, with sessile or stalked glands. Bracteoles 2, 1.5–3.5 mm, margin entire or sparsely serrate, apex acute. Calyx 3.5–5 mm, with sessile glands, without raised veins in fruit; lobes 2–3 mm, ovate to lanceolate, apex short acuminate. Corolla white, pale purple, or red, 1–1.4 cm. Capsule dark brown, compressed, ellipsoid to subglobose, ca. 3 mm. Fl. and fr. Mar–Nov.

Ponds, wet places; below 1800 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Cambodia, India, Indonesia, Japan, Laos, Malaysia, Nepal, Pakistan, Sikkim, Sri Lanka, Thailand, Vietnam; Africa, SW Asia, Australia, Oceania].

4. *Limmophila heterophylla* (Roxburgh) Benth, Scroph. Ind. 25. 1835.

异叶石龙尾 yi ye shi long wei

Columnnea heterophylla Roxburgh, Fl. Ind. ed. 1832, 3: 97. 1832.

Perennials, aquatic. Aerial stems with sessile glands or pilose or nearly smooth and glabrous. Submerged leaves to 50 cm, multiparted; segments capillary. Aerial leaves opposite or whorled, sessile, oblong, ca. 15 × 3 mm, glabrous, base subamplexicaul, margin subcrenate; veins 3–5, parallel. Flowers sessile and in terminal spikes or short pedicellate and solitary in leaf axils. Bracteoles absent. Calyx ca. 3 mm, with sessile glands, without raised veins in fruit. Corolla pale purple, ca. 5 mm, glabrous. Capsule pale brown, subglobose, ca. 2.5 mm. Fl. Jul.

Rice fields, brackish waters; low elevations. Anhui, Guangdong, Jiangxi, Taiwan [Cambodia, India, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

5. *Limmophila connata* (Buchanan-Hamilton ex D. Don) Handel-Mazzetti, Symb. Sin. 7: 837. 1936.

抱茎石龙尾 bao jing shi long wei

Cybbanthera connata Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 87. 1825; *Limmophila connata*

(Buchanan-Hamilton) Pennell; *L. hypericifolia* (Benth) Benth; *Stemodia hypericifolia* Benth.

Herbs, terrestrial, 30–50 cm tall. Stems erect or ascending, simple or sparsely branched, glabrous, apically short glandular hairy. Leaves opposite or sometimes 3–5 in a whorl on sprouts near rhizomes, sessile; leaf blade linear, ovate-lanceolate, or lanceolate, 2–4 × 0.3–2 cm, base subamplexicaul, margin entire or rarely obscurely toothed; veins 3–7, parallel. Spikes terminal, lax; bracts glandular puberulent. Flowers sessile or subsessile. Bracteoles 2, linear, ca. 5 mm, glandular puberulent, base adherent to calyx tube. Calyx cylindric, ca. 7 mm, glandular puberulent, without raised veins in fruit. Corolla blue to purple, 1.1–1.5 cm, outside sparsely pubescent, inside villous. Capsule subglobose, ca. 3.5 × 3 mm, veins 2 and bulging. Fl. and fr. Sep–Nov.

Along streams, grassland, wet places; below 1400 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Yunnan [India, Laos, Myanmar, Nepal, Thailand, Vietnam].

6. *Limmophila rugosa* (Roth) Merrill, Interpr. Herb. Amboin. 466. 1917.

大叶石龙尾 da ye shi long wei

Herpestis rugosa Roth, Nov. Pl. Sp. 290. 1821.

Perennials, 10–50 cm tall. Rhizomes transverse. Stems 1 to few, ± fascicled, erect or ascending, usually unbranched, glabrous. Leaves opposite; petiole 1–2 cm, narrowly winged; leaf blade ovate, rhomboid-elliptic, or elliptic, 3–9 × 1–5 cm, abaxially hispidulous along veins, adaxially glabrous or sparsely hispidulous, margin crenate; veins pinnate, ca. 10 on each side of midrib, abaxially raised. Peduncle 0.2–3 cm; bracts subspatulate-oblong, with flattened membranous glands, margin entire or apically undulate-toothed and ciliate. Flowers axillary, solitary, sessile, usually appearing capitate. Bracteoles absent. Calyx 6–8 mm, without raised veins in fruit or with 5 raised veins and flattened membranous glands, margin ciliate. Corolla purple-red to blue, to 1.6 cm. Style slender, apically cylindric, pubescent, with a membranous auricle on both sides. Capsule pale brown, ovoid, ca. 5 mm. Fl. and fr. Aug–Nov.

Adjacent to water, mountain valleys, grassland; below 900 m. Anhui, Fujian, Guangdong, Guangxi, Hunan, Taiwan, Yunnan [Bhutan, India, Indonesia, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Philippines, Sikkim, Thailand, Vietnam; Pacific Islands].

Used medicinally.

7. *Limmophila aromatica* (Lamarck) Merrill, Interpr. Herb. Amboin. 466. 1917.

紫苏草 zi su cao

Ambulia aromatica Lamarck, Encycl. 1: 128. 1783; *Limmophila aromaticoides* Yang & Yen; *L. chinensis*

subsp. *aromatica* (Lamarck) T. Yamazaki; *L. gratissima* Blume; *L. punctata* Blume; *L. punctata* var. *subracemosa* Benth.

Annuals or perennials. Stems 30–70 cm, simple to much branched, glabrous or glandular, base decumbent and rooting from nodes. Leaves opposite or in whorls of 3, sessile, ovate-lanceolate to lanceolate-elliptic, 1–5 × 0.3–1.5 cm, base semiamplexicaul, margin crenate and serrate; veins pinnate. Flowers solitary in leaf axils or in terminal or axillary racemes. Pedicel 0.5–2 cm, glabrous or glandular. Bracteoles linear to linear-lanceolate, 1.5–2 mm. Calyx 4–6 mm, glabrous or glandular pubescent, with raised veins in fruit. Corolla white, blue-purple, or pink, 1–1.3 cm, sparsely and finely glandular, inside white villous. Style apex dilated; stigma short, 2-lamellate. Capsule ovoid, ca. 6 mm. Fl. and fr. Mar–Sep.

Around reservoirs and other moist places; low elevations. Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Taiwan [Bhutan, India (Darjeeling), Indonesia (Java), Japan, Korea, Laos, Philippines, Vietnam; Australia].

The characters used by Yang & Yen (Bot. Bull. Acad. Sinica 38: 285–295. 1997) to distinguish *Linnophila aromaticoides* from *L. aromatica* clearly fall within the variation range of the latter.

8. *Linnophila chinensis* (Osbeck) Merrill, Amer. J. Bot. 3: 581. 1916.

中华石龙尾 *zhong hua shi long wei*

Columnnea chinensis Osbeck, Dagb. Ostind. Resa 230. 1757; *Linnophila chevalieri* Bonati; *L. hirsuta* (Heyne ex Benth.) Benth.; *Stemodia hirsuta* Heyne ex Benth.

Herbs, 5–50 cm tall. Stems basally prostrate, rooting from nodes, simple or basally branched, villous to subglabrous. Leaves opposite or in whorls of 3 or 4, sessile, ovate-lanceolate, linear-lanceolate, or rarely spatulate, 0.5–5.3 × 0.2–1.5 cm, abaxially villous along veins, adaxially glabrous or sparsely villous, base subamplexicaul, margin serrate; veins pinnate, inconspicuous. Flowers solitary in leaf axils, or in terminal panicles. Pedicel 3–5 mm, villous to subglabrous. Bracteoles ca. 2 mm. Calyx 5–7 mm, villous to subglabrous, with raised veins in fruit. Corolla purple-red, blue, or rarely white, 1–1.5 cm. Capsule

compressed, broadly ellipsoid, ca. 5 mm. Fl. and fr. Oct–May.

Edge of water, wet fields; below 1800 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India (Darjeeling), Indonesia, Laos, W Malaysia, Sikkim, Thailand, Vietnam; Australia].

9. *Linnophila repens* (Benth.) Benth. in A. de Candolle, Prodr. 10: 387. 1846.

匍匐石龙尾 *pu fu shi long wei*

Stemodia repens Benth. in Lindley, Bot. Reg. 17: ad t. 1470. sp. 11. 1832.

Herbs, to 45 cm tall; stems, pedicels, bracts, and bracteoles hispidulous or rarely glabrous. Stems erect, basally prostrate or repent, simple or branched. Leaves opposite, sessile, narrowly elliptic, linear-lanceolate, or lanceolate-elliptic, 0.5–3 cm × 3–10 mm, adaxially hispidulous or subglabrous, base subamplexicaul, margin serrate; veins pinnate. Flowers solitary and axillary, or in axillary racemes. Pedicel 0.5–3 mm, hispidulous. Bracteoles 2–3 mm. Calyx 4–6 mm, hispidulous to subglabrous, with raised veins in fruit; lobes 1.5–3 mm, narrowly lanceolate, margin ciliate, apex acuminate. Corolla white, purple-red, or blue, 5–10 mm, outside glabrous, inside white villous. Capsule ovoid, 3–4 mm. Fl. and fr. Nov–May.

Moist places near water; low elevations. Guangxi, Hainan [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia].

10. *Linnophila erecta* Benth. in A. de Candolle, Prodr. 10: 388. 1846.

直立石龙尾 *zhi li shi long wei*

Annuals, 15–25 cm tall. Stems erect or ascending, simple or much branched, glabrous or hispidulous. Leaves opposite, sessile or base narrowed and appearing stalked; leaf blade linear-elliptic, 0.5–3 cm × 3–8 mm, glabrous, margin crenate and toothed, veins pinnate. Flowers solitary and axillary or in axillary or terminal racemes. Pedicel 2–4 mm, glabrous or hispidulous, recurved in fruit. Bracteoles linear, 0.5–0.8 mm. Calyx 4–5 mm, glabrous, with raised veins in fruit. Corolla white or pink, 6–7 mm, outside glabrous. Capsule ovoid, ca. 3.5 mm. Fl. and fr. Jul–Oct.

Wet grassland, near water; below 1500 m. Guangdong, Yunnan [Indonesia, Malaysia, Myanmar, Thailand, Vietnam].

16. LANCEA J. D. Hooker & Thomson, Hooker's J. Bot. Kew. Gard. Misc. 9: 244. 1857.

肉果草属 *rou guo cao shu*

Herbs, perennial, subglabrous. Rhizomes long, slender, with fibrous roots. Stems short. Leaves few, opposite, lower ones scalelike; petiole short, winged; leaf blade pinnately veined. Inflorescences terminal, short, few flowered. Calyx campanulate; lobes 5, subequal, as long as tube. Corolla 2-lipped; tube cylindrical; lower lip large, spreading flat, with 2 plaits at base, 3-lobed, middle lobe entire or 2-lobed; upper lip 2-lobed or divided, erect or ± spreading flat, slightly arched. Stamens 4, didynamous; filaments glabrous or hairy; anther locules distinct, diverging. Ovary glabrous. Stigma fanlike or 2-lamellate. Fruit globose, berrylike, nearly fleshy, indehiscent. Seeds numerous; seed coat thin.

Two species: Bhutan, China, India, Mongolia, Sikkim; both species in China.

- 1a. Stems and leaves glabrous; calyx leathery; corolla tube 0.8–1.3 cm, middle lobe of lower lip entire; stamens inserted near middle of corolla tube; filaments glabrous 1. *L. tibetica*
1b. Stems and leaves hairy; calyx membranous; corolla tube more than 2 cm, middle lobe of lower lip 2-lobed; stamens inserted at throat; filaments pilose 2. *L. hirsuta*

1. *Lancea tibetica* J. D. Hooker & Thomson, Hooker's J. Bot. Kew Gard. Misc. 9: 244. 1857.

肉果草 rou guo cao

Herbs, 3–7(–15) cm tall, glabrous except for petioles. Rhizomes to 10 cm, with a pair of membranous scales on each node. Leaves 6–10, ± rosulate; leaf blade obovate, obovate-oblong, or spatulate, 2–7 cm, subleathery, base tapering, margin entire or obscurely and sparsely toothed, apex obtuse and usually apiculate. Flowers in fascicles of 3–5 or in a raceme; bracts subulate-lanceolate. Calyx ca. 1 cm, leathery; lobes subulate-triangular. Corolla dark blue to purple, 1.5–2.5 cm; tube 0.8–1.3 cm; throat yellowish and/or with purple dots; lower lip middle lobe entire; upper lip erect, deeply 2-lobed, rarely shallowly 2-parted. Stamens inserted near middle of tube; filaments glabrous. Fruit red to dark purple, ovoid, ca. 1 cm, included in persistent calyx. Seeds numerous, brownish yellow, oblong, ca. 1 mm. Fl. May–Jul, fr. Jul–Sep.

Grassland, sparse forests, along streams; 2000–4500 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India, Mongolia, Sikkim].

2. *Lancea hirsuta* Bonati, Bull. Soc. Bot. France 56: 467. 1909.

粗毛肉果草 cu mao rou guo cao

Herbs, 4–8 cm tall; stems and leaves with coarse multicellular hairs. Rhizomes much branched, with membranous scales on nodes. Leaf blade ovate-oblong, 3–5 cm, papery, base attenuate, margin shallowly crenate, apex obtuse. Racemes 4–10-flowered; bracts lanceolate, longer than calyx, base dilated and semiamplexicaul. Calyx ca. 7 mm, membranous; lobes lanceolate, margin ciliate. Corolla blue-purple, 2.8–3.2 cm; tube more than 2 cm, outside hairy; lower lip middle lobe 2-lobed; upper lip shallowly 2-parted, truncate. Stamens inserted at throat; 2 filaments villous. Style glabrous, as long as stamens. Fl. Jul.
• Grassland, mountain slopes, under forests; 3700–4100 m. NW Sichuan, NW Yunnan.

17. **PICRIA** Loureiro, Fl. Cochinch. 2: 392. 1790.

苦玄参属 ku xuan shen shu

Curanga Jussieu.

Herbs, creeping or diffuse. Leaves opposite, petiolate. Flowers in terminal or axillary racemes; bracts small. Pedicel slender, apex dilated. Bracteoles absent. Calyx divided to base into 4 spreading segments; lower and upper lobes large and further enlarged in fruit, base cordate, margin entire; upper lobe often apically shallowly 2-lobed; lateral lobes narrow. Corolla limb 2-lipped; lower lip longer than upper lip, spreading, 3-lobed; upper lip base wide, apex emarginate. Stamens 4; anterior pair often reduced to clavate staminodes; posterior pair perfect, inserted at base of corolla lobes, included; anthers coherent, locules distinct, divaricate. Stigma 2-lamellate. Capsule included in calyx, septicial, valves separating from wide placental axis. Seeds numerous; seed coat rugose and scrobiculate-reticulate.

Two species: S and SE Asia, China; one species in China.

1. *Picria felterrae* Loureiro, Fl. Cochinch. 2: 393. 1790.

苦玄参 ku xuan shen

Curanga amara Jussieu; *C. felterrae* (Loureiro) Merrill.

Herbs, to 1 m tall, rooting from lower nodes. Branches divaricate, striate. Petiole 0.5–2 cm; leaf blade ovate to sometimes suborbicular, to 5.5 × 3 cm, abaxially hispid on veins, adaxially short hispid, base cuneate, rounded, or truncate, margin crenate-serrate, apex acute; lateral veins 4 or 5 on each side of midrib. Racemes 4–8-flowered. Pedicel to 1 cm. Calyx lobes oblong-ovate, to 1.4 × 1 cm in fruit, veins conspicuously reticulate;

lower lobe smaller than upper; upper lobe often apically 2-lobed; 2 lateral lobes linear. Corolla white or red-brown, ca. 1.2 cm; tube ca. 6.5 mm, constricted at middle; lower lip ca. 6.5 mm; upper lip erect, ca. 4.5 mm, base wide, apically narrowly suboblong, emarginate. Anterior filaments puberulent. Capsule ovoid, 5–6 mm.

Sparse forests, fields; 700–1400 m. Guangdong, Guangxi, Guizhou, S Yunnan [India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

18. **LEGAZPIA** Blanco, Fl. Filip., ed. 2, 2: 338. 1845.

三翅萼属 san chi e shu

Torenia sect. *Tridens* Bentham.

Herbs, glabrous or hispidulous. Stems elongated, branched, creeping, rooting from lower nodes. Leaves opposite, petiolate. Umbels axillary; peduncle short, with or without 2 small involucre bracts. Flowers pedicellate, bracteolate. Calyx broadly 3-winged, apex shallowly 3-lobed. Corolla small, 2-lipped. Stamens 4, didynamous, 2 anterior filaments appendaged; anther locules divaricate. Stigma 2-lamellate. Capsule septicidal.

Two species: SE Asia, China, Oceania; one species in China.

1. *Legazpia polygonoides* (Benth) T. Yamazaki, J. Jap. Bot. 30: 359. 1955.

三翅萼 san chi e

Torenia polygonoides Benth, Scroph. Ind. 39. 1835.

Herbs, subglabrous. Branches slender. Petiole 0.5–0.8 mm; leaf blade ovate-elliptic to ovate-rhomboid, 1–2 cm, papery, glabrous, margin crenate-serrate on distal 2/3. Inflorescences 1–4-flowered; peduncle 0.5–1.5 cm;

involucre bracts 2, acerose, ca. 1 mm. Pedicel 2–6 mm; bracteole subulate, 1–2 mm. Calyx oblong to suborbicular, to 9 mm in fruit, base short auriculate, wings to 4 mm wide, apex with 3 small sharp teeth. Corolla white or purple-blue, slightly longer than calyx; lower lip 3-lobed; upper lip entire; lobe apices obtuse. Capsule oblong-ovoid, ca. 8 mm. Fl. and fr. Jul–Aug.

Trailsides, shady and wet places of mountain valleys. Guangdong, Guangxi [Indonesia, Malaysia, Myanmar, Philippines; Oceania].

19. LINDERNIA Allioni, Mélanges Philos. Math. Soc. Roy. Turin. 3: 178. 1766.

母草属 mu cao shu

Anagalloides Krock; *Bonnaya* Link & Otto; *Ilysanthes* Rafinesque.

Herbs, erect, prostrate, or creeping. Leaves opposite; petiolate or sessile; leaf blade margin often toothed or rarely entire; veins pinnate or palmate. Inflorescences terminal or axillary, racemose, sometimes pseudo-umbellate, rarely in large panicles, or flowers solitary. Flowers opposite or alternate, often pedicellate. Bracteoles absent. Calyx lobes 5, equal or subequal, parted, or split on 1 side. Corolla lower lip larger than upper, extended; upper lip erect. Stamens 4, all fertile or 2 anterior reduced and filaments appendaged; anthers coherent or apex of locules of anterior ones pointed or spurred. Style mostly 2-lamellate, apex often enlarged. Seeds small, numerous.

About 70 species: widely distributed throughout warm regions of New and Old World; 29 species in China.

1a. Stems creeping, procumbent, or diffuse, rarely suberect or erect, sometimes long stoloniferous.

2a. Calyx shallowly lobed, lobes triangular-ovate 3. *L. crustacea*

2b. Calyx lobed to or almost to base, lobes sublinear.

3a. Capsule much longer than persistent calyx.

4a. Leaves narrow, linear-lanceolate, rarely lanceolate; main veins parallel 19. *L. micrantha*

4b. Leaves wide, mostly oblong; veins pinnate.

5a. Leaf margin conspicuously mucronate toothed.

6a. Leaves petiolate; margin acute-serrate; corolla 10–14 mm 24. *L. ruellioides*

6b. Leaves sessile or short petiolate; margin aristate-serrate; corolla ca. 7 mm 25. *L. ciliata*

5b. Leaf margin without conspicuous mucronate teeth.

7a. Leaf base gradually narrowing; flowers paired, corolla violet; fruiting pedicel less than 0.6 cm 20. *L. brevipedunculata*

7b. Leaf base truncate to subcordate; flowers solitary, corolla white or pale purple; fruiting pedicel 0.6–2 cm 21. *L. anagallis*

3b. Capsule almost as long as or shorter than persistent calyx.

8a. Leaf length much greater than width at least in lower part of stem, oblong-lanceolate to obovate-oblong.

9a. Plants without long stolons; calyx ca. 3 mm in fruit.

10a. Plants hairy throughout except corolla; leaves to 5 cm, apex obtuse to rounded; pedicel to 1 cm, recurved in fruit 10. *L. viscosa*

10b. Plants glabrous throughout except calyx; leaves 1–1.5 cm, apex acute; pedicel 1–2 cm, not recurved in fruit 29. *L. dubia*

9b. Plants with long stolons, rooting from nodes; calyx ca. 5–8 mm in fruit.

11a. Stems and branches densely with horizontally spreading, silvery and shiny hairs 7.5–10 mm; leaf apex acute to obtuse 11. *L. mollis*

11b. Stems and branches sparsely pubescent with uniformly curved, neither silvery nor shiny

hairs ca. 2.5 mm; leaf apex rounded 26. *L. cyrtotricha*

8b. Leaf length almost equalling width, subovate to orbicular.

- 12a. Inflorescences terminal; capsule ovoid-globose 9. *L. pusilla*
- 12b. Inflorescences axillary; capsule fusiform-ovoid to ellipsoid-oblong.
- 13a. Plants densely hairy; leaf blade suborbicular, apex rounded 17. *L. kiangsiensis*
- 13b. Plants setose or subglabrous; leaf blade ovate, deltoid-orbicular, or subtriangular-ovate,
apex subacute to subobtusate.
- 14a. Leaves 0.4–1.3 cm; flowers solitary 15. *L. setulosa*
- 14b. Leaves 1.6–2.5 cm; flowers 6–10 16. *L. scutellariiformis*
- 1b. Stems erect, occasionally decumbent.
- 15a. Stem nodes 2–4; inflorescences pseudo-umbellate, at base with 2 pairs decussate or unequally pseudo-whorled bracts 2. *L. dictyophora*
- 15b. Stem nodes many; inflorescences racemose, spicate, or umbellate fascicles, without pseudo-whorled bracts.
- 16a. Leaf veins parallel.
- 17a. Leaf blade margin conspicuously crenate or serrate; calyx lobed to middle or 2/3 of calyx length 1. *L. nummulariifolia*
- 17b. Leaf blade margin entire or somewhat serrate; calyx lobed almost to base.
- 18a. Capsule as long as or only slightly longer than persistent calyx.
- 19a. Plants glandular hairy; fertile stamens 2; stigma discoid 6. *L. jiujuanica*
- 19b. Plants glabrous; fertile stamens 4; stigma 2-lobed 7. *L. procumbens*
- 18b. Capsule at least ca. 2 × as long as persistent calyx.
- 20a. Leaves ovate-lanceolate to narrowly ovate, 0.5–1.5 cm; capsule narrowly ovoid to ellipsoid, ca. 2 × as long as persistent calyx 27. *L. hyssopoides*
- 20b. Leaves linear to linear-lanceolate, 1–4 cm; capsule linear, more than 2 × as long as persistent calyx 19. *L. micrantha*
- 16b. Leaf veins pinnate.
- 21a. Leaves to 12 cm; upper calyx lobe larger than other lobes 8. *L. megaphylla*
- 21b. Leaves less than 4.5 cm; calyx lobes subequal.
- 22a. Calyx lobed to 1/3 of its length.
- 23a. Stems often much branched; branches spreading at an angle of 50–90°; internodes mostly equal in length 3. *L. crustacea*
- 23b. Stems often simple or sparsely branched; branches spreading at an angle of 10–50°; internodes short below, elongated above middle.
- 24a. Leaf margin usually irregularly toothed; capsule shorter than persistent calyx 5. *L. oblonga*
- 24b. Leaf margin entire; capsule as long as persistent calyx 4. *L. taishanensis*
- 22b. Calyx lobed to or near base.
- 25a. Flowers numerous in racemes or sometimes panicles.
- 26a. Perennials; capsule shorter than persistent calyx 13. *L. macrobotrys*
- 26b. Annuals; capsule 2–3 × as long as persistent calyx.
- 27a. Leaf base amplexicaul, margin densely aristate-serrate 25. *L. ciliata*
- 27b. Leaf base cuneate and decurrent, margin not densely aristate-serrate.
- 28a. Capsule cylindrical, 2 × or more as long as persistent calyx 23. *L. antipoda*
- 28b. Capsule globose to ellipsoid, almost as long as to shorter than persistent calyx.
- 29a. Leaves sessile or short petiolate 10. *L. viscosa*
- 29b. Petiole to 1.4 cm 12. *L. elata*
- 25b. Flowers solitary or few umbellate or in short racemes.
- 30a. Branches spreading at an angle of 45°; plants often wider than tall or as wide as tall.
- 31a. Plants 14–20 cm tall, ± woody with age; leaves thick, margin 12–18-toothed; calyx ca. 10 mm, lobes with long needlelike tip, longer than fruit 18. *L. stricta*

- 31b. Plants less than 10 cm tall, herbaceous; leaves thin, margin 8–12-toothed; calyx ca. 5 mm, lobes without long needlelike tip, \pm as long as fruit 28. *L. delicatula*
- 30b. Branches not spreading at angle of 45°; plants longer than wide.
- 32a. Capsule ovoid, as long as persistent calyx; leaves not linear 14. *L. yaoshanensis*
- 32b. Capsule cylindrical, 2–3 \times as long as persistent calyx; leaves linear.
- 33a. Leaf base somewhat amplexicaul; bracts linear; corolla lower middle lobe larger than other lobes 22. *L. tenuifolia*
- 33b. Leaf base cuneate and decurrent; bracts subulate; corolla lobes subequal 23. *L. antipoda*

1. *Lindernia nummulariifolia* (D. Don) Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 79. 1895.

宽叶母草 kuan ye mu cao

Vandellia nummulariifolia D. Don, Prodr. Fl. Nepal. 86. 1825; *Lindernia sessiliflora* (Benth) Wettstein; *Vandellia chinensis* T. Yamazaki; *V. sessiliflora* Benth.

Annuals, 1–15 cm tall. Roots fibrous. Stems erect, subquadrangular, sparsely spreading hairy on angles. Leaf blade broadly ovate to orbicular-ovate, 5–12 \times 4–8 mm, abaxially glabrous or sparsely hairy only on midrib, base broadly cuneate to cordate, margin shallowly crenate to undulate or acuminate toothed, apex obtuse; veins parallel from base. Inflorescences terminal or axillary subumbels, few flowered. Central flowers sessile or short pedicelled, cleistogamous; other flowers on pedicels ca. 2 cm, sometimes sterile. Calyx ca. 3 mm, lobed to middle or 2/3 of length; lobes ovate to lanceolate-ovate. Corolla violet, rarely blue or white, ca. 7 mm; lower lip spreading flat, 3-lobed; upper lip ovate. Filaments of anterior stamens basally small appendaged. Capsule narrowly ellipsoid, ca. 2 \times as long as persistent calyx, apex acuminate. Seeds brown. Fl. Jul–Sep, fr. Aug–Nov.

Edge of rice fields, along streams, wet places; below 1800 m. Gansu, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [Kashmir, Myanmar, Nepal, Sikkim, Thailand, Vietnam].

2. *Lindernia dictyophora* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 397. 1979.

网萼母草 wang e mu cao

Annuals, erect, 7–10 cm. Stems simple, with 2–4 nodes, conspicuously ribbed, subglabrous, with or without adventitious roots on first node. Petiole 4–5 mm, narrowly winged; leaf blade ovate to ovate-elliptic, 1.2–2.5 \times 0.6–1.2 cm, subglabrous to sparsely hirtellous, base rounded to broadly cuneate, margin appressed serrate, apex acute to obtuse. Inflorescences pseudo-umbellate; bracts 2 pairs, decussate or unequally whorled. Flowers open, cleistogamous, or sterile. Calyx campanulate, 5-ridged, upper ridge narrowly winged; lobes often irregular in fruit, upper lobe narrowly ovate, smaller than lower lobe, margin entire, apex acuminate. Corolla white. Filaments of anterior stamens unappendaged. Ovary glabrous. Style persistent; stigma

lamellate. Capsule ellipsoid to oblong, slightly shorter than persistent calyx.

Forests; ca. 1400 m. Yunnan (Jinghong Xian) [Thailand].

3. *Lindernia crustacea* (Linnaeus) F. Mueller, Syst. Census Austral. Pl. 1: 97. 1882.

母草 mu cao

Capraria crustacea Linnaeus, Mant. Pl. 1: 87. 1767; *Vandellia bodinieri* H. Léveillé; *V. crustacea* (Linnaeus) Benth.

Annuals, 10–20 cm tall, much branched. Branches widely spreading, subquadrangular, deeply sulcate, glabrous. Petiole 1–8 mm; leaf blade triangular-ovate to broadly ovate, 1–2 \times 0.5–1.1 cm, abaxially pilose along veins to subglabrous, adaxially subglabrous, base broadly cuneate to rounded, margin shallowly crenate or serrate, apex obtuse to subacute. Flowers axillary and solitary or in short apical racemes. Pedicel slender, 0.5–2.2 cm, subglabrous. Calyx urnlike, 3–5 mm, shallowly lobed; lobes triangular-ovate, outside sparsely pubescent. Corolla purple, 5–8 mm; tube slightly longer than calyx; lower lip 3-lobed, middle lobe larger and slightly longer than upper lip; upper lip ovate, sometimes shallowly 2-lobed. Stamens didynamous. Style fugacious. Capsule broadly ellipsoid, almost as long as persistent calyx. Seeds pale yellow-brown, subglobose, scrobiculate. Fl. and fr. year round.

Moist areas, rice fields, grassland, trailsides; below 1300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [widely distributed in tropics and subtropics].

Used medicinally.

4. *Lindernia taishanensis* F. Z. Li, Bull. Bot. Res., Harbin 6(1): 169. 1986.

泰山母草 tai shan mu cao

Annuals, 3–10 cm tall. Stems erect, quadrangular, branched, nodes 3 or 4, internodes increasing in length upward. Branches few, ascending. Petiole short; leaf blade ovate to narrowly ovate, 3–7 \times 2–4 mm, glabrous, base rounded to broadly cuneate, margin entire and short strigose, apex obtuse. Flowers axillary, solitary or in short racemes. Pedicel slender, 0.5–2 cm, sparsely short strigose to subglabrous. Calyx tubular, 3–4 mm, outside sparsely short strigose, shallowly lobed; lobes triangular-ovate. Corolla purple; lower lip 3-lobed; upper lip emarginate. Stamens didynamous, anterior

ones with a curved clavate appendage. Capsule ellipsoid, nearly as long as persistent calyx. Seeds yellowish, globose. Fl. and fr. Oct.

• Shandong (Tai Shan).

5. *Lindernia oblonga* (Benth) Merrill & Chun, Sunyatsenia 5: 180. 1940.

棱萼母草 *leng e mu cao*

Vandellia oblonga Benth, Scroph. Ind. 35. 1835;

Lindernia subcrenulata (Miquel) Merrill; *Torenia oblonga* (Benth) Hance; *Vandellia subcrenulata* Miquel.

Perennials. Roots fibrous. Rhizomes horizontal. Stems erect or sometimes procumbent and ascending, subquadrangular, glabrous, median internodes to 6 cm. Branches few, ascending. Leaves short petiolate below, sessile and subamplexicaul above; leaf blade rhomboid-ovate to rhomboid-lanceolate, 5–20 × 3–8 mm, base broadly cuneate, margin often with few irregular undulate sinuses or small teeth, or entire, apex subacute to rounded. Racemes lax, usually less than 10-flowered; bracts lanceolate. Pedicel slender, 0.7–2.5 cm. Calyx narrowly campanulate, lobed to 1/4 length; lobes triangular-ovate, glabrous, apex acute and recurved, midrib evident. Corolla purple to purple-blue, to 1.3 cm or more; tube ca. 7 mm; lower lip 3-lobed; upper lip 2-lobed. Stigma broadly lamellate. Capsule ellipsoid, shorter than persistent calyx. Seeds numerous. Fl. May–Jul, fr. Aug–Oct.

Sandy soil; low elevations. Guangdong, Hainan [Cambodia, Laos, Vietnam].

6. *Lindernia jiuahuanica* X. H. Guo & X. L. Liu, Acta Phytotax. Sin. 26: 153. 1988.

九华山母草 *jiu hua shan mu cao*

Annuals, 10–15 cm tall. Stems erect, branched, pilose, sparsely glandular hairy. Leaves sessile, broadly ovate, 4–6 × 2–5 mm, sparsely glandular hairy, margin entire, apex acute; veins parallel from base. Flowers axillary. Pedicel 3–10 mm, rarely subsessile. Calyx ca. 3 mm, lobed almost to base; lobes linear-lanceolate, outside glandular hairy. Corolla blue-purple, ca. 4.5 mm; lower lip 3-lobed, middle lobe 2-parted; upper lip emarginate. Fertile stamens 2, posterior, included; filaments ca. 0.5 mm; reduced stamens 2, anterior. Stigma discoid. Capsule ovoid, ca. 4 mm, slightly longer than persistent calyx. Seeds pale brown, cylindrical-fusiform; seed coat reticulate. Fl. Jul–Sep, fr. Aug–Oct.

• Mountains; ca. 700 m. Anhui (Jiu Hua Shan).

7. *Lindernia procumbens* (Krocker) Borbás, Békés Vámegey Fl. 80. 1881.

陌上菜 *mo shang cai*

Anagaloides procumbens Krocker, Fl. Siles 2(1): 398. 1790; *Lindernia erecta* (Benth) Bonati; *Vandellia erecta* Benth.

Herbs, erect, caespitose, 5–20 cm, basally much branched, glabrous. Roots slender. Leaves sessile,

elliptic to oblong, somewhat rhomboid, 1–2.5 × 0.6–1.2 cm, glabrous, margin entire or weakly obtusely toothed, apex obtuse to rounded; veins 3–5, parallel from base. Flower axillary, solitary. Pedicel slender, 1.2–2 cm, longer than subtending leaf, glabrous. Calyx lobed almost to base; lobes linear-lanceolate, ca. 4 mm, outside sparsely pubescent, apex obtuse. Corolla pink to purple, 5–7 mm; tube ca. 3.5 mm; lower lip ca. 3 mm, 3-lobed, middle lobe rounded and larger than other lobes, lateral lobes elliptic; upper lip ca. 1 mm, 2-lobed. Stamens 4, all fertile; filaments of anterior stamens with a small glanduliform appendage. Stigma 2-lobed. Capsule globose to ovoid-globose, as long as or slightly longer than persistent calyx. Seeds oblong; seed coat reticulate. Fl. Jul–Oct, fr. Sep–Nov.

Next to water, wet areas; below 1200 m. Anhui, Guangdong, Guangxi, Guizhou, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, India, Indonesia (Java), Japan, Kashmir, Kazakstan, Laos, Nepal, Pakistan, Russia, Tajikistan, Thailand, Vietnam; S Europe].

8. *Lindernia megaphylla* P. C. Tsoong, Acta Phytotax. Sin. 8: 67. 1959.

大叶母草 *da ye mu cao*

Annuals, erect, to 40 cm tall. Stems usually branched, subquadrangular, striate, puberulent, nodes inflated. Petiole to 2.4 cm, winged; leaf blade oblong to ovate-oblong, to 12 × 5.3 cm, abaxially glabrous but veins puberulent, adaxially puberulent, base broadly cuneate and often asymmetrical, margin rounded serrate, apex acute. Racemes to 15 cm, glandular hairy; bracts linear, ca. 2 mm. Pedicel to 2 cm. Calyx lobed to base; lobes irregular, linear, 3-veined, upper lobe almost 2 × as long as other lobes and to 1.5 cm after flowering. Corolla white, to 1.2 cm; lower lip 3-lobed, middle lobe broadly ovate and larger than narrowly ovate lateral lobes; upper lip triangular-ovate, margin entire. Stamens didynamous; anterior filaments basally with a reniform appendage. Style included; stigma 2-lamellate. Capsule ovoid-ellipsoid.

• Dense forests. Guangdong, Guangxi, Hainan.

Lindernia megaphylla is similar to *L. foliosa* Bonati of Vietnam, from which it is distinguished by the lack of rhizomes and by having calyx upper lobes ca. 2 × as long as lower lobes and corolla tube glabrous inside.

9. *Lindernia pusilla* (Willdenow) Boldingh, Zakfl. Java 165. 1916.

细茎母草 *xi jing mu cao*

Gratiola pusilla Willdenow, Sp. Pl. 1: 105. 1797; *Lindernia hirta* (Chamisso & Schlechtendal) Pennell; *L. stellarifolia* Hayata; *Torenia hirta* Chamisso & Schlechtendal; *Vandellia hirta* (Chamisso & Schlechtendal) T. Yamazaki.

Annuals, 6–30 cm tall, diffuse, sometimes long stoloniferous. Stems suberect, subglabrous or hairy, densely coarsely hairy on nodes, internodes to 6 cm. Leaves short petiolate below, sessile above; leaf blade ovate, cordate, or occasionally orbicular, to 1.2 cm,

sparsely with appressed coarse hairs, base cuneate to subcordate, margin subcrenate or entire, veins impressed on adaxial surface. Inflorescences terminal, subumbellate-racemose, 3–5-flowered. Pedicel slender, 0.8–1.5 cm, pilose to subglabrous. Calyx deeply lobed; lobes lanceolate, coarsely hairy outside. Corolla purple, ca. 9 mm; lower lip ca. 5.5 mm, much longer than upper lip; upper lip broadly ovate, emarginate.

Filaments of anterior stamens slender, base geniculate. Stigma 2-lamellate. Capsule ovoid-globose, almost as long as persistent calyx. Seeds oblong, tuberculate. Fl. May–Sep, fr. Sep–Nov.

By water, wet places, rice fields, forests; 800–1600 m. Guangxi, Hainan, Taiwan, S Yunnan [Cambodia, India, Indonesia, Laos, Malay-sia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam].

10. *Lindernia viscosa* (Hornemann) Boldingh, Zakfl. Java 165. 1916.

黏毛母草 nian mao mu cao

Gratiola viscosa Hornemann, Enum. Pl. Hort. Hafn. 19. 1807; *Hornemannia viscosa* (Hornemann) Willdenow; *Lindernia cruciformis* Hayata; *Vandellia viscosa* (Hornemann) Merrill.

Annuals, without long stolons. Stems erect or sparsely diffuse, striate, with coarse spreading long hairs. Leaves short petiolate below, sessile above; leaf blade ovate-oblong, to 5 cm, sparsely coarsely hairy, base decurrent, margin undulate and toothed, apex obtuse to rounded. Upper leaves sessile, wider than long, smaller than basal leaves, base semiamplexicaul and sometimes broadly cordate. Raceme lax, 6–10-flowered; peduncle ascending to spreading at anthesis, recurved after flowering, to 1 cm in fruit, coarsely hairy; bracts small, lanceolate. Pedicel ascending to spreading at anthesis, recurved and to 1 cm in fruit, coarsely hairy. Calyx ca. 3 mm, lobed to base; lobes narrowly lanceolate, outside coarsely hairy. Corolla white or yellowish, to 5–6 mm; lower lip ca. 3 mm, lobes subequal; upper lip ca. 2 mm, 2-lobed. Stamens 4, all fertile. Capsule globose, almost as long as persistent calyx. Seeds ellipsoid-oblong. Fl. May–Aug, fr. Sep–Nov.

Forests, next to rocks; 900–1300 m. Guangdong, Guangxi, Jiangxi, Taiwan, S Yunnan [Cambodia, India (Darjeeling), Indonesia, Laos, Myanmar, New Guinea, Philippines, Sikkim, Thailand, Vietnam].

11. *Lindernia mollis* (Benth) Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 79. 1895.

红骨母草 hong gu mu cao

Vandellia mollis Benth, Scroph. Ind. 37. 1835; *Diceros montanus* Blume; *Lindernia montana* (Blume) Koorders, not Hiern; *Vandellia montana* (Blume) Benth.

Annuals, creeping, stoloniferous, rooting from nodes, shiny white hirtellous except for corolla. Roots fibrous. Stems ± curved and apically ascending, 5–20 cm or longer, few branched, striate, internodes long. Leaves sessile to short petiolate; leaf blade oblong-lanceolate to oblong, 0.7–2.5 cm × 2–6 mm, with white shiny sericeous appressed hairs, base cuneate to subcordate, margin irregularly serrate to crenate, apex acute to obtuse. Racemes axillary from upper leaves, short or sometimes subumbellate, to 10-flowered or more, sometimes flowers solitary in axils; bracts small, subulate. Pedicel to 2.5 cm. Calyx to 5–7 mm, lobed to base; lobes lanceolate. Corolla purple to yellow-white, 8–10 mm; lower lip spreading flat, 3-lobed. Filaments of anterior stamens with a toothlike appendage. Stigma 2-lobed. Capsule narrowly ovoid, shorter than persistent calyx. Seeds lattice-tuberculate. Fl. Jul–Oct, fr. Sep–Nov.

Fields, scrub on sunny mountain slopes, forest edges, along streams; 900–1400 m. Fujian, Guangdong, Guangxi, Jiangxi, S Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Pakistan, Vietnam].

12. *Lindernia elata* (Benth) Wettstein in Engler & Prantl, Nat. Pflanzenfam. 4(3b): 79. 1891.

荨麻母草 qian ma mu cao

Vandellia elata Benth, Scroph. Ind. 36. 1835; *Lindernia urticifolia* (Hance) Bonati; *Vandellia urticifolia* Hance.

Annuals, erect, to 40 cm tall, usually much branched, basally woody with age. Stems conspicuously angled, densely hirsute. Petiole to 1.4 cm, narrowly winged; leaf blade triangular-ovate, 1.2–2 × 1.2–2 cm, patently hirsute, base cuneate to truncate and often decurrent, margin coarsely acute serrate, apex acute. Flowers numerous, mostly in axillary racemes forming panicles; bracts narrowly lanceolate, hairy. Pedicel 2–7 mm, ascending, hairy. Calyx to 4 mm in fruit, lobed to base; lobes linear-lanceolate, patently hairy. Corolla purple, purple-red, or blue, ca. 4 mm; tube ca. 1 mm, inflated at middle; lower lip 3-lobed; upper lip emarginate. Filaments of anterior stamens with a clavate appendage. Capsule ellipsoid, shorter than persistent calyx. Seeds ribbed. Fl. Jul–Oct, fr. Sep–Nov.

Rice fields, grassland, sandy mountain slopes; low elevations. Fujian, Guangdong, Guangxi, Yunnan [Cambodia, Indonesia (Kalimantan), Malaysia, Thailand, Vietnam].

Lindernia elata var. *chinensis* (Bonati) Handel-Mazzetti has been reported from China, but no specimens have been seen by the authors.

13. *Lindernia macrobotrys* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 396. 1979.

长序母草 chang xu mu cao

Perennials, more than 30 cm tall, suberect or basally decumbent and curved. Roots adventitious. Stems subquadrangular, narrowly winged. Petiole 2–6 mm,

narrowly winged; leaf blade triangular to broadly triangular-ovate, 1.6–2.3 × 1.2–2 cm, abaxially subglabrous, adaxially sparsely hispidulous, base truncate to broadly cuneate, margin triangular serrate, apex acute to rarely obtuse. Racemes 6–10 cm, in large lax panicles; bracts linear-lanceolate, ca. 5 mm, spreading to reflexed, margin entire. Pedicel 1–1.5 cm, glabrous. Calyx 6–7 mm, lobed to base; lobes linear-lanceolate, glabrous or sparsely hairy, apex acuminate, midrib conspicuous. Corolla white, ca. 6 mm. Capsule ovoid-oblong to fusiform-ovate, shorter than persistent calyx. Seeds ovoid, bulging on surface.

• Guangdong (Qujiang Xian).

14. *Lindernia yaoshanensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 396. 1979.

瑶山母草 yao shan mu cao

Herbs, to 50 cm tall, often rhizomatous. Stems suberect or ascending, subquadrangular, pubescent to subglabrous, rooting from basal nodes. Petiole to 5–10 mm, pubescent; leaf blade narrowly triangular to narrowly triangular-ovate, 2–3.5 × 1–2 cm, appressed hairy, base broadly cuneate, margin 11–25-toothed, apex acute. Flowers axillary and solitary or in 3–5-flowered racemes; bracts narrow. Pedicel 2–8 mm, to 16 mm in fruit, pubescent. Calyx to 9 mm, lobed to base; lobes linear, to 6 mm, subequal, hirsute along midrib, apex acute. Corolla to 1–1.2 cm; lower lip ca. 6.5 mm, 3-lobed, lateral lobes oblong and ca. 2/3 as long as middle lobe; upper lip triangular, ca. 3.5 mm, apex truncate and subemarginate. Filaments of anterior stamens basally with a clavate appendage ca. 0.5 mm; anthers mucronate. Stigma lamellate. Ovary glabrous. Capsule ovoid, as long as persistent calyx. Fl. Jul.

• Guangxi (Yaoshan), Guizhou.

15. *Lindernia setulosa* (Maximowicz) Tuyama ex H. Hara, J. Jap. Bot. 19: 207. 1943.

刺毛母草 ci mao mu cao

Torenia setulosa Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 31: 72. 1887; *Vandellia cavaleriei* H. Léveillé; *V. setulosa* (Maximowicz) T. Yamazaki. Annuals. Stems mostly procumbent, rarely ascending to suberect, branched, subquadrangular, winged at ridges, striate, setose or subglabrous. Petiole less than 3 mm; leaf blade broadly ovate to deltoid-orbicular, 4–13 × 3–12 mm, sometimes wider than long, adaxially sparsely appressed hairy, base broadly cuneate and subequal, margin with 4–6 pairs of broadly triangular teeth, apex subacute. Flowers axillary and solitary, or more often in lax racemes. Pedicel to 2 cm. Calyx to 5 mm in fruit, lobed to base; lobes linear, spreading flat at anthesis, inflexed and covering capsule with age, margin hirsute, midrib raised and hirsute. Corolla white or light purple, to 7 mm, slightly longer than calyx; lower lip spreading flat; upper lip ovate. Stamens 4, all fertile. Capsule fusiform-ovoid, shorter than persistent calyx. Seeds ellipsoid. Fl. May–Aug, fr. Jul–Nov.

Valleys, trailsides, forests, grassland; below 1100 m. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Sichuan, Zhejiang [Japan].

16. *Lindernia scutellariiformis* T. Yamazaki, J. Jap. Bot. 27: 67. 1952.

黄芩母草 huang qin mu cao

Vandellia scutellariiformis (T. Yamazaki) T. Yamazaki. Herbs. Roots fibrous. Stems slender, much branched, 20–36 cm, channeled, pubescent, base creeping and rooting from nodes. Petiole ca. 5 mm; leaf blade triangular-ovate, 1.6–2.5 × 0.8–1.5 cm, abaxially hairy along veins, adaxially glabrous, base broadly cuneate, subtruncate, or subcordate, margin with 6–10 pairs of triangular acute teeth, apex acute to subobtusate. Racemes 6–10-flowered, lax, axillary; bracts linear-lanceolate, ca. 5 mm, sparsely hairy. Pedicel 1–1.8 cm, gradually shorter upward, sparsely hairy. Calyx campanulate, 5–9 mm, lobed to base; lobes linear-lanceolate, outside sparsely short hairy, margin entire, apex acuminate. Corolla to 1.3 cm; lower lip 3-lobed, lobes broadly ovate, middle lobe larger and longer than upper lip; upper lip 2-lobed, lobes narrow. Filaments of anterior stamens with a clavate appendage. Stigma lamellate. Capsule ellipsoid-oblong, shorter than persistent calyx.

• Taiwan (Tainan Xian).

17. *Lindernia kiangsiensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 396. 1979.

江西母草 jiang xi mu cao

Annuals, to 20 cm, creeping, sparsely branched. Rhizomes slender. Stems and branches quadrangular, striate, densely patent hirsute. Petiole 3–5 mm, hirsute; leaf blade suborbicular, rarely broadly ovate to suboblong, 0.8–1.5 × 0.8–1.5 cm, densely patent hirsute, base usually truncate, margin triangular serrate, apex rounded; veins abaxially conspicuous. Peduncle patent hirsute. Inflorescences axillary, (1 or)2(–4)-flowered; bracts linear-lanceolate to narrowly ovate. Pedicel 1.5–1.9 cm, patent hirsute. Calyx 6–8 mm, lobed to base; lobes linear-lanceolate to linear, outside patent hirsute, margin patently hirsute, veins conspicuous. Corolla pink to bluish, ca. 1.2 cm; tube ca. 8 mm; lower lip 3-lobed, longer than upper lip; upper lip 2-lobed. Filaments of anterior stamens with a clavate appendage. Capsule fusiform-ovoid, shorter than persistent calyx, ribbed. Seeds yellow-brown, ovoid-globose.

• Mixed forests, trailsides; ca. 600 m. Jiangxi (Anyuan Xian, Hui-chang Xian).

18. *Lindernia stricta* P. C. Tsoong & T. C. Ku, Fl. Reipubl. Popularis Sin. 67(2): 397. 1979.

坚挺母草 jian ting mu cao

Herbs, 14–20 cm tall. Stems erect, ± woody, quadrangular, narrowly winged on angles, sparsely hirsute; branches spreading at 45° then ascending. Leaves sessile or short petiolate; leaf blade thick, triangular-ovate to ovate-lanceolate, 1.5–2.8 × 0.5–1.4 cm, abaxially hairy on veins, adaxially sparsely hirsute, base broadly cuneate to subrounded, margin with 12–18

appressed saw-teeth, apex acute. Flowers axillary, solitary or few in short umbellate fascicles. Pedicel 1.5–2.5 cm, hirsute. Calyx ca. 1 cm, lobed to base; lobes linear-lanceolate, apex narrowly acuminate, midrib raised with dense rough hairs these dilated at base. Corolla ca. 8 mm; lower lip ca. 5 mm, lobes rounded, apex subemarginate; upper lip ovate, margin entire. Fertile stamens 2, posterior; filaments short; anthers large. Sterile stamens 2, anterior; filaments to 2 mm, without appendages. Capsule oblong-ovoid, ca. 2/3 as long as persistent calyx. Seeds brown.

• Shady places of valleys or trailsides; low elevations. Guangxi (Gui Xian, Xing'an).

19. *Lindernia micrantha* D. Don, Prodr. Fl. Nepal: 85. 1825.

狭叶母草 xia ye mu cao

Lindernia angustifolia (Benth) Wettstein; *Vandellia angustifolia* Benth.

Annuals, to 40 cm tall. Roots fibrous, abundant. Stems usually erect, striate, glabrous; branches few to numerous, ascending, striate, glabrous. Leaves sessile, linear to linear-lanceolate, 1–4 cm × 2–8 mm, glabrous, margin entire or somewhat irregularly serrate; main veins 3–5, parallel. Flowers axillary, solitary. Pedicel to 3.5 cm in fruit, striate, glabrous. Calyx ca. 2.5 mm, to 4 mm in fruit, lobed to base; lobes narrowly lanceolate, glabrous. Corolla purple, blue-purple, or white, ca. 6.5 mm; lower lip slightly longer than upper, spreading flat, 3-lobed; upper lip 2-lobed. Filaments of anterior stamens with a linear appendage; posterior anthers with connective of lower locule produced into a long tail equalling locule. Style persistent. Capsule linear, to 1.4 cm, more than 2 × as long as persistent calyx. Seeds brownish, oblong. Fl. May–Oct, fr. Jul–Nov.

Rice fields, along rivers, wet areas; ca. 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Jiangsu, Jiangxi, Henan, Hubei, Hunan, Yunnan, Zhejiang [Cambodia, India, Indonesia (Java), Japan, S Korea, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

20. *Lindernia brevipedunculata* Migo, J. Shanghai Sci. Inst. 4: 160. 1949.

短梗母草 duan geng mu cao

Vandellia brevipedunculata (Migo) T. Yamazaki.

Herbs, glabrous. Roots branched, fibrous. Stems procumbent, to 30 cm, quadrangular, diffuse, much branched, rooting from nodes; branches spreading. Petiole 3–5 mm; blades of stem leaves and long branches ovate-elliptic, lanceolate-oblong, or oblanceolate, 1.5–2 × 0.4–1 cm, base gradually narrowing, margin obscurely crenate; leaves on short branches 1/3–1/2 as long as those on stem. Flowers axillary and paired or in apical racemes. Pedicel slender, ca. 6 mm, gradually shorter upward, ridged. Calyx campanulate, basally connate; lobes linear-lanceolate, ca. 5 mm, erect, ± spreading flat. Corolla violet, 7–8 mm. Filaments of anterior stamens filiform, ca. 1.5 mm, appendiculate; posterior filaments ca. 1 mm. Style 2-

lobed. Capsule cylindric-oblong, ca. 2 × as long as persistent calyx; style persistent.

• Zhejiang (Lin'an Xian).

21. *Lindernia anagallis* (N. L. Burman) Pennell, J. Arnold Arbor. 24: 252. 1943.

长蒴母草 chang shuo mu cao

Ruellia anagallis N. L. Burman, Fl. Indica 135. 1768; *Gratiola cordifolia* Colsmann; *Lindernia cordifolia* (Colsmann) Merrill; *Vandellia anagallis* (N. L. Burman) T. Yamazaki; *V. callitrichifolia* H. Léveillé; *V. cordifolia* (Colsmann) G. Don.

Annuals, 10–40 cm. Roots fibrous. Stems creeping, often branched, striate, glabrous, rooting from nodes. Leaves short petiolate to sessile; leaf blade triangular-ovate, ovate, or oblong, 0.4–2 × 0.7–1.2 cm, glabrous, base truncate to subcordate, margin shallowly crenate, apex rounded to acute; lateral veins 3 or 4 on each side of midrib, spreading at an angle of 45°. Flowers axillary, solitary. Pedicel 6–10 mm, to 2 cm in fruit, glabrous. Calyx ca. 5 mm, basally connate; lobes narrowly lanceolate, glabrous. Corolla white or light purple, 0.8–1.2 cm; lower lip slightly longer than upper lip, spreading flat, 3-lobed, lobes subequal; upper lip ovate, 2-lobed. Filaments of anterior stamens basally with a clavate appendage. Stigma 2-lobed. Capsule linear-ovoid, ca. 2 × as long as persistent calyx. Seeds ovoid, tuberculate. Fl. Apr–Sep, fr. Jun–Nov.

Edge of forests, along streams, rice fields, wet places; ca. 1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [Bhutan, Cambodia, India, Japan, Laos, Malaysia, Myanmar, Philippines, Sikkim, Thailand, Vietnam; Australia].

Used medicinally.

22. *Lindernia tenuifolia* (Colsmann) Alston in Trimen, Hand. Fl. Ceylon 6(suppl.): 214. 1931.

细叶母草 xi ye mu cao

Gratiola tenuifolia Colsmann, Prodr. Descr. Gratiol. 8. 1793; *Bonnaya tenuifolia* (Colsmann) Sprengel; *Ilysanthes tenuifolia* (Colsmann) Urban; *Vandellia tenuifolia* (Colsmann) Haines.

Annuals, to 15 cm tall. Roots fibrous, fascicled. Stems erect or subprostrate and ascending, much branched, striate, glabrous, rarely rooting from 2nd or 3rd nodes. Leaves sessile, linear, 1–2.8 cm × ca. 2 mm, glabrous, base somewhat amplexicaul, margin obscurely short serrate to subentire; midrib conspicuous. Flowers few, opposite to leaves; bracts linear, 1.5–3.5 mm. Pedicel 5–10 mm, glabrous, reflexed in fruit. Calyx basally connate; lobes linear-lanceolate, ca. 2 mm, glabrous, apex obtuse, midrib conspicuous. Corolla purple-red; lower lip 3-lobed, middle lobe larger than other lobes and slightly longer than upper lip; upper lip reduced, obscurely 2-lobed. Fertile stamens 2, posterior. Staminodes 2, anterior. Capsule cylindric, to 1.5 cm, 2–3 × as long as persistent calyx, apex acuminate.

Beside water, trailsides; low elevations. Guangdong, Guangxi, Taiwan [Cambodia, India, Indonesia, Laos, W Malaysia, Myanmar, New Guinea, Philippines, Vietnam].

23. *Lindernia antipoda* (Linnaeus) Alston in Trimen, Hand. Fl. Ceylon 6(suppl.): 24. 1931.

泥花母草 ni hua mu cao

Ruellia antipoda Linnaeus, Sp. Pl. 2: 635. 1753; *Bonnaya antipoda* (Linnaeus) Druce; *B. veronicifolia* (Retzius) Sprengel; *Gratiola veronicifolia* Retzius; *Ilysanthes antipoda* (Linnaeus) Merrill; *Lindernia veronicifolia* (Retzius) F. Mueller; *Vandellia veronicifolia* (Retzius) Haines.

Annuals to 30 cm tall. Roots fibrous, fascicled. Stems suberect or prostrate basally and rooting from lower nodes then ascending, many branched, channeled, glabrous. Petiole short and wide; leaf blade oblong, oblong-lanceolate, oblong-oblongate, or \pm linear-lanceolate, 0.8–4 \times 0.6–2 cm, glabrous, base cuneate and decurrent, margin obscurely to sharply serrate or subentire, apex acute to rounded. Racemes terminal, to 15 cm, 2–20-flowered; bracts subulate. Pedicel to 1.5 cm, ascending, spreading, to deflexed in fruit. Calyx lobed to base; lobes lanceolate, hispidulous along midrib and edges. Corolla purple, purplish white, or white, to 1 cm; tube to 7 mm; lower lip 3-lobed, lobes subequal; upper lip 2-lobed. Fertile stamens 2, posterior; filaments unappendaged. Reduced stamens 2, anterior; filaments slightly curved, glandular. Stigma lamellate. Capsule cylindrical, 2 \times or more as long as persistent calyx. Seeds brown, irregularly triangular-ovoid; seed coat reticulate. Fl. and fr. spring-autumn.

Rice fields, wet grassland; below 1700 m. Anhui, Fujian, Guangdong, Guangxi, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific Islands].

Used medicinally.

According to T. Yamazaki (Fl. Thailand 5(2): 198. 1990) *Lindernia viatica* (Kerr ex Barnett) Philcox occurs in Taiwan. It closely resembles *L. antipoda*, but we have not seen any specimens from Taiwan.

24. *Lindernia ruellioides* (Colsmann) Pennell, Brittonia 2: 182. 1936.

旱田草 han tian cao

Gratiola ruellioides Colsmann, Prodr. Descr. Gratiol. 12. 1793; *Bonnaya reptans* (Roxburgh) Sprengel; *Gratiola reptans* Roxburgh; *Ilysanthes ruellioides* (Colsmann) Kuntze.

Annuals, 10–15 cm tall. Stolons to 30 cm. Stems rarely erect, usually branched, subglabrous, rooting from nodes. Petiole 0.3–2 cm, distally thicker; leaf blade oblong, elliptic, ovate-oblong, or orbicular, 1–4 \times 0.6–2 cm, scabrous pubescent to subglabrous, base subamplexicaul or broadly cuneate, margin above base

densely and regularly acute-serrate, apex obtuse to acute. Racemes terminal, 2–10-flowered; bracts lanceolate-linear. Pedicel short, distally gradually thicker, glabrous. Calyx ca. 6 mm, to 1 cm in fruit, base connate; lobes linear-lanceolate, glabrous. Corolla purple-red, 1–1.4 cm; tube 7–9 mm; lower lip 3-lobed, lobes subequal or middle lobe slightly larger than other lobes; upper lip 2-lobed. Fertile stamens 2, posterior, unappendaged; sterile stamens 2, anterior. Stigma flattened. Capsule conical, ca. 2 \times as long as persistent calyx. Seeds brown, ellipsoid. Fl. Jun–Sep, fr. Jul–Nov.

Grassland, plains, mountain valleys, forests; below 1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan (Ryukyu Islands), Malaysia, Myanmar, New Guinea, Philippines, Vietnam].

Used medicinally.

25. *Lindernia ciliata* (Colsmann) Pennell, Brittonia 2: 182. 1936.

刺齿泥花草 ci chi ni hua cao

Gratiola ciliata Colsmann, Prodr. Descr. Gratiol. 14. 1793; *Bonnaya brachiata* Link & Otto; *Gratiola serrata* Roxburgh; *Ilysanthes serrata* (Roxburgh) Urban; *Vandellia ciliata* (Colsmann) T. Yamazaki.

Annuals, to 20 cm tall. Stems erect or diffuse, much branched; branches decumbent, sometimes rooting from last node. Leaves sessile or short petiolate; leaf blade oblong to lanceolate-oblong, 0.7–4.5 \times 0.3–1.2 cm, glabrous, base amplexicaul, margin densely aristate-serrate, apex acute to obtuse. Racemes terminal; bracts lanceolate, ca. 1/2 as long as pedicels. Calyx ca. 5 mm, lobed to base; lobes narrowly lanceolate, with a spinelike tip. Corolla light purple or white, ca. 7 mm; tube to 4.5 mm; lower lip almost as long as upper lip, often unequally 3-lobed, middle lobe larger than other lobes; upper lip ovate; lobe apices rounded. Fertile stamens 2, posterior; reduced stamens 2, anterior, forming prominent plaits on base of lower lip. Style \pm as long as fertile stamens. Capsule cylindrical, ca. 3 \times as long as persistent calyx, apex mucronate. Seeds irregularly triangular. Fl. and fr. summer-winter.

Moist places, rice fields, grassland, wastelands, trailsides; ca. 1300 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, SE Xizang, Yunnan [Cambodia, India, Japan (Ryukyu Islands), Laos, Malaysia, Myanmar, Philippines, Vietnam; N Australia].

Used medicinally.

26. *Lindernia cyrtotricha* P. C. Tsoong & T. C. Ku, Fl. Reipubl. Popularis Sin. 67(2): 398. 1979.

曲毛母草 qu mao mu cao

Herbs, long stoloniferous. Stems ribbed, uncinately-hispidulous, rooting from nodes. Leaves on stems ca. 1 \times 1 cm, margin crenate. Petiole of branch leaves 4–8 mm, narrowly winged, uncinately hispidulous; leaf blade broadly ovate to ovate-oblong, 2.6–6 \times 1.8–3.5 cm,

with uncinately appressed hairs densely so abaxially along veins, margin above base or middle crenate and serrate, apex rounded. Racemes terminal on short branches, lax, 2–12-flowered; bracts linear-lanceolate, ca. 3 mm. Pedicel 0.8–2.5 cm. Calyx 5–7 mm, lobed to base; lobes lanceolate to linear, uncinately hispidulous, margin entire, midrib conspicuous. Corolla ca. 5 mm; lower lip 3-lobed; upper lip arched, unlobed. Fertile stamens 2, posterior, lower than staminodes; filaments short; anther with a curved hooklike spur. Staminodes 2, filament short, unequal. Capsule subglobose, shorter than persistent calyx. Seeds ovoid, yellow-brown foveolate.

• Mountain slopes, dense forests; ca. 400 m. Hainan (Baoting Xian).
27. *Lindernia hyssopoides* (Linnaeus) Haines, Bot. Bihar Orissa 4: 666. 1922.

尖果母草 jian guo mu cao

Gratiola hyssopoides Linnaeus, Mant. Pl. 174. 1771;
Bonnaya hyssopoides (Linnaeus) Benth; *Ilysanthes hyssopoides* (Linnaeus) Benth.

Herbs, to 30 cm tall. Roots fibrous, tufted. Stems erect or somewhat ascending, simple, striate, glabrous. Leaves sessile, subamplexicaul, narrowly ovate to ovate-lanceolate, 5–15 × ca. 4 mm, glabrous, margin entire or with 2 or 3 pairs of inconspicuous small teeth; veins 3, parallel. Flowers in axils of upper leaves, solitary. Pedicel 0.5–3 cm, slender, ascending in flower, spreading to reflexed after flowering. Calyx ca. 3 mm, lobed to base; lobes lanceolate. Corolla red, purple, or white, with 2 convex lines at throat, 0.9–1.1 cm; lower lip 3-lobed, lobes subequal; upper lip deeply 2-lobed, lobes narrowly triangular-ovate. Fertile stamens 2, posterior. Staminodes 2, anterior; filaments short, divided. Style short, apex 2-lamellate. Capsule narrowly ovoid, ca. 6 mm. Seeds yellow-brown, oblong, obscurely ribbed. Fl. May–Oct, fr. Aug–Nov.

Dry fields, wet areas; ca. 1200 m. Guangxi, Hainan, Yunnan [India, Indonesia, Sri Lanka, Vietnam].

28. *Lindernia delicatula* P. C. Tsoong & T. C. Ku, Fl. Reipubl. Popularis Sin. 67(2): 398. 1979.

柔弱母草 rou ruo mu cao

Annuals, less than 10 cm tall. Roots fibrous. Stems erect, densely hirsute, branched; branches often spreading at an angle of 45°, densely hirsute. Leaves sessile or petiole short winged; leaf blade thin, narrowly ovate to narrowly ovate-elliptic, 1–1.8 × 0.5–1.2 cm, hairy, abaxially light green, adaxially dark green, margin shallowly obtuse serrate, 8–12-toothed; veins convex. Flowers axillary and solitary or in short terminal racemes; bracts ovate. Pedicel ca. 2 cm, hairy. Calyx ca. 5 mm, lobed to base; lobes lanceolate, densely hirsute, apex acuminate, midrib and reticulate veins conspicuous. Corolla ca. 1 cm; lower lip slightly longer than upper lip, 3-lobed; upper lip obscurely 2-lobed. Fertile stamens 2, posterior; abortive stamens 2, anterior, filaments with a spurlike appendage. Ovary glabrous. Stigma lamellate. Capsule narrowly ovoid to ellipsoid, somewhat shorter than persistent calyx. Seeds brown, ovoid.

• Mountain slopes; ca. 700 m. Guangxi (Longzhou Xian).

29. *Lindernia dubia* (Linnaeus) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 141. 1935.

北美母草 bei mei mu cao

Gratiola dubia Linnaeus, Sp. Pl. 1: 17. 1753; *G. anagallidea* Michaux; *Lindernia anagallidea* (Michaux) Pennell; *L. dubia* var. *anagallidea* (Michaux)

Cooperrider.

Annuals to 25 cm tall, diffuse, glabrous throughout except calyx. Stems purple, quadrangular, rooting at lower nodes, much branched. Leaves sessile, elliptic, 1–1.5 cm × 3–6 mm, decreasing in size upward, base rounded to cuneate, apex acute; veins 3–5, only primary vein conspicuous. Flowers axillary, solitary, in panicles. Pedicel slender, 1–2 cm. Calyx ca. 3 mm; lobes free to base, ca. 0.5 mm wide, hispidulous above, apex acuminate, obscurely 3-veined. Corolla white or pale blue, ca. 6.5 mm; lower lip 3-lobed; upper lip galeate, shallowly 2-lobed, lobes sharply pointed. Fertile stamens 2, posterior; staminodes 2, clavate, unappendaged, apex obtuse. Style ca. 3.5 mm. Capsule oblong, ca. 4 × 2.3 mm, rounded at both ends. Seeds ellipsoid.

Shallow water; low elevations. Guangdong, Taiwan [native to North America]

20. TORENIA Linnaeus, Sp. Pl. 2: 619. 1753.

蝴蝶草属 hu die cao shu

Herbs, glabrous or villous, rarely hispidulous. Leaves opposite, usually petiolate. Inflorescences racemose or in axillary umbellate fascicles, rarely dichotomous and terminal flowers reduced, or 1-flowered. Flowers pedicellate. Calyx ribbed or winged, often 2-lipped and short toothed, usually 5-lobed. Corolla 2-lipped; lower lip 3-lobed, lobes subequal; upper lip erect, apex entire, emarginate, or 2-lobed. Stamens 4; anterior filaments appendaged or less commonly unappendaged; posterior stamens included; anthers connivent in pairs, locules often apically confluent. Ovary apically usually with short coarse hairs. Style apically 2-lamellate. Capsule oblong, included in persistent calyx, septicidal. Seeds numerous, scrobiculate.

About 50 species: mostly in tropical Africa and Asia; ten species in China.

1a. Calyx ribbed or narrowly winged, wing at anthesis less than 1 mm wide.

- 2a. Plants hirsute; corolla 1.2–1.4 cm 1. *T. benthamiana*
 2b. Plants pilose, hirtellous, or villous; corolla 0.8–1.2 cm.
 3a. Inflorescences 2–5-flowered axillary fascicles 5. *T. parviflora*
 3b. Inflorescences racemose or dichotomous.
 4a. Inflorescences usually dichotomous; plants creeping or ascending 2. *T. biniflora*
 4b. Inflorescences racemose; plants erect or sometimes diffuse 3. *T. flava*
 1b. Calyx broadly winged, wing at anthesis more than 1 mm wide.
 5a. Filaments not appendaged.
 6a. Corolla 2.5–4 cm, exceeding calyx by 1–2.3 cm; inflorescences usually racemose; stems simple or branched above middle; often cultivated 6. *T. fournieri*
 6b. Corolla 1.5–2.2 cm, exceeding calyx by 0.1–0.2 cm; inflorescences solitary or fascicled; stems branched near base; not cultivated 7. *T. violacea*
 5b. Filaments appendaged.
 7a. Flowers in racemes 4. *T. fordii*
 7b. Flowers in fascicles or solitary.
 8a. Calyx base truncate or somewhat rounded, wings not decurrent; plants erect 8. *T. cordifolia*
 8b. Calyx base neither truncate nor rounded, wings \pm decurrent; plants mostly creeping.
 9a. Corolla 1.5–2.5 cm, exceeding calyx by 0.4–1 cm; filament appendage 1–2 mm 9. *T. asiatica*
 9b. Corolla 2.5–3.9 cm, exceeding calyx by 1.1–2.1 cm; filament appendage 2–4 mm 10. *T. concolor*

1. *Torenia benthamiana* Hance, Ann. Sci. Nat. Bot., sér. 4, 18: 226. 1862.

毛叶蝴蝶草 mao ye hu die cao

Torenia nantoensis Hayata.

Herbs, densely white hirsute, rooting from lower nodes.

Branches numerous. Petiole ca. 1 cm; leaf blade ovate to ovate-cordate, 1.5–2.2 \times 1–1.8 cm, base cuneate, margin crenate, apex obtuse. Inflorescences axillary, usually 3-flowered fascicles, rarely 1-flowered or racemose and 5-flowered. Pedicel 3 cm in fruit. Calyx slender, 6–9 mm at anthesis, to 1.5 cm in fruit, 5-ribbed, somewhat 2-lipped. Corolla purple-red, pale blue-purple, or whitish, 1.2–1.4 cm; lower lip lobes suborbicular, middle lobe ca. 4 mm and slightly larger than lateral lobes; upper lip oblong, ca. 5 \times 4 mm. Anterior stamens appendages 1.5–2 mm. Capsule narrowly ellipsoid, ca. 10 \times 2–3 mm. Fl. and fr. Aug–May.

• Mountain slopes in shade, trailsides, along stream; low elevations. S Fujian, Guangdong, Guangxi, Hainan, Taiwan.

2. *Torenia biniflora* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 399. 1979.

二花蝴蝶草 er hua hu die cao

Annuals, sparsely hirtellous. Stems 17–50 cm, simple or branched at base, creeping or ascending, rooting from lower nodes. Petiole 6–10 mm; leaf blade ovate to narrowly ovate, 2–4 \times 1–2.5 cm, base rounded to rarely broadly cuneate, margin coarsely toothed, apex acute to short acuminate. Inflorescences from middle or lower leaf axils, usually dichotomous, sometimes racemose, 2–8-flowered; bracts triangular-subulate to linear, ca. 3 mm, pubescent. Pedicel 5–8 mm, 6–12 mm in fruit, pubescent. Calyx tubular, ca. 1 cm, to 1.2 cm in fruit, 5-winged; wings unequal, 0.5–1 mm wide; lobes 5, narrowly lanceolate, 3–4 mm, apex acuminate. Corolla yellow, rarely white and faintly blue, ca. 1.1 cm. Anterior stamens appendages subclavate, ca. 3 mm.

Style apically dilated, 2-lobed, lobes rounded. Capsule ellipsoid, ca. 7 \times 3 mm. Fl. and fr. Jul–Oct.

• Dense forests, shady and wet places along trails; below 1000 m. Guangdong, Guangxi, Hainan.

3. *Torenia flava* Buchanan-Hamilton ex Bentham, Scroph. Ind. 38. 1835.

黄花蝴蝶草 huang hua hu die cao

Torenia hokutensis Hayata.

Herbs, erect, 25–40 cm tall, usually branched from base, villous. Petiole ca. 5.8 mm; leaf blade ovate to elliptic, 3–5 \times 1–2 cm, abaxially glabrous except for veins, adaxially pilose, base cuneate and tapering, margin crenate. Racemes terminal, 10–20 cm; bracts oblong-ovate, 5–8 mm, villous, margin ciliate, apex acuminate. Pedicel ca. 5 mm, usually shorter than calyx. Calyx narrowly cylindrical, straight to slightly curved, 5–10 \times 2–3 mm, 10–15 \times 3–5 mm in fruit, villous, 5-ribbed; veins ciliate; lobes 5, narrowly lanceolate, nearly as long as calyx tube in fruit. Corolla yellow; tube 1–1.2 cm; lower lip lobes suborbicular, subequal; upper lip lobes slightly larger than lower lobes, margin entire or emarginate. Anterior stamens appendages ca. 1 mm. Capsule narrowly ellipsoid. Fl. and fr. Jun–Nov.

Dry meadows, forest margins; below 1000 m. Guangdong, Guangxi, Hainan, Taiwan, S Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

4. *Torenia fordii* J. D. Hooker, Bot. Mag. 111: t. 6797B. 1885.

紫斑蝴蝶草 zi ban hu die cao

Herbs, 25–40 cm tall, villous. Stems erect, stout. Petiole 1–1.5 cm; leaf blade broadly ovate to ovate-triangular, 3–5 \times 2.5–4 cm, white and sparsely hairy, base abruptly constricted and broadly cuneate, margin coarsely triangular acute-serrate. Racemes terminal; bracts oblong-ovate, 5–10 mm, somewhat enveloping pedicel, margin ciliate, apex acuminate. Pedicel ca. 1 cm, to 2

cm in fruit. Calyx obovate-fusiform, ca. $12 \times 5-7$ mm, ca. 1.8×0.8 cm in fruit, 5-winged; wings unequal in width, 2 wider wings to 2 mm; lobes 5, short, more evident in fruit, subequal, ovate-triangular, apex acuminate. Corolla yellow, 1.5–1.8 cm; lower lip lobes rotund, ca. 3×3.5 mm, middle lobe apically orange-colored, lateral lobes distally blue; upper lip ca. 4×5 mm, emarginate. Anterior stamens appendages toothlike. Capsule cylindrical, $9-11 \times 2-3$ mm, compressed, 4-furrowed. Fl. and fr. Jul–Oct.

• Mountain slopes, sparse forests, along streams; low elevations. Fujian, Guangdong, Hunan, Jiangxi.

5. *Torenia parviflora* Buchanan-Hamilton ex Bentham, Scroph. Ind. 39. 1835.

小花蝴蝶草 xiao hua hu die cao

Herbs, 7–20 cm tall, villous. Stems erect or diffuse, branched from base; branches often decumbent, rooting from nodes. Petiole ca. 5 mm; leaf blade ovate to ovate-lanceolate, $1-2 \times 0.8-1.5$ cm, glabrous, base broadly cuneate, margin serrate, apex acute. Inflorescences axillary near stem apex, usually 2–5-flowered fascicles. Calyx 6–8 mm in fruit, 5-ribbed. Corolla blue, 0.8–1.2 cm. Anterior stamens with a toothlike appendage. Capsule 5–7 mm. Seeds ca. 0.4 mm. Fr. Oct.

Guangxi [India, Indonesia; tropical Africa and America].

6. *Torenia fournieri* Linden ex Fournier, Ill. Hort. 23: 129. 1876.

蓝猪耳 lan zhu er

Herbs, 15–50 cm tall. Stems erect, quadrangular, simple or branched above middle, subglabrous. Petiole 1–2 cm; leaf blade oblong-ovate to ovate, $3-5 \times 1.5-2.5$ cm, subglabrous, margin coarsely serrate. Racemes often terminal; bracts linear, 2–5 mm. Pedicel 1–2 cm. Calyx ellipsoid, $1.3-1.9 \times$ ca. 0.8 cm, green or purple-red at apex and margin, 5-winged; wings decurrent, ca. 2 mm wide, becoming ca. 3 mm wide in fruit; lips subtriangular, 1.5–1.7 cm, sometimes apically lobed. Corolla 2.5–4 cm, exceeding calyx by 1–2.3 cm; tube pale violet, upper side yellow; lower lip lobes purple-blue, middle lobe with a yellow patch near base, oblong to suborbicular, ca. 10×8 mm, subequal; upper lip pale blue, erect, broadly obovate, $1-1.2 \times 1.2-1.5$ cm, emarginate. Stamens unappendaged. Capsule narrowly ellipsoid ca. 12×0.5 mm. Seeds yellow. Fl. and fr. Jun–Dec.

Usually cultivated in S China but sometimes occurring by roadsides or in fields; below 1200 m. Fujian, Guangdong, Guangxi, Taiwan, Yunnan, Zhejiang [Cambodia, Laos, Thailand, Vietnam].

7. *Torenia violacea* (Azaola ex Blanco) Pennell, J. Arnold Arbor. 24: 255. 1943.

紫萼蝴蝶草 zi e hu die cao

Mimulus violaceus Azaola ex Blanco, Fl. Filip., ed. 2, 357. 1845; *Torenia exappendiculata* Regel; *T. peduncularis* Bentham ex J. D. Hooker; *T. violacea* var. *chinensis* T. Yamazaki.

Herbs, 8–35 cm tall. Stems erect or somewhat decumbent, branched near base. Leaves decreasing in size upward; petiole 0.5–2 cm; leaf blade ovate to narrowly ovate, $2-4 \times 1-2$ cm, villous, base cuneate to somewhat truncate, margin shallowly serrate, apex acuminate. Flowers in terminal fascicles or solitary in leaf axils, rarely in racemes. Pedicel ca. 1.5 cm, to 3 cm in fruit. Calyx \pm purple-red, oblong-fusiform, 1.3–1.7 cm \times 6–8 mm, to 2×1 cm in fruit, base rounded and slightly decurrent, 5-winged and wings to 2.5 mm wide; lobes 5. Corolla pale yellow or white, 1.5–2.2 cm, exceeding calyx by 1–2 mm; lower lip lobes with a blue patch, center of middle lobe with an additional yellow patch, ca. 3×4 mm, subequal; upper lip suberect, sub-orbicular, ca. 6 mm in diam. Stamens unappendaged. Capsule 1.1–1.4 cm. Seeds yellow, ca. 0.4 mm. Fl. and fr. Aug–Nov.

Grassland on mountain slopes, forests, along trails; 200–2000 m. Guangdong, Guangxi, Guizhou, Hubei, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia (Java), Laos, Malaysia, Philippines, Sikkim, Thailand, Vietnam].

8. *Torenia cordifolia* Roxburgh, Pl. Coromandel 2: 52. 1798.

西南蝴蝶草 xi nan hu die cao

Annuals, 15–20 cm tall, sparsely white villous. Stems erect, branched from base; branches decussate, ascending, base sparsely diffuse. Petiole 0.8–1.5 cm; leaf blade ovate to cordate, $2.5-3.5 \times 1.5-2.5$ cm, sparsely villous, base cuneate and \pm decurrent, margin coarsely triangular-serrate. Inflorescences 3–5-flowered axillary fascicles; bracts linear, ca. 5 mm. Pedicel 1.5–2 cm, often ascending. Calyx ovate-oblong, ca. 1.3×0.7 cm, base truncate to somewhat rounded, never decurrent, 5-winged; wings subundulate, ca. 2 mm wide, sometimes upper wing ca. 1 mm wide; lips triangular, 5 lobes becoming evident in fruit. Corolla blue-purple, 1.3–2 cm; lower lip lobes subequal; upper lip wider than long, margin somewhat involute, apex entire or emarginate. Anterior stamens appendages toothlike to filiform. Capsule oblong, ca. 9×4 mm. Fl. and fr. Sep–Nov.

Mountain slopes, trailsides, wet places near streams; 600–1700 m. Guizhou, Hubei (Xianfeng Xian), Sichuan, Yunnan [Bhutan, Cambodia, India (Darjeeling), Sikkim, Vietnam].

9. *Torenia asiatica* Linnaeus, Sp. Pl. 2: 619. 1753.

光叶蝴蝶草 guang ye hu die cao

Torenia glabra Osbeck.

Herbs, creeping to suberect, rooting from nodes. Branches numerous, long, slender. Petiole 2–8 mm; leaf blade triangular-ovate, narrowly ovate, or ovate-orbicular, $1.5-3.2 \times 1-2$ cm, glabrous or sparsely villous, base abruptly constricted and subtruncate to broadly cuneate, margin crenate and serrate. Flowers axillary and solitary or in fascicles. Pedicel 0.5–2 cm. Calyx 0.8–1.5 cm, 1.5–2 cm in fruit, 2-lipped, 5-winged; lips narrowly triangular, apex acuminate, further lobed into 5 small lobes; wings more than 1 mm wide, \pm

decurent. Corolla purple-red to blue-red, 1.5–2.5 cm, exceeding calyx by 0.4–1 cm. Anterior stamens appendages linear, 1–2 mm. Capsule 1–1.3 cm. Seeds yellow, ca. 0.4 mm. Fl. and fr. Jun–Sep.

Mountain slopes, trailsides, shady places; below 1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Vietnam].

We agree with Burt (Rheedea 1: 7. 1991) in that the species treated as *Torenia asiatica* in Fl. Reipubl. Popularis Sin. 67(2): 164. 1979 may in fact be a Himalayan species, *T. cordata* (Griffith) Dutta, and the species that was treated as *T. glabra* is in fact *T. asiatica*.

10. *Torenia concolor* Lindley, Bot. Reg. 32: t. 62. 1846.

单色蝴蝶草 dan se hu die cao

Torenia concolor var. *formosana* T. Yamazaki; *T. radicans* Vaniot; *T. rubens* Benth.

Herbs, creeping. Stems quadrangular, rooting from nodes; branches ascending or erect. Petiole 2–10 mm;

leaf blade triangular-ovate, narrowly ovate, or rarely ovate-orbicular, 1–4 × 0.8–2.5 cm, glabrous or sparsely villous, base broadly cuneate to subtruncate, margin serrate or crenate and serrate, apex obtuse to acute.

Flowers axillary or terminal, solitary or in fascicles.

Pedicel 2–3.5 cm, to 5 cm in fruit. Calyx 1.2–1.7 cm, to 2.3 cm in fruit, base decurrent; wings 5, slightly more than 1 mm wide; lips narrowly triangular with 5 small lobes evident in fruit. Corolla blue to blue-purple, 2.5–3.9 cm, exceeding calyx lobes by 1.1–2.1 cm. Anterior stamens appendages filiform, 2–4 mm. Capsule 1.5–1.8 cm. Fl. and fr. May–Nov.

Forests, mountain valleys, trailsides; below 1500(–2500) m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Japan (Ryukyu Islands), Laos, Vietnam].

21. MIMULUS Linnaeus, Sp. Pl. 2: 634. 1753.

沟酸浆属 gou suan jiang shu

Herbs, annual or perennial, erect, diffusely prostrate, or creeping, glabrous or glandular hairy, sometimes viscid. Stems simple or branched, terete or quadrangular and winged. Leaves opposite, margin entire to toothed. Flowers axillary and solitary or in terminal racemes. Bracteoles present or absent. Calyx tubular to campanulate, often inflated in fruit, glabrous to villous, 5-ribbed, with veins sometimes narrowly winged, 5-lobed; lobes short, regular or irregular. Corolla 2-lipped; tube cylindrical, longer than calyx, palate with 2 bulging plaits; lower lip 3-lobed, lobes often spreading flat; upper lip 2-lobed, lobes erect or reflexed. Stamens 4, didynamous, inserted on corolla tube, included. Stigma 2-lamellate. Capsule compressed, loculicidal. Seeds numerous, ovoid to oblong, minute; seed coat smooth or reticulate.

About 150 species: worldwide; five species in China.

1a. Flowers with 2 linear bracteoles 1. *M. bracteosus*

1b. Flowers without bracteoles.

2a. Plants 4–25 cm; stems prostrate or decumbent; upper leaves sessile and amplexicaul; pedicel often longer than leaves 2. *M. bodinieri*

2b. Plants usually taller than 25 cm; stems erect or diffuse; upper leaf bases truncate, cuneate, or subrounded;

pedicel often shorter than leaves.

3a. Leaves orbicular, margin double serrate 3. *M. tibeticus*

3b. Leaves ovate, ovate-triangular, or ovate-oblong, margin not double serrate.

4a. Leaf base cuneate; calyx 1–1.5 cm; seeds reticulate 4. *M. szechuanensis*

4b. Leaf base truncate; calyx ca. 0.5 cm; seeds papillose 5. *M. tenellus*

1. *Mimulus bracteosus* P. C. Tsoong, Acta Phytotax. Sin. 3: 415. 1955.

小苞沟酸浆 xiao bao gou suan jiang

Annuals, to 55 cm tall. Stems 1, smooth, basally ribbed, apically narrowly winged. Leaves 7–9 pairs, sessile, lower leaves spatulate-obovate, ca. 3.5 cm, middle leaves narrowly ovate to spatulate-oblong, 6–10 × 2–3 cm, margin irregularly serrate distally, apex caudate-acute. Flowers solitary from upper leaf axils.

Pedicel ca. 3.5 cm, to 6 cm in fruit, ribbed. Bracteoles 2, inserted near pedicel apex, linear, ca. 8 mm. Calyx tubular, ca. 20 × 7 mm, with somewhat winglike ribs, hirtellous; lobes spinescent, ca. 5 mm. Corolla yellow with red dots, 3.5–4.5 cm; tube subcylindrical, 3–3.5 cm; lower lip slightly longer than upper lip; lobes ovate-

orbicular, margin yellow ciliate. Filaments glabrous. Fl. Jun–Jul.

• Edge of forests, along streams, meadows; 1000–1500 m. W Sichuan.

2. *Mimulus bodinieri* Vaniot, Bull. Acad. Int. Géogr. Bot. 15: 86. 1905.

匍生沟酸浆 pu sheng gou suan jiang

Perennials, glabrous. Stems prostrate to decumbent, 4–25 cm, simple or branched, rooting from nodes; branches short, quadrangular, narrowly winged. Leaves sometimes short petiolate below, sessile and amplexicaul above; leaf blade broadly ovate, 0.8–3 × 0.4–1.5 cm, larger ones at middle of stem, margin sparsely serrulate, apex acute to apiculate, pinnately veined. Flowers few, solitary in upper leaf axils.

Pedicel slender, often longer than leaves. Bracteoles absent. Calyx campanulate, 5–10 mm; lobes broadly triangular, short, margin sparsely ciliate, apex apiculate. Corolla yellow with a purple patch at throat, 1–2 cm; tube slightly longer than calyx. Capsule obovoid to oblong, ca. 8 mm. Seeds subglobose. Fl. Apr–May, fr. May–Jun.

• Beside streams and lakes; 1900–2400 m. Yunnan.

3. *Mimulus tibeticus* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 399. 1979.

西藏沟酸浆 xi zang gou suan jiang

Herbs, to 1 m tall, sparsely villous. Stems erect or basally prostrate, stout, quadrangular, unbranched, rooting from lower nodes. Petiole ca. 3 cm lower on stem, upper leaves sessile; leaf blade orbicular, 3–5 cm, papery, base rounded, margin double serrate, apex rounded to emarginate, veins palmate. Flowers solitary in upper leaf axils. Pedicel 2–3.5 cm, nearly as long as leaf blade. Bracteoles absent. Calyx broadly campanulate, ca. 1 cm, apex truncate; lobes broad, to 1 mm, upper lobe largest, apex apiculate. Corolla golden yellow, ca. 2 cm; lower lip longer than upper, middle lobe larger than others; upper lip erect, lobes suborbicular. Style exerted from corolla. Fl. Sep.

• Shady wet places; below 3700 m. S Xizang (Lhasa Shi).

4. *Mimulus szechuanensis* Pai, Contr. Inst. Bot. Natl. Acad. Peiping 2: 119. 1934.

四川沟酸浆 si chuan gou suan jiang

Mimulus szechuanensis var. *glandulosa* Pai.

Perennials, to 60 cm tall, erect. Rhizomes long, rooting from nodes. Stems quadrangular, glabrous or sometimes villous, narrowly 4-winged, often branched. Petiole ca. 1.5 cm; leaf blade ovate, 2–6 × 1–3 cm, base cuneate, margin sparsely toothed, apex acute. Flowers solitary in upper leaf axils. Pedicel 1–5 cm. Bracteoles absent. Calyx tubular, 1–1.5 cm, ca. 2 cm in fruit, pubescent, narrowly winged, apex oblique; lobes spinelike, upper lobe largest. Corolla yellow; tube ca. 2 cm, slightly longer than calyx; throat with a purple patch; lower lip as long as upper lip. Capsule narrowly ellipsoid, 1–1.5 cm, somewhat compressed, included in persistent calyx. Seeds brown, ovoid; seed coat reticulate. Fl. Jun–Aug.

• Moist places in forests, along streams; 1300–2800 m. Gansu, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

5. *Mimulus tenellus* Bunge, Enum. Pl. China Bor. 49. 1833.

沟酸浆 gou suan jiang

Perennials, to 40 cm tall, glabrous. Stems slender, often diffuse, much branched, basally creeping, quadrangular, narrowly 4-winged or not. Petiole 1–3 cm, slender; leaf blade ovate, ovate-triangular, or ovate-oblong, 1–3 × 0.4–1.5 cm, base truncate, margin sparsely serrate, apex acute; veins pinnate or palmate. Flowers axillary, solitary. Pedicel nearly as long as petiole or whole leaf. Bracteoles absent. Calyx cylindrical to broadly campanulate, 5–10 mm or longer, saccate in fruit, sometimes narrowly winged, apex truncate or

suboblique; lobes small, spinelike. Corolla yellow, throat with red spots; tube funnellform, 1.5–3 × as long as calyx, densely barbate. Stamens and style glabrous, included. Capsule ellipsoid, slightly shorter than calyx. Seeds ovoid, papillose. Fl. and fr. Jun–Sep.

Beside water, wet places, forests, trailsides; 500–3000 m. Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India (Assam), Japan, Nepal, Sikkim, Vietnam].

1a. Calyx cylindrical, apex truncate.

2a. Stems often diffuse; pedicel shorter than leaves; calyx ca. 5 mm ... 5a. var. *tenellus*

2b. Stems suberect; pedicel as long as whole leaf; calyx ca. 10 mm or longer 5b. var. *nepalensis*

1b. Calyx broadly campanulate, apex suboblique.

3a. Stems not winged; leaves pinnately veined 5c. var. *procerus*

3b. Stems winged; leaves palmately veined 5d. var. *platyphyllus*

5a. *Mimulus tenellus* var. *tenellus*

沟酸浆(原变种) gou suan jiang (yuan bian zhong)

Stems often diffuse. Pedicel nearly as long as petioles.

Calyx cylindrical, ca. 5 mm, apex truncate.

Beside water; below 1200 m. Hebei, Henan, Jilin, Liaoning, Shaanxi, Shandong, Shanxi.

5b. *Mimulus tenellus* var. *nepalensis* (Benth) P. C. Tsoong ex H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 171. 1979.

尼泊尔沟酸浆 ni bo er gou suan jiang

Mimulus assamicus Griffith; *M. formosanus* Hayata; *M. nepalensis* Benth, Scroph. Ind. 29. 1835; *M. tenellus* subsp. *nepalensis* (Benth) D. Y. Hong ex H. P. Yang.

Stems suberect. Pedicel nearly as long as whole leaf.

Calyx cylindrical, ca. 1 cm or longer, apex truncate.

Beside water, wet places; 500–3000 m. Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, (Assam), Japan, Nepal, Vietnam].

5c. *Mimulus tenellus* var. *procerus* (Grant) Handel-Mazzetti, Symb. Sin. 7: 832. 1936.

高大沟酸浆 gao da gou suan jiang

Mimulus nepalensis Benth var. *procerus* Grant, Ann. Missouri Bot. Gard. 11: 207. 1924; *M. tenellus* subsp. *nepalensis* var. *procerus* (Grant) D. Y. Hong.

Stems simple, erect, 20–35 cm tall, wingless. Leaves pinnately veined. Calyx broadly campanulate, apex suboblique, sometimes upper lobes larger than lower. Corolla to 3 cm.

Forests, along streams; 200–3800 m. Sichuan, Yunnan [Nepal, Sikkim].

5d. *Mimulus tenellus* var. *platyphyllus* (Franchet) P. C. Tsoong ex H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 171. 1979.

南红藤 nan hong teng

Mimulus nepalensis Benth. var. *platyphyllus* Franchet, *Nouv. Arch. Mus. Hist. Nat.* 10: 103. 1888; *M. nepalensis* f. *maior* H. Winkler; *M. tenellus* var. *maior* (H. Winkler) Handel-Mazzetti.
Stems winged. Leaves large, thick, palmately veined, base broadly cuneate, margin entire or coarsely serrate

above middle. Calyx broadly campanulate, apex suboblique.

• Forests, trailsides; 1900–2200 m. Sichuan, Yunnan. Used medicinally.

22. CYRTANDROMOEIA Zollinger, *Syst. Verz.* 55, 58. 1855.

囊萼花属 nang e hua shu

Perennials. Stems erect, quadrangular, basally woody. Leaves opposite, petiolate, simple. Inflorescences axillary or from basal woody part of stem, cymose, few to many flowered or flower solitary from axil of upper leaves; bracts small, membranous. Calyx tubular, becoming urceolate in fruit, apex truncate and shallowly 5-lobed. Corolla funnellform; limb sublunate; lower lip 3-lobed; upper lip 2-lobed; lobes orbicular. Stamens 4, didynamous, inserted basally on corolla tube; anther locules divergent, apices confluent. Ovary conical or cylindrical. Style filiform; stigma 2-lamellate. Capsule loculicidal, enclosed in calyx. Seeds numerous, ellipsoid, reticulate.
About 10 species: S and SE Asia; one species in China.

1. *Cyrtandromoeia grandiflora* C. B. Clarke in A. de Candolle & C. de Candolle, *Monogr. Phan.* 5: 186. 1883.

囊萼花 nang e hua

Herbs, 1–2 m tall. Stems densely pubescent. Petiole 1–4 cm, puberulent; leaf blade narrowly oblong to oblong-lanceolate, 8–22 × 3–5.5 cm, abaxially densely pubescent along veins, adaxially sparsely pilose, base acuminate, margin serrate, apex acuminate. Inflorescences 4–7 cm, cymose, 2–6-flowered; peduncle puberulent. Pedicel puberulent. Calyx 0.8–2.5 × 0.4–1

cm, to 3 cm in fruit. Corolla white or pale violet, 3–5.5 cm, outside sparsely glandular pilose. Capsule ellipsoid, ca. 13 × 5 mm. Fl. and fr. Aug–Sep.

Forests; below 1100 m. ?NW and S Yunnan [Indonesia (Sumatra), Myanmar, Thailand].

Cyrtandromoeia pterocaulis D. D. Tao, X. D. Li & X. Yang has been described from NW Yunnan (*Acta Bot. Yunnan.* 17: 156. 1995) but may be conspecific with *C. cymulosa* C. B. Clarke of Myanmar.

23. MAZUS Loureiro, *Fl. Cochinch.* 2: 385. 1790.

通泉草属 tong quan cao shu

Hornemannia Willdenow.

Herbs, relatively small. Stems terete or rarely quadrangular (*Mazus lanceifolius*), erect or procumbent and rooting from lower nodes. Leaves in a rosette or opposite, often upper leaves alternate; petiole winged. Racemes ± secund; bracts small. Bacteoles present or absent. Flowers small. Calyx funnellform or campanulate, 5-lobed. Corolla 2-lipped, palate with 2 longitudinal plaits; lower lip 3-lobed; upper lip 2-lobed. Stamens 4, didynamous, inserted on corolla tube; anther locules divergent, apically connivent. Ovary hairy or glabrous. Style glabrous; stigma 2-lamellate. Capsule ± compressed, included in cupular persistent calyx, loculicidal. Seeds small, numerous.

About 35 species: China, India, Indonesia, Japan, Korea, Malaysia, Mongolia, Philippines, Russia, Vietnam; Australia, New Zealand; 25 species in China.

1a. Stems quadrangular 25. *M. lanceifolius*

1b. Stems terete or somewhat ribbed, never quadrangular.

2a. Ovary hairy; stems basally woody with age; calyx veins conspicuous.

3a. Plants relatively stout, erect, never rooting from nodes; flowers ca. 1.5 cm or more; calyx funnellform, 0.8–1.6 cm in fruit, over 1 cm in diam.

4a. Stem leaves sessile; corolla 1.5–2 cm; capsule ovoid 1. *M. stachydifolius*

4b. Stem leaves petiolate; corolla ca. 2.6 cm; capsule globose 2. *M. caducifer*

3b. Plants slender, procumbent, rooting from nodes; flowers less than 1.5 cm; calyx campanulate, 0.3–0.8

cm in fruit, less than 1 cm in diam.

5a. Basal leaves caudate; calyx lobes triangular-lanceolate; corolla upper lip lobes apically acute, margin entire 3. *M. spicatus*

5b. Basal leaves not caudate; calyx lobes ovate; corolla upper lip lobes apically subtruncate, margin with few small irregular teeth near apex 4. *M. xiuningensis*

- 2b. Ovary glabrous; stems herbaceous (woody in *M. celsioides*); calyx veins inconspicuous.
- 6a. Plants stoloniferous.
- 7a. Plants glabrous or soon glabrescent.
- 8a. Stems less than 10 cm tall.
- 9a. Basal leaves thin papery; bracts ca. 1 mm 7. *M. rockii*
- 9b. Basal leaves ± fleshy; bracts 5–12 mm 15. *M. longipes*
- 8b. Stems more than 10 cm tall.
- 10a. Stems erect to obliquely ascending, 10–15 cm tall; middle lobe of corolla lower lip obovate, smaller than lateral lobes 21. *M. miquelii*
- 10b. Stems creeping, to 30 cm; middle lobe of corolla lower lip narrowly ovate, longer than lateral lobes 23. *M. gracilis*
- 7b. Plants pubescent, sometimes only when young.
- 11a. Stem leaves often alternate.
- 12a. Stems erect to obliquely ascending, 10–15 cm tall 21. *M. miquelii*
- 12b. Stems procumbent, 30–45 cm 24. *M. procumbens*
- 11b. Stem leaves often opposite or plants scapose.
- 13a. Stems less than 8 cm tall 16. *M. surculosus*
- 13b. Stems to 30 cm tall.
- 14a. Basal leaf blade suborbicular to broadly ovate; pedicel 1.5–2.5 cm; calyx lobes less than 1/3 of calyx length 20. *M. henryi*
- 14b. Basal leaf blade spatulate; pedicel 0.5–0.6 cm; calyx lobes ca. 1/2 of calyx length 22. *M. alpinus*
- 6b. Plants not stoloniferous.
- 15a. Stem leaves 2–4 pairs or numerous.
- 16a. Calyx lobes ca. 1/3 of calyx length.
- 17a. Stems basally woody; leaf margin irregularly serrate, pandurately lobed below middle; stems and leaves abaxially green 12. *M. celsioides*
- 17b. Stems herbaceous; leaves margin irregularly sinuate-toothed; stems and leaves abaxially purple 13. *M. solanifolius*
- 16b. Calyx lobes ca. 1/2 of calyx length.
- 18a. Perennials, white villous.
- 19a. Stem leaves crowded; corolla purple-red, lower middle lobe longer than other lobes 14. *M. kweichowensis*
- 19b. Stem leaves 2–4 pairs; corolla blue-purple, lower middle lobe shorter than other lobes 18. *M. saltuarius*
- 18b. Annuals, glabrous or sparsely pubescent.
- 20a. Pedicel 0.3–1.2 cm; corolla lower lip lobes obovate; upper lobes ovate-triangular 17. *M. pumilus*
- 20b. Pedicel ca. 1.5 cm; corolla lower lip lobes broadly ovate; upper lobes oblong-ovate 19. *M. fukienensis*
- 15b. Stem leaves absent or 1 or 2.
- 21a. Corolla 2–3 cm, lobes usually erose or fimbriate apically; leaves usually to 20 cm.
- 22a. Plants glabrous or sparsely villous; leaves thick papery to subleathery; pedicel 1–15 cm 5. *M. omeiensis*
- 22b. Plants densely white or rusty pubescent; leaves papery; pedicel to 4 cm ... 6. *M. pulchellus*
- 21b. Corolla less than 2 cm, lobes not fimbriate; leaves less than 12 cm.
- 23a. Plants mostly over 10 cm; flowers usually over 10.
- 24a. Pedicel ca. 5 cm; leaves oblanceolate, margin sharply toothed; flowering stems erect 10. *M. lecomtei*

- 24b. Pedicel 1–3 cm; leaves obovate-spatulate, margin obtusely toothed or pinnately lobed; flowering stems not erect 11. *M. fauriei*
- 23b. Plants less than 10 cm; flowers less than 10.
- 25a. Leaf margin entire; flowers 1–3; pedicel to 3 cm 9. *M. oliganthus*
- 25b. Leaf margin dentate or shallowly lobed; flowers 4–10; pedicel less than 2 cm.
- 26a. Plants glabrous or subglabrous; calyx lobes subulate-triangular; corolla yellow or dark purple 7. *M. rockii*
- 26b. Plants sparsely white villous; calyx lobes oblong-lanceolate; corolla white or white with purple spots 8. *M. humilis*

1. *Mazus stachydifolius* (Turczaninow) Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 20: 438. 1875.
弹刀子菜 dan dao zi cai

Tittmannia stachydifolia Turczaninow, Bull. Soc. Imp. Naturalistes Moscow 7: 156. 1837; *Mazus simadus* Masamune; *M. villosus* Hemsley; *Vandellia stachydifolia* Walpers.

Perennials, 10–50 cm tall, white villous. Rhizomes short. Stems erect, rarely ascending, terete, basally woody with age. Basal leaves short petiolate; leaf blade spatulate. Stem leaves opposite or upper ones alternate, sessile, elliptic to obovate-lanceolate, 2–7 cm, papery, margin irregularly serrate. Racemes terminal, lax, 2–20 cm; bracts triangular-ovate, ca. 1 mm. Pedicel shorter than or ± as long as calyx. Calyx funnelform, 5–10 mm, to 1.6 cm in fruit, over 1 cm in diam.; lobes slightly longer than tube, lanceolate-triangular, apex narrowly acute, conspicuously 10-veined. Corolla blue-purple, 1.5–2 cm; tube almost as long as lips; lower lip yellow-punctate, large, spreading flat, papillate glandular hairy, middle lobe smaller than other lobes and suborbicular; upper lip short, lobes narrowly triangular, apex acute. Ovary apically long hirsute. Capsule ovoid, 2–3.5 mm, flattened. Fl. Apr–Jun, fr. Jul–Sep.

Trailsides, grassland, wet places at edge of forests; below 1500 m. Anhui, Guangdong, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Zhejiang [Korea, Mongolia, Russia].

2. *Mazus caducifer* Hance, J. Bot. 20: 292. 1882.

早落通泉草 zao luo tong quan cao
Perennials, 20–50 cm tall, stout, white villous. Roots fibrous, to 20 cm, primary root considerably shorter. Stems erect or ascending, terete, woody near base, sometimes branched. Basal leaves mostly in a rosette, often deciduous; leaf blade obovate-spatulate. Stem leaves opposite, petiolate; leaf blade ovate-spatulate, 3.5–10 cm, papery, base tapering, margin coarsely irregularly serrate, sometimes shallowly lobed. Racemes terminal, lax, to 35 cm; bracts ovate-triangular, apex acute. Pedicel 0.8–1.5 cm. Calyx funnelform, ca. 1.3 cm in fruit, over 1 cm in diam.; lobes almost as long

as tube, ovate-lanceolate, apex acute, veins 10. Corolla light blue-purple, ca. 2 × as long as calyx; lower lip middle lobe exserted and smaller than lateral lobes; upper lip lobes apically acute. Ovary hairy. Capsule globose. Seeds brown. Fl. Apr–May, fr. Jun–Aug.

• Trailsides, wet places in forests, grassland; ca. 1300 m. Anhui, Jiangxi, Zhejiang.

3. *Mazus spicatus* Vaniot, Bull. Acad. Int. Géogr. Bot. 15: 85. 1905.

毛果通泉草 mao guo tong quan cao

Mazus angusticalyx P. C. Tsoong; *M. bodinieri* Bonati.

Perennials, 10–30 cm tall, white to pale rusty villous. Primary root 2–4 cm. Stems terete, slender, rigid, usually woody and much branched at base, erect or procumbent and ascending, rooting from nodes. Basal leaves few, caudate. Stem leaves opposite or upper ones alternate; petiole to 1 cm on lower leaves, decreasing in length to lacking upward; leaf blade obovate to obovate-spatulate, 1–4 cm, base tapering, margin incised-serrate. Racemes terminal, lax, to 20 cm; bracts subulate. Pedicel slender, almost as long as calyx.

Calyx campanulate, 5–8 mm in fruit, less than 1 cm in diam., veins 10; lobes triangular-lanceolate, as long as tube, margin and veins ciliate, apex acute. Corolla white or light purple, 0.8–1.2 cm; lateral lobes of lower lip rounded and entire, middle lobe narrower and longer and with an emarginate apex; upper lip lobes narrowly acute. Ovary long hirsute. Capsule light yellow, ovoid, small, long hirsute. Fl. May–Jun, fr. Jul–Aug.

• Mountain slopes, trailsides, grassland; 700–2300 m. Guangxi, Guizhou, Hubei, Hunan, S Shaanxi, Sichuan.

4. *Mazus xiuningensis* X. H. Guo & X. L. Liu, Act. Phytotax. Sin. 28: 163. 1990.

休宁通泉草 xiu ning tong quan cao

Perennials. Primary root slender and long. Stems diffuse, pubescent, rooting from nodes. Petiole 1.5–6.5 cm, densely pubescent. Basal leaves rosulate, rotund, ovate-orbicular, or elliptic, 1–6 × 0.8–4 cm, pubescent, base abruptly cuneate and decurrent, margin repand and crenate. Stem leaves opposite or alternate, similar to basal leaves. Peduncle slender, densely pubescent. Calyx broadly campanulate, 3–5 mm, deeply 5-lobed, outside densely villous; lobes ovate, 2–2.5 mm, veins

conspicuous. Corolla white or light red; tube 6–8 mm; lower lip middle lobe 7–9 mm, lateral lobes 5.5–7.5 mm; upper lip erect, 4–6 mm, lobes apically subtruncate and with few irregular small teeth. Ovary rotund, with dense clavate glandular hairs. Stigma unequally 2-lobed. Capsule ovoid. Fl. Jun–Jul, fr. Aug–Sep.

• About 400 m. SE Anhui.

5. *Mazus omeiensis* H. L. Li, *Taiwania* 1: 161. 1950.

岩白菜 *yan bai cai*

Mazus crassifolius P. C. Tsoong; *M. neriifolius* H. L. Li.

Perennials, 10–30 cm tall, stout, glabrous or sparsely villous. Rhizomes short or to 15 cm. Leaves all basal, rosulate; leaf blade obovate-spatulate to spatulate, 3–20 cm, thick papery to subleathery, abaxially glaucous, adaxially green and bright, base tapering, margin sparsely and coarsely toothed, apex rounded to obtuse. Scapes 1(–4), herbaceous, erect or ascending, striate. Racemes lax flowered; bracts narrowly lanceolate, to 6 mm. Pedicel 1–1.5 cm, glandular hairy. Calyx campanulate, ca. 7 mm; lobes ca. 1/2 as long as tube, ovate-triangular, veins inconspicuous. Corolla light blue-purple, 2–3 cm; tube enlarged near throat; lower lip margin erose-toothed, apex truncate and emarginate; upper lip erect, shorter than lower lip, lobes ca. 4 mm wide, apex rounded. Ovary glabrous. Capsule ovoid, ca. 5 mm. Fl. Apr–Jul, fr. Jul–Sep.

• Moist crevices; 500–2000 m. NW Guizhou, SW Sichuan.

The whole plant is used medicinally.

6. *Mazus pulchellus* Hemsley in F. B. Forbes & Hemsley, *J. Linn. Soc., Bot.* 26: 182. 1890.

美丽通泉草 *mei li tong quan cao*

Mazus pulchellus var. *primuliformis* Bonati.

Perennials, ca. 20 cm tall, densely white or rusty pubescent, glabrescent. Roots fibrous, tufted. Rhizomes short. Leaves all basal, rosulate; leaf blade obovate-spatulate to oblong-spatulate, to 20 cm, papery, base tapering, margin incised-serrate, double serrate, or irregularly pinnately parted, apex rounded. Scapes 1–5, herbaceous, erect or ascending, simple or sparsely branched. Racemes lax, numerous flowered; bracts narrowly lanceolate, 2–5 mm. Pedicel slender, to 4 cm. Calyx campanulate, 5–7 mm; lobes much shorter than tube, narrowly ovate, apex acute, veins inconspicuous. Corolla red, purple, or dark violet, 2–2.5 cm; lower lip lobes sparsely fimbriate-toothed, middle lobe narrower and longer than lateral lobes; upper lip erect, short, lobes subrounded, margin fimbriate-toothed, apex truncate. Ovary glabrous. Capsule ovoid. Fl. and fr. Mar–Jun.

• Moist places in rocky crevices, forests; ca. 1600 m. W Hubei, SE Sichuan, SE Yunnan.

7. *Mazus rockii* H. L. Li, *Brittonia* 8: 35. 1954.

丽江通泉草 *li jiang tong quan cao*

Perennials, 4–8 cm tall, glabrous or subglabrous. Roots fibrous, numerous, tufted. Rhizomes short. Stolons

short, with many minute leaves. Leaves mostly basal, rosulate, sessile, obovate-lanceolate to spatulate, 0.8–2 cm, thin papery, base tapering, margin basally subentire and apically sparsely sharp serrate, apex acute to obtuse. Flowering shoots 3–5, ascending, few branched, leafless or with few small leaves. Racemes terminal, less than 10-flowered; bracts ca. 1 mm, caudate. Pedicel less than 2 cm. Calyx funnelform ca. 5 mm, slightly enlarged in fruit; lobes subulate-triangular, as long as tube, apex narrowly acute, veins inconspicuous. Corolla yellow to dark purple, 8–11 mm; lower lip ca. 2 × as long as upper lip, middle lobe slightly longer, nearly 1/2 as wide as lateral lobes; upper lip small, lobes narrowly triangular-ovate. Ovary ovoid, glabrous. Fl. May–Oct.

• Mountain slopes; 2500–3400 m. NW Yunnan.

8. *Mazus humilis* Handel-Mazzetti, *Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 63: 11. 1926.

低矮通泉草 *di ai tong quan cao*

Perennials, less than 10 cm tall, white villous. Roots fibrous, numerous, tufted. Rhizomes short. Basal leaves numerous, rosulate; petiole inconspicuous to almost as long as leaf blade; leaf blade obovate-spatulate to oblong-obovate, 1–3.5 cm, papery, base tapering, margin irregularly and coarsely toothed or lobed, apex obtuse. Scapes 1–8, erect, 2–6 cm. Flowers solitary or in racemes to 7-flowered. Pedicel at lower part of scape 1–2 cm in fruit, glandular hairy. Calyx funnelform, 5–7 mm, glandular hairy; lobes oblong-lanceolate, as long as tube, apex obtuse, veins inconspicuous. Corolla white or white with purple spots, ca. 1 cm; tube almost as long as lips; lower lip lobes subrounded, middle lobe slightly longer and narrower than lateral lobes; upper lip erect, lobes subovate. Ovary glabrous. Capsule globose. Fl. and fr. Jun.

• Wet grassland; 2500–3500 m. Guangxi, SW Sichuan, NW Yunnan.

9. *Mazus oliganthus* H. L. Li, *Brittonia* 8: 34. 1954.

稀花通泉草 *xi hua tong quan cao*

Perennials, 3–5 cm tall, glabrous or sparsely pubescent, without stolons. Rhizomes thick. Roots fibrous, 0.5–1 mm thick. Leaves basal; petiole 1–1.3 cm, glabrous or ciliate; leaf blade oblong to oblong-ovate, 1–1.2 cm × 5–7 mm or longer, base attenuate, margin entire, apex rounded. Racemes terminal, 1–3-flowered; bracts oblong, ca. 5 mm; peduncle absent or to 5 mm. Pedicel slender, to 3 cm. Calyx ca. 5 mm, glabrous or sparsely pubescent, parted to middle; lobes triangular-ovate, apex acute, veins inconspicuous. Corolla pink, 1–2 cm, outside glabrous, inside hairy at throat; lower lip ca. 6 × 6 mm; upper lip 2–3 mm. Style included. Ovary glabrous. Fl. Mar–May.

• Moist places; 2500–3000 m. NE Yunnan (Tongchuan Xian).

10. *Mazus lecomtei* Bonati, *Bull. Herb. Boissier* 2: 538. 1908.

莲座通泉草 *lian zuo tong quan cao*

Mazus lecomtei var. *ramosus* Bonati.

Perennials, to 15 cm tall, white villous. Primary root turbinate, often fleshy and inflated, to 6 cm; lateral roots few. Leaves mostly basal, numerous, rosulate; petiole broadly winged; leaf blade oblanceolate, to 4 cm or longer, base tapering, margin irregularly incised toothed, apex obtuse. Flowering shoots erect, rarely ascending, unbranched or basally branched, leafless or with 1 or 2 small opposite or alternate leaves. Racemes 10–20-flowered, lax; bracts needlelike, short. Lower pedicel longer than calyx, ca. 5 cm. Calyx campanulate, ca. 5 mm; lobes lanceolate, as long as tube, apex acute, veins inconspicuous. Corolla purplish violet, ca. 1 cm; lower lip middle lobe longer than lateral lobes, all lobes entire; upper lip short, triangular. Ovary glabrous. Capsule globose. Seeds brown-yellow. Fl. and fr. Mar–May.

• Wet grassland, trailsides, beside water; 1000–2600 m. SW Sichuan, NW Yunnan.

11. *Mazus fauriei* Bonati, Bull. Herb. Boissier 2: 537. 1908.

台湾通泉草 tai wan tong quan cao

Mazus japonicus (Thunberg) Kuntze var. *tenuiracemus* Hayata ex Makino & Nemoto; *M. taihokuensis* Masamune.

Perennials, to 8–20 cm tall, white villous. Primary root short, fibrous roots numerous, tufted. Flowering stems not erect. Leaves all basal, rosulate; petiole broadly winged; leaf blade obovate-spatulate, 2–6 cm, papery, base tapering, margin coarsely serrate to double serrate or basally pinnately parted, apex obtuse. Flowering stems often branched, terete to somewhat ribbed, slender, ascending, leafless or with 1 or 2 small leaves. Racemes 3–15-flowered, lax; bracts ovate-triangular, 1.5–3 mm. Pedicel slender 1–2 cm. Calyx campanulate, 5–7 mm, enlarged to 1 cm in fruit; lobes as long as tube, lanceolate-triangular, apex acute, veins inconspicuous. Corolla light purple, 1.2–2 cm; lower lip ovate, middle lobe narrower and longer than lateral lobes; upper lip erect, lobes narrowly triangular. Ovary glabrous. Capsule globose, slightly longer than calyx tube. Seeds brown-yellow; seed coat finely reticulate. Fl. and fr. Apr–May.

Coastal cliffs; near sea level. N Taiwan [Japan].

12. *Mazus celsioides* Handel-Mazzetti, Symb. Sin. 7: 833. 1936.

琴叶通泉草 qin ye tong quan cao

Annuals, to 40 cm tall, stout, without stolons, white villous. Primary root short, fibrous roots numerous. Stems 1–3-branched, erect, rigid, basally woody, usually branched from base; branches long and further branched. Leaves decreasing in size upward. Basal leaves numerous, rosulate, to 10 cm, early deciduous. Stem leaves numerous; petiole broadly winged; leaf blade oblong-obovate, to 8 cm below, base tapering, margin irregularly serrate and below middle pandurate lobed, apex rounded. Racemes terminal, rigid,

elongated to 20 cm, many flowered, often lax in fruit; bracts narrowly lanceolate. Pedicel erect, upper ones shorter than calyx. Calyx funnelliform, to 6 mm, enlarged in fruit; lobes to 2 mm, broadly ovate-triangular, apex acute, veins inconspicuous. Corolla pink to violet, ca. 2 × as long as calyx; lower lip lobes rounded, middle one narrow and small; upper lip short, apex subobtusate. Ovary glabrous. Capsule ovoid. Seeds yellow-green, slightly channeled. Fl. and fr. Jun–Jul.

• Mixed forests, mountain slopes, along streams; ca. 2000 m. SE Xizang, NW Yunnan.

13. *Mazus solanifolius* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 399. 1979.

茄叶通泉草 qie ye tong quan cao

Perennials, 10–15 cm tall, sparsely rusty-red villous with long multicellular hairs. Roots many, fibrous. Rhizomes slender, to 9 cm. Stems 1–2, erect, herbaceous, purple, longitudinally striate. Basal leaves caudate. Stem leaves 4–6, mostly crowded apically on stem, lower stems leafless or with 1 or 2 smaller leaves; petiole 1.5–4 cm, stout; leaf blade elliptic-ovate to oblong-ovate, 4–8 cm, papery, abaxially purple, base broadly cuneate, margin irregularly sinuate-toothed, apex acute. Racemes terminal, ascending, to 8–11 cm, slender, 1–5-flowered; bracts linear-lanceolate, apex acute. Pedicel shorter than calyx. Calyx campanulate, 5–8 mm; lobes ca. 1/3 as long as calyx, veins inconspicuous. Corolla purple ca. 2 cm; lower lip lobes subequal, apex obtuse and praemorse; upper lip lobes triangular. Ovary glabrous. Capsule ovoid. Fl. and fr. May–Jun.

• Moist sparse forests, montane forests. SW Sichuan (Leibo Xian).

14. *Mazus kweichowensis* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 399. 1979.

贵州通泉草 gui zhou tong quan cao

Perennials, 15–30 cm tall, white villous and glandular hairy. Primary root short, fibrous roots numerous, tufted. Stems mostly 2–4-branched from base, erect, herbaceous, longitudinally striate. Basal leaves rosulate, often deciduous. Stem leaves opposite, crowded; leaf blade obovate-spatulate, larger and to 7 cm at middle of stem, papery, base tapering, margin of leaves above middle of stem irregularly serrate or sinuate-toothed, lower leaves pinnatisect, apex rounded; pinnae 2–4 pairs, ovate to oblong, margin sparsely toothed. Racemes terminal; bracts lanceolate. Pedicel shorter than calyx. Calyx campanulate, 6–7 mm, enlarged in fruit; lobes as long as tube, ovate-triangular, apex acute, veins inconspicuous. Corolla purple-red, ca. 1 cm; lateral lobes of lower lip subrounded, middle lobe broadly ovate, narrower, and longer than other lobes; upper lip ovate-triangular. Ovary glabrous. Capsule ovoid. Fl. and fr. May–Jun.

• Beside water; ca. 900 m. SE Guizhou.

15. *Mazus longipes* Bonati, Bull. Herb. Boissier 2: 532. 1908.

长蔓通泉草 chang wan tong quan cao

Perennials, less than 10 cm tall, glabrous. Primary root short; fibrous roots numerous, tufted. Stolons internodes to 5 cm. Basal leaves rosulate; petiole 1–4 cm, narrowly winged; leaf blade obovate, 1–4 cm, ± fleshy, base obtuse and tapering, margin entire or sinuate-toothed. Leaves on stolons opposite; petiole as long as or longer than leaf blade; leaf blade suborbicular, slightly smaller than basal leaves. Flowering stems short, erect. Racemes 3–6-flowered; bracts lanceolate, 5–12 mm. Pedicel 1–4 cm. Calyx campanulate, 4–10 mm; lobes ovate-lanceolate, ca. 2/5 of calyx length, apex acute. Corolla white or light purple, 1.2–1.8 cm; lower lip lobes suborbicular, middle lobe slightly longer and narrower than lateral lobes; upper lip lobes linear-triangular or semi-orbicular, and apex obtuse. Ovary glabrous. Capsule ovoid. Fl. Mar–May.

• Dry fields, trailsides, grassland; ca. 2100 m. Guizhou, Yunnan.

16. Mazus surculosus D. Don, Prodr. Fl. Nepal. 87. 1825. 西藏通泉草 xi zang tong quan cao Perennials, to 8 cm tall, sparsely white villous. Stems short; stolons slender, internodes more than 4 cm. Basal leaves rosulate; leaf blade obovate to spatulate, 2–7 cm including petiole, papery, base often pinnately pandurate parted, margin irregularly crenate, apex rounded. Leaves on stolons opposite, short petiolate; leaf blade rotund to obovate, much smaller than basal leaves. Scape longer than leaves, erect; racemes with flowers almost from base, lax. Basal pedicels to 2 cm. Calyx tube campanulate, 4–8 mm; lobes ca. 1/3 as long as calyx, broadly ovate, apex obtuse to subacute. Corolla pink to light purple, ca. 2 × as long as calyx; lower lip middle lobe ovate and longer than lateral lobes; upper lip erect, short, lobes suborbicular. Capsule ovoid, ca. 4 mm. Seeds surface smooth. Fl. and fr. Jun–Jul.

Grassland at forest edges; 2000–3300 m. Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

17. Mazus pumilus (N. L. Burman) Steenis, Nova Guinea n.s. 9(1): 31. 1958.

通泉草 tong quan cao

Annuals, 3–30 cm tall, glabrous or sparsely pubescent. Primary root perpendicular, elongated or shortened; fibrous roots numerous, scattered or tufted. Stems 1 or more, erect, ascending, or procumbent-ascending, rooting from prostrate nodes. Basal leaves early deciduous or few to numerous and sometimes rosulate; leaf blade obovate-spatulate to ovate-oblancheolate, 2–6 cm, membranous to papery, base cuneate and decurrent, margin coarsely and irregularly toothed or pinnately parted with 1 or 2 lobules, rarely subentire, apex entire or obscurely and sparsely toothed. Stem leaves opposite or few alternate. Racemes terminal, elongated to apically fascicled, usually 3–20-flowered, lax. Pedicel 3–12 mm. Calyx campanulate, 3–8 mm, enlarged in fruit or not; lobes ovate, almost as long as tube, apex

acute. Corolla white, purple, or blue, ca. 1 cm; lower lip middle lobe smaller than lateral lobes, slightly exerted, obovate; upper lip lobes ovate-triangular. Ovary glabrous. Capsule globose. Fl. and fr. Apr–Oct.

Wet grassland, along streams, trailsides, waste fields, wet places and edge of forests, grassland on mountain slopes; 1200–3800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, NW India, Indonesia, Japan (Ryukyu Islands), Kashmir, Korea, Nepal, New Guinea, Philippines, Russia, Sikkim, Thailand, Vietnam].

1a. Calyx enlarged in fruit to 2 cm in diam.; petiole of basal leaves often equal to or longer than blade

..... 17d. var. *macrocalyx*

1b. Calyx not conspicuously enlarged in fruit; petiole of basal leaves shorter than blade.

2a. Plants to 10 cm; leaf margin subentire

..... 17b. var. *wangii*

2b. Plants more than 10 cm; leaf margin dentate or lobed.

3a. Stems numerous, much branched; pedicel less than 5(–7) mm

..... 17c. var. *delavayi*

3b. Stems few, few branched; pedicel

5–12 mm 17a. var. *pumilus*

17a. Mazus pumilus var. **pumilus**

通泉草(原变种) tong quan cao (yuan bian zhong)

Lobelia pumila N. L. Burman, Fl. Indica 186. 1768;

Hornemannia bicolor Willdenow; *Lindernia japonica*

Thunberg; *Mazus japonicus* (Thunberg) Kuntze; *M.*

rugosus Loureiro; *M. vandellioides* Hance ex Hemsley;

Tittmannia obovata Bunge; *Vandellia obovata* Walpers.

Plants more than 10 cm. Stems few, few branched.

Petiole of basal leaves shorter than blade; leaf margin dentate or lobed. Racemes 5–20-flowered. Pedicel 5–12 mm. Calyx not enlarged in fruit. Fl. and fr. Apr–Oct.

Wet grassland, along streams, trailsides, waste fields, edge of forests; below 2500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, Indonesia, Japan (Ryukyu Islands), Kashmir, Korea, New Guinea, Philippines, Russia, Sikkim, Thailand, Vietnam].

17b. Mazus pumilus var. **wangii** (H. L. Li) T. L. Chin ex D. Y. Hong, Novon 6: 374. 1996.

通泉草匍茎变种 tong quan cao pu jing bian zhong

Mazus wangii H. L. Li, Brittonia 8: 37. 1954; *Mazus japonicus* (Thunberg) Kuntze var. *wangii* (H. L. Li) P.

C. Tsoong.

Plants less than 10 cm. Stems with creeping ascending branches. Petiole of basal leaves shorter than blade; leaf margin subentire. Racemes 3–7-flowered. Calyx not enlarged in fruit.

• Moist places in forest; 1500–2500 m. S Yunnan.

17c. *Mazus pumilus* var. *delavayi* (Bonati) T. L. Chin ex D. Y. Hong, *Novon* 6: 374. 1996.

通泉草多枝变种 tong quan cao duo zhi bian zhong

Mazus delavayi Bonati, *Bull. Herb. Boissier* 2: 530. 1908; *Mazus japonicus* (Thunberg) Kuntze var. *delavayi* (Bonati) P. C. Tsoong.

Plants more than 10 cm. Stems numerous, much branched. Petiole of basal leaves shorter than blade. Racemes elongated, 10–20-flowered. Pedicel short, less than 5(–7) mm. Calyx not enlarged in fruit.

Trailsides, wet grassland; 1200–3800 m. Guangxi, W Sichuan, Yunnan [Bhutan, NW India, Kashmir, Nepal, Sikkim].

17d. *Mazus pumilus* var. *macrocalyx* (Bonati) T. Yamazaki, *J. Jap. Bot.* 55: 11. 1980.

通泉草大萼变种 tong quan cao da e bian zhong

Mazus macrocalyx Bonati, *Bull. Herb. Boissier* 2: 529. 1908; *M. japonicus* (Thunberg) Kuntze var. *macrocalyx* (Bonati) P. C. Tsoong.

Stems unbranched. Petiole of basal leaf often as long as leaf blade or longer. Calyx ca. 2 × enlarged in fruit, to 2 cm in diam.

Along streams, trailsides, grassland on mountain slopes; 1200–2800 m. Guangdong, Guangxi, Sichuan, Taiwan, Yunnan [Thailand].

18. *Mazus saltuaris* Handel-Mazzetti, *Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 63: 10. 1926.

林地通泉草 lin di tong quan cao

Perennials, 6–20 cm tall, white villous. Primary root short; fibrous roots numerous, slender. Stems 1–5, unbranched, creeping for a short distance then ascending. Basal leaves numerous, rosulate; leaf blade obovate-spatulate, 1.5–9 cm including petiole, base tapering, margin undulate and toothed, or irregularly crenate. Stem leaves opposite, 2–4 pairs, rarely alternate, 1/3–1/2 as large as basal leaves; petiole short; leaf blade obovate to suborbicular, margin coarsely serrate. Racemes terminal, 3–12-flowered; bracts ovate-lanceolate, membranous, ca. 2 mm. Pedicel less than 1 cm. Calyx funnellform, 6–7 mm; lobes ovate-oblong, as long as tube, apex obtuse or apiculate. Corolla blue-purple, 1–1.6 cm; lower lip rounded, slightly exerted, middle lobe shorter than lateral lobes; upper lip lobes ovate to oblong. Ovary glabrous. Fl. Mar–Apr.

• Moist sparse forests, hilly areas, grassland along trails; 100–800 m. Hunan, Jiangxi.

19. *Mazus fukienensis* P. C. Tsoong, *Kew Bull.* 1954: 445. 1954.

福建通泉草 fu jian tong quan cao

Annuals, 15–30 cm tall, glabrous or sparsely pilose. Primary root short; fibrous roots clustered. Stems 1 to numerous, ascending, not creeping. Basal leaves rosulate; petiole as long as leaf blade, broadly winged;

leaf blade oblong-spatulate, 2.5–4.5 cm including petiole, papery, base tapering, margin crenate and sometimes entire near base or 1–3-toothed on each side. Stem leaves opposite, 2–4 pairs; petiole short; leaf blade similar to basal leaves, ca. 1/2 as long. Racemes to 20 cm, 6–20-flowered; bracts ovate-lanceolate, 2.5–3.5 mm. Pedicel to 1.5 cm. Calyx broadly campanulate, less than 3.5 mm, to 7 mm in fruit; lobes broadly ovate, equalling tube in length, apex acute. Corolla blue-purple, ca. 1 cm; lower lip lobes broadly ovate, exerted; upper lip lobes oblong-ovate. Ovary glabrous. Capsule globose. Fl. and fr. Apr–May.

• Along rivers. Fujian.

20. *Mazus henryi* P. C. Tsoong, *Kew Bull.* 1954: 444. 1954.

长柄通泉草 chang bing tong quan cao

Mazus henryi var. *elatior* P. C. Tsoong.

Perennials, densely lanose when young, glabrescent. Primary root short; fibrous roots ca. 7 cm, clustered. Stems to 25 cm, erect or ascending; stolons elongated, internodes 6–10 cm. Petiole 2.5–7 cm. Basal leaves 5–12, clustered, nearly rosulate; leaf blade suborbicular to broadly ovate, 2.5–5 cm, to 3 cm wide, margin crenate, teeth apices callous, sometimes with 1 or 2 pairs of lobes near base. Leaves on stolons opposite; petiole to 3 cm; blade smaller and more rounded than basal leaves, to 3 cm wide, margin often unlobed. Racemes terminal, shortened or elongated to 15 cm, lax, 2–13-flowered. Pedicel 1.5–2.5 cm. Calyx campanulate, 5–10 mm; lobes ovate-triangular, less than 1/3 of calyx length. Corolla light purple 1.2–1.6 cm; lower lip lobes subrounded, middle lobe smaller than lateral lobes and exerted; upper lip lobes lanceolate. Ovary glabrous. Capsule subglobose, ca. 4 mm. Fl. Jan–Apr, fr. Apr–May.

Edge of forests, mixed forests, wet and dense forests; 800–2200 m. C to S Yunnan [Laos].

21. *Mazus miquelii* Makino, *Bot. Mag. (Tokyo)* 16: 162. 1902.

匍茎通泉草 pu jing tong quan cao

Mazus fargesii Bonati, *M. japonicus* Bonati (1908), not Kuntze (1891); *M. miquelii* Makino var. *stolonifer* (Maximowicz) Nakai; *M. rugosus* Loureiro var. *stolonifer* Maximowicz; *M. stolonifer* (Maximowicz) Makino; *M. wilsonii* Bonati; *Vandellia japonica* Miquel. Perennials, glabrous or sparsely villous. Primary root short; fibrous roots numerous, clustered. Stems erect to obliquely ascending, 10–15 cm; stolons to 15–20 cm, rooting from nodes or not. Basal leaves numerous, rosulate, petiolate; leaf blade obovate-spatulate, 3–7 cm including petiole, margin coarsely serrate, sometimes pinnatisect. Stem leaves on erect stems alternate, on stolons mostly opposite; petiole short; leaf blade ovate to subrounded, 1.5–4 cm including petiole, less than 2 cm wide, margin sparsely serrate. Racemes terminal,

elongated, lax. Pedicel gradually shorter toward inflorescence apex, lower ones to 2 cm. Calyx campanulate-funnelform, 7–10 mm; lobes lanceolate-triangular, as long as tube. Corolla purple or white with purplish spots, 1.5–2 cm; lower lip middle lobe obovate, shorter than lateral lobes and slightly exserted; upper lip erect, short. Capsule globose, slightly exserted. Fl. and fr. Feb–Aug.

Trailsides in wet places, sparse forests; below 300 m. Anhui, Fujian, Guangxi, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [Japan].

22. *Mazus alpinus* Masamune, J. Soc. Trop. Agric. 2: 153. 1930.

高山通泉草 gao shan tong quan cao

Perennials. Stems erect or ascending, scapose; stolons to 30 cm, hirsute, sometimes very sparsely so. Basal leaves rosulate; leaf blade spatulate, 1.5–5 × 0.8–1.5 cm, base attenuate, margin coarsely crenate, dentate, or pinnately lobed. Stolon leaves opposite, sessile or petiolate; leaf blade obovate to subrounded, much smaller than basal leaves. Flowering stems scapose, to 15 cm, hirsute. Racemes borne on main stems and on stolons, 3–13-flowered; bracts subulate. Pedicel 5–6 mm. Calyx campanulate, 3–8 mm, parted to middle; lobes subulate-lanceolate, as long as tube, apex acute. Corolla pale purple, 1–2.2 cm. Fl. and fr. Mar–Sep.

• Grassland on rocky slopes; 1700–3400 m. Taiwan.

23. *Mazus gracilis* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 181. 1890.

纤细通泉草 xian xi tong quan cao

Perennials, glabrous or soon glabrescent. Stems creeping, to 30 cm, slender, conspicuously stoloniferous. Basal leaves petiolate; leaf blade spatulate to ovate, 2–5 cm including petiole, thin, margin sparsely serrate. Stem leaves opposite, petiolate; leaf blade obovate-spatulate to subrounded, 1–2.5 cm including petiole, margin crenate to subentire. Racemes usually axillary, rarely terminal, ascending, to 15 cm, lax. Pedicel slender, 1–1.5 cm in fruit. Calyx campanulate, 4–7 mm, slightly enlarged in fruit; lobes ovate-lanceolate, as long as tube, apex acute to obtuse. Corolla yellow with purple patches, white, blue-purple, or pale violet, 1.2–1.5 cm; lower lip middle lobe narrowly ovate, narrower, longer than lateral lobes; plaits with sparse glandular hairs; upper lip erect. Ovary glabrous. Capsule globose. Seeds brown-yellow; seed coat smooth. Fl. and fr. Apr–Jul.

24. *DODARTIA* Linnaeus, Sp. Pl. 2: 633. 1753.

野胡麻属 ye hu ma shu

Herbs, perennial, erect. Stems 1 or fascicled, much branched. Leaves few and small, opposite or alternate, sessile. Racemes terminal. Flowers few, solitary from bract axils. Calyx campanulate, persistent, 5-lobed. Corolla 2-lipped; tube tubular, longer than lips; lower lip longer and broader than upper lip, with 2 bulging plaits, 3-lobed, middle lobe smaller than others; upper lip short, erect, emarginate. Stamens 4, didynamous, inserted above middle of corolla tube, glabrous, included; anther locules distinct, divergent. Ovary 2-loculed. Style straight; stigma capitate, 2-lobed. Capsule subglobose. Seeds numerous.

One species: China, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan.

• Moist hilly areas, trailsides, beside water; below 800 m. Henan, Hubei, Jiangsu, Jiangxi, Zhejiang.

We have not seen any specimens of *Mazus cavaleriei* Bonati (Bull. Herb. Boissier. 2: 534. 1908). According to the original description and the photo of the type specimen (*Cavalerie 2324* from Pinbei, Guizhou) it is similar to *M. gracilis* but differs by the deeply incised serrate leaves and the calyx lobes being longer than the tube.

24. *Mazus procumbens* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 182. 1890.

长匍通泉草 chang pu tong quan cao

Perennials, white villous. Stems numerous, slender, hard, procumbent, 30–45 cm, simple or branched, internodes often shorter than leaves, conspicuously stoloniferous. Basal leaves several to numerous, often deciduous. Stem leaves often alternate, long petiolate; leaf blade orbicular-spatulate to subrounded, 1.5–6 cm including petiole, larger at middle of stem, base truncate to subrounded and tapering. Racemes terminal, to 13 cm or more, lax. Pedicel slender, 1–2 × as long as flower. Calyx campanulate, ca. 5 mm, white villous; lobes ovate-lanceolate, as long as or slightly longer than tube, apex acute. Corolla purple, less than 1 cm. Capsule globose, small. Fl. and fr. May.

• W Hubei.

25. *Mazus lanceifolius* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 181. 1890.

狭叶通泉草 xia ye tong quan cao

Perennials, 20–30 cm tall, black when dry, glabrous or soon glabrescent. Stems numerous, erect, quadrangular, slender. Leaves opposite, subsessile; lower leaves scalelike and small, obovate-oblong, apex obtuse; middle and upper leaves with leaf blade lanceolate to narrowly so, 6–9 cm, submembranous, abaxially glaucous and light green, base cuneate, margin sparsely to obscurely serrate, apex acute to narrowly acuminate, lateral veins several. Racemes terminal, scorpioid, ca. 6-flowered; bracts narrowly lanceolate. Flowers small. Pedicel shorter than flower, slender. Calyx funnelform, 6–9 mm, 5-lobed; lobes lanceolate, as long as tube in length, apex acute, midrib conspicuous, lateral veins inconspicuous. Corolla hardly exserted from calyx. Capsule ovoid, apex acuminate. Fl. and fr. Mar.

• W Hubei, E Sichuan.

1. *Dodartia orientalis* Linnaeus, Sp. Pl. 2: 633. 1753.

野胡麻 ye hu ma

Herbs, 15–50 cm tall, glabrous or sparsely villous when young. Roots stout, elongated to 20 cm. Stems with brown-yellow scales near base; branches, slender, angled. Leaves basally opposite, apically often alternate; leaf blade scalelike to broadly linear, 1–4 cm, margin entire or sparsely toothed. Racemes elongated, 3–7-flowered. Pedicel 0.5–1 mm. Calyx ca. 4 mm, subleathery; lobes broadly triangular, subequal. Corolla

purple to dark purple-red, 1.5–2.5 cm; lower lip plaits densely glandular hairy, lateral lobes suborbicular, middle lobe ligulate; upper lip ovate, straight. Anthers purple. Ovary ovoid-globose, ca. 1.5 mm. Style linear, glabrous. Capsule brown to dark brown, ca. 5 mm in diam., apex apiculate. Seeds black, ovoid, 0.5–0.7 mm. Fl. and fr. May–Sep.

Ditch banks, cultivated fields, in waste fields, desert, dry river beds; below 1200 m. Gansu, Nei Mongol, Sichuan, Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

25. MICROCARPAEA R. Brown, Prodr. 435. 1810.

小果草属 xiao guo cao shu

Herbs, small, creeping, much branched, cushionlike. Leaves opposite, small. Flowers axillary. Calyx tubular-campanulate, 5-angled, 5-toothed. Corolla subcampanulate, 4-lobed; lower lip 3-lobed, patent; upper lip entire, short, erect. Stamens 2, anterior. Capsule slightly flattened, 2-grooved, loculicidal. Seeds few, ovoid-fusiform, ± smooth.

One species: E Asia, Pacific Islands.

1. *Microcarpaea minima* (J. König ex Retzius) Merrill, Philipp. J. Sci. 7: 100. 1912.

小果草 xiao guo cao

Paederota minima J. König ex Retzius, Observ. Bot. 5: 10. 1789; *Microcarpaea muscosa* R. Brown.

Annuals. Stems slender, many branched, glabrous. Leaves sessile, amplexicaul, broadly linear to narrowly oblong, 3–4 × 1–2 mm, margin entire and somewhat

thick; veins inconspicuous. Flowers sometimes 1 per node, alternate, sessile. Calyx ca. 2.5 mm; lobes narrowly deltoid-ovate, sparsely ciliate. Corolla pink, ovoid, as long as calyx. Capsule ovoid, shorter than calyx. Seeds brownish yellow, ca. 0.3 mm. Fl. Jul–Oct. Paddy fields, swamps; 500–1400 m. Guangdong, Guizhou (Jiangkou Xian), Taiwan, Yunnan (Jinghong, Xichou), Zhejiang (Huangyan Xian) [India, Indonesia, Japan, Korea, Malaysia, Thailand, Vietnam; Oceania].

26. LIMOSELLA Linnaeus, Sp. Pl. 2: 631. 1753.

水茫草属 shui mang cao shu

Herbs, dwarf, aquatic or terrestrial, cespitose, creeping, or floating. Stolons rooting from nodes or acaulescent. Leaves fascicled, opposite, or alternate on elongated branches, long petiolate. Flowers axillary, minute, short pedicellate. Bracteoles absent. Calyx campanulate, 5-lobed. Corolla radiate-campanulate, regular; tube short; lobes 5, subequal. Stamens 4, equal, inserted near middle of corolla tube; filaments filiform; anthers confluent, 1-loculed. Ovary basally 2-loculed. Style short; stigma capitate. Capsule indistinctly dehiscent. Seeds numerous, ovoid, small; seed coat rugose.

About seven species: worldwide; one species in China.

1. *Limosella aquatica* Linnaeus, Sp. Pl. 2: 631. 1753.

水茫草 shui mang cao

Annuals, 3–5(–10) cm tall, fascicled, glabrous. Stolons slender, short, rooting from nodes. Leaves basal, fascicled or rosulate. Petiole 1–4(–9) cm; leaf blade broadly linear to narrowly spatulate, 3–15 mm, ± fleshy, margin entire, apex obtuse. Flowers 3–10. Pedicel 0.7–1.3 cm, slender. Calyx 1.5–2.5 mm, membranous; lobes

ovate-triangular, 0.5–0.8 mm, apex acuminate. Corolla white, pale lilac, or reddish, 2–3.5 mm; lobes oblong to oblong-ovate, 1–1.5 mm, apex obtuse. Capsule ovoid, ca. 3 mm. Seeds fusiform. Fl. and fr. Apr–Sep.

Along streams, wet grassland at edge of forests, sometimes floating; 1700–2400(–4000) m. Heilongjiang, Jilin, Qinghai, Sichuan, Xizang, Yunnan [throughout temperate zones of northern and southern hemispheres].

27. LINARIA Miller, Gard. Dict. Abr. ed. 4, 2. 1754.

柳穿鱼属 liu chuan yu shu

Herbs, annual or perennial. Leaves alternate, opposite, or whorled, often sessile; veins 1 or several and campylodromous. Inflorescences spicate, racemose, or rarely capitate. Calyx 5-lobed almost to base. Corolla tube tubular, base spurred; limb 2-lipped; lower lip convex, dilated toward center of upper lip, almost closed at throat, and making corolla personate, 3-lobed, densely glandular hairy; upper lip erect, 2-lobed. Stamens 4, anterior 2 longer; anthers anterior and posterior connivent in 2 pairs, locules parallel, divergent after dehiscence. Stigma apex

often emarginate. Capsule ovoid or globose, apically dehiscent by irregular pores, valves irregular. Seeds numerous, flattened, often disclike with a broadly winged margin, rarely 3-angled and wingless or reniform and with a thickened margin.

About 100 species: northern temperate zones, mainly in Asia and Europe; ten species in China.

1a. Leaves opposite or whorled at least basally.

2a. Leaf blade linear; seeds disclike, broadly winged at margin; corolla spur 10–15 mm 7. *L. vulgaris*

2b. Leaf blade ovate to oblong; seeds reniform, thickened at margin; corolla spur 3–6 mm 9. *L. japonica*

1b. Leaves alternate.

3a. Corolla spur 2–6 mm; inflorescence axis and pedicels with long glandular hairs.

4a. Calyx lobes linear-lanceolate, less than 2 mm wide; corolla spur 5–6 mm 5. *L. tibetica*

4b. Calyx lobes lanceolate to narrowly ovate, 2–3 mm wide; corolla spur 2–4 mm 6. *L. yunnanensis*

3b. Corolla spur more than 7 mm; inflorescence axis and pedicels glabrous or sparsely with short glandular hairs (densely glandular villous in *L. buriatica*).

5a. Leaves ovate-lanceolate, distinctly 3-veined; seeds 3-angled 10. *L. genistifolia*

5b. Leaves lanceolate to linear, mostly 1-veined; seeds disclike.

6a. Flowers purple to purple-red.

7a. Plants 30–50 cm tall; corolla spurs 10–15 mm, straight 1. *L. bungei*

7b. Plants 15–20 cm tall; corolla spurs 7–8 mm, slightly curved at tip 2. *L. kulabensis*

6b. Flowers yellow.

8a. Plants glabrous except for corolla; calyx lobes narrowly oblong to ovate 3. *L. longicalcarata*

8b. Inflorescence axes, pedicels, or calyces ± glandular hairy, rarely glabrous; calyx lobes linear

to ovate-lanceolate.

9a. Seeds smooth in center; calyx lobes elliptic-lanceolate, apex acute to obtuse .. 4. *L. incompleta*

9b. Seeds verrucose in center; calyx lobes linear-lanceolate to ovate-lanceolate, apex acute to acuminate.

10a. Stems often more than 20 cm tall, branched from middle or apically; inflorescences,

pedicels, and calyces glabrous or sparsely short glandular hairy; calyx lobes lanceolate

to ovate-lanceolate, more than 1.5 mm wide 7. *L. vulgaris*

10b. Stems often less than 20 cm tall, many branched at base; inflorescences, pedicels, and calyces densely long glandular hairy; calyx lobes linear-lanceolate, 1–1.5 mm wide 8. *L. buriatica*

1. *Linaria bungei* Kuprianova, Trudy Bot. Inst. Akad. Nauk SSSR, ser. 1, Fl. Sist. Vyssh. Rast. 2: 298. 1936.

紫花柳穿鱼 *zi hua liu chuan yu*

Linaria praecox Bunge (1834), not Hoffmannsegg & Link (1809); *L. transiliensis* Kuprianova.

Perennials, 30–50 cm tall. Stems often cespitose, sometimes sterile, often many branched from middle or apically, glabrous. Leaves alternate; leaf blade linear, 2–5 cm × 2–3 mm, glabrous. Inflorescences spicate, with several to numerous flowers, elongated in fruit, axis and pedicels glabrous. Calyx glabrous or sparsely with short glandular hairs; lobes narrowly oblong to ovate-lanceolate, 2–3 × 1.2–2 mm. Corolla purple, 1.2–1.5 cm (excluding spur); spur straight, 1–1.5 cm; lateral lobes of lower lip ca. 1 mm; upper lip ovate-triangular, longer than lower lip. Capsule subglobose, 5–7 × 4–5 mm. Seeds disclike, margin broadly winged, center smooth. Fl. May–Aug.

Grasslands, stony mountain slopes; 500–2000 m. NW Xinjiang [Kazakhstan, Kyrgyzstan, Russia].

2. *Linaria kulabensis* B. Fedtschenko, Repert. Spec. Nov. Regni Veg. 10: 380. 1912.

帕米尔柳穿鱼 *pa mi er liu chuan yu*

Perennials, 15–20 cm tall. Stems persistent underground, to 1 cm in diam., present year's growth branched at base. Leaves alternate; leaf blade linear-elliptic, 1.5–3 cm × 3–5 mm, base and apex acute; veins 3, inconspicuous. Inflorescences spicate, to 7 cm at anthesis, to 10-flowered; bracts ovate-lanceolate, longer than pedicel. Pedicel ca. 2 mm at anthesis. Calyx pubescent with granular-glandular hairs; lobes narrowly oblong, ca. 3 × 1–1.5 mm, apex obtuse. Corolla purple-red, to 1.4 cm (excluding spur); spur 7–8 mm, tip slightly curved; lower lip ca. 2 mm, shorter than upper, lateral lobes shorter and to 3 mm wide, middle lobe slightly narrower, lobe apices obtuse; upper lip with a deep notch ca. 1.8 mm, lobes ca. 3 mm wide in middle. Fl. May–Jun.

Gravelly slopes; ca. 2800 m. SW Xinjiang (Wuqia Xian) [Tajikistan].
3. *Linaria longicalcarata* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 399. 1979.

长距柳穿鱼 *chang ju liu chuan yu*

Perennials, 15–35 cm tall, glabrous except for corolla. Stems branched above middle. Leaves alternate; leaf blade linear, 1–4.5 cm × 2–4 mm. Inflorescences lax spicate, several flowered; bracts lanceolate. Pedicel 1–3 mm. Calyx lobes narrowly oblong to ovate, 2.5–3 × 1.2–1.8 mm, apex obtuse. Corolla yellow, convex part orange, 1.1–1.4 cm (excluding spur); spur 1–2 cm, straight; upper lip slightly longer than lower; lobes obtuse at apex. Capsule 6–8 × ca. 5 mm. Seeds disclike, ca. 3 mm, center smooth. Fl. Jul–Aug.

• Shaded slopes, among grasses by streams and stony places; 1100–1400 m. NW Xinjiang (Burqin Xian, Toli Xian).

4. *Linaria incompleta* Kuprianova, Sovetsk. Bot. 4: 114. 1936.

光籽柳穿鱼 *guang zi liu chuan yu*

Perennials, 25–30 cm tall. Stems erect, apically with sterile or rarely fertile branches, glabrous. Leaves linear-filiform, 2–6 cm × 1–2 mm, glabrous. Inflorescences 3–10-flowered; bracts nearly as long as or longer than pedicels. Pedicel 2–3 mm. Calyx ± capitate glandular hairy; lobes elliptic-lanceolate, 3–4 × 1.5–2 mm, apex acute to obtuse. Corolla yellow, 1.2–1.4 cm (excluding spur); spur ca. 1.4 cm, slightly curved; upper lip ca. 9 mm. Capsule oblong-globose, ca. 8 mm. Seeds disclike, smooth, margin broad. Fl. Jun. Steppes. N Xinjiang [Mongolia, Russia; Europe].

Only two specimens have been examined by the authors. One collected by Karelin and Kirilow in 1840 and the other *Schrenk 276*. Because the specimens are not in good condition, the species description may need to be amended when additional material becomes available.

5. *Linaria thibetica* Franchet, Bull. Soc. Bot. France 47: 11. 1900.

宽叶柳穿鱼 *kuan ye liu chuan yu*

Linaria yunnanensis W. W. Smith var. *caerulea* H. L. Li.

Perennials, to 1 m tall. Stems often several, cespitose, simple or apically branched, glabrous. Leaves alternate, sessile, narrowly elliptic to ovate-elliptic, 2–5 × 0.6–1.3 cm, glabrous, veins 3–5. Inflorescences spicate, terminal, with numerous crowded flowers, to 12 cm in fruit, axis and pedicels with sparse multicellular glandular hairs; bracts lanceolate. Pedicel short. Calyx with multicellular glandular hairs on both surfaces or only on inside; lobes linear-lanceolate, 5–7 × 1–2 mm. Corolla pale purple or yellow, 8–10 mm (excluding spur); spur 5–6 mm, slightly curved; lips equal in length; lower lip lobes ovate, ca. 2 mm wide, apex ± acute. Capsule globose, ca. 9 × 6 mm. Seed disclike, margin broadly winged, center verrucose. Fl. Jul–Sep.

• Meadow slopes, forest margins, sparse thickets; 2500–3800 m. W Sichuan, SE Xizang, NW Yunnan.

Flowers in Sichuan and Yunnan are pale purple, while in Xizang they are yellow.

6. *Linaria yunnanensis* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 110. 1916.

云南柳穿鱼 *yun nan liu chuan yu*

Perennials, to 1 m tall. Stems often several, cespitose, simple or apically branched, glabrous. Leaves alternate, sessile, elliptic, 2–5 × 1.5–3 cm. Inflorescence axes and pedicels long glandular hairy; bracts ovate-lanceolate. Calyx with multicellular glandular hairs on both surfaces or only inside; lobes lanceolate to narrowly ovate, 5–7 × 2–3 mm, widest in middle. Corolla yellow, ca. 1.2 cm (excluding spur); spur 2–4 mm, slightly curved; lips equal in length; lower lobes ovate, apex obtuse. Capsule globose. Seeds disclike, center verrucose, margin broadly winged. Fl. and fr. Jul–Sep.

• Open stony slopes; ca. 3000 m. NW Yunnan.

Linaria yunnanensis has nearly the same habit as *L. thibetica*. Further study is needed to determine if *L. yunnanensis* is a distinct species or should be a variety of *L. thibetica*.

7. *Linaria vulgaris* Miller, Gard. Dict. ed. 8, 1. 1768.

柳穿鱼 *liu chuan yu*

Perennials, 20–80 cm tall, glabrous except for inflorescences. Stems erect, often apically branched. Leaves usually numerous and alternate, rarely basal ones whorled, rarely all in whorls of 4; leaf blade linear, 2–8 × 0.2–1.5 cm, veins 1(–3). Inflorescences racemose, flowers crowded, axis elongating in fruit; axis and pedicels glabrous to densely with short glandular hairs; bracts linear to narrowly lanceolate, longer than pedicel. Pedicel 2–8 mm. Calyx glabrous or inside sparsely glandular hairy; lobes lanceolate to ovate-lanceolate. Corolla yellow, 1–1.5 cm (excluding spur); spur 1–1.5 cm, slightly curved; lateral lower lip lobes ovate-orbicular, 3–4 mm wide, middle lobe ligular; upper lip longer than lower lip, lobes ca. 2 mm, ovate. Capsule ovoid-globose. Seeds disclike, margin broadly winged, center verrucose when mature. Fl. Jun–Sep.

Mountain slopes, trailsides, meadows, gravelly steppes, forests; below 2200 m. NE Gansu, Hebei, Heilongjiang, Henan, N Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, NW Xinjiang [Korea, Russia; Europe].

Linaria vulgaris is a widely distributed species with a number of local races often treated as species; *L. vulgaris* subsp. *vulgaris* does not occur in China.

- 1a. Leaf blade linear; calyx lobes less than 1.5 mm wide, inside sparsely glandular hairy; lower leaves usually 1-veined 7a. subsp. *chinensis*
- 1b. Leaf blade linear-lanceolate to lanceolate; calyx lobes more than 1.5 mm wide, inside subglabrous; leaves 3-veined . 7b. subsp. *acutiloba*

7a. *Linaria vulgaris* subsp. *chinensis* (Bunge ex Debeaux) D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 206. 1979.

柳穿鱼(原亚种) *liu chuan yu (yuan ya zhong)*

Linaria vulgaris var. *chinensis* Bunge ex Debeaux, Actes Soc. Linn. Bordeaux 31: 336. 1876.

Leaves alternate, rarely lower ones or all whorled; leaf blade linear, 2–6 cm × 2–4(–10) mm, 1(–3)-veined. Inflorescence axis and pedicels glabrous or sparsely short glandular hairy. Calyx lobes lanceolate, ca. 4 × 1–1.5 mm, inside sparsely with glandular hairs. Fl. Jun–Sep.

Mountain slopes, trailsides, meadows, gravelly steppes; below 1000 m. NE Gansu, Hebei, Heilongjiang, Henan, N Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong [Korea].

Used medicinally for treating heart disease caused by rheumatism.

7b. *Linaria vulgaris* subsp. *acutiloba* (Fischer ex Reichenbach) D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 208. 1979.

新疆柳穿鱼 xin jiang liu chuan yu

Linaria acutiloba Fischer ex Reichenbach, Iconogr. Bot. Pl. Crit. 5: 14. 1827.

Leaves alternate; leaf blade linear-lanceolate to lanceolate, 3–8 × 0.5–1.5 cm, 3-veined. Inflorescence axis and pedicels glabrous. Calyx lobes lanceolate to ovate-lanceolate, more than 1.5 mm wide, inside subglabrous. Fl. Jun–Aug.

Ravine meadows, forests; 1000–2200 m. NW and NE Xinjiang [Mongolia, Russia].

8. *Linaria buriatica* Turczaninow ex Benth in A. de Candolle, Prodr. 10: 281. 1846.

多枝柳穿鱼 duo zhi liu chuan yu

Perennials, 8–20 cm tall. Stems many branched at base, often diffuse. Leaves alternate, numerous, crowded; leaf blade filiform to narrowly linear, 1.5–5 cm, glabrous, 1-veined. Inflorescences racemose, terminal, 3–7 cm, axis and pedicels densely glandular villous; bracts linear-lanceolate, lowermost ca. 1 cm. Pedicel and calyx glandular hairy. Calyx lobes linear-lanceolate, 4–6 × ca. 1 mm. Corolla yellow, 1.2–1.5 cm (excluding spur); spur 0.8–1.5 cm, slightly curved; lateral lobes of lower lip oblong, 2–5 mm wide, middle lobe narrower; upper lip longer than lower, lobes ca. 2 mm, apex rounded or obtuse. Capsule ovoid-globose, ca. 9 × 7 mm. Seeds dislike, margin broadly winged, center verrucose. Fl. Jun–Aug.

Steppes, wasted fields, dunes; 100–200 m. N Nei Mongol [Mongolia, Russia (E Siberia)].

9. *Linaria japonica* Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 115. 1865.

海滨柳穿鱼 hai bin liu chuan yu

Perennials, 15–40 cm tall, grayish, glabrous. Stems ascending, often branched. Leaves opposite or in whorls of 3 or 4, often irregularly whorled or alternate upward, sessile, ovate, obovate, or oblong, 1.5–3 × 0.5–1.5 cm, base obtuse to subcuneate, apex obtuse to subacute; veins obscurely 3-campylodromous. Inflorescences racemose; bracts similar to but much smaller than leaves. Pedicel 3–5 mm. Calyx lobes ovate to lanceolate, 2.5–4 × 1.5–2.5 mm. Corolla bright yellow, 1.2–1.7 cm (excluding spur); spur 3–6 mm, straight; lateral lobes of lower lip 3–5 mm wide, middle lobe narrower; upper lip longer than lower. Capsule globose, ca. 6 mm in diam. Seeds reniform, ca. 2.5 × 1.5 mm, margin thickened. Fl. Aug.

Sandy beaches; near sea level. Liaoning [Japan, Korea, Russia (Far East)].

10. *Linaria genistifolia* (Linnaeus) Miller, Gard. Dict. 14. 1768.

卵叶柳穿鱼 luan ye liu chuan yu

Antirrhinum genistifolium Linnaeus, Sp. Pl. 2: 616. 1753.

Perennials, 50–100 cm tall. Stems erect, apically branched, glabrous. Leaves alternate; leaf blade ovate-lanceolate, 2.5–3.5 × 0.8–1 cm, glabrous, distinctly 3-veined. Inflorescences paniculate, with few to numerous flowers, glabrous except for corolla. Pedicel 3–5 mm, shorter than bracts. Calyx lobes narrowly lanceolate, 5–6 mm. Corolla pale yellow, 1.1–1.2 cm (excluding spur); spur 7–12 mm, slightly curved; tube wide; lower lip with whitish yellow pubescence in throat, lobes ovate, ca. 4 mm wide; apex of upper lip lobes acuminate. Capsule globose, as long as or slightly longer than calyx, 5–6 mm in diam. Seeds brown-gray, 3-angled, edges narrowly winged, reticulate-rugose. Fl. Jul.

Sandy areas, forests. N Xinjiang [Kazakhstan, Russia; Europe].

28. MIMULICALYX P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 400. 1979.

虾子草属 xia zi cao shu

Herbs, perennial. Stems quadrangular. Leaves opposite, basal and rosulate or all on stem. Racemes axillary, opposite, sometimes in compound racemes. Pedicel much longer than flower. Bracteoles absent. Calyx tubular, campanulate in fruit, 5-ribbed; lobes triangular, 1/3–1/2 of tube length, rib reaching lobe apex. Corolla pale purple or pale red; tube long; palate with 2 bulging plaits; limb 2-lipped; lower lip longer than upper, 3-lobed; lobes somewhat spreading, crisp, margin ciliate; lateral lobes of lower lip exerted in bud, as long as lobes of upper lip at anthesis; middle lobe orbicular, larger than other lobes, base with 2 bulging glandular hairy plaits, margin slightly recurved; upper lip erect, lobes 2 and wider than long. Stamens 4, included, didynamous; anther locules basally divaricate, apically confluent. Stigma 2-lobed. Capsule oblong, ± compressed, emarginate, loculicidal, placenta dilated. Seeds numerous, ellipsoid, ± compressed, with a transparent membrane.

• Two species: endemic to China.

1a. Plants with primary roots; leaves mostly basal, stem leaves 3 or 4 pairs; racemes usually short branched; pedicel

in fruit to 2.6 cm 1. *M. rosulatus*

1b. Plants with fibrous and fascicled roots; leaves all on stem, more than 10 pairs; racemes unbranched; pedicel in

fruit to 4 cm or more 2. *M. paludigenus*

1. *Mimulicalyx rosulatus* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 400. 1979.

虾子草 xia zi cao

Herbs, 3–30 cm tall. Primary root to 7 cm. Leaves mostly basal; petiole to 1.3 cm; leaf blade narrowly spatulate, to more than 4 cm, ± fleshy and thick, base narrowly cuneate, margin subentire with few inconspicuous teeth, apex obtuse. Leaves on flowering stems 3 or 4 pairs; leaf blade linear-lanceolate, 0.8–2.5 cm, base somewhat amplexicaul, apex obtuse. Racemes to 20 cm, sometimes basally branched, more than 20-flowered per stem; bracts shorter than pedicel, to 2 cm basally on inflorescence. Pedicel in fruit to 2.6 cm. Calyx ca. 5 mm, ca. 8 × 4.5 mm in fruit, main veins 5; lobes recurved near apex. Capsule ca. 5 mm, included. Seeds brown.

• Marshes. Yunnan (Jianshui Xian).

2. *Mimulicalyx paludigenus* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 400. 1979.

沼生虾子草 zhao sheng xia zi cao

Herbs, to 45 cm tall, glabrous. Roots fibrous, fascicled. Stems 1–3, erect or basally somewhat prostrate. Leaves all on stem, more than 10 pairs; leaf blade spatulate-oblongate to broadly lanceolate, 2–5 × 0.5–1.2 cm, base wide and subamplexicaul, margin entire or with few small callous teeth, apex obtuse. Flowers axillary, varying in number. Pedicel conspicuously longer than bracts, in fruit to 4 cm or more. Calyx ca. 1.5 mm in fruit, main veins 5; lobes recurved near apex. Fl. Jun–Sep, fr. Jul–Oct.

• Swamps, rice fields, along streams; 1100–1600 m. Sichuan (Huidong Xian), Yunnan (Mengzi Xian, Yanshan Xian).

29. *DIGITALIS* Linnaeus, Sp. Pl. 2: 621. 1753.

毛地黄属 mao di huang shu

Herbs, rarely basally woody. Stems simple or branched at base. Leaves alternate, large, often crowded below, margin entire or toothed. Flowers in terminal, often second racemes. Calyx 5-lobed; lobes imbricate. Corolla oblique, tubular-campanulate, often constricted beyond ovary, somewhat ventricose; limb slightly 2-lipped; lower lip 3-lobed, middle lobe longer than lateral lobes; upper lip lobes much reduced, emarginate. Stamens 4, didynamous, included; anthers touching in pairs, locules divaricate, apically confluent. Style 2-lobed. Capsule ovoid, septicidal. Seeds numerous, oblong to subovoid, small, ribbed; seed coat scrobiculate-reticulate.

About 25 species: Asia, Europe; one species cultivated in China.

1. *Digitalis purpurea* Linnaeus, Sp. Pl. 2: 622. 1753.

毛地黄 mao di huang

Annuals or perennials, 60–120 cm tall, gray-white pubescent and glandular hairy except for corolla and sometimes for subglabrous stems. Stems 1 or few and cespitose. Basal leaves mostly rosulate; petiole narrowly winged, to 15 cm; leaf blade ovate to oblong-elliptic, 5–15 cm, base tapering, margin crenate and rarely serrate, apex acuminate to obtuse. Stem leaves

similar to basal leaves, decreasing in size upward, sessile or short petiolate and forming bracts. Calyx campanulate, ca. 1 cm; segments free, oblong-ovate. Corolla purple to white, 3–4.5 cm, inside spotted, lobe apex white pubescent. Capsule ca. 1.5 cm. Seeds clavate, puberulent. Fl. May–Jun.

Native to Europe but sometimes naturalized in disturbed areas; low elevations. Jiangsu, Jiangxi, Sichuan, Zhejiang [Europe]. Cultivated as an ornamental and also used medicinally.

30. *REHMANNIA* Liboschitz ex Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 1: 36. 1835.

地黄属 di huang shu

Herbs, perennial. Rhizomes present. Stems erect, simple or branched from base. Basal leaves rosulate, stem leaves alternate and petiolate; leaf blade varying in shape, often hairy, margin toothed or lobed. Inflorescences sometimes scapose. Flowers axillary and solitary or in terminal racemes, pedicellate. Bracteoles present or absent. Calyx 5(–7)-lobed. Corolla purple-red or yellow, tubular; tube slightly curved or straight, ± dorsiventrally compressed, with 2 plaits from tube base to throat; limb ± 2-lipped, 5-lobed. Stamens 4, didynamous, rarely 5 and 1 smaller than other 4, included; anthers coherent in pairs, locules fertile. Ovary base with a disc, 2-loculed, rarely 1-loculed; ovules numerous. Stigma 2-lamellate. Capsule with persistent calyx, loculicidal. Seeds minute; seed coat reticulate.

• Six species: endemic to China.

- 1a. Flowers with 1 or 2 bracteoles.
 2a. Bracteoles narrowly elliptic, pinnately lobed 5. *R. piasezkii*
 2b. Bracteoles subulate 6. *R. henryi*
 1b. Flowers without bracteoles.
 3a. Corolla 3–4.5 cm, tube narrow.
 4a. Basal leaves persistent; pedicel slender, ascending 1. *R. glutinosa*
 4b. Basal leaves caducous; pedicel stout, erect and subparallel to stem 2. *R. solanifolia*
 3b. Corolla 5.6–7 cm, tube inflated.
 5a. Flower including pedicel longer than bract 3. *R. chingii*
 5b. Flower including pedicel equal to or shorter than bract 4. *R. elata*

1. *Rehmannia glutinosa* (Gaertner) Liboschitz ex Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 1: 36. 1835.

地黄 di huang

Digitalis glutinosa Gaertner, Novi Comment. Acad. Sci. Imp. Petrop. 14: 544. 1770; *Rehmannia chinensis* Liboschitz ex Fischer & C. A. Meyer; *R. glutinosa* var. *hemsleyana* Diels; *R. glutinosa* var. *huechingensis* Chao & Shih; *R. glutinosa* f. *huechingensis* (Chao & Shih) P. G. Hsiao, *R. glutinosa* f. *purpurea* Matsuda.

Herbs, 10–30 cm tall, densely villous with glandular and eglandular hairs. Rhizomes to 5.5 cm, fleshy. Stems purple-red. Basal leaves usually rosulate. Stem leaves gradually or abruptly decreasing in size or reduced to bracts upward; leaf blade ovate to narrowly elliptic, 2–13 × 1–6 cm, base tapering, margin irregularly crenate or obtusely serrate to toothed. Flowers axillary or in terminal racemes. Pedicel 0.5–3 cm, slender, ascending. Bracteoles absent. Calyx 1–1.5 cm, 10-veined; lobes 5, oblong-lanceolate, ovate-lanceolate, or subtriangular, 5–6 × 2–3 mm, rarely 2 lower lobes further lobed. Corolla 3–4.5 cm, white villous; tube narrow; lobes outside purple-red, inside yellow-purple, 5–7 × 4–10 mm, apex obtuse to emarginate. Stamens 4; anther locules oblong, ca. 2.5 mm, base divaricate. Ovary 2-loculed when young, 1-loculed with age. Capsule ovoid to narrowly ovoid, 1–1.5 cm. Fl. and fr. Apr–Jul.

• Mountain slopes, trailsides; near sea level to 1100 m. Gansu, Hebei, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi.

Rehmannia glutinosa is widely cultivated for its rhizomes which are used medicinally.

2. *Rehmannia solanifolia* P. C. Tsoong & T. L. Chin, Fl. Reipubl. Popularis Sin. 67(2): 401. 1979.

茄叶地黄 qie ye di huang

Herbs, 20–50 cm tall, villous, with few glandular hairs. Stems erect, unbranched. Basal leaves caducous. Stem leaves gradually decreasing in size upward; petiole 2–3 cm; leaf blade elliptic, 8–10 × 4–5 cm, abaxially pilose, adaxially subglabrous, base cuneate and tapering, margin coarsely triangular-toothed, coarsely serrate, or rarely undulate-toothed, veins raised. Pedicel stout, erect, subparallel to stem, to 7 cm in fruit, villous. Bracteoles absent. Calyx campanulate, 1.5–2 cm, villous; lobes 5–7, ovate-triangular, 5–7 × 3–4 mm,

unequal, apex acute. Corolla purple-red, 4–4.5 cm, outside white villous with glandular and eglandular hairs; tube narrow; lower lip lobes oblong, subequal, ca. 12 × 1 cm, middle lobe sometimes further 2-lobed; upper lip broadly oblong, ca. 1 × 2 mm, 2-lobed to middle. Stamens 4 or 5. Ovary glabrous, stout. Stigma subglobose. Fl. and fr. Apr–May.

• Grassland; ca. 1300 m. Sichuan (Chengkou Xian).

3. *Rehmannia chingii* H. L. Li, Taiwaniana 1: 78. 1948.

天目地黄 tian mu di huang

Herbs, 30–60 cm tall, villous. Stems simple or branched. Basal leaves subrosulate; petiole 2–7 cm, winged; leaf blade elliptic, 6–12 × 3–6 cm, sparsely white villous, base cuneate and gradually attenuate, margin irregularly crenate, coarsely serrate, or crenate. Stem leaves similar to basal leaves, gradually decreasing in size upward. Flowers exceeding bract. Pedicel villous, with eglandular and glandular hairs. Bracteoles absent. Calyx 1–2 cm; lobes lanceolate to ovate-lanceolate, villous with eglandular and glandular hairs; lower 2 lobes 3–7 mm, subequal; upper 3 lobes slightly longer than lower lobes, middle lobe 1–1.2 cm; lateral lobes 5–8 mm. Corolla purple-red, 5.5–7 cm, outside villous; tube inflated; lower lip narrowly elliptic, apex acute to rounded, middle lobe ca. 2 × 1.4 cm, lateral lobes slightly smaller than other lobes; upper lip lobes ovate, 1.4–1.8 cm, apex subacute to rounded. Stamens 4; filaments basally short glandular hairy. Capsule ovoid, ca. 1.4 cm. Seeds ovoid to narrowly ovoid, ca. 1 mm. Fl. Apr–May, fr. May–Jun.

• Grassland on mountain slopes, trailsides; 100–500 m. Anhui, Jiangxi, Zhejiang.

4. *Rehmannia elata* N. E. Brown ex Prain, Bot. Mag. 136: t. 8302. 1910.

高地黄 gao di huang

Herbs, sparsely villous to villous. Stems 1. Petiole 5–6 cm, winged; leaf blade obovate-oblong to elliptic, papery, abaxially sparsely villous along veins, adaxially subglabrous, base cuneate and tapering, margin with 2–6 pairs of lobes and lobes irregularly triangular and entire or toothed, apex obtuse. Flowers including pedicel equal to or shorter than bracts. Pedicel 3–4 cm, villous. Bracteoles absent. Calyx 2–3 cm, villous; lobes 5, unequal. Corolla purple-red, ca. 6 cm; tube inflated,

abaxially subsaccate; throat villous; lower lip lobes oblong to suborbicular, 6–10 × 5–10 mm; upper lip lobes transversely oblong, 0.6–1 × 0.8–1.2 cm, subequal. Filaments glabrous. Style slightly longer than stamens. Fl. Jun.

• Hubei.

5. *Rehmannia piasezkii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 502. 1880.

裂叶地黄 lie ye di huang

Rehmannia angulata (Oliver) Hemsley; *R. glutinosa* Liboschitz ex Fischer & C. A. Meyer var. *angulata* Oliver; *R. glutinosa* var. *piasezkii* (Maximowicz) Diels. Herbs, 30–100 cm tall, villous. Stems simple or branched from base. Petiole ca. 4 cm, decurrent and gradually shorter upward; leaf blade narrowly elliptic, to 15 × 7 cm, white villous, pinnately parted and lobes subtriangular, lobe margin triangularly toothed. Flowers borne above middle of stem. Pedicel 2–4 cm, villous with eglandular and glandular hairs. Bracteoles 2, similar to leaves in shape, sessile, inserted near base of pedicels. Calyx 1.5–3 cm, villous and glandular hairy, unequally 5-lobed; lower lobes ovate-lanceolate, 0.5–1.5 cm; upper lobes lanceolate, ca. 2.3 × 2.3–3 cm. Corolla purple-red, 5–6 cm; tube 3.5–4 cm, somewhat saccate, outside villous or glabrous, inside long glandular villous on plaits, apex extended; lower lip middle lobe obovate-oblong and 1–1.6 × ca. 1 cm,

lateral lobes suborbicular and 0.8–1.2 × 1.1–1.2 cm; upper lip lobes transversely oblong, 1–1.1 × 1.1–1.5 cm. Filaments glabrous or sparsely glandular pilose. Stigma unequally 2-lamellate. Fl. May–Sep.

• Mountain slopes; 800–1500 m. Hubei, Shaanxi.

6. *Rehmannia henryi* N. E. Brown, Bull. Misc. Inform. Kew 1909. 262. 1909.

湖北地黄 hu bei di huang

Herbs, 15–40 cm tall, villous. Basal leaves somewhat crowded; petiole 2–8 cm, winged; leaf blade elliptic-oblong to spatulate, 6–17 × 3–8 cm, villous, base tapering, margin irregularly crenate, rarely lobed. Stem leaves similar to basal leaves, gradually decreasing in size upward. Pedicel ca. 2.5 cm, lowermost to 5.5 cm. Bracteoles inserted near base of pedicel, yellow-brown, subulate, ca. 3 mm, villous. Calyx yellow-brown, 1.8–2.5 cm, villous; lobes ovate-lanceolate, 8–12 × 3–4 mm, spreading flat, margin entire or shallowly toothed, apex obtuse. Corolla yellowish, 5–7 cm; tube outside white villous; lower lip lobes oblong, middle lobe ca. 1.8 × 1.5 cm, lateral lobes ca. 1.5 × 1.4 cm, equal; upper lip lobes transversely oblong, ca. 1.3 × 1.5 cm. Filaments basally sparsely and short glandular pubescent. Ovary glabrous. Stigma globose. Fl. Apr–May.

• Trailsides, rock crevices; below 400 m. Hubei.

31. **TRIAENOPHORA** Solereder, Ber. Deutsch. Bot. Ges. 27: 399. 1909.

呆白菜属 dai bai cai shu

Herbs, perennial, densely white lanose-villous. Rhizomes present. Stems simple or branched. Basal leaves ± rosulate, petiolate; leaf blade white woolly to subglabrous, margin toothed, lobed, or entire. Stem leaves similar to basal leaves, gradually decreasing in size and bracteate above. Flowers in somewhat secund racemes apically on stem. Bracteoles 2, linear. Calyx lobes 5, each lobe 3-parted; lobules linear, unequal. Corolla tubular, ± 2-lipped, 5-lobed. Stamens 4, didynamous. Ovary 2-loculed. Capsule oblong. Seeds numerous.

• Two species: endemic to China.

1a. Leaf margin serrate, apex acute; calyx 1–1.5 cm 1. *T. rupestris*

1b. Leaf margin entire or subentire, apex rounded; calyx ca. 0.7 cm 2. *T. integra*

1. *Trienophora rupestris* (Hemsley) Solereder, Ber. Deutsch. Bot. Ges. 27: 399. 1909.

呆白菜 dai bai cai

Rehmannia rupestris Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 195. 1890.

Herbs, 25–50 cm tall; stems, pedicels, petioles, and calyces white woolly. Stems simple or branched at base, ± woody. Basal leaves petiole 3–6 cm; leaf blade ovate-oblong to narrowly elliptic, 7–13 cm, thick, subleathery, white lanose-villous or subglabrous, base subrounded to broadly cuneate, margin coarsely serrate or lobed and toothed. Pedicel 0.6–2 cm. Bracteoles ca. 5 mm, inserted at middle of pedicels. Calyx 1–1.5 cm; lobules 3–6 mm. Corolla purple-red; tube narrowly tubular, straight or slightly curved; lower lip lobes oblong-ovate, ca. 6 × 5 mm; upper lip lobes broadly ovate, ca. 5 × 6

mm. Filaments glabrous. Ovary ovoid, ca. 5 mm. Style slightly longer than stamens, apex 2-lobed; stigma lobes subglobose. Seeds minute, oblong. Fl. Jul–Sep.

• Cliff faces; 200–1200 m. Hubei.

2. *Trienophora integra* (H. L. Li) Ivanina, Bot. Mater. Gerb. Inst. Komarova Akad. Nauk. SSSR 17: 393. 1955.

全缘叶呆白菜 quan yuan ye dai bai cai

Rehmannia integra H. L. Li, Taiwan 1: 80. 1948.

Herbs, 30–40 cm tall, white lanuginous or glabrescent. Branches thick, pendulous. Basal leaves petiole 5–8 cm; leaf blade ovate-oblong, 5–9 × 3–5.5 cm, base truncate to rounded, margin entire or subentire, apex rounded. Stem leaves petiole ca. 2.5 × 1.5 cm; leaf blade similar to basal leaves, smaller. Pedicel 5–10 mm. Calyx

tubular-campanulate, ca. 7 × 7 mm, 10-ribbed; lobules irregular, linear, ca. 7 mm, apex acuminate. Corolla ca. 5 cm, glandular pilose; tube 4–4.5 cm; limb 2-lipped, ca. 2.8 cm in diam., lower lobes subequal, rounded; upper lip longer than lower lip, 2-lobed. Stamens included,

glabrous; anthers ca. 2 mm. Ovary ovoid, glabrous. Style included, glabrous.
• Sichuan (Chengkou Xian).
Known only from the type specimen.

32. HEMIPHGRAMMA Wallich, Trans. Linn. Soc. London 13: 611. 1822.

鞭打绣球属 bian da xiu qiu shu

Herbs, diffusely creeping, villous. Stems slender, much branched, rooting from nodes. Leaves dimorphic. Stem leaves opposite, flat, orbicular. Branch leaves crowded, needlelike, involute. Flowers axillary, solitary. Calyx deeply 5-lobed to base, lobes narrow. Corolla white or rose, actinomorphic; lobes 5, subequal, as long as tube. Stamens 4, included, equal, inserted at base of corolla. Style shorter than or as long as stamens; stigma subulate or 2-lobed. Capsule septicial lengthwise, valves entire or 2-parted. Seeds numerous; seed coat smooth.

One species: tropical and subtropical Asia.

1. Hemiphragma heterophyllum Wallich, Trans. Linn. Soc. London 13: 612. 1822.

鞭打绣球 bian da xiu qiu

Perennials. Leaves on main stems with petiole 2–5(–10) mm or sometimes sessile; leaf blade orbicular, cordate, or reniform, 0.5–2 cm, base truncate, subcordate, or cuneate, margin serrately 2–7-toothed, apex obtuse to acuminate, veins inconspicuous. Leaves on branches crowded, needlelike, sometimes linear-lanceolate upward, 3–5 mm. Flowers sessile or short pedicelled. Calyx lobes narrowly triangular-lanceolate, 3–5 mm, subequal. Corolla white or rose, ca. 6 mm; tube short campanulate; lobes 5, orbicular to oblong, subequal, sometimes transparently punctate. Filaments filiform, adnate to corolla tube; anther locules apically confluent. Style ca. 1 mm. Capsule red, ovoid to globose, berrylike, ± fleshy, shiny, 5–6(–10) mm. Seeds pale yellow-brown, ovoid, to 1 mm. Fl. Apr–Jun, fr. Jun–Aug.

Alpine grassland, rock crevices, among herbs; 2600–4100 m. Gansu, Guangxi, Guizhou, Hubei, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Indonesia (Sulawesi), Nepal, Philippines, Sikkim].

1a. Leaves wider than long 1b. var. *pedicellatum*

1b. Leaves ± as wide as long.

2a. Leaf margin 5–7-toothed on each side;
flowers sessile 1a. var. *heterophyllum*

2b. Leaf margin 3–5-toothed on each side;
flowers short pedicellate 1c. var. *dentatum*

1a. Hemiphragma heterophyllum var. *heterophyllum*

鞭打绣球(原变种) bian da xiu qiu (yuan bian zhong)
Leaves 0.8–2 cm, ± as wide as long, margin serrately 5–7-toothed. Pedicel lacking.

Alpine grassland, rock crevices; 2000–4000 m. Fujian, Gansu, Guizhou, Hubei, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India, Indonesia (Sulawesi), Nepal, Philippines, Sikkim].

1b. Hemiphragma heterophyllum var. *pedicellatum*

Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 60: 154. 1923.

鞭打绣球有梗变种 bian da xiu qiu you geng bian zhong

Leaves wider than long, margin serrately 2–4-toothed. Pedicel 4–15 mm, slender.

• Among herbs; 3600–4100 m. NW Yunnan.

1c. Hemiphragma heterophyllum var. *dentatum* (Elmer) T. Yamazaki, J. Jap. Bot. 25: 212. 1950.

鞭打绣球齿状变种 bian da xiu qiu chi zhuang bian zhong

Nertera dentata Elmer, Leaflet Philipp. Bot. 1: 15. 1906;
Logania dentata (Elmer) Hayata.

Leaves 5–11 mm, ± as wide as long, thick, margin serrately 3–5-toothed. Pedicel short.

Among herbs; 2600–3000 m. Guangxi, Taiwan [Philippines].

33. ELLISIOPHYLLUM Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 16: 223. 1871.

幌菊属 huang ju shu

Moseleya Hemsley.

Herbs, prostrate. Stoloniferous. Leaves alternate, long petiolate; leaf blade pinnately parted nearly to midrib, segments incised and apically crenate. Bracts small, subulate. Flowers small, actinomorphic, solitary in leaf axils. Pedicel slender. Calyx campanulate, 5-lobed, parted to middle, outside densely hairy. Corolla tube inside densely barbate with unicellular hairs from throat to base; lobes 5, equal. Stamens 4, equal, inserted at corolla throat; anthers narrowly sagittate, 2-loculed. Disc cupular, sometimes suboblique, margin undulate. Ovary 2-loculed, apically barbate or subglabrous. Stigma 2-lobed. Capsule globose, included. Seeds densely villous with ± peltate hairs.

One species: Bhutan, China, India, Japan, New Guinea, Philippines.

1. Ellisiophyllum pinnatum (Wallich ex Benth) Makino, Bot. Mag. (Tokyo) 20: 91. 1906.

幌菊 huang ju

Ourisia pinnata Wallich ex Benth, Scroph. Ind. 47. 1835; *Ellisiophyllum reptans* Maximowicz; *Hornemannia pinnata* (Wallich ex Benth) Benth; *Moseleya pinnata* (Wallich ex Benth) Hemsley; *Sibthorpia pinnata* (Wallich ex Benth) Benth. Perennials, creeping, densely pubescent except for corolla. Stolons to 1 m, rooting from nodes, internodes 1.5–4 cm. Petiole 2.5–6 × ca. 1.2 mm, as thick or slightly thicker than stolon; leaf blade ovate to oblong-ovate, 2–5 cm, papery, sparsely villous, margin lobed below middle and acutely crenate above middle,

segments 5–9 and obovate. Pedicel subulate-triangular, nearly as long as petiole. Calyx 5–7 mm, membranous, lobes ovate to narrowly elliptic. Corolla white, funnelform, 7–12 mm; lobes oblong to spatulate. Capsule 4–5 mm in diam. Seeds few, subglobose, ca. 1.5 mm in diam. Fl. and fr. Jul–Sep.

Grassland, along streams, sparse forests; 1500–2500 m. Gansu, Guangxi, Guizhou, Hebei, Jiangxi, Sichuan, Yunnan [Bhutan, India, Japan, New Guinea, Philippines].

34. NEOPICRORHIZA D. Y. Hong, Opera Bot. 75: 56. 1984.

胡黄连属 hu huang lian shu

Herbs, perennial. Rhizomes stout, elongated. Leaves all basal, rosulate. Spikes terminal. Flowers bracteate. Bracteoles absent. Calyx lobed to near base. Corolla 2-lipped; upper lip much longer than lower, emarginate. Stamens 4; anterior 2 exceeding lower lip; posterior 2 slightly shorter than upper lip; anther locules basally divaricate, apically confluent. Ovary 2-loculed; ovules numerous. Capsule apically septifragal. Seed surface hyaline reticulate.

One species: Bhutan, China, Nepal, Sikkim.

1. *Neopicrorhiza scrophulariiflora* (Pennell) D. Y. Hong, Opera Bot. 75: 56. 1984.

胡黄连 hu huang lian

Picrorhiza scrophulariiflora Pennell, Acad. Nat. Sci. Philadelphia Monogr. 5: 65. 1943.

Perennials, 4–12 cm tall. Rhizomes to 1 cm in diam., coarsely rooting from nodes. Petiole short; leaf blade spatulate to ovate, 3–6 cm, black when dry, base tapering, margin serrate or rarely double serrate. Scape brown glandular hairy; spike 1–2 cm. Pedicel 2–3 mm. Calyx 4–6 mm, to 1 cm in fruit; lobes lanceolate to

obovate-oblong, upper lobe sublinear, brown glandular hairy. Corolla dark purple, 8–10 mm, outside pubescent; tube abaxially 2–3 mm, adaxially 4–5 mm; lower lip ca. 1/2 as long as upper, 3-lobed, lateral lobes with 2 or 3 small teeth; upper lip ± hooked, emarginate. Filaments glabrous, anterior 2 ca. 7 mm, posterior 2 ca. 4 mm.

Ovary 1–1.2 mm. Style 5–6 × as long as ovary. Capsule narrowly ovoid, 8–10 mm. Fl. Jul–Aug, fr. Aug–Sept.

Alpine grassland, gravelly areas; 3600–4400 m. W Sichuan, S Xizang, NW Yunnan [Bhutan, Nepal, Sikkim].

The rhizomes are used medicinally.

35. VERONICASTRUM Heister ex Fabricius, Enum. 111. 1759.

腹水草属 fu shui cao shu

Botryopleuron Hemsley; *Calorhabdos* Benth; *Leptandra* Nuttall.

Herbs, perennial. Roots usually densely yellow tomentose when young. Rhizomes short to long, rarely absent. Stems erect or arching and rooting at apex. Leaves alternate, opposite, or whorled. Inflorescences terminal or axillary, spicate. Flowers usually crowded. Calyx 5-lobed, upper lobe slightly smaller than others. Corolla 4-lobed; tube tubular, straight or slightly curved, usually with a ring of villous hairs inside, rarely glabrous; limb actinomorphic or ± 2-lipped; lobes unequal in width, upper widest, lower narrowest. Stamens 2; filaments usually basally villous, rarely glabrous, adnate to upper part of corolla tube; anther locules connivent, not confluent. Stigma small, slightly dilated. Capsule ovoid to ovoid-globose, slightly compressed laterally, 2-grooved, 4-valved. Seeds numerous per capsule.

About 20 species: E Asia, North America; 13 species in China.

1a. Stems winged; corolla tube as long as wide; corolla lobes as long as tube.

2a. Stems ca. 100 cm tall; leaf blade oblong, ovate, or lanceolate 10. *V. caulopteron*

2b. Stems 15–30 cm tall; leaf blade linear to elliptic 11. *V. formosanum*

1b. Stems terete or angular (but usually winged in *V. brunonianum* subsp. *sutchuense*); corolla tube longer than

wide; corolla lobes shorter than tube (equal to tube in *V. rhombifolia* and *V. axillare*).

3a. Corolla slightly to conspicuously 2-lipped, lower lobes ± reflexed, upper often galeate; seed coat transparent.

4a. Stems herbaceous, erect; leaves sessile, narrowly elliptic; corolla conspicuously 2-lipped, lower lobes

strongly reflexed 1. *V. brunonianum*

- 4b. Stems ± woody, climbing; leaves petiolate, blade ovate to ovate-lanceolate; corolla slightly 2-lipped, lower lobes not strongly reflexed 2. *V. yunnanense*
- 3b. Corolla actinomorphic, lobes straight; seed coat not transparent.
- 5a. Inflorescences terminal on main stems; flowers pedicellate; leaves sessile.
- 6a. Leaves in whorls of 4–6, oblong to broadly linear, 1.5–4.5 cm wide 12. *V. sibiricum*
- 6b. Leaves alternate, linear, ca. 0.6 cm wide 13. *V. tubiflorum*
- 5b. Inflorescences axillary or terminal on branches (sometimes terminal on main stem in *V. stenostachium*); flowers sessile; leaves short petiolate to subsessile.
- 7a. Bracts ovate-orbicular or ovate-lanceolate; corolla tube subglabrous inside 8. *V. robustum*
- 7b. Bracts linear-lanceolate to subulate; corolla tube with a ring of villous hairs inside.
- 8a. Leaves rhomboid, rarely rhomboid-ovate; corolla lobes 1/3–1/2 of corolla length 9. *V. rhombifolium*
- 8b. Leaves not rhomboid (rhomboid-ovate in *V. villosulum*); corolla lobes 1/6–1/4 of corolla length (1/3–1/2 in *V. axillare*).
- 9a. Ovaries and young fruit hairy; inflorescence axes, bracts, and calyx lobes densely capitate glandular or hispidulous 3. *V. longispicatum*
- 9b. Ovaries and young fruit glabrous; inflorescence axes, bracts, and calyx lobes not densely capitate glandular (bracts and calyx lobes sometimes densely pubescent in *V. villosulum* var. *villosulum* and var. *hirsutum*).
- 10a. Corolla lobes 1/3–1/2 of corolla length; stems angular in middle and apically 6. *V. axillare*
- 10b. Corolla lobes 1/6–1/4 of corolla length; stems terete, sometimes apically angular.
- 11a. Inflorescences less than 1.5 cm 7. *V. villosulum*
- 11b. Inflorescences 1.5–8 cm.
- 12a. Leaves narrowly ovate to lanceolate, 7–20 cm 4. *V. stenostachyum*
- 12b. Leaves ovate-orbicular to orbicular, 4–7 cm 5. *V. latifolium*

1. *Veronicastrum brunonianum* (Benth) D. Y. Hong in T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 230. 1979.

美穗草 mei sui cao

Rhizomes to 10 cm. Stems herbaceous, erect, 30–150 cm tall, terete, wingless or rarely winged, basally glabrous, apically with multicellular glandular hairs; branches rarely developed. Leaves alternate, sessile, narrowly elliptic, 10–20 × 3–5 cm, glabrous or adaxially sparsely puberulent, base cuneate to ± rounded and sometimes slightly amplexicaul, margin dentate to serrate, apex acuminate to caudate-acuminate. Inflorescences terminal, often 1, occasionally 2 or more, long caudate, axis densely glandular with multicellular hairs. Corolla white, yellow-white, grayish yellow, or orange-yellow, 6–8 mm, arching 30° forward; tube apically hairy inside; limb 2–3 mm, conspicuously 2-lipped, unequally lobed; lower lip linear-lanceolate, reflexed; upper lip 3-lobed, middle lobe ovate-orbicular and straight or ± galeate, lateral lobes erect or reversed toward lateral-posterior position. Stamens ± exerted; filaments hairy or sometimes glabrous; anthers to 2.5 mm. Capsule ovoid-globose, ca. 4 mm. Seeds angular; seed coat thick, transparent, reticulate. Fl. Jul–Sep.

Ravines, shaded slopes with grasses, under forests; 1500–3000 m. Guizhou (Fangjing Shan, Panxian Tequ), W Hubei, Sichuan, Xizang (Mainling Xian), Yunnan [Bhutan, Nepal, Sikkim].

- 1a. Stems wingless; filaments hairy 1a. subsp. *brunonianum*
- 1b. Stems usually winged; filaments mostly glabrous 1b. subsp. *sutchuenense*

1a. *Veronicastrum brunonianum* subsp. *brunonianum*
美穗草(原亚种) mei sui cao (yuan ya zhong)

Calorhabdos brunoniana Benth, Bot. Reg. 21: ad t. 1770. no. 72. 1835.

Stems terete, wingless. Filaments hairy. Fl. Jul–Sep.

Ravines, shaded slopes with grasses, under forests; 1500–3000 m. Guizhou (Fangjing Shan, Panxian Tequ), W Hubei, Sichuan (E of Erlang Shan), Xizang (Mainling Xian), Yunnan [Bhutan, Nepal, Sikkim].

1b. *Veronicastrum brunonianum* subsp. *sutchuenense* (Franchet) D. Y. Hong, Novon 6: 23. 1996.

川鄂美穗草 chuan e mei sui cao

Calorhabdos sutchuenensis Franchet, Bull. Soc. Bot. France 47: 18. 1900.

Stems usually winged. Filaments mostly glabrous. Fl. Jul.

• E Sichuan (Chengkou Xian, Wuxi Xian), W Hubei (Fangxian, Shennongjia Linqu).

The type locality of *Calorhabdos sutchuenensis* is Chengkou, E Sichuan, from where the specimens examined seem to be rather different from typical *Veronicastrum brunonianum* in having stems winged and filaments glabrous. However, the examination of two specimens from the Shennongjia Mountains of W Hubei showed that

one had winged stems and hairy filaments, while the other had wingless stems and glabrous filaments.

2. *Veronicastrum yunnanense* (W. W. Smith) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 130. 1957.
云南腹水草 yun nan fu shui cao

Botryopleuron yunnanense W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 9. 1917.

Stems ± woody, climbing, terete, obscurely angular, branched in middle, villous with multicellular hairs or with curly brown hairs. Leaves alternate, petiolate; leaf blade ovate to ovate-lanceolate, 3–5 × 1–2.5 cm, adaxially dark when dry, sparsely hairy. Inflorescences terminal, 3–6 cm, capitate glandular. Corolla white or blue, 5–6 mm, slightly arching forward; tube sparsely hairy inside; limb slightly 2-lipped, unequally lobed; lower lip 1-lobed, broadly linear, often reflexed; upper lip 3-lobed, middle lobe ± galeate. Stamens exerted; filaments basally hairy. Capsule ca. 2.5 mm. Seeds ovoid; seed coat thin, transparent, conspicuously reticulate. Fl. May–Aug.

• Scrub, forest margins. SW Sichuan, Yunnan (Yongping Xian, Yao'an Xian).

3. *Veronicastrum longispicatum* (Merrill) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 128. 1957.

长穗腹水草 chang sui fu shui cao

Botryopleuron longispicatum Merrill, Philipp. J. Sci. 21: 509. 1922.

Plants rhizomatous. Stems basally ± woody, erect, rarely trailing, to 1 m tall, terete, apically narrowly angular, glabrous to densely with yellow short curly hairs. Leaves alternate; petiole short; leaf blade ovate to ovate-lanceolate, 8–18 × 3–9 cm, papery to leathery, glabrous or abaxially sparsely puberulent, base rounded to rarely cordate, margin deltoid dentate, apex acuminate to caudate-acuminate. Inflorescences axillary, sometimes terminal, 3–10 cm, densely glandular hairy or hispidulous (sometimes excluding corolla); bracts narrow. Calyx much shorter than corolla; lobes subulate. Corolla white or purple, 5–6 mm, slightly curved forward, glabrous or glandular hairy outside; limb actinomorphic; lobes ca. 1/4 of corolla length, narrowly triangular. Stamens conspicuously exerted; filaments basally hairy. Ovary entirely or apically glandular hairy. Capsule ovoid, ca. 3 mm, hairy when young. Seeds ovoid-globose, ca. 0.5 mm; seed coat obscurely reticulate. Fl. Jul–Sep.

• Forests, thickets; below 1000 m. Guangdong, Guangxi (Jiuwan Shan), S Hunan.

The indumentum of *Veronicastrum longispicatum* is variable. Plants with glabrous stems are usually glandular hairy on the inflorescence axis and other floral parts, including the outer surface of the corollas. Plants with short curly hairs on the stems are hispidulous on the inflorescence axis and various floral parts, but the outer surface of the corollas are glabrous. Other combinations are also found.

4. *Veronicastrum stenostachyum* (Hemsley) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 128. 1957.

腹水草 fu shui cao

Rhizomes short, horizontal. Stems erect or arching, glabrous or hairy. Leaves alternate; petiole short; leaf blade ovate to lanceolate, 7–20 cm, membranous to papery, apex narrowly acuminate. Inflorescences axillary, sometimes terminal on main stems, 1.5–8 cm; bracts shorter or equal in length to corolla, sparsely ciliate, rarely glabrous. Calyx shorter or equal in length to corolla, sparsely ciliate, rarely glabrous. Corolla white, pale red, purple, or purple-red, 5–6 mm, straight; limb actinomorphic; lobes subdeltoid, less than 1 mm. Stamens conspicuously exerted; filaments hairy. Capsule ovoid. Seeds small; seed coat reticulate. Fl. Jun–Sep.

• Scrub, forests, forest margins; below 1300 m. NW Fujian, N to NE Guizhou, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan.

1a. Stems erect, branched 4b. subsp. *nanchuanense*
1b. Stems usually arching, simple.

2a. Stems glabrous 4a. subsp. *stenostachyum*
2b. Stems sparsely with yellow curly hairs 4c. subsp. *plukenetii*

4a. *Veronicastrum stenostachyum* subsp. *stenostachyum*
腹水草(原亚种) fu shui cao (yuan ya zhong)

Calorhabdos stenostachya Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 196. 1890; *C. fargesii* Franchet; *C. venosa* Hemsley p.p. excluding syntype from Zhejiang.

Stems more than 1 m, mostly arching and rooting apically, rarely erect, angular, glabrous. Leaf blade narrowly ovate to lanceolate. Inflorescences axillary, sometimes terminal on leafy branches, rarely also on main stems. Bracts and calyces shorter than or rarely as long as corolla, sparsely ciliate. Corolla white, purple, or purple-red. Fl. Jul–Sep.

• N Guizhou, W Hubei, NW Hunan, S Shaanxi, Sichuan (E of Erlang Shan).

Used medicinally.

This subspecies is variable and may be polytypic. Plants from S Shaanxi and NE Sichuan have usually broader leaves and bracts and more coarsely dentate leaf margin, while those from Emei Shan and Ya'an have narrower, lanceolate to ovate-lanceolate leaves and sparsely flowered inflorescences also terminal on main stems.

4b. *Veronicastrum stenostachyum* subsp. *nanchuanense* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 401. 1979.

南川腹水草 nan chuan fu shui cao

Stems erect, 50 cm tall, branched, with yellow short curly hairs. Leaf blade ovate to ovate-lanceolate, margin deltoid dentate to rarely serrate. Inflorescences axillary and terminal. Calyx lobes filiform, shorter than bracts, subglabrous. Corolla pale red. Fl. Jun–Aug.

• Sichuan (Nanchuan Xian).

4c. *Veronicastrum stenostachyum* subsp. *plukenetii* (T. Yamazaki) D. Y. Hong in T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 236. 1979.

腹水草 fu shui cao

Botryopleuron plukenetii T. Yamazaki, J. Jap. Bot. 27: 66. 1952.

Stems arching and rooting apically, sparsely with yellow short curly hairs. Leaf blade narrowly ovate to ovate-lanceolate, 9–16 × 3–6 cm, membranous to papery. Inflorescences 1.5–5 cm. Bracts and calyx lobes subulate, ciliate or glabrous. Fl. Jul–Aug.

• NW Fujian, NE Guizhou, Hubei (Xingshan Xian), Hunan, Jiangxi.

5. *Veronicastrum latifolium* (Hemsley) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 130. 1957.

宽叶腹水草 kuan ye fu shui cao

Calorhabdos latifolia Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 196. 1890.

Stems more than 1 m, apically arching and rooting, terete, apically narrowly angular, usually with yellow, short curly hairs, rarely glabrous. Leaves alternate; petiole short; leaf blade ovate-orbicular to orbicular, 4–7 × 2–5 cm, usually sparsely hispidulous, rarely glabrous, base rounded, truncate, or broadly cuneate, margin deltoid dentate, apex short acuminate. Inflorescences axillary, rarely also terminal, 1.5–4 cm; bracts narrow, ciliate. Calyx lobes ciliate. Corolla pale purple or white, ca. 5 mm, straight, limb actinomorphic; lobes deltoid, less than 1 mm. Stamens conspicuously exerted; filaments hairy. Capsule ovoid, 2–3 mm. Seeds ovoid-globose, ca. 0.3 mm; seed coat reticulate. Fl. Aug–Sep.

• Forests, thickets, sometimes hanging from rocks; 300–500 m. Guizhou, Hubei, Hunan, C to E Sichuan.

6. *Veronicastrum axillare* (Siebold & Zuccarini) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 130. 1957. 爬岩红 pa yan hong

Paederota axillaris Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 144. 1846; *Botryopleuron formosanum* Masamune; *Calorhabdos simadai* Masamune.

Rhizomes short, horizontal. Stems arching and rooting apically, basally terete, angular in middle and apically, glabrous, rarely sparsely hairy on angles. Leaves alternate; petiole short; leaf blade ovate to ovate-lanceolate, 5–12 cm, papery, glabrous, margin obliquely deltoid dentate, apex acuminate. Inflorescences axillary, rarely terminal, 1–3 cm. Bracts and calyx lobes linear-lanceolate to subulate, glabrous or ciliate. Corolla purple to purple-red, 4–5 mm, straight; limb actinomorphic; lobes ca. 2 mm, narrowly triangular. Stamens slightly to conspicuously exerted, exceeding corolla by ca. 2 mm; filaments hairy; anthers 0.6–1.5 mm. Capsule ovoid-globose, ca. 3 mm. Seeds oblong, ca. 0.6 mm; seed coat obscurely reticulate. Fl. Jul–Sep.

Forests, grasslands at forest margins, shaded places in valleys; low elevations. Anhui (Shucheng Xian), Fujian, Guangdong (Ruyuan Yao Zizhi Xian), S Jiangsu, Jiangxi, Taiwan (Xinzhu Xian), Zhejiang [Japan].

7. *Veronicastrum villosulum* (Miquel) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 130. 1957. 毛叶腹水草 mao ye fu shui cao

Rhizomes short. Stems arching and rooting apically, terete, sometimes apically narrowly angular. Leaves alternate; petiole short; leaf blade rhomboid-ovate, 4–15 × 1.5–7 cm, glabrous or hairy, base mostly broadly cuneate to rarely rounded, margin dentate, apex acute to acuminate. Inflorescences capitate, axillary, 1–1.5 cm; bracts lanceolate, as long as or shorter than corolla, ciliate. Calyx shorter than bracts; lobes subulate. Corolla straight; limb actinomorphic; lobes 1–2 mm. Stamens conspicuously exerted; filaments hairy; anthers 1.2–1.5 mm. Capsule ovoid, ca. 2.5 mm. Seeds black, globose. Fl. May–Sep.

Forests, grasslands at forest margins, thickets; 400–900 m. Anhui, N Fujian, E to N Jiangxi, Zhejiang [Japan].

Veronicastrum villosulum is very variable in indumentum, leaf margin, corolla length, and merosity. However, its inflorescences are always short, capitate or subcapitate, bracts and calyx lobes are always ciliate, and by these characters it can be distinguished from *V. axillare* and *V. stenostachyum*. Four varieties can be tentatively recognized although they are not always correlated with distinct geographical distributions.

1a. Corolla lobes deltoid, ca. 1 mm 7a. var. *villosulum*

1b. Corolla lobes narrowly triangular, 1–2 mm.

2a. Leaves 4–8 cm; corolla 3.5–5 mm

..... 7c. var. *parviflorum*

2b. Leaves 6–15 cm; corolla 5–9 mm.

3a. Stems and leaves hairy .. 7b. var. *hirsutum*

3b. Stems and leaves glabrous 7d. var. *glabrum*

7a. *Veronicastrum villosulum* var. *villosulum*

毛叶腹水草(原变种) mao ye fu shui cao (yuan bian zhong)

Paederota villosula Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 118. 1866; *Botryopleuron macrophyllum* H. L. Li.

Stems, leaves, bracts, and calyx lobes densely with brown multicellular glandular hairs. Leaf blade 7–12 × 3–7 cm. Corolla purple to purple-blue, 6–7 mm; lobes ca. 1 mm, deltoid. Fl. Jun–Aug.

Forests. S Anhui (Huang Shan, Qimen Xian), N Jiangxi (Lu Shan), Zhejiang (Kaihua Xian) [Japan].

Used medicinally for fever caused by snail-borne diseases.

7b. *Veronicastrum villosulum* var. *hirsutum* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 401. 1979.

刚毛腹水草 gang mao fu shui cao

Stems usually with brownish yellow pubescence of multicellular curly hairs, rarely with brown multicellular glandular hairs. Leaf blade mostly ovate to ovate-orbicular, hirsute, rarely with brown multicellular glandular hairs. Bracts and calyx lobes with long to short glandular hairs. Corolla purple, 5–9 mm; lobes 1.5–2 mm, narrowly triangular. Fl. May–Aug.

• Forests; 400–600 m. N Fujian, E Jiangxi, S Zhejiang.

7c. *Veronicastrum villosulum* var. *parviflorum* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 401. 1979.

两头忙 liang tou mang

Veronicastrum lungtsuanense M. Cheng & Z. J. Feng.

Stems densely with short curly hairs. Leaf blade ovate to ovate-lanceolate, 4–8 × 1.5–3 cm, with short curly hairs on veins, base truncate to rounded to rarely broadly cuneate, margin crenate with sinuses basally having a pointed process. Corolla white, 3.5–5 mm; lobes 1.2–1.6 mm. Fl. Jul–Sep.

• Forests, grasslands at forest margins; ca. 900 m. S Zhejiang.

7d. *Veronicastrum villosulum* var. *glabrum* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 402. 1979.

铁钓竿 tie diao gan

Stems and leaves glabrous. Leaf blade narrowly ovate to ovate-lanceolate, 6–15 × 2.5–6 cm, papery, adaxially lucid, base rounded, margin dentate with teeth oblique toward leaf apex, apex acuminate. Bracts and calyx lobes densely ciliate. Corolla purple, pale purple, or purple blue, 5–6 mm; lobes narrowly triangular, ca. 1.5 mm.

• Forests and thickets. Anhui (Qimen Xian), S Zhejiang.

Used medicinally for fever caused by snail-borne diseases.

8. *Veronicastrum robustum* (Diels) D. Y. Hong in T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 244. 1979.

粗壮腹水草 cu zhuang fu shui cao

Rhizomes short. Stems erect, to 1 m tall, ± twisted apically at each node, stout, terete, glabrous. Leaves alternate, subsessile; leaf blade lanceolate to ovate-orbicular, 15–27 × 3.5–11 cm. Inflorescences axillary, ascending, patent or ± pendulous, sometimes 2 or 3 in leaf axil, 2–6 cm; bracts ovate-orbicular to ovate-lanceolate, 1.5–5 mm, short ciliate. Calyx lobes shorter than bracts, lanceolate, short ciliate. Corolla purple or white, 4.5–7 mm, straight; tube subglabrous inside; limb actinomorphic; lobes 1–2 mm, narrowly triangular. Stamens conspicuously exerted; filaments hairy. Capsule 2.5–3 mm. Seeds oblong. Fl. Jun–Jul.

• Sparse forests, thickets. NW Fujian, NW Guangxi, SW Hunan, NE Jiangxi.

1a. Leaves ovate to lanceolate, usually serrate, adaxially with curly hairs on lower 1/2 of midrib 8a. subsp. *robustum*

1b. Leaves ovate-orbicular, dentate, glabrous 8b. subsp. *grandifolium*

8a. *Veronicastrum robustum* subsp. *robustum*

粗壮腹水草(原亚种) cu zhuang fu shui cao (yuan ya zhong)

Calorhabdos robusta Diels, Notizbl. Bot. Gart. Mus. Berlin-Dahlem 9: 1031. 1927.

Leaves adaxially lucid, with short curly hairs on basal 1/2 of midrib; leaf blade ovate to lanceolate, 15–20 × 3.5–8.5 cm, green-black, base rounded to broadly

cuneate or rarely shallowly cordate, margin usually serrate. Fl. Jun–Jul.

• Sparse forests, thickets; 500–600 m. NW Fujian, NE Jiangxi.

8b. *Veronicastrum robustum* subsp. *grandifolium* T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 402. 1979.

大叶腹水草 da ye fu shui cao

Leaves glabrous; leaf blade ovate-orbicular, rarely lanceolate, 15–27 × 7–11 cm, green or brown, not lucid, base cordate, truncate, or rounded, margin mostly dentate.

• Sparse forests, thickets. NW Guangxi, SW Hunan.

9. *Veronicastrum rhombifolium* (Handel-Mazzetti) P. C. Tsoong ex T. L. Chin & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 245. 1979.

菱叶腹水草 ling ye fu shui cao

Botryopleuron rhombifolium Handel-Mazzetti, Oesterr. Bot. Z. 90: 124. 1941.

Rhizomes short. Stems often erect, ca. 50 cm tall, rarely trailing and rooting and ca. 1 m, angular, wingless, with multicellular hirsute hairs. Leaves alternate; petiole short; leaf blade often rhomboid, rarely rhomboid-ovate, 4–6 × 1.5–3 cm, papery, with multicellular hispid hairs, sometimes abaxially purple, margin serrate to crenate. Inflorescences axillary, sometimes surrounded by several leafy involucre bracts and appearing terminal, 1–3 cm, horizontal or pendulous in fruit. Bracts and calyx lobes lanceolate to subulate, densely ciliate, slightly shorter or as long as corolla. Corolla purple, red, or white, 5–6 mm, straight; limb actinomorphic; lobes subulate-triangular, 1/3–1/2 of corolla length. Stamens conspicuously exerted; filaments hairy. Capsule ovoid, 3–4 mm. Seeds ovoid-globose, ca. 0.4 mm; seed coat reticulate. Fl. Aug–Sep.

• Thickets; below 2800 m. Sichuan (Ya'an Diqu).

10. *Veronicastrum caulopterum* (Hance) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 127. 1957.

四方麻 si fang ma

Calorhabdos cauloptera Hance in Trimmer, J. Bot. 15: 298. 1877; *Veronica martini* H. Léveillé.

Stems erect, ca. 1 m tall, branched, with wings ca. 1 mm wide, glabrous. Leaves alternate, subsessile or petiole ca. 4 mm; leaf blade oblong, ovate, or lanceolate, 3–10 × 1.2–4 cm. Inflorescences terminal on main stems and on leafy branches; bracts long caudate. Pedicel less than 1 mm. Calyx lobes subulate-lanceolate, ca. 1.5 mm. Corolla red, purple-red, or dark purple, 4–5 mm; tube as long as limb; limb ± actinomorphic; upper lobes ovate-orbicular, lower lobes lanceolate. Stamens slightly exerted; filaments hairy. Capsule ovoid to ovoid-globose, 2–3.5 mm. Fl. Aug–Nov.

• Valley meadows, sparse forests; below 2000 m. Guangdong, Guangxi, Guizhou (Xingren Xian), SW Hubei, Hunan, Jiangxi, SE Yunnan.

Used medicinally to treat dysentery and sore throat.

One specimen from Pingshan, Sichuan (*T. T. Yü 4333*) belongs to *Veronicastrum caulopterum* but differs in having thin stems prostrate basally, petioles ca. 1 cm, short and lax inflorescences, and pedicel ca. 2 mm. Furthermore, it is a distant disjunct from the main area and seems to merit subspecific rank. However, the material is inadequate for a proper taxonomic treatment.

11. *Veronicastrum formosanum* (Masamune) T. Yamazaki, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 127. 1957.

台湾腹水草 tai wan fu shui cao

Veronica formosana Masamune, J. Soc. Trop. Agric. 2: 241. 1930; *Calorhabdos kitamurae* Ohwi; *Veronicastrum kitamurae* (Ohwi) T. Yamazaki.

Stems erect, 15–30 cm tall, simple or branched, winged, glabrous. Leaves alternate, subsessile to short petiolate; leaf blade broadly linear to elliptic, 4–11 × 0.5–2 cm, glabrous, base attenuate, margin serrate to dentate and with ascending teeth tips, apex acute to acuminate.

Racemes terminal on main stems and leafy branches, 1.5–4.5 cm; bracts subulate-lanceolate, 3–5 × ca. 1 mm. Calyx glabrous; lobes subulate-lanceolate, 3–4 × ca. 1 mm. Corolla greenish to yellowish or purplish, ca. 3 mm, pubescent; tube as long as limb; limb actinomorphic. Stamens nearly as long as corolla; filaments hairy. Capsule ovoid-globose, 3–4 mm, glabrous. Fl. Jul–Aug.

• 2000–3000 m; Taiwan (Hualian Xian).

12. *Veronicastrum sibiricum* (Linnaeus) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 321. 1935.

草本威灵仙 cao ben wei ling xian

Veronica sibirica Linnaeus, Sp. Pl. ed. 2, 12. 1762; *V. sibirica* var. *glabra* Nakai.

Rhizomes horizontal, to 13 cm, internodes short. Stems erect, simple, terete, glabrous or sparsely villous and with multicellular hairs. Leaves in whorls of 4–6, sessile, oblong to broadly linear, 8–15 × 1.5–4.5 cm, glabrous or sparsely hirsute and with multicellular hairs. Inflorescences terminal; bracts long caudate, glabrous. Calyx less than 1/2 as long as corolla; lobes subulate. Corolla red-purple, purple, or pale purple, 5–7 mm; tube tubular, straight, apically hairy inside; limb actinomorphic; lobes 1.5–2 mm. Capsule ovoid, ca. 3.5 mm. Seeds ellipsoid. Fl. Jul–Sep.

Trailsides, grassy slopes, thickets; below 2500 m. E Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, N Shaanxi, N Shanxi, Shandong [Japan, Korea, Mongolia, Russia].

13. *Veronicastrum tubiflorum* (Fischer & C. A. Meyer) H. Hara, J. Jap. Bot. 16: 159. 1940.

管花腹水草 guan hua fu shui cao

Veronica tubiflora Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 2: 53. 1835.

Roots glabrous. Rhizomes absent. Stems erect, 40–70 cm tall, simple, terete, apically villous. Leaves alternate, sessile, linear, 3–9 × ca. 0.6 cm, papery, abaxially densely villous, adaxially hispidulous, glabrescent, margin sparsely serrate, 1-veined. Inflorescences terminal, single, 5–15 cm, axis and pedicels sparsely villous. Calyx lobes lanceolate, ca. 1.5 mm, short ciliate. Corolla blue to pale red, ca. 6 mm; tube tubular, straight, apically hairy inside; limb actinomorphic; lobes ca. 1/4 of corolla length. Capsule ovoid, 2–2.5 mm, apex acute. Fl. Jun–Aug.

Meadows, thickets; low elevations. Heilongjiang, Jilin, Nei Mongol [Mongolia, Russia (Far East, E Siberia)].

36. SCROFELLA Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 511. 1888.

细穗玄参属 xi sui xuan shen shu

Herbs, perennial. Roots glabrous. Rhizomes present. Stems erect. Leaves alternate. Inflorescences terminal, spicate. Flowers crowded. Calyx 5-lobed, upper lobe much smaller than other lobes. Corolla unequally 4-lobed; tube at first as long as limb, straight, becoming jar-shaped and slightly longer than limb; limb 2-lipped; lower lip narrowly ligulate, conspicuously reflexed; upper lip shallowly 3-lobed, middle lobe wider than lateral 2, base with dense tuft of hairs, apex subtruncate, lateral lobes revolute toward lateral-posterior position. Stamens 2, included; filaments glabrous, adnate to middle of corolla tube; anther locules parallel, not confluent. Disc cupular. Style short, persistent; stigma slightly dilated, short clavate, apex obscurely emarginate. Capsule ovoid-conical, slightly compressed laterally, 2-grooved, 4-valved. Seeds numerous per capsule, ellipsoid, slightly curved; seed coat thick, transparent, foveolate.

• One species: endemic to China.

1. *Scrofella chinensis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 511. 1888.

细穗玄参 xi sui xuan shen

Stems 20–50 cm, simple, glabrous. Leaves crowded, sessile, oblong to lanceolate, 2–6 × ca. 1 cm, upper leaves narrower, glabrous, margin entire, midrib

prominent. Inflorescences to 10 cm; axes, bracts, and calyx lobes glandular villous; bracts subulate. Calyx lobes subulate, ca. 2 mm. Corolla white, ca. 4 mm.

Capsule ca. 4 mm. Seeds ca. 1 mm. Fl. Jul–Aug.

• Meadows; 2800–3900 m. SE Gansu, E Qinghai, Sichuan (Barkam Xian, Songpan Xian).

37. PSEUDOLYSIMACHION (W. D. J. Koch) Opiz, Seznam 80. 1852.

穗花属 *sui hua shu*

Veronica sect. *Pseudolysimachia* W. D. J. Koch, Syn. Fl. Germ. Helv. 527. 1837.

Herbs, perennial. Roots glabrous. Rhizomes usually long. Stems 1 or cespitose, base sometimes woody. Leaves opposite or whorled, rarely alternate. Inflorescences terminal, dense racemes or spikes; bracts small, narrow. Calyx 4-lobed; lobes subequal. Corolla 4-lobed; tube rarely less than 1/3 of corolla length, villous inside; limb slightly zygomorphic; upper lobe widest. Stamens 2; filaments adnate to posterior part of corolla tube; anther locules apically confluent. Style persistent; stigma capitate. Capsule subglobose, slightly laterally compressed, apex rounded-obtuse and emarginate, loculicidal. Seeds numerous per capsule, flattened, smooth.

About 20 species: Asia, Europe; ten species in China.

- 1a. Leaves all alternate or at least apically on stem (rarely all opposite in *P. linariifolium*).
- 2a. Stems 1, very rarely 2; rhizomes herbaceous; corolla tube ca. 1/3 of corolla length 1. *P. linariifolium*
- 2b. Stems cespitose; rhizomes woody; corolla tube 1/3–1/2 of corolla length 2. *P. pinnatum*
- 1b. Leaves opposite or whorled (sometimes alternate upward in *P. incanum*).
- 3a. Pedicel absent or less than 2 mm; ovary and capsule apically hairy.
- 4a. Stems mostly densely white woolly; corolla lobes ovate to ovate-orbicular 3. *P. incanum*
- 4b. Stems mostly villous and green, gray-green, or gray; corolla lobes ovate-lanceolate to lanceolate.
- 5a. Leaf blade deeply cut to dentate; leaf axils often with sterile branches; calyx lobes glandular ciliate; corolla white, lobes apically slightly thickened and reflexed 4. *P. alatavicum*
- 5b. Leaf blade crenate or entire; leaf axils without branches; calyx lobes eglandular ciliate, otherwise often glandular hairy; corolla blue, purple, rarely white, lobes apically not thickened and erect to slightly patent 5. *P. spicatum*
- 3b. Pedicel 2 mm or more; ovary and capsule glabrous (ovary sometimes hairy in *P. kiusianum*).
- 6a. Leaves sessile, ± amplexicaul at least basally or to middle of stem; corolla tube less than 1/3 of corolla length.
- 7a. Stems usually with white and curly hairs; leaves opposite, petiolate 10. *P. rotundum*
- 7b. Stems glabrous or puberulent; leaves alternate, sessile or subsessile 1. *P. linariifolium*
- 6b. Leaves petiolate; corolla tube at least 1/3 of corolla length.
- 8a. Leaf margin deeply cut to pinnately parted; corolla white or pink 7. *P. dauricum*
- 8b. Leaf margin dentate to double dentate or serrate to double serrate, sometimes deeply serrate; corolla purple to blue.
- 9a. Stems glabrous or apically very sparsely villous; leaf blade lanceolate; stamens conspicuously exerted 8. *P. longifolium*
- 9b. Stems pubescent, sometimes densely so, rarely apically glabrous; leaf blade narrowly oblong, deltoid-ovate, ovate-lanceolate, or elliptic; stamens included.
- 10a. Lower leaves subsessile; leaf blade narrowly oblong to elliptic 6. *P. spurium*
- 10b. Lower leaves petiole 1–2.5 cm; leaf blade deltoid-ovate to ovate-lanceolate .. 9. *P. kiusianum*

1. *Pseudolysimachion linariifolium* (Pallas ex Link) Holub, Folia Geobot. Phytotax. 2: 422. 1967.

细叶穗花 *xi ye sui hua*

Rhizomes short, herbaceous. Stems erect, 1 or rarely 2, 30–80 cm tall, often simple, usually with white curly hairs. Leaves alternate at least apically on stem, rarely all opposite, sessile or subsessile; leaf blade linear to ovate-orbicular, glabrous or white pubescent, margin entire or occasionally distally dentate. Inflorescences 1 or several. Pedicel 2–4 mm, pubescent. Corolla blue, purple, or rarely white, 5–6 mm; tube ca. 2 mm; upper lobe ovate-orbicular, other 3 lobes ovate. Stamens

exserted, glabrous. Capsule 2–3.5 × 2–3.5 mm. Fl. Jun–Oct.

Meadows, thickets, sparse forests; 200–2100 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia (Far East, E Siberia)].

- 1a. Leaves alternate or sometimes lower ones opposite; leaf blade linear to linear-oblong 1a. subsp. *linariifolium*
- 1b. Leaves almost all opposite or at least lower ones; leaf blade broadly linear to ovate-

orbicular

..... 1b. subsp. *dilatatum*

1a. *Pseudolysimachion linariifolium* subsp. *linariifolium*

细叶水蔓菁 xi ye shui man jing

Veronica linariifolia Pallas ex Link, Jahrb. Gewächsk. 1(3): 35. 1820; *V. angustifolia* Fischer ex Link.

Leaves alternate or sometimes lower ones opposite; leaf blade linear to linear-oblong, 2–6 × 0.2–1 cm, margin basally entire and apically dentate, occasionally entire. Fl. Jun–Sep.

Meadows, thickets, sparse forests; 200–2100 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Russia (Far East, E Siberia)].

1b. *Pseudolysimachion linariifolium* subsp. *dilatatum* (Nakai & Kitagawa) D. Y. Hong, Novon 6: 23. 1996.

水蔓菁 shui man jing

Veronica angustifolia Fischer var. *dilatata* Nakai & Kitagawa, Rep. Exped. Manchoukuo sect. 4(1): 54. 1934; *Pseudolysimachion galactites* (Hance) Holub; *Veronica galactites* Hance; *V. jeholensis* Nakai; *V. linariifolia* Pallas ex Link var. *dilatata* (Nakai & Kitagawa) Nakai & Kitagawa; *V. linariifolia* subsp. *dilatata* (Nakai & Kitagawa) D. Y. Hong; *V. linariifolia* var. *jeholensis* (Nakai) Kitagawa.

Leaves opposite at least on lower nodes; leaf blade broadly linear to ovate-orbicular, 0.5–2 cm wide, margin always dentate. Fl. Jul–Oct.

• Meadows, thickets; 200–2100 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang. Edible, used as a vegetable.

2. *Pseudolysimachion pinnatum* (Linnaeus) Holub, Folia Geobot. Phytotax. 2: 425. 1967.

羽叶穗花 yu ye sui hua

Veronica pinnata Linnaeus, Mant. Pl. 1: 24. 1767; *Pseudolysimachion laetum* (Karelin & Kirilow) Holub; *Veronica laeta* Karelin & Kirilow.

Rhizomes woody. Plants with short upwardly appressed white hairs. Stems several, cespitose, erect or slightly procumbent, 10–40 cm tall, often with sterile branches in axil of leaves, base woody. Leaves alternate; leaf blade pinnatisect, 1–3 cm × 1–5 mm, ± falciform curved; segments linear to oblanceolate, margin dentate to subentire. Inflorescences narrowly spicate. Pedicel as long as or slightly longer than calyx lobes. Calyx 2–2.5 mm. Corolla pale blue, pale purple, or rarely white, 5–7 mm; tube 2–3 mm; lobes apically rounded obtuse, upper lobe orbicular, other 3 lobes ovate-orbicular. Stamens slightly exerted. Capsule 2–4 × 2–4 mm. Seeds ca. 1 mm. Fl. Jun–Aug. $2n = 34$.

Stony slopes, forests steppes; below 2000 m. N Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

3. *Pseudolysimachion incanum* (Linnaeus) Holub, Folia Geobot. Phytotax. 2: 424. 1967.

白兔儿尾苗 bai tu er wei miao

Veronica incana Linnaeus, Sp. Pl. 1: 10. 1753; *V. xilinensis* Y. Z. Zhao.

Plants densely white woolly, leaves adaxially sparsely woolly and gray-green. Stems erect or ascending, several and cespitose, 15–40 cm tall, simple. Leaves opposite, sometimes alternate upward; petiole of lower leaves ca. 2 cm, other leaves subsessile; leaf blade oblong to broadly linear, 1.5–3 × 0.3–1.5 cm, base cuneate, margin crenate or entire, apex obtuse to acute. Inflorescences narrowly spicate. Pedicel short. Calyx ca. 2 mm. Corolla blue, blue-purple, or white, 5–7 mm; tube 1.5–2 mm; lobes often reflexed, ovate to ovate-orbicular. Stamens slightly exerted. Ovary and basal portion of style with multicellular glandular hairs. Capsule slightly longer than calyx, hairy. Fl. Jun–Aug. $2n = 68$.

Steppes, dunes; below 1200 m. N Heilongjiang, N Nei Mongol, N Xinjiang [N Japan, Kazakistan, Korea, Mongolia, Russia; Europe].

4. *Pseudolysimachion alatavicum* (Popov) Holub, Folia Geobot. Phytotax. 2: 423. 1967.

阿拉套穗花 a la tao sui hua

Veronica alatavica Popov, Byull. Moskovsk. Obsch. Isp. Prir., Otd. Biol. 47: 87. 1938.

Rhizomes branched, woody. Stems gray, erect or ascending, numerous, cespitose, 30–50 cm tall, simple, sometimes with sterile branches from leaf axil, densely with appressed white hairs. Leaves opposite; petiole to 1 cm; leaf blade elliptic, 2–5 × 0.8–2 cm, hairy, abaxially more densely, margin deeply cut or dentate. Inflorescences ca. 5 cm in flower. Pedicel less than 1 mm in flower. Corolla white, ca. 5 mm; tube ca. 2 mm; lobes apically thickened and reflexed, upper lobe narrowly ovate, other 3 lobes lanceolate. Stamens conspicuously exerted. Ovary narrowly ovoid, hispid with multicellular hairs. Fl. Jul–Aug.

Mountain slopes; 1500–2500 m. Xinjiang (Shawan Xian) [Kazakhstan, Kyrgyzstan].

5. *Pseudolysimachion spicatum* (Linnaeus) Opiz, Seznam 80. 1852.

穗花 sui hua

Veronica spicata Linnaeus, Sp. Pl. 1: 10. 1753; *V. porphyriana* Pavlov; *V. spicata* subsp. *porphyriana* (Pavlov) Elenevsky.

Stems often gray or gray-green, erect or ascending, 1 or several and cespitose, 15–50 cm tall, simple, densely villous hairy, rarely basally mixed with glutinous glandular hairs, apically densely with viscid glandular hairs. Leaves opposite, often more crowded at stem base; petiole of lower leaves ca. 2.5 cm, shorter to subsessile on upper leaves; leaf blade oblong to lanceolate, 2–8 × 0.5–3 cm, smaller upward, sparsely to densely with viscid glandular hairs, margin entire or crenate. Inflorescences densely with viscid glandular hairs. Flowers subsessile. Calyx 2.5–3.5 mm. Corolla purple, blue, or rarely white, 6–7 mm; tube ca. 1/3 of corolla length; lobes slightly patent, upper lobe ovate-

lanceolate and other 3 lobes lanceolate. Stamens slightly exerted. Young capsule oblong-globose, with multicellular glandular hairs. Fl. Jul–Sep. $2n = 34, 64, 68, 70$.

Meadows, coniferous forests; below 2500 m. NW Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia; Europe].

6. Pseudolysimachion spurium (Linnaeus) Rauschert, Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg, Math.-Naturwiss. Reihe 15: 775. 1966.

轮叶穗花 lun ye sui hua

Veronica spuria Linnaeus, Sp. Pl. 1: 10. 1753; *V. paniculata* Linnaeus.

Stems erect, 30–100 cm tall, apically branched, densely with short curly hairs. Leaves in whorls of 3 or 4 or opposite, lower leaves subsessile, others with petioles 3–8 mm; leaf blade narrowly oblong to elliptic, 3–8 × 1–3 cm, puberulent, margin deeply dentate, sometimes double dentate, upper leaves often subentire.

Inflorescences several to numerous racemes, short glandular hairy. Pedicel ca. 2 mm. Calyx ca. 2 mm. Corolla purple to blue, 5–6 mm; tube 1/3–2/5 of corolla length; lobes patent, upper lobe obovate-orbicular, other 3 lobes narrowly ovate. Stamens slightly exerted.

Ovary glabrous. Style ca. 6 mm. Capsule 2.5–3.5 × 2–2.5 mm. Fl. Jul–Aug. $2n = 34$.

Mountain slopes, steppes; ca. 1100 m. NW Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia; Europe].

7. Pseudolysimachion dauricum (Steven) Holub, Folia Geobot. Phytotax. 2: 424. 1967.

大穗花 da sui hua

Veronica daurica Steven, Mém. Soc. Imp. Naturalistes Moscou 5: 339. 1817.

Stems erect, 1 or several and cespitose, to 1 m tall, simple or rarely apically branched, usually densely with multicellular glandular hairs or villous, with a ring at each node connecting petiole base. Leaves opposite; petiole 1–1.5 cm, rarely shorter; leaf blade ovate, ovate-lanceolate, or lanceolate, 2–8 × 1–3.5 cm, glandular pubescent, base often cordate to rarely acute, margin basally deeply cut to pinnately parted, often mixed with double teeth, apically and segments coarsely dentate, apex often obtuse. Inflorescences 1, rarely several, never in a large panicle, glandular hairy. Pedicel 2–3 mm. Corolla white or pink, ca. 8 mm; tube ca. 1/3 of corolla length; lobes patent, ovate-orbicular to narrowly ovate. Stamens slightly exerted. Capsule as long as calyx. Persistent style ca. 1 cm. Fl. Jul–Aug. $2n = 32$.

Steppes, dunes, sparse forests; below 1300 m. Hebei, Heilongjiang, Henan (Shangcheng Xian), Jilin, Liaoning, Nei Mongol [Korea, Mongolia, Russia (Far East, E Siberia)].

8. Pseudolysimachion longifolium (Linnaeus) Opiz, Seznam 80. 1852.

兔儿尾苗 tu er wei miao

Veronica longifolia Linnaeus, Sp. Pl. 1: 10. 1753; *V. exortiva* Kitagawa, p.p. excl. specim. Saghal; *V. longifolia* var. *exortiva* (Kitagawa) Kitagawa.

Stems erect, 1 or several and cespitose, 40–100 cm tall or more, usually simple, with sterile branches in leaf axils, with a ring at each node connecting petiole bases, glabrous or apically very sparsely white villous. Leaves opposite, occasionally in whorls of 3 or 4; petiole 2–4(–10) mm; leaf blade lanceolate, 4–15 × 1–3 cm, glabrous or with short curly hairs, base rounded to broadly cuneate to sometimes cordate, margin deeply serrate, and often partly double serrate, apex acuminate. Inflorescences 1 or several, never in a large panicle, with white short curly hairs. Pedicel straight, ca. 2 mm. Corolla purple to blue, 5–6 mm; tube 2/5–1/2 of corolla length; lobes patent, upper lobe ovate, other 3 lobes narrowly ovate. Stamens conspicuously exerted. Capsule ca. 3 mm, glabrous. Persistent style ca. 7 mm. Fl. Jun–Aug. $2n = 34, 64, 68, 70$.

Steppes, grassy mountain slopes, meadows at forest edges, *Betula* forests; below 1500 m. Heilongjiang, Jilin (Wangqing Xian), Nei Mongol, N Xinjiang [Kazakhstan, N Korea, Mongolia, Russia; SW Asia, Europe].

9. Pseudolysimachion kiusianum (Furumi) T. Yamazaki, J. Jap. Bot. 43: 409. 1968.

长毛穗花 chang mao sui hua

Veronica kiusiana Furumi, Bot. Mag. (Tokyo) 30: 122. 1916; *V. glabrifolia* Kitagawa; *V. kiusiana* var. *glabrifolia* (Kitagawa) Kitagawa.

Stems erect, 1 or several and cespitose, more than 50 cm tall, sometimes apically branched, often pubescent, rarely apically glabrous, with a ring at each node connecting petiole bases. Leaves opposite; petiole 1–2.5 cm, shorter upward, pubescent; leaf blade deltoid-ovate to ovate-lanceolate, 4–12 × 2.5–6 cm, glabrous or sparsely pubescent, base truncate, shallowly cordate, or rarely cuneate, margin deltoid dentate, apex acute to acuminate. Inflorescences 1 or rarely more, never in a large panicle, axis and pedicels villous. Pedicel 2–5 mm. Corolla purple to blue, 5–7 mm; tube ca. 1/3 of corolla length; upper lobe ovate-orbicular, other 3 lobes ovate. Stamens slightly exerted. Ovary hairy or glabrous. Capsule 3–5 mm, glabrous. Fl. Aug–Sep. $2n = 34, 68$.

Meadows, grasses at forest edges. SE Jilin, Liaoning (Zhuanghe Xian) [Japan, Korea].

10. Pseudolysimachion rotundum (Nakai) T. Yamazaki, J. Jap. Bot. 43: 411. 1968.

无柄穗花 wu bing sui hua

Veronica rotunda Nakai, Bot. Mag. (Tokyo) 29: 3. 1915.

Stems 1, erect, ca. 1 m tall, simple or apically branched, glabrous or puberulent, with a ring at each node connecting petiole bases. Leaves opposite, sessile, ± amplexicaul, sometimes short petiolate upward; leaf blade glabrous or abaxially pubescent along veins, base

cuneate, margin deltoid dentate, apex acute to short acuminate. Inflorescences mostly 1, axis densely with white short curly hairs. Pedicel 2–5 mm, densely with multicellular glandular hairs, rarely villous. Corolla blue, blue-purple, or rarely white, 6–7 mm; tube less than 1/3 of corolla length; lobes ± patent, upper lobe ovate-orbicular, other 3 lobes narrowly ovate. Stamens exerted. Capsule 3–5 mm. Fl. Jun–Aug. $2n = 34$.

Meadows, among grasses at forest margins, forests, grassy mountain slopes; below 1600 m. Anhui (Yuexi Xian), Heilongjiang, Henan (Shangcheng Xian), Jilin, Liaoning, Shanxi, Zhejiang (Lin'an Xian) [Japan, Korea, Russia (Far East)].

1a. Leaf blade narrowly elliptic to lanceolate,

1.5–3 cm wide 10a. subsp. *subintegrum*

1b. Leaf blade ovate, 3–6 cm wide 10b. subsp. *coreanum*

10a. *Pseudolysimachion rotundum* subsp. *subintegrum* (Nakai) D. Y. Hong, Novon 6: 23. 1996.

东北穗花 dong bei sui hua

Veronica spuria Linnaeus var. *subintegra* Nakai, Bot. Mag. (Tokyo) 25: 62. 1911; *V. komarovii* Monjuschko; *V. rotunda* Nakai var. *subintegra* (Nakai) T. Yamazaki.

Leaf blade narrowly elliptic to lanceolate, 6–13 × 1.5–3 cm. Fl. Jun–Aug.

Meadows, among grasses at forest margins, forests; below 1600 m. Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia (Far East)].

10b. *Pseudolysimachion rotundum* subsp. *coreanum* (Nakai) D. Y. Hong, Novon 6: 23. 1996.

朝鲜穗花 chao xian sui hua

Veronica coreana Nakai, Bot. Mag. (Tokyo) 32: 228. 1918; *V. rotunda* Nakai var. *coreana* (Nakai) T. Yamazaki.

Leaf blade ovate, 3–6 cm wide. Fl. Jul–Aug.

Grassy mountain slopes; 1100–1300 m. Anhui (Yuexi Xian), Henan (Shangcheng Xian), Liaoning, Shanxi, Zhejiang (Lin'an Xian) [Korea].

38. VERONICA Linnaeus, Sp. Pl. 1: 9. 1753.

婆婆纳属 po po na shu

Hong Deyuan (洪德元); Manfred A. Fischer¹

Herbs, perennial with rhizomes or annuals. Roots glabrous. Stems erect, procumbent, or creeping, base sometimes woody. Leaves mostly opposite, rarely whorled or upper ones alternate. Inflorescences terminal or axillary racemes, sometimes spicate, long or short and capitate. Calyx 4-lobed, if 5-lobed upper lobe much smaller than other lobes. Corolla 4-sect or 4-lobed, rarely slightly 2-lipped; tube short and limb subrotate, rarely tube conspicuous, 1/3–1/2 of corolla length, usually hairy inside; lobes usually patent, unequal in width, upper lobe widest, lower lobe narrowest. Stamens 2; filaments adnate to posterior part of corolla tube; anther locules parallel or divergent, apically confluent. Style persistent; stigma capitate. Capsule diverse in shape, slightly to strongly compressed laterally, 1-grooved, loculicidal. Seeds 2–50 per capsule, flattened and convex on both sides, navicular or cupular.

About 250 species: cosmopolitan, mainly in Asia and Europe; 53 species in China.

1a. Inflorescences terminal, sometimes bracts leaflike and flowers appearing axillary.

2a. Perennials with rhizomes or woody roots.

3a. Calyx lobes 4; corolla subrotate, tube inconspicuous; capsule strongly compressed.

4a. Capsule obovoid, longer than wide; inflorescences few flowered; stems erect or ascending, never creeping 6. *V. stelleri*

4b. Capsule subreniform, shorter than wide; inflorescences many flowered; stems often creeping at base 7. *V. serpyllifolia*

3b. Calyx lobes (4 or)5; corolla tube mostly conspicuous, 1.5–2 mm, rarely shorter; capsule slightly compressed.

5a. Plants woolly, white 5. *V. lanuginosa*

5b. Plants tomentose or villous, with multicellular glandular hairs, green or gray-green.

6a. Inflorescences elongated, lax; infructescences 10–20 cm; leaf blade lanceolate to ovate-lanceolate, margin deeply cut 2. *V. lanosa*

6b. Inflorescences capitate; infructescences less than 5 cm; leaf blade orbicular to ovate, margin shallowly cut or subentire.

7a. Style ca. 0.5 mm 3. *V. alpina*

7b. Style 6–7 mm.

8a. Stamens exerted; plants tomentose with white multicellular hairs, gray-green; infructescences slightly elongated 1. *V. densiflora*

8b. Stamens included; plants densely with brown or brown-yellow multicellular glandular hairs; infructescences elongated to 5 cm 4. *V. capitata*

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- 2b. Annuals without rhizomes.
- 9a. Seeds convex on both sides; pedicel several × shorter than bract (as long as or slightly longer in *V. pusilla*).
- 10a. Leaves pinnatifid; stems simple or fastigiata; capsule pubescent 9. *V. verna*
- 10b. Leaves entire, crenate, or dentate; stems branched; capsule glabrous or ciliate and otherwise glabrous.
- 11a. Pedicel 1.5–2 × longer than calyx 11. *V. pusilla*
- 11b. Pedicel shorter than calyx.
- 12a. Stems glabrous or short glandular pubescent; leaves oblanceolate to narrowly oblong, base cuneate, margin entire or dentate above middle; corolla usually white 8. *V. peregrina*
- 12b. Stems densely villous along 2 lines; leaves ovate-orbicular, base rounded, margin conspicuously crenate; corolla blue 10. *V. arvensis*
- 9b. Seeds navicular, convex on 1 side, with a deep groove on other; pedicel as long as or longer than bract, rarely slightly shorter.
- 13a. Plants diffuse; bracts similar in size to leaves.
- 14a. Pedicel slightly shorter than bract; capsule 4–6 mm wide, with inconspicuous reticulate veins, apically notched nearly at an acute angle, lobes rounded; style ca. 1.5 mm, as long as notch or slightly exerted 12. *V. polita*
- 14b. Pedicel longer than bract; capsule 6–9 mm wide, with conspicuous reticulate veins, apically notched at a right to an obtuse angle, lobes obtuse; style 2–3 mm, conspicuously exerted 13. *V. persica*
- 13b. Plants erect, simple or branched below middle; bracts smaller than leaves.
- 15a. Leaves 4, under inflorescences, nearly whorled.
- 16a. Pedicel slender, 2–5 × longer than bract; calyx equally parted to base, lobes lanceolate 18. *V. tenuissima*
- 16b. Pedicel slightly longer than bract; calyx unequally parted, laterally parted to middle, lobes rhomboid-ovate 19. *V. cardiocarpa*
- 15b. Leaves more than 4, pairs distant.
- 17a. Seeds smooth; calyx lobes obscurely 3-veined or only midrib visible, red ciliate; plants often reddish 14. *V. rubrifolia*
- 17b. Seeds transversely rugose; calyx lobes conspicuously 3-veined, white ciliate; plants green.
- 18a. Calyx lobes in fruit usually to 1.6 mm wide; seeds usually 8–14 per capsule, 1.3–1.7 × 0.7–0.8 mm, deeply transversely rugose (with 5 folds); pedicel in fruit usually distinctly recurved, usually longer than bract 17. *V. campylopoda*
- 18b. Calyx lobes in fruit usually 2–3.5 mm wide; seeds usually 4–8 per capsule, 1.7–2.5 × 0.9–1.5 mm, obscurely reticulate-rugose; pedicel in fruit usually patent, often shorter than bract.
- 19a. Pedicel slightly recurved in fruit, pedicel and calyx densely glandular pubescent with hairs 0.4–0.7(–1) mm; corolla 4–6 mm in diam.; capsule (4–)5–8 mm wide, notch angle 30–45(–60)°; style (0.8–)1–1.3(–1.7) mm 16. *V. arguteserrata*
- 19b. Pedicel straight in fruit, pedicel and calyx short puberulent with hairs 0.1–0.3 mm; corolla 3–4 mm in diam.; capsule (3–)3.5–5(–6) mm wide, notch angle acute (narrow); style 0.4–0.8 mm 15. *V. biloba*
- 1b. Inflorescences axillary, usually in pairs, sometimes arrested development of stem apex causes inflorescences to appear terminal.
- 20a. Plants aquatic or helophytic; stems ± succulent.
- 21a. Stems creeping; capsule wider than long 53. *V. beccabunga*
- 21b. Stems ± erect; capsule as wide as or narrower than long.
- 22a. Style ca. 3 mm; capsule basally wider than apically, apically notched 49. *V. oxycarpa*
- 22b. Style less than 2.5 mm; capsule basally and apically equal in width, apically rounded or emarginate.
- 23a. Capsule ellipsoid, length exceeding width, apically emarginate; calyx lobes appressed to capsule, outside densely glandular hairy 52. *V. anagaloides*

- 23b. Capsule subglobose, length equal to width, apically rounded; calyx lobes not closely appressed to capsule in fruit, glabrous or sparsely glandular hairy.
- 24a. Pedicel curved, at an acute angle with inflorescence axis; racemes less than 1 cm wide, usually glabrous 50. *V. anagallis-aquatica*
- 24b. Pedicel straight, at a right angle with inflorescence axis; racemes 1–1.5 cm wide, sparsely glandular pubescent 51. *V. undulata*
- 20b. Plants terrestrial; stems not succulent.
- 25a. Rhizomes less than 1 cm, nodes and internodes inconspicuous; calyx 5-lobed, upper lobe much smaller (sometimes 4-lobed in *V. rockii* and *V. filipes*); corolla tube conspicuous; capsule slightly compressed (strongly compressed in *V. filipes*), length exceeding width.
- 26a. Capsule oblong to ovoid-globose, strongly compressed; corolla tube inside with a ring of villous hairs; stamens longer than or as long as corolla 25. *V. filipes*
- 26b. Capsule ovoid to ovoid-conical, slightly compressed; corolla tube inside often glabrous (villous in *V. himalensis*); stamens shorter than corolla.
- 27a. Corolla to 10 mm, outside with multicellular glandular hairs; capsule more than 5 mm wide; leaves ± amplexicaul, margin conspicuously dentate 24. *V. himalensis*
- 27b. Corolla 0.3–0.6 mm, outside glabrous; capsule less than 5 mm wide; leaves never amplexicaul, margin not conspicuously dentate.
- 28a. Ovary and capsule glabrous or sparsely pubescent 22. *V. rockii*
- 28b. Ovary and capsule hirsute with multicellular hairs.
- 29a. Inflorescences long and lax, not capitate at anthesis 20. *V. eriogyne*
- 29b. Inflorescences usually capitate at anthesis (elongated in *V. ciliata* subsp. *zhongdianensis*).
- 30a. Capsule ovoid, 4–5 mm wide; calyx lobes narrowly elliptic to oblanceolate; plants less than 10-flowered; leaves densely villous 23. *V. chinoalpina*
- 30b. Capsule narrowly ovoid to narrowly ovoid-conical, less than 4 mm wide; calyx lobes linear-lanceolate; plants usually more than 10-flowered; leaves glabrescent 21. *V. ciliata*
- 25b. Rhizomes more than 1 cm, with obvious nodes and internodes; calyx 4-lobed (5-lobed in *V. teucrium*); corolla tube inconspicuous; capsule usually strongly compressed (not strongly in *V. teucrium* and *V. morrisonicola*), width exceeding length (length exceeding width in *V. teucrium* and *V. morrisonicola*).
- 31a. Stems densely white villous; lower leaves withered at anthesis 48. *V. tibetica*
- 31b. Above combination of characters absent.
- 32a. Inflorescences less than 3 cm, 1–5-flowered.
- 33a. Flowers 2–5, in corymbs; capsule obcordate-deltoid 30. *V. szechuanica*
- 33b. Flowers 1–3, in fascicles; capsule reniform 31. *V. chayuenis*
- 32b. Inflorescences usually more than 3 cm, lax, more than 5-flowered.
- 34a. Capsule obcordate to obovoid-cordate.
- 35a. Calyx 5-lobed; pedicel as long as or longer than bract; capsule glabrous 26. *V. teucrium*
- 35b. Calyx 4-lobed; pedicel shorter or rarely longer than bract; capsule hairy or ciliate.
- 36a. Stems creeping; capsule longer than wide 32. *V. morrisonicola*
- 36b. Stems erect or ascending; capsule as long as or shorter than wide.
- 37a. Stems branched at base; style 0.3–0.5 mm; inflorescences usually less than 5 cm, rarely to 10 cm 29. *V. javanica*
- 37b. Stems simple; style 3–6 mm; inflorescences to 30 cm.
- 38a. Stems densely villous with multicellular hairs along 2 lines; pedicel longer than or as long as bract; style 5–6 mm 27. *V. chamaedrys*
- 38b. Stems evenly villous with multicellular hairs; pedicel much shorter than bract; style 3–4 mm 28. *V. laxa*
- 34b. Capsule mostly triangular or pliciform-rhomboid, rarely obcordate-reniform or reniform.
- 39a. Capsule obcordate-reniform or reniform, base truncate-rounded.
- 40a. Stems creeping and rooting at least below middle; bracts and calyces glabrous; style 5–6 mm 34. *V. laxissima*

- 40b. Stems ascending; bracts and calyces ciliate; style less than 5 mm.
- 41a. Inflorescences several flowered; leaf base truncate 33. *V. sutchuenensis*
- 41b. Inflorescences 1- or 2-flowered; leaf base shallowly cordate 35. *V. vandellioides*
- 39b. Capsule pliciform-rhomboid or deltoid-flabellate, base truncate or cuneate-truncate.
- 42a. Stems creeping; leaf blade less than 2 cm.
- 43a. Lower leaves petiole ca. 7 mm; leaf blade triangular-orbicular, margin with 2 or 3 broadly crenate lobes on each side, base truncate; inflorescences 1–4-flowered 47. *V. oligosperma*
- 43b. Lower leaves subsessile; leaf blade elliptic, margin serrate, base cuneate; inflorescences ca. 10-flowered 46. *V. forrestii*
- 42b. Stems erect or ascending (sometimes creeping basally or below middle in *V. tsinglingensis*, *V. riae*, and *V. henryi*); leaf blade mostly more than 2 cm (less than 2 cm in *V. taiwanica*).
- 44a. Stems 1–5 cm; leaves often rosulate; inflorescences much longer than stems .. 45. *V. piroliformis*
- 44b. Stems (8–)10–30 cm; leaves never rosulate; inflorescences shorter than stems.
- 45a. Leaves sessile, ± amplexicaul 44. *V. deltigera*
- 45b. Leaves conspicuously petiolate.
- 46a. Stamens longer than or as long as corolla; style more than 5.5 mm; pedicel more than 5 mm.
- 47a. Longest petioles 1.5–3 cm; leaves papery, glabrous; capsule almost entirely glabrous 36. *V. fargesii*
- 47b. Longest petioles 0.5–0.7 cm; leaves membranous, adaxially sparsely puberulent; capsule apically sparsely glandular ciliate 37. *V. tsinglingensis*
- 46b. Stamens shorter than corolla; style less than 4 mm (6–7 mm in *V. longipetiolata*); pedicel less than 3 mm (5–7 mm in *V. riae*).
- 48a. Style 6–7 mm; petiole 3–4 cm on lower leaves 38. *V. longipetiolata*
- 48b. Style less than 4 mm; petiole 0.3–1.5 cm.
- 49a. Leaves membranous; inflorescences to 11 cm; peduncle more than 3 cm; pedicel to 5 mm at anthesis, to 7 mm in fruit; style 3–4 mm 40. *V. riae*
- 49b. Leaves papery; inflorescences less than 8 cm; peduncle less than 2 cm; pedicel less than 3 mm; style less than 3 mm.
- 50a. Calyx lobes narrowly elliptic to oblanceolate, sparsely glandular ciliate, apex obtuse; inflorescences axis and pedicels glandular hairy 43. *V. yunnanensis*
- 50b. Calyx lobes linear-lanceolate, glabrous or sparsely ciliate, apex acute or acuminate; inflorescences axis and pedicels villous.
- 51a. Inflorescences 1.5–2 cm; corolla 4–5 mm in diam.; capsule 7–8 mm wide; style 1.5–1.8 mm; leaf blade 1–1.5 × 0.8–1.2 cm 42. *V. taiwanica*
- 51b. Inflorescences 3–7 cm; corolla 10–12 mm in diam.; capsule 9–11 mm wide; style 2–3 mm; leaf blade 2–5 × 1.2–3 cm.
- 52a. Stems basally densely pubescent; lower leaves deltoid-orbicular to shallowly cordate, upper leaves ovate to ovate-orbicular, apex often obtuse; petiole 1–1.5 cm 39. *V. cana*
- 52b. Stems basally subglabrous; leaves ovate to narrowly ovate, apex often acute; petiole less than 1 cm 41. *V. henryi*

1. *Veronica densiflora* Ledebour, Fl. Altaic. 1: 34. 1839.

密花婆婆纳 mi hua po po na

Perennials, caespitose. Rhizomes elongated, branched. Stems ascending, much branched at base, 5–15 cm tall, glabrous or basally obscurely pubescent along 2 lines and apically tomentose with white multicellular hairs. Leaves sessile, lower ones scalelike; leaf blade ovate-

orbicular, 1–2 × 0.5–1.5 cm, sparsely villous, margin equally dentate. Inflorescences terminal, racemose, capitate; bracts elliptic, lowermost to 8 mm, densely white tomentose. Pedicel 2–2.5 mm. Calyx 5-lobed, densely white tomentose; lobes obovate-lanceolate, upper lobe much smaller than others. Corolla dark blue, 5–7 mm, pilose; tube 1.5–2 mm; lobes obovate-

orbicular to ovate. Stamens exerted. Ovary apically hairy. Capsule obovate, slightly compressed, ca. 4 mm, glabrous or apically hairy. Style ca. 6 mm. Seeds ca. 1 mm. Fl. May–Jun.

Stony slopes, forests, alpine zone; below 3400 m. Xinjiang (Yining Xian) [Kazakhstan, Mongolia, Russia].

2. *Veronica lanosa* Royle ex Benth, Scroph. Ind. 45. 1835. 长梗婆婆纳 chang geng po po na

Perennials. Rhizomes woody. Stems ascending, simple or apically branched, 20–35 cm tall, white villous.

Leaves sessile or short petiolate, lower ones scalelike; leaf blade lanceolate to ovate-lanceolate, 1.5–3.6 × 0.6–1.5 cm, glabrous or sparsely villous with multicellular hairs, margin deeply serrate. Inflorescences terminal, racemose, elongated, lax, 10–20 cm in fruit, axis and pedicels villous or glandular hairy; lower bracts similar to leaves in shape. Pedicel 3–6 mm at anthesis, to 1.5 cm in fruit, slightly curved. Calyx (4 or)5-lobed; lobes villous ciliate. Corolla blue, ca. 6 mm; tube 1.5–2 mm, hairy inside; lobes orbicular or width exceeding length. Stamens shorter than or nearly as long as corolla.

Capsule slightly compressed, 5–7 mm, slightly tapered, apex slightly emarginate. Style ca. 7 mm. Fl. Jul–Aug.

S Xinjiang, W Xizang [NE Afghanistan, NW India, Kashmir, Pakistan].

Veronica lanosa was reduced to synonymy of *V. deltigera* Wallich ex Benth in FRPS (Fl. Reipubl. Popularis Sin. 67(2): 275. 1979). No Chinese specimens of *V. lanosa* have been seen by the authors, but its occurrence should be expected in S Xinjiang and W Xizang range.

3. *Veronica alpina* Linnaeus subsp. ***pumila*** (Allioni) Dostál, Kvetena CSR. 1303. 1950.

短花柱婆婆纳 duan hua zhu po po na

Veronica pumila Allioni, Fl. Pedem. 1: 75. 1785; *V. alpina* var. *australis* Wahlenberg; *V. lasiocarpa* Pennell. Perennials. Rhizomes short and slender. Stems simple, slightly procumbent, 10–20 cm tall, sparsely woolly.

Leaves sessile, ovate, 0.7–2 × 0.5–1 cm, sparsely pubescent, base obtuse, margin crenate to subentire, apex obtuse. Inflorescences terminal, racemose, short at anthesis, 2–3 cm in fruit, with multicellular hairs; bracts oblanceolate, 4–5 mm. Pedicel ascending, 1.5–2 mm. Calyx 3–4 mm; lobes 4(or 5), elliptic, if 5-lobed upper lobe very small. Corolla slightly longer than calyx; tube 1.5–2 mm, white; lobes orbicular; limb dark blue or blue-purple, margin incised dentate, apex truncate. Capsule obcordate-ovoid, slightly compressed, hirsute with multicellular hairs. Style ca. 0.5 mm. Seeds ca. 0.5 mm. Fl. Jul–Aug.

3000–4500 m. W Xizang [Kashmir, Pakistan, Russia (S Siberia); Europe].

4. *Veronica capitata* Royle ex Benth, Scroph. Ind. 45. 1835.

头花婆婆纳 tou hua po po na

Perennials. Rhizomes horizontal. Stems basally procumbent, apically erect, simple or branched from middle, 7–15 cm tall, basally glabrescent, middle and

apically densely with multicellular glandular hairs.

Leaves sessile, lower ones scalelike; leaf blade ovate-orbicular, 1–2 × 0.6–1.5 cm, with multicellular glandular hairs, base rounded obtuse, margin entire or obscurely dentate-incised, apex obtuse. Inflorescences terminal, racemose-capitate in flower, elongated to 5 cm in fruit, with multicellular glandular hairs except for corolla; bracts leaflike, elliptic. Pedicel short, elongated to 5 mm after flowering. Calyx 4–5 mm; lobes broadly linear to oblanceolate. Corolla ca. 8 mm; tube 1–1.5 mm, glabrous inside; lobes erect, ovate-orbicular, ovate, or narrowly oblong. Ovary apex sparsely hairy. Capsule slightly compressed; style to 7 mm.

Alpine meadows; 3000–4500 m. W Xizang [NW India, Kashmir].

5. *Veronica lanuginosa* Benth ex J. D. Hooker, Fl. Brit. India 4: 293. 1884.

棉毛婆婆纳 mian mao po po na

Perennials, densely white woolly. Stems ascending, sometimes branched from base and middle, 5–15 cm tall, internodes less than 1 cm. Leaves often crowded, imbricate, sessile, lower ones scalelike; leaf blade orbicular, ca. 1 × 1 cm, margin entire or serrate. Inflorescences terminal, racemose or subcapitate; bracts imbricate, subequal in size. Pedicel ca. 4 mm. Calyx ca. 5 mm, densely woolly, 5-lobed; lobes obovate-lanceolate, upper lobe much smaller than others. Corolla 0.9–1.2 cm; tube 2–2.5 mm; lobes slightly patent, upper lobe to 7 mm wide. Stamens slightly shorter than corolla. Ovary apically pubescent. Capsule ellipsoid, slightly compressed, as long as calyx, pubescent. Style ca. 6 mm. Fl. Jun.

4000–4700 m. S Xizang [Bhutan, Nepal, Sikkim].

6. *Veronica stelleri* Pallas ex Link var. ***longistyla*** Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 6: 127. 1942.

长白婆婆纳 chang bai po po na

Perennials. Rhizomes long, slender. Stems erect or ascending, simple, 5–20 cm tall, sparsely villous. Leaves sometimes alternate apically on stem, 4–7 pairs, sessile, ovate to ovate-orbicular, 1–2 × 0.7–1.3 cm, sparsely pubescent, margin shallowly incised to conspicuously dentate. Racemes terminal, lax, 1–2.5 cm, with multicellular glandular hairs; bracts similar to leaves in shape, margin entire. Pedicel ca. 1.2 cm, longer than bract. Calyx 4-lobed; lobes elliptic to lanceolate. Corolla blue to purple, subrotate, 5–7 mm; lobes patent, with short glandular hairs below middle, upper lobe orbicular, other 3 lobes ovate. Stamens slightly exerted. Capsule obovoid, strongly compressed, ca. 6 × 4 mm, with multicellular glandular hairs, apex obtuse and notched. Style 5–7 mm, curly. Seeds ovoid-globose, flattened, slightly convex on both sides, ca. 1 mm. Fl. Jul–Aug. $2n = 18$.

Alpine meadows, 2200–2700 m. Jilin (Changbai Shan) [Japan, Korea, Russia (Far East)].

7. *Veronica serpyllifolia* Linnaeus, Sp. Pl. 1: 12. 1753.

小婆婆纳 xiao po po na

Veronica humifusa Dickson; *V. serpyllifolia* subsp. *humifusa* (Dickson) Syme; *V. serpyllifolia* var. *humifusa* (Dickson) Vahl.

Perennials. Rhizomes long, slender. Stems cespitose, creeping, erect from middle, 10–30 cm tall, often branched, villous with multicellular hairs, apically often with multicellular glandular hairs. Leaves sometimes alternate apically on stem, sessile, lower ones sometimes short petiolate; leaf blade ovate-orbicular to ovate-oblong, 0.8–2.5 × 0.7–1.5 cm, margin shallowly incised or rarely entire, veins 3–5 or pinnately veined. Racemes terminal, sometimes also axillary, 10–40-flowered, to 20 cm in fruit, with multicellular glandular hairs; lower bracts similar to leaves in shape. Pedicel 2–4 mm in flower, 4–6 mm in fruit. Calyx 4-lobed. Corolla color variable from almost white with blue lines to solid blue, purple, or purplish red, subrotate, ca. 4 mm. Capsule subreniform, strongly compressed, 2.5–3 × 4–5 mm, base rounded to subtruncate, margin glandular ciliate, apex obtuse and notched. Style ca. 2.5 mm. Seeds flattened, slightly convex on both sides. Fl. Apr–Jun. $2n = 14$.

Mountain meadows; 400–3700 m. Gansu, Guizhou, Hubei, Hunan, Liaoning, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [widely distributed in north temperate zones and subtropical alpine mountains].

8. *Veronica peregrina* Linnaeus, Sp. Pl. 1: 14. 1753.

蚊母草 wen mu cao

Annuals, 5–25 cm tall, often many branched from base; main stems erect; branches diffuse, entirely glabrous or densely glandular pubescent. Leaves sessile, lower ones oblanceolate, upper narrowly oblong, 1–2.5 cm × 2–6(–8) mm, margin entire or deltoid dentate above middle. Racemes terminal and axillary, elongated, lax, to 20 cm in fruit; bracts alternate, similar to but slightly smaller than leaves. Pedicel less than 2 mm. Calyx 4-lobed; lobes broadly linear to narrowly oblong, 3–4 mm. Corolla white or pale blue, rotate, ca. 2 mm; lobes narrowly oblong to ovate. Stamens shorter than corolla. Capsule obcordate, strongly compressed, 3–4 mm, wider than long, margin short glandular ciliate, apex conspicuously notched. Style 0.2–0.3 mm, included in notch. Seeds ca. 40 per capsule, oblong, flattened, convex on both sides, smooth. Fl. May–Jun. $2n = 52$.

Moist waste lands, roadsides; below 3000 m. Native to North America, naturalized in Anhui, Fujian, Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shandong, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Korea, Mongolia, Russia; Europe].

9. *Veronica verna* Linnaeus, Sp. Pl. 1: 14. 1753.

裂叶婆婆纳 lie ye po po na

Annuals. Stems erect, simple or fastigiate, 5–25 cm tall, hairs white and curly. Leaves early deciduous, lower ones short petiolate, middle sessile; leaf blade ovate,

pinnatifid, 5–12 × 4–7 mm, hispidulous, segment margin crenate or entire. Racemes terminal and axillary, elongated, many flowered, glandular or hispid hairy; bracts alternate, lower ones lanceolate and lobed, upper linear and entire. Pedicel 0.5–2.5 mm. Calyx 4-lobed; lobes narrowly lanceolate, 3-veined. Corolla pale blue to blue-purple, rotate, ca. 1/2 as long as calyx; lobes orbicular to ovate. Stamens shorter than corolla. Capsule obcordate, strongly compressed, ca. 3 × 4 mm, base broadly cuneate to rounded, puberulent on surfaces, margin glandular or hispid ciliate. Style less than 1 mm, shorter to almost as high as notch. Seeds ca. 8 per capsule, flattened, convex on both sides, 0.7–0.9 × 0.5–0.7 mm, smooth. Fl. Mar–Jul. $2n = 16$.

Steppes, *Betula* forests, trailsides, fields; below 2500 m. Xinjiang [Afghanistan, NW India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

10. *Veronica arvensis* Linnaeus, Sp. Pl. 1: 13. 1753.

直立婆婆纳 zhi li po po na

Annuals. Stems erect or ascending, simple or branched and diffuse, 5–30 cm tall, with white multicellular hairs often concentrated along 2 lines. Leaves often 3–5 pairs, lower ones short petiolate, upper sessile; leaf blade ovate-orbicular, 5–15 × 4–10 mm, hirsute, margin crenate, veins 3–5. Racemes terminal, lax, elongated to 20 cm, many flowered, with multicellular glandular hairs; bracts alternate, leaflike, lower ones narrowly ovate and sparsely crenate, upper ones narrowly elliptic and entire. Pedicel less than 2 mm. Calyx 4-lobed, 3–4 mm; lobes linear-lanceolate, lower 2 lobes longer than upper 2. Corolla blue to blue-purple, rotate, ca. 2 mm, shorter than calyx; lobes orbicular to narrowly oblong. Stamens shorter than corolla. Capsule obcordate, strongly compressed, 2.5–3.5 × 3–4 mm, glabrous, margin glandular ciliate, apex notch very deep; lobes rounded-obtuse. Style less than 1 mm, shorter than to equalling notch. Seeds oblong, ca. 1 mm, smooth. Fl. Apr–May. $2n = 16$.

Naturalized in waste grassy places and along roads; below 2000 m. Anhui, Fujian, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Taiwan [native to S Europe and SW Asia, naturalized over most of the world].

Veronica arvensis is a common weed in many parts of China and is expected to be found in Xinjiang.

11. *Veronica pusilla* Kotschy & Boissier, Pl. Pers. Austr., ed. R. F. Hohenacker, no. 717. 1845, printed label with a descr.

侏倭婆婆纳 zhu wo po po na

Veronica conferta Boissier; *V. glaberrima* Boissier & Balansa; *V. perpusilla* Boissier ex Bentham.

Annuals. Stems slender, small, glabrous or apically sparsely short hairy. Stems 2–12(–20) cm tall, simple or basally branched. Lower leaves short petiolate and often early withering, upper subsessile and not withering; leaf blade oblong to ovate-oblong, 3–5 × 1–2.5 mm, base attenuate, margin entire and glandular ciliate. Racemes terminal and axillary, short to ±

elongated, lax, few flowered; bracts alternate, leaflike, lower obovate-lanceolate, upper linear. Pedicel 3–7 mm, as long as or slightly longer than bract, curved upward in fruit, 1.5–2 × longer than calyx, glandular hairy. Calyx 4-lobed; lobes linear-lanceolate to ovate-oblong, midrib conspicuous. Corolla pale blue, as long as or shorter than calyx; tube short. Capsule reniform-obcordate, compressed, 2–3 × 3.5–7 mm, glabrous or very sparsely glandular hairy, apex parted 1/3–1/2 of capsule length; lobes ovate-oblong. Style 0.3–0.6 mm, much shorter than notch. Seeds ellipsoid, flattened, ca. 1 mm, smooth. Fl. Apr–Jun. $2n = 14$.

Along rivers and streams, from low mountains to alpine; below 5500 m. Xinjiang [Afghanistan, NW India, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan; SW Asia].

12. *Veronica polita* Fries, Novit. Fl. Suec. 5. 63. 1817.

婆婆纳 po po na

Veronica didyma Tenore var. *lilacina* T. Yamazaki.

Annuals. Stems diffuse, 10–30 cm, sparsely pubescent. Leaves opposite, 1–3 pairs; petiole 1–5 mm; leaf blade ovate to suborbicular, 5–11 × 4–9 mm, abaxially whitish hairy, adaxially sparsely pubescent to subglabrous, margin revolute with 2–4 deeply incised teeth per side. Racemes terminal, lax, very long; bracts alternate, sometimes basally opposite, petiolate, leaflike. Pedicel in fruit (3–)6–13(–15) mm, equalling bract or slightly shorter, ± recurved. Calyx 4-lobed; lobes elliptic to ovate, slightly dilated in fruit, 4–6 × 2.5–4 mm, sparsely puberulent, veins 3(–5). Corolla usually blue, rarely white, rotate, 4–7 mm in diam.; lobes orbicular to ovate. Stamens shorter than corolla. Capsule reniform, 3–4 × 4–6 mm, very slightly compressed, apically notched at an acute angle; lobes rounded, densely glandular pubescent, mixed with shorter eglandular hairs, veins inconspicuous. Style usually 1–1.6 mm, about as high as notch to slightly exserted. Seeds strongly navicular, elliptic, usually 0.9–1.6 × 0.8–1.3 mm; seed coat transversely rugose on dorsal side. Fl. Mar–Oct. $2n = 14$.

Naturalized in waste fields; below 2200 m. Anhui, Beijing Shi, Fujian, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [native in SW Asia and naturalized over most of the world].

Stems and leaves are sweet and edible.

13. *Veronica persica* Poiret, Encycl. 8: 542. 1808.

阿拉伯婆婆纳 a la bo po po na

Annuals, sometimes biennials. Stems diffuse, ca. 10–20 cm tall, 20–50 cm, densely pubescent with multicellular hairs often more densely so along 2 lines. Opposite leaves in (2 or)3 or 4(or 5) pairs; petiole 1–8 mm; leaf blade ovate-lanceolate to suborbicular, (6–)10–20(–25) × (5–)8–15(–20) mm, evenly sparsely pubescent on both surfaces, margin flat, obtusely crenate-serrate, 3–6(–10)-toothed per side. Racemes terminal, lax, very long; bracts alternate, leaflike, petiolate, uppermost ones smaller than others. Fruiting pedicel (1.2–)1.5–3(–

4) cm, usually longer than bract. Calyx 4-lobed; lobes ovate-lanceolate, 5–8(–10) × 2.5–3.5(–4) mm in fruit, sparsely pubescent, veins 3. Corolla usually blue, rotate, 0.8–1.4 cm in diam., throat sparsely hairy; lobes ovate to orbicular. Stamens slightly shorter than corolla. Capsule obcordate, strongly compressed, 4–6 × 6–9 mm, apically notched at right to obtuse angle; lobes obtuse, ± glandular hairy, venation conspicuously reticulate. Style 2–3 mm, exserted. Seeds slightly navicular, usually 1.4–2.3 × 0.9–1.6 mm; seed coat deeply rugose dorsally. Fl. Mar–May. $2n = 28$.

Naturalized in waste fields and roadsides; below 1700 m. Anhui, Fujian, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, W Xinjiang (Yining Xian), E Xizang, Yunnan, Zhejiang [native to SW Asia and since the 19th century spread over most of the world].

14. *Veronica rubrifolia* Boissier, Diagn. Pl. Orient., ser. 1, 2 (12): 46. 1853.

红叶婆婆纳 hong ye po po na

Veronica ferganica Popov; *V. uncinata* Pennell.

Annuals. Stems erect, often reddish, 1–7 cm tall, simple or branched from middle, white pubescent. Petiole ca. 2 mm to sessile upward; leaf blade ovate to ovate-oblong, 3–10 × 2–5 mm, abaxially sparsely pubescent, adaxially glabrous, margin entire or lower leaves sparsely and shallowly incised. Racemes ca. 2 cm, axis and pedicels pubescent and glandular hairy; bracts alternate, smaller than leaves, linear to lanceolate. Flowers solitary in bract axils. Pedicel 2–4(–5) mm, shorter to longer than bract, apically curved after flowering. Calyx 4-lobed, slightly enlarged, 3–4.5(–6) mm, abaxially villous and with multicellular hairs; lobes ovate, margin reddish glandular ciliate, obscurely 3-veined. Corolla white or pale blue, rotate, shorter than calyx; lobes ovate. Capsule obcordate, 2.5–3.5 mm, slightly shorter than calyx, strongly compressed, ca. 4 mm wide, parted to middle, notch angle 70–90°; lobes ovate, margin red glandular ciliate, otherwise glabrous or eglandular puberulent. Style ca. 5 mm. Seeds ovoid-navicular, ca. 1 mm; seed coat smooth. Fr. May.

Sandy places, dry slopes; below 3800 m. N Xinjiang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia].

15. *Veronica biloba* Linnaeus, Mant. Pl. 2: 172. 1771.

两裂婆婆纳 liang lie po po na

Annuals 5–20(–30) cm tall. Stems erect, usually branched basally and from middle, sparsely pubescent. Leaves short petiolate; leaf blade oblong to ovate-lanceolate, 0.5–3 × 0.4–1.3 cm, base broadly cuneate to rounded, margin sparsely shallowly dentate. Racemes terminal, sometimes also axillary, 2–25 cm, puberulent with hairs 0.1–0.3 mm, sparsely glandular hairy; bracts alternate, smaller than leaves, lanceolate to ovate-lanceolate, margin entire. Pedicel 3–7(–11) mm, as long as or shorter than bract, patent and straight in fruit. Calyx 4-lobed, laterally more shallowly parted to 3/4 of length; lobes ovate to ovate-lanceolate, 4–8 × 2–4 mm in fruit, margin entire, apex acute, conspicuously 3-

veined. Corolla white, blue, or purple, rotate, 3–4 mm in diam.; upper lobe orbicular and other 3 lobes ovate-orbicular. Filaments shorter than corolla. Capsule strongly compressed, shorter than calyx, 3–4.5 × 3.5–5(–6) mm, short glandular hairy, apex notch 1/2–2/3 of capsule length and forming 2 almost free lobes, notch apex less than 30°; lobes apically rounded obtuse. Style 0.4–0.8 mm, included in notch. Seeds 4–6 per capsule, navicular, 1.5–2.2 × 0.7–1.3 mm; seed coat obscurely transversely rugose. Fl. Apr–Aug. $2n = 28$.

Waste fields, steppes, slopes; 800–3600 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, W Sichuan, Xinjiang, Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

16. *Veronica arguteserrata* Regel & Schmalhausen in Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 5: 626. 1878.

尖齿婆婆纳 jian chi po po na

Veronica bartsiiifolia Boissier ex Freyn; *V.*

bornmuelleri Haussknecht; *V. karatavica* Pavlov ex Nevski.

Annuals. Stems erect, 10–30(–50) cm tall, simple or branched, densely pubescent. Petiole 3–8 mm; leaf blade lanceolate, elliptic, or ovate, 1–3.5 × 0.3–1.5 cm, sparsely pubescent, margin serrate. Racemes terminal, sometimes also axillary, 2–30 cm, glandular pubescent with hairs 0.4–0.7(–1) mm; bracts alternate, ovate-lanceolate, basal ones serrate, apex acute. Pedicel 3–12 mm in fruit, recurved at top, glandular hairy mixed with eglandular hairs. Calyx 4-lobed, laterally more shallowly parted to 3/4 of length; lobes ovate-lanceolate, 5–10 × 2–4 mm in fruit, margin sometimes toothed, apex acute, veins distinctly 3. Capsule obcordate, shorter than calyx, strongly compressed, 3.5–5 × 4–8 mm, apex notch 1/2–2/3 of capsule length and angled at 30–60°.

Style, 0.8–1.5 mm, reaching about middle of notch. Seeds 4–8 per capsule, navicular, 1.8–2.5 × 1–1.5 mm; seed coat reticulate, obscurely transversely rugose. Fl. Mar–Jun.

Steppes, waste fields, sparse woods; 600–3000 m. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, naturalized in North America].

Only one Chinese specimen (*Kuan Ke-jie* 4332) from Xinjiang has been seen by the authors.

17. *Veronica campylopoda* Boissier, *Diagn. Pl. Orient.*, ser. 1, 1(4): 80. 1844.

弯果婆婆纳 wan guo po po na

Annuals 5–15(–30) cm tall. Stems erect, slender, simple or branched below middle, curly hairy. Lower leaves short petiolate; leaf blade oblong to lanceolate, 4–12 × 2–5 mm, sparsely hairy, margin entire or dentate. Racemes terminal, sometimes also axillary, lax, to 10 cm, axis and pedicels with white curly hairs to 0.2 mm mixed with glandular hairs; bracts alternate, narrowly lanceolate, smaller than leaves, margin entire or rarely dentate, apex acute. Pedicel filiform, 4–6(–10) mm in fruit, usually longer and to 2 × as long as bract, usually

distinctly recurved in fruit. Calyx 4-lobed, laterally not parted to base; lobes lanceolate, ca. 3–5(–6) × 1–1.6 mm, sparsely with eglandular and glandular hairs, hairs 0.1–0.3 mm, apex short acuminate. Corolla blue to pale blue, rotate, 2–4 mm in diam. Capsule nearly as long as to slightly shorter than calyx, strongly compressed, 3–4 × 3.5–4.5(–6) mm or smaller, notched almost to base; lobes obovate, notch angle 45–60(–75)°. Style (0.5–)0.8–1.2(–1.4) mm, to middle of notch. Seeds 6–14 per capsule, navicular, narrowly ovoid, ca. (1–)1.3–1.7(–2) × 0.6–0.8(–1.1) mm; seed coat transversely 4–6-folded. Fr. Jun. $2n = 42$.

Waste fields, dry slopes. Xinjiang, W Xizang [Afghanistan, India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

18. *Veronica tenuissima* Borissova, *Fl. URSS*. 22: 403. 1955.

丝茎婆婆纳 si jing po po na

Veronica tetraphylla Popov (1922), not Boeber ex Georgi (1800).

Annuals, 5–10 cm tall. Stems erect, glabrous or puberulent. Leaves 4, whorled below inflorescence; leaf blade oblong to oblong-lanceolate, 3–10 mm, glabrous, base attenuate into short petiole, margin entire. Racemes lax, ± twisting; bracts alternate, much smaller than leaves, oblanceolate to sublinear, margin entire. Flower 1 in bract axil. Pedicel long, thin, 3.5–12 mm, 2–5 × as long as bract, curved downward after flowering. Calyx 4-lobed, 2–3 mm, parted to base; lobes linear-lanceolate, subglabrous, midrib conspicuous. Corolla blue, rotate, 1–3 mm in diam. Capsule reniform, strongly compressed, 1.5–2 × 2.5–3 mm, parted to 2/3 length, glabrous, notch angle ca. 90°. Style 0.5–0.7 mm. Seeds 8–12 per capsule, oblong, 0.7–1.3 × 0.5–0.7 mm; seed coat dorsally slightly wavy. Fl. Apr–Jun.

Clay plains, mountain valleys, slopes. N Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan; SW Asia].

19. *Veronica cardiocarpa* (Karelin & Kirilov) Walpers, *Repert. Bot. Syst.* 3: 335. 1844.

心果婆婆纳 xin guo po po na

Diplophyllum cardiocarpum Karelin & Kirilov, *Bull. Soc. Imp. Naturalistes Moscou* 15: 417. 1842.

Annuals. Stems erect, pubescent. Leaves 4, below inflorescence, whorled or nearly so; petiole 2–5 mm; leaf blade ovate-oblong, 1–2.5 × 0.5–1.5 cm, widest in middle or below middle, base rounded, margin dentate. Racemes terminal; bracts alternate, much smaller than leaves, margin sparsely deltoid dentate. Pedicel 5–8(–12) mm in fruit, as long as or longer than calyx, shorter to longer than bract in fruit, ± patent, straight or slightly curved below top. Calyx 4-lobed, 6–12 mm in fruit, ca. 2 × as long as capsule, laterally parted to 1/2–2/3 length; lobes rhomboid-ovate, sparsely ciliate, apex short acuminate, veins 2 or 3. Corolla rotate, 2–4 mm in diam. Capsule obcordate, strongly compressed, 2–4.5 × 4.5–5.5 mm, deeply notched; lobes ovate-orbicular, obtuse. Style 0.5–0.8 mm, ca. 1/2 as long as notch. Seeds 6–8

per capsule, yellow, ovoid, cupular, ca 1.2–1.8 × 0.9–1.2 mm; seed coat smooth or nearly so. Fl. Mar–Apr.

Stony slopes, forests, meadows at forest edges. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, S Turkmenistan, Uzbekistan; SW Asia (N Iran)].

Only *Veronica cardiocarpa* var. *cardiocarpa* occurs in China.

20. *Veronica eriogyne* H. Winkler, Repert. Spec. Nov. Regni Veg. Beih. 12: 480. 1922.

毛果婆婆纳 mao guo po po na

Perennials, 20–50 cm tall. Rhizomes short. Stems erect, simple or sometimes branched at base, usually white villous with multicellular hairs along 2 lines. Leaves sessile, lanceolate to linear-lanceolate, 2–5 × 0.4–1.5 cm, villous with multicellular hairs along veins, margin shallowly incised-toothed. Racemes 2–4, axillary from uppermost leaves, 2–7 cm at anthesis, spicate, flowers crowded, elongated to 20 cm in fruit, villous with multicellular hairs; peduncle 3–10 cm; bracts broadly linear, much longer than pedicel. Calyx deeply parted, 5-lobed; lobes broadly linear to linear-lanceolate, 3–4 mm, upper much smaller than other 4. Corolla purple to blue, ca. 4 mm; tube 1/2–2/3 of corolla length, inside glabrous or puberulent; lobes obovate to narrowly oblong. Stamens slightly shorter than corolla; filaments adnate to corolla for most of their length. Capsule narrowly ovoid, slightly compressed, apically tapering, 5–7 × 2–3.5 mm, hairy, apex obtuse. Style 2–3.5 mm. Seeds more than 40 per capsule, oblong-ovoid, flattened, slightly convex on both sides, ca. 0.6 mm; seed coat smooth. Fl. Jul.

• Alpine meadows; 2500–4500 m. SE Gansu, E Qinghai, W Sichuan, E Xizang.

21. *Veronica ciliata* Fischer, Mém. Soc. Imp. Naturalistes Moscou 3: 45. 1812.

长果婆婆纳 chang guo po po na

Perennials. Rhizomes less than 1 cm. Stems erect or ascending, simple or branched at base, gray-white hairy throughout, or hairs only along 2 lines. Leaves sessile or lower subsessile; leaf blade oblong to ovate-lanceolate, pubescent, glabrescent, base acute, margin entire, serrate, or deeply incised-dentate, apex acute. Racemes 1–4, axillary from uppermost leaves, villous or hirsute with multicellular hairs (except for corolla); bracts broadly linear, longer than pedicel. Calyx deeply parted, 5-lobed; lobes linear-lanceolate, upper much smaller than other 4. Corolla tube 1/5–2/5 of corolla length, glabrous inside; lobes obovate-orbicular to narrowly oblong. Stamens shorter than corolla. Capsule ovoid-conical, slightly compressed, tapered apically, almost entirely hirsute, apex obtuse and emarginate. Seeds more than 40 per capsule, oblong-ovoid, flattened, slightly convex on both sides, 0.6–0.8 mm, smooth. Fl. Jun–Aug.

Alpine meadows, forests; 2700–4700 m. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, NW to W Sichuan, Xinjiang, Xizang, Yunnan [NW

India, Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Sikkim, Tajikistan].

1a. Racemes elongated, rarely capitate; corolla tube 1/3–2/5 of corolla length

..... 21b. subsp. *zhongdianensis*

1b. Racemes capitate at anthesis, elongated or not in fruit; corolla tube 1/5–1/3 of corolla length.

2a. Stems cespitose 21a. subsp. *ciliata*

2b. Stems often 1 21c. subsp. *cephaloides*

21a. *Veronica ciliata* subsp. *ciliata*

长果婆婆纳(原亚种) chang guo po po na (yuan ya zhong)

Veronica chingii H. L. Li.

Stems cespitose, 10–30 cm tall. Leaf blade 1.5–3.5 × 0.5–2 cm, margin entire or serrate. Racemes subcapitate, rarely elongated. Pedicel 1–3 mm. Calyx lobes 3–4 × ca. 1.5 mm, slightly enlarged in fruit. Corolla 3–6 mm; lobes 1/5–1/3 of corolla length. Capsule 5–8 × 2–3.5 mm. Style 1–3 mm. Fl. Jun–Aug.

Alpine meadows; 3000–4700 m. Gansu, Nei Mongol (Helan Shan), Ningxia, Qinghai, Shaanxi, NW Sichuan, Xinjiang, N Xizang [Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

21b. *Veronica ciliata* subsp. *zhongdianensis* D. Y. Hong, Acta Phytotax. Sin. 16(3): 24. 1978.

中甸长果婆婆纳 zhong dian chang guo po po na

Stems often 1, 10–60 cm tall. Leaf blade margin dentate. Racemes usually elongated, very rarely capitate. Pedicel to 6 mm. Calyx lobes to 8 × 2 mm. Corolla tube 1/3–2/5 of corolla length. Capsule 5–7 × 3.5–4 mm. Style 0.7–2 mm. Fl. Jun–Aug.

• Alpine meadows, forests; 2700–4400 m. W Sichuan, SE Xizang, N Yunnan.

21c. *Veronica ciliata* subsp. *cephaloides* (Pennell) D. Y. Hong, Acta Phytotax. Sin. 16(3): 24. 1978.

拉萨长果婆婆纳 la sa chang guo po po na

Veronica cephaloides Pennell, Acad. Nat. Sci. Philadelphia Monogr. 5: 84. 1943; *V. nana* Pennell.

Stems often 1, 15–20(–40) cm tall. Leaf blade margin deeply incised-dentate or rarely entire. Racemes capitate at anthesis, elongated or not after flowering. Corolla small; tube ca. 1/3 of corolla length. Capsule ca. 5 × 2.5 mm. Style 0.8–1.5 mm. Fl. Jul–Aug.

Alpine meadows; 3300–5800 m. S Xizang [NW India, Kashmir, Nepal, Pakistan, Sikkim].

The whole plant is used in Tibetan medicine.

22. *Veronica rockii* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 104: 210. 1952.

光果婆婆纳 guang guo po po na

Perennials, 17–40 cm tall. Rhizomes less than 1 cm. Stems erect, simple, rarely basally branched, pubescent with multicellular hairs along 2 lines. Leaves sessile, narrowly oblong to lanceolate, 1.5–8 × 0.4–2 cm, villous or glabrescent, base rounded, margin deltoid

dentate. Racemes 2–4, axillary from uppermost leaves, vertical or ascending, 2–7 cm in flower, to 15 cm in fruit, pubescent; bracts linear, usually shorter than pedicel. Calyx deeply parted, 5-lobed; lobes linear-elliptic, ca. 3 mm at anthesis, to 4–6 mm in fruit, upper lobe much smaller or wanting. Corolla blue or purple, 3–4 mm; tube glabrous inside, adaxially parted to ca. 1/2 of corolla length, abaxially lobed to 3/5; lobes ovate-orbicular to elliptic. Stamens much shorter than corolla, adnate to corolla for most of their length. Ovary and capsule glabrous or rarely sparsely hairy. Capsule ovoid to ovoid-conical, tapering, apex obtuse. Style 1–1.5 mm. Seeds more than 40 per capsule, flattened, slightly convex on both sides; seed coat smooth. Fl. Jul–Aug.

• Mountain slopes; 1300–3800 m. Gansu, Hebei, Henan, Hubei, S Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, N Yunnan.

1a. Style ca. 1 mm 22a. subsp. *rockii*

1b. Style ca. 1.5 mm 22b. subsp. *stenocarpa*

22a. *Veronica rockii* subsp. *rockii*

光果婆婆纳(原亚种) *guang guo po po na* (yuan ya zhong)

Racemes erect to ascending. Capsule 4–8 × 2.5–4 mm. Style ca. 1 mm. Fl. Jul–Aug.

• Mountain slopes; 2000–3600 m. Gansu, Hebei, Henan, Hubei, S Nei Mongol, Qinghai, Shaanxi, Shanxi, N Sichuan.

22b. *Veronica rockii* subsp. *stenocarpa* (H. L. Li) D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 402. 1979.

尖果婆婆纳 *jian guo po po na*

Veronica stenocarpa H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 104: 211. 1952.

Racemes ascending, lax. Capsule 4–6 mm. Style ca. 1.5 mm. Fl. Aug.

• Mountain slopes; 1300–3800 m. SW Sichuan, N Yunnan.

23. *Veronica chinoalpina* T. Yamazaki, J. Jap. Bot. 27: 63. 1952.

河北婆婆纳 *he bei po po na*

Perennials, 8–17 cm tall. Rhizomes less than 1 cm. Stems ascending, simple, densely villous with yellow-gray multicellular hairs. Leaves sessile or lower ones short petiolate; leaf blade of lower leaves elliptic to ovate, upper ovate-lanceolate to lanceolate, 0.8–2 × 0.3–1 cm, villous with multicellular hairs, margin entire or few dentate at middle. Racemes 2 or 3, few flowered in axils of uppermost leaves, forming a head, appearing terminal; peduncle 0.5–1.5 cm, villous with multicellular hairs; bracts oblanceolate, as long as pedicel. Calyx 5-lobed; lobes narrowly elliptic to oblanceolate, ca. 3 mm at anthesis, ca. 5 × 2 mm in fruit, upper much smaller than other 4. Capsule ovoid, slightly compressed, 6–7 × 4–5 mm, apically obtuse and emarginate, hirsute with multicellular hairs. Style 1.5–2 mm. Seeds more than 40 per capsule, oblong, flattened and slightly convex on both sides, ca. 1 mm; seed coat smooth. Fr. Aug.

• Mountain slopes; ca. 3000 m. Hebei (Xiaowutai Shan).

Yamazaki misplaced *Veronica chinoalpina* in sect. *Veronicastrum* which characteristically has terminal inflorescences. Although the inflorescences of this species may superficially appear to be terminal, they are actually axillary.

24. *Veronica himalensis* D. Don, Prodr. Fl. Nepal. 92. 1825.

大花婆婆纳 *da hua po po na*

Perennials, 40–60 cm tall. Rhizomes less than 1 cm. Stems erect, simple or sometimes basally branched, pubescent. Leaves sessile, ± amplexicaul upward, ovate to ovate-lanceolate, 3–5 × 2–3 cm, pubescent, base broadly cuneate to rounded, margin serrate and double serrate, apex obtuse, acute, or acuminate. Racemes 2–4, axillary from upper leaves, lax, to 15 cm, pubescent with multicellular hairs; bract broadly linear, nearly as long as pedicel. Pedicel straight, to 1 cm. Calyx 5-lobed; lobes broadly linear to lanceolate, ca. 7 mm, upper smaller than other 4. Corolla purple to blue, ca. 1 cm, with multicellular glandular hairs; tube ca. 2.5 mm, villous inside; lobes obovate to elliptic. Stamens slightly shorter than corolla. Capsule ovoid, slightly compressed, ca. 8 × 5 mm, apex obtuse and emarginate, subglabrous or sparsely with multicellular hairs.

Persistent style 5–10 mm. Seeds more than 50 per capsule, flattened and slightly convex on both sides, ca. 1 mm; seed coat smooth. Fl. Jun–Aug.

Alpine meadows; 3400–4000 m. S Xizang, Yunnan (Bijiang Xian) [Bhutan, India, NE Myanmar, Nepal, Sikkim].

1a. Pedicel and calyx pubescent with

multicellular eglandular hairs 24a. subsp. *himalensis*

1b. Pedicel and calyx with multicellular

glandular hairs 24b. subsp. *yunnanensis*

24a. *Veronica himalensis* subsp. *himalensis*

大花婆婆纳(原亚种) *da hua po po na* (yuan ya zhong)

Leaves sparsely pubescent. Pedicel and calyx pubescent with multicellular eglandular hairs. Fl. Jun–Jul.

Alpine meadows; 3400–4000 m. S Xizang [Bhutan, India, Nepal, Sikkim].

24b. *Veronica himalensis* subsp. *yunnanensis* (P. C. Tsoong) D. Y. Hong, Novon 6: 23. 1996.

多腺大花婆婆纳 *duo xian da hua po po na*

Veronica himalensis var. *yunnanensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 402. 1979.

Leaves densely pubescent. Pedicel and calyx with brown multicellular glandular hairs. Fl. Jun–Aug.

Alpine meadows; ca. 4000 m. Yunnan (Bijiang Xian) [NE Myanmar].

25. *Veronica filipes* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 403. 1979.

丝梗婆婆纳 *si geng po po na*

Perennials, 6–15 cm tall. Rhizomes less than 1 cm.

Stems to 7, cespitose, ascending, often basally purple.

Lower leaves scalelike; petiole less than 5 mm; leaf blade ovate to orbicular, 1.2–2.5 × 0.6–1.8 cm, hirsute or sparsely with multicellular hairs, base attenuate into petiole, margin entire or crenate on lower leaves, obtuse dentate to serrate on upper leaves, apex rounded to acute. Racemes 2–4, axillary, 2–5-flowered, subcapitate at anthesis, elongated after flowering, pubescent with multicellular hairs except for corolla; bracts broadly linear to oblanceolate. Pedicel 3–10 mm. Calyx lobes 4 or 5, if 5 then upper lobe much smaller and other 4 broadly linear to linear-elliptic, 3–5 mm. Corolla blue to pale purple, 5–7 mm, rotate; tube 0.8–1.8 mm, inside with a ring of hairs; lobes narrowly ovate to orbicular. Stamens as long as or to 2 mm longer than corolla. Capsule oblong to ovoid-globose, strongly compressed, ca. 3 × 2.5 mm, hirsute. Style 5–7 mm. Seeds ca. 8 per locule, flattened, ca. 1.2 × 0.8 mm; seed coat smooth. Fl. Jun–Aug.

• Alpine stony or sandy slopes; 3400–4500 m. S Gansu, E Qinghai, NW Sichuan.

26. *Veronica teucrium* Linnaeus subsp. **altaica** Watzl, Abh. K.K. Zool.-Bot. Ges. Wien 5: 49. 1910.

卷毛婆婆纳 juan mao po po na

Veronica krylovii Schischkin.

Perennials, 10–70 cm. Stems 1 or often several, cespitose, erect or ascending, simple, densely with short and upward curly hairs. Leaves sessile or lower short petiolate; leaf blade ovate, narrowly oblong, or lanceolate, 1.5–4 × 0.2–2 cm, sparsely puberulent, margin with deep incised obtuse teeth and sometimes double dentate. Racemes axillary from upper leaves, 2–4 cm, to 12 cm in fruit, axis and pedicels curly hairy. Pedicel as long as or longer than bract, vertical, to 1 cm in fruit. Calyx lobes 5, lanceolate, ca. 5 mm, upper lobe smaller than others, short ciliate, apex obtuse. Corolla bright blue, pink, or white, rotate, 6–7 mm; tube less than 1.5 mm; throat hairy; lobes ovate to broadly ovate, apex obtuse. Capsule obcordate-ovoid, 4–6 × 3–4.5 mm, slightly compressed, glabrous. Style 5–6 mm, curved. Seeds 2–10 per locule, ovate, ca. 1.6 × 1.4 mm, flattened. Fl. May–Jun. $2n = 64$.

Sparse forests, grasslands; below 2000 m. NW Heilongjiang, N Nei Mongol, N Xinjiang [Kazakstan, Russia].

27. *Veronica chamaedrys* Linnaeus, Sp. Pl. 1: 13. 1753.

石蚕叶婆婆纳 shi can ye po po na

Perennials, 10–50 cm tall. Stems ascending, simple, densely pubescent with multicellular hairs along 2 lines. Lower leaves short petiolate, upper ones sessile; leaf blade ovate to ovate-orbicular, ca. 2.5 × 1.5–2 cm, sparsely puberulent, base truncate to slightly cordate, margin with deeply incised obtuse teeth, apex obtuse. Racemes paired, axillary from upper leaves, with multicellular glandular hairs (except corolla); bracts linear-elliptic, shorter or as long as pedicel. Calyx lobes 4, lanceolate, subequal. Corolla blue, rotate, ca. 1.2 cm in diam., subglabrous inside; tube less than 1.5 mm;

upper and lateral lobes wider than long, lower lobes obovate. Stamens shorter than corolla. Capsule obcordate, strongly compressed. Style 5–6 mm. Seeds (2–)6–10(–14) per locule, flattened, ca. 1.5 × 1 mm. Fl. May. $2n = 16, 32$.

Liaoning (Fengcheng Xian) [Kazakstan, Russia; Europe].

Only one Chinese specimen has been collected from a slope near the railway in Fengcheng.

28. *Veronica laxa* Bentham, Scroph. Ind. 45. 1835.

疏花婆婆纳 shu hua po po na

Perennials, (15–)50–80 cm tall, entirely with white multicellular hairs. Stems erect or ascending, simple. Leaves sessile or short petiolate; leaf blade ovate to ovate-deltoid, 2–5 × 1–3 cm, margin coarsely dentate and mostly double dentate. Racemes 1 or 2, axillary from middle and upper leaves, lax, to 20 cm in fruit; bracts broadly linear to oblanceolate, ca. 5 mm. Pedicel much shorter than bract. Calyx 4-lobed; lobes linear-elliptic, subequal, ca. 4 mm at anthesis, 5–6 mm in fruit. Corolla purple to blue, rotate, 6–10 mm in diam.; tube less than 1.5 mm; throat hairy; lobes orbicular to rhomboid-ovate. Stamens almost as long as corolla. Capsule obcordate, strongly compressed, 4–6 × 5–6 mm, ciliate with multicellular hairs, base cuneate to rounded. Style 3–4 mm. Seeds 2–10 per locule, ovate, flattened, ca. 1 mm. Fl. Jun. $2n = 46$.

Valleys, forest slopes; 1500–2500 m. SE Gansu, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan [India, Japan, Kashmir, Pakistan].

29. *Veronica javanica* Blume, Bijdr. 742. 1826.

多枝婆婆纳 duo zhi po po na

Veronica murorum Maximowicz.

Annals or biennials, 10–30 cm tall, pubescent with multicellular hairs. Stems branched at base, main stems erect or ascending, lateral branches procumbent-ascending. Petiole 1–7 mm; leaf blade ovate to ovate-triangular, 1–4 × 0.7–3 cm, base shallowly cordate to truncate, margin deeply incised dentate, apex obtuse. Racemes axillary, short and subcorymbose at anthesis, elongated and to 10 cm in fruit; bracts linear to oblanceolate, 4–6 mm. Pedicel much shorter than bract. Calyx 4-lobed; lobes linear-elliptic, 2–5 mm, subequal. Corolla white, pink, or red-purple, rotate, ca. 2 mm; tube less than 1.5 mm; throat hairy. Stamens ca. 1/2 as long as corolla. Capsule obcordate, strongly compressed, 2–3 × 3–4 mm, ciliate, base broadly cuneate or ± rounded, notch ca. 1/3 of capsule length. Style 0.3–0.5 mm. Seeds 2–10 per locule, flattened, slightly convex, ca. 0.5 mm. Fl. Feb–Apr.

Trailsides, mountain slopes, by streams; below 2300 m. Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, S Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Japan, Laos, Myanmar, Philippines, Sikkim, Vietnam; Africa].

30. *Veronica szechuanica* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 383. 1894.

四川婆婆纳 si chuan po po na

Perennials, 5–35 cm tall. Stems branched or simple. Petiole laterally ciliate; leaf blade ovate, both surfaces or adaxially hirsute with multicellular hairs, base broadly cuneate to shallowly cordate, apex obtuse to acute. Racemes 2–6, axillary from upper leaves, less than 3 cm, 3–5-flowered, in corymbs; bract sometimes on middle or basal part of pedicel, linear, nearly as long as pedicel, ciliate. Pedicel straight, ca. 5 mm. Calyx 4-lobed; lobes linear to obovate-lanceolate, 3–5 mm, subequal, ciliate with multicellular hairs. Corolla white or rarely pale purple, 5–7 mm; tube 1.5–2 mm, glabrous inside; lobes ovate to ovate-orbicular. Stamens slightly shorter than corolla. Capsule obcordate-deltoid, strongly compressed, 4–6 × 6–7 mm, ciliate with multicellular hairs. Style 2–3 mm. Seeds 2–10 per locule, oblong-ovate, flattened, slightly convex, ca. 1 mm. Fl. Jun–Jul.

Valleys or grassy slopes, forests or forest edges, alpine meadows; 1600–4400 m. SE Gansu, W Hubei, E Qinghai, S Shaanxi, Sichuan, S Xizang, NW Yunnan [Bhutan, NW India, Sikkim].

1a. Leaves hairy only adaxially; plants (5–)15–35 cm tall; stems usually simple or few branched

..... 30a. subsp. *szechuanica*

1b. Leaves hairy; plants 5–15 cm tall; stems often branched 30b. subsp. *sikkimensis*

30a. *Veronica szechuanica* subsp. *szechuanica*
四川婆婆纳(原亚种) si chuan po po na (yuan ya zhong)

Stems simple or few branched, (5–)15–35 cm tall, pubescent along 2 lines. Petiole 5–10 mm on lower leaves, shorter on upper; leaf blade 1.5–5.5 × 1–3 cm, adaxially sparsely hirsute with multicellular hairs, base broadly cuneate, rounded, or shallowly cordate. Fl. Jul.

• Valleys, grassy slopes, forests, forest margins; 1600–3500 m. SE Gansu, W Hubei, E Qinghai, S Shaanxi, E Sichuan.

30b. *Veronica szechuanica* subsp. *sikkimensis* (J. D. Hooker) D. Y. Hong in P. C. Tsoong & D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 304. 1979.

多毛四川婆婆纳 duo mao si chuan po po na

Veronica capitata Royle ex Benth var. *sikkimensis* J. D. Hooker, Fl. Brit. India 4: 295. 1884; *V. umbelliformis* Pennell.

Stems 5–15 cm tall, often branched; branches procumbent or ascending, densely hairy. Petiole 2–10 mm; leaves small, hairy, base mostly shallowly cordate to truncate. Fl. Jun–Jul.

Alpine meadows, forests; 2800–4400 m. W to SW Sichuan, S Xizang, NW Yunnan [Bhutan, NW India, Sikkim].

31. *Veronica chayuensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 403. 1979.

察隅婆婆纳 cha yu po po na

Perennials, 4–6 cm tall. Stems erect or ascending, white pubescent with multicellular hairs along 2 lines. Lower

leaves few, small, subsessile, often scalelike; middle ones crowded, large, short petiolate; upper subsessile; leaf blade orbicular to ovate-orbicular, 1–1.5 × ca. 1 cm, subglabrous, margin entire on lower leaves, others 3–5-toothed on each side. Flowers 1–3, fascicled in axils of upper leaves, appearing terminal; bracts broadly linear, ciliate. Pedicel 1–1.5 mm. Calyx 4-lobed; lobes linear-elliptic, ca. 2.5 mm at anthesis, to 4 mm in fruit, sparsely ciliate with multicellular hairs. Corolla white, ca. 4.5 mm; tube ca. 1 mm, glabrous inside; lower lobe obovate-elliptic, lateral 2 lobes obovate, upper lobe broadly oblong and to 4 mm wide, apex subtruncate. Stamens shorter than corolla. Capsule strongly compressed, reniform, laterally rounded, ca. 3.5 × 5 mm, upper margin glandular ciliate. Style 1.8–2.3 mm. Seeds numerous, flattened, slightly convex. Fl. Aug.

• Gravelly slopes by water, meadows, forests: 3500–4200 m. S Xizang, Yunnan (Gongshan).

32. *Veronica morrisonicola* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 174. 1908.

匍茎婆婆纳 pu jing po po na

Perennials, 10–20 cm tall. Stems long creeping, basally woody, apically ascending, often simple, with brown multicellular glandular hairs. Leaves densely crowded, rarely evenly distributed; leaf blade ovate to obovate-lanceolate, 1–3.2 × 0.3–1 cm, with multicellular glandular hairs, base rounded to cuneate and attenuate into a short petiole, apex acute to slightly obtuse.

Racemes in pairs, axillary from upper leaves, elongated, with numerous flowers, with brown multicellular glandular hairs; peduncle to 6.5 cm; bracts linear-oblongate, 4–5 mm. Calyx 4-lobed; lobes linear-elliptic, 4–6 mm, subequal. Corolla rotate, 4–7 mm; tube less than 1.5 mm; throat hairy; lobes orbicular to ovate. Stamens longer than corolla. Capsule obcordate, strongly compressed, 5–6 × 4–5 mm, margin ciliate with multicellular hairs. Style ca. 4 mm. Seeds 2–10 per locule, ovate, flattened, slightly convex, ca. 1 mm. Fl. May–Sep.

• Moist forests, coniferous forests, bamboo thickets, grassy slopes; 2300–3900 m. Taiwan.

33. *Veronica sutchuenensis* Franchet, Bull. Soc. Bot. France 47: 20. 1900.

川西婆婆纳 chuan xi po po na

Perennials, 10–25 cm tall. Stems ascending, densely villous with gray-white multicellular hairs. Petiole 5–10 mm, decreasing in size upward; leaf blade orbicular to deltoid-ovate, 1–3 × 1–2 cm, lower ones smaller, pubescent, base truncate, margin dentate, apex obtuse to acute. Racemes opposite in axils of uppermost leaves, 2–6 cm, 4–8-flowered, with yellow-white multicellular hairs (except for corolla); peduncle 1–3 cm; bracts linear, 3–5 mm. Pedicel straight, 3–5 mm. Calyx 4-lobed; lobes broadly linear to linear-oblongate, 4–5 mm, subequal. Corolla pink, rotate, 0.8–1.2 cm in diam.; tube less than 1.5 mm; throat hairy; lobes obovate to

orbicular. Stamens slightly shorter than corolla. Capsule obcordate-reniform to reniform, strongly compressed, ca. 4 × 6–7 mm, lateral angles rounded to rounded-obtuse, margin ciliate with multicellular glandular hairs. Style ca. 3 mm. Seeds 2–10 per locule, flattened, slightly convex. Fl. May–Jun.

• Forests, grassy slopes; 2000–2700 m. Sichuan.

34. *Veronica laxissima* D. Y. Hong, *Novon* 6: 23. 1996.

极疏花婆婆纳 ji shu hua po po na

Perennials. Stems slender, creeping and rooting at least below middle, 10–15 cm, ca. 0.5 mm in diam., villous with multicellular hairs. Leaves more than 6 pairs, evenly or almost evenly distributed on stem; petiole 2–3 mm, upper leaves sessile; leaf blade ovate-orbicular to oblong, 1–1.5 cm × 6–9 mm, lower ones smaller, glabrous, base rounded, margin crenate, apex obtuse. Racemes usually 2, axillary from upper and uppermost leaves, several flowered, lax, 3–12 cm, axis and pedicels densely with multicellular glandular hairs; peduncle 3–6.5 cm; bracts linear to linear-elliptic, 2–4 mm, glabrous. Pedicel straight, 6–7 mm. Calyx glabrous, 4-lobed; lobes elliptic to linear-elliptic, 2.5–3 × ca. 1 mm, subequal. Corolla rotate, 7–8 mm in diam.; tube less than 0.5 mm; lower lobe oblong, other 3 lobes oblong-orbicular. Ovary and young fruit strongly compressed, ciliate, lateral angles rounded. Style 5–6 mm.

• E Sichuan (Chengkou Xian).

Although no mature fruit have been seen, *Veronica laxissima* seems to be closely related to *V. sutchuenensis* Franchet.

35. *Veronica vandellioides* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 32: 514. 1888.

唐古拉婆婆纳 tang gu la po po na

Perennials, 5–25 cm tall, entirely pubescent with ± multicellular hairs. Stems to 25, cespitose, very rarely 1, slender, ascending to ± diffuse. Leaves subsessile or petiole to 1 cm; leaf blade ovate-orbicular, 0.7–2 × 0.6–1.8 cm, base cordate to truncate, margin 2–5-crenate on each side, apex obtuse. Racemes 4–10, axillary, sometimes only from upper leaves, 1- or 2-flowered; 1-flowered inflorescences with peduncle slender, 0.6–2 cm; bracts (appearing to be bracteoles) at middle of peduncle, broadly linear, less than 5 mm. Pedicel slender, 3–10 mm. Calyx 4-lobed; lobes narrowly elliptic, subequal, ca. 3 mm at anthesis, 4–6 mm in fruit. Corolla pale blue, pink, or white, rotate, slightly longer than calyx; tube less than 1.5 mm; throat hairy; lobes orbicular to ovate. Stamens slightly shorter than corolla. Capsule subobcordate-reniform, strongly compressed, 3–4 × 5–6 mm, base truncate-rounded. Style ca. 2 mm. Seeds 2–10 per locule, ovoid, flattened, slightly convex, ca. 1.5 mm. Fl. Jul–Aug.

• Forests, meadows; 2000–4400 m. Gansu, Qinghai, Shaanxi (Taibai Shan), W Sichuan, C to N Xizang.

36. *Veronica fargesii* Franchet, *Bull. Soc. Bot. France* 47: 21. 1900.

城口婆婆纳 cheng kou po po na

Perennials, 10–15 cm tall. Stems 1, simple, erect or ascending, subglabrous, entirely villous with multicellular hairs, or hairs only along 2 lines. Leaves 3–5 pairs, lower and middle 1 or 2 pairs distant, with petiole 1.5–3 cm, others often subwhorled below inflorescences and with a shorter petiole or sessile and leaf blade large; leaf blade ovate to ovate-lanceolate, 3–6 × 1.5–3.5 cm, papery, glabrous, abaxially purplish, base rounded to cuneate, margin dentate toothed toward leaf apex, apex acute to obtuse. Racemes 2–4, opposite, axillary in uppermost leaves, 8–12 cm, lax, many flowered, axis and pedicels sparsely pubescent with multicellular hairs; peduncle 3–6 cm; bracts glabrous, slightly shorter than pedicel. Pedicel straight, 5–7 mm, slightly elongated in fruit. Calyx 4-lobed; lobes lanceolate, 3–4 mm, subequal, glabrous. Corolla white or purple striate, rotate, 1–1.3 cm in diam.; tube less than 1.5 mm; throat hairy. Stamens as long as corolla. Capsule pliciform-rhomboid, strongly compressed, ca. 4 × 9–10 mm, almost entirely glabrous, base angle 120°, lateral angles acute, emarginate. Style 6–8 mm. Seeds 2–10 per locule, ovoid, flattened, slightly convex, ca. 1.5 mm. Fl. Jun.

• Shaded and moist places; 1000–2000 m. W Hubei, E Sichuan (Chengkou Xian, Nanchuan Xian).

37. *Veronica tsinglingensis* D. Y. Hong, *Fl. Reipubl. Popularis Sin.* 67(2): 403. 1979.

陕川婆婆纳 shan chuan po po na

Perennials, 10–20 cm tall. Stems ascending, creeping near base, sparsely with gray-white multicellular hairs, more densely so below nodes. Leaves 3–5 pairs, evenly or unevenly distributed; petiole 5–7 mm; leaf blade ovate to narrowly ovate, membranous, abaxially glabrous or occasionally hairy, adaxially puberulent, base obtuse, margin 4–9-toothed on each side and rarely double dentate, apex obtuse to acute; upper leaves 1.5–3.5 × 0.8–1.5 cm. Racemes 1 or 2, axillary in upper leaves, 5–10 cm, 5–10-flowered, axis and pedicels puberulent; peduncle 2–3 cm; bracts linear to linear-lanceolate, usually shorter than pedicel, subglabrous. Pedicel straight, 5–8 mm. Calyx 4-lobed; lobes linear-lanceolate to linear-oblong, 3–4 mm, subequal, sparsely ciliate with multicellular glandular hairs. Corolla white, purple striate, rotate, ca. 1 cm in diam.; tube less than 1.5 mm; throat sparsely villous. Stamens slightly longer than corolla. Capsule pliciform-rhomboid, strongly compressed, 3–3.5 × 7–8 mm, base cuneate-truncate, base angle greater than 120°, lateral angles acute to obtuse, margin apically sparsely ciliate with multicellular glandular hairs, emarginate. Style 5.5–8 mm. Seeds 2–10 per locule, oblong-ovoid, flattened, slightly convex, ca. 1.2 mm. Fl. Jun–Jul.

• Forests, meadows; 1500–3000 m. W Hubei, S Shaanxi, NE Sichuan.

38. *Veronica longipetiolata* D. Y. Hong, *Fl. Reipubl. Popularis Sin.* 67(2): 403. 1979.

长柄婆婆纳 chang bing po po na

Perennials, 20–30 cm tall. Stems erect, rarely ascending, simple, sparsely villous with multicellular hairs. Leaves 4 or 5 pairs, ± evenly distributed; petiole 3–4 cm on lower leaves, shorter on upper; leaf blade shallowly cordate to ovate, 4–8 × 2–4.5 cm, larger upward, papery, abaxially puberulent along midrib, adaxially puberulent, margin deeply incised dentate. Racemes (1 or)2–4, in axils of uppermost leaves, 10–20 cm, lax; bracts linear, longer than pedicel, glabrous or sparsely ciliate. Pedicel straight, 2–3 mm. Calyx 4-lobed; lobes lanceolate, 3–4 mm, subequal, glabrous or sparsely ciliate. Corolla blue, purple-blue, or pink, rotate, ca. 1.2 cm in diam.; tube less than 1.5 mm; throat sparsely villous with multicellular hairs. Stamens shorter than corolla. Capsule deltoid-flabelliform, strongly compressed, ca. 4 × 7–9 mm, base subtruncate or at an angle of ca. 150°, margin apically sparsely ciliate with multicellular hairs, emarginate. Style 6–7 mm. Seeds 2–10 per locule, ovate-globose, flattened, slightly convex, ca. 1.5 mm. Fl. Jun.

• Grassy places in forests; 2400–2700 m. Xizang (Nyalam Xian).

39. *Veronica cana* Wallich ex Benth, Scroph. Ind. 45. 1835.

灰毛婆婆纳 hui mao po po na

Perennials, 20–25 cm tall. Stems erect or ascending, simple, densely villous with gray-white multicellular hairs. Leaves 4 or 5 pairs; lower leaves petiole 1–1.5 cm; leaf blade shallowly cordate to deltoid-orbicular, smaller than upper leaves; upper leaves shorter petioled, leaf blade ovate-orbicular to ovate, 2.5–4 × 1.5–3 cm; all leaves papery, sparsely with gray-white hairs, base rounded, margin coarsely dentate, apex mostly obtuse. Racemes usually paired, axillary from uppermost leaves, 3–7 cm, lax, axis and pedicels villous with multicellular hairs; peduncle 1–2 cm; bracts broadly linear, almost as long as pedicel. Calyx 4-lobed; lobes lanceolate, 3–5 mm, subequal, glabrous or sparsely ciliate. Corolla white, rotate, ca. 1.2 cm in diam.; tube less than 1.5 mm; throat hairy. Capsule deltoid-flabelliform, strongly compressed, ca. 5 × 9–10 mm, base subtruncate or with an angle greater than 120°, margin apically sparsely glandular ciliate, emarginate. Style 2–3 mm. Seeds 2–10 per locule, flattened, slightly convex. Fl. Jun.

Forests; 2000–3500 m. S Xizang, NW Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

40. *Veronica riae* H. Winkler, Repert. Spec. Nov. Regni Veg. Beih. 12: 481. 1922.

膜叶婆婆纳 mo ye po po na

Perennials, 10–20 cm tall. Stems slender, ascending, creeping at base, simple, pubescent with multicellular hairs. Leaves 3 or 4 pairs, crowded apically on stem; lower petioles 5–10 mm, upper leaves sessile; leaf blade ovate to ovate-oblong, 2–4 × 1–2.5 cm, membranous, abaxially subglabrous, adaxially sparsely

pubescent with multicellular hairs, base slightly oblique, margin dentate with teeth toward leaf apex. Racemes (1 or)2(or 3), axillary from upper leaves, 8–11 cm, 5–20-flowered, pubescent with multicellular hairs; peduncle more than 3 cm; bracts broadly linear, 2–3 mm. Pedicel straight, 5–7 mm. Calyx 4-lobed; lobes linear-lanceolate, ca. 3 mm, subequal, glabrous. Corolla red, rotate, ca. 1 cm in diam.; tube less than 1.5 mm; throat hairy. Stamens shorter than corolla. Capsule nearly as long as calyx, ca. 2 × as wide as long, apically ciliate, emarginate. Style 3–4 mm. Seeds 2–10 per locule, flattened, slightly convex. Fl. May–Jun.

• Forests; ca. 2000 m. Sichuan (Ya'an Xian, Tianquan Xian).

41. *Veronica henryi* T. Yamazaki, J. Jap. Bot. 31: 296. 1956.

华中婆婆纳 hua zhong po po na

Veronica cana Wallich ex Benth subsp. *henryi* (T. Yamazaki) Elenevsky.

Perennials, 8–25 cm tall. Stems erect, ascending, or creeping and rooting below middle, basally subglabrous, apically villous, often red-purple, branched or not. Leaves 4–6 pairs, evenly distributed to crowded apically on stem; lower petioles ca. 1 cm, upper shorter; leaf blade ovate to narrowly ovate, 2–5 × 1.2–3 cm, papery, glabrous, or puberulent, or puberulent only adaxially, base usually cuneate, margin dentate with teeth toward leaf apex, apex often acute. Racemes 1–4 pairs, axillary from upper leaves, lax, 2–7-flowered, 3–6 cm, axis and pedicels villous; peduncle 0.5–1.5 cm; bracts linear-lanceolate, shorter than pedicel, glabrous. Pedicel straight, 1–2 mm at anthesis, ca. 3 mm in fruit. Calyx 4-lobed; lobes linear-lanceolate, subequal, 3–4 mm at anthesis, elongated in fruit, glabrous. Corolla white or pale red, purple striate, rotate, ca. 1 cm in diam.; tube less than 1.5 mm; throat hairy. Stamens slightly shorter than corolla. Capsule pliciform-rhomboid, strongly compressed, 4–5 × 9–11 mm, base subtruncate or at an angle greater than 120°, margin apically sparsely ciliate with multicellular glandular hairs, emarginate. Style 2–3 mm. Seeds 2–10 per capsule, flattened, slightly convex, ca. 1.5 mm. Fl. Apr–May.

• Shaded moist places; 500–2300 m. Guangxi, Guizhou, Hubei, Hunan, Jiangxi (Wugong Shan), Sichuan, Yunnan.

Veronica henryi has been confused with *V. cana*, but they are distinct and no intermediates have been found. The relationship between *V. henryi* and *V. riae* is not completely understood, and *V. henryi* may be conspecific with *V. riae*.

42. *Veronica taiwanica* T. Yamazaki, J. Jap. Bot. 31: 297. 1956.

台湾婆婆纳 tai wan po po na

Perennials, 10–15 cm tall. Stems ascending, sparsely pubescent basally and densely apically. Leaves 3–6 pairs; petiole 5–8 mm, pubescent; leaf blade broadly ovate to deltoid-orbicular, 1–1.5 × 0.8–1.5 cm, papery,

puberulent, base truncate to rounded, margin with 5–7 shallowly incised teeth on each side with tip toward leaf apex, apex acute. Racemes axillary in upper leaves, 1.5–2 cm, (1 or)2- or 3(–5)-flowered, nearly as long as leaves; bracts linear, glabrescent. Pedicel often subtended by a pair of linear bracteoles, ca. 2 mm in fruit, puberulent. Calyx 4-lobed; lobes linear-lanceolate, 2–3 mm, subequal, glabrous or glabrescent, apex acuminate. Corolla pink, rotate, 4–5 mm in diam.; tube less than 1.5 mm; throat hairy. Capsule pliciform-rhomboid, strongly compressed, 3–4 × 7–8 mm, angled, base cuneate-truncate, apically short ciliate on angles, emarginate. Style 1.5–1.8 mm. Seeds 2–10 per locule, ovoid, flattened, slightly convex, ca. 1.2 mm. Fl. Apr–Jul.

• Disturbed slopes along trails; ca. 1600 m. Taiwan (Ilan Xian).

43. *Veronica yunnanensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 404. 1979.

云南婆婆纳 yun nan po po na

Perennials, 10–30 cm tall. Stems slender, ascending, simple, entirely villous with multicellular hairs or hairs only along 2 lines. Leaves 4 or 5 pairs, ± evenly distributed; petiole 3–7 mm, upper ones shorter; lower leaf blades small, ovate, base rounded-obtuse; upper ones narrowly ovate to ovate-lanceolate, 2–3 × 1–1.5 cm, base rounded; all leaf blades glabrous or adaxially sparsely hairy, margin with 4 or more deep incised teeth, teeth curved toward leaf apex, apex acute to acuminate. Racemes (1 or)2(or 3), axillary in upper leaves, ca. 2 cm, to 8 cm in fruit, lax, 2–10-flowered, axis and pedicels with dense multicellular glandular hairs; peduncle 0.5–2 cm; bracts linear, 3–4 mm, subglabrous. Pedicel straight. Calyx 4-lobed; lobes narrowly elliptic to oblanceolate, ca. 3 mm, subequal, ciliate with multicellular glandular hairs. Corolla pink, rotate, ca. 1.1 cm in diam.; tube less than 1.5 mm; throat villous; lower lobe obovate, other 3 obovate-orbicular. Stamens much shorter than corolla. Capsule pliciform-rhomboid, strongly compressed, 4–5 × 8–10 mm, base angle slightly larger than 120°, margin apically glandular ciliate, emarginate. Style ca. 3 mm. Seeds 2–10 per locule, ovoid, flattened, slightly convex, ca. 0.6 mm. Fl. Jun–Aug.

• Forests, meadows, forest edges; 3000–4000 m. NW Yunnan.

44. *Veronica deltigera* Wallich ex Benth. Scroph. Ind. 45. 1835.

半抱茎婆婆纳 ban bao jing po po na

Veronica semiamplexicaulis D. Y. Hong.

Perennials, ca. 25 cm tall. Stems erect or ascending, sometimes rooting at base, simple or with underdeveloped branches from middle or apically, densely villous with multicellular hairs or hairs only along 2 lines. Leaves 6–8 pairs, evenly distributed, sessile and ± amplexicaul; leaf blade ovate, 2–3 × 1–2 cm, lower ones smaller, glabrous, base rounded to

truncate, margin dentate to crenate toward leaf apex, apex acute to short acuminate. Racemes 1 or 2, axillary in upper leaves, 7–9 cm in flower, to 10-flowered, axis basally puberulent, densely glandular hairy in middle and apically; peduncle 2–3.5 cm; bracts broadly linear to lanceolate. Pedicel straight, shorter than bract. Calyx 4-lobed; lobes lanceolate, 4–5 mm, subequal, with sparse multicellular glandular hairs. Corolla blue-purple, rotate, to 1.3 cm in diam.; tube less than 1.5 mm, glabrous inside. Stamens shorter than corolla. Young fruit strongly compressed, base truncate, lateral angle acute, margin apically ciliate with multicellular glandular hairs, emarginate. Style 4–5 mm. Seeds 2–10 per locule, flattened, slightly convex. Fl. Jun.

Slope thickets, meadows; 2700–3100 m. S Xizang (Qomolangma Feng) [E Nepal].

45. *Veronica piroliformis* Franchet, Bull. Soc. Bot. France 47: 20. 1900.

鹿蹄草婆婆纳 lu ti cao po po na

Perennials. Rhizomes thick, branched. Roots ca. 1 mm in diam. Stems 1–5 cm, ascending or erect, hairy, internodes to 2 cm. Leaves crowded, often rosulate, rarely evenly distributed; petiole long to short, winged or wingless; leaf blade mostly spatulate, rarely elliptic or orbicular, 3–8 × 1–3.5 cm, larger upward, subglabrous to densely pubescent with multicellular hairs, base cuneate and attenuate into petiole, margin dentate, apex acute to obtuse. Racemes 1(–3), axillary, erect, scapose, to 20 cm, densely with brown-yellow multicellular glandular hairs (except for corolla). Pedicel straight, nearly as long as bract. Calyx 4-lobed; lobes linear-oblong to obovate-lanceolate, ca. 4 × 2 mm, subequal. Corolla blue, purple, or white, rotate, 1–1.2 cm in diam.; tube less than 1.5 mm; throat hairy. Capsule pliciform-rhomboid, strongly compressed, 4–5 × 7–9 mm, base subtruncate or at an angle greater than 120°, lateral angles acute to obtuse, emarginate. Style ca. 1.5 mm. Seeds 2–10 per locule, ovoid-rounded, flattened, slightly convex, ca. 1.5 mm. Fl. Jun–Jul.

• Slope meadows, forests, limestone crevices; 2600–4000 m. SW Sichuan (Puge Xian), NW Yunnan.

46. *Veronica forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 282. 1912.

大理婆婆纳 da li po po na

Perennials. Stems creeping at least basally, 5–20 cm, villous, internodes 0.2–1(–3) cm and leaves crowded, to internodes ca. 3 cm and leaves evenly distributed. Leaves sessile or subsessile; leaf blade elliptic, 1–2 cm × 3–7 mm, papery, glabrous, base cuneate and attenuate into an inconspicuous petiole, margin entire basally, serrate at middle and apically, apex obtuse to acute. Racemes 1 or 2, axillary from lower and middle leaves, 5–15 cm, ca. 10-flowered, axis and pedicels densely with multicellular glandular hairs; bracts linear to linear-lanceolate, shorter than pedicel. Pedicel straight, ca. 1 cm in fruit. Calyx 4-lobed; lobes linear-elliptic, ca.

5 mm, subequal, with multicellular glandular hairs. Corolla red or white, rotate, 1–1.2 cm in diam.; tube less than 1.5 mm; throat hairy. Capsule pliciform-rhomboid, strongly compressed, ca. 5 × 7 mm, glandular, base angle ca. 120°, lateral angles acute to obtuse, margin apically with multicellular glandular hairs, emarginate. Style ca. 3 mm. Seeds 2–10 per locule, flattened, slightly convex, ca. 1 mm. Fl. Jun.

• Forests; 2000–3000 m. Yunnan (Dali Xian, Yangbi Xian).

47. *Veronica oligosperma* Hayata, Icon. Pl. Formosan. 5: 128. 1915.

少籽婆婆纳 shao zi po po na

Perennials. Stems creeping, densely villous with multicellular hairs. Petiole of lower leaves ca. 7 mm, shorter upward; leaf blade triangular-orbicular, 0.6–2 × 0.6–1.5 cm, sparsely villous with multicellular hairs, margin with 2 or 3 pairs of deeply incised coarse teeth with tips toward leaf apex, teeth margin recurved and thickened. Racemes 1, axillary from upper leaves, 1–4-flowered, villous with multicellular hairs (except for corolla); peduncle 1–3 cm; bracts linear to linear-lanceolate, shorter than pedicel. Pedicel ca. 6 mm, curved at anthesis, straight in fruit. Calyx 4-lobed; lobes narrowly elliptic, ca. 4 × 1.5 mm, subequal, with sparse multicellular glandular hairs, apex obtuse. Corolla rotate; tube less than 1.5 mm; throat hairy. Capsule pliciform-rhomboid, strongly compressed, 4–5 × 8–9 mm, margin apically ciliate with multicellular glandular hairs, emarginate. Style 2.5–3 mm, reflexed. Seeds 2–10 per locule, oblong-ovoid, flattened, slightly convex, ca. 1.6 mm. Fl. May–Sep.

• Moist forests; 2500–3500 m. Taiwan.

48. *Veronica tibetica* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 404. 1979.

西藏婆婆纳 xi zang po po na

Perennials, ca. 10 cm tall. Roots thick, to 1 mm in diam. Rhizomes horizontal. Stems several, cespitose, ascending, simple, densely villous with white multicellular hairs. Leaves basally crowded, withered at anthesis; middle and upper leaves 3 or 4 pairs and larger upward; petiole 5–7 mm, shorter on lower leaves; leaf blade deltoid-ovate to ovate, 1–2 × 1–1.5 cm, papery, densely villous with white multicellular hairs, margin deeply incised with 5–7 and often obtuse teeth on each side, apex obtuse to acute, veins conspicuously reticulate. Racemes 1 or 2, axillary from uppermost leaves, appearing terminal, 2–3 cm in flower, axis and pedicels with multicellular glandular hairs; peduncle ca. 1 cm; bracts linear-elliptic, longer than pedicel, very sparsely hairy. Pedicel ca. 2 mm at anthesis. Calyx 4-lobed; lobes narrowly elliptic, 3–4 mm, subequal, sparsely ciliate. Corolla white, rotate, ca. 1.1 cm in diam.; tube less than 1.5 mm, glabrous in throat; lower lobe obovate, other 3 lobes orbicular. Stamens slightly shorter than corolla. Ovary and young fruit strongly

compressed, margin apically ciliate. Style ca. 3.5 mm.

Fl. Jun.

• Valley forests; ca. 2500 m. S Xizang (Gyirong Xian).

No mature fruit have been seen, but the glabrous corollas, dwarf habit, several pairs of withered leaves basally on stem at anthesis, short and thick rhizomes, and thick roots indicate that this is a distinct species.

49. *Veronica oxycarpa* Boissier in Kotschy, Pl. Pers. Austr., ed. R. F. Hohenacker, no. 639. 1845, printed label with a descr.

尖果水苦茛 jian guo shui ku mai

Veronica anagallis-aquatica Linnaeus subsp. *oxycarpa* (Boissier) Elenevsky.

Perennials, rhizomes often more than 20 cm. Stems 30–100 cm tall, erect or procumbent at base, simple or with procumbent branches, ± succulent, glabrous or apically sparsely glandular hairy. Lower leaves short petiolate, others sessile and semiamplexicaul; leaf blade ovate to elliptic, lanceolate upward, 3–8 × 1–3 cm, margin entire or serrate; leaves on branches smaller than others, short petiolate. Racemes axillary, many flowered, to 15 cm, often curved and ascending. Pedicel 4–10 mm in fruit, longer than bract, curved and ascending. Calyx 4-lobed, as long as capsule or slightly shorter; lobes ovate-lanceolate, slightly unequal in width. Corolla blue, pale purple, or white, ca. 6 mm in diam.; tube short; lobes slightly unequal in width. Capsule ovoid-deltoid, slightly compressed, apically tapering, 3–4 × 2.5–3 mm, apex slightly notched. Style ca. 3 mm. Seeds ca. 30 per capsule, slightly flattened, ca. 0.5 mm. Fl. Jun–Aug. $2n = 18$.

By water near forests, open places near water. N Xinjiang, Xizang [Afghanistan, Bhutan, Kazakstan, Kyrgyzstan, Pakistan, Sikkim, Tajikistan, Turkmenistan; SW Asia].

50. *Veronica anagallis-aquatica* Linnaeus, Sp. Pl. 1: 12. 1753.

北水苦茛 bei shui ku mai

Perennials or rarely annuals, usually glabrous, rarely sparsely glandular hairy on inflorescence axes, pedicels, calyces, and capsules. Rhizomes inclined. Stems erect or procumbent at base, branched or not, 10–100 cm tall, ± succulent. Leaves sessile, amplexicaul upward; leaf blade elliptic to ovate, sometime ovate-oblong, rarely lanceolate, 2–10 × 1–3.5 cm, margin entire or sparsely serrate. Racemes axillary, many flowered, longer than leaves, often less than 1 cm wide. Pedicel 4–10 mm in fruit, as long as or longer than bract, ascending, at acute angle with inflorescence axis, curved upward in fruit and thus capsule close to inflorescence axis. Calyx 4-lobed; lobes ovate-lanceolate, ca. 3 mm, equal in size, erect or patent, not appressed to capsule in fruit, apex acute. Corolla pale blue, pale purple, or white, rotate, 4–5 mm in diam.; tube short; lobes broadly ovate, slightly unequal in width. Stamens shorter than corolla. Capsule subglobose, as long as wide, slightly compressed, as long as calyx, apex rounded and slightly notched. Style 1.5–2 mm. Seeds numerous, slightly flattened, convex on both sides. Fl. Apr–Sep. $2n = 36$.

By water or in swamps; below 4000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Europe, naturalized in North America].

Young plants are edible. Fruit are abnormally swollen when parasitized by insects. These galls are called *xian tao cao* and are used medicinally.

Veronica anagallis-aquatica is an extremely widespread species. Its geographic variation and its relations to other species (e.g., *V. anagalloides*, *V. oxycarpa*, and *V. undulata*, as well as other species in *V. sect. Beccabunga* that do not occur in China) is still not fully understood.

51. *Veronica undulata* Wallich ex Jack in Roxburgh, Fl. Ind. 1: 147. 1820.

水苦菜 shui ku mai

Veronica anagallis-aquatica Linnaeus subsp. *undulata* (Wallich ex Jack) Elenevsky.

Perennials, rarely annuals; stems, inflorescence axes, pedicels, calyces, and capsules sparsely with capitate glandular hairs. Rhizomes inclined. Stems erect or procumbent at base, branched or not, 10–100 cm tall, ± succulent. Leaves sessile, amplexicaul upward; leaf blade mostly elliptic to ovate, sometime ovate-oblong or linear-lanceolate, rarely lanceolate, 2–10 × 1–3.5 cm, margin usually serrate. Racemes axillary, longer than leaves, 1–1.5 cm wide, many flowered. Pedicel 3–5 mm, as long as or shorter than bract, straight, at a right angle with inflorescence axis, patent in fruit. Calyx 4-lobed; lobes ovate-lanceolate, ca. 3 mm, equal in size, erect to patent, not appressed to capsule in fruit, apex acute. Corolla pale blue, pale purple, or white, rotate, 4–5 mm in diam.; tube short; lobes broadly ovate, slightly unequal in width. Stamens shorter than corolla. Capsule subglobose, as long as wide and as calyx, slightly compressed, apex rounded and slightly notched. Style 1–1.5 mm. Seeds ca. 30 per capsule, slightly flattened, convex on both sides. Fl. Apr–Sep. $2n = 18$.

By water or in swamps; below 2800 m. Throughout China except Nei Mongol, Ningxia, Qinghai, Xizang [E Afghanistan, N India, Japan, Korea, Laos, Nepal, Pakistan, Thailand, Vietnam].

Veronica undulata and *V. anagallis-aquatica* differ morphologically and geographically, with the latter not occurring in SE China.

Plants with galls are used to stimulate blood circulation, relieve pains, stimulate menstrual flow, and stop bleeding.

52. *Veronica anagalloides* Gussone, Pl. Rar. 5: t. 3. 1826.

长果水苦菜 chang guo shui ku mai

Annuals; inflorescence axes, pedicels, calyces, and capsules usually sparsely glandular hairy. Stems 15–50 cm tall, erect, simple or branched at base, ± succulent, very sparsely glandular hairy, sometimes glabrous. Leaves

sessile, semiamplexicaul, lanceolate to linear-lanceolate, 2–5 × 0.5–1 cm, margin subentire to serrate. Racemes axillary, to 15 cm, many flowered. Pedicel 3–7 mm, straight or apically slightly curved, at an angle of 60–70° with inflorescence axis. Calyx 4-lobed; lobes elliptic, equal in size, obscurely 3-veined, outside glandular hairy, apex acute, erect and appressed to capsule in fruit. Corolla blue to pale purple, rotate, 3 mm in diam.; tube short; lobes slightly unequal in width. Capsule ellipsoid to broadly so, slightly compressed, 2.5–4 × 2–2.5 mm, longer than calyx, emarginate. Style ca. 1.5 mm. Seeds ca. 30 per capsule, slightly flattened, convex on both sides, ca. 0.7 mm. Fl. Jun–Jul, fr. Jul–Sep. $2n = 18$.

Ditches, river sides, wet places; 300–2900 m. Gansu (Yumen Shi), Heilongjiang (Harbin Shi), Nei Mongol (Tongliao Xian, Wulabu Meng), Qinghai (Delingha), N Shaanxi, Shanxi, N Xizang [Afghanistan, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, C to S Europe].

53. *Veronica beccabunga* Linnaeus subsp. *muscosa* (Korshinsky) Elenevsky, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 82: 153. 1977.

有柄水苦菜 you bing shui ku mai

Veronica beccabunga var. *muscosa* Korshinsky, Zap.

Imp. Akad. Nauk. Fiz.-Mat. Otd. 4(4): 96. 1896; *V. hjuleri* Paulsen.

Perennials, 2–10 cm tall, glabrous. Rhizomes elongated. Stems repent, 10–30 cm, apically slightly ascending, branched, ± succulent. Petiole 1–5 mm, conspicuous; leaf blade suborbicular, ovate, or oblong, 0.5–2.5 × 0.3–1.5 cm, margin subentire or shallowly serrulate to crenulate and 5–9-toothed per side. Racemes axillary, 1–3 cm, 3–15-flowered; peduncle 0.3–1.5 (–2) cm in fruit, to 1/2 as long as subtending leaf. Pedicel 3–8 mm, straight, almost horizontally patent. Calyx 4-lobed; lobes ovate-lanceolate, equal in size, reflexed or ± distant from capsule. Corolla pale purple to pale blue, rotate, ca. 5 mm in diam., tube short; lobes slightly unequal in width. Capsule subrounded, slightly compressed, 3–4 × 3–5 mm, apex notch inconspicuous. Style 1–2 mm. Seeds ca. 30 per capsule, slightly flattened, convex on both sides; seed coat shallowly reticulate. Fl. Apr–Sep.

By water; 1200–2500 m. SW Sichuan (Muli Zangzu Zizhixian), Xinjiang, NW Yunnan, [Afghanistan, Kashmir, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (E Iran)].

Veronica beccabunga subsp. *abscondita* M. A. Fischer occurs in the mountains of SW Asia, whereas *V. beccabunga* subsp. *beccabunga* occurs widely in Europe to N and W Turkey and is naturalized in North America.

39. LAGOTIS Gaertner, Novi Comment. Acad. Sci. Imp. Petrop. 14: 533. 1770.

兔耳草属 tu er cao shu

Gymnandra Pallas.

Herbs, perennial, fleshy, glabrous. Rhizomes stout. Lateral roots few to numerous. Stems 1 to numerous, or main stem inconspicuous, unbranched. Leaves mostly basal; petiole winged, base often dilated; leaf blade margin entire, serrate, or pinnately parted. Scapes 1 to numerous. Inflorescences narrowly spicate or capitate, densely flowered; bracts imbricate. Bracteoles absent. Calyx spathe-like, lower side splitting to base, upper side lobed or splitting to base, membranous, margin ciliate. Corolla 2-lipped; lower lip 2–4-lobed; upper lip entire or 2-lobed. Stamens 2, inserted at corolla sinuses or filaments adnate to margin near base of upper lip and as long as lip or shorter; anthers mostly reniform. Ovary 2-loculed. Stigma capitate or 2-lobed. Fruit drupaceous. Seeds 1 or 2.

About 30 species: northern hemisphere; 17 species in China.

1a. Plants without conspicuous main stem.

2a. Plants stoloniferous; corolla 4–6 mm.

3a. Root crown enclosed by fibrous remnants of old leaves; leaves entire 1. *L. brachystachya*

3b. Root crown without remnants of old leaves; leaves pinnately parted 2. *L. pharica*

2b. Plants not stoloniferous; corolla 6–10 mm.

4a. Flowering stems not scapose; spikes elongated; rhizomes short 5. *L. decumbens*

4b. Flowering stems scapose; spikes ovoid; rhizomes long.

5a. Petioles and leaves abaxially purple-red; bracts to 1.5 cm, subleathery 3. *L. praecox*

5b. Petioles and leaves abaxially not purple-red; bracts ca. 0.8 cm, papery 4. *L. ramalana*

1b. Plants with conspicuous erect stem.

6a. Corolla tube straight; style short.

7a. Leaf blade thin, papery; anther subsagittate.

8a. Stem leaves sessile, smaller than basal leaves; calyx at anthesis slightly longer than bract 10. *L. yunnanensis*

8b. Stem leaves short petiolate, as large as or slightly smaller than basal leaves; calyx at anthesis shorter than bract 11. *L. wardii*

7b. Leaf blade thick, somewhat fleshy or subleathery; anther reniform.

9a. Corolla tube longer than limb; inflorescences elongated to more than 1/2 stem length 6. *L. crassifolia*

9b. Corolla tube as long as or slightly shorter than limb; inflorescences mostly capitate, less than 1/2 stem length.

10a. Root crown often with remnants of old petioles; bracts suborbicular 7. *L. brevitiba*

10b. Root crown without remnants of old petioles; bracts ovate, obovate, or ovate-lanceolate.

11a. Plants ca. 5 cm tall; stems usually erect 8. *L. humilis*

11b. Plants more than 6 cm tall; stems prostrate, diffuse or obliquely ascending 9. *L. alutacea*

6b. Corolla tube slightly curved forward; style long.

12a. Filaments adnate to base of upper corolla lip margin; style exerted.

13a. Root crown without remnants of old petioles; calyx ca. 2 × as long as bract above middle of inflorescence 12. *L. clarkei*

13b. Root crown usually with remnants of old petioles; calyx shorter than bract 13. *L. integrifolia*

12b. Filaments inserted at corolla sinuses; style included or reaching mouth of corolla tube (slightly exerted in *L. kongboensis*).

14a. Inflorescences subcapitate; bracts linear-oblong to spatulate 14. *L. angustibracteata*

14b. Inflorescences elongated; bracts ovate, obovate, or ovate-lanceolate.

15a. Bract margin entire; basal leaf blade 4–11 cm, margin entire or sparsely and irregularly serrulate 17. *L. integra*

15b. Bract margin serrate; basal leaf blade 2–4.5 cm, margin coarsely or obtusely toothed.

16a. Corolla tube 2–3 × as long as limb 15. *L. macrosiphon*

16b. Corolla tube slightly longer than limb 16. *L. kongboensis*

1. *Logotis brachystachya* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 525. 1881.

短穗兔耳草 duan sui tu er cao

Kokonoria stolonifera Keng & P. C. Keng.

Herbs, 4–8 cm tall. Lateral roots numerous, fascicled, to 10 cm, fleshy; root crown with fibrous remnants of old petioles. Rhizomes less than 3 cm. Stolons purplish red, more than 30 cm, 1–2 mm in diam. Leaves basal,

rosulate; petiole 1–5 cm, broadly winged, flattened; leaf blade broadly linear to lanceolate, 2–7 cm, base tapering, margin entire, apex acuminate. Scapes few, slender, prostrate to erect, not exceeding leaves; spikes dense, 1–1.5 cm; bracts ovate-lanceolate, 4–8 mm, papery. Calyx as long as or slightly shorter than corolla tube, apex of upper side split for more than 1/3 length, margin long ciliate. Corolla white, reddish, or purple,

5–6 mm; tube straight, longer than limb; lower lip lobes 2, oblong, 1–1.2 mm wide; upper lip unlobed, ovate to ovate-oblong, 1.5–2 mm wide. Stamens shorter than upper lip. Disc 4-lobed. Style exerted; stigma capitate. Fruit red, ovate. Fl. and fr. May–Aug.

• Alpine grassland, sandy grassland on riverbanks and lake shores; 3200–4500 m. Gansu, Qinghai, Sichuan, Xinjiang.

The whole plant is used medicinally.

2. *Lagotis pharica* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65(2): 62. 1896.

裂叶兔耳草 lie ye tu er cao

Lagotis incisifolia Handel-Mazzetti.

Herbs, 4–15 cm tall. Lateral roots fascicled, fleshy; root crown with 2–4 scarious brown ovate scales. Rhizomes short, slender. Stolons more than 7 cm. Leaves 2–6, basal; petiole 1.2–7 cm, narrowly winged, flattened, base dilated and sheathlike; leaf blade ovate to oblong, as long as or shorter than petiole, pinnately parted; segments 3–5, linear, margin obtuse-serrate. Scapes 1–3, ascending, nearly as long as leaves; spikes 1.5–2.5 cm; bracts broadly obovate to ovate-oblong, 4–6 mm, thick, pubescent, margin entire, apically crenate. Calyx 2-lobed; lobes lanceolate, 2–3 mm. Corolla violet, 4–5.5 mm; tube straight, nearly as long as limb; lower lip lobes 3, linear-oblong; upper lip 2-lobed. Filaments as long as or longer than lips. Style shorter than lips, slender; stigma small, capitate to emarginate. Fruit narrowly ovoid-globose. Fl. May.

Alpine grassland; ca. 4300 m. W Sichuan, SE Xizang [Bhutan].

3. *Lagotis praecox* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 217. 1919.

紫叶兔耳草 zi ye tu er cao

Herbs, 5–18 cm tall. Lateral roots to 25 cm, fleshy; root crown with remnants of old petioles. Rhizomes to 6 cm. Leaves basal, subleathery; petiole abaxially purple-red, 4–7(–11) cm, narrowly winged, base much dilated into a sheathlike scale; leaf blade reniform, orbicular, or ovate, 4–7 cm, abaxially purple-red, base cordate, truncate, or broadly cuneate, margin coarsely crenate, apex rounded to obtuse. Scapes 1–5, ascending, nearly as long as leaves; spikes ovoid, 1.5–2.5 cm; bracts densely imbricate, obovate to suborbicular, to 1.5 cm, subleathery, enclosing flowers. Calyx lower side 2-lobed; lobes lanceolate-oblong, margin finely fimbriate. Corolla blue, ca. 6 mm; tube straight, as long as limb; lower lip lobes 2 or 3, lanceolate; upper lip ovate, emarginate or 2-lobed. Stamens exerted. Stigma capitate. Fruit elliptic-oblong, ca. 7 mm. Fl. and fr. Jul–Aug.

• Alpine grassland, sandy and gravelly areas; 4500–5200 m. W Sichuan, NW Yunnan.

4. *Lagotis ramalana* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 177. 1895.

圆叶兔耳草 yuan ye tu er cao

Herbs, 5–8 cm tall. Lateral roots to 15 cm or longer, fleshy. Rhizomes obliquely elongated, to 5 cm. Leaves 3–6, basal; petiole 1–5 cm, flattened, broadly winged, base sheathlike; leaf blade ovate, nearly as long as petiole, base broadly cuneate, margin crenate, apex rounded. Scapes 2 to few, erect or ascending, slightly longer or rarely shorter than leaves; spikes ovoid, 1.5–2 cm; bracts obovate to spatulate, ca. 8 mm, basally on inflorescence, papery. Calyx 2-lobed; lobes lanceolate, 2–3 mm, membranous, margin ciliolate. Corolla blue-purple, 6–7 mm; tube straight, ca. 2 × as long as limb; lower lip lobes 2, narrowly elliptic; upper lip unlobed, ovate to oblong, 1.5–2 mm wide, emarginate to truncate. Stamens exerted. Style slightly shorter than corolla; stigma minute, capitate. Fruit elliptic, ca. 7 mm, 1-seeded. Fl. and fr. May–Aug.

Alpine grassland; 4000–5300 m. Gansu, Qinghai, NW Sichuan, Xizang [Bhutan].

5. *Lagotis decumbens* Ruprecht, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 14(4): 64. 1869.

倾卧兔耳草 qing wo tu er cao

Lagotis glauca Gaertner subsp. *australis* Maximowicz.

Herbs, 8–15 cm tall. Old root crown with 1–3 series of ovate scales. Rhizomes short, ca. 6 mm in diam. Stems 1–3, prostrate to ascending, 5–20 cm, slender. Basal leaves 5–10; petiole 6–7 cm; leaf blade ovate-oblong to ovate-elliptic, 2.5–6 cm, base broadly cuneate, margin coarsely serrate, apex obtuse. Stem leaves 3 or 4, sessile or short petiolate; leaf blade ovate, much smaller than basal leaves, margin obscurely toothed, apex acute. Spikes ca. 2.5 cm, dense; bracts broadly elliptic, to 1 cm. Calyx 2-lobed nearly to base. Corolla pale blue, ca. 1 cm; tube ± straight, much longer than limb; lower lip 3- or 4-parted, spreading flat; upper lip suborbicular, apex entire or emarginate. Filaments short. Style included. Fl. Jun–Jul.

Moraines, along streams, stony slopes; 4800–5500 m. Xinjiang, Xizang [Kyrgyzstan, Tajikistan].

6. *Lagotis crassifolia* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65(2): 63. 1896.

厚叶兔耳草 hou ye tu er cao

Herbs, 2–12 cm tall. Lateral roots few, fibrous. Rhizomes elongated, coarse, fleshy. Stems to 8, ascending. Basal leaves numerous, thick, fleshy; petiole stout, 2–7 cm, flattened, base expanded, sheathlike; leaf blade ovate to ovate-oblong, 2–6 cm, thick, base cuneate, margin coarsely toothed, apex obtuse, acuminate tipped. Stem leaves 3 or 4, subsessile, smaller than basal leaves. Spikes elongated, more than 1/2 as long as stem; bracts ovate, shorter than flower, margin subentire, apex acute. Calyx apex of upper side 2-lobed. Corolla blue-purple or white, 1–1.3 cm; tube straight, ca. 2 × as long as limb; lower lip lobes 2 or 3, lanceolate; upper lip unlobed, ovate-oblong. Filaments short; anthers reniform. Style shorter than corolla tube; stigma capitate or 2-lobed. Fruit oblong. Fl. and fr. Jul–Sep.

Alpine grassland; 4200–5300 m. Xizang (Yadong Xian) [Bhutan, Sikkim].

7. *Lagotis brevityba* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 524. 1881.

短筒兔耳草 duan tong tu er cao

Herbs, 5–15 cm tall. Lateral roots few, to 10 cm, 1–1.5 mm in diam.; root crown often with remnants of old petioles. Rhizomes coarse, short. Stems 1–3, longer than leaves. Basal leaves 4–7; petiole 2–6.5 cm; leaf blade ovate to ovate-oblong, 1.6–6 cm, thick, margin irregularly crenate or rarely subentire. Stem leaves numerous, short petiolate to sessile, smaller than basal leaves. Spikes capitate to oblong, 2–3 cm, to 6 cm in fruit; bracts often longer than corolla tube, suborbicular. Calyx apex of upper side parted 1/4–1/3 of length; lobes ovate-orbicular. Corolla pale blue or white and purplish, 0.8–1.3 cm; tube straight, nearly equalling limb to slightly shorter; lower lip slightly longer than upper lip, 2-lobed, lobes linear-lanceolate; upper lip unlobed, obovate-oblong, apex entire or emarginate. Anthers reniform. Stigma capitate. Fruit narrowly ovoid, ca. 5 mm. Fl. and fr. Jun–Aug.

• Alpine grassland, sandy slopes; 3000–4500 m. SW Gansu, E Qinghai, Xizang.

8. *Lagotis humilis* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 404. 1979.

矮兔耳草 ai tu er cao

Herbs, ca. 5 cm tall. Rhizomes erect or oblique, short, narrow, with few lateral and fibrous roots. Stems 1 or 2, erect, slightly longer than leaves. Basal leaves 3–5; petiole 1.5–2 cm, flattened, base somewhat expanded; leaf blade ovate to broadly ovate, thick, shorter than or almost as long as petiole, base cuneate, margin coarsely crenate, apex acuminate and mucronate. Stem leaves 1–3, short petiolate to sessile, smaller than basal leaves. Spikes dense, capitate to oblong, 1–2.5 cm; bracts obovate, margin toothed above middle, apex acute. Calyx membranous, 2-lobed, veins conspicuous and almost reaching apex. Corolla blue to purple, 0.9–1.2 cm; tube straight; lower lip nearly as long as upper, lobes 2, narrowly lanceolate; upper lip oblong, emarginate. Anthers reniform. Style included; stigma 2-lobed. Fl. Jun.

• Grassland on mountain slopes, gravel slopes; 5100–5200 m. SW Xizang.

9. *Lagotis alutacea* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 215. 1919.

革叶兔耳草 ge ye tu er cao

Herbs, 6–15 cm tall. Lateral roots numerous, to 12 cm, with few fibrous roots. Rhizomes oblique, to 7 cm, fleshy, unbranched. Stems 1–4, prostrate, diffuse or obliquely ascending. Basal leaves 3–6; petiole 2–5 cm, flattened, base expanded, sheathlike; leaf blade suborbicular, broadly ovate, or broadly ovate-oblong, 2–6 cm, thick, margin entire, obtusely serrate, or crenate. Stem leaves few, short petiolate to sessile, smaller than basal leaves. Spikes dense, ovoid to oblong,

2.5–7 cm; bracts obovate to ovate-lanceolate, longer than calyx, apex acute. Calyx 4–8 mm, apex of upper side lobed, primary veins 2, reaching lobe apex. Corolla pale-purple, blue, or whitish yellow, 0.9–1.5 cm; tube straight; lower lip lobes 2(or 3), narrowly lanceolate; upper lip lanceolate to oblong, margin entire, apex notched or shallowly 2(or 3)-lobed. Anthers reniform. Style included; stigma capitate or 2-lobed. Fl. May–Sep.

• Alpine grassland, sandy and stony slopes; 3400–5000 m. SW to W Sichuan, NW Yunnan.

1a. Plants 15–25 cm; bracts as long as calyx 9c. var. *foliosa*

1b. Plants 6–15 cm; bracts longer than calyx.

2a. Corolla 0.9–1.2 cm, upper lip entire

..... 9a. var. *alutacea*

2b. Corolla 1.2–1.5 cm, upper lip notched

or shallowly 2(or 3)-lobed 9b. var. *rockii*

9a. *Lagotis alutacea* var. *alutacea*

革叶兔耳草(原变种) ge ye tu er cao (yuan bian zhong)

Lagotis lancilimba H. L. Li.

Bracts longer than calyx. Corolla 0.9–1.2 cm; upper lip lanceolate to oblong, margin entire. Fl. May–Sep.

• Alpine grassland, sandy slopes; 3600–4800 m. SW Sichuan, NW Yunnan.

9b. *Lagotis alutacea* var. *rockii* (H. L. Li) P. C. Tsoong ex H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 336. 1979.

革叶兔耳草裂唇变种 ge ye tu er cao lie chun bian zhong

Lagotis rockii H. L. Li, Brittonia 8: 27. 1954.

Bracts longer than calyx. Corolla 1.2–1.5 cm; upper lip notched or shallowly 2(or 3)-lobed. Fl. May–Jul.

• Alpine grassland, stony slopes; 3400–5000 m. W Sichuan, NW Yunnan.

9c. *Lagotis alutacea* var. *foliosa* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 219. 1919.

革叶兔耳草多叶变种 ge ye tu er cao duo ye bian zhong

Plants 15–25 cm. Leaves elliptic to ovate.

Inflorescences to 8 cm. Bracts as long as calyx.

• Stony moist pastures; ca. 3500 m. NW Yunnan.

10. *Lagotis yunnanensis* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 219. 1919.

云南兔耳草 yun nan tu er cao

Herbs, 15–35 cm tall. Lateral roots numerous, to 15 cm, 1–2 mm in diam. Rhizomes to 6 cm. Stems 1 or 2, erect, longer than leaves. Basal leaves 4–6; petiole 6–10 cm; leaf blade ovate to oblong, 3.5–7(–12) cm, papery, base cuneate and tapering, margin broadly crenate or rarely entire, apex rounded and apiculate. Stem leaves 2–6, sessile, smaller than basal leaves. Spikes 4–10 cm, ca. 2

cm in diam.; bracts dark yellow-green, ovate to ovate-lanceolate, apex ± sharp. Calyx pale yellow-green, at anthesis slightly longer than bracts, margin thin fimbriate. Corolla white, rarely purple, 0.8–1.2 cm; tube straight, as long as or slightly longer than limb; lower lip lobes 2–4, lanceolate; upper lip unlobed, rarely 2-lobed, lobes oblong. Anthers subsagittate. Style included. Fl. Jun–Aug.

• Alpine grassland; 3300–4700 m. NW Sichuan, Xizang, NW Yunnan.

11. *Lagotis wardii* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 218. 1919.

箭药兔耳草 jian yao tu er cao

Herbs, 12–22 cm tall. Lateral roots numerous. Rhizomes elongated. Stems 1, obliquely ascending, as long as leaves or slightly longer. Basal leaves 3 or 4; petiole 3–12 cm, base slightly expanded; leaf blade suborbicular, obovate, or ovate-oblong, 6–12 cm, papery when dry, margin broadly crenate, veins ± conspicuous. Stem leaves 2–5, short petiolate. Spikes nearly globose, at anthesis elongated to 7 cm; bracts narrowly lanceolate. Calyx at anthesis shorter than bracts, margin thin fimbriate, primary veins slightly exerted, forming 2 short points. Corolla whitish; tube straight, ca. 7 mm, slightly longer than calyx; lower lip lobes 2, narrowly lanceolate; upper lip unlobed, lanceolate to oblong. Anthers subsagittate, included. Stigma 2-lobed. Disc obliquely and shallowly cupular. Fl. Aug.

• Alpine grassland; 3700–4500 m. SE Xizang, Yunnan.

12. *Lagotis clarkei* J. D. Hooker, Fl. Brit. India 4: 559. 1885.

大萼兔耳草 da e tu er cao

Herbs, 15–30 cm tall. Rhizomes 7–12 mm in diam. Lateral roots fascicled; root crown without remnants of old petioles. Stems 1 or 2, stout, ascending, longer than leaves. Basal leaves numerous, rosulate; petiole 4–7 cm, base sheathlike; leaf blade ovate to ovate-oblong, 4–9 cm, subleathery when dry, margin irregularly serrate. Stem leaves numerous, subsessile, smaller than basal leaves. Spikes to 10 cm, slender, often recurved; bracts ovate. Calyx wide and large, 1–2 × as long as bract, enclosing corolla; lobes ovate-triangular to suborbicular. Corolla blue-purple, 5–8 mm; tube slightly bowed, nearly as long as limb; lower lip lobes 3, lanceolate; upper lip unlobed, obovate-orbicular, apex obtuse to praemorse. Filaments adnate to base of upper corolla lip margin. Style exerted; stigma 2-lobed. Fl. Aug–Sep.

Open areas in alpine scrub, alpine grassland; 4600–5300 m. Xizang (Yadong Xian) [Bhutan, Nepal, Sikkim].

13. *Lagotis integrifolia* (Willdenow) Schischkin ex Vikulova, Fl. URSS 22: 502. 1955.

亚中兔耳草 ya zhong tu er cao

Gymnandra integrifolia Willdenow, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 5: 392. 1811; *G. pallasii* Chamisso & Schlechtendal; *L. pallasii* (Chamisso & Schlechtendal) Ruprecht.

Herbs, 10–40 cm tall. Rhizomes to 4 cm. Lateral roots slender, 5–8 cm, with few fibrous roots; root crown with remnants of old petioles. Stems 1, stout, erect or somewhat flexuous, longer than leaves. Basal leaves 2–4; petiole 3–12 cm, base sheathlike; leaf blade ovate, ovate-elliptic, oblong, or ovate-lanceolate, nearly as long as petiole, fleshy, base cuneate, margin entire or obscurely undulate-toothed. Stem leaves usually 1–4, sessile or short petiolate, smaller than basal leaves. Spikes dense, 5–12 cm, elongated in fruit; bracts broadly ovate to oblong, apex apiculate. Calyx shorter than bract; lobes triangular. Corolla dull white, pale blue, or purple, 0.8–1.2 cm; tube longer than limb, basally curved forward; lower lip lobes 2 or 3, lanceolate, usually revolute in fruit; upper lip unlobed, oblong, margin entire or shortly 2- or 3-toothed, rarely 2-lobed. Filaments adnate to base of upper corolla lip margin. Style exerted; stigma capitate or emarginate. Fruit oblong, 5–6 mm. Fl. and fr. Jun–Aug.

Thickets, gravel slopes; 2400–3100 m. Nei Mongol, Shanxi (Wutai Shan), Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

14. *Lagotis angustibracteata* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin. 67(2): 404. 1979.

狭苞兔耳草 xia bao tu er cao

Herbs, 5–14 cm tall. Lateral roots more than 4 cm; root crown without remnants of old petioles. Rhizomes ca. 6 mm in diam. Stems often 2, slightly longer than leaves. Basal leaves 4–6; petiole 4–10 cm; leaf blade broadly ovate to orbicular, 3–4 cm, margin crenate. Stem leaves 3 or 4, short petiolate or sessile, smaller than basal leaves, margin undulate to subentire. Spikes dense, subcapitate, 1–3 cm; bracts linear-oblong to spatulate, 8–10 mm. Calyx shorter than bracts, nearly as long as corolla tube, emarginate to subentire, primary veins 2. Corolla dull red, 0.9–1.1 cm; tube slightly longer than limb, curved; lower lip slightly longer than upper, 2-lobed; lobes oblong-lanceolate, apex acuminate; upper lip unlobed, oblong, ca. 3 mm. Stamens inserted at corolla sinuses. Style included; stigma capitate. Fl. Jun.

• Alpine gravelly areas with running water; 4600–4700 m. Qinghai.

15. *Lagotis macrosiphon* P. C. Tsoong & H. P. Yang, Fl. Reipubl. Popularis Sin 67(2): 405. 1979.

大筒兔耳草 da tong tu er cao

Herbs, 10–15 cm tall. Lateral roots to 15 cm, with few fibrous roots. Rhizomes elongated, to more than 3 cm, 4–7 mm in diam. Stems 1–5, slightly longer than leaves. Basal leaves numerous; petiole stout, 4–10 cm, gradually expanding toward base to 8 mm wide; leaf blade broadly ovate, elliptic, or obovate, 3–4.5 cm,

margin obtusely toothed. Stem leaves 2–4, ca. 2.5 cm. Spikes ovoid-globose to oblong, 2.5–6 cm; bracts ovate to obovate, shorter than corolla tube, margin serrate. Calyx membranous, transparent, apex of upper side shallowly lobed, margin praemorse, primary veins 2, not toothlike. Corolla white or purple, 1–1.2 cm; tube 2–3 × as long as limb, slightly bowed; lower lip nearly as long as upper, 2-lobed, ovate; upper lip unlobed, ovate-oblong, ca. 2 mm wide. Stamens less than 1 mm; anthers reniform. Disc large, obliquely cupular. Ovary ovoid. Style reaching mouth of corolla tube; stigma 2-lobed. Fl. Jun–Jul.

• Gravelly areas; 4600–4700 m. SW Xizang.

16. *Lagotis kongboensis* T. Yamazaki, J. Jap. Bot. 46: 242. 1971.

粗筒兔耳草 *cu tong tu er cao*

Herbs, 6–15 cm tall. Lateral roots ca. 6 cm; root crown without persistent leaf sheaths. Rhizomes ca. 3 cm, 6–10 mm in diam. Stems 1 or few, erect to decumbent, longer than leaves. Basal leaves 3–7; petiole 2.5–4.5 cm, base sheathlike; leaf blade elliptic to oblong-elliptic, 2–4 cm, margin usually coarsely double serrate. Stem leaves 3–5, sessile or short petiolate; leaf blade ovate to broadly so, much smaller than basal leaves, margin sharply toothed. Spikes 2–3.5 cm; bracts ovate, 6–8 mm, margin incised-serrate. Calyx ca. 5 mm; lobes lanceolate, ca. 1.2 mm, primary veins 2, reaching lobe apex. Corolla white or pale blue, ca. 7 mm; tube ca. 4 mm, slightly longer than limb, ± curved, inside hairy; lower lip as long as upper, 2-lobed, narrow; upper lip 2-

lobed, lobes linear, ca. 3 × 0.7 mm. Style slightly exerted; stigma capitate. Fl. Aug.

• Mountain slopes; 4500–4600 m. S to SE Xizang.

17. *Lagotis integra* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 216. 1919.

全缘兔耳草 *quan yuan tu er cao*

Lagotis micrantha Handel-Mazzetti.

Herbs, 7–50 cm tall. Lateral roots numerous, fascicled, to 16 cm, 1–2 mm in diam., with few fibrous roots. Rhizomes elongated to 6 cm or shortened and thick. Stems 1 to few, stout, longer than leaves. Basal leaves 4–8; petiole long, base sheathlike; leaf blade ovate to ovate-lanceolate, 4–11 cm, margin entire or sparsely and irregularly serrulate. Stem leaves 3–11, subsessile, much smaller than basal leaves, margin entire or obscurely incised. Spikes 5–15 cm; bracts ovate to ovate-lanceolate, gradually decreasing in size upward, shorter than calyx, margin entire. Calyx large, longer than corolla tube, apex of upper side 2-lobed, lobes obtuse-triangular, ciliolate. Corolla pale yellow, green-white, or rarely purple, 5–8 mm; tube conspicuously curved forward, longer than limb; lower lip 2-lobed, lobes lanceolate; upper lip unlobed, elliptic, apex entire or emarginate. Style included. Fruit black, conical, 5–6 mm. Seeds 2. Fl. and fr. Jun–Aug.

• Alpine grassland, conifer forests; 3200–4800 m. S Qinghai, W Sichuan, E Xizang, NW Yunnan.

Roots used medicinally.

40. **PETITMENGINIA** Bonati in Lecomte, Notul. Syst. (Paris) 1: 335. 1911.

毛冠四蕊草属 *mao guan si rui cao shu*

Herbs, terrestrial. Stems erect. Leaves alternate, sessile to subsessile, gradually decreasing in size upward, pinnately parted, 1-veined. Flowers solitary in leaf axils or in racemes. Bracteoles 2. Calyx campanulate, 5-lobed. Corolla small, obscurely 2-lipped; lower lip longer than upper lip, 3-lobed, lobes spreading flat; upper lip straight, 2-lobed. Stamens 4, somewhat didynamous, included; anther locules 2, distinct, base mucronate. Style slender; stigma inconspicuous, apex acute. Capsule globose, sometimes ± compressed, as long as or shorter than calyx, base rounded, apex truncate or emarginate, 4-valved. Seeds numerous, pyramidal to oblong; seed coat reticulate.

Two species: Cambodia, China, Laos, Thailand; both in China.

1a. Calyx hirsute, with 5 thickened folds between lobes; seeds ca. 0.6 × 0.3 mm 1. *P. comosa*

1b. Calyx densely scabrous, without folds; seeds ca. 0.4 × 0.2 mm 2. *P. matsumurae*

1. *Petitmenginia comosa* Bonati in Lecomte, Notul. Syst. (Paris) 1: 335. 1911.

滇毛冠四蕊草 *dian mao guan si rui cao*

Sopubia comosa (Bonati) T. Yamazaki.

Herbs, ca. 50 cm tall. Stems stout, terete, fastigiate branched above, densely hispidulous. Leaves subsessile; leaf blade linear to filiform, 2–7 cm × 1–3 mm, abaxially scabrous, adaxially glabrescent, margin revolute, entire or with 2 acuminate teeth. Bracteoles ovate, ca. 4 × 2–3 mm, scabrous, apex attenuate-acuminate. Calyx ca. 4 × 4 mm, hirsute, 5-angular, with

5 thickened folds between lobes; lobes deltoid-lanceolate, fleshy, scabrous, margin revolute. Corolla rose-violet, tubular, ca. 8 mm, outside sparsely pilose; lobes orbicular, ca. 2 × 2 mm. Capsule globose, ± compressed, ca. 4 × 4 mm. Seeds oblong, ca. 0.6 × 0.3 mm.

Open grassland. S Yunnan [Cambodia, Laos, Thailand].

2. *Petitmenginia matsumurae* T. Yamazaki, J. Jap. Bot. 25: 214. 1950.

毛冠四蕊草 *mao guan si rui cao*

Herbs, 40–60 cm tall. Stems simple or few branched, with brown crisped hairs. Leaves sessile, linear, 1.5–5

cm × 1–2 mm, ± fleshy, abaxially scabrous on veins, adaxially scabrous, margin revolute, scabrous, 1- or 2-toothed per side on lower leaves; upper leaves entire, apex acute, midvein conspicuous. Flowers solitary in axils of upper leaves. Pedicel 1.5–2 mm, densely brown hairy. Bracteoles linear, as long as calyx. Calyx ca. 3 mm in flower, to 4 × 3 mm in fruit, densely scabrous;

lobes triangular-lanceolate, base expanded, apex acute. Corolla 6–7 mm; tube narrow, densely puberulent distally to middle; lobes ovate-orbicular, coarsely hairy outside. Style densely scabrous hairy. Capsule globose, ca. 4 × 3 mm. Seeds ca. 0.4 × 0.2 mm. Fl. and fr. ± Aug.

• Low elevations. Jiangsu (Nanjing Shi).

We have not seen any specimens of the species.

41. CENTRANTHERA R. Brown, Prodr. 438. 1810.

胡麻草属 hu ma cao shu

Herbs, mostly annual. Flowers axillary, solitary, short pedicellate. Bracteoles 2. Calyx usually split on 1 side, spathe-like, margin entire, apex acute, acuminate, or sometimes obtuse. Corolla funnelform, swelling below throat or distally gradually expanding, somewhat 2-lipped; lobes 5, subequal, erect or spreading. Stamens 4, didynamous; filaments usually hairy; anthers meeting in pairs, locules transverse, base spurred or mucronate, 2-loculed; 1 locule fertile, other reduced and empty. Style apex ligulate, enlarged, stigmatic. Capsule loculicidal; valves entire. Seeds numerous; seed coat loose, spirally striate or reticulate.

About nine species: tropical and subtropical Asia; three species in China.

1a. Leaves 1–2.6 cm wide, abaxially with 3 longitudinal subparallel bulging veins, margin serrate . 1. *C. grandiflora*

1b. Leaves to 0.4 cm wide, abaxially with only midvein bulging, margin entire.

2a. Stems much branched at base; bracts longer than corolla; corolla ca. 0.9 cm 2. *C. tranquebarica*

2b. Stems branched at or above middle; bracts shorter or rarely as long as corolla; corolla 1.5–4 cm 3. *C. cochinchinensis*

1. *Centranthera grandiflora* Benth, Scroph. Ind. 50. 1835.

大花胡麻草 da hua hu ma cao

Herbs, 50–80 cm tall. Stems stout, erect, terete or subteragonal, hirsute, apically channeled, simple or apically sparsely branched. Leaves opposite below, rarely apically alternate, sessile, elliptic, 2–5 × 1–2.6 cm, margin somewhat revolute, sparsely serrate, 3–5-toothed or -lobed, with pustulose or circular scalelike-based setae, abaxially with 3 longitudinal, coarsely bulging, and subparallel veins. Pedicel 4–6 mm, hispidulous. Bracteoles inserted at base of pedicel, subulate, 4–5 mm, hispidulous. Calyx ovate, 1.4–2 × ca. 1 cm, hispidulous, apex constricted into a point ca. 2 mm, slightly bowed. Corolla yellow, 3.5–4.3 cm. Fl. Jul–Sep.

Trailsides, open fields; ca. 800 m. Guangxi, Guizhou, Xizang (Zayü Xian), Yunnan [Bhutan, India, Myanmar, Nepal, Sikkim, Vietnam].

2. *Centranthera tranquebarica* (Sprengel) Merrill in Merrill & Chun, Sunyatsenia 5: 182. 1940.

矮胡麻草 ai hu ma cao

Razumovia tranquebarica Sprengel, Mant. Prim. Fl. Hal. 45. 1807; *Centranthera humifusa* Wallich ex Benth; *C. tonkinensis* Bonati.

Herbs, slender, basally hirsute, apically subglabrous. Stems erect or prostrate, branched from base; branches slender, mostly diffuse and ascending, dense, fascicled, 5–30 cm. Leaves opposite, rarely alternate below, sessile, linear-lanceolate, usually 0.8–2.5 cm × 2–3 mm, glabrous or midrib with scabrous scalelike bulges on both surfaces or abaxially short hairy, margin entire and slightly revolute, apex acuminate. Bracts longer than corolla. Calyx ovate, ca. 3.5 mm at anthesis, to 5.5 mm

in fruit, hispidulous. Corolla yellow, brown striate, ca. 9 mm; throat densely black punctate; lower lip lobes suboblong, ca. 2 mm wide, apex somewhat sharp; upper lip ca. 3 mm, lobes suborbicular and ca. 2 mm in diam. Anterior stamens 3–5 mm; filaments densely white lanose-villous. Posterior stamens 2–4 mm; filaments apically villous. Ovary oblong, ca. 3 × 2.5 cm, glabrous. Capsule subglobose, 4–5 × ca. 4 mm, as long as persistent calyx. Seeds yellow, cylindrical-conical, ca. 1 mm; seed coat reticulate. Fl. and fr. Jul–Oct.

Grassland on mountain slopes, trailsides, sandy slopes near ocean; low elevations. Fujian (Xiamen Shi), C Guangdong, Guangxi, Hainan [Cambodia, India, Laos, Malaysia, Sri Lanka, Thailand, Vietnam].

3. *Centranthera cochinchinensis* (Loureiro) Merrill, Trans. Amer. Philos. Soc. 24(2): 353. 1935.

胡麻草 hu ma cao

Herbs, (13–)30–60 cm tall; stems, leaf blades, bracts, and calyces setiferous. Stems erect, basally subterete, channeled, usually branched at or above middle. Leaves opposite, rarely alternate, sessile, linear-lanceolate, 2–3 cm × 3–4 mm, margin entire and subrevolute, midrib abaxially bulging. Bracts shorter or rarely as long as corolla. Flowers borne above middle of stem. Calyx 7–15 × 4–6 mm, densely hispid, apex constricted, slightly curved; lobes reduced to 3 mucros. Corolla yellow, purple-red, or white with purple lobes, 1.5–4 cm; lower lip lobes 3, orbicular; upper lip lobes 2, orbicular. Anterior stamens ca. 1 cm; posterior stamens 6–7 mm; filaments all woolly. Ovary glabrous. Stigma linear-elliptic, ca. 3 × 1 mm, hairy. Capsule ovoid, ca. 8 × 4 mm, apex mucronate. Seeds yellow, small, spirally striate. Fl. and fr. Jul–Oct.

Dry grassy slopes, grassland, fields, forests, wastelands, rice fields; near sea level to 1500 m. Anhui, Fujian, Guangdong, Guangxi,

Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Xizang, Yunnan [Cambodia, India, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Oceania].

- 1a. Corolla 3.5–4 cm; plants robust
..... 3a. var. *cochinchinensis*
1b. Corolla less than 2.5 cm; plants slender.
2a. Corolla 1.5–1.6(–2.2) cm, purplish
red or nearly white 3b. var. *nepalensis*
2b. Corolla 1.5–2.5 cm, entirely yellow
or with pink lobes 3c. var. *lutea*

3a. *Centranthera cochinchinensis* var. *cochinchinensis*

胡麻草(原变种) hu ma cao (yuan bian zhong)

Digitalis cochinchinensis Loureiro, Fl. Cochinch. 2: 378. 1790; *Centranthera cochinchinensis* var. *longiflora* (Merrill) P. C. Tsoong; *C. longiflora* (Merrill) Merrill; *Razumovia cochinchinensis* (Loureiro) Merrill; *R. longiflora* Merrill.

Plants robust. Corolla 3.5–4 cm, reddish white with yellow stripes. Fl. and fr. Jul–Oct.

Dry grassy slopes or grassland; 500–1500 m. Guangdong, Guangxi, Yunnan [Cambodia, Laos, Vietnam].

3b. *Centranthera cochinchinensis* var. *nepalensis* (D. Don) Merrill, 150th Anniv. Vol. Bot. Gard. Calcutta 56. 1942.

西南胡麻草 xi nan hu ma cao

Centranthera nepalensis D. Don, Prodr. Fl. Nepal. 88. 1825; *Razumovia cochinchinensis* (Loureiro) Merrill var. *nepalensis* (D. Don) Merrill.

Plants slender. Corolla 1.5–1.6(–2.2) cm, pale purple-red to nearly white. Fl. and fr. Aug–Oct.

Grassland, fields, forests; 700–1500 m. Sichuan, Xizang, Yunnan [India, Nepal, Sri Lanka].

The whole plant is used medicinally.

3c. *Centranthera cochinchinensis* var. *lutea* (H. Hara) H. Hara, Enum. Sperm. Jap. 1: 246. 1948.

中南胡麻草 zhong nan hu ma cao

Razumovia cochinchinensis (Loureiro) Merrill var. *lutea* H. Hara, J. Jap. Bot. 17: 397. 1941; *Centranthera rubra* H. L. Li.

Plants slender. Calyx 8–10 × 3–4 mm. Corolla entirely yellow or rarely with pink lobes, 1.5–2.5 cm.

Wastelands, rice fields; near sea level to 1100 m. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hunan, Jiangsu, Jiangxi, Sichuan, Xizang, Yunnan [Cambodia, India, Japan, Korea, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

42. ALECTRA Thunberg, Nov. Gen. Pl. 81. 1781.

黑蒴属 hei shuo shu

Melasma P. J. Bergius.

Herbs, erect, rigid, blackened when dry, scabrous. Leaves opposite or sometimes apically alternate; leaf blade margin entire or serrate, veins 3. Flowers in bracteate terminal spikes or racemes. Bracteoles 2, opposite. Calyx campanulate; lobes 5, valvate. Corolla subcampanulate; lobes 5, wide, spreading flat, imbricate; lower lobe outer in bud. Stamens 4, didynamous; anther locules parallel, distinct, bases mucronate. Style long, bent; stigma elongated, ligulate. Capsule subglobose, included, loculicidal; valves entire or 2-parted. Seeds numerous, minute.

About 30 species: tropical Africa, America, and Asia; one species in China.

1. *Alectra avensis* (Benth) Merrill, Philipp. J. Sci. Bot. 12: 109. 1917.

黑蒴 hei shuo

Glossostylis avensis Benth, Scroph. Ind. 49. 1835; *Alectra dentata* (Benth) Kuntze; *A. indica* Benth; *Hymenospermum dentatum* Benth; *Melasma avense* (Benth) Handel-Mazzetti; *Micrargeria formosana* (Hayata) Hayata; *Sopubia formosana* Hayata.

Annuals, 10–50 cm tall. Stems basally woody, simple or few branched, hairy. Leaves sessile or subsessile; leaf blade broadly ovate to ovate-lanceolate, 2–3 cm, papery, densely short hairy, adaxially sometimes setose when mature, base cuneate, margin with 2–6 pairs of coarse triangular teeth, apex obtuse to acuminate.

43. LEPTORHABDOS Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 23. 1841.

方茎草属 fang jing cao shu

Dargeria Decaisne.

Racemes basally lax, apically dense. Bracteoles linear-oblong, narrow, longer to slightly shorter than calyx, hairy. Calyx ca. 5 mm, membranous, barbate; lobes triangular, nearly as long as tube. Corolla yellow, ca. 6–8 mm; tube broadly campanulate; lobes suborbicular, spreading; lower lobe slightly larger than other 4. Stamens inserted near base of corolla tube; filaments of 2 anterior stamens with long multicellular glandular hairs. Stigma glandular velutinous. Seeds terete, to 1 mm; seed coat reticulate. Fl. and fr. Aug–Nov.

Grassland on mountain slopes, sparse forests; 700–2100 m. Guangdong, Guangxi, Taiwan, Yunnan [Bhutan, India, Indonesia (Java), Myanmar, Philippines, Sikkim].

Herbs, hemiparasitic. Stems quadrangular. Leaves opposite below, alternate above. Flowers in racemes. Bracteoles absent. Calyx tubular-campanulate, 5-lobed. Corolla tube tubular-funnelform; limb 5-lobed; lobes 2-parted almost to base. Stamens 4, slightly didynamous, inserted at corolla tube; anther locules free, parallel. Ovules 2 per locule. Stigma capitate. Capsule compressed, loculicidal. Seeds oblong or angular, truncate and at an oblique angle at adjoining faces; seed coat rugose.

One species: C and SW Asia, NW China.

1. *Leptorhabdos parviflora* (Benth) Benth in A. de Candolle, Prodr. 10: 510. 1846.
方茎草 fang jing cao

Gerardia parviflora Benth, Scroph. Ind. 48. 1835;
Leptorhabdos micrantha Schrenk.

Annuals, 20–100 cm tall, short glandular hairy. Stems erect, much branched and broomlike, basally purple-brown. Leaves opposite, sometimes alternate above, decreasing in size upward; lower leaf blade linear, 4–8 cm, pinnatisect; segments 1–5 pairs, narrowly linear, margin entire or toothed. Racemes long; bracts linear. Calyx 3–5 mm, 10-veined; lobes 5, subulate-triangular,

shorter than tube. Corolla pink, ca. 6 mm; tube 2/3 of corolla length; lobes ovate-orbicular, 2-parted almost to base. Capsule oblong, 4–6 mm, margin apically short ciliate, apex obtuse and emarginate. Seeds ca. 2 mm. Fl. Jul–Aug.

Banks of rivers and lakes, depressions, steppes; 800–1500 m. Gansu (Anxi Xian), Xinjiang [Afghanistan, NW India, Kashmir, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Leptorhabdos parviflora is expected to occur in Xizang, for it reaches 30°N latitude and 80°E longitude in the Himalayas.

44. SOPUBIA Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 88. 1825.

短冠草属 duan guan cao shu

Herbs, mostly annual. Stem branches opposite, rarely 3 in a whorl apically. Leaves entire or dissected. Flowers in terminal racemes or panicles, bracteate. Bracts foliaceous. Calyx campanulate, 5-lobed. Corolla lobes 5, spreading; lower lobes 2, inner in bud. Stamens 4, didynamous, included; anther locules 2 per stamen, 1 fertile, 1 reduced and empty. Stigma subligulate. Capsule ovoid to oblong, apex rounded or compressed, emarginate or deeply concave, loculicidal; valves not divided or shallowly lobed, separating from placental axis. Seeds numerous; seed coat loose.

About 40 species: Africa, tropical to subtropical E Asia; two species in China.

Sopubia stricta G. Don has been reported from the coast of Guangdong, but we have not seen Chinese specimens.

- 1a. Corolla tube ca. 3 mm; calyx lobes woolly inside, sinuses sharply angled; capsule glabrous, almost as long as or shorter than persistent calyx; pedicel ca. 10 mm 1. *S. trifida*
1b. Corolla tube ca. 7 mm; calyx lobes glabrous inside, sinuses rounded; capsule hispidulous, much longer than persistent calyx; pedicel 1.5–2 mm or flower subsessile 2. *S. lasiocarpa*

1. *Sopubia trifida* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 88. 1825.

短冠草 duan guan cao

Annuals, 40–90 cm tall. Stems erect, 1 or few, often apically much branched, rarely in whorls of 3, angled, striate, puberulent. Leaves opposite or sometimes upper leaves alternate; lower leaves dissected, segments narrow; upper leaves undivided; leaf blade linear, 3–6 cm, margin entire. Racemes in panicles; bracts to 1 cm. Pedicel ca. 1 cm, slender, flexuous. Bracteoles 2, needlelike, near apex of pedicel. Calyx 10-ribbed; lobes triangular, wider than long, apex acute to obtuse, inside and margin lanose; sinuses angled. Corolla yellow to purple; tube ca. 3 mm; lobes orbicular-obovate, ca. 5 mm, subequal, apex rounded. Filaments ± flattened; fertile anther locules oblong-ovate, ca. 2.5 mm, densely comose at base; sterile anther locules clavate, ca. 1 mm, stipitate. Capsule globose, glabrous, almost as long as or shorter than persistent calyx. Style persistent. Fl. Jun–Jul, fr. Sep.

Grassland on mountain slopes, fields; 1600–2100 m. Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan [Bhutan, India, Indonesia (Java), Laos, Malaysia, Nepal, Pakistan, Philippines, Sikkim; Africa].

2. *Sopubia lasiocarpa* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 67(2): 405. 1979.

毛果短冠草 mao guo duan guan cao

Annuals, to 38 cm tall. Stems erect, basally terete, apically branched and ribbed, with short crisp hairs. Leaves opposite or upper subalternate; leaf blade linear, to 5 cm × 1.5 mm, adaxially hispidulous, margin revolute; midrib abaxially raised. Racemes sparsely flowered, in a large panicle; lower bracts longer than flowers, upper ones shorter. Pedicel 1.5–2 mm, pubescent. Bracteoles 2, near base of calyx. Calyx ca. 1.5 mm, 10-veined; lobes narrowly triangular, subequal, outside hispidulous, inside glabrous, apex acute; fruiting calyx inflated to 3.5 × 5 mm, shallowly campanulate, outside hispidulous, sinuses rounded. Corolla purplish, ca. 1 cm; tube ca. 7 mm; lobes obovate, subequal. Ovary and style hispidulous; stigmas 2. Capsule 5–6 mm, much longer than persistent calyx,

hispidulous, apex deeply concave, to 2/5 of capsule length. Seed dark brown, irregularly oblong. Fl. and fr. Sep.

• Moist grassland; 100–400 m. Hunan, Jiangsu, Zhejiang.

45. BUCHNERA Linnaeus, Sp. Pl. 2: 630. 1753.

黑草属 hei cao shu

Herbs, hemiparasitic, erect, rigid, black when dry, usually scabrous. Leaves basally opposite, apically alternate; leaf blade margin entire, often coarsely toothed at stem base. Inflorescences spikes or spicate racemes. Bracteoles 2. Calyx tubular, veins 10, sometimes inconspicuous; lobes 5, short. Corolla lobes 5, subequal. Stamens 4, didynamous, included; anthers 1-loculed, erect, dorsifixed, base obtuse, apex mucronate. Style apically clavate; stigma entire or incised. Capsule loculicidal; valves entire. Seeds numerous, somewhat dorsiventrally compressed.

About 60 species: tropical to subtropical regions; one species in China.

1. *Buchnera cruciata* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 91. 1825.

黑草 hei cao

Buchnera densiflora Hooker & Arnott; *B. stricta* Benth.

Herbs, 8–50 cm tall, with curved hairs. Stems simple or apically somewhat branched. Basal leaves rosulate; petiole inconspicuous; leaf blade obovate, 2–2.5 × 1–1.5 cm, base tapering. Stem leaves sessile, linear to linear-oblong, 1.5–4.5 cm × 3–5(–12) mm, margin often with 2 to few obtuse teeth. Spikes terminal, cylindrical to subquadrangular, 1–4.5 cm, to 6.5 cm in fruit; bracts ovate, ca. 4.8 × 2.5 mm, outside and margin

densely villous, apex acuminate. Bracteoles linear, 2–3 mm, villous. Calyx 4–4.5 mm, slightly curved; tube outside villous; lobes triangular, subequal, villous, apex acuminate. Corolla blue-purple, narrowly tubular, somewhat curved, 6–7 mm, somewhat ribbed, villous on portion exerted from calyx; throat constricted; lobes obovate to oblanceolate, 1.5–2 × ca. 1 mm. Anthers ca. 1 mm. Ovary ovoid, 2–2.5 mm. Capsule oblong, ca. 5 mm. Seeds ± spirally striate. Fl. and fr. Apr–Jan.

Mountain slopes, sparse forests; below 1600 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Yunnan. [Cambodia, N India, Indonesia (Sumatra), Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam].

All parts of the plant are used medicinally.

46. STRIGA Loureiro, Fl. Cochinch. 1: 22. 1790.

独脚金属 du jiao jin shu

Herbs, parasitic. Leaves opposite below, alternate above, narrow, sometimes reduced to scales. Flowers solitary in leaf axils or in spikes, usually with a pair of bracteoles. Calyx tubular, conspicuously 5–15-ribbed, 5-lobed. Corolla salverform; tube curved in middle or apically; limb patent, weakly 2-lipped; lower lip 3-lobed; upper lip shorter than lower, entire, emarginate to 2-lobed. Stamens 4, didynamous; anthers 1-loculed, base spurless, apex pointed. Stigma clavate. Capsule loculicidal. Seeds numerous, ovoid to oblong; seed coat reticulate.

About 20 species: Africa, tropical and subtropical Asia, Oceania; four species in China.

1a. Calyx 15-ribbed, 0.9–1.5 cm.

2a. Calyx lobes ca. 2 × as long as tube; corolla tube to 1.2 cm 2. *S. masuria*

2b. Calyx lobes almost as long as tube; corolla tube ca. 2 cm 3. *S. angustifolia*

1b. Calyx 5- or 10-ribbed, less than 0.8 cm.

3a. Calyx 10-ribbed; corolla tube curved near apex, limb bright yellow, rarely white or red 1. *S. asiatica*

3b. Calyx 5-ribbed; corolla tube curved above middle, limb white or pale pink 4. *S. densiflora*

1. *Striga asiatica* (Linnaeus) Kuntze, Rev. Gen. Pl. 466. 1891.

独脚金 du jiao jin

Buchnera asiatica Linnaeus, Sp. Pl. 2: 630. 1753;

Striga asiatica var. *humilis* (Benth.) D. Y. Hong; *S.*

hirsuta Benth.; *S. hirsuta* var. *humilis* Benth.; *S.*

lutea Loureiro.

Annuals, 10–20(–30) cm tall, entirely hirsute. Stems erect, 1, rarely branched. Leaf blade linear to narrowly lanceolate, 5–20 × 1–4 mm, sometimes reduced to scales. Flowers axillary, solitary or in a spike upward. Calyx 4–8 mm, 10-ribbed; lobes 5, ± as long as tube, subulate. Corolla usually yellow, rarely red or white; tube 0.8–1.5 cm, apically strongly curved; upper lip 2-

lobed. Capsule ovoid, enveloped in persistent calyx. Fl. autumn.

Crop fields, waste grasslands; below 800 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Taiwan, Yunnan [Bhutan, Cambodia, India, Nepal, Philippines, Sri Lanka, Thailand, Vietnam; Africa, America].

The whole plant is used for treating intestinal parasites. This species is harmful to crops, particularly to sugar cane.

2. *Striga masuria* (Buchanan-Hamilton ex Benth.)

Benth. in Hooker, Companion Bot. Mag. 1: 364. 1836.

大独脚金 da du jiao jin

Buchnera masuria Buchanan-Hamilton ex Benth.,

Scriph. Ind. 41. 1835.

Perennials, 30–60 cm tall, entirely hispid. Stems erect, ± quadrangular, simple or weakly branched. Leaf blade linear, 2–3 cm, longest at middle of stem. Flowers solitary, rarely in a spike. Calyx ca. 1 cm at anthesis, to 1.5 cm in fruit, 15-ribbed; lobes ca. 2 × as long as tube, linear-elliptic. Corolla pink, white, or yellow; tube to 1.2 cm, apically curved forward; upper lip ca. 1/2 as long as lower, apex notched. Capsule ovoid, ca. 6 mm. Fl. summer–autumn.

Grassy slopes, hard forests; to 1100 m. Fujian, Guangdong, Guangxi, S Guizhou, Hunan (Hengshan Xian), S Jiangsu, SW Sichuan, Taiwan, Yunnan [Cambodia, India, Laos, Myanmar, Nepal, Philippines, Thailand, Vietnam].

3. *Striga angustifolia* (D. Don) C. J. Saldanha, Bull. Bot. Surv. India. 5: 70. 1963.

狭叶独脚金 *xia ye du jiao jin*

Buchnera angustifolia D. Don, Prodr. Fl. Nepal. 91. 1825.

Annuals, 15–45 cm tall. Stems erect, subquadrangular, simple, rarely apically branched, hispidulous. Leaves sessile, linear, 1.5–3.5 cm × 1–2 mm, lower ones smaller, scabrous hairy. Spikes 3- to numerous flowered, 3–15 cm; bracts similar to leaves in shape and size. Pedicel less than 2 mm. Bracteoles less than 1 mm, linear. Calyx 9–10 mm, 15-ribbed, hispidulous along

ribs; lobes almost as long as tube, subulate. Corolla white, 1.2–1.5 cm; tube ca. 2 cm × 1 mm, apically curved forward; limb 4–6 mm; lower lip lobes 4–6 × 3–4 mm. Capsule obovoid-oblong, ca. 4.5 × 3 mm. Seeds brown, minute. Fl. Sep–Dec.

Grassy places; low elevations. Hainan (Dongfang Xian) [Bhutan, India, Myanmar, Nepal, Sri Lanka, Vietnam].

4. *Striga densiflora* (Benth) Benth in Hooker, Companion Bot. Mag. 1: 363. 1836.

密花独脚金 *mi hua du jiao jin*

Buchnera densiflora Benth, Scroph. Ind. 41. 1835.

?Perennials, ca. 25 cm tall, entirely hispid. Stems erect. Leaf blade linear, ca. 1 cm. Inflorescences terminal lax spikes; bracts longer than calyx. Calyx 5–6 mm, 5-ribbed; lobes nearly as long as tube, awn-shaped. Corolla tube ca. 1 cm, slightly curved above middle; upper lip emarginate. Capsule enveloped in calyx, oblong, ca. 2.5 mm.

Yunnan (Mengzi Xian) [India, Sikkim].

Only one specimen has been seen. Its characters of calyx, corolla tube, upper corolla lip, and capsule are consistent with the original description. However, the corolla of the specimen is not intact and the above description is incomplete.

47. CASTILLEJA Mutis ex Linnaeus f., Suppl. Pl. 47. 1781.

火焰草属 *huo yan cao shu*

Herbs, annuals or perennials, rarely shrubs, hemiparasitic. Spikes or racemes terminal; bracts leaflike, often broader than leaves, variously colored, entire or lobed. Calyx tubular, base often gibbous abaxially, 2- or 4-lobed, median clefts usually deeper than lateral. Corolla tube included in calyx; limb conspicuously 2-lipped; lower lip short, patent, 3-lobed; upper lip elongated, rostrate apex entire. Stamens 4, didynamous; anthers enclosed by upper lip. Capsule loculicidal. Seeds numerous, minute; seed coat transparent, foveolate.

About 200 species: mainly in W North America, about ten species in N Asia and E Europe; one species in China.

1. *Castilleja pallida* (Linnaeus) Kunth, Syn. Pl. 2: 100. 1823.

火焰草 *huo yan cao*

Bartsia pallida Linnaeus, Sp. Pl. 2: 602. 1753.

Perennials, 20–30 cm tall, white pubescent. Stems usually cespitose, erect, simple. Leaves alternate, sometimes subopposite at base of stem, sessile, linear to linear-lanceolate, 2–8 cm × 2–5 mm, margin entire, veins 3. Spikes 3–12 cm; bracts yellow-white, ovate-

lanceolate, 1–3 × 0.5–1.2 cm. Calyx ca. 2 cm, medially parted to ca. 1/2 length, laterally parted to ca. 1/4 of its length; lobes linear. Corolla pale yellow or white, 2.5–3 cm; tube tubular. Anther locules unequal in length and parallel. Capsule ovoid, slightly compressed, glabrous, ca. 1 cm, apex caudate, hooklike. Fl. Jun–Aug.

Meadows, saline meadows, rarely in thickets; 700–900 m. NW Heilongjiang, N Nei Mongol [Mongolia, Russia; E Europe, N North America].

48. TRIPHYSARIA Fischer & C. A. Meyer, Index Hort. Petrop. 2: 52. 1836.

直果草属 *zhi guo cao shu*

Herbs, annual, hemiparasitic. Leaves alternate. Spikes terminal; bracts often broader than leaves. Calyx subequally 4-lobed. Corolla elongated, conspicuously 2-lipped; lower lip 3-lobed, base of lobes ± saccate; upper lip slightly longer than lower lip, rostrate, entire. Stamens 4, didynamous; anthers 1-loculed. Stigma entire. Capsule compressed, 2-sulcate, loculicidal. Seeds numerous.

Six species: W North America, particularly California; one species in China.

1. *Triphysaria chinensis* (D. Y. Hong) D. Y. Hong, Novon 6: 374. 1996.

直果草 *zhi guo cao*

Orthocarpus chinensis D. Y. Hong, Fl. Reipubl.

Popularis Sin. 67(2): 405. 1979.

Annuals, diffuse, ca. 15 cm tall, white hirsute. Stems much branched basally. Leaves several, sessile, broadly linear, 1–2 cm, parted into several narrow segments.

Spikes elongated, almost from base of stems, lax; bracts deltoid-orbicular, longer than flowers and fruit, palmatisect, segments parted. Calyx tubular, 5–7 mm, parted to middle; lobes subulate-triangular, lower 2 slightly shorter than others. Corolla 5–6 mm; limb purple;

tube yellow when dry; lower lip shallowly saccate, obscurely toothed; upper lip apex hooklike. Anthers narrowly ellipsoid. Capsule oblong, glabrous, ca. 3.5 × 2.5 mm. Seeds dark brown, ca. 1 mm, curved; seed coat transparent, reticulate. Fl. Sep–Oct.

• W Hubei (Xingshan Xian).

Triphysaria chinensis is similar to the North American species *T. pusilla* (Benth) Chuang & Heckard, from which it differs in having palmatisect rather than pinnatisect bracts and transparent and reticulate seed coat. The great disjunction and close relationship between these two species is unexplained. *Triphysaria chinensis* is only known from the type specimen collected in 1926.

49. MELAMPYRUM Linnaeus, Sp. Pl. 2: 605. 1753.

山罗花属 shan luo hua shu

Chingyungia T. M. Ai.

Herbs, annual, hemiparasitic. Leaves opposite, entire. Flowers solitary in axils of bracts or congregated into racemes or spikes; bracts leaflike in shape, margin often with pointed or setose teeth, rarely entire. Calyx campanulate; lobes 4, upper 2 larger than lower. Corolla tube tubular, gradually expanded upward; limb dilated, 2-lipped; lower lip patent, base 2-plicate, apex 3-lobed; upper lip galeate, compressed, slightly shorter than upper lip, margin revolute, apex obtuse. Stamens 4, didynamous, enclosed by galea; anthers connivent, locules equal in size and base conically pointed, bearded along slit after dehiscence. Ovules 2 per locule. Stigma capitate, entire. Capsule ovoid, slightly compressed, straight or oblique, loculicidal, apex obtuse or tapered. Seeds 1–4, oblong, large, smooth.

About 20 species: Northern hemisphere; three species in China.

Melampyrum taxonomy is quite complex, and the number of recognized species varies with authors. There is a great deal of variation in certain characters, particularly in bract morphology. Chinese plants were once classified into 8 species, which are here treated as 2, in addition to 1 newly recorded species.

- 1a. Corolla yellowish white with orange on sides; corolla tube 3–4 × as long as limb; bracts ovate-orbicular to cordate-ovate, apex rounded; calyx lobes lanceolate to ovate 2. *M. laxum*
- 1b. Corolla purple to red with white on sides; corolla tube ca. 2 × as long as limb; bracts linear-lanceolate to ovate, apex slightly obtuse, acute, or acuminate; calyx lobes lanceolate, subulate-triangular, or triangular.
 - 2a. Bracts linear-lanceolate, often entire, sometimes 1- or 2-toothed; calyx lobes narrowly triangular to subulate-triangular; corolla 1.2–1.6 cm 3. *M. klebelsbergianum*
 - 2b. Bracts lanceolate to ovate, usually with awn-shaped or setoselike teeth; calyx lobes lanceolate; corolla 1.5–2 cm 1. *M. roseum*

1. *Melampyrum roseum* Maximowicz, Prim. Fl. Amur. 210. 1859.

山罗花 shan luo hua

Annuals, 15–80 cm tall, entirely sparsely with scaly short hairs. Stems erect, subquadrangular, branched or rarely simple, sometimes pubescent with multicellular hairs along 2 lines. Petiole ca. 5 mm; leaf blade linear, linear-lanceolate, elliptic, ovate-elliptic, or narrowly ovate, base rounded to cuneate, apex acuminate to sometimes obtuse. Bracts lanceolate to ovate with pointed teeth at base or whole margin with setoselike teeth, apex acute to acuminate. Calyx ca. 4 mm, often scabrous, often with multicellular hairs along veins; lobes narrowly triangular to subulate-triangular, short ciliate. Corolla purple, purple-red, or red, with white on sides, 1.5–2 cm; tube ca. 2 × as long as limb; galea densely barbate inside. Capsule ovoid, 8–10 mm, scaly hairy or rarely glabrous, apex truncate to oblique. Seeds black, ca. 3 mm. Fl. summer–autumn.

Thickets on slopes, among high grasses; below 1500 m. Anhui, Fujian, Gansu, Guangdong (Lianxian), Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Zhejiang [Japan, Korea, Russia (Far East)].

Melampyrum roseum is very variable, particularly in leaf shape, bract shape and margin, and shape of calyx lobes. Some forms are closely correlated with geographical distribution but others are not. The species has sometimes been treated as six or seven species, but the variation appears to sort into four varieties.

- 1a. Leaves linear to linear-lanceolate; bracts lanceolate 1b. var. *setaceum*
- 1b. Leaves lanceolate, elliptic, ovate-lanceolate, or narrowly ovate; bracts ovate to ovate-lanceolate.
 - 2a. Leaf apex ± obtuse; bract apex ± obtuse to acute, margin often with short awn-shaped teeth 1d. var. *obtusifolium*
 - 2b. Leaf apex acuminate; bract apex acute to narrowly acuminate, margin with long setoselike teeth, sometimes with pointed teeth near base.
 - 3a. Leaves narrowly ovate; calyx lobes narrowly acuminate to caudate 1c. var. *ovalifolium*
 - 3b. Leaves lanceolate to ovate-lanceolate; calyx lobes narrowly triangular to subulate-triangular 1a. var. *roseum*

1a. *Melampyrum roseum* var. *roseum*

山罗花(原变种) shan luo hua (yuan bian zhong)
Melampyrum laxum Miquel var. *henryanum* Beauverd, p.p.; *M. roseum* subsp. *hirsutum* (Beauverd) Soó; *M. roseum* var. *hirsutum* Beauverd.

Leaf blade lanceolate to ovate-lanceolate, 2–8 × 0.8–3 cm, base rounded to cuneate, apex acuminate. Bracts green, acute to narrowly acuminate, with pointed teeth at basal margin or with long setoselike teeth along whole margin, margin rarely entire. Calyx lobes narrowly triangular to subulate-triangular. Fl. summer–autumn.

Thickets on slopes, among high grasses; below 1500 m. Anhui, Fujian, Gansu, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Zhejiang [Japan, Korea, Russia (Far East)].

1b. *Melampyrum roseum* var. *setaceum* Maximowicz ex Palibin, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 168. 1900.
狭叶山罗花 xia ye shan luo hua

Melampyrum setaceum (Maximowicz ex Palibin) Nakai.
Leaf blade linear to linear-lanceolate, 3–8 mm wide, apex acuminate. Bracts purple-red to green, lanceolate, margin entire or with long setoselike teeth, apex narrowly acuminate. Fr. Oct.
Liaoning [Korea, Russia (Far East)].

1c. *Melampyrum roseum* var. *ovalifolium* (Nakai) Nakai ex Beauverd, Mém. Soc. Phys. Genève 38: 549. 1916.
卵叶山罗花 luan ye shan luo hua
Melampyrum ovalifolium Nakai, Bot. Mag. (Tokyo) 23: 6. 1909.

Leaf blade narrowly ovate, base shallowly cordate, rounded, or broadly cuneate, apex acuminate. Bract margins with long setoselike teeth, apex acuminate to narrowly acuminate. Flowers crowded. Calyx lobes narrowly acuminate to caudate. Fl. Jun–Aug.

Open slopes; below 900 m. Zhejiang (Tianmu Shan, Tiantai Shan) [W Japan, Korea].

1d. *Melampyrum roseum* var. *obtusifolium* (Bonati) D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 367. 1979.
钝叶山罗花 dun ye shan luo hua
Melampyrum obtusifolium Bonati in Pampanini, Nuovo Giorn. Bot. Ital., n.s. 17: 713. 1910; *M. henryanum* (Beauverd) Soó, p.p.; *M. laxum* Miquel var. *henryanum* Beauverd, p.p.; *M. laxum* var. *obtusifolium* (Bonati) Beauverd; *Scutellaria esquirolii* H. Léveillé & Vaniot.

Leaf blade elliptic to ovate-lanceolate, base often cuneate and attenuate, apex ± obtuse. Bracts ovate,

margin often with short awn-shaped teeth, apex ± obtuse to acute. Calyx lobes triangular to narrowly triangular. Fl. Jun–Jul.

• Mountain woods or grasses; 700–1000 m. Guangdong (Lianxian), Guizhou, Hubei (Xingshan Xian, Junxian).

2. *Melampyrum laxum* Miquel, Ann. Mus. Bot. Lugduno-Batavum 2: 123. 1866.

圆苞山罗花 yuan bao shan luo hua

Annuals 25–35 cm tall. Stems erect, branched, pubescent with multicellular hairs along 2 lines. Leaf blade ovate, 2–4 × 0.8–1.5 cm, with short scaly hairs. Flowers evenly distributed to ± crowded; bracts cordate-ovate to ovate-orbicular, apex rounded; lower bract margins basally with 1–3 pairs of coarse teeth; upper bract margins with numerous short awn-shaped teeth. Flowers evenly distributed to ± crowded. Calyx lobes lanceolate to ovate, 2–3 mm at anthesis, ca. 4 mm in fruit, sparsely pubescent on veins, apex acute to obtuse. Corolla color unknown but possibly yellowish white, with throat orange on sides, 1.6–1.8 cm; tube 3–4 × as long as limb; galea densely barbate inside. Capsule ovoid, tapered, slightly oblique, ca. 1 cm, with sparse short scaly hairs. Fl. Aug.

Trailsides on forest slopes. Fujian, Zhejiang (Lishui Xian) [Japan].

None of the three Chinese specimens seen by the authors recorded flower color.

3. *Melampyrum klebelsbergianum* Soó, J. Bot. 65: 144. 1927, p.p. excl. spec. from Gansu and Shanxi.

滇川山罗花 dian chuan shan luo hua

Chingyungia scutellarioidea T. M. Ai; *M. henryanum* Soó, p.p.

Annuals, 20–60 cm tall. Stems erect, quadrangular, branched, pubescent along 2 lines. Petiole ca. 5 mm; leaf blade lanceolate, rarely ovate-lanceolate or linear-lanceolate, 2–5 × ca. 1.5 cm, scabrous, apex acuminate to an obtuse tip. Flowers starting from 5th to 9th node of stem; bracts linear-lanceolate, margin often entire but basally sometimes with 1 or 2 short to rarely long teeth, apex ± obtuse. Calyx 4–5 mm; lobes lanceolate, ciliate, puberulent on veins. Corolla purple-red to red, with white sides, 1.2–1.6 cm; tube ca. 2 × as long as limb; galea densely barbate inside. Capsule ovoid-conical, 8–10 mm, scabrous, apex truncate to oblique. Seeds black, 2.5–3 mm. Fl. Jun–Aug.

• Grassy slopes, forests; 1200–3400 m. Guizhou (Guiding Xian), Sichuan, NW Yunnan.

**50. PHTHEIROSPERMUM Bunge ex Fischer & C. A. Meyer,
Index Sem. Hort. Petrop. 1: 35. 1835.**

松蒿属 song hao shu

Herbs, annual or perennial, viscid glandular villous. Stems 1 or cespitose. Leaves petiolate or sessile; leaf blade pinnately parted to pinnatisect. Flowers axillary from upper leaves, in lax racemes, short pedicellate. Bracteoles absent. Calyx campanulate, 5-lobed; lobes entire to pinnately parted. Corolla tubular, with 2 folds; lower lip spreading flat, 3-lobed; upper lip shorter than lower, erect, 2-lobed; lobes revolute. Stamens 4, didynamous; anterior stamens longer than posterior, included or \pm exerted; anthers glabrous or woolly; anther locules 2, equal, distinct, parallel, mucronate. Ovary narrowly ovoid, apex 2-lobed. Capsule ovoid, compressed, beaked, loculicidal, valves entire. Seed ovoid; seed coat reticulate.

About three species: E Asia; two species in China.

- 1a. Annuals; pinnae narrowly ovate to ovate-orbicular; corolla pale red to purple-red 1. *P. japonicum*
 1b. Perennials; pinnae linear; corolla yellow to orange-yellow 2. *P. tenuisectum*

1. *Phtheirospermum japonicum* (Thunberg) Kanitz, Exp. Asiae Orient. 12. 1878.
 松蒿 song hao

裂叶松蒿 lie ye song hao

Gerardia japonica Thunberg in Murray, Syst. Veg. ed 14, 553. 1784; *Phtheirospermum chinense* Bunge.

Perennials, 10–55 cm tall. Stems numerous, cespitose, slender, basally curved, ascending, simple or apically branched. Leaves opposite or sometimes subopposite above middle of stem; leaf blade triangular-ovate, 1–4 \times 0.5–3.5 cm, pinnatisect; pinnae linear, with villous multicellular glandular hairs, apex obtuse and sometimes mucronate. Flowers solitary. Pedicel 1–3 mm. Calyx 5–8 mm, glandular villous; lobes ovate to lanceolate, 2–4 \times 1–2 mm, margin entire or parted into 2 or more segments. Corolla usually yellow to orange-yellow, outside glandular and eglandular villous; tube 0.6–1.5 cm; throat hairy; lower lobes obovate, 4–6.5 mm, subequal or middle lobe slightly larger than lateral lobes, margin ciliate, apex obtuse to emarginate; upper lobes ovate, 3–4 mm. Stamens included. Ovary pilose. Capsule 4–6 mm. Seeds ovoid, less than 1 mm. Fl. and fr. May–Oct.

Annuals, (5–)60–100 cm tall. Stems erect or curved and ascending, usually much branched. Leaves opposite; petiole 5–12 mm, narrowly winged; leaf blade narrowly triangular-ovate, 1.5–5.5 \times 0.8–3 cm, pinnately parted to pinnatisect; pinnae narrowly ovate to ovate-orbicular, 4–10 \times 2–5 mm, base suboblique, margin double serrate or parted. Pedicel 2–7 mm. Calyx 4–10 mm; lobes lanceolate, 2–6 \times 1–3 mm, foliaceous, pinnately parted. Corolla pale red to purple-red, 0.8–2.5 cm, outside villous; lower lobes obtuse; upper lobes triangular-ovate. Filaments basally pilose. Capsule 6–10 mm. Seeds flattened, ca. 1.2 mm. Fl. and fr. Jun–Oct.

Shady places in thickets on mountain slopes; 100–1900 m. throughout China except Xinjiang [Japan, Korea, Russia (Far East)].

Grassy slopes, under woods, in thickets; 1900–4100 m. Guizhou, Qinghai, Sichuan, Xizang, Yunnan [Bhutan].

2. *Phtheirospermum tenuisectum* Bureau & Franchet, J. Bot. 5: 129. 1891.

51. EUPHRASIA Linnaeus, Sp. Pl. 2: 604. 1753.

小米草属 xiao mi cao shu

Herbs, annual or perennial, hemiparasitic. Leaves opposite, lower ones usually small, increasing in size upward. Inflorescences terminal spikes or racemes; bracts larger than leaves, opposite, palmately veined, margin callous thickened dentate. Calyx tubular to campanulate, 4-lobed, more deeply parted medianly than laterally. Corolla tube tubular, apically inflated; limb 2-lipped; lower lip 3-lobed, lobe apices often emarginate; upper lip straight, galeate, lobes \pm revolute. Stamens 4, didynamous, anthers connivent and enclosed by galea; locules parallel and free, pointed at base but posterior 2 anthers each with 1 locule spurred, all 4 with barbate hairs along slit. Stigma slightly dilated, entire or 2-lobed. Capsule \pm compressed, 2-grooved, loculicidal, apex obtuse. Seeds numerous, small, ellipsoid, with cross striate wings.

About 200 species: cosmopolitan; 11 species in China, belonging to 2 disjunct sections.

The taxa in this genus often are hemiparasitic on grasses.

The Taiwan species of *Euphrasia* all belong to *E. sect. Paradoxae* Pugsley, which includes perennial taxa that also occur in tropical alpine mountains on SE Asian islands, New Guinea, New Zealand, and Juan Fernandez Island of Chile. All the other Chinese species of *Euphrasia* belong to *E. sect. Semicalcaratae* Benthams, which includes annual taxa that occur in the northern hemisphere temperate zones as well as alpine mountains in the northern subtropics.

1a. Annuals; bracts conspicuously larger than leaves (sect. *Semicalcaratae*).

2a. Plants pubescent throughout with eglandular hairs 1. *E. pectinata*

2b. Plants sparsely pubescent on upper stems, leaves, bracts, and calyx with capitate glandular hairs mixed with eglandular hairs.

3a. Stalks of glandular hairs short, 1- or 2-loculed.

- 4a. Corolla upper side 0.5–1 cm, middle lobe of lower lip less than 3 mm wide 2. *E. regelii*
 4b. Corolla upper side 0.9–1.1 cm, middle lobe of lower lip 3–4 mm wide 3. *E. jaeschkei*
 3b. Stalks of glandular hairs long, (2 or)3- to several loculed.
 5a. Corolla upper side 4–8 mm; stems often slender, simple, rarely apically branched 4. *E. hirtella*
 5b. Corolla upper side 8–12 mm; stems often stout, usually branched from middle and apically 5. *E. amurensis*
 1b. Perennials, stems often woody at base; bracts as large as leaves or slightly larger (sect. *Paradoxae*).
 6a. Calyx lobes ca. 2 × as long as tube 10. *E. nankotaizanensis*
 6b. Calyx lobes nearly as long as tube.
 7a. Plants lacking glandular hairs 6. *E. matsudae*
 7b. Plants with glandular hairs.
 8a. Calyx hispid 8. *E. pumilio*
 8b. Calyx glandular hairy.
 9a. Leaves glabrous or sparsely pubescent 7. *E. transmorrisonensis*
 9b. Leaves densely pubescent on both surfaces.
 10a. Leaf pubescence soft, mixed with glandular hairs 9. *E. tarokoana*
 10b. Leaf pubescence glandular viscosa 11. *E. durietziana*

1. *Euphrasia pectinata* Tenore, Fl. Napol. 1: 36. 1811.

小米草 xiao mi cao

Annuals, 10–50 cm tall, pubescent with eglandular hairs. Stems erect, white pubescent. Leaves sessile, ovate to deltoid-orbicular, 1–2 × 0.7–1.5 cm, hispid, margin toothed. Spikes 3–15 cm, flowers crowded, elongated and lax in fruit; bracts leaflike, conspicuously larger than leaves. Calyx tubular, 5–7 mm, hispid; lobes narrowly triangular, apex acuminate. Corolla white or pale purple, pubescent outside and upper side more densely so; upper side 5–10 mm; lower lip ca. 1 mm, longer than galea, lobes conspicuously notched. Anthers brown. Capsule narrowly oblong, 4–8 mm, emarginate. Seeds white, ca. 1 mm. Fl. Jun–Sep.

Shaded grassy slopes, thickets, slopes in steppes or meadows, rarely by water or sparse woods; 2400–3200(–4000) m. W Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shandong, Shanxi, NW Sichuan, Xinjiang [Korea, Mongolia, Russia (Far East); Europe].

- 1a. Leaf and bract base cuneate; stems simple or branched from base 1a. subsp. *pectinata*
 1b. Leaf and bract base subtruncate, rarely broadly cuneate; stems usually branched from middle and above.
 2a. Leaves and bracts subglabrous 1b. subsp. *simplex*
 2b. Leaves and bracts adaxially densely hispidulous 1c. subsp. *sichuanica*

1a. *Euphrasia pectinata* subsp. *pectinata*

小米草(原亚种) xiao mi cao (yuan ya zhong)

Euphrasia officinalis Linnaeus, nom. ambig.; *E. tatarica* Fischer ex Sprengel.

Stems 10–30(–45) cm tall, simple or branched from base. Leaves and bracts ovate to ovate-orbicular, sparsely hispid along veins, base cuneate, margin with several obtuse to acute teeth. Fl. Jun–Sep.

Shaded grassy slopes, thickets. W Gansu, N Hebei, Nei Mongol, Ningxia, Qinghai, N Shanxi, Xinjiang [Mongolia, Russia (Far East); Europe].

1b. *Euphrasia pectinata* subsp. *simplex* (Freyn) D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 374. 1979.

高枝小米草 gao zhi xiao mi cao

Euphrasia maximowiczii Wettstein var. *simplex* Freyn, Oesterr. Bot. Z. 52: 404. 1902; *E. subpetiolaris* Pugsley; *E. tatarica* var. *simplex* (Freyn) T. Yamazaki.

Stems (15–)25–50 cm tall, usually branched from middle and above. Leaves and bracts ovate-orbicular to deltoid-orbicular, subglabrous, base subtruncate, margin teeth acute, acuminate, or awn-shaped. Fl. Aug–Sep.

Slopes in steppes or meadows, rarely by water or sparse woods; ca. 2600 m. Hebei, Heilongjiang, Jilin, Liaoning, S Nei Mongol, Shandong, Shanxi, Xinjiang [Korea, Russia (Far East)].

1c. *Euphrasia pectinata* subsp. *sichuanica* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 406. 1979.

四川小米草 si chuan xiao mi cao

Stems (15–)25–45 cm tall, branched from middle and above. Leaves and bracts ovate-orbicular to deltoid-orbicular, 1–2 × 0.7–1.5 cm, adaxially densely hispidulous, base usually subtruncate to rarely broadly cuneate, margin teeth acute, acuminate, or awn-shaped.

• Meadows; 2400–3200 m. NW Sichuan.

2. *Euphrasia regelii* Wettstein, Monogr. Euphrasia 81. 1896.

短腺小米草 duan xian xiao mi cao

Euphrasia kingdon-wardii Pugsley.

Annuals, 3–35 cm tall. Stems erect, simple or branched, white pubescent. Leaves sessile, ovate to orbicular, 5–15 × 3–13 mm, hispid with mixed eglandular and short capitate-glandular hairs, stalks of glandular hairs 1- or rarely 2-loculed, base broadly cuneate to subtruncate, margin 3–6-toothed on each side, apex obtuse. Spikes usually short in flower, to 15 cm in fruit; bracts leaflike, conspicuously larger than leaves. Calyx tubular, 4–5 mm, to 8 mm in fruit, with same kind of hairs as leaves and bracts; lobes lanceolate to subulate, 3–5 mm, apex acuminate. Corolla white, galea often purplish, upper side 5–10 mm, sparsely white pubescent and most densely so on outer surface; lower lip longer than galea, lobes conspicuously notched, middle lobe less than 3

mm wide. Capsule narrowly oblong, 4–9 × 2–3 mm, emarginate. Fl. May–Sep.

Subalpine and alpine meadows, forests; 1200–4000 m. Gansu, Hebei, W Hubei, S Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, SE Xizang, NW Yunnan [Kashmir, Kazakstan, Kyrgyzstan, Mongolia, Russia (Far East), Tajikistan, Uzbekistan].

1a. Leaf and bract base cuneate to broadly cuneate; plants almost black when dry 2a. subsp. *regelii*

1b. Leaf and bract base subtruncate; plants yellow-green when dry ... 2b. subsp. *kangtienensis*

2a. *Euphrasia regelii* subsp. *regelii*

短腺小米草(原亚种) duan xian xiao mi cao (yuan ya zhong)

Euphrasia fangii H. L. Li; *E. forrestii* H. L. Li; *E. rockii* H. L. Li.

Stems 3–35 cm tall, almost black when dry. Leaves and bracts ovate to ovate-orbicular, base cuneate to broadly cuneate, teeth acute, acuminate, or awn-shaped. Corolla 5–10 mm on dorsal side. Fl. May–Sep.

Subalpine and alpine meadows, forests; 1200–3500 m. Gansu, Hebei, W Hubei, S Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, NW Yunnan [Kashmir, Kazakstan, Russia (Far East)].

Specimens from Hebei usually have very few glandular hairs and are hardly distinguished from *Euphrasia pectinata*.

2b. *Euphrasia regelii* subsp. *kangtienensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 406. 1979.

川藏短腺小米草 chuan zang duan xian xiao mi cao

Stems 5–20(–35) cm tall, yellow-green when dry. Leaves and bracts ovate-orbicular to orbicular, base subtruncate, margin teeth obtuse to acute. Corolla 6–8 mm on dorsal side. Fl. Jul–Aug.

• Meadows; 2900–4000 m. W Sichuan, SE Xizang.

3. *Euphrasia jaeschkei* Wettstein, Monogr. Euphrasia 80. 1896.

大花小米草 da hua xiao mi cao

Annuals, 10–20 cm tall. Stems erect, simple or branched from base to middle or rarely from apical part, white pubescent. Leaves ovate-orbicular, 6–12 × 4–10 mm, hispid with capitate glandular and eglandular hairs, stalks of glandular hairs 1- or 2-loculed, margin with 3–5 obtuse to acute teeth per side. Spikes terminal; bracts conspicuously larger than leaves, pubescence as on leaves, marginal teeth acute to acuminate. Calyx ca. 7 mm, pubescence as on leaves; lobes subulate-triangular. Corolla pale purple to pink-white, upper side 0.9–1.1 cm; lower lip conspicuously longer than galea, middle lobe 3–4 mm wide; galea lobes ca. 1.2 mm wide. Capsule emarginate. Fl. Jun.

Meadows; 3200–3400 m. Xizang (Gyirong Xian) [India, Nepal, Pakistan].

4. *Euphrasia hirtella* Jordan ex Reuter, Compt.-Rend. Trav. Soc. Haller 4: 120. 1854–1856.

长腺小米草 chang xian xiao mi cao

Euphrasia hirtella var. *paupera* T. Yamazaki.

Annuals, 3–40 cm tall, pubescent with long stalked capitate glandular hairs. Stems erect, usually slender, simple, rarely apically branched, hirsute with both long

capitate glandular and eglandular hairs. Leaves sessile, ovate to orbicular, base cuneate to rounded, margin with 2 to several obtuse to acuminate teeth on each side. Spikes with several to numerous flowers; bracts leaflike, conspicuously larger than leaves. Calyx 3–4 mm; lobes lanceolate to subulate. Corolla white or galea pale purple, upper side 4–8 mm. Capsule oblong, 4–6 mm, emarginate. Fl. Jun–Aug.

Meadows, steppes, forest edges, conifer forests; 1400–1800 m. Heilongjiang, Jilin, Nei Mongol, Xinjiang, Xizang [Kazakstan, Korea, Mongolia, Russia; Europe].

5. *Euphrasia amurensis* Freyn, Oesterr. Bot. Z. 52: 404. 1902.

东北小米草 dong bei xiao mi cao

Annuals, 10–40 cm tall, stout, hirsute with both capitate glandular and eglandular hairs, stalks of glandular hairs 2–4 loculed. Stems often stout, usually branched at middle and apically. Leaves oblong to ovate, base cuneate to broadly cuneate, sometimes attenuate into a short petiole, margin with 3–6 obtuse, acute, or acuminate teeth on each side. Spikes with numerous flowers; bracts leaflike, conspicuously larger than leaves. Calyx tubular-campanulate, 3–4 mm; lobes subulate. Corolla often white, galea sometimes pale purple, upper side 0.8–1.2 cm; lower lip conspicuously longer than galea; galea apex conspicuously notched. Capsule oblong, ca. 4 mm, emarginate. Fl. Jun–Aug. Steppes. NW Heilongjiang, N Nei Mongol [Russia (Far East)].

6. *Euphrasia matsudae* Yamamoto, Trans. Nat. Hist. Soc. Taiwan 20: 107. 1930.

光叶小米草 guang ye xiao mi cao

Euphrasia bilineata Ohwi; *E. exilis* Ohwi; *E. filicaulis* Y. Kimura; *E. masamuneana* Ohwi.

Perennials, to 29 cm tall, hairs eglandular. Stems caespitose, slender, prostrate, or prostrate at base and apically ascending to suberect, simple or branched, entirely pubescent or pubescent along 2 lines, or basally entirely pubescent and apically pubescent along 2 lines. Leaves ovate, ovate-orbicular, or obovate-orbicular, 3–8.5 × 2–5 mm, glabrous or nearly so, base rounded to broadly cuneate, margin acutely to obtusely 1–3(or 4)-toothed on each side, apex obtuse to rounded. Spikes terminal; bracts usually wider than leaves, glabrous. Pedicel 0.5–7 mm. Calyx 3.5–5 mm, glabrous or sparsely hispid along veins and margin; lobes as long as tube, oblong-lanceolate, apex obtuse. Corolla white, yellow, or light yellow with purple spots and venation, upper side 6–11 mm. Anther locules with barbate hairs along slit after dehiscence. Capsule conspicuously shorter than calyx, hirsute. Fl. Feb–Nov.

• Subalpine and alpine zones, forests, forest edges, steep slopes; 2000–3000 m. Taiwan.

Euphrasia matsudae is a common and variable species, particularly in habit, leaf margin (number of teeth), indumentum of stems, and pedicel length.

7. *Euphrasia transmorrisonensis* Hayata, Icon. Pl. Formosan. 5: 129. 1915.

台湾小米草 tai wan xiao mi cao

Euphrasia tatakensis Masamune.

Perennials, to 16 cm tall. Stems usually prostrate and apically ascending, simple or branched, entirely pubescent or with hairs along 2 lines. Leaves ovate, 3–10 × 2–8 mm, papery, glabrous or sparsely pubescent, rarely hispid on margin, base broadly cuneate to rounded, margin acutely 1–3(or 4)-toothed on each side, apex obtuse. Spikes terminal; bracts similar to leaves in shape and size, slightly wider, sparsely to rarely densely glandular hairy. Calyx 3.5–5 mm, sparsely to densely glandular hairy; lobes as long as tube, lanceolate, apex acute. Corolla mostly white, galea purplish-maroon on outer surface, upper side 0.8–1.3 cm; lower lip with a yellow palate and dark longitudinal lines, outer surface with glandular hairs ca. 8 mm. Anther locules with barbate hairs along slit after dehiscence. Capsule oblong-ovoid, shorter than calyx, hirsute. Fl. Aug–Nov.

• Alpine areas; 2600–3300 m. Taiwan.

Euphrasia transmorrisonensis is relatively common, variable, and similar to *E. matsudae* from which it seems to be distinguished by its glandular hairy bracts and calyces.

8. *Euphrasia pumilio* Ohwi, Acta Phytotax. Geobot. 2: 306. 1933.

矮小米草 ai xiao mi cao

Euphrasia fukuyamai Masamune; *E. kanzanensis* Masamune.

Perennials, 5–11 cm tall. Stems cespitose, simple, erect or ascending, basally white pubescent, apically pubescent only along 2 lines. Leaves at base of stem sessile, 1–2 mm, sparsely hispid with capitate glandular and eglandular hairs, margin crenately 1- or 2-toothed on each side; middle and upper leaves oblong-orbicular, 6–11 × 5–9 mm, abaxially hispid along veins, adaxially densely hispid or glabrous, base rounded, margin crenately 2- or 3-toothed, apex rounded. Racemes terminal; bracts as large as leaves, glabrous or hispid. Pedicel ca. 4 mm in fruit. Calyx 4–5 mm, hispid along veins and on margin; lobes as long as tube, obovate-linear, apex rounded. Corolla upper side ca. 9 mm. Anther locules with barbate hairs along slit after dehiscence. Ovary brown hirsute.

• Stream banks, alpine meadows; 3100–3800 m. Taiwan (Nantou Xian, Taizhong Xian).

9. *Euphrasia tarokoana* Ohwi, Acta Phytotax. Geobot. 2: 149. 1933.

大鲁阁小米草 da lu ge xiao mi cao

Perennials, 10–30 cm tall, herbage densely hispid or rarely mixed with capitate glandular hairs, abaxially pubescent only along veins. Stems usually cespitose, erect or ascending, branched, 1–1.5 mm in diam.

Leaves ovate-orbicular to orbicular, 3–8 × 3–8 mm, subleathery, densely pubescent on both surfaces, pubescence soft and mixed with glandular hairs, base rounded, margin crenately 1–3-toothed on each side, apex rounded. Spikes terminal; bracts similar to leaves, wider, densely glandular hairy and hispid. Pedicel short or nearly absent. Calyx 3.5–6 mm, densely glandular hairy and eglandular hispid; lobes as long as tube, narrowly oblong, apex obtuse. Corolla outer surface glandular and pubescent, upper side 1.2–1.4 cm. Anther locules with barbate hairs along slit after dehiscence. Capsule obovate, 4–6.5 mm, hirsute. Seeds ca. 1 mm. Fl. Nov–Apr.

• Mountain ridges; 1300–2000 m. Taiwan (Hualian Xian).

10. *Euphrasia nankotaizanensis* Yamamoto, Trans. Nat. Hist. Soc. Taiwan 20: 104. 1930.

高山小米草 gao shan xiao mi cao

Perennials, 5–20 cm tall. Stems ascending or erect, often basally prostrate, simple or branched, densely white pubescent. Leaves increasing in size upward; leaf blade ovate to narrowly ovate, 5–12 × 4–8 mm, hispid, base rounded, margin acutely 3- or 4(–6)-toothed on each side, apex rounded. Spikes terminal; bracts similar to leaves in shape, slightly larger, hispid with eglandular and capitate glandular hairs. Calyx to 7 mm in fruit, densely capitate glandular; lobes ca. 2 × as long as tube, ovate-lanceolate, apex obtuse. Corolla yellow, capitate glandular, upper side 1.2–1.4 cm; tube ca. 1 cm; lower lip oblong, ca. 2 × 1.5 mm; galea shallowly notched. Anther locules with barbate hairs along slit after dehiscence. Capsule narrowly ovoid, nearly as long as calyx, sparsely hirsute. Fl. Jul–Oct.

• Gravelly slopes; 2800–3600 m. Taiwan (Ilan Xian, Taizhong Xian).

11. *Euphrasia durietziana* Ohwi, Acta Phytotax. Geobot. 2: 149. 1933.

多腺小米草 duo xian xiao mi cao

Euphrasia durietzii Yamamoto.

Perennials, 10–20 cm tall, densely viscose glandular and hirsute throughout, glandular hairs capitate. Stems basally procumbent, apically ascending, or ascending from base, usually simple, rarely few branched. Leaves at base of stem ovate-orbicular, 2–5 mm; middle and upper leaves 5–7 × 4–6 mm, densely pubescent on both surfaces, base rounded, margin with 2 or 3(or 4) triangular and obtuse teeth, apex obtuse. Spikes terminal; bracts similar to leaves. Pedicel to 6 mm. Calyx ca. 4 mm; lobes nearly as long as tube, oblong-lanceolate, apex obtuse. Corolla outer surface glandular hairy, upper side 0.8–1.2 cm. Anther locules with barbate hairs along slit after dehiscence. Capsule nearly as long as calyx, hirsute. Fl. Jun–Sep.

• Alpine scrub; 2800–3500 m. Taiwan (Hualian Xian, Ilan Xian).

52. OMPHALOTRIX Maximowicz, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Second Pt. Sci. Nat. 9: 208. 1859.

脐草属 qi cao shu

Herbs, annual. Leaves opposite. Racemes in panicles. Pedicel elongated. Calyx tube tubular-campanulate, parted medianly to 2/5 length, parted on lateral sides to 1/3–1/2 length, 5-veined. Corolla lower lip deeply 3-lobed, lobes patent; upper lip galeate, straight, margin flat, emarginate. Stamens 4, enclosed by galea; anthers arrow-shaped, locule base extending into spurs, barbate along slit after dehiscence. Stigma capitate. Capsule loculicidal. Seeds numerous; wings white, cross striate.

One species: China, Korea, Russia (Far East).

1. Omphalotrix longipes Maximowicz, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Second Pt. Sci. Nat. 9: 209. 1858.

脐草 qi cao

Annuals, ca. 60 cm tall. Stems erect, slender, with white appressed hairs, apically branched. Leaves mostly all deciduous in fruit, sessile, linear-elliptic, 5–15 × 2–4 mm, glabrous, margin callous thickened and with several pointed teeth on each side. Bracts similar to leaves in shape. Pedicel slender, straight or slightly

arching, 5–10 mm, slightly more elongated in fruit, with same hairs as stems. Calyx 3–5 mm; lobes ovate-triangular, margin scabrous. Corolla white, 5–6 mm, pubescent externally. Capsule oblong, compressed, as long as calyx, hirsute, apex obtuse. Seeds ellipsoid, ca. 1 mm. Fl. Jun–Sep.

Moist places; 300–400 m. Beijing Shi (Miaofeng Shan), Hebei (Xiaowutai Shan), Heilongjiang, Jilin, Liaoning, E Nei Mongol [Korea, Russia (Far East)].

53. PSEUDOBARTSIA D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 406. 1979.

五齿萼属 wu chi e shu

Herbs, annual. Leaves opposite; leaf blade palmatisect, 3-parted. Racemes terminal. Calyx 10-veined, 5-lobed, parted to ca. 1/2 length, upper lobe slightly shallower. Corolla 2-lipped; lower lip exerted in bud, 3-lobed at anthesis, lobes patent, base 2-plicate; upper lip obscurely galeate, parted slightly beyond middle. Stamens 4, didynamous, enclosed by galea; anther locules equal, apically confluent, obovoid, pointed at base. Stigma capitate. Capsule loculicidal. Seeds numerous, sculptured, slightly curved; seed coat reticulate.

• One species: endemic to China.

Pseudobartsia is one of the most primitive members of the tribe *Rhinantheae*. The genus is related to *Odontites* Ludwig and *Bartsia* Linnaeus, and it is also similar to *Phtheirospermum* Bunge. Tao (Acta Bot. Yunnan. 15: 232. 1993) treated *Pseudobartsia yunnanensis* as conspecific with the Himalayan *Phtheirospermum glandulosum* Benth. However, more comparative material is needed before the generic placement of *P. glandulosum* and the possible synonymy of *P. yunnanensis* can be confirmed.

1. Pseudobartsia yunnanensis D. Y. Hong, Fl. Reipubl. Popularis Sin. 67(2): 406. 1979.

五齿萼 wu chi e

Annuals, 8–13 cm tall, densely with multicellular glandular hairs. Stems erect or ascending, simple, slender. Lower leaves small, ovate-orbicular, 3-lobed to deeply 3-parted. Petiole of middle and upper leaves ca. 1 mm; leaf blade 4–6 mm, 3-parted, middle segment linear-oblongate, ca. 2 × as long as lateral linear segments. Racemes with several distant flowers; bracts

similar to leaves in shape, 1 per flower. Pedicel short. Calyx campanulate, ca. 3.5 mm; lobes linear. Corolla yellow, ca. 4 mm; lower lip lobes obovate-orbicular; upper lip straight, apex rounded. Ovary hairy. Style ca. 2.5 mm, hairy. Capsule oblong, compressed, shorter than calyx, hirsute, apex emarginate, with persistent style. Seeds brown, ellipsoid, minute. Fl. Oct.

• Forests; ca. 2300 m. Yunnan (Songming Xian).

54. ODONTITES Ludwig, Inst. Reg. Veg., ed. 2, 120. 1757.

疗齿草属 liao chi cao shu

Herbs, hemiparasitic. Leaves opposite. Bracts smaller than leaves. Calyx 4-lobed. Corolla tube tubular; limb 2-lipped; lower lip ± spreading, 3-lobed, lateral lobes entire, middle lobe emarginate; upper lip slightly arching, obscurely galeate, margin straight, apex entire to emarginate. Stamens 4, didynamous, enclosed by galea; anther locules slightly divergent, pointed at base. Stigma capitate. Capsule loculicidal. Seeds numerous, pendulous, sculptured, winged; wings cross striate.

About 20 species: temperate regions of Asia, Europe, and N Africa; one species in China.

1. Odontites vulgaris Moench, Methodus 499. 1794.

疗齿草 liao chi cao

Euphrasia odontites Linnaeus; *E. serotina* Lamarck; *Odontites serotina* (Lamarck) Dumotier.

Annuals, 20–60 cm tall, entirely with appressed white hairs. Stems often branched from middle and apically, quadrangular above. Leaves sessile, lanceolate to linear-lanceolate, 1–4.5 × 0.3–1 cm, margin sparsely dentate. Spikes terminal; lower bracts leaflike. Calyx campanulate, 4–7 mm, slightly inflated in fruit; lobes narrowly triangular. Corolla purple, purple-red, or pale red, 8–10 mm, white villous outside. Capsule narrowly

oblong, slightly compressed, 4–7 mm, apically hirsute. Seeds ellipsoid, ca. 1.5 mm. Fl. Jul–Aug.

Meadows; below 2000 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai (Xunhua Salarzu Zizhi Xian), S Shaanxi, Shanxi, Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Russia, Tadjikistan, Uzbekistan; Europe].

55. RHINANTHUS Linnaeus, Sp. Pl. 2: 603. 1753.

鼻花属 bi hua shu

Alectorolophus Zinn.

Herbs, hemiparasitic. Leaves opposite. Racemes terminal. Calyx 4-lobed, upper side parted to ca. 1/2 length, other lobes shallow. Corolla 2-lipped; lower lip 3-lobed; upper lip galeate, extending into a short 2-lobed beak. Stamens 4, enclosed by galea; anthers connivent, locules transversely divergent, spurless, barbate along slit after dehiscence. Capsule loculicidal. Seeds several per locule, broadly winged.

About 50 species: North America, N Asia, Europe; one species in China.

Depending on the author, the number of species varies greatly in this genus.

1. *Rhinanthus glaber* Lamarck, Fl. Franç. 2: 352. 1778.

鼻花 bi hua

Alectorolophus major (Ehrhart) Reichenbach; *A. songaricus* Sterneck; *A. vernalis* N. W. Zinger; *Rhinanthus major* Ehrhart (1791), not Linnaeus (1753); *Rhinanthus songaricus* (Sterneck) Fedtschenko; *R. vernalis* (N. W. Zinger) B. Schischkin & Sergievskaja. Annuals, 15–60 cm tall. Stems erect, angular, pubescent along 4 lines, simple or branched; branches and leaves ascending almost vertically, close to main stems. Leaves sessile, linear to linear-lanceolate, 2–6 cm, as long as internodes, hispidulous, abaxially with hairs on spotlike processes, margin regularly deltoid-dentate

with ascending teeth, callous thickened, short ciliate. Bracts wider than leaves, lower bracts with long and pointed teeth, upper ones short toothed. Pedicel ca. 2 mm. Calyx compressed, becoming inflated and subglobose in fruit, ca. 1 cm; lobes narrowly triangular. Corolla yellow, ca. 1.7 cm; lower lip appressed to galea. Capsule subglobose, strongly compressed, ca. 8 mm in diam., included in calyx. Seeds almost semiglobose, flattened, ca. 4.5 mm, wing ca. 1 mm broad. Fl. Jun–Aug.

Meadows; 1200–2400 m. Heilongjiang, Jilin, Liaoning, N Nei Mongol, N Xinjiang [Kazakstan, Mongolia, Russia; Europe].

56. XIZANGIA D. Y. Hong, Acta Phytotax. Sin. 24: 139. 1986.

马松蒿属 ma song hao shu

Herbs, perennial. Leaves opposite. Racemes terminal, lax; lower bracts larger than upper. Calyx unequally 5-lobed, lower 2 lobes largest and ca. 2/3 of calyx length, other 3 lobes ca. 1/3 of calyx length. Corolla tubular; limb nearly as wide as tube, 2-lipped; lower lip conspicuously 2-plicate, 3-lobed, lobes oblong; upper lip conspicuously galeate, 2-lobed, lobes revolute. Stamens 4, didynamous; anther locules equal, base awn-pointed, barbate along slit after dehiscence. Ovules numerous per locule. Stigma capitate. Capsule loculicidal. Seeds numerous; seed coat transparent, reticulate.

• One species: endemic to China.

1. *Xizangia serrata* D. Y. Hong, Acta Phytotax. Sin. 24: 141. 1986.

马松蒿 ma song hao

Perennials, 15–25 m tall. Stems erect. Leaves sessile, ovate to ovate-lanceolate, 1–1.8 × 0.5–1 cm, glabrous, base rounded, margin serrate, apex obtuse to acute; veins 3–5. Raceme axis sparsely glandular hairy; bracts sessile, leaflike, glandular ciliate. Pedicel absent or 1–2 mm. Calyx ca. 1.1 cm, with multicellular glandular

hairs along veins and lobes margin, lower 2 lobes ca. 8 mm, upper ca. 5 mm, all lobes narrowly triangular and 2.5–3 mm wide. Corolla ca. 1.2 cm; limb ca. 1.2 mm; lower lip lobes ca. 1 × 1 mm. Stamens included, enclosed by galea. Style ca. 8 mm, sparsely pubescent. Capsule slightly compressed, ca. 7 × 4.5 mm, hirsute. Seeds globose, ca. 1 mm in diam. Fl. Aug.

• Gravelly slopes at forest edges; 3100–3400 m. Xizang (Bomi Xian).

57. PEDICULARIS Linnaeus, Sp. Pl. 2: 607. 1753.

马先蒿属 ma xian hao shu

Yang Hanbi (杨汉碧)¹; Noel H. Holmgren², Robert R. Mill³

Herbs perennial or annual, rarely biennial, hemiparasitic. Leaves alternate, opposite, or whorled, usually pinnatifid to 1- or 2-pinnatisect, rarely entire or dentate; lower leaves usually long petiolate; upper leaves often \pm sessile. Inflorescences terminal or flowers axillary; bracts usually leaflike. Calyx tubular to campanulate, often \pm bilabiate, usually deeply cleft anteriorly, (2–)5-lobed. Corolla purple, red, yellow, or white, strongly bilabiate; upper lip (galea) hooded, enclosing anthers, laterally compressed, rounded or truncate, or terminating in teeth or in a beak; lower lip 3-lobed, usually spreading, external to upper lip in bud. Stamens 4, didynamous; filaments glabrous or pubescent; anthers mucronate or not. Stigma capitate. Capsule moderately compressed or not, loculicidal. Seeds numerous, reticulate or costate.

About 600 species: best represented in the mountains of SW China and widespread in the frigid and alpine zones of the northern hemisphere; 352 species (271 endemic) in China.

From the limited available data, the species of *Pedicularis* in China are pollinated by bumblebees gathering nectar and/or pollen on nectariferous non-beaked species, and pollen only, by scraping or vibrating, on beaked species including those with long corolla tubes (Macior, L. W. 1988. *Plant Species Biol.* 3: 61–66.; Macior, L. W. & S. K. Sood. 1991. *Plant Species Biol.* 6: 75–81.; Macior, L. W., pers. comm.).

The rank of series has been traditionally used in *Pedicularis* since the time of Prain's work (*Ann. Bot. Gard. (Calcutta)* 3: 1–196. 1890). Sections (and subgenera) have also been used (e.g., by Bunge in *Walpers, Repert. Bot. Syst.* 3: 409–433. 1844; Li, H. L. *Proc. Acad. Nat. Sci. Philadelphia* 101: 1–214. 1949; Yamazaki, T. 1988. A revision of the genus *Pedicularis* in Nepal. *in: Ohba, H. & Malla, S.B. (eds.), The Himalayan Plants* 1: 91–161, and others). Because series names have been used widely (e.g., Tsoong, P. C., 1955, *Acta Phytotax. Sin.* 4: 103–147; Tsoong, P.C., 1963, *Fl. Reipubl. Popularis Sin.* 68) but sectional names only in revisions covering limited areas (e.g., Yamazaki, T. 1988) and since not all species have been assigned to sections yet, the rank of series is used here.

1a. Leaves opposite or whorled (or in ser. 26, 84, 86, 87 alternate apically).

2a. Leaves opposite or occasionally alternate.

3a. Corolla galea beakless.

4a. Corolla galea toothless.

5a. Leaves lanceolate to linear.

6a. Leaves entire or obscurely crenate 50. *Salicifoliae*

6b. Leaves pinnatifid to pinnatisect 102. *Flammeae*

5b. Leaves \pm ovate.

7a. Corolla 3–3.5 cm; roots glabrous 21. *Salviiflorae*

7b. Corolla less than 2 cm; roots densely yellow-brown pubescent 26. *Aloenses*

4b. Corolla galea toothed.

8a. Leaves mostly basal, stem leaves often only in 1 pair; flowers in a densely capitate spike or flowers only 2 or 3.

9a. Plants 2–4 cm tall; flowers few; galea without a protuberance at middle of margin on each side

87. *Collatae*

9b. Plants usually more than 10 cm tall; galea with a protuberance at middle of margin on each side 89. *Cernuae*

8b. Leaves mostly on stem, basal leaves few; flowers not in a dense capitulum, more than 2 or 3.

10a. Corolla galea at least as long as lower lip.

11a. Corolla apex with several teeth on each side of margin 76. *Lyratae*

11b. Corolla apex obscurely 2-toothed 36. *Pteridifoliae*

10b. Corolla galea shorter, only ca. 1/2 as long as lower lip, apex with only 1 tooth on each side of margin.

12a. Calyx relatively large, with dense reticulate veins, teeth triangular, entire 38. *Pentagonae*

12b. Calyx relatively small, without dense reticulate veins, teeth leaflike, serrate 84. *Atrovirides*

3b. Corolla galea beaked.

13a. Corolla tube \pm elongated, more than 2 \times as long as calyx.

14a. Stems usually flexuous, ascending, more than 40 cm tall.

15a. Corolla beak bending downward 28. *Flexuosae*

15b. Corolla beak bending upward 33. *Omiianae*

14b. Stems diffuse or if erect then more than 10 cm tall.

16a. Plants low; stems short or sometimes nearly absent.

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- 17a. Stems short, erect, \pm woody; leaf segments few; corolla beak slightly recurved 75. *Urceolatae*
- 17b. Stems often trailing or plants \pm stemless, not woody; leaves pinnatisect; corolla beak straight 31. *Axillares*
- 16b. Stems \pm elongated, diffuse.
- 18a. Stems herbaceous; calyx lobes shorter than calyx tube; galea not dilated apically, toothless at margin 86. *Sikkimenses*
- 18b. Stems \pm woody; calyx lobes longer than calyx tube; galea dilated apically, toothed on lower margin 34. *Batangenses*
- 13b. Corolla tube not elongated, less than $2 \times$ as long as calyx.
- 19a. Stems repent basally.
- 20a. Plants annual; leaves on stem, not fernlike 77. *Reptantes*
- 20b. Plants perennial; leaves basal, fernlike 30. *Vagantes*
- 19b. Stems erect, not repent if diffuse.
- 21a. Beak of galea slender, usually S-shaped; leaves narrowly lanceolate to linear-lanceolate 80. *Integrifoliae*
- 21b. Beak of galea short, straight or curved, not S-shaped; leaves wider.
- 22a. Corolla with 2 colors 73. *Binariae*
- 22b. Corolla with only 1 color.
- 23a. Leaves alternate, often pseudo-opposite throughout; flowers long pedicellate.
- 24a. Galea not crested, beak usually straight; calyx not or slightly cleft anteriorly.
- 25a. Plants 5–9 cm tall; stems 2–4; Xizang 96. *Mychophilae*
- 25b. Plants 30–70 cm tall; stems single; not in Xizang 45. *Racemosae*
- 24b. Galea usually crested, sometimes inconspicuously; calyx deeply cleft anteriorly.
- 26a. Beak curved; calyx 2- or 3-lobed 97. *Franchetianae*
- 26b. Beak straight or falcate; calyx 3–5-lobed 67. *Strobilaceae*
- 23b. Leaves opposite throughout; flowers not long pedicellate.
- 27a. Stem leaves long petiolate; inflorescences long spicate; calyx large, with dense reticulate veins, lobes entire 39. *Dichotomae*
- 27b. Stem leaves short petiolate; inflorescences short; calyx small, without reticulate veins, lobes serrate.
- 28a. Galea margin 1-auricled, apex of beak erose-denticulate 88. *Pseudoasplenifoliae*
- 28b. Galea margin not auricled, apex of beak not erose-denticulate.
- 29a. Galea marginally 2-toothed; leaves small, broadly ovate 85. *Remotilobae*
- 29b. Galea not marginally 2-toothed; leaves larger, narrower 79. *Debiles*
- 2b. Leaves usually in whorls of 3 or 4.
- 30a. Corolla galea beakless (short beaked in ser. 52, 22, 61, 59).
- 31a. Corolla galea toothed.
- 32a. Bases of whorled petioles of leaves or at least bracts connate, cupular 40. *Reges*
- 32b. Bases of petioles of leaves and bracts not connate or cupular.
- 33a. Corolla tube strongly decurved in calyx, corolla \pm S-shaped 55. *Microchilae*
- 33b. Corolla tube not strongly decurved in calyx, corolla not S-shaped.
- 34a. Calyx lobes 2, calyx tube deeply cleft anteriorly 52. *Ikomanae*
- 34b. Calyx lobes 5, calyx tube slightly cleft anteriorly.
- 35a. Calyx lobes triangular or lanceolate, entire 51. *Rigidae*
- 35b. Calyx lobes \pm leaflike, serrate 22. *Melampyriflorae*
- 31b. Corolla galea toothless.
- 36a. Bases of petioles of leaves and bracts connate, cupular 40. *Reges*
- 36b. Bases of petioles of leaves and bracts not connate or cupular.
- 37a. Corolla tube decurved basally.
- 38a. Corolla yellow, galea plicate; anthers apiculate at apex 53. *Plicatae*
- 38b. Corolla usually purple, red, white, or rarely yellow, galea not plicate; anthers not apiculate at apex 54. *Verticillatae*
- 37b. Corolla tube erect or decurved apically.
- 39a. Corolla tube \pm erect.
- 40a. Plants annual; leaf segments 5–7 pairs 61. *Simae*

- 40b. Plants perennial; leaf segments 7–17 pairs 1. *Gloriosae*
- 39b. Corolla tube decurved.
- 41a. Inflorescences and calyx densely tomentose 81. *Pilostachyae*
- 41b. Inflorescences and calyx glabrous or sparsely pubescent.
- 42a. Corolla tube \pm decurved at middle.
- 43a. Plants annual; stems (15–)30–80 cm tall, often branched apically; corolla 7–9 mm ... 58. *Molles*
- 43b. Plants perennial; stems 5–12 cm tall, simple; corolla 22–30 mm 57. *Caucasicae*
- 42b. Corolla tube slightly curved, expanded, or bent forward apically.
- 44a. Leaves pinnatipartite to pinnatisect; leaves whorled 60. *Abrotanifoliae*
- 44b. Leaves pinnatilobate to pinnatifid; leaves opposite or whorled 59. *Denudatae*
- 30b. Corolla galea beaked.
- 45a. Corolla tube ca. 2.5–3 \times as long as calyx 43. *Cyathophyllae*
- 45b. Corolla tube less than 3 \times as long as calyx.
- 46a. Bases of petioles of leaves and bracts connate, cupular.
- 47a. Galea navicular; beak indistinct 41. *Cyathophylloides*
- 47b. Galea not navicular; beak long, distinct 42. *Superbae*
- 46b. Bases of petioles of leaves and bracts not connate or cupular.
- 48a. Flowers scarcely 6 mm, in a dense capitate raceme 25. *Coniferae*
- 48b. Flowers more than 10 mm.
- 49a. Beak of galea shorter than anther-containing part.
- 50a. Stems with curved branches 23. *Longicaules*
- 50b. Stems unbranched, or with erect straight branches.
- 51a. Corolla tube decurved in calyx tube 56. *Cheilanthifoliae*
- 51b. Corolla tube not decurved in calyx tube.
- 52a. Corolla tube decurved in throat of calyx tube 23. *Longicaules*
- 52b. Corolla tube not decurved or decurved outside calyx lobes.
- 53a. Anther-containing part of galea red, goosehead-shaped; stem leaves in 1 or 2 pairs 90. *Tatsienenses*
- 53b. Anther-containing part of galea not red, not goosehead-shaped; stem leaves numerous 62. *Myriophyllae*
- 49b. Beak of galea longer than anther-containing part.
- 54a. Beak of galea coiled or twisted.
- 55a. Corolla tube bent at a right angle apically 83. *Meteororhynchae*
- 55b. Corolla tube not bent at a right angle apically.
- 56a. Corolla yellow or purplish, with yellowish tube apically and lower lip basally 74. *Pectinatiformes*
- 56b. Corolla purplish red or yellow, or yellow with purple galea.
- 57a. Calyx often less than 6 mm, lobes \pm serrate; bracts narrower, serrate or pinnatilobate 63. *Semitortae*
- 57b. Calyx often ca. 10 mm, lobes \pm entire; bracts at least ovate and entire apically . 64. *Pectinatae*
- 54b. Beak of galea straight or slightly falcate-curved.
- 58a. Stems branched apically.
- 59a. Branches in whorls of 4–6, often woody; beak of galea slightly falcate-curved; calyx lobes ovate; capsule ca. 1/2 exceeding calyx 24. *Graciles*
- 59b. Branches opposite or in whorls of 4, herbaceous; beak of galea bent upward; calyx lobes triangular; capsule ca. 4/5 exceeding calyx 27. *Moupinenses*
- 58b. Stems unbranched apically.
- 60a. Corolla tube decurved in calyx 56. *Cheilanthifoliae*
- 60b. Corolla tube not decurved.
- 61a. Basal leaves large, persistent, \pm lanceolate or narrowly oblong, pinnatifid, with many segments; stem leaves in whorls of 3 82. *Tantalorhynchae*
- 61b. Basal leaves smaller or not persistent, \pm elliptic to ovate, with few segments; stem leaves sometimes opposite 78. *Brevifoliae*
- 1b. Leaves alternate or at least alternate apically (or in ser. 1, 30, 31, 33, 34, 36, 37, 45, 67, 102 rarely with pseudo-opposite or opposite leaves).
- 62a. Corolla slightly beaked or beakless (beak not longer than wide).

- 63a. Galea with marginal teeth near apex.
- 64a. Galea with several marginal teeth on each side near apex 105. *Rhynchodontae*
- 64b. Galea usually with a distinct marginal tooth on each side of apex.
- 65a. Lower corolla lip usually erect or slightly spreading, corolla tube usually not decurved.
- 66a. Plants branched 44. *Pedicularis*
- 66b. Plants usually unbranched.
- 67a. Basal leaves to 28 cm, with 5–9 pairs of segments 36. *Pteridifoliae*
- 67b. Basal leaves less than 12 cm, with more segments.
- 68a. Plants reddish or reddish brown hirtellous; basal leaves persistent 20. *Hirtellae*
- 68b. Plants not hirtellous; basal leaves not persistent 16. *Striatae*
- 65b. Lower corolla lip spreading, corolla tube usually decurved.
- 69a. Leaves opposite or sometimes alternate apically; stems ascending 84. *Atrovirides*
- 69b. Leaves alternate; stems erect.
- 70a. Plants usually less than 15 cm tall.
- 71a. Plants without persistent marcescent leaves at base; inflorescences more than 1/2 total height of plants, centrifugal 104. *Pseudo-oederianae*
- 71b. Plants with persistent marcescent leaves at base; inflorescences short spicate or capitate 92. *Merrillianae*
- 70b. Plants usually more than 15 cm tall.
- 72a. Leaves usually 2-pinnatifid, 1-pinnatisect, 2-pinnatisect, or pinnatipartite 66. *Comosae*
- 72b. Leaves usually 1-pinnatisect, with linear-lanceolate, dentate segments 65. *Sudeticae*
- 63b. Galea without marginal teeth.
- 73a. Corolla tube decurved apically, lower lip spreading; capsule oblique.
- 74a. Plants usually caespitose or procumbent to ascending.
- 75a. Inflorescences terminal and basilar, usually distinctly centrifugal 103. *Corydaloides*
- 75b. Flowers few, axillary 87. *Collatae*
- 74b. Plants erect; flowers in a spike, or few and basilar, long pedicellate.
- 76a. Inflorescences short, capitate or flowers few, not distinctly centrifugal 91. *Roseae*
- 76b. Inflorescences elongated, spicate, with dense flowers 102. *Flammeae*
- 73b. Corolla tube usually erect or occasionally decurved basally, lower lip not spreading; capsule not oblique.
- 77a. Flowers axillary.
- 78a. Plants usually stemless 29. *Acaules*
- 78b. Plants with distinct stems 26. *Aloenses*
- 77b. Flowers usually in terminal inflorescences; plants with distinct erect stems.
- 79a. Apex of galea acute 2. *Grandiflorae*
- 79b. Apex of galea usually rounded or obtuse.
- 80a. Throat of corolla expanded, lower lip long stipitate basally 3. *Tsekouenses*
- 80b. Throat of corolla not expanded, lower lip not stipitate.
- 81a. Stem leaves usually few; plants not drying black 1. *Gloriosae*
- 81b. Stem leaves usually numerous; plants drying black or not.
- 82a. Leaves linear to linear-lanceolate, pinnatipartite; plants to 1 m tall 4. *Tristes*
- 82b. Leaves ovate to elliptic-oblong, dentate to pinnatilobate; plants less than 40 cm tall.
- 83a. Plants drying black; rhizomes distinct, rootstock developed, roots glabrous; leaves alternate; corolla large, galea falcate apically 5. *Galeatae*
- 83b. Plants not drying black; without rhizomes, roots densely yellowish brown pubescent; leaves mostly opposite; corolla ca. 1.3 cm, galea \pm straight 26. *Aloenses*
- 62b. Corolla beaked.
- 84a. Corolla tube at least 2 \times as long as calyx (except *P. bicolor* of ser. *Wilsoniae*).
- 85a. Plants usually diffuse; calyx lobes usually 5.
- 86a. Plants \pm woody; leaves with linear segments; galea usually abruptly constricted into a straight beak 34. *Batangenses*
- 86b. Plants herbaceous; leaves with ovate to oblong segments; galea usually gradually constricted into a beak.
- 87a. Beak of galea bent upward 33. *Omiianae*
- 87b. Beak of galea not bent upward, usually straight or twisted 35. *Muscicolae*

- 85b. Plants erect or ± stemless; if stems diffuse, calyx lobes 2 or 3, not 5.
- 88a. Plants more than 10 cm tall, if smaller, corolla often yellow, or corolla red-purple and less than 1.5 cm.
- 89a. Inflorescences short, racemose, centripetal; galea 1-toothed on each side 71. *Amplitubae*
- 89b. Inflorescences usually longer, centrifugal; galea toothless at margin.
- 90a. Lower corolla lip spreading, not enveloping galea 111. *Longiflorae*
- 90b. Lower corolla lip not spreading, usually enveloping galea, only slender beak projecting 112. *Megalanthae*
- 88b. Plants less than 10 cm tall; corolla ± red-purple.
- 91a. Pedicel to 1–4 cm; galea circinate-incurved basally 101. *Neolatitubae*
- 91b. Pedicel shorter; galea not incurved basally.
- 92a. Corolla tube expanded apically 100. *Wilsoniae*
- 92b. Corolla tube not expanded apically.
- 93a. Corolla with lower lip less than 2 cm wide; corolla tube slender, usually less than 0.75 mm wide 99. *Albiflorae*
- 93b. Corolla with lower lip more than 2 cm wide; corolla tube usually more than 1 mm wide.
- 94a. Leaves pinnatifid; beak of galea usually downward uncinat 108. *Robustae*
- 94b. Leaves ± entire or only pinnatifid; beak of galea not downward uncinat 110. *Pumiliones*
- 84b. Corolla tube less than 2 × as long as calyx.
- 95a. Galea usually marginally long ciliate.
- 96a. Galea navicular.
- 97a. Leaves linear to linear-lanceolate or oblong-lanceolate, pinnatilobate or dentate 8. *Craspedotrichae*
- 97b. Leaves not linear, shorter and wider, segmented.
- 98a. Leaves pinnatisect, with linear-lanceolate segments 17. *Proboscideae*
- 98b. Leaves double dentate to pinnatipartite, with shorter and wider segments.
- 99a. Leaves ± lanceolate-oblong, less than 3.5 × as long as wide 7. *Dolichocymbae*
- 99b. Leaves not linear to linear-lanceolate, more than 4 × as long as wide 6. *Rudes*
- 96b. Galea not navicular.
- 100a. Beak of galea nearly as long as lower corolla lip.
- 101a. Leaves mostly basal, pinnatisect with lanceolate segments; beak of galea with apical tuft of hairs 18. *Lachnoglossae*
- 101b. Leaves mostly on stem, not pinnatisect; beak of galea without apical tuft of hairs.
- 102a. Lobes of lower corolla lip long stipitate basally, galea ± abruptly constricted into a slender beak 11. *Lasiophrydes*
- 102b. Lobes of lower corolla lip not stipitate, galea gradually constricted into a beak.
- 103a. Plants usually more than 30 cm tall, to 80 cm; galea less than 3 mm wide, sparsely pubescent 9. *Imbricatae*
- 103b. Plants usually less than 30 cm tall; galea 4–5 mm wide, densely pubescent ... 10. *Trichoglossae*
- 100b. Beak of galea longer than lower corolla lip.
- 104a. Leaves linear or linear-lanceolate.
- 105a. Plants usually more than 30 cm tall, to 1 m; beak of galea not twisted; lobes of lower corolla lip narrowly lanceolate 12. *Kongboenses*
- 105b. Plants less than 30 cm tall; beak of galea S-shaped; lobes of lower corolla lip short, wide 15. *Kialenses*
- 104b. Leaves not narrowly linear.
- 106a. Leaves ± ovate, usually more than 3.5 cm wide 14. *Excelsae*
- 106b. Leaves linear-lanceolate to lanceolate-oblong, usually less than 3.5 cm wide (except *P. angustilabris* to 5.5 cm wide).
- 107a. Galea not twisted, densely villous at base and at margin; lobes of lower corolla lip not square-shaped 19. *Recurvae*
- 107b. Galea strongly twisted, glabrous or villous on lower margin and beak; lobes of lower corolla lip nearly square-shaped 15. *Kialenses*

- 95b. Galea not marginally long ciliate.
- 108a. Inflorescences distinctly centrifugal.
- 109a. Beak of galea more than 3 × as long as lower corolla lip 107. *Macrorhynchae*
- 109b. Beak of galea shorter or slightly longer than lower corolla lip.
- 110a. Lower corolla lip less than 1.2 cm wide 106. *Filiculae*
- 110b. Lower corolla lip usually more than 1.5 cm wide 109. *Macranthae*
- 108b. Inflorescences distinctly centripetal or indistinctly centrifugal.
- 111a. Stems weak, slender, usually diffuse; flowers usually axillary.
- 112a. Flowers usually in clusters at base of stems 30. *Vagantes*
- 112b. Flowers not in clusters at base of stems, solitary.
- 113a. Galea with pairs of marginal teeth 94. *Odontophorae*
- 113b. Galea without marginal teeth.
- 114a. Leaves without distinct reticulate veins abaxially; calyx tube without reticulate veins 31. *Axillares*
- 114b. Leaves with distinct reticulate veins abaxially; calyx tube with reticulate veins apically 32. *Infirmas*
- 111b. Stems erect or ± ascending, or ± stemless; flowers arising from a stock.
- 115a. Inflorescences usually elongated, not interrupted.
- 116a. Stems to 80 cm tall; leaves relatively large; corolla relatively small, beak of galea bent upward, lower lip 1/4 to 1/3 as long as galea 13. *Subsurrectae*
- 116b. Stems shorter; leaves relatively small; corolla relatively large, beak of galea bent downward only, lower lip longer 69. *Oxycarpae*
- 115b. Inflorescences usually subcapitate, few flowered, or ± elongated and interrupted basally.
- 117a. Plants less than 10 cm tall, without a distinct main stem.
- 118a. Leaves numerous, persistent, with several narrow segments 93. *Asplenifoliae*
- 118b. Leaves few, not persistent, with fewer wider segments.
- 119a. Lower corolla lip more than 2 cm wide, galea usually robust, apex of beak 2-cleft 108. *Robustae*
- 119b. Lower corolla lip narrower, galea narrower, apex of beak not 2-cleft.
- 120a. Stems rigid; leaves alternate; roots numerous 95. *Paucifoliae*
- 120b. Stems usually weak, flexuous; leaves usually pseudo-opposite; roots few 96. *Mychophilae*
- 117b. Plants more than 10 cm tall.
- 121a. Pedicel to 3–11.5 cm; galea not twisted 97. *Franchetianae*
- 121b. Pedicel less than 3 cm; galea strongly twisted laterally.
- 122a. Flowers ± in a capitulum.
- 123a. Corolla more than 3 cm; lower lip relatively wide, often completely enveloping galea 98. *Pseudomacranthae*
- 123b. Corolla usually less than 2.5 cm; lower lip relatively narrow, often spreading, not enveloping galea.
- 124a. Leaves to 2.5–13 × 14 cm, stem leaves often ovate-elliptic 37. *Phaceliifoliae*
- 124b. Leaves smaller, ± oblong or lanceolate.
- 125a. Plants usually branched basally and at middle 67. *Strobiliceae*
- 125b. Plants unbranched or only branched basally.
- 126a. Corolla to 2.8 cm; beak of galea very long, S-shaped or semicircular 72. *Rhinanthoides*
- 126b. Corolla smaller; beak of galea shorter, not S-shaped or semicircular.
- 127a. Leaves pinnatifid or pinnatipartite 95. *Paucifoliae*
- 127b. Leaves pinnatisect or pinnatipartite 68. *Oliganthae*
- 122b. Flowers ± in a raceme.
- 128a. Galea strongly twisted laterally at base 70. *Dissectae*
- 128b. Galea not strongly twisted laterally at base.
- 129a. Leaves often ovate or elliptic, with few segments 49. *Furfurae*
- 129b. Leaves oblong to linear, with numerous segments, some merely crenate.
- 130a. Basal leaves cespitose; plants herbaceous; bracts petiolate 95. *Paucifoliae*
- 130b. Basal leaves not cespitose; plants ± woody; bracts sessile.
- 131a. Leaves only double dentate or entire.
- 132a. Beak of galea distinct 45. *Racemosae*

- 132b. Beak of galea indistinct 46. *Carnosae*
 131b. Leaves pinnatipartite to pinnatisect.
 133a. Pedicel relatively short; beak of galea short or obscure 47. *Microphyllae*
 133b. Pedicel relatively long, distinct; beak of galea slender 48. *Polyphyllatae*
1. Ser. Gloriosae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 92. 1890.

灿烂系 can lan xi

Herbs tall, not drying black. Stems often single, erect. Leaves alternate or in pseudo-whorls, pinnatifid to pinnatisect. Stem leaves usually few. Inflorescences long spicate. Calyx 5-lobed. Corolla large; tube erect, 2–3 × as long as calyx; galea toothless, marginally villous.

About six species: Europe to N Asia; two species in China.

- 1a. Plants with basal leaves; calyx lobes serrate; corolla pubescent only along galea margin, middle lobe of lower lip without 2 teeth at base 1. *P. sceptrum-carolinum*
 1b. Plants without basal leaves; calyx lobes often entire; corolla pubescent throughout, middle lobe of lower lip with 2 teeth at base 2. *P. odontochila*

1. *Pedicularis sceptrum-carolinum* Linnaeus, Sp. Pl. 2: 608. 1753.

旌节马先蒿 jing jie ma xian hao

Herbs perennial, to 60 cm tall, glabrous or sparsely ciliolate. Stems often single. Basal leaves in a rosette; petiole to 12 cm; leaf blade oblanceolate to linear-oblong, to 30 × 4 cm, pinnatifid to pinnatisect; segments 7–17 pairs, ovate to oblong, pinnatilobate, incised-double dentate, teeth white and callose. Stem leaves few, alternate or in pseudo-whorls of 3, similar to basal leaves but smaller. Inflorescences to more than 20 cm. Flowers often pseudo-opposite or in pseudo-whorls, lax; bracts broadly ovate. Calyx 1–1.5 cm; lobes serrate. Corolla yellow, sometimes purple-red at apex of lower lip and galea, to 3.8 cm, glabrous except on galea; tube ca. 1.5 cm; lips connivent; galea falcate, densely bearded along margin (corolla otherwise glabrous); lower lip with middle lobe entire. Filaments glabrous apically. Capsule globose, ca. 2 cm, short mucronate. Fl. Jun–Aug, fr. Aug–Sep. $2n = 32$.

Swampy woods, moist banks, marshy meadows; 400–500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Kazakstan, Korea, Mongolia, Russia; C and N Europe].

It is not known to which subspecies the Nei Mongol plants belong.

- 1a. Stems and leaves subglabrous 1a. subsp. *sceptrum-carolinum*

- 1b. Stems and leaves pubescent .. 1b. subsp. *pubescens*

1a. *Pedicularis sceptrum-carolinum* subsp. ***sceptrum-carolinum***

旌节马先蒿(原亚种) jing jie ma xian hao (yuan ya zhong)

Pedicularis sceptrum-carolinum var. *glabra* Bunge.

Stems and leaves subglabrous.

2. Ser. Grandiflorae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 93. 1890.

野苏子系 ye su zi xi

Herbs tall, drying black. Stems often many branched. Leaves alternate, large, 2- or 3-pinnatisect. Inflorescences long racemose, centripetal. Corolla large; galea toothless, apex acute. Anthers apiculate.

One species: China and Russia (Far East).

3. *Pedicularis grandiflora* Fischer, Mém. Soc. Imp. Naturalistes Moscou 3: 60. 1812.

Swampy woods, moist banks, marshy meadows; 400–500 m. Heilongjiang, Jilin, Liaoning [Japan, Kazakstan, Mongolia, Russia; C and N Europe].

1b. *Pedicularis sceptrum-carolinum* subsp. ***pubescens*** (Bunge) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 37. 1963.

有毛旌节马先蒿 you mao jing jie ma xian hao

Pedicularis sceptrum-carolinum Linnaeus var. *pubescens* Bunge in Ledebour, Fl. Ross. 3: 303. 1847; *P. sceptrum-carolinum* f. *pubescens* (Bunge) Kitagawa; *P. pubescens* (Bunge) Pai.

Stems and leaves pubescent.

Heilongjiang, Jilin, Liaoning [Korea, Russia].

2. *Pedicularis odontochila* Diels, Bot. Jahrb. Syst. 36, Beibl. 82: 97. 1905.

齿唇马先蒿 chi chun ma xian hao

Herbs to 40–50 cm tall, gray-white silky pubescent throughout. Stems single. Leaves on stem, not forming basal rosette, alternate, sessile, oblong, 5–8 × 2–3 cm, pinnatifid; segments dentate. Inflorescences spicate; bracts leaflike, small. Calyx ca. 1 cm; lobes equal, often entire. Corolla 4–4.5 cm, pubescent throughout; lips connivent; galea erect, 1.5–1.8 cm, marginally bearded; lower lip slightly shorter than galea, 3–4 × 5–6 mm, middle lobe with 2 teeth at base. Filaments glabrous. Fl. Jul.

• Shaanxi (Qinling).

Known from the original collection only. No specimens seen.

Herbs perennial, to more than 1 m tall, often many branched. Roots fascicled, ± fleshy. Stems stout, hollow, ribbed, densely and minutely appressed puberulent. Basal leaves withering early; petiole to 7 cm; leaf blade ovate-oblong, to 23 cm, 2-pinnatisect; segments lanceolate, pinnatipartite to pinnatisect, dentate, teeth white and callose. Inflorescences long racemose, centripetal, lax; bracts subtriangular, inconspicuous.

Calyx ca. 8 mm; lobes 5, equal, triangular, serrate. Corolla purple, 2.5–3.5 cm; lips ± connivent; galea falcate, marginally densely bearded; lower lip slightly shorter than galea. Filaments glabrous. Capsule ovoid, ca. 1.3 cm × 9 mm, apiculate. Fl. Jul–Aug, fr. Aug–Sep.

Swampy meadows; 300–400 m. Jilin, Nei Mongol [Russia].

3. Ser. Tsekouenses H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 8. 1949.

茨口系 ci kou xi

Herbs not drying black. Stems many branched basally. Leaves alternate; basal leaves numerous, long petiolate, pinnatifid to pinnatipartite. Inflorescences often capitate, few flowered. Corolla often purple spotted, large, throat expanded; galea falcate, rounded or obtuse apically, toothless; lower lip long stipitate basally.

One species: China and N Myanmar.

4. Pedicularis tsekouensis Bonati, Bull. Soc. Bot. France 54: 373. 1907.

茨口马先蒿 ci kou ma xian hao

Herbs, perennial, 10–60 cm tall, pubescent throughout. Roots fascicled, slender. Basal leaves in a rosette; petiole (1–)2–10 cm; leaf blade lanceolate-oblong to ovate-elliptic, 2–8 cm; segments 4–10 pairs, oblique ovate to triangular, pubescent, margin double dentate. Stem leaves absent or few, similar

to basal leaves but with shorter petioles and smaller. Inflorescences capitate or racemose, elongating to more than 25 cm, lax; bracts leaflike. Pedicel ca. 9 mm. Calyx ca. 1 cm; lobes 5, unequal. Corolla pale yellow to rose, often purple spotted, to 3 cm; tube slightly longer than calyx; galea densely pubescent apically. Filaments 2 pubescent, 2 glabrous; anthers apiculate. Fl. Jun–Sep, fr. Aug–Oct.

Dry stony pastures among *Pinus* and *Rhododendron* scrubs; 3000–4500 m. SW Sichuan, NW Yunnan [N Myanmar].

4. Ser. Tristes Benth in A. de Candolle, Prodr. 10: 579. 1846.

阴郁系 yin yu xi

Herbs to 1 m tall, drying black. Roots single, somewhat fleshy, with a tuft of fibrous roots near top. Stems unbranched. Stem leaves usually numerous. Leaves alternate, sessile, linear to linear-lanceolate, pinnatipartite or pinnatifid. Inflorescences racemose. Corolla yellow or pale yellow; galea falcate, toothless, apex acute or obtuse, beakless; lower lip not spreading.

Three species: China, Russia (Siberia); all three in China.

1a. Galea not densely pubescent at margin; bracts longer than flowers 7. *P. shansiensis*

1b. Galea densely pubescent at margin; bracts shorter than flowers.

2a. Corolla 2.6–3 cm; galea 4–5 mm wide; calyx lobes entire or obscurely serrate; filaments glabrous 5. *P. tristis*

2b. Corolla 4–4.5 cm; galea 6–8 mm wide; calyx lobes distinctly serrate; filaments sparsely pubescent 6. *P. paiana*

5. Pedicularis tristis Linnaeus, Sp. Pl. 2: 608. 1753.

阴郁马先蒿 yin yu ma xian hao

Herbs perennial, 15–50 cm tall. Stems hollow, with lines of hairs. Leaves linear to linear-lanceolate, to 8 × 2 cm, abaxially with long hairs along midvein, adaxially white pubescent, pinnatipartite; segments triangular to ovate, incised-double dentate.

Inflorescences to 20 cm, often interrupted basally; bracts triangular-ovate, shorter than flowers, pubescent. Calyx to 1.5 cm, densely pubescent to subglabrous; lobes 5, ± equal, linear-lanceolate, entire or obscurely serrate. Corolla yellow, 2.6–3 cm; tube barely exceeding calyx lobes, pubescent; galea 4–5 mm wide, margin densely pubescent, apex obtuse or acute. Filaments glabrous. Fl. Jun–Aug, fr. Jul–Sep. 2n = 16.

Alpine and subalpine wet meadows, shrubby grassland; 2700–3200 m. Gansu, Shanxi [Mongolia, Russia (Siberia, Far East)].

6. Pedicularis paiana H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 61. 1949.

白氏马先蒿 bai shi ma xian hao

Pedicularis tristis Linnaeus var. *macrantha* Maximowicz.

Herbs perennial, to 35 cm tall. Stems erect, pubescent, longitudinally striate. Leaves mostly on stem, lanceolate-oblong, to 8 × 2 cm, sparsely pubescent, pinnatifid; segments 10–15 pairs, dentate. Bracts leaflike, longer than calyx, shorter than flowers. Calyx pubescent; tube to 1.5 cm; lobes 5, ± equal, lanceolate-oblong, distinctly serrate. Corolla yellow, 4–4.5 cm, pubescent; tube ca. as long as galea; galea 6–8 mm wide, margin densely ciliate, apex acute; lower lip ca. as long as galea, lobes ± equal. Filaments sparsely pubescent. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows, *Picea* forests; 2800–3000 m. Gansu, W Sichuan.

7. *Pedicularis shansiensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 397. 1963.

山西马先蒿 shan xi ma xian hao

Herbs perennial, to 70 cm tall. Stems hollow, with lines of hairs. Leaves lanceolate-linear, 5–12 × 0.8–4.5 cm, with sparse, long, white hairs, pinnatipartite; segments 9–15 pairs, triangular-ovate to lanceolate-oblong, pinnatifid, margin dentate-incised, teeth callose. Inflorescences to 18 cm, interrupted basally; bracts leaflike, longer than flowers. Calyx ca. 1.4 cm, slightly

cleft anteriorly; lobes 5, unequal, posterior lobe smaller than lateral ones. Corolla pale yellow, ca. 4.5 cm, densely glandular pubescent throughout; tube to 2.5 cm; galea margin not densely pubescent, apex obtuse. Filaments glabrous. Capsule oblong-ovoid, slightly compressed, ca. 2 cm × 9 mm, apex acute. Seeds triangular, ca. 4 × 2 mm. Fl. Jun–Aug, fr. Jul–Sep.

• Alpine grassy slopes, thickets; 1200–2400 m. Henan, Shaanxi, Shanxi.

5. Ser. *Galeatae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 244. 1995.

显盔系 xian kui xi

Herbs drying black. Rhizomes distinct; rootstock developed, roots glabrous. Stems erect, unbranched. Stem leaves alternate, sessile, ovate to elliptic-oblong, margin double dentate. Flowers few, large; galea red, falcate apically, toothless, margin not long bearded, apex obtuse.

• One species: endemic to China.

8. *Pedicularis galeata* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 130. 1921.

显盔马先蒿 xian kui ma xian hao

Herbs perennial, 15–35 cm tall. Stems hollow, with lines of hairs. Leaves alternate, sessile, lanceolate-oblong to ovate-elliptic. Middle leaves larger than basal and apical leaves, to 4 × 2.2 cm, abaxially sparsely villous along midvein, adaxially brown pubescent along midvein, base broadly cuneate to rounded, apex obtuse to acute. Inflorescences lax racemes, capitate at anthesis,

elongating in fruit, ± sessile; bracts leaflike. Calyx ca. 1.1 cm, sparsely villous along midvein; lobes 5, unequal. Corolla purple, 2–2.2 cm; tube barely exceeding calyx, sparsely pubescent; galea ca. 5 mm wide; lower lip ca. 1.3 cm, ciliate. Filaments glabrous; anthers apiculate. Capsule broadly ovoid, compressed, ca. 1.5 × 1 cm, apex acute. Fl. Aug, fr. Sep.

• Grassy slopes; 3500–4400 m. NW Yunnan.

6. Ser. *Rudes* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 83. 1890.

粗野系 cu ye xi

Herbs tall, drying black. Stems unbranched or sometimes branched apically. Leaves alternate, sessile, ± linear to linear-lanceolate, more than 4 × as long as wide, pinnatipartite or pinnatisect. Inflorescences racemose or conical. Corolla navicular or falcate, slightly beaked.

Six species: China, N Myanmar; five species in China.

1a. Lower corolla lip stipitate basally; galea margin not bearded 13. *P. prainiana*

1b. Lower corolla lip ± sessile; galea margin densely bearded.

2a. Corolla tube glabrous or sparsely pubescent externally; calyx glabrous 11. *P. princeps*

2b. Corolla tube pubescent externally; calyx glandular pubescent.

3a. Calyx 3–4 mm, lobes ± entire; corolla tube ca. 3 × as long as calyx 10. *P. decora*

3b. Calyx 5–7 mm, lobes serrate; corolla tube ca. 2 × as long as calyx.

4a. Leaf segments to 24 pairs; calyx 5–6.5 mm; capsule ca. 13 × 8 mm 9. *P. rudis*

4b. Leaf segments to 15 pairs; calyx to 7 mm; capsule ca. 17 × 9 mm 12. *P. dunniana*

9. *Pedicularis rudis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 67. 1877.

粗野马先蒿 cu ye ma xian hao

Herbs perennial, to more than 1 m, usually branched apically, pubescent. Stems hollow. Stem leaves clasping, lanceolate-linear, 3–15 × 0.8–2.2 cm, pinnatipartite; segments to 24 pairs, oblong to lanceolate, pubescent, margin double dentate. Inflorescences long spicate, more than 30 cm, glandular pubescent; bracts leaflike below, ovate above, longer than calyx. Calyx 5–6.5 mm, densely white glandular pubescent; lobes 5, ± equal, serrate. Corolla white, 2–2.2 cm; tube ca. 1.2 cm, pubescent externally; galea

purple-red apically, front yellow, navicular, margin densely bearded, apex mucronulate, bent slightly upward; lower lip ± sessile, ca. as long as galea, ciliate. Filaments glabrous. Capsule broadly ovoid, compressed, ca. 1.3 cm × 8 mm, apex acute. Fl. Jul–Aug, fr. Aug–Sep.

• Grassy slopes, *Picea* forests, *Betula* forests; 2200–3400 m. W Gansu, Nei Mongol, Qinghai, Shaanxi, N Sichuan, E Xizang.

10. *Pedicularis decora* Franchet, Bull. Soc. Bot. France 47: 28. 1900.

美观马先蒿 mei guan ma xian hao

Pedicularis lasiantha H. L. Li.

Herbs perennial, to 1 m tall, pubescent. Stems branched apically or unbranched, sparsely white villous. Leaves narrowly lanceolate, to 10 × 2.5 cm, pinnatipartite; segments 20 pairs, oblong-lanceolate, margin double dentate. Inflorescences long spicate, interrupted basally, densely glandular pubescent; bracts leaflike below. Calyx 3–4 mm, densely glandular pubescent; lobes 5, triangular, ± entire. Corolla yellow; tube ca. 1.2 cm, ca. 3 × as long as calyx, pubescent outside; galea navicular, ca. as long as lower lip, margin densely bearded; lower lip ± sessile. Capsule ovoid, compressed, ca. 1.4 cm × 8 mm, apex short acuminate. Fl. Jun–Jul, fr. Aug.

• Grassy slopes, *Picea* forests, *Betula* forests; 2200–2800 m. S Gansu, W Hubei, S Shaanxi, NE Sichuan.

11. *Pedicularis princeps* Bureau & Franchet, J. Bot. (Morot) 5: 129. 1891.

高超马先蒿 *gao chao ma xian hao*

Herbs perennial, more than 1 m tall. Stems branched apically or unbranched, usually shiny black, pubescent. Leaves clasping, lanceolate, 2.5–8 × 0.5–2.4 cm, abaxially sparsely white pubescent, adaxially brown pubescent along midvein, pinnatipartite; segments 18 pairs, lanceolate-oblong, margin double dentate. Inflorescences long racemose, to more than 20 cm, interrupted basally; bracts leaflike. Pedicel to 3 mm, glabrous. Calyx 5–6 mm, glabrous; lobes 5, triangular, entire. Corolla pale yellow, to 1.5 cm; tube ca. 1.1 cm, glabrous or sparsely pubescent on outside; galea usually falcate, margin densely bearded; lower lip ± sessile, ca. as long as galea, ciliate. Filaments pubescent. Fl. Jun–Jul, fr. Aug–Sep.

• Grassy slopes, thickets, forests; 2800–3500 m. W Sichuan, NW Yunnan.

7. Ser. *Dolichocymbae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 244. 1995.

长舟系 *chang zhou xi*

Herbs drying black. Stems erect, not or rarely branched. Leaves ± lanceolate-oblong, less than 3.5 × as long as wide, margin lobed or double dentate. Corolla galea navicular; beak short.

• One species: endemic in China.

14. *Pedicularis dolichocymba* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 102. 1920.

长舟马先蒿 *chang zhou ma xian hao*

Pedicularis macrocalyx Bonati.

Herbs perennial, 13–40 cm tall. Stems rarely branched, longitudinally grooved, with lines of brown hairs. Leaves alternate, sessile; basal leaves scalelike; stem leaves ovate-oblong to lanceolate-oblong, 2.5–6 × 0.3–2 cm, middle leaves largest, abaxially sparsely villous along midvein, adaxially densely brown pubescent along midvein, margin lobed or double dentate.

12. *Pedicularis dunniana* Bonati, Notes Roy. Bot. Gard. Edinburgh 8: 44. 1913.

邓氏马先蒿 *deng shi ma xian hao*

Pedicularis aequibarbis Handel-Mazzetti.

Herbs perennial, to 1.6 m tall, brown pubescent throughout. Stems 1 to several, sturdy, hollow, sometimes branched apically. Leaves clasping, linear-lanceolate. Middle leaves largest, sparsely pubescent, pinnatipartite; segments to 15 pairs, lanceolate-oblong, margin lobed or double dentate. Inflorescences to 20 cm, elongating to 26 cm in fruit, glandular pubescent; upper bracts slightly longer than calyx. Calyx to 7 mm, densely glandular pubescent or not; lobes 5, serrate. Corolla yellow, to 2 cm; tube ca. 1.2 cm, pubescent; galea navicular, margin densely bearded; lower lip ± sessile; nearly as long as galea. Capsule ovoid-oblong, ca. 1.7 cm × 9 mm, apex acute. Seeds ca. 3 × 1.2 mm, reticulate. Fl. Jul, fr. Aug–Sep.

• Grassy slopes, forests; 3300–3800 m. W Sichuan, NW Yunnan.

13. *Pedicularis prainiana* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 567. 1888.

帕兰氏马先蒿 *pa lan shi ma xian hao*

Herbs perennial. Stems single, to 45 cm tall, erect, rigid, hollow, striate, leafy. Leaves linear-oblong, 7–10 × 1.5–2 cm, base auriculate, pinnatisect; segments 15–25 pairs, ovate-oblong, margin acute-dentate. Inflorescences erect, dense; bracts linear-oblong, basal ones longer than flowers, upper ones shorter than calyx. Pedicel 2–3 mm. Calyx ca. 1.6 cm × 5 mm, membranous, hirtellous; lobes 5, unequal. Corolla tube ca. 1.7 cm, slightly longer than calyx; galea navicular, margin not bearded, sparsely pubescent abaxially; lower lip stipitate basally, ciliate. Filaments glabrous. Fl. Jul, fr. Aug.

Scrubby slopes; 3000–3700 m. S Xizang [N Bhutan].

8. Ser. *Craspedotrichae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 8. 1949.

缘毛系 yuan mao xi

Herbs tall. Stems erect or ascending, rarely branched. Leaves alternate, linear to linear-lanceolate or oblong-lanceolate, pinnatifid or dentate. Corolla galea often navicular; beak short.

About 14 species: Bhutan, China, E Nepal, Sikkim; ten species in China.

- 1a. Galea conspicuously navicular, much enlarged, bent upward.
2a. Lobes of lower corolla lip narrow, lanceolate 18. *P. angustiloba*
2b. Lobes of lower corolla lip wider, ± rounded.
3a. Galea much longer than lower corolla lip, ca. 1.6 cm; lower lip ca. 8 × 11 mm ... 15. *P. pseudosteingeri*
3b. Galea nearly as long as or slightly longer than lower corolla lip, ca. 1.4 cm; lower lip ca. 1.1 × 1.2 cm.
4a. Corolla tube short, nearly as long as calyx; 2 filaments pubescent, 2 completely glabrous including extreme apex 16. *P. trichomata*
4b. Corolla tube longer, ca. 1.5 × as long as calyx; 2 filaments densely hirsute, 2 glabrous except sparsely hairy at anther insertion 17. *P. lophotricha*
1b. Galea inconspicuously navicular, slightly enlarged, pointing forward or bent downward.
5a. Plants less than 30 cm tall; leaves to 3 cm; corolla rose, beak of galea long 24. *P. craspedotricha*
5b. Plants usually more than 30 cm tall; leaves to over 8 cm; corolla ± yellow, beak of galea indistinct.
6a. Calyx densely pubescent, lobes distinctly serrulate 19. *P. ingens*
6b. Calyx glabrous or sometimes sparsely pubescent, lobes entire or rarely serrulate.
7a. Corolla tube ca. as long as to slightly longer than calyx; leaves with 50 or more teeth on each side.
8a. Calyx ca. 1.1 cm, lobes ± entire 20. *P. steingeri*
8b. Calyx to 1.3 cm, lobes distinctly serrulate 21. *P. pseudoingens*
7b. Corolla tube 1.5–2 × as long as calyx; leaves with less than 50 teeth on each side.
9a. Leaves incised-dentate; 2 filaments pubescent, 2 glabrous 22. *P. trichocymba*
9b. Leaves incised-lobed, ca. 1/3 distance from margin to midvein; all filaments glabrous 23. *P. tongolensis*

15. *Pedicularis pseudosteingeri* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 157. 1926.

假司氏马先蒿 jia si shi ma xian hao

Herbs perennial, drying black. Stems more than 40 cm tall, erect, grayish brown pubescent. Stem leaves clasping, sessile, linear-lanceolate, to 6 cm × 6 mm; middle leaves largest, margin incised-double dentate, teeth to 20 pairs. Inflorescences to 15 cm, dense; bracts leaflike, slightly longer than calyx. Calyx to 1.6 cm, glabrescent; lobes 5, triangular-ovate, ca. 4 mm.

Corolla purple; tube ca. 1.2 cm; galea conspicuously navicular, to 1.6 cm × 5 mm, margin densely long pubescent; lower lip much shorter than galea, ca. 8 mm × 1.1 cm, lobes ± rounded. Filaments 2 pubescent, 2 glabrous. Fl. Jun–Aug, fr. Aug–Sep.

• Open stone meadows, forest margins, *Picea* forests; 3000–4300 m. SW Sichuan, Yunnan.

16. *Pedicularis trichomata* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 70. 1949.

须毛马先蒿 xu mao ma xian hao

Herbs perennial, drying black. Stems to 40 cm tall, erect, unbranched, densely grayish brown pubescent, with few ovate scales at base. Leaves ± clasping, sessile, linear-lanceolate, 3.5–4.5 cm × 5–6 mm, base auriculate, margin incised-double dentate, apex acute.

Inflorescences racemose, to 15 cm, dense; bracts leaflike. Pedicel 1–1.5 mm. Calyx oblong-ovate, to 1.2 cm; lobes 5, triangular, ± entire. Corolla yellow; tube ca. 1.1 cm; galea conspicuously navicular, ca. 1.5 cm × 4.5 mm, margin densely long pubescent; lower lip ca. 1.1 × 1.2 cm, lobes ± rounded, denticulate. Filaments 2 pubescent, 2 completely glabrous including extreme apex. Ovary ca. 4 mm.

• NW Yunnan.

17. *Pedicularis lophotricha* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 71. 1949.

盔须马先蒿 kui xu ma xian hao

Herbs perennial. Stems 35–40 cm tall, erect, unbranched, hispid. Leaves sessile, linear-lanceolate, 5–6.5 cm × 6–8 mm, adaxially glabrous except for pubescent midvein, base broadly auriculate, margin crenate, apex acute. Inflorescences long racemose, 10–17 cm, ± dense; bracts leaflike, upper ones ca. 2/3 longer than corolla. Pedicel 1–2 mm. Calyx oblong-ovate, ca. 1.2 cm; lobes 5, ± equal, ciliate, ± entire. Corolla yellow, ca. 3 cm; tube erect, ca. 1.5 × as long as calyx; galea ca. 1.4 cm, margin densely long pubescent; beak 2–4 mm, apex cleft; lower lip nearly as long as galea, lobes ± rounded. Upper filament pair densely

hirsute in distal half, lower pair glabrous except for few hairs just below anther. Fl. Jun, fr. Jul.

• In *Salix* scrubs; 4300–4700 m. W Sichuan.

18. *Pedicularis angustiloba* P. C. Tsoong, Acta Phytotax. Sin. 3: 303. 1955.

狭裂马先蒿 xia lie ma xian hao

Herbs perennial, drying black. Stems to 70 cm tall, erect, unbranched, subglabrous, leafy throughout. Basal leaves early deciduous. Stem leaves clasping, lanceolate-linear, ca. 7 cm × 7 mm, adaxially shiny; segments 27–40 pairs, margin double dentate. Inflorescences 10–25 cm, pubescent; bracts leaflike, longer than flowers. Calyx ca. 1 cm; tube ca. 6 mm, white villous; lobes 5, ± equal, ± entire. Corolla yellow; tube ca. 9 mm, slightly shorter than calyx; galea purple spotted, conspicuously navicular, margin pilose, apex slightly curved; beak decurved, ca. 1.5 mm; lower lip ca. 1.4 cm × 8–9 mm, ± ciliate, lobes lanceolate, denticulate. Filaments pubescent. Fl. Jun–Aug, fr. Aug.

• Loose moraine screes, dry places in forests; 3400–4500 m. E Xizang.

19. *Pedicularis ingens* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 565. 1888.

硕大马先蒿 shuo da ma xian hao

Herbs perennial, drying black. Stems more than 60 cm tall, erect, hollow, pubescent, with oblong scales at base. Basal leaves withering early; stem leaves clasping, sessile, oblong-linear, to 9 × 1.2 cm, base auriculate, margin incised-double dentate, teeth more than 40 pairs, apex acute. Inflorescences to 20 cm; bracts leaflike. Calyx to 1.2 cm, densely pubescent; lobes 5, serrulate. Corolla yellow, ca. 2.5 cm; tube slender, ca. 1.4 cm; galea inconspicuously navicular, margin long pubescent; beak short, indistinct, apex 2-cleft; lower lip ca. 8 mm × 1 cm, lobes denticulate. Filaments 2 pubescent, 2 glabrous. Fl. Jul–Sep, fr. Sep.

• High weedy slopes, grassy and scrubby slopes; 3000–4200 m. Gansu, E Qinghai, N Sichuan.

20. *Pedicularis steingeri* Bonati, Bull. Soc. Bot. France 55: 311. 1908.

司氏马先蒿 si shi ma xian hao

Herbs perennial, drying black. Stems more than 70 cm tall, erect, hollow, pilosulous. Basal leaves scalelike; stem leaves clasping, linear, to 7 cm × 7 mm, base hastate, margin incised-double dentate, teeth more than 60 pairs. Inflorescences to 20 cm; bracts ovate-lanceolate, ciliate. Calyx ca. 1.1 cm; lobes 5, triangular-ovate, ciliate, ± entire. Corolla yellow; tube ca. 1.2 cm; galea falcate, inconspicuously navicular, margin bearded; beak short, indistinct, decurved; lower lip ca. 7 mm × 1 cm. Filaments 2 pubescent, 2 glabrous. Fl. Aug, fr. Sep.

• Amidst grass in shrubbery; ca. 3900 m. W Sichuan.

21. *Pedicularis pseudoingens* Bonati, Notes Roy. Bot. Gard. Edinburgh 8: 135. 1913.

假硕大马先蒿 jia shuo da ma xian hao

Herbs perennial, drying black. Stems to 1 m tall, erect, hollow, glabrescent, striate. Basal leaves small, scalelike; stem leaves linear, base hastate; segments more than 50 pairs, glabrous, margin incised-double dentate. Inflorescences to 30 cm, lax basally; bracts leaflike. Calyx to 1.3 cm, glabrous; lobes 5, triangular-lanceolate, to 5 mm, distinctly serrulate. Corolla yellowish green; tube 1.2–1.5 cm, glabrous; galea falcate apically, inconspicuously navicular, margin long bearded; lower lip ca. 9 mm × 1 cm. Filaments 2 pubescent, 2 glabrous. Capsule obliquely ellipsoid-ovoid, slightly compressed, ca. 1.6 cm × 6.5 mm, rarely exceeding calyx, long apiculate. Fl. Jul–Aug, fr. Sep.

• Scrubs, grassy slopes; 3000–4300 m. NW Yunnan.

22. *Pedicularis trichocymba* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 72. 1949.

毛舟马先蒿 mao zhou ma xian hao

Herbs perennial. Stems to 60 cm tall, erect, sturdy, unbranched, glabrous, striate, leafy throughout. Leaves sessile, linear-lanceolate, 6.5–7.5 cm × 7–10 mm, glabrous, base auriculate, margin incised-dentate. Inflorescences racemose, ca. 15 cm, interrupted basally; bracts leaflike, exceeding flowers. Pedicel 1–1.5 mm. Calyx 8–10 mm, glabrous; lobes 5, equal. Corolla yellow, 2.4–2.6 cm; tube erect, ca. 2 × as long as calyx; galea curved apically, inconspicuously navicular, 8–10 mm; beak scarcely 2 mm; lower lip ca. as long as galea. Filaments 2 pubescent, 2 glabrous. Fl. May–Jun, fr. Jul.

• 2700–4700 m. W Sichuan.

23. *Pedicularis tongolensis* Franchet, Bull. Soc. Bot. France 47: 29. 1900.

东俄洛马先蒿 dong e luo ma xian hao

Herbs perennial. Stems 30–60 cm tall, erect, unbranched, long pubescent, leafy throughout. Leaves sessile, lanceolate-linear, 5–7 cm; lobes densely incised. Inflorescences spicate, more than 15 cm, loose. Calyx membranous, sparsely pubescent; lobes 5, ovate-lanceolate, ca. 3 × shorter than tube, long ciliate, entire. Corolla yellow; tube ca. 2 × longer than calyx; galea curved, inconspicuously navicular, margin densely red pubescent; beak curved; lower lip scarcely shorter than galea. Filaments glabrous.

• W Sichuan.

24. *Pedicularis craspedotricha* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 564. 1888.

缘毛马先蒿 yuan mao ma xian hao

Herbs perennial. Stems erect or ascending, to 26 cm tall, glabrous except for 2 lines of hairs, striate. Basal leaves scalelike; stem leaves ± clasping, sessile, linear-lanceolate, to 3 cm × 4.5 mm, crenate-double dentate. Inflorescences capitate or loosely racemose, 2–10-flowered; bracts leaflike. Pedicel 0.5–1.5 cm. Calyx ca. 7 mm; lobes 5, triangular, entire, ca. 1/2 as long as tube. Corolla rose; tube scarcely longer than calyx; galea inconspicuously navicular, bearded along margin; beak

slender, erose apically; lower lip shorter than galea.
Filaments glabrous.

• Alpine meadows, forests; 3400–4500 m. Gansu, NW Sichuan.

9. Ser. Imbricatae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 244. 1995.

覆瓦系 fu wa xi

Herbs usually 30 cm to 1 m tall, drying black. Stems erect, rarely branched. Leaves alternate, mostly on stem, sessile, linear to linear-oblong, pinnatifid. Inflorescences racemose. Corolla galea crescent-shaped, less than 3 mm wide, sparsely pubescent; beak distinct.

Four species: China, Bhutan, India, Nepal, and Sikkim; one species in China.

25. Pedicularis clarkei J. D. Hooker, Fl. Brit. India 4: 310. 1884.

克氏马先蒿 ke shi ma xian hao

Herbs perennial, hirtellous. Rhizomes fleshy. Stems to 50–80 cm tall, rigid, hollow, unbranched, striate. Basal leaves withering early; stem leaves clasping, linear-oblong, 4–6 cm × 7.5–12.5 mm, base auriform; segments 15–25 pairs, ovate-oblong, incised-dentate. Inflorescences rigid, dense; bracts leaflike. Pedicel 2–3

mm. Calyx ca. 1.5 cm, pubescent, 5-lobed. Corolla purple; tube 1.6–1.8 cm; beak of galea ca. 5 mm, less than 3 mm wide, sparsely pubescent, apex 2-lobed; lower lip ciliate. Filaments glabrous. Capsule ovoid, ca. 1.6 cm, apiculate. Fl. Jul–Sep, fr. Aug–Sep. $2n = 16$.

Among dwarf scrubs, steep banks below cliffs; 3700–4500 m. S Xizang [Bhutan, India, Nepal, Sikkim].

10. Ser. Trichoglossae H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 8. 1949.

毛盔系 mao kui xi

Herbs usually less than 30 cm tall, drying black. Stems erect, unbranched. Stem leaves alternate, lanceolate-linear to lanceolate-oblong, pinnatifid to pinnatisect. Inflorescences capitate to racemose. Corolla purple-red or blackish purple, large; tube shorter or slightly longer than calyx; galea strongly curved, 4–5 mm wide, densely long pubescent at margin and back; beak cylindrical, long, bent downward.

Two species: SW China, Bhutan, India, N Myanmar, Nepal, Sikkim; both species in China.

1a. Leaves 2–7 × 0.3–1.5 cm, with 20–25 pairs of segments; corolla tube bent basally, beak of galea very long,

lower lip glabrous 26. *P. trichoglossa*

1b. Leaves ca. 4.8 × 2 cm, with 8–12 pairs of segments; corolla tube erect, bent slightly apically, beak of galea

shorter, lower lip ciliate 27. *P. rhodotricha*

26. Pedicularis trichoglossa J. D. Hooker, Fl. Brit. India 4: 310. 1884.

毛盔马先蒿 mao kui ma xian hao

Herbs perennial, 13–60 cm tall. Stems with 2 lines of hairs, striate. Leaves clasping, sessile, linear-lanceolate, 2–7 cm × 3–15 mm, pinnatifid to pinnatipartite; segments 20–25 pairs, subglabrous except for pubescent midvein, margin double dentate.

Inflorescences racemose, 6–18 cm; axis densely pubescent; bracts linear, inconspicuous, densely pubescent. Pedicel to 3 mm, pubescent. Calyx 1.2–1.6 cm, densely blackish purple villous, 5-lobed; tube 8–10 mm. Corolla blackish purple; tube bent basally; galea densely long pubescent apically, with purple-red hairs; beak slender, incurved, glabrous; lower lip glabrous; lobes broadly rounded. Capsule broadly ovoid, 1.2–1.5 cm × ca. 9 mm, slightly exceeding calyx. Fl. Jul–Aug, fr. Aug–Sep.

Open stony meadows in forests, amidst boulder screes; 3500–5000 m. Qinghai, W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, India (Uttar Pradesh), N Myanmar, Nepal, Sikkim].

27. Pedicularis rhodotricha Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 566. 1888.

红毛马先蒿 hong mao ma xian hao

Pedicularis ramalana Britten.

Herbs perennial, 8–35 cm tall. Stems with 2 lines of hairs. Leaves short petiolate or ± clasping; leaf blade linear-lanceolate, to 4.8 × 2 cm, subglabrous, pinnatipartite to pinnatisect; segments 8–12 pairs, oblong to ovate, margin double dentate. Inflorescences capitate to racemose, to 7 cm, usually dense; bracts leaflike. Calyx purplish red, to 1 cm; lobes 5, triangular-ovate, ciliate. Corolla purple red; tube erect, slightly bent apically, ca. as long as calyx; galea 1/2 moon-shaped, densely long pubescent apically, with pale red hairs; beak bent downward only, 4–5 mm; lower lip ciliate. Fl. Jun–Aug, fr. Aug–Sep.

• Stony alpine meadows, screes; 2600–4000 m. W Sichuan, NW Yunnan.

11. Ser. Lasiophrydes H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 8. 1949.

毛颞系 mao ke xi

Herbs low or medium sized, drying black. Stems erect, usually unbranched. Leaves on stem or basal, alternate, lanceolate-linear, pinnatilobate. Inflorescences capitate to spicate, often few flowered. Corolla tube less than 2 × as long as calyx; galea bent at middle, margin densely pubescent; beak horizontal, ± straight, nearly as long as lower lip; lower lip 3-parted nearly to base, lobes stipitate basally.

• Two species: endemic to China.

1a. Corolla yellow, galea pubescent abaxially at apex, except on beak 28. *P. lasiophrys*

1b. Corolla whitish rose, galea glabrous abaxially 29. *P. cinerascens*

28. *Pedicularis lasiophrys* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 68. 1877.

毛须马先蒿 mao ke ma xian hao

Herbs perennial. Stems usually unbranched, with 2 lines of hairs, striate. Leaves mostly basal, sometimes pseudo-rosulate, short petiolate or sessile to ± clasping; leaf blade lanceolate-linear, to 4 × 1.1 cm, abaxially brown pubescent, adaxially whitish pilosulous when young, crenate-pinnatifid, dentate. Inflorescences capitate to short racemose; bracts leaflike, densely brown glandular pubescent. Calyx 6–8 mm, tomentose, 5-lobed. Corolla yellow; tube slightly longer than calyx, glabrous or pubescent; galea densely yellow pubescent except for glabrous beak; lower lip deeply 3-parted to base. Filaments glabrous. Capsule to 1 cm × 5 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows, *Picea* forests; 2900–5000 m. Gansu, Qinghai, N Sichuan.

1a. Corolla tube glabrous, lower lip glabrous 28a. var. *lasiophrys*

1b. Corolla tube pubescent, lower lip ciliate 28b. var. *sinica*

28a. *Pedicularis lasiophrys* var. *lasiophrys*

毛须马先蒿(原变种) mao ke ma xian hao (yuan bian zhong)

Corolla tube glabrous; lower lip glabrous.

• Alpine meadows, *Picea* forests; 3700–5000 m. Gansu, Qinghai.

28b. *Pedicularis lasiophrys* var. *sinica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 564. 1888.

毛被毛须马先蒿 mao bei mao ke ma xian hao

Corolla tube pubescent; lower lip ciliate.

• Alpine meadows; ca. 2900 m. E Gansu, N Sichuan.

29. *Pedicularis cinerascens* Franchet, Bull. Soc. Bot. France 47: 30. 1900.

灰色马先蒿 hui se ma xian hao

Herbs perennial, 10–28 cm tall. Stems grayish brown pubescent, striate. Leaves short petiolate to sessile or ± clasping; leaf blade narrowly lanceolate, to 4.5 × 1 cm; leaves dense and small basally, abaxially glabrous, adaxially pubescent, crenate-pinnatilobate to pinnatipartite; segments double dentate. Inflorescences capitate to laxly racemose, to 14 cm, with more than 20 flowers; bracts ovate-oblong, densely tomentose. Calyx to 1 cm, pubescent, 5-lobed. Corolla whitish rose; tube ca. 1.2 cm, glabrous; galea glabrous except for long-bearded margin, with purple hairs; lower lip deeply 3-parted nearly to base. Filaments glabrous. Capsule ca. 1.3 cm × 5 mm. Fl. Jul, fr. Jul–Aug.

• Grassy slopes; 4000–4400 m. W Sichuan.

12. Ser. *Kongboenses* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 245. 1995.

宫布系 gong bu xi

Herbs usually more than 30 cm to 1 m tall, drying black. Stems erect, stout. Leaves alternate, sessile, linear or linear-lanceolate, pinnatilobate. Inflorescences spicate. Corolla small; tube slightly longer than calyx; galea very narrow, slightly curved, marginally pubescent; beak bent upward, relatively long, slender; lobes of lower lip narrowly lanceolate.

• Two species: endemic to China.

1a. Calyx 10–13 mm; corolla tube 11–15 mm; beak of galea 7–8 mm, bent upward 30. *P. kongboensis*

1b. Calyx 8–10 mm; corolla tube ca. 9 mm; beak of galea shorter, bent slightly upward 31. *P. retingensis*

30. *Pedicularis kongboensis* P. C. Tsoong, Acta Phytotax. Sin. 3: 304. 1955.

宫布马先蒿 gong bu ma xian hao

Herbs perennial, pubescent. Stems 30–110 cm tall, branched or not. Leaves linear or linear-lanceolate, 3–12 cm × 2.5–13 mm; segments ca. 30 pairs, ovate, margin double dentate. Inflorescences 10–50 cm, often

interrupted basally, pubescent. Calyx 1–1.3 cm, pubescent; lobes 5, triangular, ± entire. Corolla tube 1.1–1.5 cm, glabrous; galea margin densely long pubescent; beak 7–8 mm; lower lip shorter than galea, 1–1.3 cm × ca. 8 mm, ciliate. Filaments 2 pubescent, 2 glabrous. Fl. Jul, fr. Aug.

• Grasslands at hilltops, open very steep hillsides; ca. 4100 m. SE Xizang.

- 1a. Calyx tube with conspicuous reticulate veins; lobes of lower corolla lip narrow
 - 1b. Calyx tube without conspicuous reticulate veins; lobes of lower corolla lip slightly wide and obtuse
- 30b. var. *obtusata*

30a. Pedicularis kongboensis var. **kongboensis**

宫布马先蒿(原变种) gong bu ma xian hao (yuan bian zhong)

Calyx tube with conspicuous reticulate veins. Lobes of lower corolla lip narrow.

• Grasslands at hilltops, open very steep hillsides; ca. 4100 m. SE Xizang.

30b. Pedicularis kongboensis var. **obtusata** P. C. Tsoong, Acta Phytotax. Sin. 3: 305. 1955.

钝裂宫布马先蒿 dun lie gong bu ma xian hao

Calyx tube without conspicuous reticulate veins. Lobes of lower corolla lip slightly wide and obtuse.

31. Pedicularis retingensis P. C. Tsoong, Acta Phytotax. Sin. 3: 305. 1955.

雷丁马先蒿 lei ding ma xian hao

Herbs perennial. Stems 30–80 cm tall, unbranched, hirsute. Leaves clasping, linear or linear-lanceolate, 5–8 cm × 5–8 mm, base truncate or cordate, subglabrous; segments ca. 30 pairs, triangular-ovate to ovate, margin incised-dentate. Inflorescences 10–30 cm; bracts leaflike, longer than flowers. Calyx 8–10 mm, glabrous; lobes 5, triangular or triangular-lanceolate, entire.

Corolla tube ca. 9 mm, glabrous; galea margin densely long pubescent; lower lip shorter than galea, ca. 1 cm × 8 mm. Filaments 2 pubescent, 2 glabrous. Fl. Jul–Aug, fr. Aug–Sep.

• Dry stony hillsides, amidst boulder screes; ca. 4100 m. SC Xizang.

13. Ser. Subsurrectae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 80. 1890.

亚举喙系 ya ju hui xi

Herbs tall, not drying black. Stems branched apically or unbranched. Stem leaves alternate, long petiolate, ovate-lanceolate, large, pinnatifid to pinnatisect; rachis winged; segments remote. Inflorescences long racemose, lax. Corolla small; galea inflated-convex, 3–4 × longer than lower lip, beak curved upward.

One species: China, N Myanmar.

32. Pedicularis vialii Franchet ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 219. 1890.

维氏马先蒿 wei shi ma xian hao

Stems to 80 cm tall, ascending, subglabrous. Leaf petiole 2–5 cm, slender, pilose; leaf blade lanceolate-oblong, to 10 × 6 cm, pilose, pinnatisect; segments lanceolate-oblong, dentate. Inflorescences elongating in fruit, to 30 cm, interrupted basally; bracts linear, distal ones shorter than calyx. Calyx 5–6 mm, glabrous; lobes

5, triangular, entire. Corolla whitish, with rose to purple galea, ca. 1 cm; beak of galea ca. 5 mm, slender, curved upward; lower lip ca. 5 mm, not spreading. Filaments glabrous. Capsule lanceolate, ca. 11 × 4.5 mm. Fl. May–Aug, fr. Jul–Sep.

Grassy slopes, coniferous forests; 2700–4300 m. W Sichuan, SE Xizang, NW Yunnan [N Myanmar].

14. Ser. Excelsae Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 523. 1888.

卓越系 zhuo yue xi

Herbs tall, not drying black. Stems branched. Leaves alternate, ± ovate, large, usually more than 3.5 cm wide, 3-pinnatifid to pinnatisect. Inflorescences long racemose. Calyx deeply cleft anteriorly. Corolla small; galea with a widened anther case, margin long bearded; beak semicircular, sinistrorse, slender.

• Two species: Bhutan, China, Nepal, Sikkim; one species in China.

33. Pedicularis excelsa J. D. Hooker, Fl. Brit. India 4: 311. 1884.

卓越马先蒿 zhuo yue ma xian hao

Herbs perennial, 0.9–1.6 m tall. Stems hollow, striate. Leaves withering early basally; petiole 2–6 cm; leaf blade ovate, to 16 × 10 cm, 3-pinnatifid to pinnatisect; segments ovate-lanceolate, margin incised-dentate, apex acute. Inflorescences 6–20 cm; bracts leaflike, ca. 9 mm, shorter than flowers. Pedicel short. Calyx ca. 5 mm; lobes 5, obtuse triangular, less than 1 mm, margin

entire. Corolla tube slightly exceeding calyx; beak of galea ca. 1 cm; lower lip ca. 1.8 cm, ciliate. Filaments glabrous. Capsule ovoid-oblong, ca. 4 × as long as calyx, apex obtuse. Fl. Aug, fr. Aug–Sep.

Deep wet humus in shade of broad-leaved forests in lower temperate zone, swamps, dense *Rhododendron* and *Abies* forests; 3200–3600 m. S Xizang [Bhutan, C Nepal, Sikkim].

15. Ser. Kialenses H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 9. 1949.

甲拉系 jia la xi

Herbs medium sized, less than 30 cm tall. Stems often many together, erect, unbranched. Leaves alternate, mostly basal, long petiolate, linear to lanceolate or lanceolate-ovate, pinnatipartite to pinnatisect. Inflorescences racemose, lax. Calyx cylindrical; lobes 3 or 5, unequal. Corolla tube slightly longer than calyx; galea strongly twisted; beak S-shaped, longer than lower lip, slender; galea margin and beak long villous or glabrous; lobes of lower lip short and wide, ± square.

• Two species: endemic to China.

- 1a. Galea margin bearded; leaf blade pinnatisect; calyx ca. 8 mm, pubescent, 5-lobed 34. *P. kialensis*
- 1b. Galea margin not bearded; leaf blade pinnatifid; calyx ca. 11 mm, sparsely pubescent or subglabrous, 3-lobed 35. *P. streptorhyncha*

34. *Pedicularis kialensis* Franchet, Bull. Soc. Bot. France 47: 22. 1900.

甲拉马先蒿 jia la ma xian hao

Herbs perennial, to 20 cm tall. Roots slender. Stems often many together, slightly pubescent. Leaves alternate; petiole to 6 cm; leaf blade lanceolate, 14–20 cm, pinnatisect; segments 8–16 pairs, ovate-lanceolate to lanceolate, incised-dentate. Inflorescences interrupted, pubescent; bracts leaflike. Pedicel to 3 mm. Calyx cylindrical, ca. 8 mm, deeply cleft anteriorly, pubescent, 5-lobed. Corolla red; tube slightly longer than calyx, glabrous; galea purple, margin bearded; beak bent upward apically, ca. 1 cm; lower lip ciliate. Filaments 2 pubescent, 2 glabrous. Capsule triangular-lanceolate, ca. 1.5 cm. Fl. Jun–Jul, fr. Sep.

• Banks, forests; 3000–4900 m. S Sichuan.

35. *Pedicularis streptorhyncha* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 397. 1963.

扭喙马先蒿 niu hui ma xian hao

Herbs perennial, 15–30 cm tall, drying black. Rootstock to 30 cm, ± fleshy. Stems 1 to several and clustered, slightly pubescent. Basal leaf petiole to 5.5 cm; leaf blade linear-lanceolate, 2.5–18 × 0.3–2 cm, pinnatilobate; segments 9–28 pairs, triangular-ovate, glabrous except adaxially hispidulous along midvein, margin double dentate. Stem leaves few or absent. Inflorescences to 20 cm; bracts leaflike. Calyx cylindrical, ca. 1.1 cm, sparsely pubescent or subglabrous, deeply cleft anteriorly, 3-lobed; posterior lobe smaller, subulate, entire, others larger and serrate. Corolla tube 1.3–1.5 cm, subglabrous; galea margin glabrous; beak to 1.7 cm; lower lip to 1.8 × 2.3 cm. Filaments 2 pubescent, 2 glabrous. Capsule triangular-lanceolate, to 2 cm. Fl. Jul–Aug. fr. Aug.

• Alpine *Quercus* scrubs, mossy *Rhododendron* scrubs; 3900–4000 m. NW Sichuan.

16. Ser. *Striatae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 81. 1877.

红纹系 hong wen xi

Herbs low or tall, drying black or slightly black. Stems erect or ascending, unbranched above. Leaves alternate; basal leaves often numerous, but withering early. Inflorescences racemose or spicate. Flowers medium sized. Corolla tube ± straight; galea 2-toothed near apex, beakless; lower lip erect or slightly spreading.

Four species: North America, NE Asia; two species in China.

1a. Inflorescences dense, long; bracts small, ± entire; calyx lobes ovate-triangular, ± entire; corolla yellow with

reddish purple stripes 36. *P. striata*

1b. Inflorescences lax, shorter; bracts longer, leaflike; calyx lobes leaflike; corolla yellow, not reddish purple

striped 37. *P. mandshurica*

36. *Pedicularis striata* Pallas, Reise Russ. Reich. 3: 737. 1776.

红纹马先蒿 hong wen ma xian hao

Herbs perennial, to 1 m tall. Roots stout. Stems erect, branched basally or unbranched, becoming woody when old, initially tomentose, glabrescent. Basal leaves in a rosette; stem leaves many; petiole 1–10 cm; leaf blade lanceolate, to 10 × 3–4 cm, pinnatipartite to pinnatisect; segments linear, serrulate. Inflorescences dense, spicate, 6–22 cm; rachis densely pubescent;

bracts shorter than flowers, glabrous or ciliate, ± entire. Calyx 1–1.3 cm, sparsely pubescent; lobes 5, unequal, ovate-triangular, ± entire. Corolla yellow with reddish purple stripes, 2.5–3.3 cm; galea falcate, with a distinct tooth on one side of margin; lower lip slightly shorter than galea. Filaments 2 pubescent, 2 glabrous. Capsule ovoid, 0.9–1.6 cm × 3–6 mm, apex mucronulate. Fl. Jun–Jul, fr. Jul–Aug.

Grassy slopes, *Betula* forests, meadows; 1300–2700 m. S Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi [Mongolia, Russia (Siberia, Far East)].

- 1a. Rachis of inflorescences, bracts, and calyx not arachnoid-lanate 36a. subsp. *striata*
1b. Rachis of inflorescences, bracts, and calyx arachnoid-lanate 36b. subsp. *arachnoidea*

36a. *Pedicularis striata* subsp. *striata*

红纹马先蒿(原亚种) hong wen ma xian hao (yuan ya zhong)

Rachis of inflorescences, bracts, and calyx not arachnoid-lanate.

Grassy slopes, *Betula* forests, meadows; 300–2700 m. Hebei, Liaoning, Ningxia, Shaanxi, Shanxi [Mongolia, Russia (Siberia, Far East)].

36b. *Pedicularis striata* subsp. *arachnoidea* (Franchet) P. C. Tsong, Fl. Reipubl. Popularis Sin. 68: 65. 1963.

蛛丝红纹马先蒿 zhu si hong wen ma xian hao
Pedicularis striata var. *arachnoidea* Franchet, Nouv. Arch. Mus. Hist. Nat., Sér. 2, 6: 106. 1883; *P. striata* var. *poliocalyx* Diels.

Rachis of inflorescences, bracts, and calyx arachnoid-lanate.

• S Gansu, Nei Mongol, W Ningxia.

37. *Pedicularis mandshurica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 79. 1877.

鸡冠子花马先蒿 ji guan zi hua ma xian hao

Herbs perennial, 25–35 cm, drying black. Roots fleshy. Stems erect or ascending, hollow, unbranched, sparsely pubescent, glabrescent when old. Basal leaves numerous; petiole to 6.5 cm; leaf blade ovate-lanceolate to lanceolate, ca. 12 × 2.5–3.5 cm, pinnatipartite to pinnatisect; segments linear-lanceolate, margin double dentate to pinnatipartite or dentate. Inflorescences racemose, lax; rachis densely pubescent; bracts leaflike, white tomentose, proximal ones much longer than flowers. Calyx 1.1–1.5 cm, initially tomentose, later glabrescent; lobes 5, leaflike, unequal. Corolla yellow, 2.2–3 cm; galea falcate, beaklike apically, 2-toothed and inconspicuously denticulate; lower lip ca. as long as galea, ciliate. Filaments 2 pubescent, 2 glabrous. Capsule cylindric-lanceolate, 1.2–1.8 cm. Fl. May–Jul, fr. Jul–Aug.

Dry grassy slopes, moist places; ca. 1000 m. Hebei, C and SE Liaoning [Korea].

17. Ser. Proboscideae Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 65. 1877.

鼻喙系 bi hui xi

Herbs tall, not drying black. Stems erect, unbranched. Leaves alternate, ± lanceolate, pectinate-pinnatisect; segments linear-lanceolate. Inflorescences long. Calyx lobes short, entire. Corolla tube less than 2 × as long as calyx; galea ± navicular, margin bearded or not; beak short.

Two species: China, Kazakstan, Mongolia, Russia (W Siberia); one species in China.

38. *Pedicularis proboscidea* Steven, Mém. Soc. Imp. Naturalistes Moscou 6: 33. 1823.

鼻喙马先蒿 bi hui ma xian hao

Herbs perennial, 45–80 cm, glabrous except for arachnoid-lanate rachis and bracts of inflorescences. Roots short, fibrous. Stems erect, stout. Basal leaves long petiolate, lanceolate, longer than petiole, pinnatisect; segments linear-lanceolate, pinnatipartite, serrulate. Inflorescences to 20 cm, dense; bracts linear.

Calyx ovate, 5–6 mm, deeply cleft anteriorly; lobes 5, triangular-lanceolate. Corolla yellow, 1.6–1.7 cm; galea margin long bearded; beak straight; lower lip ca. 9 mm × 1.5 cm. 2 filaments glabrous, 2 pubescent. Capsule obliquely ovoid, 9–10 mm. Fl. Jun–Jul, fr. Jul–Aug. $2n = 16$.

Alpine and subalpine meadows. Xinjiang [Kazakstan, Mongolia, Russia (W Siberia)].

18. Ser. Lachnoglossae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 81. 1890.

绒舌系 rong she xi

Herbs drying black. Stems erect, unbranched. Leaves mostly basal, pinnatisect with lanceolate segments; stem leaves few, alternate, pinnatisect, segments linear. Inflorescences elongated, ± lax basally. Corolla tube less than 2 × as long as calyx; galea pubescent abaxially and at margin; beak well developed, straight, nearly as long as lower lip, slender, with a tuft of hairs at apex.

One species: Bhutan, China, E Nepal, Sikkim.

39. *Pedicularis lachnoglossa* J. D. Hooker, Fl. Brit. India 4: 311. 1884.

绒舌马先蒿 rong she ma xian hao

Pedicularis lachnoglossa var. *macrantha* Bonati; *P. macrantha* (Bonati) H. Léveillé.

Herbs perennial, 20–50 cm tall. Stems usually 2–5, sometimes to 8, brown pubescent, base with petiolar

remnants from preceding years. Leaves clustered at base; petiole 3.5–8 cm; leaf blade lanceolate-linear, to 16 × 1–2.6 cm, pinnatisect; segments 20–40 pairs, lanceolate, pinnatipartite or double dentate. Inflorescences racemose, to 20 cm, usually interrupted; bracts linear, shorter than flowers. Pedicel short. Calyx cylindric-oblong, ca. 1 cm, cleft more deeply anteriorly; lobes 5, ± entire. Corolla purple-rose, ca. 1.6 cm; galea

densely red-brown pubescent abaxially and at margin; beak ca. 4 mm; lower lip densely red-brown ciliate. Filaments glabrous. Capsule long ovoid, to 1.4 cm × 6 mm. Fl. Jun–Jul, fr. Aug.

Alpine meadows, *Abies* forests, among small shrubs on hillsides; 2500–5400 m. W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, E Nepal, Sikkim].

19. *Ser. Recurvae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 9. 1949.

反曲系 fan qu xi

Herbs medium sized, not drying black. Stems erect or ascending, unbranched. Leaves alternate, long petiolate basally; leaf blades lanceolate-oblong. Inflorescences racemose or spicate. Calyx lobes entire, triangular, ciliate. Corolla red to purple-red; tube barely exceeding calyx; galea strongly bent or falcate, densely villous at base and at margin; beak well developed, bent upward, long; lower lip narrow.

• Three species: endemic to China.

1a. Leaves glabrous; distal bracts linear-lanceolate; calyx ca. 2.5 mm 40. *P. recurva*

1b. Leaves densely pubescent abaxially; distal bracts ovate; calyx 3–6 mm.

2a. Leaf petiole ca. 8 cm; leaf blade 2–7 × ca. 3 cm; calyx ca. 3 mm; lobes of lower corolla lip obtuse at apex

..... 41. *P. kangtingensis*

2b. Leaf petiole ca. 12 cm; leaf blade to 13 × 5.5 cm; calyx ca. 6 mm; lobes of lower corolla lip acute at apex

..... 42. *P. angustilabris*

40. *Pedicularis recurva* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 563. 1888.

反曲马先蒿 fan qu ma xian hao

Herbs perennial. Roots clustered, fibrous. Stems ascending, 38–80 cm tall, glabrous and purple tinted basally. Basal leaves withering early. Stem leaves alternate; petiole to 5 cm, distal ones shorter; leaf blade oblong-lanceolate, 3.5–8 × ca. 3 cm, glabrous, pinnatisect; segments 9–11 pairs, ovate to lanceolate, lobulate or double dentate. Inflorescences 5–27 cm, lax; bracts linear-lanceolate, ciliate. Calyx ca. 2.5 × 2 mm, slightly cleft anteriorly; lobes 5, triangular, ± equal, densely ciliate, entire. Corolla pale red; tube ca. 3.5 mm, exceeding calyx; galea strongly bent, apex with several dark purple spots; lobes of lower lip unequal, apex ± acute. Capsule ovoid, ca. 9 × 6.5 mm. Fl. Aug, fr. Aug–Sep.

• Boulders, rock walls; 3300–3400 m. SW Gansu, W Sichuan.

41. *Pedicularis kangtingensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 398. 1963.

康定马先蒿 kang ding ma xian hao

Herbs perennial, 19–39 cm tall. Stems single or sometimes several together, erect, straw colored, tinted with purple to dark purple, glabrous basally. Petiole to 8 cm basally; leaf blade lanceolate-oblong, 2–7 × ca. 3 cm, abaxially densely pale yellow pubescent, pinnatipartite to pinnatisect; segments pinnatipartite or

incised-dentate. Inflorescences racemose, 5.5–11 cm, lax; bracts becoming narrowly ovate upward, margin white villous. Calyx purple-red, ca. 3 mm; lobes 5, triangular, ciliate, entire. Corolla purple-red; tube ca. 3 mm; galea strongly bent, apex with several dark purple spots; lobes of lower lip obtuse at apex. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; ca. 3600 m. W Sichuan.

42. *Pedicularis angustilabris* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 82. 1949.

狭唇马先蒿 xia chun ma xian hao

Herbs perennial, 60–70 cm tall. Stems usually several together, glabrous basally. Leaves alternate; petiole ca. 12 cm, distal ones shorter, glabrous; leaf blade oblong to oblong-lanceolate, to 13 × 5.5 cm, abaxially densely pubescent, apex acute, pinnatisect; segments 15–18 pairs, linear-lanceolate to oblong-lanceolate, pinnatifid, dentate. Inflorescences spicate, to 18 cm, ± lax, many flowered; bracts ca. 6 mm, ovate, apex acute. Calyx cylindrical-ovate, ca. 6 mm, slightly cleft anteriorly; lobes 5, triangular, ± equal, densely ciliate. Corolla purple-red, ca. 1.5 cm; tube barely exceeding calyx, glabrous; galea strongly bent, apex with several dark purple spots; lobes of lower lip acute at apex. Fl. Jul, fr. Aug–Sep.

• Alpine meadows; 3000–4000 m. W Sichuan, NW Yunnan.

20. *Ser. Hirtellae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 89. 1890.

粗毛系 cu mao xi

Herbs reddish or reddish brown hirtellous, drying black. Stems single, unbranched. Basal leaves persistent; stem leaves alternate, short petiolate, less than 12 cm, pinnatifid. Inflorescences spicate. Corolla tube straight, erect; galea pubescent abaxially, 2-toothed at apex; lower lip not spreading.

• One species: endemic to China.

43. *Pedicularis hirtella* Franchet ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 209. 1890.

粗毛马先蒿 cu mao ma xian hao

Herbs biennial, 20–50 cm tall, reddish brown hirtellous, sometimes glandular pubescent. Stems erect, rigid, unbranched, with 1 or 2 lines of dense glandular hairs. Basal leaves large; petiole 4–10 mm; leaf blade ovate-oblong to lanceolate-oblong, to 5 × 2–2.5 cm, abaxially densely long pubescent along veins, adaxially long pubescent; segments 9–15 pairs, ovate to ovate-lanceolate, dentate. Stem leaves smaller than basal

leaves, ± sessile. Inflorescences spicate, 7–14 cm, often interrupted basally; bracts leaflike. Calyx cylindric, ca. 1 cm, glandular pubescent; lobes 5, linear-oblong, ± equal. Corolla white to rose, to 3 cm, glandular pubescent; tube ca. 2 × as long as calyx; galea ca. 1–1.1 cm, falcate, distinctly subulate-dentate at apex; lower lip shorter than galea, lobes rounded, ± equal, ciliate. Filaments glabrous. Fl. Aug–Sep, fr. Sep–Oct.

• Open stony pastures, thickets; 2800–3700 m. NW Yunnan.

21. Ser. *Salviiflorae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 97. 1890.

丹参花系 dan shen hua xi

Herbs tall. Roots glabrous. Stems many branched; branches and leaves opposite. Leaves ± ovate, pinnatifid to pinnatisect. Inflorescences racemose, lax. Corolla 3–3.5 cm; galea falcate or slightly falcate, beakless, toothless; lower lip ca. as long as galea.

• One species: endemic to China.

44. *Pedicularis salviiflora* Franchet ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 215. 1890.

丹参花马先蒿 dan shen hua ma xian hao

Herbs perennial, to 1.3 m tall, not drying black. Stems erect, often woody basally; branches spreading, slender, often somewhat repent, pubescent. Petiole to 1.5 cm; leaf blade ovate to oblong-lanceolate, to 7 × 3.5 cm, densely pubescent, pinnatifid to pinnatisect; segments 10–14 pairs, ovate-lanceolate to oblong, serrate. Inflorescences to 25 cm. Pedicel slender, pubescent. Calyx 1–1.5 cm, cleft anteriorly to 2/5 length, densely glandular pubescent; lobes 5, ± equal, serrate. Corolla rose to red, 3.3–5 cm, sparsely pubescent; tube 1.4–2.4 cm; galea ca. as long as lower lip, falcate, villous near apex; lower lip 1.5–2 cm, lobes rounded. Filaments glabrous. Capsule ovoid, 1.2–1.5

cm, densely pubescent or glabrous, apiculate. Fl. Aug–Sep, fr. Oct–Nov.

• Grassy slopes, forests; 2000–3900 m. Sichuan, NW Yunnan.

1a. Capsule densely pubescent 44a. var. *salviiflora*

1b. Capsule glabrous 44b. var. *leiocarpa*

44a. *Pedicularis salviiflora* var. *salviiflora*

丹参花马先蒿(原变种) dan shen hua ma xian hao
(yuan bian zhong)

Capsule densely pubescent.

• Grassy slopes, forests; 2000–3900 m. W Sichuan, NW Yunnan.

44b. *Pedicularis salviiflora* var. *leiocarpa* H. P. Yang, Acta Phytotax. Sin. 28: 136. 1990.

滑果丹参马先蒿 hua guo dan shen ma xian hao

Capsule glabrous.

• *Picea asperata* forests, slopes; ca. 3300 m. Sichuan.

22. Ser. *Melampyriflorae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 86. 1890.

山萝花系 shan luo hua xi

Herbs annual, robust. Stems rigid, erect, usually branched apically. Leaves whorled, pinnatisect. Inflorescences racemose. Calyx lobes 5, ± leaflike, serrate. Corolla tube slightly curved; galea with a very short beak at apex and 1 tooth on each side of margin.

• Three species: endemic to China.

1a. Corolla 2.1–2.6 cm; middle lobe of lower lip ovate 45. *P. floribunda*

1b. Corolla to 2.1 cm; middle lobe of lower lip rounded.

2a. Galea slightly bowed, ca. as long as tube, crested; corolla 1.8–2.1 cm; lower lip 9–11.5 mm wide;

filaments 2 pubescent 46. *P. pseudomelampyriflora*

2b. Galea straight, ca. 1/2 as long as tube, not crested; corolla ca. 1.6 cm; lower lip barely 7.5 mm wide; filaments glabrous 47. *P. melampyriflora*

45. *Pedicularis floribunda* Franchet, Bull. Soc. Bot. France 47: 31. 1900.

多花马先蒿 duo hua ma xian hao

Herbs annual, to 50–70 cm tall, not drying black. Stems branched apically, with 3 or 4 lines of hairs. Leaves in whorls of 3–6; petiole to 1.2 cm; leaf blade lanceolate-oblong, 2–5 × 0.8–1.5 cm, sparsely pubescent, pinnatisect; segments 10–18 pairs, ovate to lanceolate, pinnatipartite, incised-dentate. Inflorescences to 20 cm, lax; bracts leaflike. Pedicel 4–5 mm. Calyx 4.5–6.5 mm, densely villous along 5 veins; lobes 5, unequal, serrate. Corolla rose, 2.1–2.6 cm; tube 1.1–1.5 cm, ± straight in calyx; galea falcate, crested; lower lip 1.2–1.4 × 0.9–1.15 cm, middle lobe ovate, projecting. Filaments pubescent. Fl. Jul, fr. Aug–Sep.

• Rocky slopes; 2300–2700 m. W Sichuan.

46. *Pedicularis pseudomelampyriflora* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 155. 1926.

假山萝花马先蒿 jia shan luo hua ma xian hao

Herbs annual, to more than 60 cm tall, drying black. Stems single, ± woody when old, many branched apically; branches in whorls of 3 or 4, slender, with lines of hairs. Leaves in whorls of 3–6; petiole short; leaf blade ovate-oblong to lanceolate-oblong, 2.5–4.5 × ca. 1.5 cm, abaxially pubescent along midvein, pinnatipartite to pinnatisect; segments linear, serrate. Inflorescences with flowers in whorls in ± interrupted racemes; bracts leaflike, shorter than flowers, densely white villous. Pedicel short. Calyx ca. 4 mm, sparsely

villous; lobes 5, unequal, serrate. Corolla rose, 1.8–2.1 cm; tube nearly as long as galea, strongly curved in calyx; galea falcate, ca. as long as tube, crested; lower lip 0.9–1.2 × 0.9–1.2 cm, middle lobe rounded. Filaments 2 pubescent, 2 glabrous. Fl. Jun–Aug, fr. Sep–Oct.

• Open moist areas, thicket margins; 3000–3800 m. NW Sichuan, SE Xizang, NW Yunnan.

47. *Pedicularis melampyriflora* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 603. 1888.

山萝花马先蒿 shan luo hua ma xian hao

Herbs annual, to 1 m tall, drying black. Stems woody when old, many branched; branches in whorls of 3–6, with lines of hairs. Leaves in whorls of 3–6; petiole to 1.2 cm; leaf blade lanceolate-oblong, to 8 cm, pinnatisect; segments 7–11 pairs, lanceolate to narrowly lanceolate, abaxially subglabrous, adaxially sparsely pubescent, pinnatipartite or incised-double dentate. Inflorescences to 20 cm, lax, interrupted; bracts leaflike, longer than flowers or distal ones ca. as long as flowers. Pedicel ca. 3 mm. Calyx ca. 6 mm; lobes 5, unequal, pubescent. Corolla rose to purple, barely 1.6 cm; tube ca. 1 cm, strongly curved in calyx; galea straight, ca. 1/2 as long as tube, not crested; lower lip ca. 6 × 7.5 mm, middle lobe rounded. Filaments glabrous. Fl. Jul–Aug, fr. Sep–Oct.

• Slopes, open forests; 2700–3600 m. SW Sichuan, NW Yunnan.

23. Ser. *Longicaules* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 85. 1890.

长茎系 chang jing xi

Stems soft, long, ± diffuse, branches many, long, curved, whorled. Stem leaves in whorls of 3 or 4, pinnatisect or pinnatipartite. Flowers axillary or racemose. Calyx lobes 5, dentate. Corolla small; tube decurved in throat of calyx tube; galea beak distinct, shorter than anther-containing part of galea; middle lobe of lower lip smaller than lateral lobes, apex hoodlike, acute or acuminate.

• Two species: endemic to China.

1a. Corolla yellow, ca. 1.5 cm; beak of galea short, scarcely 1.5 mm 48. *P. dielsiana*

1b. Corolla purple-red, 1.8–2.2 cm; beak of galea 2.5–3.5 mm 49. *P. longicaulis*

48. *Pedicularis dielsiana* Bonati, Bull. Soc. Bot. France 54: 186. 1907.

第氏马先蒿 di shi ma xian hao

Herbs annual, to 90 cm tall, not drying black. Stems single, purplish black, rigid; branches in whorls of 4, slender, with 4 lines of hairs. Leaves often in whorls of 4; petiole ca. 5 mm; leaf blade oblong to ovate-oblong, 2–3.5 × 1–1.5 cm, abaxially subglabrous, adaxially sparsely pubescent, pinnatisect to pinnatipartite; segments linear to oblong, incised-double dentate. Pedicel short. Calyx 7–8 mm, glabrous; lobes 5,

unequal, posterior lobe triangular and ± entire; lateral lobes larger, ovate, serrate. Corolla yellow, ca. 1.5 cm; tube slightly longer than galea; galea falcate apically; beak 1–1.5 mm; lower lip ca. as long as galea, apex of middle lobe acuminate. Filaments glabrous. Fl. Aug, fr. Sep–Oct.

• Meadows, grassy slopes; 2000–2500 m. W Hubei, C Sichuan.

49. *Pedicularis longicaulis* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 577. 1888.

长茎马先蒿 chang jing ma xian hao

Herbs annual or perennial, to more than 1 m tall, drying black. Stems hollow, striate, with lines of hairs; branches in whorls of 3 or 4, soft, curved. Leaves opposite or in whorls of usually 3 or 4; petiole short, villous; leaf blade oblong-lanceolate, 2–4 × 1–2 cm, adaxially glandular pubescent, pinnatifid to pinnatisect; segments 10–14 pairs, linear, incised-double dentate, teeth callose. Inflorescences long racemose, terminal, to 20 cm, interrupted; bracts

24. Ser. Graciles Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 52. 1877, not Prain (1890).

纤细系 xian xi xi

Stems often rigid, woody; branches often in whorls of 4–6 and rigid. Leaves whorled or sometimes opposite. Calyx lobes 5, ovate. Corolla small; beak slightly falcate, slender. Capsule ca. 1/2 exceeding calyx or enclosed in accrescent calyx.

Five species: Afghanistan, Bhutan, China, India (Himachal Pradesh), Kashmir, Nepal, Pakistan, Sikkim; two species in China.

1a. Calyx ca. 3 mm; corolla tube ca. 6 mm, galea crested, middle lobe of lower lip hoodlike 50. *P. ramosissima*
1b. Calyx 5–7 mm; corolla tube 7–8 mm, galea not crested, middle lobe of lower lip not hoodlike 51. *P. gracilis*

50. Pedicularis ramosissima Bonati, Bull. Soc. Bot. France 55: 246. 1908.

多枝马先蒿 duo zhi ma xian hao

Herbs annual, to 50 cm tall, mostly branched; branches slender, opposite basally, in whorls of 3 apically. Leaf blade oblong-lanceolate, glabrous, pinnatisect; segments pinnatifid, margin double dentate. Flowers opposite or in whorls of 3, interrupted; bracts leaflike. Calyx ca. 3 mm, rounded, membranous; lobes 5, unequal. Corolla purple; tube ca. 6 mm; galea ± falcate, crested; beak bent downward, slightly bowed, ca. 4 mm; lower lip ca. 6 × 8 mm, middle lobe smaller than lateral lobes, ligulate, apex hoodlike. Filaments glabrous. Capsule enclosed by accrescent calyx, compressed, ovoid, ca. 9 × 6.5 mm, apex acuminate. Seeds ca. 2.2 mm. Fl. Aug.

• SW Sichuan.

51. Pedicularis gracilis Wallich ex Benth, Scroph. Ind. 52. 1835.

纤细马先蒿 xian xi ma xian hao

Herbs annual, more than 1 m tall, drying black. Stems with 3 or 4 lines of hairs, many branched; branches in whorls of 4–6. Basal leaves withering early; stem leaves in whorls of 3 or 4, ± sessile; leaf blade ovate-oblong, 2.5–3.5 × 1–1.5 cm, abaxially glabrescent, adaxially pubescent along midvein, pinnatisect; segments 6–9 pairs, oblong, incised-dentate. Inflorescences racemose, interrupted; bracts leaflike. Calyx cylindrical, 5–7 × 1–2 mm, pubescent along midvein; lobes 5, entire or serrate. Corolla purplish pink, 1.2–1.5 cm; tube straight, 7–8 mm; galea bent at a right angle apically, not crested; beak 4–5.5 mm; lower lip 7–10 mm wide, glabrous, middle lobe not hoodlike.

25. Ser. Coniferae Maximowicz ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 207. 1890.

结球系 jie qiu xi

leaflike. Pedicel short. Calyx 8–9 mm, villous; lobes 5, unequal, serrate. Corolla purple-red, 1.8–2.2 cm; tube ca. 7 mm, slightly curved in calyx; galea strongly bent at apex; beak straight, 2.5–3.5 mm; lower lip longer than galea, to 1.1–1.2 × ca. 1 cm, middle lobe lanceolate, apex acute. Filaments glabrous. Fl. Aug–Sep, fr. Sep–Oct.

• 3700–3900 m. N Yunnan.

Filaments glabrous. Capsule broadly ovoid, apiculate.

Fl. Aug–Sep, fr. Sep–Oct. $2n = 16$.

Alpine meadows on mountain slopes, grassy slopes; 2000–4000 m. W Sichuan, S Xizang, NW Yunnan [Afghanistan, Bhutan, India, Nepal, Pakistan, Sikkim].

1a. Calyx lobes entire 51a. subsp. *gracilis*

1b. Calyx lobes serrate.

2a. Capsule to 11 mm 51b. subsp. *macrocarpa*

2b. Capsule barely 8 mm 51c. subsp. *sinensis*

51a. Pedicularis gracilis subsp. *gracilis* (Wallich) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 78. 1963.

纤细马先蒿(原亚种) xian xi ma xian hao (yuan ya zhong)

Calyx lobes entire. Fl. Aug.

Alpine meadows on mountain slopes; 2200–3800 m. S Xizang [Afghanistan, Bhutan, Nepal, Pakistan, Sikkim].

51b. Pedicularis gracilis subsp. *macrocarpa* (Prain) P. C. Tsoong, Acta Phytotax. Sin. 3: 307. 1955.

大果纤细马先蒿 da guo xian xi ma xian hao

Pedicularis gracilis var. *macrocarpa* Prain, Ann. Roy.

Bot. Gard. (Calcutta) 3: 138. 1890; *P. brunoniana*

Wallich ex Pennell subsp. *typica* Pennell, nom. inval.

Calyx lobes serrate. Capsule to 1.1 cm. Fl. Jul–Aug.

3000–3300 m. S Xizang [India].

51c. Pedicularis gracilis subsp. *sinensis* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 79. 1963.

中国纤细马先蒿 zhong guo xian xi ma xian hao

Pedicularis gracilis var. *sinensis* H. L. Li, Proc. Acad.

Nat. Sci. Philadelphia 100: 279. 1948.

Calyx lobes serrate. Capsule barely 8 mm. Fl. Aug–Sep.

• Alpine meadows, grassy slopes; 2000–4000 m. W Sichuan, NW Yunnan.

Herbs tall. Stems branched apically; branches short, ascending; branches and leaves often in whorls of 3–5. Leaves small, pinnatisect. Inflorescences compact racemes. Flowers scarcely 6 mm. Corolla small; tube ca. as long as calyx; beak slender; middle lobe of lower lip hoodlike at apex.

• One species: endemic to China.

52. *Pedicularis conifera* Maximowicz ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 206. 1890.

结球马先蒿 *jie qiu ma xian hao*

Herbs annual, to more than 60 cm tall, drying black. Branches whorled, short, slender. Leaves in whorls of 4 or 5; petiole short; leaf blade ± oblong, ca. 2.5 × 1 cm, pinnatisect; segments more than 10 pairs, oblong-linear, pinnatilobate, incised-double dentate. Bracts linear. Calyx tubular, ca. 4.5 mm; lobes 5, ± equal, serrate,

glabrous. Corolla purple, ca. 6 mm, glabrous; tube erect, barely as long as calyx; galea bent at a right angle, prolonged into a beak apically; beak straight, ca. 5.5 mm, slender; lower lip ca. 3.5 × 3 mm, middle lobe smaller than lateral lobes, narrowly ovate. Filaments glabrous.

• W Hubei.

26. Ser. *Aloenses* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 147. 1949.

阿洛系 *a luo xi*

Herbs not or slightly drying black. Rhizomes absent; roots densely yellowish brown pubescent. Stems and branches slender. Branches and leaves opposite or occasionally alternate. Stem leaves ovate, rarely ovate-lanceolate. Calyx lobes 5, entire. Corolla less than 2 cm; galea ± straight to falcate, toothless, beakless; lower lip much shorter than to nearly as long as galea. Anthers acuminate.

Seven species: China, Myanmar, Sikkim; five species in China.

1a. Corolla tube more than 2 × as long as galea; stems strongly woody, densely pubescent 57. *P. petelotii*

1b. Corolla tube ca. as long as galea; stems herbaceous or becoming woody when old, striate, subglabrous.

2a. Corolla rose; lower lip nearly as long as galea 56. *P. legendrei*

2b. Corolla ± yellow; lower lip much shorter than galea.

3a. Corolla tube ca. 2 mm in diam.; filaments glabrous 55. *P. wardii*

3b. Corolla tube ca. 4 mm in diam.; filaments slightly pubescent.

4a. Leaves ca. 7 cm, segments 5–7 pairs; lower corolla lip 3–5 mm 53. *P. aurata*

4b. Leaves ca. 5 cm, segments 4 or 5 pairs; lower corolla lip ca. 2.5 mm 54. *P. aloensis*

53. *Pedicularis aurata* (Bonati) H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 152. 1949.

金黄马先蒿 *jin huang ma xian hao*

Phtheirospermum auratum Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 105. 1921.

Herbs perennial, to 30 cm tall, not drying black. Stems often branched apically, herbaceous, striate, glabrescent. Leaves opposite or occasionally alternate; petiole to 4 cm; leaf blade ovate to ovate-lanceolate, ca. 7 cm, glabrous, pinnatisect; segments 5–7 pairs, oblong-lanceolate to ovate, pinnatipartite, incised-dentate. Flowers axillary, scattered; bracts leaflike. Pedicel short. Calyx usually tinged with red, 3.5–4 mm; lobes 5, triangular. Corolla yellow, ca. 1.3 cm, nearly 2 × as long as calyx; tube ca. as long as galea, ca. 4 mm in diam.; galea ± straight or slightly falcate, apex entire; lower lip 3–5 mm, much shorter than galea, middle lobe obovate, apex emarginate. Filaments slightly pubescent. Capsule obliquely triangular-lanceolate, to 0.9–1.1 cm, short apiculate. Fl. Jul, fr. Jul–Aug.

• Bamboo thickets, *Pinus* forests; 3300–3900 m. SE Xizang, NW Yunnan.

54. *Pedicularis aloensis* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 60: 99. 1923.

阿洛马先蒿 *a luo ma xian hao*

Herbs perennial, 15–40 cm tall, not drying black. Root-stock stout, with thick stringy roots. Stems numerous, delicate, branched apically, glabrous or with 2 lines of hairs. Stem leaves opposite; petiole ca. as long as leaf blade, shorter apically; leaf blade triangular-ovate, to 5 cm, pinnatisect; segments 4 or 5 pairs, ovate-elliptic, pinnatipartite, margin double dentate. Flowers axillary, scattered; bracts leaflike. Pedicel ca. 2 mm. Calyx ca. 3.5 mm, sometimes sparsely pubescent; lobes 5, triangular, sparsely ciliate. Corolla yellow, 1.4–1.6 cm, sparsely pubescent apically; tube ca. as long as galea, ca. 4 mm in diam.; galea ± straight or slightly falcate, apex entire; lower lip ca. 2.5 mm, much shorter than galea, middle lobe rounded, apex entire. Filaments slightly pubescent. Capsule obliquely triangular-lanceolate, ca. 1 cm, short apiculate. Fl. Jul, fr. Jul–Aug.

• Bamboo thickets, forests; 3000–4000 m. NW Yunnan.

55. *Pedicularis wardii* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 133. 1921.

华氏马先蒿 *hua shi ma xian hao*

Herbs perennial. Stems numerous, ascending, 6–10 cm tall, ± branched apically, glabrous, ± woody basally. Leaves opposite; proximal petioles 1–2 cm, distal ones 5–10 mm; leaf blade ovate, glabrous or sparsely ciliate, pinnatisect; segments 5 or 6 pairs, ovate-oblong,

pinnatifid, incised-dentate. Flowers axillary, scattered; bracts linear. Pedicel 1–2 mm, glabrous. Calyx membranous, ca. 4 mm, slightly cleft anteriorly; lobes 5, lanceolate-linear, ca. 1 mm, ciliate. Corolla yellowish white; tube erect, much exceeding calyx, ca. 8 mm, ca. 2 mm in diam.; galea falcate, ca. as long as tube, apex entire, obtuse; lower lip 2–2.5 mm, much shorter than galea, ciliate, middle lobe rounded, apex emarginate. Filaments glabrous. Fl. Jul, fr. Aug.

• *Picea* forests; ca. 3000 m. SE Xizang, Yunnan.

56. *Pedicularis legendrei* Bonati, Bull. Soc. Bot. France 57 (Sess. Extraord.): 60. 1911.

勒氏马先蒿 *le shi ma xian hao*

Herbs annual to biennial, to more than 40 cm tall, ± drying black. Stems many branched, glabrous, slightly woody when old. Leaves opposite; petiole ca. 2.5 cm; leaf blade ovate-oblong, to 5.5 cm, abaxially glabrous, adaxially sparsely hispidulous, pinnatisect to pinnatipartite; segments 4–9 pairs, pinnatifid to double dentate, incised-dentate. Flowers axillary, scattered. Pedicel very short. Calyx 2.5–3 mm; lobes 5, very short, unequal. Corolla rose, ca. 1.7 cm; tube ca. 9 mm, expanded apically, glandular pubescent; galea 8.5–9 mm, slightly falcate, densely pubescent abaxially,

margin densely long pubescent near apex, apex entire; lower lip nearly as long as galea, long ciliate. Filaments 2 pubescent, 2 glabrous. Fl. Aug, fr. Sep.

• Open rocky slopes; ca. 2200 m. C and E Sichuan.

57. *Pedicularis petelotii* P. C. Tsoong, Acta Phytotax. Sin. 3: 308. 1955.

裴氏马先蒿 *pei shi ma xian hao*

Herbs annual, stout, drying black. Stems many branched, strongly woody, densely brown tomentose. Leaves opposite; petiole ca. 3 cm, sparsely long pubescent; leaf blade broadly ovate, ca. 3 × 3 cm, pinnatisect; segments 2–5 pairs, elliptic to oblong-lanceolate, pinnatisect, linear-oblong, pinnatilobate or incised-dentate. Flowers solitary in distal leaf axils. Pedicel ca. 3 mm. Calyx ca. 5.5 mm, distinctly cleft anteriorly; lobes 5, triangular, small. Corolla tube to 1.7 cm, more than 2 × as long as galea, glabrous; galea slightly falcate; lower lip ca. 6 mm, long ciliate. Filaments 2 pubescent, 2 glabrous. Capsule triangular-lanceolate, ca. 1 cm × 2.5 mm, apex acute. Fl. Jul, fr. Jul-Aug.

• About 1800 m. S Yunnan.

27. Ser. *Moupinenses* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 245. 1995.

穆坪系 *mu ping xi*

Stems herbaceous, erect, many branched; branches opposite or in whorls of 4, slender. Leaves lanceolate to oblong-lanceolate, pinnatipartite to pinnatisect. Inflorescences racemose. Calyx cleft anteriorly; lobes 5, triangular, often entire. Corolla purple; beak longer than anther-containing part of galea, bent upward, slender. Capsule 4/5 exceeding calyx.

• One species: endemic to China.

58. *Pedicularis moupinensis* Franchet, Nouv. Arch. Mus. Hist. Nat., Sér. 2, 10: 67. 1888.

穆坪马先蒿 *mu ping ma xian hao*

Herbs perennial, to 60 cm tall or more, drying black. Stems 1 to several, hollow, pubescent, shallowly striate; branches often in whorls of 4. Petiole of basal leaves to 9 cm, subglabrous; leaf blade to 12 × 5.5 cm, membranous; segments 8–20 pairs, ovate to linear-oblong, margin double dentate, apex acute. Stem leaves smaller than basal leaves, shorter petiolate or ± sessile,

lanceolate-elliptic. Inflorescences 6–16 cm, ± interrupted; bracts leaflike, longer than calyx. Calyx ca. 5.5 mm; lobes 5, narrowly triangular, often entire. Corolla purple; tube longer than calyx; galea bent at a right angle apically; beak ca. 7 mm; lower lip ca. 1.4 cm, ciliate. Filaments pubescent. Capsule ovoid-lanceolate, ca. 9 × 3.5 cm. Fl. Aug, fr. Aug–Sep.

• E Gansu, W Sichuan.

28. Ser. *Flexuosae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 73. 1890.

曲茎系 *qu jing xi*

Stems numerous, more than 40 cm tall, usually flexuous and ascending, branched basally or unbranched; branches and leaves opposite. Leaves ovate-lanceolate or oblong, pinnatipartite. Flowers axillary. Calyx 1/3 cleft anteriorly. Corolla tube more than 2 × as long as calyx; beak of galea robust.

About five species: Bhutan, China, Japan, C and E Nepal, Russia, Sikkim; one species in China.

59. *Pedicularis flexuosa* J. D. Hooker, Fl. Brit. India 4: 308. 1884.

曲茎马先蒿 *qu jing ma xian hao*

Herbs perennial, low or to 40 cm tall, pubescent. Stems flexuous, striate apically. Leaves opposite; petiole 1.5–6 cm, pubescent; leaf blade ovate-oblong, to 5 × 2.5 cm; segments 8–14 pairs, oblong, pinnatilobate to

pinnatisect, dentate, teeth callose. Flowers interrupted basally; bracts leaflike. Calyx cylindric-campanulate, 8–9 mm, villous; lobes 5, unequal, posterior one triangular and entire, lateral ones larger, serrate. Corolla tube 1.8–2.2 cm, pilose; galea falcate; beak bent downward, straight; lower lip ovate-rounded, middle lobe much smaller than lateral lobes. Filaments 2

pubescent, 2 glabrous. Capsule lanceolate, 0.9–1.2 cm, apex acute. Seeds ovoid. Fl. Jun–Aug, fr. Jul–Sep.

29. **Ser. Acaules** Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 91. 1890.

无茎系 wu jing xi

Herbs low, ± stemless. Leaves alternate; petiole long; lanceolate to oblong-lanceolate, pinnatisect. Flowers axillary; pedicel long. Corolla large; galea falcate, lacking marginal teeth, apex usually acute, beakless.

Three species: N Asia, Europe; one species in China.

60. **Pedicularis artselaeri** Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 84. 1877.

埃氏马先蒿 ai shi ma xian hao

Herbs perennial, 3–6 cm tall, drying slightly black. Roots fleshy. Stems 1 to several together, delicate, enveloped in lanceolate to ovate, membranous scales and marcescent petioles, pubescent. Petiole 5.5–9 cm, delicate, diffuse, densely tomentose; leaf blade oblong-lanceolate, 7–10 × 2–2.5 cm, abaxially rust colored hispidulous along veins, adaxially sparsely long pubescent; segments 8–14 pairs, ovate, pinnatipartite, incised-dentate. Pedicel to 10 cm, slender, curved, villous. Calyx 1.2–1.8 cm; lobes 5, ± equal, leaflike. Corolla purple, 3–4 cm; tube erect, slightly longer than to 1.5 × as long as calyx; galea ca. 1.3 cm, apex acute or obtuse; lower lip slightly longer than galea, lobes rounded, ± equal. Filaments pubescent. Capsule completely enclosed by calyx, ovoid, ca. 1.3 cm. Fl. May, fr. Jul–Aug.

Forests, moist stream beds; 2800–4000 m. S Xizang [Bhutan, C and E Nepal, Sikkim].

• Moist places, rocky slopes, forests; 1000–2800 m. Hebei, Hubei, Shaanxi, Shanxi, NE Sichuan.

1a. Apex of galea acute; lobes of lower corolla lip not sinuate; pedicel to 6.5 cm 60a. var. *artselaeri*

1b. Apex of galea obtuse; lobes of lower corolla lip sinuate; pedicel to 10 cm ... 60b. var. *wutaiensis*

60a. **Pedicularis artselaeri** var. **artselaeri**

埃氏马先蒿(原变种) ai shi ma xian hao (yuan bian zhong)

Pedicel to 6.5 cm. Apex of galea acute; lobes of lower corolla lip not sinuate.

• Moist places, rocky slopes, forests; 1000–2800 m. Hebei, Hubei, Shaanxi, Shanxi, NE Sichuan.

60b. **Pedicularis artselaeri** var. **wutaiensis** Hurusawa, J. Jap. Bot. 22: 71. 1948.

五台埃氏马先蒿 wu tai ai shi ma xian hao

Pedicel to 10 cm. Apex of galea obtuse; lobes of lower corolla lip sinuate.

• Shanxi.

30. **Ser. Vagantes** Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 81. 1890.

蔓生系 man sheng xi

Stems numerous, prostrate, repent to climbing, long, slender, sometimes plants stemless. Basal leaves long petiolate, fernlike, very large, pinnatisect to pinnatipartite. Stem leaves often pseudo-opposite, small. Flowers axillary, often in clusters, at base of stem. Corolla tube less than 2 × as long as calyx; galea beaked.

• Two species: endemic to China.

1a. Stems prostrate, repent to climbing; leaf blade 15–30 cm; corolla ca. 2.5 cm 61. *P. vagans*

1b. Stems barely 1 cm tall, or stemless; leaf blade 10–14 cm; corolla ca. 4 cm 62. *P. daochengensis*

61. **Pedicularis vagans** Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 218. 1890.

蔓生马先蒿 man sheng ma xian hao

Herbs perennial, drying black. Stems numerous, more than 40 cm, prostrate, repent to climbing, glabrous. Basal leaves fernlike; petiole to 25 cm; leaf blade oblong-lanceolate, 15–30 × 5–10 cm, pinnatisect to pinnatipartite; segments 10–17 pairs, linear-lanceolate to oblong, incised-dentate. Stem leaves alternate to ± opposite, ± ovate or ± orbicular, abaxially subglabrous, adaxially sparsely bristly; segments 2–5 pairs. Flowers often in dense clusters, axillary; bracts leaflike. Pedicel short. Calyx tubular, ca. 1.1 cm, glabrous, cleft more deeply anteriorly; lobes 5, unequal, serrate. Corolla pink, ca. 2.5 cm; tube erect, longer than calyx; galea falcate; beak conical, 3–4 mm; lower lip to 1.7 cm, spreading. Filaments subglabrous. Fl. Jul–Aug, fr. Sep–Oct.

• Forest understories, shaded wet paths, thickets; 900–2200 m. Sichuan.

62. **Pedicularis daochengensis** H. P. Yang, Bull. Bot. Res., Harbin 10(1): 29. 1990.

稻城马先蒿 dao cheng ma xian hao

Herbs perennial, ca. 15 cm tall, drying black. Stems usually 3–5 together, scarcely 1 cm, or plants stemless. Leaves nearly all basal, numerous; petiole 5–7 cm, sparsely villous; leaf blade oblong to lanceolate-oblong, 10–14 cm, abaxially white tomentose along veins, adaxially subglabrous, pinnatisect; segments 12–15 pairs, oblong, margin double dentate. Flowers nearly all basal. Pedicel 2–3 cm, slender. Calyx cylindrical, ca. 2 cm, cleft anteriorly to 1/3 of tube; lobes 5, distinctly unequal. Corolla pink, ca. 4 cm; tube ca. 2.2 cm, slightly expanded apically; galea slightly falcate; beak 2–3 mm, slender; lower lip ca. 1.8 × 2–2.5 cm, ciliate. Filaments glabrous. Capsule completely enclosed by

calyx, obliquely narrowly ovoid, ca. 2 cm, short mucronate. Fl. Jul, fr. Jul–Aug.

• *Abies fabri* forests, slopes; 3900–4200 m. Sichuan.

31. Ser. *Axillares* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 523. 1888.

腋花系 ye hua xi

Ser. *Filicifolia* Prain; ser. *Longipedes* Prain.

Herbs low. Stems very slender, often repent. Leaves ± opposite or alternate, pinnatisect. Flowers several, axillary, scattered, usually long pedicellate. Corolla tube from shorter than calyx to more than 2 × as long; beak straight.

• Seven species: endemic to China.

1a. Calyx deeply cleft anteriorly to or about middle.

2a. Calyx slightly less deeply cleft anteriorly; pedicel 0.8–1.5 cm; corolla tube longer than calyx; middle lobe

of lower corolla lip acute; filaments glabrous 68. *P. membranacea*

2b. Calyx distinctly deeply cleft anteriorly to about middle; pedicel ca. 2 cm; corolla tube shorter than calyx;

middle lobe of lower corolla lip rounded; filaments villous 69. *P. aquilina*

1b. Calyx not as deeply cleft anteriorly.

3a. Plants barely 10 cm tall, without repent stems; pedicel 1.5–6 cm 63. *P. longipes*

3b. Plants more than 15 cm tall, often with repent stems; pedicel 0.5–2.5 cm.

4a. Plants drying black; leaf segments pinnatipartite to pinnatifid 64. *P. axillaris*

4b. Plants not drying black; leaf segments pinnatifid.

5a. Leaf segments 6–12 pairs, middle lobe of lower corolla lip hoodlike at apex 65. *P. laxiflora*

5b. Leaf segments 2–7 pairs; middle lobe of lower corolla lip not hoodlike at apex.

6a. Middle lobe of lower corolla lip acute at apex; filaments 2 pubescent 66. *P. nasturtiifolia*

6b. Middle lobe of lower corolla lip rounded at apex; filaments glabrous 67. *P. filicifolia*

63. *Pedicularis longipes* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 554. 1888.

长梗马先蒿 chang geng ma xian hao

Herbs perennial, low, barely 10 cm tall, ± stemless, delicate, not drying black. Stems 3–4 cm, leafy, occasionally few branched. Leaves alternate; petiole to 3–6 cm; leaf blade oblong to oblong-lanceolate, to 7 × 2.5 cm, pinnatisect; segments 4–9 pairs, oblong-lanceolate, pinnatisect, incised-dentate. Flowers few. Pedicel curved, 1.5–6 cm, slender. Calyx turbinate-campanulate, ca. 6.5 mm, slightly cleft anteriorly; lobes 5, lanceolate-linear, ± entire to obscurely dentate. Corolla rose, ca. 1.6 cm; tube more than 2 × as long as calyx; galea ca. 9 mm, ± bent at a right angle; beak straight, slender; lower lip ca. 1.1 × 1.4 cm, middle lobe rounded, smaller than lateral lobes, ciliate. Filaments glabrous. Fl. Jul–Aug, fr. Sep.

• Moist *Abies* forests; 3400–4100 m. NW and W Sichuan.

64. *Pedicularis axillaris* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 555. 1888.

腋花马先蒿 ye hua ma xian hao

Pedicularis heterophylla Bonati; *P. lacerata* Bonati. Herbs perennial, weak, often procumbent, drying black. Stems 2 or more together, usually branched basally; branches very slender, repent or ascending, sparsely pubescent. Leaves mostly opposite; petiole to 2.5 cm; leaf blade elliptic-lanceolate, to 8 × 3 cm, pinnatisect; segments 5–12 pairs, pinnatipartite to pinnatifid, incised-dentate. Pedicel erect at anthesis, later elongating to 2.5 cm, becoming curved. Calyx turbinate-cylindric, ca. 6 mm, slightly cleft anteriorly; lobes 5,

incised-dentate. Corolla purple or greenish white; tube erect, ca. 2 × as long as calyx, glabrous; galea bent at a right angle; beak bent slightly downward, slender; lower lip ca. 8 mm, ciliate. Filaments glabrous. Capsule compressed, ovoid, ca. 8 × 6.5 mm, apex acuminate. Fl. Jun–Aug, fr. Jul–Sep.

• Moist and open pastures, shaded damp places in forests and thickets, open rock crevices; 2700–4000 m. SW Sichuan, SE Xizang, NW Yunnan.

1a. Plants tall; petiole short; corolla purple

..... 64a. subsp. *axillaris*

1b. Plants smaller; petiole long; corolla

greenish

white 64b. subsp. *balfouriana*

64a. *Pedicularis axillaris* subsp. *axillaris*

腋花马先蒿(原亚种) ye hua ma xian hao (yuan ya zhong)

Plants tall. Petiole short. Corolla purple.

• Moist pastures, shaded damp places in forests and thickets, open rock crevices; 3000–4000 m. SW Sichuan, SE Xizang, NW Yunnan.

64b. *Pedicularis axillaris* subsp. *balfouriana* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 90. 1963.

巴氏腋花马先蒿 ba shi ye hua ma xian hao

Pedicularis balfouriana Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 82. 1911; *P. axillaris* var. *balfouriana* (Bonati) H. L. Li.

Plants small. Petiole long. Corolla greenish white.

• Open pastures; 2700–3400 m. NW Yunnan.

65. *Pedicularis laxiflora* Franchet, Bull. Soc. Bot. France 47: 27. 1900.

疏花马先蒿 *shu hua ma xian hao*

Herbs perennial, not drying black. Stems few, ± flexuously ascending, unbranched, or sometimes with long repent branches. Leaves mostly alternate, glabrous; petiole to 2.8 cm; leaf blade oblong-lanceolate to oblong, to 10 × 2–3.5 cm, abaxially subglabrous, adaxially slightly pubescent along midvein, pinnatisect; segments 6–12 pairs, often pinnatipartite, ovate-oblong to ovate-lanceolate, incised-dentate. Pedicel 1–1.5 cm. Calyx tube 4–4.5 mm, slightly cleft anteriorly; lobes 5, unequal, serrate. Corolla pink; tube ca. 8 mm; galea strongly curved, scarcely 5 mm; beak bent slightly downward, ca. 3 mm, slender; lower lip to 1.3 cm, nearly 2 × as long as galea, middle lobe broadly ovate, apex hoodlike. Filaments 2 pubescent, 2 glabrous. Capsule ovoid, compressed, mucronate. Fl. Jun–Jul, fr. Jul–Aug.

• Moist places; 2500–3300 m. E Sichuan.

66. *Pedicularis nasturtiifolia* Franchet, Bull. Soc. Bot. France 47: 28. 1900.

焊菜叶马先蒿 *han cai ye ma xian hao*

Herbs perennial, not drying black. Stems usually single, dichotomously branched or unbranched, weak, repent, subglabrous. Leaves ± opposite; petiole 1–5 cm, slightly long pubescent; leaf blade ovate to oblong, to 9 × 3–5 cm, membranous, abaxially subglabrous, adaxially slightly hirtellous, pinnatisect; segments 2–7 pairs, broadly ovate, ± pinnatifid, margin double dentate. Pedicel slender, 8–20 cm, subglabrous. Calyx cylindrical-obconical, ca. 7 mm, slightly cleft anteriorly; lobes 5, slightly unequal, leaflike, glabrous apically, sparsely white villous along midvein at base. Corolla rose; tube less than 2 × as long as calyx, ca. 1.2 cm; lower lip large, slightly ciliate, middle lobe narrowly ovate, apex acute. Filaments 2 pubescent, 2 glabrous. Fl. Jun–Jul, fr. Jul–Aug.

• Moist places, forests; ca. 2000 m. W Hubei, Shaanxi, E Sichuan.

67. *Pedicularis filicifolia* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 208. 1890.

羊齿叶马先蒿 *yang chi ye ma xian hao*

Herbs perennial, not drying black. Stems several together, to 50 cm, weak, repent, ± woody at base with age, internodes to 4–7 cm, with 2 lines of hairs. Leaves nearly all opposite; petiole to 3.5 cm, glabrous; leaf blade elliptic, 4–5 × 2.5–3 cm, abaxially glabrous, adaxially slightly pubescent, pinnatisect; segments 3–5 pairs, ovate to ovate-oblong, incised-double dentate.

32. Ser. *Infirmae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 148. 1949.

孱弱系 *chan ruo xi*

Roots fascicled, slender. Stems soft, fleshy, ± erect, flexuous or procumbent. Leaves alternate or subopposite. Basal leaves few, long petiolate; stem leaves alternate or pseudo-opposite, smaller than basal leaves, with distinct reticulate veins abaxially, pinnatipartite to pinnatisect. Calyx tube with distinct reticulate veins apically. Flowers several, axillary, widely spaced. Corolla tube less than 2 × as long as calyx; galea beaked.

• One species: endemic to China.

70. *Pedicularis infirma* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 161. 1949.

Pedicel slender, ca. 1.5 cm, glabrous. Calyx tube 6–7.5 mm, subglabrous, slightly cleft anteriorly; lobes 5, distinctly unequal, posterior one smallest. Corolla purple-red, 1.8–2.4 cm; tube erect, 0.8–1.4 cm; galea ca. 1 cm; beak bent upward, to 5 mm, slender; lower lip longer than galea, ca. 1.2 cm × 8 mm, middle lobe rounded. Filaments glabrous. Fl. Jul–Aug, fr. Aug–Sep.

• Forests; 1400–1500 m. W Hubei.

68. *Pedicularis membranacea* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 168. 1949.

膜叶马先蒿 *mo ye ma xian hao*

Herbs perennial, not drying black. Stems often several together, more than 60 cm, repent, densely gray-brown pubescent basally. Leaves alternate or ± opposite at branches; petiole to 7.5 cm; leaf blade ovate-elliptic to lanceolate-oblong, 1.5–10 × ca. 4.5 cm, membranous, abaxially glabrous, adaxially slightly hirtellous, pinnatisect; segments 4–8 pairs, ovate to ovate-oblong, pinnatifid or incised-double dentate. Pedicel 0.8–1.5 cm. Calyx 5–8 mm, slightly cleft anteriorly; lobes 5, equal or unequal. Corolla purple, to 1.5 cm; tube erect, nearly 1.5 × as long as calyx; galea bent at a right angle apically; beak straight, ca. 4 mm, slender; lower lip to 1.2 cm, middle lobe acute at apex. Filaments glabrous. Capsule enclosed by calyx, compressed, ovoid, to 7 × 5 mm, very oblique, mucronate. Fl. Aug, fr. Aug–Sep.

• Forests, rocky slopes; 2200–2400 m. WC Sichuan.

69. *Pedicularis aquilina* Bonati, Bull. Soc. Bot. France 55: 245. 1908.

鹰嘴马先蒿 *ying zui ma xian hao*

Herbs perennial. Stems numerous, 20–30 cm, procumbent, slightly branched or unbranched, subglabrous, leafy. Stem leaves alternate; petiole ca. 1 cm, glabrous; leaf blade ovate-elliptic, 1–3 cm, slightly hispid, pinnatisect; segments 6–8 pairs, lanceolate, pinnatifid, apex acute. Flowers remotely arranged; bracts leaflike, nearly as long as flowers. Pedicel ± curved, slender, ca. 2 cm. Calyx ± spathe-like, cleft to middle of tube anteriorly; tube ca. 5 mm, membranous; lobes 5, equal, apex flabellate, 3–6 mm. Corolla purple, small; tube shorter than calyx; galea erect, strongly curved apically, longer than tube, with a pair of teeth at throat; beak horizontal, 5–6 mm, slender; lower lip ca. as long as galea, ca. 7 mm × 1.5 cm, middle lobe rounded. Filaments villous.

• Yunnan.

孱弱马先蒿 *chan ruo ma xian hao*

Herbs perennial, to 11 cm tall. Roots fleshy. Stems numerous, weak, flexuous ascending, or \pm procumbent, pubescent. Leaves alternate or \pm opposite. Petiole of basal leaves to 7 cm, glabrous; leaf blade ovate-oblong, 5.5–13 \times ca. 2.5 cm, pinnatisect; segments 6 or 7 pairs, ovate to oblong, pinnatifid to pinnatisect, membranous, glabrous, dentate. Stem leaves similar to basal leaves, but smaller and shorter petiolate. Inflorescences racemose, 8–9 cm, interrupted basally; bracts leaflike, proximal ones longer than flowers,

distal ones ca. as long as flowers. Pedicel erect, ca. 1.3 cm, pubescent. Calyx 1–1.2 cm, villous, slightly cleft anteriorly; lobes 5, unequal, leaflike. Corolla purple, ca. 2 cm; tube erect, longer than calyx, slightly pubescent; galea falcate; beak straight, conical, ca. 3 mm; lower lip slightly longer than galea, ciliate. Filaments villous. Capsule enclosed by accrescent calyx, compressed, ovoid, to 1 cm \times 7–8 mm, apex acute. Fl. and fr. Sep.

- Open and sandy places; ca. 3000 m. NW Yunnan.

33. Ser. Omiiana H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 148. 1949.

峨眉系 e mei xi

Plants herbaceous. Stems often ascending to decumbent. Basal leaves long petiolate, lanceolate to elliptic, pinnatisect; segments ovate to oblong; stem leaves often pseudo-opposite. Flowers axillary, pedicellate. Calyx lobes 5. Corolla tube more than 4 \times as long as calyx; beak bent upward, slender.

- One species: endemic to China.

71. *Pedicularis omiiana* Bonati, Bull. Soc. Bot. France 54: 184, 375. 1907.

峨眉马先蒿 e mei ma xian hao

Herbs perennial, drying black. Stems usually several together, erect, ascending to decumbent or procumbent, densely pubescent. Basal leaves numerous; petiole to 9 cm, slightly puberulent to villous; leaf blade ovate-oblong to oblong-lanceolate, 6–11 \times 2–3 cm, pinnatisect; segments 11–15 pairs, ovate to ovate-oblong, margin double dentate. Stem leaves alternate or often \pm opposite, similar to basal leaves but smaller. Pedicel ca. 1 cm, pubescent. Calyx narrowly campanulate, ca. 8 mm, subglabrous or slightly villous; lobes 5, \pm equal, entire to serrate. Corolla purple; tube erect, slender, to 3–4.5 cm, slightly pubescent; galea erect, obtusely curved; beak cylindrical, to 7 mm; lower lip deeply lobed, lobes rounded, margin glabrous. Filaments glabrous. Capsule obliquely long ovoid, ca. 1.3 cm, apiculate. Fl. Jun–Jul, fr. Jul–Sep.

- Damp places in forests, thickets; 2300–3200 m. W and WC Sichuan.

1a. Stems erect to decumbent; calyx lobes narrow, \pm entire 71a. subsp. *omiiana*

1b. Stems procumbent; calyx lobes wide, serrate 71b. subsp. *diffusa*

71a. *Pedicularis omiiana* subsp. *omiiana*

峨眉马先蒿(原亚种) e mei ma xian hao (yuan ya zhong)

Stems erect to decumbent. Petiole puberulent. Calyx lobes narrow, \pm entire.

- Damp places in forests, thickets; 2300–3200 m. WC Sichuan.

71b. *Pedicularis omiiana* subsp. *diffusa* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 97. 1963.

铺散峨眉马先蒿 pu san e mei ma xian hao

Pedicularis omiiana var. *diffusa* Bonati, Bull. Soc. Bot. France 54: 185, 376. 1907.

Stems procumbent. Petiole and midvein abaxially villous. Calyx lobes wide, serrate. Fl. May–Jul.

- W Sichuan.

34. Ser. Batangensis H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 148. 1949.

巴塘系 ba tang xi

Plants usually diffuse. Stems slender, \pm woody, many branched basally; branches long, decumbent. Leaves opposite or pseudo-opposite, oblong-lanceolate, pinnatisect; segments linear. Flowers axillary, pedicellate. Calyx lobes usually 5, longer than calyx tube. Corolla tube more than 2 \times as long as calyx, slender; galea much dilated apically with 2 teeth at margin, usually abruptly constricted into a beak; beak straight, slender.

- One species: endemic to China.

72. *Pedicularis batangensis* Bureau & Franchet, J. Bot. (Morot) 5: 106. 1891.

巴塘马先蒿 ba tang ma xian hao

Herbs perennial, 10–20 cm tall, drying black. Stems many, clustered, sometimes repent, only ascending apically; branches opposite, to 30 cm, with 2 lines of hairs. Leaves \pm opposite, \pm leathery; petiole 1–2 cm, pubescent; leaf blade oblong to ovate-oblong, 2–3 \times 1–2 cm, pubescent; segments linear to linear-lanceolate, dentate or lobed. Flowers scattered. Pedicel ca. 1 cm,

pubescent. Calyx ca. 1 cm; tube obconical; lobes 5, lanceolate, posterior one \pm entire, lateral lobes larger, leaflike. Corolla pink to rose, erect, 1.7–3 cm, densely pubescent; galea bent at a right angle, abruptly constricted into a beak apically; beak ca. 5.5 mm, slender, straight; lower lip 1.5–1.8 cm wide, ciliate. Filaments glabrous. Capsule ovoid, slightly compressed, apiculate. Fl. Jun–Aug, fr. Aug–Sep.

- Open rocky slopes; 2500–3100 m. NW and W Sichuan.

35. Ser. *Muscicolae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 523. 1888.

藓生系 xian sheng xi

Stems many, slender, procumbent and repent, usually branched. Leaves elliptic to lanceolate, pinnatifid to pinnatisect. Flowers axillary. Corolla long tubular; tube at least 2 × as long as calyx; galea twisted or not; beak straight or S-shaped, not bent upward, slender.

• Ten species: endemic to China.

1a. Calyx slightly cleft anteriorly.

2a. Corolla tube 1.4–2.5 cm; beak of galea 3–4 mm; filaments ± pubescent.

3a. Calyx ca. 10 mm; corolla tube ca. 2.5 cm; lower lip ca. 1.2 × 1.5 cm; pedicel to 3.5 cm 73. *P. nanchuanensis*

3b. Calyx ca. 3.5 mm; corolla tube 1.4–1.8 cm; lower lip ca. 1.1 × 1.1 cm; pedicel 0.8–1.4(–1.7) cm 74. *P. chengxianensis*

2b. Corolla tube 4–7.5 cm; beak of galea 5–10 mm; filaments glabrous.

4a. Leaves 2.5–3.5 cm, segments 4–6 pairs 77. *P. gracilituba*

4b. Leaves to 5–10 cm, segments 4–12 pairs.

5a. Calyx lobes unequal; corolla tube glabrous; lower lip ca. 1.4 cm wide; beak of galea shorter,

not

S-shaped 79. *P. macrosiphon*

5b. Calyx lobes ± equal; corolla tube pubescent; lower lip to 2 cm wide; beak of galea ca. 1 cm,

S-shaped 80. *P. muscicola*

1b. Calyx deeply cleft anteriorly.

6a. Beak of corolla to 10 cm.

7a. Stems 5–10 cm, glabrous; corolla 4–5 cm; lower lip not ciliate; filaments glabrous 81. *P. pseudomuscicola*

7b. Stems to 25 cm, slightly pubescent; corolla 6–9 cm; lower lip ciliate; filaments 2 pubescent, 2

glabrous 82. *P. ruoergaiensis*

6b. Beak of corolla barely 1 cm.

8a. Calyx 5-lobed 78. *P. geosiphon*

8b. Calyx 2–4-lobed.

9a. Corolla tube to 9.5 cm; beak of galea not curved; stems to 20 cm; petiole to 4.5 cm ... 75. *P. sorbifolia*

9b. Corolla tube 2–2.6 cm; beak of galea curved; stems to 40 cm; petiole to 2 cm 76. *P. quxiangensis*

73. *Pedicularis nanchuanensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 399. 1963.

南川马先蒿 nan chuan ma xian hao

Herbs perennial, 15–25 cm tall. Roots fleshy. Stems erect, 4–7 cm, many branched; branches ascending or procumbent basally, densely white villous. Leaves alternate or sometimes ± opposite at branches; petiole to 5 cm, but barely 1.5–2 cm on branches, slightly villous; leaf blade oblong-lanceolate to ovate-oblong, 6–11 × 2.5–5 cm, slightly pubescent, pinnatisect; segments 7–12 pairs, ovate to lanceolate, pinnatifid, incised-dentate. Flowers widely spaced. Pedicel to 3.5 mm. Calyx ca. 1 cm, slightly cleft anteriorly, densely villous along 5 veins; lobes 5, ± equal, leaflike. Corolla red, ca. 3 cm; tube erect, ca. 2.5 cm, slender, pubescent; galea glabrous, ± bent at a right angle apically; beak straight, barely 3–4 mm; lower lip longer than galea, ca. 1.2 × 1.5 cm. Filaments 2 pubescent, 2 glabrous. Fl. May–Jun, fr. Jul–Aug.

• Margins of bamboo groves; 2100–2300 m. SE Sichuan.

74. *Pedicularis chengxianensis* Z. G. Ma & Z. Z. Ma, Bull. Bot. Res., Harbin 13: 63. 1993.

成县马先蒿 cheng xian ma xian hao

Herbs perennial, drying black. Roots cylindrical, fleshy; rhizomes slender, with narrowly triangular,

membranous scales. Stems erect, ca. 4 cm tall; lateral branches sharply ascending, to 40 cm, slender, pubescent. Leaves alternate; petiole ca. 8 cm (ca. 1.5 cm on lateral branches), long pubescent; leaf blade narrowly elliptic or ovate, 5.5–12 × 2.2–3.5 cm (leaves of lateral branches smaller), pinnatisect; segments 4–16 pairs, ca. 1 cm × 4 mm, ovate, white scurfy, double serrate or pinnatifid. Pedicel 0.8–1.4(–1.7) cm, with long hairs. Flowers solitary, axillary, few. Calyx tubular, ca. 3.5 mm, slightly cleft anteriorly, pilose, short pubescent; lobes 5, equal, linear to linear-lanceolate, ca. 2.5 mm. Corolla wine red; tube 1.4–1.8 cm, moderately long pubescent; galea erect, ca. 4.5 mm, inner margin ca. 3 mm, each side with 1 obtuse tooth; anther-bearing part bent at a right angle to erect part, beak ca. 3 mm, slender, 2-lobed at apex; lower lip whitish rose, ca. 1.1 × 1.1 cm, margin often ciliate, middle lobe exserted, broadly ovate or triangular-ovate, small. Filaments sometimes loosely short pilose at apex. Capsule enclosed at base by persistent calyx, apex obliquely bent, short beaked. Seeds compressed, obovoid, white striate. Fl. and fr. May–Jun.

• Steep slopes, shrubs; 1600–1700 m. Gansu (Chengxian, Jishan).

75. *Pedicularis sorbifolia* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 400. 1963.

花楸叶马先蒿 *hua qiu ye ma xian hao*

Herbs perennial, slightly pubescent. Stems curved, to 20 cm, slender. Basal leaves large, alternate or opposite; petiole to 4.5 cm; leaf blade lanceolate-obovate, pinnatisect; segments 6–13 pairs, ovate to oblong, to 1.8 cm × 8 mm, incised-double dentate, apex acute.

Stem leaves similar to basal ones but smaller. Pedicel 3–8 mm. Calyx scarcely 1 cm, cleft anteriorly to middle of tube, 2–4-lobed. Corolla tube to 9.5 cm, pubescent; galea ± bent at a right angle apically; beak straight, short, inconspicuous; lower lip longer than galea, middle lobe smaller than lateral lobes, narrowly ovate, projecting. Filaments glabrous. Fl. Aug, fr. Sep.

• Mossy places in old growth *Abies* forests; ca. 3300 m. W Sichuan.

76. *Pedicularis quxiangensis* H. P. Yang, Bull. Bot. Res., Harbin 2(4): 137. 1982.

曲乡马先蒿 *qu xiang ma xian hao*

Herbs perennial, subglabrous, drying black. Stems ascending or diffuse, often to 40 cm. Leaves opposite near base, distal ones alternate; petiole slender, to 2 cm; leaf blade ovate to elliptic, 1–2 cm, pinnatisect; segments 4 or 5 pairs, ovate to oblong, glabrous, margin double dentate. Flowers widely spaced. Pedicel 5–10 mm. Calyx cylindric, 8–9 mm, cleft anteriorly to middle of tube, slightly pubescent; lobes 3, unequal. Corolla red, 3–3.5 cm; tube 2–2.6 cm, slightly pubescent; galea ± bent at a right angle apically; beak semicircular, ca. 7 mm; lower lip ca. 9 mm × 1.3 cm, ciliate, middle lobe smaller than lateral lobes, apex emarginate. Filaments glabrous. Capsule enclosed by accrescent calyx, ovoid, slightly compressed, ca. 1.2 cm. Fl. and fr. Aug–Sep.

• In tufts of grass on hillsides; ca. 3400 m. S Xizang.

77. *Pedicularis gracilituba* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 173. 1949.

细管马先蒿 *xi guan ma xian hao*

Herbs perennial, 4–6 cm, rarely to 15 cm tall, glabrous or pubescent, drying black. Stems densely clustered or few, slender, soft, leafy. Leaves alternate, basal and stem ones similar; petiole 0.2–4 cm, often longer than leaf blade, slender, subglabrous to conspicuously pubescent; leaf blade lanceolate-oblong, membranous, glabrous or adaxially sparsely hispidulous, 2.5–3.5 × 0.7–2 cm, pinnatisect; segments 4–6 pairs, ovate to ovate-oblong, deeply incised-dentate. Flowers widely spaced. Pedicel slender, to 1 cm. Calyx 7–10 mm, slightly cleft anteriorly, pubescent; lobes 5, ± equal. Corolla purple, ca. 7 cm; tube to 6.5 cm, slender, pubescent; galea bent at a right angle apically; beak falcate, inconspicuous; lower lip ca. 1 × 1.3 cm, not ciliate. Filaments glabrous. Fl. Jun–Jul, fr. Aug.

• Alpine meadows, forests; 3300–4000 m. SW Sichuan, NW Yunnan.

1a. Stems many; petiole and pedicel often ± glabrous; leaves sparsely hispidulous adaxially

..... 77a. subsp. *gracilituba*

1b. Stems few; petiole and pedicel conspicuously pubescent; leaves densely bristly adaxially

..... 77b. subsp. *setosa*

77a. *Pedicularis gracilituba* subsp. *gracilituba*

细管马先蒿(原亚种) *xi guan ma xian hao* (*yuan ya zhong*)

Stems many. Petiole and pedicel often ± glabrous. Leaves sparsely hispidulous adaxially.

• Alpine meadows, forests; 3600–4000 m. SW Sichuan.

77b. *Pedicularis gracilituba* subsp. *setosa* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 101. 1963.

刺毛细管马先蒿 *ci mao xi guan ma xian hao*

Pedicularis gracilituba var. *setosa* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 174. 1949.

Stems few. Petiole and pedicel conspicuously pubescent. Leaves densely bristly adaxially. Fl. Jul.

• Forests; ca. 3300 m. NW Yunnan.

78. *Pedicularis geosiphon* H. Smith & P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 400. 1963.

地管马先蒿 *di guan ma xian hao*

Herbs perennial, sparsely pubescent, not drying black. Rootstock filiform, to 10 cm. Stems often 2–4, widely spaced, black, glabrous, with 5 or 6 leaves. Leaves alternate; petiole to 3 cm, subglabrous; leaf blade linear-oblong, more than 4 × 1.5 cm, abaxially glabrous, adaxially sparsely pubescent, pinnatisect; segments ca. 4 or 5 pairs, oblique ovate, incised-dentate.

Inflorescences 1–3-flowered. Pedicel to 1.5 cm, glabrous. Calyx cylindric; tube ca. 7 mm, cleft anteriorly to middle of tube, sparsely villous; lobes 5,

unequal. Corolla tube 4.5–6.5 cm, pubescent; galea ± bent at a right angle apically, with 1 marginal tooth on each side near apex; beak straight, ca. 4 mm; lower lip ca. 2 × 2 cm, longer than galea. Filaments glabrous. Fl. Jul, fr. Aug.

• Mossy places in old growth coniferous forests; 3500–3900 m. S Gansu, N Sichuan.

79. *Pedicularis macrosiphon* Franchet, Nouv. Arch. Mus. Hist. Nat., Sér. 2, 10: 66. 1888.

大管马先蒿 *da guan ma xian hao*

Pedicularis lucifuga Bonati; *P. macrosiphon* var. *tribuloides* (Bonati) H. L. Li; *P. tribuloides* Bonati.

Herbs perennial, usually densely tufted, drying black. Stems slender, flexuous, ascending or repent, to 40 cm. Proximal leaves usually ± opposite, distal ones alternate; petiole to 6 cm, pubescent; leaf blade ovate-lanceolate to linear-oblong, to 10 cm, abaxially villous along midvein, adaxially sparsely pubescent, pinnatisect; segments 7–12 pairs, ovate to oblong, spinescent double dentate. Flowers widely spaced. Pedicel to 1 cm. Calyx ca. 1 cm, slightly cleft anteriorly, villous along veins; lobes 5, unequal. Corolla pale purple to rose, 4.5–6 cm or sometimes to 7–8 cm; tube erect, 4–5 cm, glabrous; galea bent at a right angle apically; beak straight, short; lower lip longer than galea, ca. 1.5 × 1.4

cm. Filaments glabrous. Capsule completely enclosed by calyx, oblong to obovoid, compressed, 1–1.2 cm, apex acute. Fl. May–Aug, fr. Jul–Sep.

• Moist shaded forests, ravines; 1200–3500 m. NW Sichuan, NW Yunnan.

80. *Pedicularis muscicola* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 54. 1877.

藓生马先蒿 xian sheng ma xian hao

Herbs perennial, pubescent, drying black. Stems cespitose, usually densely tufted, central stems erect, outer stems usually flexuous, ascending or procumbent, to 25 cm. Leaves alternate; petiole to 1.5 cm, sparsely villous; leaf blade elliptic to lanceolate, to 5 cm, abaxially subglabrous, adaxially sparsely pubescent, densely ciliolate along midvein, pinnatisect; segments 4–9 pairs, ovate to lanceolate, spinescent-double dentate. Pedicel to 1.5 cm, densely white villous to subglabrous. Calyx cylindrical, to 1.1 cm, slightly cleft anteriorly, villous along veins; lobes 5, ± equal. Corolla rose; tube 4–7.5 cm, pubescent; galea twisted; beak S-shaped, ca. 1 cm, slender; lower lip ca. 2 × 2 cm. Filaments glabrous. Capsule enclosed by calyx, compressed, ovoid, ca. 1 cm × 7 mm. Fl. May–Jul, fr. Aug.

• Shaded damp places in *Picea* forests, under shrubs, near water in valleys; 1700–2700 m. Gansu, Hebei, W Hubei, Nei Mongol, Qinghai, Shaanxi, Shanxi.

81. *Pedicularis pseudomuscicola* Bonati, Bull. Soc. Bot. France 54: 371. 1907.

假藓生马先蒿 jia xian sheng ma xian hao

Herbs perennial, diffuse. Stems cespitose, spreading or procumbent, ± black, 5–10 cm, glabrous, shiny. Leaves

alternate; petiole of basal leaves 5–7 cm; leaf blade linear-oblong, ca. 3.5 cm, glabrous, adaxially shiny, pinnatisect; segments 10–20 pairs, ovate-oblong, margin lobed, spinescent dentate. Stem leaves similar to basal ones but smaller. Pedicel 5–8 mm, slender, curved. Calyx cylindrical; tube ca. as long as pedicel, shallowly cleft anteriorly; lobes 5, ± equal. Corolla purple, 4–5 cm; tube slender, 3.5–4.5 cm, white pubescent apically, glabrous basally; galea twisted basally; beak semi-circular, 6–10 mm, slender; lower lip ca. 1 × 1.5–2 cm, glabrous. Filaments glabrous. Fl. Aug–Sep, fr. Sep–Oct.

• 2800–3700 m. W Sichuan.

82. *Pedicularis ruergaiensis* H. P. Yang, Acta Phytotax. Sin. 27: 222. 1989.

若尔盖马先蒿 ruo er gai ma xian hao

Herbs perennial, slightly pubescent, drying black. Stems curved, to 25 cm, slender. Leaves pseudo-opposite, distal ones often alternate; petiole to 2 cm; leaf blade linear-oblong, 4–6 cm, abaxially glabrous, adaxially pubescent, pinnatisect; segments oblique-ovate, very widely spaced, incised-dentate. Pedicel to 5–10 mm. Calyx cylindrical, 1–1.5 cm, shallowly cleft anteriorly; lobes 5, equal, slightly enlarged and serrate apically. Corolla purple-red, 6–9 cm; tube 5–8 cm, villous; galea bent at a right angle apically; beak evenly deflexed, ± curved, ca. 1 cm, slender; lower lip 1.6–1.8 × 1.8–2.2 cm, ciliate, middle lobe smaller than lateral ones, rounded. Filaments 2 pubescent, 2 glabrous. Fl. Jun, fr. Jul–Aug.

• *Tsuga chinensis* forests; 2700–2800 m. N Sichuan.

36. Ser. *Pteridifoliae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 147. 1949.

蕨叶系 jue ye xi

Stems to 28 cm, unbranched. Basal leaves long petiolate, large, pinnatisect; segments 5–9 pairs. Stem leaves few, alternate, small. Inflorescences short spicate. Calyx 5-lobed. Corolla yellow; tube straight, 2–3 × as long as calyx; galea obscurely 2-toothed, beakless; lower lip shorter than galea.

• One species: endemic to China.

83. *Pedicularis pteridifolia* Bonati, Bull. Misc. Inform. Kew 1908: 252. 1908.

蕨叶马先蒿 jue ye ma xian hao

Herbs perennial, to 40–60 cm tall, flexuously ascending, drying black. Stems single, striate, glabrous. Leaves alternate; petiole to 5–9 cm, glabrous; leaf blade oblong-ovate to broadly ovate, to 15–28 cm, abaxially subglabrous along midvein, adaxially sparsely glandular pubescent, densely ciliolate along midvein, pinnatipartite to pinnatisect; segments 5–9 pairs, ovate-oblong to narrowly lanceolate, pinnatifid, margin

double dentate. Inflorescences, spicate, 4.5–7 cm; bracts leaflike basally. Pedicel short. Calyx glabrous; tube 5–6 mm; lobes 5, equal, triangular, entire. Corolla 2–2.8 cm; tube erect, glabrous; galea erect, slightly pubescent along margin, rounded in front, apex bent downward; lower lip ciliate, middle lobe emarginate. Filaments 2 pubescent, 2 glabrous. Capsule compressed, lanceolate, ca. 1.3 cm × 4 mm, apex acute. Fl. and fr. Sep–Oct.

• Forests; 800–1600 m. Sichuan.

37. Ser. *Phaceliifoliae* Bonati, Bull. Soc. Bot. France 57, Mém. 18: 14. 1910.

法且利亚叶系 fa qie li ya ye xi

Stems 1 to several together, short branched apically or unbranched. Basal leaves long petiolate, large, pinnatisect. Stem leaves alternate or ± opposite. Leaves often ovate-elliptic, to 15 × 14 cm. Inflorescences ± compact, capitate. Corolla red or white; tube straight, ca. 2 × as long as calyx; galea twisted laterally; beak ± curved downward.

• Two species: endemic to China.

- 1a. Corolla tube scarcely longer than calyx; beak curved downward, parallel to proximal part of galea; leaf blade to 15 cm, leathery 84. *P. phaceliifolia*
 1b. Corolla tube ca. 2 × as long as calyx; beak ± straight, curved only apically, pointing forward, perpendicular to basal part of galea; leaf blade 5–6 cm, membranous 85. *P. fargesii*

84. *Pedicularis phaceliifolia* Franchet, Bull. Soc. Bot. France 47: 27. 1900.

法且利亚叶马先蒿 fa qie li ya ye ma xian hao
 Herbs annual or biennial, to 60 cm tall, glabrous, not drying black. Stems ± flexuous ascending. Basal leaf petiole to 20 cm; leaf blade ovate-oblong to oblong-lanceolate, 10–15 × 7–13 cm, pinnatisect to pinnatifid; segments 7–10 pairs, ovate to oblong, leathery, pinnatifid, dentate. Stem leaves often opposite, only alternate apically, smaller than basal leaves. Inflorescences ± capitate; bracts leaflike, shorter than flowers. Calyx ca. 7 mm, slightly cleft anteriorly; lobes 5, unequal. Corolla white; tube scarcely longer than calyx; galea semicircular apically; beak parallel to basal part of galea, curved downward, 1.5–2.5 mm; lower lip ca. as long as galea. Filaments villous. Capsule obliquely lanceolate, ca. 1.7 cm, apex acute. Fl. Jun–Aug, fr. Sep–Oct.

• Grassy slopes, shaded places, *Abies* forests, under shrubs; 1500–3400 m. W Sichuan, NW Yunnan.

85. *Pedicularis fargesii* Franchet, Bull. Soc. Bot. France 47: 26. 1900.

法氏马先蒿 fa shi ma xian hao

Herbs annual or biennial, to 20–40 cm tall, subglabrous, not drying black. Petiole of basal leaves 4–7 cm; leaf blade ovate-oblong to elliptic-oblong, 5–6 × 2.5–3.5 cm, membranous, pinnatisect to pinnatifid; segments 5–8 pairs, ovate-oblong, incised-double dentate, abaxially sparsely white pubescent along veins, adaxially glabrous. Stem leaves often only 2 or absent, ± opposite. Inflorescences capitate, 5- or 6-flowered; bracts leaflike. Calyx ca. 1 cm, slightly cleft anteriorly; lobes 5, ± equal, serrate. Corolla white, ca. 2 cm; tube slender, ca. 2 × as long as calyx; galea crescent-shaped apically; beak pointing forward, perpendicular to basal part of galea, ± straight, curved only apically; lower lip slightly shorter than galea, ciliate. Filaments villous. Fl. Jun–Jul, fr. Aug–Sep.

• *Pinus* and *Abies* forests, grassy slopes; 1400–1800 m. S Gansu, W Hubei, Hunan, E Sichuan.

38. Ser. *Pentagonae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 257. 1948.

五角系 wu jiao xi

Herbs drying black. Roots much thickened, fascicled. Stems erect. Leaves mostly on stem, opposite, lanceolate, pinnatisect. Inflorescences spicate. Calyx inflated, strongly 5-angled, with dense reticulate veins; lobes 5, triangular, entire. Corolla tube slightly bent distally; galea shorter than lower lip, 1-toothed on each side, beakless; lower lip spreading.

• One species: endemic to China.

86. *Pedicularis pentagona* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 347. 1948.

五角马先蒿 wu jiao ma xian hao

Herbs perennial, to 20 cm tall. Roots fleshy. Stems erect, branched apically or unbranched, pubescent. Leaves opposite; petiole ca. 1.3 cm, winged; leaf blade lanceolate, ca. 2 × 1.5 cm, glabrous, sometimes ciliate, pinnatisect; segments widely spaced, linear, deeply dentate. Inflorescences to 9 cm. Flowers opposite; bracts leaflike basally, long ovate apically, ciliate. Ca-

lyx long ovate, membranous, to 1.5 cm, ciliate along veins; lobes 5, unequal, triangular, entire. Corolla pink to purple, to 2.5 cm; tube ca. 2 × as long as calyx tube; galea erect, rounded apically, beakless; margin of lower lip fimbriate. Filaments pubescent. Capsule enclosed by accrescent calyx tube, ovoid, compressed, apiculate. Fl. Jul–Aug, fr. Aug–Sep.

• Dry slopes, moist shaded banks in valleys; 2800–3300 m. SW Sichuan, E Xizang, NW Yunnan.

39. Ser. *Dichotomae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 258. 1948.

二歧系 er qi xi

Stems dichotomously branched or unbranched. Leaves opposite, ovate to lanceolate, pinnatisect. Stem leaves long petiolate. Inflorescences spicate. Flowers opposite. Calyx large, strongly 5-angled, with dense reticulate veins; lobes 5, entire. Corolla tube slightly exceeding calyx; galea 1-toothed on each side; beak often straight, slender.

• One species: endemic to China.

87. *Pedicularis dichotoma* Bonati, Bull. Soc. Bot. France 55: 247. 1908.

二歧马先蒿 er qi ma xian hao

Pedicularis dichotoma var. *wardiana* Bonati.

Herbs perennial, to 30 cm tall, not drying black. Roots not fleshy. Stems dichotomously branched or unbranched, pubescent. Leaves opposite; petiole ca. 3 cm, winged; leaf blade ovate-oblong to oblong-lanceolate, ca. 4 cm, pinnatisect; segments 5–7 pairs, widely spaced, linear, pinnatifid or dentate. Inflorescences 5–12 cm. Flowers opposite, 2–18 pairs;

bracts ovate, ciliate, apex often pinnatisect. Calyx long ovate, membranous, ca. 1.3 cm, strongly 5-veined, ciliate along veins; lobes 5, unequal, triangular, posterior one smallest. Corolla pink, ca. 2 cm; galea ± bent at a right angle apically; beak horizontal, straight, slender; lower lip glabrous at margin, middle lobe

smaller than prominent lateral lobes. Filaments pubescent. Capsule enclosed by accrescent calyx, ovoid, apiculate. Fl. Jul–Sep, fr. Aug–Sep.

• Open alpine pastures, open forests; 2700–4300 m. SW Sichuan, E Xizang, NW Yunnan.

40. Ser. Reges H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 257. 1948.
大王系 dai wang xi

Stems branched or not. Leaves in whorls of 3 or 4, sometimes opposite; bases of whorled petioles or at least bracts connate, dilated, cupular. Calyx deeply cleft anteriorly, 2-lobed; lobes entire. Galea rounded, much expanded apically, 1-toothed on each side or toothless, beakless.

Two species: China, India, Myanmar; both species in China.

- 1a. Leaves mostly in whorls of 4, sometimes in 3's; most petiole and bract bases enlarged and connate 88. *P. rex*
1b. Leaves mostly in whorls of 3, sometimes opposite or rarely in 4's; bases of bracts enlarged and connate, but petiole bases usually not enlarged and connate 89. *P. thamnophila*

88. Pedicularis rex C. B. Clarke ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 589. 1888.

大王马先蒿 dai wang ma xian hao

Herbs perennial, 10–90 cm tall, not drying black. Stems erect, pubescent or subglabrous, branched or not; branches whorled. Leaves in whorls of (3 or)4; most petiole bases enlarged, connate, cupular, to 0.5–1.5 cm; leaf blade linear-oblong to lanceolate-oblong, 3.5–12 × 1–4 cm, pinnatisect to pinnatipartite; segments 10–14 pairs, linear-oblong to oblong, dentate. Inflorescences spicate, interrupted basally; bracts leaflike, longer than flowers, base enlarged, connate, cupular. Calyx 1–1.2 cm, membranous, glabrous; lobes 2 or 3, rounded. Corolla yellow, purple-red, or white, erect, ca. 3 cm; tube 2–2.5 cm; galea sparsely pubescent, apex bent downward, truncate, marginal teeth 2 or none; lower lip shorter than galea, ciliate; middle lobe very small. Filaments at least 2 pubescent. Capsule ovoid, 1–1.5 cm, apex acute. Seeds ca. 3 mm. Fl. May–Aug, fr. Aug–Sep.

Open pastures, slopes, coniferous forests, alpine *Pinus* forests; 2500–4300 m. SC Guizhou, W Hubei, SW and W Sichuan, SE Xizang, C, NE, and NW Yunnan [N India, N Myanmar]

- 1a. Corolla purple-red or white.
2a. Corolla purple-red; filaments sparsely pubescent 88c. subsp. *lipskyana*
2b. Corolla white with purplish galea; 2 filaments densely pubescent 88d. subsp. *zayuensis*
1b. Corolla yellow.
3a. Plants barely 20 cm tall; calyx 2- or 3-lobed 88b. subsp. *parva*
3b. Plants often more than 20 cm tall; calyx 2-lobed.
4a. Galea sometimes toothless; corolla 1.5–3 cm; basal leaves long petiolate, caducous 88a. subsp. *rex*

- 4b. Galea teeth subulate; corolla 2–2.5 cm; basal leaves short petiolate, persistent 88e. subsp. *pseudocyathus*

88a. Pedicularis rex subsp. *rex*

大王马先蒿(原亚种) dai wang ma xian hao (yuan ya zhong)

Plants often more than 20 cm tall. Calyx 2-lobed. Corolla yellow, 1.5–3 cm; galea sometimes lacking marginal teeth.

Open pastures, slopes, coniferous forests; 2500–4300 m. SW Sichuan, C, NE, and NW Yunnan [N India, N Myanmar]

This subspecies includes two varieties: var. *rex* with a corolla 3 cm and var. *rockii* (Bonati) H. L. Li with a corolla 1.5–2.2 cm.

88b. Pedicularis rex subsp. *parva* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 111. 1963.

矮小大王马先蒿 ai xiao dai wang ma xian hao

Pedicularis rex var. *parva* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 151. 1926.

Plants barely 20 cm tall. Calyx 2- or 3-lobed. Corolla yellow, ca. 3 cm. Fl. May–Jul.

• NW Yunnan.

88c. Pedicularis rex subsp. *lipskyana* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 111. 1963.

立氏大王马先蒿 li shi dai wang ma xian hao
Pedicularis lipskyana Bonati, Bull. Soc. Bot. France 57 (Sess. Extraord.): 58. 1911; *P. lamarum* H. Limpricht; *P. rex* var. *purpurea* Bonati.

Plants 10–90 cm tall. Calyx 2-lobed. Corolla purple-red, ca. 3 cm. Filaments sparsely pubescent. Fl. May–Jul.

• W Hubei, W Sichuan.

88d. Pedicularis rex subsp. *zayuensis* H. P. Yang, Acta Phytotax. Sin. 28: 136. 1990.

察隅大王马先蒿 cha yu dai wang ma xian hao
Plants 50–60 cm tall. Calyx 2-lobed. Corolla white, ca. 3 cm; galea purplish. Filaments 2 densely pubescent, 2 glabrous. Fl. Jun–Jul.

• Alpine *Pinus* forests; ca. 3200 m. SE Xizang (Zayu).

88e. *Pedicularis rex* subsp. *pseudocyathus* (Vaniot ex Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 111. 1963.

假斗大王马先蒿 *ja dou dai wang ma xian hao*
Pedicularis rex var. *pseudocyathus* Vaniot ex Bonati, Bull. Acad. Int. Géogr. Bot. 13: 240. 1904.
Plants often more than 20 cm tall. Basal leaves short petiolate. Calyx 2-toothed. Corolla yellow, 2–2.5 cm; galea teeth subulate. Fl. May.

• SC Guizhou.

89. *Pedicularis thamnophila* (Handel-Mazzetti) H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 339. 1948.

灌丛马先蒿 *guan cong ma xian hao*
Pedicularis rex C. B. Clarke ex Maximowicz var. *thamnophila* Handel-Mazzetti, Symb. Sin. 7: 854. 1936.
Herbs perennial, to 20–60 cm tall, drying black. Roots ± fleshy. Stems long branched throughout entire length or near base only; branches opposite or in whorls of 3, with 4 lines of glandular hairs. Leaves mostly in whorls of 3, sometimes opposite or rarely in 4's; petiole to 3.5 cm, pubescent, usually not enlarged and connate; leaf blade oblong or linear-oblong, ca. 1 cm × 2–5 mm, pinnatisect; segments 9–12 pairs, narrowly lanceolate, pinnatipartite, incised-dentate. Inflorescences spicate; bracts leaflike, bases enlarged, connate, cupular, 1–1.5 cm high. Calyx 7–8 mm, membranous, glabrous, cleft anteriorly to 1/2 as long as tube; lobes rounded. Corolla yellow, 2–2.5 cm, pubescent; tube ca. 2 × as long as calyx; galea erect, bowed apically, ca. as long as tube,

with 2 marginal teeth; lower lip 7–8 mm, ciliate. Filaments pubescent. Fl. Jun–Jul, fr. Aug.

• *Picea* forests, alpine meadows, meadows of canopy gaps in *Abies* forests; 3200–4000 m. SW and W Sichuan, SE Xizang, NW Yunnan.

- 1a. Plants more than 20 cm tall; stems long branched throughout entire length; leaves ca. 5 cm wide 89a. subsp. *thamnophila*
1b. Plants barely 15 cm tall; stems long branched near base only; leaves barely 2 cm wide 89b. subsp. *cupuliformis*

89a. *Pedicularis thamnophila* subsp. *thamnophila*
灌丛马先蒿(原亚种) *guan cong ma xian hao* (yuan ya zhong)

Plants more than 20 cm tall. Stems long branched throughout entire length. Leaves ca. 5 cm wide. Fl. Jun–Jul.

• *Picea* forests, alpine meadows; 3200–3500 m. SW Sichuan, SE Xizang, NW Yunnan

89b. *Pedicularis thamnophila* subsp. *cupuliformis* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 113. 1963.

杯状灌丛马先蒿 *bei zhuang guan cong ma xian hao*
Pedicularis cupuliformis H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 340. 1948.

Plants low, barely 15 cm tall. Stems long branched near base only. Leaves barely 2 cm wide. Fl. Jul.

• Meadows of canopy gaps in *Abies* forests; ca. 4000 m. W Sichuan.

41. Ser. *Cyathophylloides* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 257. 1948.

拟斗叶系 *ni dou ye xi*

Stems erect, branched basally or unbranched. Leaves in whorls of 3 or 4, pinnatisect; bases of petioles and bracts connate, greatly dilated, cupular. Calyx slightly cleft anteriorly; lobes 2, serrate. Corolla tube ca. 2 × as long as calyx; galea navicular, expanded apically, indistinctly beaked, apex toothless to very obscurely 1-toothed.

• One species: endemic to China.

90. *Pedicularis cyathophylloides* H. Limpricht, Repert. Spec. Nov. Regni Veg. 18: 243. 1922.

拟斗叶马先蒿 *ni dou ye ma xian hao*

Herbs perennial. Stems erect, pubescent. Leaves in whorls of 3 or 4; petiole bases enlarged, connate, cupular; leaf blade long ovate or broadly lanceolate, sparsely pubescent, abaxially ciliate along midvein, pinnatisect; segments 10 pairs, linear, incised-dentate. Flower whorls few, lax; bracts leaflike, base enlarged, connate. Calyx cylindrical, ca. 1.1 cm, pubescent; lobes 2,

ovate-lanceolate, serrate. Corolla pink to rose, ca. 3 cm; tube slender; galea erect basally, rounded and expanded apically, finely pubescent, apex slightly protruding, pointing outward, obscurely 2-toothed, truncate; lower lip slightly longer than galea. Filaments villous. Capsule compressed, ovoid, ca. 2.2 cm, apex acute. Seeds long ovoid, ca. 3 mm. Fl. and fr. Jul–Aug.

• *Picea* forests, *Betula* woodlands; 3500–3900 m. NW Sichuan, NE Xizang.

42. Ser. *Superbae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 524. 1888.

华丽系 *hua li xi*

Stems erect, branched or not, robust. Leaves in whorls of 3 or 4, pinnatisect; bases of petioles and bracts connate, greatly dilated, cupular. Calyx 2- or 5-lobed, double serrate. Corolla large; tube as long as to slightly longer than calyx; galea ± falcate, ending in a prominent beak; lower lip wide.

• Two species: endemic to China.

- 1a. Calyx less than 1/3 cleft anteriorly, 5-lobed; corolla purplish red to red; beak of galea 2–4 mm, straight 91. *P. superba*
1b. Calyx 1/3 cleft anteriorly, 2-lobed; corolla yellow; beak of galea 5–6 mm, bent downward 92. *P. connata*

91. *Pedicularis superba* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 588. 1888.

华丽马先蒿 hua li ma xian hao

Herbs perennial, 30–90 cm tall. Roots thickened, fascicled. Stems hollow, unbranched, with 4–10 cm internodes, sparsely pubescent or glabrous. Leaves in whorls of 3 or 4; bases of distal petioles and bracts greatly dilated, connate; leaf blade long elliptic, proximal 1 or 2 whorls largest, 9–13 cm, pinnatisect; segments 12–15 pairs, lanceolate or linear-lanceolate, incised-dentate. Inflorescences spicate, to 20 cm; bracts leaflike. Calyx 2.2–2.5 cm, slightly cleft anteriorly; lobes 5, unequal. Corolla purplish red to red, 3.7–5 cm; tube 1.5–3 cm, slightly enlarged and curved apically; galea erect, glabrous; beak straight, triangular, 2–4 mm; lower lip ca. as long as galea, 1.7–2 × 2.7–3.5 cm, ciliate. Filaments pubescent. Capsule compressed, ovoid, 2–2.5 × 1–1.2 cm. Fl. Jun–Aug, fr. Jul–Aug.

• Alpine meadows, open stony pastures, shaded places near forest margins; 2800–4000 m. SW Sichuan, NW Yunnan.

43. Ser. *Cyathophyllae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 257. 1948.

斗叶系 dou ye xi

Stems erect, unbranched. Leaves in whorls of 3 or 4, pinnatisect. Bases of petioles and bracts greatly dilated, connate. Calyx 2–5-lobed. Corolla tube ca. 3 × as long as calyx; galea strongly deflexed; beak curved, slender.

• Two species: endemic to China.

1a. Galea not crested; middle lobe of lower corolla lip entire; calyx 2-lobed 93. *P. cyathophylla*

1b. Galea crested; middle lobe of lower corolla lip emarginate apically; calyx 3–5-lobed 94. *P. xiangchengensis*

93. *Pedicularis cyathophylla* Franchet, Bull. Soc. Bot. France 47: 25. 1900.

斗叶马先蒿 dou ye ma xian hao

Herbs perennial, 15–55 cm tall. Roots conical, with a tuft of fibrous roots near apex. Stems pubescent. Leaves in whorls of 3 or 4, petioles and bract bases greatly dilated, connate, cupular, to 5 cm high; leaf blade long elliptic, to 14 × 4 cm, abaxially sparsely ciliate along veins, pinnatisect; segments incised-dentate.

Inflorescences spicate; bracts leaflike apically, pinnatilobate, pubescent. Calyx ca. 1.5 cm, long pubescent, deeply cleft anteriorly; lobes 2, oblong-lanceolate, 2–3 mm, incised-serrate to entire. Corolla purple-red, 5–6 cm; tube bent at a right angle apically, 3.5–5(–6) cm × 2–2.5 mm, slender; galea strongly bent, not crested; beak curved inward, ca. 7 mm; lower lip wider than long, ± enveloping galea, middle lobe entire. Filaments pubescent throughout. Fl. May–Jul, fr. Jul–Aug.

• Alpine meadows; ca. 4700 m. SW Sichuan, NW Yunnan.

94. *Pedicularis xiangchengensis* H. P. Yang, Acta Phytotax. Sin. 28: 137. 1990.

92. *Pedicularis connata* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 342. 1948.

连叶马先蒿 lian ye ma xian hao

Herbs perennial, 30–40 cm tall. Stems usually branched basally, pubescent or glabrescent. Leaves in whorls of 4, proximal ones sometimes opposite; petiole 4–5 cm, slender, bases often dilated, connate; leaf blade oblong-lanceolate, 9–10 × 2.5–3 cm, membranous, glabrous or glabrescent, pinnatisect; segments 8–11 pairs oblong-lanceolate, margin double dentate or lobed. Flowers axillary; bracts leaflike. Pedicel 1–2 mm. Calyx ca. 1.5 cm, 1/3 cleft anteriorly; lobes 2, lanceolate-oblong, 7–8 mm. Corolla yellow; tube erect, 1.7–2 cm; galea erect basally, ca. 1 cm; beak bent downward, 5–6 mm, slender; lower lip 1.3–1.8 cm; lobes 3, rounded, middle lobe smallest. 2 filaments sparsely villous and 2 glabrous or all pubescent. Fl. Jul–Aug, fr. Aug–Sep.

• Forests in valleys; 4000–4300 m. SW Sichuan, NW Yunnan.

乡城马先蒿 xiang cheng ma xian hao

Herbs perennial, 30–50 cm tall, ± drying black. Roots stout, woody. Stems 1–3, glabrescent. Basal leaves numerous, persistent; petiole 3–4 cm; leaf blade oblong to lanceolate-oblong, 8–10 cm, glabrescent, pinnatisect; segments 10–15 pairs, oblong, margin double dentate. Stem leaves in whorls of 4, similar to basal leaves but with much dilated and connate petioles. Inflorescences racemose, to 20–30 cm, interrupted; bracts leaflike, petioles strongly connate, cupular, to 2 cm high. Pedicel ca. 1 mm. Calyx oblong, ca. 1.5 cm, glabrescent, ca. 1/2 cleft anteriorly; lobes 3–5, small. Corolla purple-red, 3.5–4 cm; tube 2.5–3 cm, glabrous externally; galea nearly falcate apically, crested; beak slightly S-shaped, 6–7 mm; lower lip ca. 1.3 × 1.2 cm, ciliate, middle lobe emarginate apically. Filaments pubescent throughout. Capsule enclosed by accrescent calyx, ellipsoid-ovoid, slightly compressed, ca. 2 cm. Fl. Jul–Aug, fr. Aug–Sep.

• Gullies, forests on mountain slopes; 4100–4300 m. W Sichuan.

44. Ser. *Pedicularis*

沼生系 zhao sheng xi

Ser. *Palustres* Maximowicz.

Herbs not drying black. Stems 1 to several together, usually many branched apically. Stem leaves alternate or opposite, linear-lanceolate to ovate, pinnatifid to pinnatisect. Flowers loosely racemose. Calyx 2- or 3-lobed. Corolla tube slightly exceeding calyx; galea 1-toothed on each side at apex; lower lip ca. as long as galea.

Twelve species: arctic and subarctic regions of both hemispheres; three species in China.

This series was formerly treated as ser. *Palustres* Maximowicz that included the type of the genus *Pedicularis*, *P. sylvatica* Linnaeus.

1a. Leaves pinnatisect; calyx lobes serrate 95. *P. palustris*

1b. Leaves pinnatifid to pinnatipartite; calyx lobes entire.

2a. Leaves linear-lanceolate, segments serrate or double dentate apically 96. *P. labradorica*

2b. Leaves ovate to lanceolate-oblong, segments lobed or double dentate 97. *P. kiangsiensis*

95. *Pedicularis palustris* Linnaeus, Sp. Pl. 2: 607. 1753.

沼生马先蒿 zhao sheng ma xian hao

Herbs biennial, sometimes annual, 30–60 cm tall, subglabrous. Stems erect, usually many branched; branches rigid, alternate, rarely pseudo-opposite or pseudo-whorled. Leaves alternate or opposite, rarely whorled, short petiolate or sessile; leaf blade triangular-lanceolate to linear, subglabrous, pinnatisect; segments linear to lanceolate, pinnatifid to dentate. Inflorescences racemose; bracts leaflike. Pedicel 1–2 mm. Calyx 7–8 mm; lobes 2, crenate-serrate. Corolla purple, 1.3–2.5 cm; tube erect, nearly 2 × as long as calyx, glabrous; galea erect, with 1 subulate marginal tooth on each side at apex; lower lip slightly longer than galea, ciliate. Filaments glabrous. Capsule obliquely ovoid, apiculate. Fl. Aug, fr. Sep. $2n = 16$.

Marshy places, swampy meadows, flat bogs, ditches; ca. 400 m. NW Heilongjiang, NE Nei Mongol, N Xinjiang [Kazakhstan, N Mongolia, Russia; C and N Europe].

1a. Corolla 1.8–2.5 cm; plants biennial

..... 95a. subsp. *palustris*

1b. Corolla 1.3–1.6 cm; plants annual 95b. subsp. *karoi*

95a. *Pedicularis palustris* subsp. *palustris*

沼生马先蒿(原亚种) zhao sheng ma xian hao (yuan ya zhong)

Pedicularis erecta Gilibert.

Plants biennial. Corolla 1.8–2.5 cm.

Marshy places. N Xinjiang [Kazakhstan, N Mongolia, Russia (European part); C and N Europe].

95b. *Pedicularis palustris* subsp. *karoi* (Freyn) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 117. 1963.

卡氏沼生马先蒿 ka shi zhao sheng ma xian hao

Pedicularis karoi Freyn, Oesterr. Bot. Z. 46: 26. 1896.

Plants annual. Corolla 1.3–1.6 cm.

Swampy meadows, flat bogs, watery ditches; ca. 400 m. NW Heilongjiang, NE Nei Mongol [Mongolia, Russia].

96. *Pedicularis labradorica* Wirsing, Eclog. Bot. 2: t. 10. 1778.

拉巴拉多马先蒿 la ba la duo ma xian hao

Pedicularis euphrasioides Stephan ex Willdenow; *P.*

euphrasioides var. *labradorica* (Houttuyn) Willdenow;

P. labradorica Houttuyn, not Wirsing; *P. labradorica* Wirsing var. *simplex* Hultén.

Herbs biennial, 10–30 cm tall. Stems erect, rigid, pubescent, many branched; branches alternate, rarely opposite. Leaves alternate or ± opposite; petiole 2–10 mm; leaf blade linear-lanceolate, 1.5–6 cm, abaxially glandular pubescent, adaxially glabrous, pinnatifid or only double dentate apically; segments serrate or distal ones double dentate. Inflorescences racemose; bracts leaflike. Pedicel ca. 1 mm. Calyx 6–7 mm, ± leathery, glabrous or sparsely pubescent, deeply cleft anteriorly; lobes 3, unequal, entire. Corolla yellow, sometimes galea tinged with red or purple, 1.8–2 cm; tube ca. 1/2 as long as calyx, glabrous; galea slightly curved apically, with 1 lanceolate marginal tooth on each side at apex; lower lip nearly as long as galea, ciliate.

Filaments 2 pubescent, 2 glabrous. Capsule broadly lanceolate, apex acute. Fl. Aug, fr. Sep. $2n = 16$.

Mossy and lichenous luxuriant heath and tundra; 300–900 m. NE Nei Mongol [Arctic and subarctic Asia, Europe, and North America].

97. *Pedicularis kiangsiensis* P. C. Tsoong & S. H. Cheng, Fl. Reipubl. Popularis Sin. 68: 119. 1963.

江西马先蒿 jiang xi ma xian hao

Herbs perennial, 70–80 cm tall. Stems erect, branched or not, with 2 lines of hairs. Leaves pseudo-opposite, often alternate apically; petiole 1–2.5 cm; leaf blade long ovate to lanceolate-oblong, 2–4 cm, abaxially subglabrous, adaxially sparsely pubescent, pinnatifid to pinnatipartite; segments 4–9 pairs, oblong to obliquely triangular-ovate, margin lobed or double dentate. Inflorescences racemose, short; bracts leaflike, shorter than flowers. Pedicel ± curved, densely pubescent.

Calyx ca. 7 mm, glandular pubescent, deeply cleft anteriorly; lobes 2, equal, entire, apex acute. Corolla 2–2.2 cm; tube ca. 1.2 cm; galea falcate, 8–9 mm, with 1 fine marginal tooth on each side at apex; lower lip ca. 8 × 7 mm, ciliate. Filaments glabrous. Fl. Aug–Sep, fr. Sep–Oct.

• Rocks of sunny slopes, among shrubs on mountain summits; 1500–1700 m. Jiangxi (Wukung Shan), Zhejiang.

45. Ser. *Racemosae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 77. 1890.

总花系 zong hua xi

Ser. *Compactae* Maximowicz.

Plants ± woody. Stems usually many branched apically. Leaves alternate or sometimes opposite basally, ovate to linear-lanceolate, margin crenate and double dentate. Inflorescences racemose or flowers axillary; bracts sessile. Calyx deeply cleft anteriorly, 2-lobed. Corolla large; tube ca. 2 × as long as calyx or shorter; beak distinct.

Six species: North America, Asia, Europe; one species in China.

98. *Pedicularis resupinata* Linnaeus, Sp. Pl. 2: 608. 1753.

返顾马先蒿 fan gu ma xian hao

Herbs perennial, 30–70 cm tall, not drying black. Roots fascicled, fibrous. Stems often single, erect, many branched apically, sparsely pubescent or subglabrous. Stem leaves numerous, petiolate or uppermost sometimes sessile; petiole to 12 mm, glabrous or pubescent; leaf blade ovate to oblong-lanceolate, 2.5–5.5 × 1–2 cm, membranous to papery, glabrous or sparsely pubescent, base broadly cuneate to rounded, margin crenate or serrate, apex acuminate. Flowers axillary. Pedicel short or absent. Calyx 6–9 mm, glabrescent; lobes 2, broad, entire. Corolla pink to purple or yellowish, 2–2.5 cm; tube straight, 1.2–1.5 cm; galea falcate; beak conical, ca. 3 mm; lower lip slightly longer than galea, ciliate. Filaments 2 pubescent, 2 glabrous. Capsule obliquely oblong-lanceolate, 1.1–1.6 cm, slightly longer than calyx. Fl. Jun–Aug, fr. Jul–Sep. 2n = 16, 32.

Grassy slopes, open forests; 300–2000 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan [Japan, Kazakstan, Korea, Mongolia, Russia].

1a. Plants sparsely pubescent to glabrous.

2a. Corolla pink to purple; capsule obliquely oblong-lanceolate, slightly longer than calyx

..... 98a. subsp. *resupinata*

2b. Corolla yellowish; capsule obliquely linear-lanceolate, ca. 2 × as long as calyx or more 98b. subsp. *galeobdolon*

1b. Plants ± densely pubescent.

3a. Leaves 2.5–3.5 cm; beak of corolla short, truncate 98c. subsp. *crassicaulis*

3b. Leaves 4–5.5 cm; beak of corolla longer, conical 98d. subsp. *lasiophylla*

98a. *Pedicularis resupinata* subsp. *resupinata*

返顾马先蒿(原亚种) fan gu ma xian hao (yuan ya zhong)

Plants sparsely pubescent to glabrous. Corolla pink to purple. Capsule obliquely oblong-lanceolate, slightly longer than calyx.

Grassy slopes, open forests; 300–2000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan [Japan, Kazakstan, Korea, Mongolia, Russia].

98b. *Pedicularis resupinata* subsp. *galeobdolon* (Diels) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 121. 1963.

鼬臭返顾马先蒿 you xiu fan gu ma xian hao
Pedicularis galeobdolon Diels, Bot. Jahrb. Syst. 36 (Beibl. 82): 96. 1905; *P. resupinata* var. *galeobdolon* (Diels) H. Limpricht.

Plants glabrous. Leaves 3–5 cm. Corolla yellowish, beak ca. 2 mm. Capsule obliquely linear-lanceolate, ca. 2 × as long as calyx or more. Fl. May–Jul.

• W Hubei, S Shaanxi, E Sichuan.

98c. *Pedicularis resupinata* subsp. *crassicaulis* (Vaniot ex Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 121. 1963.

粗茎返顾马先蒿 cu jing fan gu ma xian hao

Pedicularis crassicaulis Vaniot ex Bonati, Bull. Acad. Int. Géogr. Bot. 13: 241. 1904; *P. resupinata* var. *crassicaulis* (Vaniot ex Bonati) H. Limpricht.

Plants densely pubescent. Leaves short, 2.5–3.5 cm. Corolla pink to purple; beak short, truncate. Capsule ovoid, ca. 1.2 cm. Fl. May–Jun.

• Guangxi, Guizhou, Hubei, Sichuan.

98d. *Pedicularis resupinata* subsp. *lasiophylla* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 402. 1963.

毛叶返顾马先蒿 mao ye fan gu ma xian hao

Plants densely pubescent. Leaves long, 4–5.5 cm. Corolla pink to purple; beak conical, long. Capsule obliquely oblong-lanceolate, 1.1–1.6 cm. Fl. Jul–Aug.

• Shaanxi.

46. Ser. *Carnosae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 77. 1890.

肉质系 rou zhi xi

Plants ± woody. Stems many branched apically or unbranched. Leaves alternate, ovate to linear-oblong, shallowly to deeply crenate. Inflorescences spicate, racemose, or axillary, usually short and compact; bracts sessile. Calyx 2-lobed or sometimes 4- or 5-lobed. Corolla tube less than 2 × as long as calyx; galea recurved apically; beak short, indistinct.

About 12 species: Bhutan, China, India, Nepal, Sri Lanka, Thailand; nine species in China.

1a. Calyx glabrous, lobes entire; leaves linear-lanceolate 99. *P. nigra*

1b. Calyx pubescent, lobes serrulate, serrate, or lobed; leaves ± ovate or oblong .

- 2a. Corolla 3.5–4.5 cm, tube ca. 2 cm.
 3a. Calyx lobes ca. 1/2 as long as calyx tube; lower corolla lip longer than galea; leaves petiolate 100. *P. lunglingensis*
 3b. Calyx lobes ca. 1/3 as long as calyx tube or less; lower corolla lip shorter than galea; leaves ± sessile
 101. *P. gagnepainiana*
- 2b. Corolla 2.5–3.5 cm, tube to 1.8 cm.
 4a. Leaves to 10 × 2.5 cm, petiole distinct; calyx deeply cleft anteriorly, lobes narrow ... 102. *P. veronicifolia*
 4b. Leaves to 6 × 1.5 cm, petiole short or absent; calyx scarcely cleft anteriorly, lobes wider.
 5a. Lower corolla lip wider than long or nearly equal; beak of galea 2–3 mm.
 6a. Calyx lobes 4; filaments 2 pubescent; beak of galea ca. 2 mm 106. *P. crenata*
 6b. Calyx lobes 5; filaments glabrous; beak of galea ca. 3 mm 107. *P. gyirongensis*
 5b. Lower corolla lip longer than wide; beak of galea 1–1.5 mm.
 7a. Corolla tube 0.8–1.1 cm, slightly exceeding calyx; filaments glabrous 103. *P. koueytchensis*
 7b. Corolla tube ca. 1.8 cm, 1.5–2 × as long as calyx; filaments pubescent.
 8a. Leaves ca. 4 cm × 12 mm, ca. 10-crenate on each side 104. *P. crenularis*
 8b. Leaves 2–3.5 cm × 6–9 mm, 12- or 13-crenate on each side 105. *P. tsiangii*

99. *Pedicularis nigra* (Bonati) Vaniot ex Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 130. 1904.

黑马先蒿 *hei ma xian hao*

Pedicularis collettii Prain var. *nigra* Bonati, Bull. Acad. Int. Géogr. Bot. 13: 240. 1904; *P. tongchouanensis* Bonati.

Herbs perennial, to 70 cm tall, glabrous, drying black. Rootstock fleshy. Stems erect, rigid, branched or not. Leaves alternate, occasionally pseudo-opposite; petiole to 10 cm; leaf blade often linear-lanceolate, to 7 cm × 9 mm, abaxially sparsely pubescent, adaxially densely hispidulous, long attenuate at both ends, finely double dentate. Inflorescences spicate; bracts leaflike. Calyx 1–1.5 cm, 1/2 cleft anteriorly, glabrous; lobes 2, triangular, ± entire. Corolla violet-red, 2.8–3.5 cm, sparsely fine pubescent; tube straight, to 2.2 cm; galea falcate, to 1.5 cm; beak scarcely conspicuous; lower lip to 1.4 × 1.1 cm, erose-serrulate. Filaments sparsely pubescent. Capsule obliquely lanceolate, ca. 1.4 cm × 4.5 mm, slightly longer than calyx, apex acute. Seeds black, triangular-ovoid, ca. 1.2 mm. Fl. Jul–Oct, fr. Aug–Nov.
 • Grassy slopes; 1100–2300 m. Guizhou, E and S Yunnan [N Thailand].

100. *Pedicularis lunglingensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 160. 1926.

龙陵马先蒿 *long ling ma xian hao*

Herbs perennial, 10–15 cm tall, hirsute throughout. Stems erect or ascending, often branched; branches slender, 5–7 cm. Leaf petiole 5–7 mm; leaf blade ovate-oblong to narrowly oblong, 2–3 × 0.6–1.5 cm, fleshy, base broadly cuneate, pinnatifid; segments elliptic, crenate. Flowers axillary, sessile; bracts leaflike, longer than calyx. Calyx 1–1.2 cm, cleft anteriorly, densely villous; lobes 2, ca. 1/2 as long as tube, incised-serrulate. Corolla red or purple, 3.5–4 cm, glabrous; tube straight, ca. 2 cm; galea falcate, 1–1.5 cm; beak ca. 1 mm, truncate; lower lip longer than galea, to 1.6 cm,

glabrous. Filaments sparsely long pubescent to subglabrous. Fl. Sep–Oct, fr. Oct–Nov.

• Grassy slopes; 1200–1500 m. S Yunnan.

101. *Pedicularis gagnepainiana* Bonati, Arch. Bot. Bull. Mens. 1: 218. 1927.

嘎氏马先蒿 *ga shi ma xian hao*

Herbs perennial, to 30 cm tall. Stems many branched at middle, densely red-brown pubescent. Leaves ± sessile, ovate-oblong, 2–4 × 1–1.5 cm, fleshy, long pubescent along midvein, entire or incised-serrulate, apex obtuse. Cymes corymbose; bracts sessile, triangular, shorter than flowers, pubescent. Calyx to 1.5 cm, fleshy, ciliate, nearly 1/2 cleft anteriorly; lobes 2, ca. 1/3 as long as tube or less, broadly ovate to rounded, double serrulate. Corolla rose, 4–4.5 cm, glabrous; tube ca. 2 cm; galea falcate, more than 2 cm; beak short; lower lip slightly shorter than galea, glabrous. Filaments sparsely pubescent. Fl. Oct, fr. Nov.

• W Guizhou.

102. *Pedicularis veronicifolia* Franchet, Bull. Soc. Bot. France 47: 30. 1900.

地黄叶马先蒿 *di huang ye ma xian hao*

Herbs perennial, to 60 cm tall. Rootstock fleshy. Stems erect, many branched or unbranched, finely pubescent or glabrescent. Leaves petiolate; leaf blade obovate to rhomboid-lanceolate, 4–10 × 1–2.5 cm, hispid on both surfaces, base long attenuate, pinnatifid or double crenate, apex rounded to attenuate. Inflorescences racemose, more than 10 cm, interrupted basally; bracts broadly ovate to oblong-ovate. Calyx ca. 1.2 cm, densely hispidulous, long pubescent along veins, deeply cleft anteriorly; lobes 2(or 3), narrow, distinctly serrulate. Corolla pale rose, 2.4–3 cm; tube 1.4–1.5 cm, glabrous; galea falcate, 1.1–1.4 cm; beak to 2 mm, truncate; lower lip ca. 1 cm. Filaments villous. Capsule obliquely lanceolate-ovoid, 1.1–1.3 cm, apex acute. Fl. Aug–Oct, fr. Sep–Nov.

• Grassy slopes, forests; 1000–2600 m. NW and SW Sichuan, E and S Yunnan.

103. *Pedicularis koueytchensis* Bonati, Arch. Bot. Bull. Mens. 1: 217. 1927.

滇东马先蒿 dian dong ma xian hao

Herbs perennial, 10–30 cm tall, not drying black.

Rootstock fleshy. Stems single, erect, branched apically or unbranched, densely woolly pubescent. Proximal leaves petiolate, distal ones sessile; petiole to 1 cm; leaf blade ovate-oblong, 2–2.5 × 0.8–1.2 cm, fleshy, densely pubescent on both surfaces, pinnatifid; segments 7–9 pairs, dentate, teeth callose. Inflorescences short racemose or spicate, 6–10-flowered; bracts 1–1.4 cm × 5–7 mm, pubescent. Pedicel short or ± absent. Calyx 1–1.1 cm, membranous, villous; lobes 2, rounded, ca. 1/4 as long as tube, serrulate. Corolla purple-red, 2–2.5 cm; tube 8–11 mm, slightly exceeding calyx; galea falcate, 1.3–1.5 cm; beak ca. 1.5 mm, erose, truncate; lower lip longer than galea, 1.3–1.4 × 1.1–1.3 cm. Filaments glabrous. Fl. Jul–Oct, fr. Sep–Oct.

• Stony mountain pastures; 2700–3400 m. E Yunnan.

104. *Pedicularis crenularis* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 48. 1949.

细波齿马先蒿 xi bo chi ma xian hao

Herbs ca. 30 cm tall. Stems single, branched apically, densely pubescent. Leaves ± sessile, linear-oblong, ca. 4 × 1.2 cm, ± fleshy, abaxially densely villous, adaxially tomentose, base rounded or subcordate, pinnatilobate; segments rounded, 10-crenate on each side, apex acute. Inflorescences spicate, 3.5–5 cm; bracts leaflike, ca. 1.5 cm × 4–6 mm, densely pubescent on both surfaces. Flowers ± dense. Calyx cylindrical, densely pubescent, deeply cleft anteriorly; lobes 2, flabellate, serrate. Corolla rose, ca. 3 cm, glabrous; tube erect, ca. 1.8 cm; galea falcate apically, ca. 1.2 cm; beak conical, barely 1 mm, apex truncate; lower lip ca. as long as galea, glabrous. Filaments sparsely long pubescent. Capsule obliquely lanceolate, ca. 1.3 cm × 4.5 mm. Fl. and fr. Oct.

• W Yunnan.

105. *Pedicularis tsiangii* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 47. 1949.

蒋氏马先蒿 jiang shi ma xian hao

Herbs ca. 35 cm tall. Stems erect, branched basally, densely pubescent. Leaves ± sessile, linear-oblong, 2–3.5 cm × 6–9 mm, ± fleshy, pubescent on both surfaces, base rounded or subcordate, 12- or 13-crenate on each side, apex acute. Inflorescences spicate, to 8 cm; bracts ovate-oblong, ca. 2 cm × 6 mm, pubescent on both surfaces, crenate. Flowers ± dense. Calyx cylindrical, ca. 1.2 cm × 3 mm, membranous, pubescent, deeply cleft anteriorly; lobes 2, flabellate, serrate. Corolla rose, ca. 3.5 cm, glabrous; tube erect, ca. 1.8 cm; galea straight basally, strongly falcate apically, ca. 1.7 cm; beak barely 1 mm, apex truncate; lower lip ca. as long as galea, glabrous. Filaments sparsely pubescent. Fl. Oct, fr. Nov.

• Open hillsides; ca. 500 m. SW Guizhou.

106. *Pedicularis crenata* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 559. 1888.

波齿马先蒿 bo chi ma xian hao

Herbs perennial, 20–35 cm tall, base ± woody, densely gray pubescent, not drying black. Stems erect, leafy, not or sometimes 2- or 3-branched; branches forked or ascending. Leaves short petiolate (barely 1 mm) to ± sessile; leaf blade linear-oblong, sometimes ovate-elliptic basally, 2–6 × 0.3–1.8 cm, ± fleshy, densely tomentose on both surfaces, base attenuate to subcordate-clasping, double crenate, teeth callose, apex obtuse. Inflorescences short racemose, many flowered, interrupted basally; bracts leaflike, ovate, longer than calyx. Pedicel 1.5–2 mm, hispid. Calyx ca. 1.1 cm; tube to 1.8 cm, membranous, densely villous, scarcely cleft anteriorly; lobes 2(or 4), serrate. Corolla red or purple, 2.2–2.4 cm; tube erect, exceeding calyx; galea recurved apically; beak ca. 2 mm, apex truncate; lower lip 0.9–1 × 1.1–1.4 cm, slightly longer than galea, ciliate. Filaments 2 sparsely pubescent, 2 glabrous. Fl. Aug–Sep, fr. Sep–Oct.

• Alpine meadows, grassy slopes, among limestone rocks; 2600–3400 m. NW Yunnan.

1a. Leaves 2–6 × 0.3–1.8 cm, base attenuate to rounded 106a. subsp. *crenata*

1b. Leaves ca. 2 × 0.7–0.8 cm, base subcordate-clasping or rarely broadly cuneate 106b. subsp. *crenatiformis*

106a. *Pedicularis crenata* subsp. *crenata*

波齿马先蒿(原亚种) bo chi ma xian hao (yuan ya zhong)

Leaves 2–6 × 0.3–1.8 cm, base attenuate to rounded. Fl. Aug–Sep, fr. Oct.

• Alpine meadows, grassy slopes; 2600–3000 m. NW Yunnan.

106b. *Pedicularis crenata* subsp. *crenatiformis* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 129. 1963.

全裂波齿马先蒿 quan lie bo chi ma xian hao

Pedicularis crenata var. *crenatiformis* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 159. 1926.

Leaves ca. 2 cm × 7–8 mm, base subcordate-clasping or rarely broadly cuneate. Fl. Aug, fr. Sep.

• Among limestone rocks; 3300–3400 m. NW Yunnan.

107. *Pedicularis gyirongensis* H. P. Yang, Bull. Bot. Res., Harbin 2(4): 138. 1982.

吉隆马先蒿 ji long ma xian hao

Herbs perennial, 20–30 cm tall, white villous, drying black. Stems erect, many branched; branches slender, ascending. Leaves few; petiole 1–7 mm; leaf blade obovate-oblong to elliptic-oblong, 1–4 cm, fleshy, densely villous on both surfaces, base cuneate or rounded, margin double dentate, apex obtuse.

Inflorescences racemose, elongating in fruit, many flowered; bracts leaflike, longer than calyx. Pedicel barely 4 mm, slender. Calyx cylindric, ca. 7 mm, membranous, distinctly villous, 1/3 cleft anteriorly; lobes 5, unequal, serrate. Corolla red, ca. 1.8 cm; tube erect, exceeding calyx; galea nearly bent at a right angle

apically, front very elevated, densely pubescent; beak ca. 3 mm, slender; lower lip ca. 1.2 × 1.8 cm, ciliate. Filaments glabrous. Capsule narrowly ovoid, ca. 1 cm, short apiculate. Fl. and fr. Aug–Sep.

- Mixed forests on hillsides; ca. 2400 m. S Xizang (Gyirong).

47. **Ser. Microphyllae** Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 76. 1890.

小叶系 xiao ye xi

Stems erect or branches diffuse basally, many branched or unbranched. Leaves alternate, lanceolate-oblong, pinnatifid to pinnatisect. Inflorescences racemose or subcapitate. Pedicel short. Calyx deeply cleft anteriorly; lobes (3 or)5, equal, serrate. Corolla tube ca. 2 × as long as calyx; galea curved; beak short or obscure.

Five species: China, India, Laos, Vietnam; three species in China.

1a. Leaves 1- or 2-pinnatisect, segments pinnatifid, lanceolate-oblong to linear-lanceolate; galea long, apex with

an obscure beak; pedicels barely 1 mm 108. *P. tenuisecta*

1b. Leaves 1-pinnatisect or pinnatifid, segments ovate to oblong, crenate to pinnatifid; galea shorter, apex with a

conspicuous beak; pedicels 3–6 mm.

2a. Corolla 1.8–2.5 cm; beak of galea ca. 1.5 mm; lower lip glabrous 109. *P. henryi*

2b. Corolla 2.5–3 cm; beak of galea ca. 3 mm; lower lip sparsely ciliate 110. *P. labordei*

108. *Pedicularis tenuisecta* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 558. 1888.

纤裂马先蒿 xian lie ma xian hao

Herbs perennial, 30–60 cm tall, drying black. Stems 1 to several, erect, rigid, leafy, sometimes many branched, densely pubescent. Leaves sessile, ovate-elliptic to lanceolate-oblong, 1–3 cm × 3–15 mm, pubescent on both surfaces, 1- or 2-pinnatisect; segments ca. 10 pairs, lanceolate-oblong to linear-lanceolate, pinnatifid. Inflorescences racemose, to 20 cm, many flowered; bracts leaflike, longer than calyx, shorter than flowers. Pedicel barely 1 mm. Calyx ovoid, 6–9 mm, deeply cleft anteriorly, sparsely pubescent; lobes 5, serrate. Corolla purple-red, 1.5–2.4 cm; tube slightly bent basally, ca. 2 × as long as calyx tube, expanded apically; galea curved at middle, apex obtuse or truncate; beak obscure; lower lip shorter than galea, to 1.1 cm. Filaments sparsely villous. Capsule obliquely lanceolate-ovoid, ca. 1.1 cm × 4.5 mm. Fl. Aug–Sep, fr. Sep–Nov.

Alpine meadows in coniferous forests; 1500–3700 m. W Guizhou, SW Sichuan, NW Yunnan [Laos].

109. *Pedicularis henryi* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 560. 1888.

亨氏马先蒿 heng shi ma xian hao

Herbs perennial, 16–35 cm tall, drying black. Stems ascending, often several, ± diffuse at base, leafy, densely rust colored pubescent. Leaf petiole 0.5–1.5 cm, slender, pubescent; leaf blade oblong-lanceolate to linear-oblong, 1.5–3.4 cm × 5–8 mm, papery, pubescent on both surfaces, 1-pinnatisect; segments 6–12 pairs, oblong to ovate, dentate, teeth white and callose. Inflorescences racemose, to 20 cm, often interrupted

basally. Pedicel 3–5 mm, slender, densely pubescent. Calyx to 8 mm, 1/2–2/3 cleft anteriorly; lobes (3 or)5, unequal, pubescent, serrate. Corolla purplish red, 1.8–2.5 cm; tube straight, 0.9–1.3 cm; galea curved apically; beak ca. 1.5 mm, apex shallowly 2-cleft; lower lip ca. as long as or slightly longer than galea, glabrous. Filaments densely villous. Capsule obliquely lanceolate-ovoid, to 1.6 cm × 4.5 mm, short apiculate. Fl. May–Sep, fr. Aug–Nov.

• Open mountain slopes, meadows, open forests; 400–1400 m. N Guangdong, NW Guangxi, W Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Yunnan, Zhejiang [Laos, Vietnam].

110. *Pedicularis labordei* Vaniot ex Bonati, Bull. Acad. Int. Géogr. Bot. 13: 242. 1904.

拉氏马先蒿 la shi ma xian hao

Pedicularis stapfii Bonati.

Herbs perennial. Stems procumbent to ascending, numerous, many branched, pubescent. Leaves alternate, sometimes ± opposite; petiole 5–10 mm, densely long white pubescent; leaf blade oblong, 2–4.5 cm, pubescent on both surfaces, pinnatifid or sometimes 1-pinnatisect; segments 5–8 pairs, ovate-lanceolate to triangular-ovate, pinnatifid or incised-double dentate. Inflorescences subcapitate, 2.5–3 cm; bracts leaflike, shorter than flowers. Pedicel 5–6 mm, slender, long pubescent. Calyx 1–1.2 cm, 1/2 cleft anteriorly, densely villous along veins; lobes 5, unequal to ± equal, flabellate, serrate. Corolla purple-red, 2.5–3 cm; tube slightly curved at middle, ca. 1.5 cm, expanded apically; galea nearly rectangularly bent apically, front elevated; beak ca. 3 mm; lower lip ca. 1 × 1.4 cm, sparsely ciliate. Filaments long pubescent. Capsule obliquely narrowly ovoid, ca. 1.1 cm × 5 mm, slightly exceeding calyx, apiculate. Fl. Jul–Sep, fr. Aug–Oct.

- Alpine meadows; 2800–3500 m. NW Guizhou, SW Sichuan, E and NW Yunnan.

48. Ser. Polyphyllatae Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 121. 1921.

多叶系 duo ye xi

Stems erect or somewhat prostrate, usually many branched. Stem leaves alternate or sometimes opposite, many, short petiolate, ovate to oblong, pinnatifid to pinnatisect. Inflorescences short racemose or capitate. Pedicel well developed. Calyx deeply cleft anteriorly, (3 or)5-lobed. Corolla tube ca. as long as or slightly longer than calyx, straight; galea often dentate; beak slender.

- Five species: endemic to China.

1a. Corolla tube 1.5–1.7 cm.

2a. Galea not marginally toothed; calyx more than 1/2 cleft anteriorly; filaments glabrous . 114. *P. limprichtiana*

2b. Galea marginally 2-toothed; calyx shallowly cleft anteriorly; filaments pubescent 115. *P. kariensis*

1b. Corolla tube less than 1 cm.

3a. Beak of galea bent upward; middle lobe of lower corolla lip rounded, apex not emarginate; leaves pinnatifid

..... 111. *P. pinetorum*

3b. Beak of galea straight or bent downward; middle lobe of lower corolla lip often ovate, apex emarginate;

leaves pinnatifid to pinnatifid.

4a. Leaf segments 5–11 pairs; filaments villous 112. *P. gruina*

4b. Leaf segments 4 or 5 pairs; filaments 2 densely pubescent 113. *P. stadlmanniana*

111. *Pedicularis pinetorum* Handel-Mazzetti, Symb. Sin. 7: 861. 1936.

松林马先蒿 song lin ma xian hao

Herbs perennial, 21–35 cm tall. Roots fascicled, fleshy. Stems single, long white pubescent. Leaves alternate, ± forming a basal rosette; petiole to 1.3 cm, distal ones ± sessile; leaf blade elliptic or oblong, 2–5.5 cm × 5–14 mm, sparsely long pubescent on both surfaces, pinnatifid; segments 6–9 pairs, callose-serrate. Inflorescences racemose, to 18 cm, interrupted basally; bracts leaflike, more than 1 cm apically. Pedicel barely 5 mm, slender. Calyx campanulate, ca. 1 cm; lobes 5, unequal, serrate. Corolla red, 1.6–1.8 cm; tube ca. as long as calyx, glabrous; galea slightly falcate, glandular; beak bent upward, ca. 5 mm, marginally 2-toothed; lower lip ca. 1 × 2 cm, middle lobe rounded, apex not emarginate. Filaments sparsely pubescent apically. Fl. Aug, fr. Sep–Oct.

- *Pinus* forests; 2500–2800 m. NW Yunnan.

112. *Pedicularis gruina* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 536. 1888.

鹤首马先蒿 he shou ma xian hao

Herbs perennial, 15–40 cm tall, drying black, sparsely to densely pubescent. Stems often several, usually many branched; branches erect or procumbent basally, sparsely pubescent. Leaves alternate; petiole short; leaf blade ± ovate-oblong, to 2 cm × 8 mm, pubescent on both surfaces, pinnatifid to pinnatifid; segments 5–11 pairs, oblong, incised-double dentate, teeth callose. Inflorescences short racemose or subcapitate to long racemose. Pedicel 0.5–1.6 cm, slender, pubescent. Calyx 7–10 mm, 1/3–1/2 cleft anteriorly; lobes 5, unequal, densely rust colored pubescent, serrate. Corolla red to purplish red, 1.5–2 cm; tube erect, 7–10 mm; galea bent at a right angle apically, shaped like ibis head, dentate or protuberant on each side of margin;

beak filiform, ca. 5 mm; lower lip longer than galea, ca. 1 × 1.6 cm, middle lobe smaller than lateral lobes, apex emarginate. Filaments densely villous. Capsule ovoid, 1–1.2 cm × 5–6 mm, apex acute. Fl. Jul–Oct, fr. Sep–Oct.

- Alpine meadows, mixed forests, damp soil by gully margins, mountainsides; 2600–3000 m. NW Yunnan.

1a. Leaves and flowers densely arranged; inflorescence longer, racemose 112c. subsp. *polyphylla*

1b. Leaves and flowers ± laxly arranged; inflorescences short racemose or subcapitate.

2a. Plants sparsely pubescent; leaves to 2 × 0.8 cm, pinnatifid to pinnatisect 112a. subsp. *gruina*

2b. Plants densely pubescent; leaves to 10 × 3.3 cm, pinnatifid 112b. subsp. *pilosa*

112a. *Pedicularis gruina* subsp. *gruina*

鹤首马先蒿(原亚种) he shou ma xian hao (yuan ya zhong)

Pedicularis gruina var. *laxiflora* Franchet.

Plants sparsely pubescent. Leaves ± laxly arranged, to 2 cm × 8 mm, pinnatifid to pinnatisect. Inflorescences short racemose or subcapitate, ± laxly arranged.

- Alpine meadows, mixed forests, damp soil by gully margins; 2600–3000 m. NW Yunnan.

112b. *Pedicularis gruina* subsp. *pilosa* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 136. 1963.

多毛鹤首马先蒿 duo mao he shou ma xian hao

Pedicularis polyphylla Franchet ex Maximowicz var. *pilosa* Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 80. 1911; *P. gruina* var. *cinerascens* Franchet ex H. L. Li; *P. margaritae* Bonati; *P. polyphylloides* Bonati.

Plants densely pubescent. Leaves \pm laxly arranged, to 10×3.3 cm, pinnatifid. Inflorescences short racemose or subcapitate, \pm laxly arranged. Fl. Sep–Oct.

• Mountainsides; ca. 2600 m. NW Yunnan.

112c. *Pedicularis gruina* subsp. ***polyphylla*** (Franchet ex Maximowicz) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 136. 1963.

多叶鹤首马先蒿 duo ye he shou ma xian hao

Pedicularis polyphylla Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 543. 1888; *P. gruina* var. *polyphylla* (Franchet ex Maximowicz) H. L. Li.

Plants sparsely pubescent. Leaves densely arranged. Inflorescences densely arranged, long racemose, to 24 cm. Fl. Jul.

• Alpine meadows; 2800–3000 m. NW Yunnan.

Holmgren suggests that the differences between the three infra-specific taxa may be due to normal variation.

113. *Pedicularis stadlmanniana* Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 87. 1911.

施氏马先蒿 shi shi ma xian hao

Herbs low, 6–10 cm tall. Roots fibrous. Stems prostrate, several, branching basally. Leaves alternate; petiole 1–1.5 cm, densely reddish ciliate; leaf blade broadly ovate, $1.5\text{--}2 \times 1.5\text{--}2$ cm, pinnatifid; segments 4 or 5 pairs, anterior linear, posterior triangular, apex obtuse, incised-dentate. Flowers alternate; bracts leaflike. Pedicel erect, 0.5–2 cm. Calyx campanulate, 1/2 cleft anteriorly; tube membranous, white villous; lobes 5, unequal, leaflike. Corolla pale rose, ca. 1.8 cm; tube 7–8 mm, slightly exceeding calyx; galea curved apically, pubescent abaxially, marginally 2-toothed; beak filiform, ca. 7 mm; lower lip longer than galea, ciliate; middle lobe emarginate. Filaments pubescent, anterior pair more densely so. Fl. Jul, fr. Aug–Sep.

• Grassy openings in *Pinus* forests; 2400–3100 m. C and NW Yunnan.

114. *Pedicularis limprichtiana* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 62: 239. 1925.

林氏马先蒿 lin shi ma xian hao

49. Ser. *Furfuraceae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 75. 1890.

糠秕系 kang bi xi

Ser. *Talienses* H. L. Li.

Stems branched basally or unbranched, not drying black. Leaves mostly on stem, alternate, long petiolate; leaf blade often ovate or elliptic, large, pinnatifid to pinnatisect; segments few. Inflorescences laxly racemose or axillary. Calyx deeply to shallowly cleft anteriorly, (2–)5-lobed. Corolla tube ca. as long as to $2 \times$ as long as calyx; beak of galea slender.

Five species: Bhutan, China, India, Myanmar, Nepal, Sikkim; all five in China.

1a. Leaves \pm ovate or orbicular, pinnatifid to pinnatipartite.

2a. Middle lobe of lower corolla lip not emarginate apically; calyx slightly cleft anteriorly, lobes large 119. *P. pantlingii*

2b. Middle lobe of lower corolla lip emarginate apically; calyx usually deeply cleft anteriorly, lobes smaller

..... 120. *P. furfuracea*

1b. Leaves \pm oblong to lanceolate, pinnatisect to pinnatipartite.

3a. Leaf segments 3–5 pairs; filaments sparsely pubescent 116. *P. taliensis*

3b. Leaf segments 5–10 pairs; all filaments glabrous or 2 pubescent.

Herbs perennial, 8–20 cm tall. Stems 1 to several, central stem erect, outer stems usually procumbent to ascending, longer, often long branched, white pubescent. Leaves alternate or sometimes proximal ones opposite; petiole 3–8 mm, pubescent; leaf blade oblong, $1.5\text{--}5$ cm \times $4\text{--}8$ mm, abaxially densely pubescent along veins, adaxially sparsely pubescent, pinnatipartite; segments 8–12 pairs, oblong, incised-dentate. Inflorescences subcapitate, remotely axillary; bracts leaflike. Pedicel ca. 8 mm, slender. Calyx tube ca. 8 mm, more than 1/2 cleft anteriorly; lobes (3 or)5, leaflike. Corolla rose, glabrous; tube ca. 1.5 cm, expanded apically; galea ca. 5 mm, curved at 40° , lacking marginal teeth; beak bent downward, filiform, ca. 4 mm; lower lip ca. 8 mm \times 1.5 cm, sparsely ciliate, middle lobe apex emarginate. Filaments glabrous. Capsule narrowly ovoid, ca. as long as calyx, apex acuminate. Fl. Aug–Sep, fr. Sep–Oct.

• Stony meadows, margins of bamboo groves; 2100–3400 m. SW Sichuan, NE Yunnan.

115. *Pedicularis kariensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 120. 1921.

卡里马先蒿 ka li ma xian hao

Herbs perennial, 7–8 cm tall. Roots clavate, very elongated. Stems flexuous, stout, angled, woolly, branched. Basal leaves withering early. Stem leaves few, alternate; petiole ca. 1 mm, villous; leaf blade ovate-oblong, $2.5\text{--}3 \times$ ca. 1.5 cm, 2-pinnatipartite; segments 3 or 4 pairs, alternate, incised-dentate. Inflorescences capitate, axillary. Pedicel 1–2 mm. Calyx cylindric, shallowly cleft anteriorly, membranous; lobes 5, 3–4 mm, unequal, posterior one sublinear and entire, lateral lobes flabellate, deeply serrate. Corolla deep rose, ca. 2.5 cm; tube curved, 1.5–1.7 cm, expanded apically, externally glabrous; galea falcate, marginally 1-toothed on each side, glabrous abaxially; beak straight; lower lip ca. $2 \times$ 2.5 cm, ciliate. Filaments long pubescent. Fl. Aug, fr. Sep.

• Open moist stony pastures; 3900–4100 m. NW Yunnan.

- 4a. Calyx 1/2–1/3 cleft anteriorly; lower corolla lip ciliate; galea without auriculate protuberance on each side of margin; all filaments glabrous 117. *P. microcalyx*
- 4b. Calyx slightly cleft anteriorly; lower corolla lip not ciliate; galea with auriculate protuberance on each side of margin; filaments 2 pubescent 118. *P. hemsleyana*

116. *Pedicularis taliensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 87. 1911.
大理马先蒿 da li ma xian hao

Herbs perennial, 15–20 cm tall. Main root stout. Stems soft, erect or ascending, single to several, glabrous or with lines of hairs. Basal leaves withering early. Stem leaves alternate, glabrous; petiole 4–10 mm; leaf blade ovate-oblong, ca. 2 × 1.5 cm, pinnatisect; segments 3–5 pairs, widely spaced, linear-oblong, pinnatifid, dentate, teeth callose. Flowers solitary in leaf axils, widely spaced. Pedicel erect, ca. 2 mm. Calyx campanulate, 3–4 mm, villous, not reticulate, slightly cleft anteriorly; lobes 5–7, triangular, small, sometimes obscure, entire, or the posterior lobe 2- or 3-toothed. Corolla pale rose, ca. 1 cm; tube erect, slightly longer than calyx, expanded apically; galea bent at a right angle apically, pubescent abaxially; beak ± bent downward, ca. 3 mm; lower lip ca. as long as galea, long ciliate, middle lobe hoodlike apically. Filaments sparsely pubescent. Capsule prism-shaped, 2–2.5 × as long as calyx. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows, margins of *Pinus* forests; 2700–3400 m. NW Yunnan.

117. *Pedicularis microcalyx* J. D. Hooker, Fl. Brit. India 4: 315. 1884.
小萼马先蒿 xiao e ma xian hao

Herbs perennial, 10–40 cm tall. Stems slender and flexuous, glabrous or with 2 lines of hairs, branched basally or unbranched. Basal leaves few, withering early; petiole 6–8 cm. Stem leaves few, alternate; petiole 1.5–3 cm; leaf blade lanceolate, 2.5–6 × 1–1.5 cm, abaxially scurfy, adaxially glabrous, pinnatipartite and pinnatisect basally; segments 8–10 pairs, oblong-lanceolate, pinnatifid and dentate. Inflorescences racemose; bracts leaflike. Pedicel 1–10 mm. Calyx campanulate, ca. 5.5 mm, membranous, 1/3–1/2 cleft anteriorly; lobes 5, unequal. Corolla purplish red; tube 6–9 mm, ca. 2 × as long as calyx; galea bent at a right angle apically, lacking auriculate protuberance at margin; beak bent slightly downward, ca. 5.5 mm; lower lip ciliate. Filaments glabrous. Capsule lanceolate, more than 2 × as long as calyx, apex acute. Fl. Jun–Aug, fr. Jul–Aug.

3700–4500 m. S Xizang [Bhutan, India, Nepal, Sikkim].

118. *Pedicularis hemsleyana* Prain, Hooker's Icon. Pl. 23: t. 2210. 1892.

汉姆氏马先蒿 han mu shi ma xian hao

Herbs perennial, ca. 45 cm tall, glabrous. Stems erect or ± ascending. Leaves few; basal leaves withering early. Stem leaves alternate; petiole 1.5–3 cm; leaf blade ovate-oblong, 6–8 cm, abaxially scurfy, adaxially glabrous, pinnatipartite to pinnatisect; segments 5–8 pairs, oblong, margin double dentate. Inflorescences racemose, lax; bracts leaflike. Pedicel ca. 3 mm. Calyx narrowly campanulate, ca. 4.5 × 2.25 mm, membranous, slightly cleft anteriorly; lobes 5, unequal. Corolla purplish red; tube erect, 5–6 mm, ca. 2 × as long as calyx tube, expanded apically; galea bent at a right angle apically, with auriculate protuberance on each side of margin; beak straight or sometimes decurved, ca. 4 mm; lower lip ca. 7 × 7.5 mm, not ciliate. Filaments 2 pubescent, 2 glabrous.

• 2900–4000 m. W Sichuan.

119. *Pedicularis pantlingii* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 273. 1889.

潘氏马先蒿 pan shi ma xian hao

Herbs perennial, to 30–60 cm tall. Stems often several, densely pubescent apically, branched apically or unbranched; branches slender, pubescent. Leaves alternate; petiole 1–6 cm, pubescent; leaf blade ovate or triangular-ovate, sometimes orbicular, 2.5–5 × 1.5–3 cm, abaxially white scurfy, adaxially sparsely pubescent, pinnatifid to pinnatipartite; segments 3–5 pairs, ovate to triangular-ovate, dentate. Inflorescences racemose, interrupted basally; bracts leaflike. Pedicel 1.5–3 mm, elongating in fruit. Calyx campanulate, 6–8 mm, slightly cleft anteriorly, yellow pubescent; lobes 5, unequal or ± equal in size, large. Corolla pale purple or pink, to ca. 1.7 cm; tube ca. 8 mm, ca. as long as or longer than calyx, slightly expanded apically; galea bent at a right angle apically; beak 5–6 mm; lower lip ciliate or glabrous, middle lobe rounded or triangular. Filaments 2 sparsely pubescent, 2 glabrous. Capsule triangular-lanceolate, 1.5–2 cm. Seeds ovoid, ca. 1.5 mm. Fl. Jul–Aug, fr. Aug–Sep.

Wet boggy places, wet banks in dense mixed forests, alpine meadows; 3500–4200 m. S and SE Xizang, NW Yunnan [Bhutan, India (Darjeeling), Myanmar, Nepal, Sikkim].

- 1a. Plants to 30–60 cm tall; leaves 2.5–5 cm; corolla ca. 1.7 cm; calyx lobes unequal; lower corolla lip ciliate, middle lobe rounded 119a. subsp. *pantlingii*
- 1b. Plants barely 30–35 cm tall; leaves ca. 2 cm; corolla barely 1.2 cm; calyx lobes ± equal;

lower corolla lip not ciliate, middle lobe triangular 119b. subsp. *chimiliensis*

119a. *Pedicularis pantlingii* subsp. *pantlingii*

潘氏马先蒿(原亚种) pan shi ma xian hao (yuan ya zhong)

Pedicularis furfuracea Wallich var. *integrifolia* J. D. Hooker.

Plants to 30–60 cm tall. Leaves 2.5–5 cm, abaxially white scurfy, adaxially pubescent. Calyx lobes unequal. Corolla ca. 1.7 cm; lower lip ciliate, middle lobe rounded. Capsule triangular-lanceolate, 1.8–2 cm.

Wet boggy places, wet banks in dense mixed forests; 3500–4200 m. S and SE Xizang, NW Yunnan [Bhutan, India (Darjeeling), Nepal, Sikkim].

Plants apparently identical to subsp. *pantlingii* but with capsules ca. 1.5 cm and leaves \pm glabrous have been referred to as *Pedicularis pantlingii* subsp. *brachycarpa* P. C. Tsoong (Fl. Reipubl. Popularis Sin. 68: 143. 1963); however, the name is invalid because it lacks a Latin description. Since the minor differences in capsular length and indumentum may be related to growing conditions, further study is required.

119b. *Pedicularis pantlingii* subsp. *chimiliensis* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 142. 1963.

缅甸潘氏马先蒿 mian dian pan shi ma xian hao

Pedicularis pantlingii var. *chimiliensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 125. 1921.

Plants 30–35 cm tall. Leaves ca. 2 cm. Calyx lobes \pm equal. Corolla barely 1.2 cm; lower lip not ciliate, middle lobe triangular.

NW Yunnan [Myanmar].

120. *Pedicularis furfuracea* Wallich ex Benth, Scroph. Ind. 53. 1835.

康砒马先蒿 kang bi ma xian hao

Herbs perennial, 6–45 cm tall. Stems branched at base; branches widely spaced, ascending, long, pubescent. Leaves alternate, few; petiole 1.5–4 cm, slender, pubescent; leaf blade oblong-ovate to ovate, 2.5–6 \times 1.5–4 cm, abaxially sparsely pubescent and densely white scurfy, adaxially sparsely pubescent or subglabrous, sometimes white scurfy, pinnatipartite; segments 4–6 pairs, ovate to lanceolate, dentate. Inflorescences laxly racemose; bracts leaflike, longer than flowers. Pedicel 1–3 mm, subglabrous. Calyx oblique ovate, 6–7 mm, membranous, 2/3 cleft anteriorly, densely white pubescent; lobes 5, 0.3–1.5 mm. Corolla purplish red; tube ca. 6 mm, glabrous, expanded apically; galea bent at a right angle apically; beak ca. 5 mm; lower lip longer than galea, middle lobe oblong, apex emarginate. Filaments 2 sparsely pubescent, 2 glabrous. Capsule lanceolate, 1–1.5 cm. Seeds ovoid, ca. 2 mm. Fl. Jun–Jul, fr. Jul–Aug. $2n = 16$.

Damp stony ground, moist stream beds; 3500–4000 m. S Xizang [Bhutan, India (Darjeeling), C and E Nepal, Sikkim].

50. Ser. *Salicifoliae* Bonati, Bull. Soc. Bot. Genève, Sér. 2, 15: 112. 1923.

柳叶系 liu ye xi

Stems erect, branched or not. Leaves opposite, lanceolate to linear, margin entire or obscurely crenate. Inflorescences spicate. Calyx lobes 5, \pm equal or sometimes unequal, entire. Corolla tube slightly longer than calyx; galea short, toothless, beakless.

• One species: endemic to China.

121. *Pedicularis salicifolia* Bonati, Bull. Soc. Bot. Genève, Sér. 2, 15: 112. 1923.

柳叶马先蒿 liu ye ma xian hao

Herbs annual, 40–60 cm tall, drying black. Roots fibrous, fascicled. Stems erect, many branched or sometimes unbranched, glabrescent. Leaves sessile, lanceolate to linear, 2–5 cm \times 3–10 mm, fleshy, shiny, sparsely long ciliate basally, \pm entire, apex acute. Inflorescences 4–10 cm; bracts ciliate, proximal ones linear, longer than flowers, middle and distal ones ovate,

shorter than flowers. Calyx 1–1.2 cm, membranous, woolly pubescent; lobes 5, unequal, triangular-lanceolate to triangular, entire, posterior one smallest. Corolla dark rose, 2.2–2.4 cm, glabrous; tube erect, 1.5–1.6 cm; galea 7–8 mm, apex truncate; lower lip 8–10 mm, middle lobe elliptic-ovate, ca. 4 mm, smaller than lateral pair. Filaments villous toward both ends; anthers apiculate. Capsule enclosed by calyx, ovoid, apex acuminate. Fl. and fr. Jul–Sep.

• Open stony pastures, forest margins; 900–3500 m. NW Yunnan.

51. Ser. *Rigidae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 86. 1890.

坚挺系 jian ting xi

Ser. *Platyrrhynchae* Maximowicz.

Herbs drying black. Stems erect, rigid, usually branched apically. Leaves in whorls of 3 or 4, lanceolate to linear or oblong, pinnatifid to pinnatisect. Inflorescences racemose or spicate. Calyx lobes 5, triangular or lanceolate, entire. Corolla tube 2–3 \times as long as calyx; galea beakless, with 1 marginal tooth on each side; beak short.

Six species: China, Myanmar, Thailand; four species in China.

1a. Leaves pinnatisect, segments linear 125. *P. rigidiformis*

1b. Leaves pinnatifid, to nearly entire, segments wider than long.

- 2a. Corolla tube ca. 3 × as long as calyx; posterior filaments sparsely pubescent 122. *P. comptoniifolia*
 2b. Corolla tube ca. 2 × as long as calyx; all or 2 filaments glabrous.
 3a. Flowers short pedicellate; inflorescences ± compactly arranged racemes 123. *P. rigida*
 3b. Flowers sessile; inflorescences ± interrupted spikes 124. *P. mairei*

122. *Pedicularis comptoniifolia* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 586. 1888.

康泊东叶马先蒿 kang bo dong ye ma xian hao
 Herbs perennial, to 60 cm tall, drying black. Stems glabrous or slightly pubescent, usually branched apically, branches in whorls of 3 or 4. Leaves in whorls of 4; petiole ca. 3 mm; leaf blade linear, to 5 cm × 7 mm, leathery, pinnatifid; segments rounded, wider than long, margin double dentate. Inflorescences racemose, many flowered, usually interrupted; bracts leaflike, longer than calyx. Calyx campanulate, ca. 6 mm; lobes 5, triangular, short, long ciliate, entire. Corolla dark red, ca. 2 cm; tube slightly bent basally, ca. 3 × as long as calyx, expanded apically; galea terminating in a short and wide beaklike apex, with 1 short marginal tooth on each side; lower lip slightly longer than galea, middle lobe slightly obovate, much smaller than lateral pair, ± projecting. Posterior 2 filaments sparsely pubescent. Fl. Jul–Sep, fr. Sep–Dec.

Open dry pastures, meadows; 2400–3000 m. SW Sichuan, N, NW, and S Yunnan [Myanmar].

123. *Pedicularis rigida* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 587. 1888.

坚挺马先蒿 jian ting ma xian hao
 Herbs perennial, to 60 cm tall, drying slightly black. Stems densely pubescent, short branched apically. Leaves usually in whorls of 4; petiole ca. 3 mm; leaf blade linear-oblong to narrowly lanceolate, to 4.5 cm × 8 mm, leathery, pinnatifid; segments wider than long, serrulate, teeth callose. Inflorescences racemose, many flowered, dense; bracts leaflike, longer than calyx. Pedicel short. Calyx campanulate, ca. 5 mm, membranous; lobes 5, triangular, long ciliate, entire. Corolla purplish red, ca. 1.8 cm; tube slightly decurved near calyx lobes, ca. 2 × as long as throat of calyx; galea slightly curved apically, with 1 subulate marginal tooth on each side; lower lip ca. as long as galea, middle lobe much smaller than lateral lobes, ovate, all lobes serrulate. Filaments glabrous. Capsule partly enclosed by calyx, oblong, ca. 7 mm. Fl. Aug–Dec, fr. Sep–Dec.

52. Ser. *Ikomanae* Hurusawa, J. Jap. Bot. 22: 76. 1948.

生驹氏系 sheng ju shi xi

Stems unbranched. Leaves in whorls of 4, pinnatisect or pinnatipartite. Calyx deeply cleft anteriorly; lobes 2, leaflike, large. Galea terminating in a short beak, with 1 marginal tooth on each side.

• One species: endemic to China.

126. *Pedicularis ikomai* Sasaki, Trans. Nat. Hist. Soc. Taiwan 20: 164. 1930.

生驹氏马先蒿 sheng ju shi ma xian hao

• Alpine pastures, shaded stony areas; 2500–3000 m. NW Yunnan.

124. *Pedicularis mairei* Bonati, Bull. Soc. Bot. France 57(Sess. Extraord.): 59. 1911.

梅氏马先蒿 mei shi ma xian hao

Herbs perennial, more than 60 cm tall, drying dark black. Stems many branched, glabrous or glabrescent except for 4 lines of hairs. Leaves in whorls of 3 or 4, opposite apically; petiole 0.5–2 cm; leaf blade linear-oblong to oblong, leathery, pinnatisect; segments 3–12 pairs, linear, ca. 1.2 cm × 1 mm, serrate. Inflorescences spicate, ± interrupted; bracts leaflike. Calyx cylindrical, 5–6 mm, membranous, glabrous, deeply cleft anteriorly; lobes 5, unequal, posterior one triangular, smaller than lateral pair, ciliate, entire. Corolla purple, 2–3 cm; tube decurved at throat of calyx, 8–10(–16) mm; galea ca. as long as tube, slightly crested, with 1 small marginal tooth on each side; beak short, ca. 1 mm; lower lip slightly longer than galea, middle lobe hoodlike, smaller than lateral pair, serrulate. Filaments glabrous. Fl. Jul–Sep, fr. Sep–Dec.

• Dry areas, pastures on mountainsides; 2500–2600 m. NE Yunnan.

125. *Pedicularis rigidiformis* Bonati, Arch. Bot. Bull. Mens. 1: 219. 1927.

拟坚挺马先蒿 ni jian ting ma xian hao

Stems tall, villous, few branched; branches erect, short, or barely spreading. Leaves in whorls of 4, mostly pubescent; petiole 5–10 mm, winged; basal leaves scalelike; stem leaves ovate, 1.5–2 × ca. 1 cm, pinnatisect; segments linear, crenate. Inflorescences spicate, elongated, interrupted; flowers in whorls of 4, sessile; bracts leaflike, mostly pubescent. Calyx ca. 5 mm, villous; lobes 5, lanceolate, ciliate. Corolla tube cylindrical, glabrous, slightly curved basally; galea bent at a right angle with a marginal tooth on each side; beak filiform; lower lip glabrous, middle lobe projecting, 2-cleft, serrulate, lateral lobes ovate-oblong, margin entire. 2 filaments villous, 2 glabrous. Capsule barely exceeding calyx. Seeds black, ca. 1 mm.

• Guizhou.

Herbs perennial, 25–27 cm tall. Stems 5–10, cespitose, dark brown, pubescent. Leaves in whorls of 4; petiole 3–5 mm; leaf blade elliptic to cordate, ca. 2.5 × 1.5–2 cm, pinnatipartite; segments oblique, serrate. Inflorescences racemose, dense, 3–5-flowered; bracts filabellate, ca. 1.1 cm × 4–5 mm, apex 3-cleft. Pedicel

ca. 2 mm. Calyx ± saccate, ca. 1.2 cm; lobes 2, navicular, ca. 8 × 5 mm, slightly fine pubescent along veins. Corolla purple, cylindric, ca. 3.1 × 1.2 cm; galea short beaked; lower lip rounded; middle lobe smaller than lateral lobes, barely 3 mm wide, lateral lobes rounded, large. Stamens (4 or)5; filaments densely pubescent. Fl. Aug.

• Rocky mountain slopes, near summit; ca. 3500 m. NE Taiwan.

Five stamens are an unusual number in the Scrophulariaceae.

Pedicularis nanfutashanensis T. Yamazaki (J. Jap. Bot. 37: 269. 1962) was described from Taiwan as being similar to this species; however, it is not treated here since material was not seen.

53. Ser. Plicatae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 95. 1890.

皱褶系 zhou zhe xi

Herbs low. Stems unbranched. Basal leaves long petiolate, persistent. Stem leaves in whorls of 4 or lowermost opposite, 1- or 2-pinnatisect. Inflorescences densely spicate. Calyx 1/2 cleft anteriorly, 4- or 5-lobed. Corolla yellow, large; tube decurved near base; galea rounded in front, plicate, toothless, beakless. Anthers apiculate at apex.

• Three species: endemic to China.

1a. Corolla 1.3–1.4 cm; calyx lobes ± equal, ± entire 129. *P. longistipitata*

1b. Corolla 1.6–2.6 cm; calyx lobes unequal, serrate.

2a. Calyx 9–13 mm; galea 5.5–9 mm 127. *P. plicata*

2b. Calyx ca. 8 mm; galea 11–12 mm 128. *P. giraldiana*

127. *Pedicularis plicata* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 598. 1888.

皱褶马先蒿 zhou zhe ma xian hao

Herbs perennial, more than 20 cm tall, drying slightly black. Roots fleshy. Stems 1–6, cespitose, central stem erect, outer stems ascending, black, with lines of hairs. Basal leaves persistent; petiole more than 3 cm, longer than leaf blade, usually whitish pubescent; leaf blade linear-lanceolate, 1–3 cm, abaxially glabrescent, adaxially finely pubescent along midvein, pinnatifid or barely pinnatisect; segments 6–12 pairs, ovate-oblong or ovate, pinnatifid or dentate. Stem leaves usually in whorls of 4, similar to basal ones but smaller and shorter petiolate. Inflorescences 3–7 cm, interrupted basally; bracts leaflike, ca. as long as flowers basally, lanceolate and shorter than flowers apically, sparsely to densely whitish long pubescent. Calyx 0.9–1.3 cm, barely 1/2 cleft anteriorly; lobes 5, unequal, serrate. Corolla yellow, 1.6–2.6 cm; tube decurved through anterior slit of calyx; galea slightly falcate, 5.5–9 × 2.5–3.5 mm, obscurely to conspicuously serrate crested, plicate; lower lip 7–9 mm; middle lobe rounded, producing a stipe. Filaments glabrous; anthers apiculate. Fl. Jul–Aug.

• Alpine regions, among limestone rocks, moist slopes, moist stony pastures; 2900–5000 m. Gansu, Qinghai, N Sichuan, SE Xizang, NW Yunnan.

1a. Inflorescences densely villous; leaves relatively wide 127b. subsp. *luteola*

1b. Inflorescences sparsely villous; leaves relatively narrow.

2a. Corolla 1.6–2.3 cm; galea obscurely serrate crested, slightly plicate 127a. subsp. *plicata*

2b. Corolla to 2.6 cm; galea conspicuously serrate crested, distinctly plicate 127c. subsp. *apiculata*

127a. *Pedicularis plicata* subsp. *plicata*

皱褶马先蒿(原亚种) zhou zhe ma xian hao (yuan ya zhong)

Leaves narrow. Inflorescences sparsely villous. Corolla 1.6–2.6 cm; galea obscurely serrate crested, slightly plicate.

• Alpine regions, among limestone rocks, moist slopes; 2900–5000 m. Gansu, Qinghai, N Sichuan.

127b. *Pedicularis plicata* subsp. *luteola* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 150. 1963.

浅黄皱褶马先蒿 qian huang zhou zhe ma xian hao

Pedicularis luteola H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 331. 1948.

Leaves wide. Inflorescences densely villous. Corolla ca. 2 cm; galea narrower, truncate at apex.

• Moist stony pastures; ca. 3700 m. NW Yunnan.

127c. *Pedicularis plicata* subsp. *apiculata* (P. C. Tsoong) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 150. 1963.

凸尖皱褶马先蒿 tu jian zhou zhe ma xian hao

Pedicularis plicata var. *apiculata* P. C. Tsoong, Acta Phytotax. Sin. 3: 309. 1954 (1955).

Leaves narrow. Inflorescences sparsely villous. Corolla to 2.6 cm; galea conspicuously serrate crested, distinctly plicate.

• 3500–4300 m. SE Xizang.

128. *Pedicularis giraldiana* Diels ex Bonati, Bull. Soc. Bot. France 57(Sess. Extraord.): 60. 1911.

奇氏马先蒿 qi shi ma xian hao.

Pedicularis plicata Maximowicz var. *giraldiana* (Diels) H. Limpricht.

Herbs perennial, to 25 cm tall, ± drying black. Roots ± fleshy. Stems cespitose; outer stems slender, long whitish pubescent. Leaves in whorls of 4. Basal leaf petiole long, to 3.5 cm; leaf blade to 3 cm × 9 mm, pinnatisect; segments to 9 pairs, widely spaced, linear-lanceolate, pinnatifid, incised-dentate. Stem leaves in 1 or 2 whorls, similar to basal leaves but shorter petiolate,

glabrous except adaxially pubescent along midvein. Inflorescences to 7 cm, interrupted basally; bracts leaflike basally, linear-lanceolate apically, shorter than flowers, margin double dentate. Calyx ca. 8 mm, 1/2 cleft anteriorly; lobes 4 or 5, unequal, serrate, densely long whitish pubescent along veins. Corolla yellow, 1.6–2.6 cm; tube decurved through anterior slit of calyx, ca. 1.4 cm; galea 1.1–1.2 cm, narrow, less rounded at apex, obscurely crested; lower lip ca. 1 cm, middle lobe fully projecting and stiped. Anthers apiculate. Fl. Aug, fr. Sep.

• 2900–3000 m. S Shaanxi.

129. *Pedicularis longistipitata* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 402. 1963.

长把马先蒿 *chang ba ma xian hao*

Herbs perennial, to 20 cm tall, drying slightly black.

Roots ± fleshy. Stems few, usually cespitose, central stem erect, outer stems ascending, with 4 lines of hairs.

Leaves in whorls of 4. Basal leaves densely cespitose, persistent; petiole to 3 cm, slender, sparsely pubescent; leaf blade linear-oblong, to 3.5 cm × 6–12 mm, abaxially pubescent, adaxially glabrous, pinnatisect; midvein winged; segments 9–12 pairs, ovate, pinnatifid, incised-dentate. Stem leaves in 1 whorl, similar to basal leaves but shorter petiolate. Inflorescences to 9 cm in fruit; proximal bracts leaflike, lanceolate, distal ones shorter than flowers. Pedicel to 4 mm in fruit. Calyx barely 6 mm, 1/2 cleft anteriorly, long whitish pubescent; lobes 5, slightly unequal, triangular, ± entire. Corolla 1.3–1.4 cm; tube decurved through anterior slit of calyx; galea slightly curved midway, 7–7.5 mm, slightly narrow crested; lower lip ca. 1 × 1 cm, middle lobe ovate, long stiped. Filaments glabrous; anthers apiculate. Capsule triangular-lanceolate, ca. 2 cm. Fl. Jul–Aug, fr. Aug–Sep.

• Moist slopes, river banks; 3600–3900 m. SE Xizang.

54. Ser. *Verticillatae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 524, 590. 1888.

轮叶系 *lun ye xi*

Ser. *Amoena* Prain; ser. *Pygmaea* Prain.

Herbs annual or perennial, low or tall, sometimes woody. Leaves in whorls of 3 or 4, some opposite proximally, elliptic to lanceolate, pinnatisect or rarely pinnatifid. Inflorescences spicate to racemose. Calyx lobes 5 or sometimes by fusion appearing 3. Corolla usually purple, red, or white, rarely yellow; tube decurved basally; galea toothless, beakless.

About 37 species: Europe, Asia, NW North America; 30 species in China.

1a. Galea of corolla ca. 1/2 as long as lower lip.

2a. Calyx lobes by fusion appearing 3.

3a. Leaf segments 6–9 pairs, linear-oblong to triangular-ovate; capsule triangular-lanceolate, ca. 12 × 4 mm

..... 149. *P. holocalyx*

3b. Leaf segments 9 or 10 pairs, ovate to oblong; capsule obliquely ovoid, 6–7 × 4 mm 150. *P. spicata*

2b. Calyx lobes distinctly 5.

4a. Leaves pinnatifid 159. *P. lineata*

4b. Leaves pinnatipartite to pinnatisect.

5a. Filaments glabrous.

6a. Roots single, not fleshy; calyx lobes triangular, ± entire or obscurely serrate 156. *P. brachycrania*

6b. Roots usually several, fleshy; calyx lobes ovate to oblong, pinnatifid 131. *P. roylei*

5b. Filaments 2 pubescent.

7a. Plants with clustered fibrous roots; calyx lobes linear-lanceolate 133. *P. likiangensis*

7b. Plants with a main root; calyx lobes wider, ± ovate or wider than long.

8a. Crown not scaly; calyx lobes unequal, posterior one triangular, entire 154. *P. diffusa*

8b. Crown ovate scaly; calyx lobes ± equal, serrate 155. *P. nyalamensis*

1b. Galea of corolla ca. as long as lower lip.

9a. Calyx deeply cleft anteriorly.

10a. Median or sometimes distal bracts subpalmatifid, usually with 3(–5) lobules.

11a. Plants 8 cm tall or more; calyx lobes slender, 2/7–2/5 as long as calyx tube, serrulate; corolla tube

decurved at middle; apex of galea not mucronulate 134. *P. violascens*

11b. Plants barely 3 cm tall; calyx lobes triangular, short, barely as long as 1/5 calyx tube, entire; corolla

tube decurved ± basally; apex of galea mucronulate 137. *P. pygmaea*

10b. Bracts pinnatifid or only serrate.

12a. Calyx with obscurely reticulate veins, lobes prominent.

- 13a. Plants usually woody, many branched apically 136. *P. chingii*
- 13b. Plants herbaceous, unbranched apically.
- 14a. Roots fleshy; calyx lobes distinctly lobulate 130. *P. rupicola*
- 14b. Roots not fleshy; calyx lobes without lobules.
- 15a. Leaves 2.5–4 × as long as wide, with 6–10 pairs of segments; corolla more than 10 mm; calyx lobes grouped posteriorly; anterior filaments pubescent 135. *P. verticillata*
- 15b. Leaves less than 2 × as long as wide, with 3 or 4 pairs of segments; corolla 9–10 mm; calyx lobes not grouped posteriorly; all filaments glabrous 158. *P. minutilabris*
- 12b. Calyx with distinct reticulate veins, lobes obscure.
- 16a. Proximal segments of leaf blade becoming leafletlike; corolla tube ca. 2.5 mm wide, strongly decurved basally 148. *P. confluens*
- 16b. Proximal segments of leaf blade not becoming leafletlike; corolla tube 0.8–1.5 mm wide, slightly decurved basally.
- 17a. Leaf segments oblong-triangular; calyx 5-lobed, tube 4.5–5.5 mm, 1/2 cleft anteriorly; filaments 2 sparsely pubescent 146. *P. transmorrisonensis*
- 17b. Leaf segments linear-lanceolate; calyx 3-lobed, tube ca. 3.5 mm, ca. 1/3 cleft anteriorly; filaments 2 villous 147. *P. ganpinensis*
- 9b. Calyx not or slightly cleft anteriorly.
- 18a. Plants less than 3 cm tall; calyx lobes distinctly 3-divided 143. *P. minima*
- 18b. Plants more than 3 cm tall; calyx lobes not distinctly 3-lobed.
- 19a. Corolla tube ca. 3 × as long as galea; apex of galea ovate, acute 145. *P. altifrontalis*
- 19b. Corolla tube ca. 2 × as long as galea; apex of galea rounded or truncate.
- 20a. Leaves pinnatifid.
- 21a. Lower corolla lip ciliate; calyx lobes ± triangular.
- 22a. Stems usually numerous, cespitose; lobes of lower corolla lip not rounded 152. *P. triangularidens*
- 22b. Stems single; lobes of lower corolla lip rounded 153. *P. dolichostachya*
- 21b. Lower corolla lip not ciliate; calyx lobes oblong to lanceolate.
- 23a. Stems rigid, usually unbranched; calyx ca. 4 mm, lobes ± serrate; plants pubescent 151. *P. szetschuanica*
- 23b. Stems many branched, branches slender and weak; calyx 2–5 cm, lobes entire; plants glabrous 157. *P. flaccida*
- 20b. Leaves ± pinnatisect.
- 24a. Median and distal bracts subpalmatifid, 3–5-lobulate, slender, fingerlike.
- 25a. Roots ± fleshy; leaves with linear, dentate segments; calyx lobes equal, ± entire 138. *P. anthemifolia*
- 25b. Roots ± woody; leaves with lanceolate, pinnatipartite segments; calyx lobes unequal, serrate 139. *P. kansuensis*
- 24b. Bracts pinnatifid or slightly palmatifid, lobes short and rounded.
- 26a. Filaments 2 or all 4 pubescent.
- 27a. Bracts broadly ovate; middle lobe of lower corolla lip ca. 3.5 mm wide 144. *P. tenera*
- 27b. Bracts linear-lanceolate; middle lobe of lower corolla lip ca. 2.5 mm wide.
- 28a. Calyx glabrous; galea not crested; lower corolla lip glabrous, apex of lobes not apiculate 140. *P. glabrescens*
- 28b. Calyx long ciliate; galea narrowly crested; lower corolla lip ciliate, apex of lobes apiculate 141. *P. zayuensis*
- 26b. Filaments glabrous.

- 29a. Calyx lobes ca. as long as calyx tube, ± pinnatisect apically, divisions slender 142. *P. daucifolia*
- 29b. Calyx lobes much shorter than calyx tube, barely serrate or entire.
- 30a. Calyx densely whitish villous, lobes ca. 1/3 as long as calyx, unequal, ± ovate-oblong, serrate; galea 5–8 mm 131. *P. roylei*
- 30b. Calyx glabrous, lobes ca. 1/5 as long as calyx, ± equal, triangular, ± entire; galea ca. 4 mm 132. *P. bomiensis*

130. *Pedicularis rupicola* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 599. 1888.

岩居马先蒿 *yan ju ma xian hao*

Herbs perennial, (4–)7–17(–22) cm tall, usually drying black. Roots thick, fleshy. Stems numerous, central stem erect, lateral branches erect to ascending, with lines of dense hairs. Leaves in whorls of 4. Basal leaves usually persistent; petiole to 2 cm. Stem leaf petiole short, to less than 5 mm; leaf blade ovate-oblong or oblong-lanceolate, 3–4(–7) cm × 5(–10) mm, villous, pinnatisect; segments 6–9 pairs, ± ovate, pinnatifid, dentate. Inflorescences spicate, 3–8(–12) cm, compact to lax; bracts leaflike, long ciliate. Calyx obliquely ovate, ca. 9 mm, membranous, deeply cleft anteriorly, densely hirsute or only villous along veins and apices; lobes 5, unequal, broadly ovate, distinctly lobulate and serrate. Corolla purple-red, 1.6–2 cm; tube ± bent at a right angle near base; galea slightly falcate, 4.5–6 mm, apex rounded; lower lip 5–7.5 × 7.5–10 mm, middle lobe ca. 1/2 as long as lateral lobes. Filaments glabrous. Capsule ca. 1/2 enclosed by accrescent calyx, 1.5–2.1 cm × 4.8–9 mm, apex acute to acuminate. Seeds ca. 3 mm. Fl. May–Jun, fr. Jul–Aug.

• Alpine meadows, rocky slopes; 2700–4800 m. SW Sichuan, SE Xizang, NW Yunnan.

- 1a. Plants to 4–20 cm tall; lateral branches usually ascending; inflorescences 3–8 cm, fascicles few, more compactly arranged; bracts and calyx ± densely hirsute; capsule obliquely lanceolate-ovate, 1.5–2 cm × 4.8–9 mm, apex acute 130a. subsp. *rupicola*
- 1b. Plants to 20(–22) cm tall; branches erect; inflorescences to 12 cm, fascicles numerous, widely spaced below; bracts and calyx usually glabrous except ciliate margins and apices; capsule long and narrow, ca. 2.1 cm × 6 mm, apex acuminate 130b. subsp. *zambalensis*

130a. *Pedicularis rupicola* subsp. *rupicola*

岩居马先蒿(原亚种) *yan ju ma xian hao (yuan ya zhong)*

Plants to 4–20 cm tall. Lateral branches usually ascending. Inflorescences 3–8 cm; fascicles few, compactly arranged; bracts and calyx ± densely hirsute. Corolla purple-red. Capsule obliquely lanceolate-ovoid, 1.5–2 cm × 4.8–9 mm, apex acute. Fl. May–Jun.

• Alpine meadows, rocky slopes; 2700–4800 m. SW Sichuan, SE Xizang, NW Yunnan.

This subspecies includes two forms: *f. rupicola* with a purple-red corolla and *f. flavescens* P. C. Tsoong with a yellowish white corolla.

130b. *Pedicularis rupicola* subsp. *zambalensis* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 157. 1963.

川西岩居马先蒿 *chuan xi yan ju ma xian hao*

Pedicularis rupicola var. *zambalensis* Bonati, Bull. Soc. Bot. France 55: 313. 1908.

Plants to 20(–22) cm tall. Branches erect.

Inflorescences to 12 cm, fascicles numerous, widely spaced below; bracts and calyx usually glabrous except for ciliate margins and apices. Capsule long, narrow, ca. 2.1 cm × 6 mm, apex acuminate. Fl. May–Sep.

• Alpine meadows. SW Sichuan, NW Yunnan.

131. *Pedicularis roylei* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 27: 517. 1881.

罗氏马先蒿 *luo shi ma xian hao*

Herbs perennial, (4–)7–15 cm tall, ± drying black, pubescent throughout. Roots fleshy, to 4–8 mm in diam. Stems 1 to several, erect or outer ones ascending, with lines of white hairs. Leaves in whorls of 3 or 4. Basal leaves cespitose and persistent; petiole to 3–6 cm. Stem leaves petiole short, barely 2–2.5 cm; leaf blade lanceolate-oblong to ovate-oblong, 2.5–4 cm, pinnatipartite; segments 7–12 pairs, lanceolate to oblong, incised-dentate. Inflorescences racemose, to 6 cm, usually interrupted basally; axis densely villous; bracts leaflike, proximal ones slightly longer than flowers. Pedicel ca. 2 mm. Calyx campanulate, 8–9 mm, densely white or deep purple villous, slightly cleft anteriorly; lobes 5, unequal, ± ovate-oblong, ca. 1/3 as long as calyx, serrate or pinnatifid. Corolla purple-red, 1.7–1.9(–2.5) cm; tube decurved basally, 1–1.1 cm, expanded apically; galea slightly falcate, 5–8 mm, rounded in front, margin entire; lower lip 8–9 mm, glabrous. Filaments glabrous. Capsule ovoid-lanceolate, ca. 1.2 cm, short apiculate. Seeds 1.2–1.5 mm. Fl. Jul–Aug, fr. Aug–Sep.

Moist alpine meadows, among small *Rhododendron*; 3400–5500 m. SW Sichuan, E and SE Xizang, NW Yunnan [Afghanistan, Bhutan, India, Kashmir].

- 1a. Inflorescence axis, bracts, and calyx villous with dense deep purple hairs; corolla to 2.5 cm, galea to 8 mm 131b. subsp. *megalantha*

- 1b. Inflorescence axis, bracts, and calyx without deep purple hairs; corolla 1.7–1.9 cm, galea 5–6 mm.
- 2a. Roots less than 4 mm in diam.; plants not gray pubescent throughout; basal leaves 2.5–4 cm, segments lanceolate to oblong
..... 131a. subsp. *roylei*
- 2b. Roots to 8 mm wide; plants usually gray pubescent throughout; basal leaves ca. 2 cm, segments ovate to oblong 131c. subsp. *shawii*

131a. *Pedicularis roylei* subsp. *roylei*

罗氏马先蒿(原亚种) *luo shi ma xian hao* (*yuan ya zhong*)

Plants not gray pubescent throughout. Roots slender, less than 4 mm in diam. Basal leaves 2.5–4 cm; segments lanceolate to oblong. Inflorescence axis, bracts, and calyx without deep purple hairs. Corolla 1.7–1.9 cm; galea 5–6 mm.

Moist alpine meadows, forests; 3400–5500 m. SW Sichuan, SE Xizang, NW Yunnan [Afghanistan, Bhutan, India, Kashmir].

This subspecies includes two varieties: var. *brevigaleata* P. C. Tsoong with a shorter galea ca. 1/2 as long as lower corolla lip, and var. *roylei* with a longer galea, slightly shorter than to ca. as long as lower lip.

131b. *Pedicularis roylei* subsp. *megalantha* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 402. 1963.

大花罗氏马先蒿 *da hua luo shi ma xian hao*
Inflorescence axis, bracts, and calyx densely deep purple villous. Corolla to 2.5 cm; galea, slightly shorter than to as long as lower lip, to 8 mm.

• Alpine meadows; 4800–5000 m. E Xizang.

131c. *Pedicularis roylei* subsp. *shawii* (P. C. Tsoong) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 159. 1963.

萧氏罗氏马先蒿 *xiao shi luo shi ma xian hao*
Pedicularis shawii P. C. Tsoong, Acta Phytotax. Sin. 3: 309. 1955; *P. roylei* var. *cinerascens* Marquand.

Plants usually gray pubescent throughout. Roots thickened, to 10 × 0.8 cm in diam. Basal leaves ca. 2 cm × 8 mm; segments ovate to oblong. Inflorescence axis, bracts, and calyx without deep purple hairs. Corolla 1.7–1.9 cm; galea slightly shorter than to as long as lower lip, 5–6 mm.

• Among small *Rhododendron*, alpine meadows; 4200–4800 m. E Xizang.

132. *Pedicularis bomiensis* H. P. Yang, Acta Phytotax. Sin. 18: 241. 1980.

波密马先蒿 *bo mi ma xian hao*

Herbs perennial, 30–40 cm tall, ± drying black. Roots slightly woody. Stems single, erect, dark purple, often many branched at middle. Leaves in whorls of 4; petiole 5–10 mm; leaf blade ovate to ovate-oblong, to 8 × 4.5 cm, pinnatisect; segments 5–8 pairs, ovate-oblong,

pinnatifid to pinnatifid, incised-dentate, glabrous. Inflorescences racemose, to 12 cm, lax, pubescent; proximal bracts leaflike, distal ones linear. Pedicel 1–3 mm. Calyx campanulate, ca. 5 mm, membranous, slightly cleft anteriorly, glabrous; lobes 5, ± equal, triangular, ca. 1/5 as long as calyx, ± entire. Corolla purplish rose, 1.2–1.4 cm; tube decurved near base, expanded apically; galea slightly falcate, ca. 4 mm; lower lip longer than galea, 8–9 mm wide; lobes retuse, erose, unequal, middle lobe smallest. Filaments glabrous. Capsule slightly exceeding calyx, obliquely ovoid, 6–7 mm. Fl. and fr. Jul–Aug.

• Thickets; ca. 3200 m. E Xizang.

133. *Pedicularis likiangensis* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 597. 1888.

丽江马先蒿 *li jiang ma xian hao*

Herbs perennial, (3–)9–18 cm tall, ± drying black. Roots fibrous, clustered. Stems 1 to several, central erect, outer ascending, with 4 lines of hairs. Leaves in whorls of 4. Basal leaves numerous, persistent; petiole ca. 3 cm, broadly winged, sparsely ciliate; leaf blade ovate-oblong, to elliptic-oblong, 6–12 × 3–8 mm, pinnatifid to pinnatisect; segments 4–6 pairs, ovate, pinnate, margin double dentate. Stem leaves 1 or 2 whorls, similar to basal leaves, but shorter petiolate; petiole 8–10 mm; leaf blade 0.8–2 cm × 4–10 mm. Inflorescences racemose, to 8 cm, interrupted; bracts leaflike, becoming shorter than flowers apically. Pedicel 1–2 mm. Calyx slightly cleft anteriorly, rust colored villous along veins; lobes 5, ± equal, linear-lanceolate. Corolla pink or red to pale purple-red, 1.4–1.6(–2.5) cm, tube ± bent at a right angle basally; galea 3–4 (–5.5) mm, rounded in front; lower lip ca. 8–10 mm, not ciliate but erose. Filaments 2 villous, 2 glabrous. Capsule ovoid-lanceolate, to 1.4 cm, short apiculate. Fl. Jun–Aug, fr. Sep.

• Alpine meadows, forest margins, grassy slopes; 3200–4600 m. SW Sichuan, E Xizang, NW Yunnan.

- 1a. Plants (4–)9–18 cm tall; corolla 1.4–1.6 cm, galea 3–4 mm, lower lip ca. 8 mm 133a. subsp. *likiangensis*
- 1b. Plants 3(–6) cm tall; corolla to 2.5 cm, galea ca. 5.5 mm, lower lip ca. 10 mm 133b. subsp. *pulchra*

133a. *Pedicularis likiangensis* subsp. *likiangensis*

丽江马先蒿(原亚种) *li jiang ma xian hao* (*yuan ya zhong*)

Pedicularis lineata Franchet ex Maximowicz var. *dissecta* Bonati.

Plants (4–)9–18 cm tall. Corolla 1.4–1.6 cm; galea 3–4 mm; lower lip ca. 8 mm.

• Alpine meadows, forest margins; 3200–4600 m. SW Sichuan, E Xizang, NW Yunnan.

133b. *Pedicularis likiangensis* subsp. *pulchra* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 403. 1963.

美丽丽江马先蒿 *mei li li jiang ma xian hao*

Plants barely 3(–6) cm tall. Corolla to 2.5 cm; galea ca. 5.5 mm; lower lip ca. 1 cm.

• Grassy slopes; 3800–4100 m. NW Yunnan.

134. *Pedicularis violascens* Schrenk ex Fischer & C. Meyer, Enum. Pl. Nov. 2: 22. 1842.

堇色马先蒿 jin se ma xian hao

Pedicularis tenuicalyx P. C. Tsoong.

Herbs perennial, 8–10(–30) cm tall, drying slightly black. Roots ± fleshy and fusiform. Stems 1–10, unbranched, with lines of hairs. Leaves opposite or in whorls of 3 proximally, in whorls of 4 distally. Basal leaves usually persistent; petiole 1–5 cm, narrowly winged; leaf blade lanceolate to linear-oblong, 2.4–4.4 cm × 1.4–1.4 mm, pinnatisect; segments 6–9 pairs, ovate, pinnatipartite, incised-double dentate. Stem leaves similar to basal leaves but shorter petiolate. Inflorescences 2–6 cm, interrupted basally; bracts broadly rhomboid-ovate, palmately 3–5-lobed, margin double dentate. Calyx 6–7 mm, membranous, 2/5 cleft anteriorly; lobes 5, unequal, 2/7–2/5 as long as calyx tube, slender, serrulate. Corolla purple-red, ca. 1.7 cm; tube decurved at middle, ca. 1.1 cm; galea ± falcate, rounded in front, longer than lower lip; lower lip barely 4 mm, middle lobe smallest, projecting. Anterior filament pair slightly pubescent. Capsule compressed, lanceolate-ovate, ca. 1.4 cm × 4 mm, obliquely apiculate. Seeds ca. 1.5 × 0.7 mm. Fl. Jul–Aug, fr. Aug–Sep.

Rocky mountain slopes, near summits; 4000–4300 m. N Xinjiang [Kazakstan, Kyrgyzstan].

135. *Pedicularis verticillata* Linnaeus, Sp. Pl. 2: 608. 1753.

轮叶马先蒿 lun ye ma xian hao

Herbs perennial, (5–)15–35 cm tall, not drying black. Roots ± fusiform. Stems 1 to more than 7, central erect, outer ascending, with 4 lines of hairs. Leaves usually in whorls of 4. Basal leaves numerous, persistent; petiole to ca. 3 cm, white villous; leaf blade oblong to linear-lanceolate, 2.5–3 × 1–1.2 (–1.8) cm, adaxially slightly pubescent, pinnatifid to pinnatisect; segments 6–10 pairs, linear-oblong to triangular-ovate, ± incised-dentate, teeth white and callose. Stem leaves similar to basal leaves but shorter petiolate or ± sessile and leaf blade smaller. Inflorescences racemose, usually dense; bracts leaflike, much longer than flowers basally, white pubescent. Calyx usually red, ovoid, ca. 6 mm, membranous, densely villous, deeply cleft anteriorly; lobes 3–5, unequal, when 3-lobed grouped posteriorly, serrate. Corolla purple, ca. 1.3 cm; tube bent at a right angle basally; galea slightly falcate, ca. 5 mm, rounded in front; lower lip ca. as long as galea, middle lobe much smaller than lateral pair, rounded. Anterior filament pair pubescent. Capsule lanceolate, 1–1.5 cm × 4–5 mm, apiculate. Seeds ca. 1.8 mm. Fl. Jun–Aug, fr. Jul–Sep. $2n = 12 + 0-2f$.

Mossy and lichenous tundra, alpine pastures, damp places; 2100–4400 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol,

Qinghai, Shaanxi, Shanxi, Sichuan, E Xizang [Japan, Russia; arctic highlands, Europe, NW North America].

1a. Plants pubescent throughout; corolla large; capsule wide; calyx lobes usually 5 135c. subsp. *tangutica*

1b. Plants at least partly glabrous; corolla small; capsule narrow; calyx lobes usually 3.

2a. Leaves 1–1.2 cm wide, pinnatipartite to pinnatisect, segments 1–2 mm wide 135a. subsp. *verticillata*

2b. Leaves 1.2–1.8 cm wide, less deeply pinnatifid, segments 3–4 mm wide 135b. subsp. *latisecta*

135a. *Pedicularis verticillata* subsp. *verticillata*

轮叶马先蒿(原亚种) lun ye ma xian hao (yuan ya zhong)

Pedicularis calosantha H. L. Li; *P. menziesii* Bentham; *P. sikangensis* H. L. Li; *P. stevenii* Bunge.

Plants at least partly glabrous. Leaves 1–1.2 cm wide, pinnatipartite to pinnatisect; segments 1–2 mm wide. Leaves and calyx lobes ± white, serrulate-denticulate, teeth callose. Calyx lobes usually 3. Corolla small. Capsule narrow.

Mossy and lichenous tundra, alpine pastures, damp places; 2100–4400 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, N and W Sichuan, E Xizang [Japan, Russia; arctic highlands, C and S Europe, NW North America].

135b. *Pedicularis verticillata* subsp. *latisecta* (Hultén) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 163. 1963.

宽裂轮叶马先蒿 kuan lie lun ye ma xian hao

Pedicularis verticillata var. *latisecta* Hultén, Kongl.

Svenska Vetenskapsakad. Handl. 8: 125. 1930.

Plants at least partly glabrous; Leaves 1.2–1.8 cm wide, less deeply pinnatifid; segments 3–4 mm wide. Leaves and calyx lobes ± white, serrulate-denticulate, teeth callose. Calyx lobes usually 3. Corolla small. Capsule narrow.

NE Shanxi [Europe].

135c. *Pedicularis verticillata* subsp. *tangutica* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 163. 1963.

唐古特轮叶马先蒿 tang gu te lun ye ma xian hao

Pedicularis tangutica Bonati, Bull. Soc. Bot. Genève 2: 328. 1912; *P. bonatiana* H. L. Li.

Plants pubescent throughout. Leaves and calyx lobes usually white, serrulate-denticulate, teeth callose. Calyx lobes usually 5. Corolla large. Capsule wide.

• Gansu, Nei Mongol, Qinghai, Shaanxi, Shanxi, NW Sichuan.

136. *Pedicularis chingii* Bonati, Arch. Bot. Bull. Mens. 1: 4. 1927.

秦氏马先蒿 qin shi ma xian hao

Herbs perennial, diffuse, puberulent when young, glabrescent. Stems woody basally, many branched; branches in whorls of 4, 10–20 cm, ascending. Leaves in whorls of 4; petiole ca. 3 cm basally, whitish, pubescent; leaf blade glabrous on both surfaces, pinnatisect; segments 5 or 6 pairs, linear, pinnatifid, incised-dentate. Flowers in whorls of 4; bracts linear.

Pedicel filiform, 1–4 mm. Calyx white, ovate, ca. 5 mm, membranous, pubescent, deeply cleft anteriorly; lobes 5, unequal, posterior one linear, lateral lobes triangular, ciliate. Corolla purple; tube decurved at middle, 4–5 mm; galea erect, 5–8 mm, apex truncate; lower lip longer than galea, 1–1.2 × ca. 1 cm, ciliate; lobes ovate. Filaments 2 pubescent, 2 glabrous. Capsule ca. 2 × as long as calyx, apiculate. Seeds dark, 1–2 × ca. 0.5 mm. Fl. Aug, fr. Aug–Sep.

• Woodlands; 3000–4200 m. S Gansu.

137. *Pedicularis pygmaea* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 595. 1888.

侏儒马先蒿 zhu ru ma xian hao

Herbs annual, to 3 cm tall, not drying black. Main root enlarged fusiform, to 2 mm in diam. Stems erect, unbranched, with 4 lines of hairs. Leaves in whorls of 4; petiole of basal leaves 5–7 mm, slender, membranous; leaf blade linear-oblong, ca. 1.5 cm, abaxially sparsely white pubescent, pinnatipartite to pinnatisect; segments 6–8 pairs, triangular-ovate, incised-double dentate, teeth white and callose. Inflorescences capitate, dense; bracts leaflike, villous. Calyx ovoid, ca. 4 mm, membranous, densely yellow villous along veins, relatively deeply cleft anteriorly; lobes 5, unequal, triangular, barely 1/5 as long as calyx tube, entire. Corolla purple, 9–10 mm; tube decurved near base, only slightly longer than calyx; galea slightly falcate, ca. 5.5 mm, apex mucronulate; lower lip ca. 4 × 6 mm, middle lobe rounded, smaller than lateral lobes. Filaments glabrous. Fl. Jul, fr. Aug.

• Grassy slopes, river banks; ca. 4000 m. NW Qinghai.

138. *Pedicularis anthemifolia* Fischer ex Colla, Herb. Pedan. 4: 370. 1835.

春黄菊叶马先蒿 chun huang ju ye ma xian hao
Herbs perennial, 8–30(–50) cm tall, not drying black. Roots numerous, ± fleshy. Stems 1 to several, erect, unbranched apically, glabrous or with 2–4 lines of hairs. Leaves in whorls of 4. Basal leaf petiole 3–4 cm, slender. Stem leaf petiole 3–5 mm; ± glabrescent; leaf blade ovate-oblong to oblong-lanceolate, 2.5–4 × 1–1.5 cm, glabrescent, pinnatipartite; segments 8–12 pairs, widely spaced, linear, dentate; rachis narrowly winged. Inflorescences racemose, 2–8 cm, interrupted basally; proximal bracts leaflike, shorter than flowers, other bracts 3–5-subpalmatifid-lobed. Pedicel 1–2 mm. Calyx cupular, 3–4 mm, membranous, glabrescent, slightly cleft anteriorly; lobes 5, equal, triangular-lanceolate, 2–3 mm, ± entire. Corolla purple-red, ca. 1.5 cm, tube ± decurved at middle, expanded apically, ca. 1 cm; galea slightly falcate, ca. 5 mm, rounded in front; lower lip ca. as long as galea, glabrous; lobes rounded, middle lobe smallest, apex slightly truncate or emarginate. Posterior filaments

pubescent apically; anthers acuminate at base. Fl. May–Jul, fr. Jul–Aug. $2n = 16$.

Subalpine grassy slopes; 2000–2500 m. N and W Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia (European part, Siberia)].

- 1a. Plants 8–30 cm tall; corolla relatively small 138a. subsp. *anthemifolia*
1b. Plants to 50 cm tall; corolla relatively large 138b. subsp. *elatior*

138a. *Pedicularis anthemifolia* subsp. *anthemifolia*

春黄菊叶马先蒿(原亚种) chun huang ju ye ma xian hao (yuan ya zhong)

Pedicularis amoena Adams ex Steven; *P. hulteniana* H. L. Li.

Plants 8–30 cm tall. Corolla small.

Subalpine grassy slopes; 2000–2500 m. N Xinjiang [Mongolia, Russia (European part, Siberia)].

138b. *Pedicularis anthemifolia* subsp. *elatior* (Regel) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 167. 1963.

高升春黄菊叶马先蒿 gao sheng chun huang ju ye ma xian hao

Pedicularis amoena Adams var. *elatior* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 348. 1880; *P. macrochila* Vvedensky.

Plants to 50 cm tall. Corolla large.

W Xinjiang [Kazakhstan, Kyrgyzstan].

139. *Pedicularis kansuensis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 516. 1881.

甘肃马先蒿 gan su ma xian hao

Herbs annual or biennial, 20–40(–45) cm tall, pubescent throughout, not drying black. Roots single, ± woody. Stems usually several, with 4 lines of hairs. Basal leaves persistent; petiole to 2.5 cm, densely pubescent. Stem leaves in whorls of 4, shorter petiolate; leaf blade oblong, sometimes ovate, to 3 × 1.4(–2) cm, pinnatisect; segments ca. 10 pairs, lanceolate, pinnatipartite, dentate, teeth callose. Inflorescences to 25(–30) cm, with many whorls, compact to interrupted; proximal bracts leaflike, other bracts 3-palmate. Pedicel short. Calyx ovoid, membranous, slightly cleft anteriorly; lobes 5, unequal, triangular, serrate. Corolla purple-pink to purple-red, sometimes white, ca. 1.5 cm; tube decurved near base, ca. 2 × as long as calyx, expanded apically; galea ± falcate, ca. 6 mm, usually crenulate-crested, apex slightly acute; lower lip slightly longer than galea, lobes rounded, middle lobe smallest, ± emarginate. Filaments 2 pubescent, 2 glabrous. Capsule slightly exceeding calyx, obliquely ovoid, apiculate. Fl. Jun–Aug, fr. Jul–Sep.

• Gravelly ground and grassy slopes in subalpine zone, damp grassy areas along field margins, damp slopes, valleys; 1800–4600 m. S and SW Gansu, Qinghai, W Sichuan, E, N, and NE Xizang, Yunnan.

- 1a. Plants densely white villous throughout 139d. subsp. *villosa*
1b. Plants sparsely white villous throughout.

- 2a. Plants usually less than 20 cm tall; lobes of lower corolla lip distinctly emarginate; basal leaves many; inflorescences dense
..... 139c. subsp. *kokonorica*
- 2b. Plants usually 20–40(–45) cm tall; lobes of lower corolla lip indistinctly emarginate; basal leaves fewer; inflorescences interrupted.
- 3a. Plants usually 20–40 cm tall; capsule small 139a. subsp. *kansuensis*
- 3b. Plants usually taller; capsule larger
..... 139b. subsp. *yargongensis*

139a. *Pedicularis kansuensis* subsp. *kansuensis*

甘肃马先蒿(原亚种) gan su ma xian hao (yuan ya zhong)

Pedicularis futtereri Diels ex Fütterer; *P. goniantha* Bureau & Franchet; *P. szetschuanica* Maximowicz var. *longispicata* Bonati ex H. Limpricht; *P. verticillata* Linnaeus var. *chinensis* Maximowicz.

Plants usually 20–40 cm tall, not densely villous throughout. Basal leaves few. Inflorescences interrupted. Lobes of lower corolla lip indistinctly emarginate. Capsule small.

• Gravelly ground and grassy slopes in subalpine zone, damp grassy areas along field margins, damp slopes; 1800–4600 m. S and SW Gansu, Qinghai, W Sichuan, E and NE Xizang.

This subspecies includes two forms: f. *kansuensis* with a purple-pink to purple-red corolla, and f. *albiflora* H. L. Li with a white corolla.

139b. *Pedicularis kansuensis* subsp. *yargongensis* (Bonati)

P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 168. 1963. 雅江甘肃马先蒿 ya jiang gan su ma xian hao
Pedicularis yargongensis Bonati, Bull. Soc. Bot. France 55: 312. 1908; *P. yargongensis* var. *longibracteata* Bonati.

Plants 20–40(–45) cm tall, not densely villous. Basal leaves few. Inflorescences interrupted. Lobes of lower corolla lip indistinctly emarginate. Capsule to 2 cm.

• W Sichuan, Yunnan.

139c. *Pedicularis kansuensis* subsp. *kokonorica* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 403. 1963.

青海甘肃马先蒿 qing hai gan su ma xian hao
Plants usually less than 20 cm tall, not densely villous. Basal leaves many. Inflorescences dense. Lobes of lower corolla lip distinctly emarginate. Fl. Jul.

• W Qinghai, N Xizang.

139d. *Pedicularis kansuensis* subsp. *villosa* P. C. Tsoong, Acta Phytotax. Sin. 3: 311. 1955.

厚毛甘肃马先蒿 hou mao gan su ma xian hao
Plants densely white villous throughout. Fl. and fr. Jul–Aug.

• Valleys; 3500–4400 m. E Xizang.

140. *Pedicularis glabrescens* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 317. 1948.

退毛马先蒿 tui mao ma xian hao

Herbs perennial, 10–25 cm tall, glabrescent, ± drying black. Roots slightly conical, ± woody. Stems several, ± ascending, unbranched, glabrescent. Proximal leaves opposite or in whorls of 3, distal ones in whorls of 4; petiole to 1.5 cm; leaf blade oblong-lanceolate, 2–3 × 1–1.5 cm, pinnatisect; segments 6–8 pairs, ovate to lanceolate-oblong, widely spaced and 1–3 pairs deeply cut basally, dentate; rachis winged. Inflorescences spicate, 4–9 cm, interrupted; bracts linear-lanceolate, leaflike, proximal ones longer than flowers. Pedicel erect, 2–5 mm, slender, glabrous. Calyx obliquely broadly ovate, membranous, glabrous, slightly cleft anteriorly; lobes 5, unequal, broadly ovate, serrate. Corolla purple, ca. 1.3 cm; tube decurved basally, 8–9 mm, expanded apically; galea slightly falcate apically, not crested, truncate in front; lower lip ca. 5 × 6 mm, glabrous, middle lobe rounded, ca. 1/2 as large as lateral lobes, ca. 2.5 mm wide. Filaments 2 pubescent, 2 glabrous. Fl. Jul, fr. Aug.

• Damp slopes; ca. 3500 m. NW Yunnan.

141. *Pedicularis zayuensis* H. P. Yang, Acta Phytotax. Sin. 18: 240. 1980.

察隅马先蒿 cha yu ma xian hao

Herbs perennial, 20–60 cm tall, ± drying black. Roots woody. Stems numerous, central stem erect, outer ones ± ascending, with 4 lines of hairs. Leaves in whorls of 4. Basal leaves densely clustered, persistent; petiole to 3 cm. Stem leaf petiole 0.5–1.5 cm; leaf blade lanceolate-oblong to ovate-oblong, 1.5–4 cm, abaxially white scurfy, adaxially glabrous, pinnatisect; segments 8–10 pairs, ovate-oblong, reflexed dentate. Inflorescences racemose, elongated to 25 cm; bracts linear-lanceolate. Pedicel 1–7 mm. Calyx ovate-oblong, ca. 6 mm, membranous, villous-ciliate, slightly cleft anteriorly; lobes 5, unequal. Corolla pale red, ca. 1.6 cm; tube decurved basally, ca. 1.1 cm, expanded apically; galea erect, narrowly crested, slightly rounded in front; lower lip longer than galea, ca. 7 mm, middle lobe rounded, smaller than lateral lobes, ca. 2.5 mm wide, lobes finely ciliate, erose, apex often apiculate. Anterior filaments pilose. Capsule slightly oblique, ovoid, apiculate. Fl. Jul, fr. Jul–Sep.

• Thickets; ca. 3300 m. SE Xizang.

142. *Pedicularis daucifolia* Bonati, Bull. Soc. Bot. France 55: 313. 1908.

胡萝卜叶马先蒿 hu luo bu ye ma xian hao

Herbs perennial, 2–25 cm tall, not drying black. Roots obconical. Stems numerous, flexuous, ascending, slightly branched basally or unbranched, villous. Leaves in whorls of 4; petiole 3–5 mm; leaf blade ovate, 1–2 cm, glabrous, pinnatisect; segments 10–14 pairs, widely spaced, oblong, pinnatipartite to pinnatisect, linear. Inflorescences spicate, interrupted; bracts leaflike. Calyx membranous, glabrous, slightly cleft anteriorly; tube 2.5–3 mm; lobes 5, equal, ovate, ca. 2.5

mm, subpinnatisect apically. Corolla tube ca. 2 × as long as calyx, ± bent at a right angle at middle, expanded apically; galea falcate apically, slightly rounded in front, apex slightly angle shaped; lower lip slightly shorter than galea, ca. 4 × 6.5 mm, middle lobe ca. 2 × 3 mm, ca. 2/3 × size of lateral lobes. Filaments glabrous. Capsule narrowly ovoid, 1–1.5 × as long as calyx, apiculate. Seeds nearly dark, 1–1.5 mm.

• W Sichuan.

143. *Pedicularis minima* P. C. Tsoong & S. H. Cheng, Fl. Reipubl. Popularis Sin. 68: 403. 1963.

细小马先蒿 xi xiao ma xian hao

Herbs annual, less than 2.6 cm tall, ± drying black. Roots filiform, slender. Stems 1–3, with 3 or 4 pairs of ovate to lanceolate scales at base, with 4 lines of hairs. Basal leaf petiole ca. 3 × 0.5 mm, glabrous; leaf blade rounded, membranous; segments 2 or 3 pairs, irregularly dentate. Stem leaves in whorls of 3 or 4; petiole to 6 mm, narrowly winged; leaf blade ovate to ovate-oblong, 4–7 cm, abaxially white scurfy, adaxially glabrous, pinnatipartite to pinnatisect; segments ca. 5 pairs, ovate, margin lobed. Inflorescences to 2 cm; bracts leaflike, shorter than flowers. Calyx ca. 3 mm, membranous, slightly cleft anteriorly; lobes 5, unequal; posterior one subulate, lateral lobes leaflike, 3-divided. Corolla ca. 1.1 cm; tube decurved ± at middle, ca. 6 mm, slightly expanded apically; galea slightly falcate, rounded in front, apex slightly truncate; lower lip ca. 3.5 × 5 mm, middle lobe rounded, slightly smaller than lateral lobes. Filaments glabrous. Fl. Jul–Aug, fr. Sep.

• NW Sichuan.

144. *Pedicularis tenera* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 320. 1948.

细茎马先蒿 xi jing ma xian hao

Herbs perennial, ca. 10 cm tall, slightly pubescent throughout, not drying black. Roots slender, woody. Stems several, dark purple, central stem usually erect or procumbent and ascending, with 4 lines of hairs. Leaves glabrous throughout. Basal leaves few; petiole to 1.8 cm. Stem leaves in whorls of 3 or 4; petiole 5–13 mm; leaf blade lanceolate-oblong to ovate-oblong, 1–2.3 cm × 4–7 mm, pinnatipartite to pinnatisect; segments 4–7 pairs, ovate, incised-dentate. Inflorescences 0.2–8.5 cm, interrupted basally; proximal bracts leaflike, distal ones shorter than flowers, broadly ovate, glabrous. Pedicel dark purple, 1.5–10 mm, glabrous. Calyx usually tinged with purple-red, ca. 4 mm, membranous, slightly cleft anteriorly; tube ca. 3 mm; lobes 5, unequal, sparsely purple villous along veins and margins. Corolla purple; tube 9–10 mm, strongly decurved basally, expanded apically; galea falcate, ca. 6 mm; lower lip 6–7 mm, middle lobe ca. 3.5 mm wide, wider than long, lobes ± rounded. Filaments 2 pubescent, 2 glabrous. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows, screes of limestone mountains; 4400–4600 m. W Sichuan.

145. *Pedicularis altifrontalis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 404. 1963.

高萼马先蒿 gao e ma xian hao

Herbs perennial, to 20 cm tall, ± drying black. Roots fleshy. Stems often numerous, outer ones usually ascending, with 4 lines of dense hairs. Leaves in whorls of 4. Basal leaves persisting at anthesis; petiole to 2.5 cm, membranous, sparsely long white ciliate; leaf blade ca. as long as petiole, ovate-oblong to oblong; segments ca. 5 pairs, ovate-oblong, glabrous on both surfaces, incised-dentate. Stem leaves few, similar to basal leaves but smaller; segments ca. 4 pairs. Inflorescences 2.5–3.5 cm; bracts leaflike, shorter than flowers. Calyx ca. 4 mm, membranous, slightly cleft anteriorly; tube ca. 3 mm; lobes 5, unequal. Corolla pale rose, with white throat, 1.3–1.5 cm; tube ± bent at a right angle basally, ca. 3 × as long as galea, slender; galea ca. 4 mm, apex ovate, acute; lower lip ca. 5 × 6.5 mm, middle lobe broadly ovate, smaller than lateral lobes. Filaments glabrous. Fl. May–Jun, fr. Jul–Aug.

• Swampy meadows; 3800–4600 m. SE Xizang.

146. *Pedicularis transmorrisonensis* Hayata, Icon. Pl. Formosan. 5: 126. 1915.

台湾马先蒿 tai wan ma xian hao

Pedicularis refracta (Maximowicz) Maximowicz var. *transmorrisonensis* (Hayata) Hurusawa.

Herbs annual, 25–30(–40) cm tall, ± woody at base. Stems unbranched, internodes to 8 cm, with 4 lines of hairs. Leaves in whorls of 4; petiole ca. 3 mm; leaf blade ovate-oblong to lanceolate-oblong, to 2 × 1 cm, abaxially pubescent and slightly scurfy, adaxially sparsely pubescent, pinnatipartite to nearly pinnatisect; segments 5–7 pairs, oblong-triangular, cuspidate-dentate, teeth callose. Inflorescences racemose, interrupted basally; bracts leaflike. Pedicel 1–2 mm, glabrous. Calyx 1/2 cleft anteriorly, white villous; tube 4.5–5.5 × ca. 2.5 mm; lobes 5, unequal, ca. 0.5 mm, posterior one triangular, lateral lobes obscure. Corolla red; tube slightly decurved basally, 7–9 mm, slightly expanded apically; galea erect, 5–6 mm, front nearly truncate; lower lip spreading, margin erose, middle lobe ovate, much smaller than lateral lobes. Filaments 2 sparsely pubescent at base, 2 glabrous. Capsule 3/5 enclosed by accrescent calyx, short lanceolate-triangular, ca. 1 cm. Seeds dark, ca. 1 × 0.7 mm.

• Taiwan.

147. *Pedicularis ganpinensis* Vaniot ex Bonati, Bull. Acad. Int. Géogr. Bot. 13: 245. 1904.

平坝马先蒿 ping ba ma xian hao

Herbs annual or biennial, to 30 cm tall, not drying black. Stems with 4 lines of hairs, internodes to 10 cm basally. Basal leaves withering early; petiole to 1.8 cm, sparsely pubescent. Stem leaves in whorls of 4, short petiolate to sessile, elliptic-lanceolate to oblong-lanceolate, 1.5–2.5 cm × 5–10 mm, abaxially pubescent and white scurfy, adaxially densely white villous, pinnatipartite; segments

5–7 pairs, linear-lanceolate, incised-dentate, teeth callose. Inflorescences spicate, interrupted basally; proximal bracts leaflike, pubescent. Calyx ca. 3.5 mm, 1/3 cleft anteriorly, veins reticulate; lobes 3, unequal, barely 1 mm, posterior one triangular, white villous along veins and ciliate. Corolla purple-red, ca. 1.5 cm; tube slightly decurved basally, expanded apically; galea slightly falcate, rounded in front; lower lip ca. 5.8 × 7 mm, middle lobe much smaller than lateral pair. Filaments 2 villous, 2 glabrous. Capsule obliquely ovoid. Fl. Jun, fr. Jun–Jul.

• Grassy slopes; ca. 1300 m. WC Guizhou.

148. *Pedicularis confluens* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 404. 1963.

连齿马先蒿 *lian chi ma xian hao*

Herbs perennial, 20–50 cm tall, drying black. Roots clustered, fibrous. Stems 1–4, often short branched apically, with 4 lines of hairs. Leaves in whorls of 4. Basal leaf petiole to 5 cm. Distal stem leaves ± sessile, ovate-oblong to oblong-lanceolate, 2–5 × 1–1.5 cm, abaxially sparsely villous along veins and often white scurfy, adaxially sparsely pubescent, densely so along midvein, pinnatifid to pinnatisect; segments 4–7 pairs, ovate to oblong-lanceolate or linear-oblong, winged, lobed or incised-dentate, proximal segments becoming leafletlike. Inflorescences spicate, to 6 cm; bracts leaflike, proximal ones slightly longer than flowers. Calyx ca. 5.5 mm, membranous, 2/5 cleft anteriorly; lobes 3, unequal, posterior one triangular, ca. 1.5 mm; lateral lobes obscure. Corolla red; tube 8–9 × ca. 2.5 mm, basal 2.5 mm strongly decurved, enlarged; galea ca. 5 mm; lower lip longer than galea, 7–8 mm × 1–1.1 cm, middle lobe rounded, smaller than lateral pair. Filaments glabrous. Fl. May, fr. Jun–Jul.

• Bamboo groves; ca. 1300 m. WC Guizhou.

149. *Pedicularis holocalyx* Handel-Mazzetti, Symb. Sin. 7: 849. 1936.

全萼马先蒿 *quan e ma xian hao*

Pedicularis spicata Pallas var. *australis* Bonati; *P. szetschuanica* Maximowicz var. *elata* Bonati.

Herbs annual, more than 50 cm tall, sparsely pubescent, not drying black. Stems single, erect, often many branched apically, with 4 lines of hairs. Leaves in whorls of 3 or 4; proximal petioles to 1 cm, winged; leaf blade oblong-lanceolate, 2–5 cm × 0.8–2.3 mm, abaxially glabrous, adaxially sparsely pubescent, pinnatifid; segments 6–9 pairs, linear-oblong to triangular-ovate, incised-dentate. Inflorescences spicate, 2–4(–6) cm; bracts leaflike, proximal ones longer than flowers, distal ones triangular-ovate, long ciliate. Flowers small. Calyx ovoid, ca. 4 mm, membranous; lobes by fusion appearing 3, unequal, posterior one triangular, ca. 0.8 mm, villous along midvein and ciliate. Corolla purplish red; tube strongly bent in calyx, deflexed, ca. 5 mm, straight and gradually expanded apically; galea ca. 2.5–3 mm,

margin entire, rounded in front; lower lip spreading, longer than galea, ca. 7 mm, middle lobe rounded, much smaller than lateral lobes. Filaments 2 villous, 2 glabrous. Capsule triangular-lanceolate, ca. 1.2 cm × 4 mm, 1/2 exceeding calyx, short apiculate. Fl. Jun, fr. Jun–Jul.

• Grassy slopes; ca. 2000 m. W Hubei, E Sichuan.

150. *Pedicularis spicata* Pallas, Reise Russ. Reich. 3: 738. 1776.

穗花马先蒿 *sui hua ma xian hao*

Herbs annual, 20–30(–40) cm tall, drying black or not. Roots conical, woody. Stems 1 to several, outer ones procumbent or ascending, unbranched or often branched apically, with 4 lines of hairs. Leaves often in whorls of 4. Basal leaves ± in a rosette, smaller than stem leaves, deciduous by anthesis. Stem leaf petiole to 1 cm, narrowly winged, pubescent; leaf blade oblong-lanceolate to linear-narrowly lanceolate, to 7 × 1.3 cm, abaxially white villous along veins, adaxially sparsely white pubescent, pinnatifid to pinnatifid; segments 9 or 10 pairs, ovate to oblong, dentate or incised-dentate, teeth callose. Inflorescences spicate, to 12 cm, interrupted basally; proximal bracts leaflike, distal ones rhomboid-ovate or flabellate, white villous. Flowers small. Calyx campanulate, 3–4 mm, slightly cleft anteriorly, membranous; lobes by fusion appearing 3, unequal, posterior one triangular, smaller than lateral pair. Corolla red; tube bent at a right angle basally, 1.2–1.8 cm; galea 3–4 mm, ± acute in front; lower lip 6–10 mm, middle lobe obovate, smaller than lateral lobes. Filaments 2 pubescent, 2 glabrous. Capsule obliquely ovoid to lanceolate-ovoid, 6–10 × ca. 4 mm, apex acute to apiculate. Fl. Jun–Sep, fr. Aug–Oct.

Wet or swampy meadows, thickets; 1500–2600 m. S Gansu, Hebei, Heilongjiang, N Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, N Sichuan [Japan, N Korea, Mongolia, Russia (E Siberia, Far East)].

1a. Capsule narrow, lanceolate-ovoid, 8–10 mm,

long apiculate 150c. subsp. *stenocarpa*

1b. Capsule narrowly ovoid, 6–7 mm, acute.

2a. Distal bracts leaflike or rhomboid-ovate;

filaments 2 densely villous 150a. subsp. *spicata*

2b. Distal bracts strongly enlarged,

becoming flabellate; filaments 2

pilose 150b. subsp. *bracteata*

150a. *Pedicularis spicata* subsp. *spicata*

穗花马先蒿(原亚种) *sui hua ma xian hao* (yuan ya zhong)

Pedicularis spicata Pallas var. *sensinowii* Bonati.

Distal bracts leaflike or rhomboid-ovate. Filaments 2 densely villous, 2 glabrous. Capsule narrowly ovoid, 6–7 mm, apex acute.

Wet or swampy meadows, thickets; 1500–2600 m. S Gansu, Hebei, Heilongjiang, N Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, N Sichuan [Japan, N Korea, Mongolia, Russia (E Siberia, Far East)].

150b. *Pedicularis spicata* subsp. *bracteata* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 405. 1963.

显苞穗花马先蒿 xian bao sui hua ma xian hao
Distal bracts strongly enlarged, becoming flabellate, to
10 × 8 mm. Filaments 2 pilose, 2 glabrous. Capsule
narrowly ovoid, 6–7 mm, apex acute. Fl. Jun.

• W Hebei.

150c. *Pedicularis spicata* subsp. ***stenocarpa*** P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 405. 1963.

狭果穗花马先蒿 xia guo sui hua ma xian hao
Bracts leaflike or rhomboid-ovate apically. Filaments 2
densely villous. Capsule lanceolate-ovoid, 8–10 mm,
long apiculate. Fr. Sep.

• W Hebei.

151. *Pedicularis szetschuanica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 601. 1888.

四川马先蒿 si chuan ma xian hao
Herbs annual, often (10–)20(–30) cm tall, pubescent to
glabrescent, not drying black. Roots single, woody
when old. Stems 1–8, rigid, outer stems ± ascending,
often unbranched, with 4 lines of hairs. Leaves in
whorls of 4; petiole of proximal leaves 0.7–3.5 cm, of
distal leaves shorter or ± sessile, white villous; leaf
blade ovate to oblong-lanceolate, 0.4–3 cm × 2.5–10(–
13) mm, pinnatifid; segments 5–11 pairs, ovate to
obovate, dentate, teeth white and callose, ± white
pubescent or glabrescent on both surfaces.

Inflorescences spicate, dense or interrupted basally;
proximal bracts leaflike, distal ones triangular-ovate,
white villous, tinged with red apically. Calyx often
tinged with purplish red, ca. 4 mm, membranous,
sometimes with red dots, slightly cleft anteriorly; lobes
5, unequal, ± serrate, posterior one triangular, smaller
than lateral lobes. Corolla purple-red, 1.4–1.7 cm; tube
ca. 2 × as long as galea, strongly decurved basally,
expanded apically; galea barely falcate, ca. 5 mm,
slightly rounded in front; lower lip 7–8 mm × ca. 1 cm,
middle lobe ovate, slightly smaller than lateral pair,
margin entire or erose-serrulate. Filaments glabrous. Fl.
Jun–Aug, fr. Aug–Sep.

• Alpine meadows, grassy slopes, ravines; 3400–4600 m. SW Gansu,
SE Qinghai, N and W Sichuan, E Xizang.

1a. Plants barely 10 cm tall, ± woody; calyx
with reticulate veins nearly throughout;
margin of lower corolla lip erose-serrulate

..... 151c. subsp. *anastomosans*

1b. Plants (10–)20(–30) cm tall, not woody;
calyx without reticulate veins throughout;
margin of lower corolla lip entire.

2a. Plants pubescent; leaf blade long ovate
to ovate-oblong or oblong-lanceolate,
0.4–3 cm × 2.5–10 mm 151a. subsp. *szetschuanica*

2b. Plants glabrescent; leaf blade oblong to
ovate, to 2.7 cm × 13 mm 151b. subsp. *latifolia*

151a. *Pedicularis szetschuanica* subsp. ***szetschuanica***

四川马先蒿(原亚种) si chuan ma xian hao (yuan ya
zhong)

Pedicularis szetschuanica var. *angustifolia* Bonati.

Plants (10–)20(–30) cm tall, not woody, pubescent.
Leaf blade long ovate to ovate-oblong or oblong-
lanceolate, 0.4–3 cm × 2.5–10 mm. Calyx without
reticulate veins throughout. Margin of lower corolla lip
entire.

• Alpine meadows, grassy slopes, ravines; 3400–4600 m. SW Gansu,
SE Qinghai, N and W Sichuan, E Xizang.

151b. *Pedicularis szetschuanica* subsp. ***latifolia*** P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 405. 1963.

宽叶四川马先蒿 kuan ye si chuan ma xian hao
Plants (10–)20(–30) cm tall, not woody, glabrescent.
Leaf blade oblong to ovate, to 2.7 × 1.3 cm. Calyx
without reticulate veins throughout. Margin of lower
corolla lip entire.

• N and W Sichuan.

151c. *Pedicularis szetschuanica* subsp. ***anastomosans*** P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 405. 1963.

网脉四川马先蒿 wang mai si chuan ma xian hao
Plants to 10 cm tall, ± woody. Calyx with reticulate
veins almost throughout. Margin of lower corolla lip
erose-serrulate. Fl. Aug.

• 3800–3900 m. E Xizang.

152. *Pedicularis triangularidens* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 406. 1963.

三角齿马先蒿 san jiao chi ma xian hao
Herbs annual, (6–)40 cm tall, not drying black. Roots ±
woody. Stems usually numerous, cespitose, unbranched
to many branched basally and unbranched apically,
densely pubescent to glabrescent. Leaves in whorls of 4.
Basal leaf petiole to 2.5 cm, sparsely pubescent. Stem
leaf petiole barely 0.5–1.5 cm; leaf blade ovate to
linear-oblong or ovate-oblong, 2–3.5 × 0.7–1.8 cm,
abaxially long pilose along midvein, adaxially sparsely
appressed pubescent, pinnatifid; segments 3–9 pairs,
rounded, margin double dentate. Inflorescences spicate,
2–8(–20) cm, interrupted basally; proximal bracts
leaflike, rhomboid-lanceolate or ± flabellate, white
villous. Calyx (3.5–)4–5.5 mm, membranous, slightly
cleft anteriorly; lobes 5, unequal, villous along veins,
ciliate. Corolla pale purple-red, (0.9–)1.3–1.7 cm; tube
7–8 mm, ± bent at a right angle basally, expanded
apically; galea nearly straight, 3.5–5.5 mm, slightly
rounded in front, apex truncate; lower lip 6–9 × 7.5–
10.5 mm, lobes ± obovate; middle lobe narrowly
obovate, smaller than lateral pair, finely glandular
ciliate. Filaments glabrous. Capsule triangular-
lanceolate, 1–1.5 cm, apex acute. Fl. May–Jul, fr. Jul–
Aug.

• Forests, grassy slopes, river banks, moss-covered forest floor,
coniferous forests; 2600–3800 m. C, N, and NW Sichuan.

1a. Plants to 40 cm tall; corolla 1.3–1.7 cm;
calyx 4–5.5 mm; leaf segments 3–9 pairs

..... 152a. subsp. *triangularidens*

1b. Plants ca. 10 cm tall; corolla scarcely 9
mm; calyx only ca. 3.5 mm; leaf
segments 3 or 4 pairs 152b. subsp. *chrysosplenoides*

152a. *Pedicularis triangularidens* subsp. *triangularidens*
三角齿马先蒿(原亚种) san jiao chi ma xian hao (yuan ya zhong)

Pedicularis szetschuanica Maximowicz var. *ovatifolia*
H. L. Li.

Plants to 40 cm tall. Leaf blade with 3–9 pairs of segments. Calyx 4–5.5 mm. Corolla 1.3–1.7 cm.

• Forests, grassy slopes, river banks, moss-covered forest floor; 2600–3800 m. C and N Sichuan.

This subspecies has two varieties: var. *triangularidens* with a wider corolla and middle lobe of lower lip narrowly obovate, and var. *angustiloba* P. C. Tsoong with a narrower corolla and middle lobe of lower lip ligulate.

152b. *Pedicularis triangularidens* subsp. *chrysosplenioides*
P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 407. 1963.

猫眼草三角齿马先蒿 mao yan cao san jiao chi ma xian hao

Plants ca. 10 cm tall. Leaf blade with 3 or 4 pairs of segments. Calyx to 3.5 mm. Corolla to 9 mm. Fl. Jul–Aug.

• Coniferous forests; ca. 3600 m. NW Sichuan.

153. *Pedicularis dolichostachya* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 313. 1948.

长穗马先蒿 chang sui ma xian hao

Herbs more than 20 cm tall. Stems single, erect, unbranched, slightly pubescent or glabrescent. Leaves in whorls of 4; petiole 3–4 mm apically, villous; leaf blade ovate-oblong or linear-oblong, ca. 2.8 × 1 cm, sparsely hirsute, pinnatifid; segments 6–8 pairs, ovate, margin ± entire, apex acute. Inflorescences to 10–15 cm, interrupted basally; bracts leaflike, ca. as long as calyx, pinnatifid. Pedicel erect, 1–3 mm. Calyx broadly ovate, 5–6 mm, membranous, without reticulate veins, sparsely hirsute, scarcely cleft anteriorly; lobes 5, ± equal, triangular, sparsely ciliate, ± entire, apex acute. Corolla purple, ca. 1.3 cm; tube slightly curved in calyx, 7–8 mm, expanded apically; galea slightly curved, ca. 5 mm, rounded in front, margin entire, apex acute; lower lip slightly longer than galea; lobes rounded, middle lobe smaller than lateral pair, projecting, sparsely ciliate. Filaments glabrous. Capsule oblong, ca. 1.8 cm × 4–5 mm, 1/2 exceeding calyx, apiculate. Fl. and fr. Aug.

• Grassland; ca. 3700 m. W Sichuan.

154. *Pedicularis diffusa* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 62(1): 7. 1893.

铺散马先蒿 pu san ma xian hao

Herbs to 40–60 cm tall. Roots slender, main root present; crown not scaly. Stems 1 to several, erect or diffuse and ascending, with 4 lines of hairs. Leaves in whorls of 4; petiole 0.5–1.5 cm, white pilose; leaf blade ovate-oblong, 2–2.5(–4.5) × 0.75–1.3 cm, pinnatifid to pinnatisect; segments 5–8 pairs, oblong to linear-oblong, incised-dentate. Inflorescences capitate or to 15–18 cm, interrupted basally. Calyx campanulate, 5–6(–10) × ca. 3.5 mm, membranous, with sparse reticulate

veins throughout, scarcely cleft anteriorly; lobes 5, unequal, posterior one triangular and entire, lateral lobes ovate and incised-serrate. Corolla rose, 1.5–2 cm; tube decurved basally; galea slightly curved, 4–5 mm, rounded in front; lower lip ca. 8 mm, middle lobe obovate, ca. 1/2 as large as lateral lobes, erose-serrulate. Anterior filaments pubescent apically. Capsule lanceolate, apex acute. Fl. and fr. May–Jul.

Riversides, stony surfaces; ca. 3800 m. S and SE Xizang [Bhutan, C and E Nepal, Sikkim].

1a. Leaves 2–2.5 cm; calyx 5–6 mm; corolla ca.

1.5 cm, galea ca. 5 mm, more than 1.2 as long as lower lip 154a. subsp. *diffusa*

1b. Leaves to 4–4.5 cm; calyx to 7–10 mm;

corolla 1.7–2 cm, galea barely 4 mm, ca.

1/2 as long as lower lip 154b. subsp. *elatior*

154a. *Pedicularis diffusa* subsp. *diffusa*

铺散马先蒿(原亚种) pu san ma xian hao (yuan ya zhong)

Leaves 2–2.5 cm. Calyx 5–6 mm. Corolla ca. 1.5 cm; galea ca. 5 mm, more than 1/2 as long as lower lip. S Xizang [Bhutan, C and E Nepal, Sikkim].

154b. *Pedicularis diffusa* subsp. *elatior* P. C. Tsoong, Acta Phytotax. Sin. 3: 312. 1955.

高升铺散马先蒿 gao sheng pu san ma xian hao

Leaves to 4–4.5 cm. Calyx to 7–10 mm. Corolla 1.7–2 cm; galea barely 4 mm, ca. 1/2 as long as lower lip. Fl. Jun.

• Riversides, stony surfaces; ca. 3800 m. SE Xizang.

155. *Pedicularis nyalamensis* H. P. Yang, Acta Phytotax. Sin. 18: 241. 1980.

聂拉木马先蒿 nie la mu ma xian hao

Herbs perennial, 15–30 cm tall, pubescent, drying black. Roots stout, woody, main root present; crown with ovate scales. Stems often numerous, purplish black, central stem erect or all stems procumbent and flexuous or ascending. Leaves in whorls of 4. Basal leaves numerous, persistent; petiole slender, 1–3 cm, pubescent. Stem leaf petiole to 1 cm; leaf blade oblong-lanceolate to oblong, 1.5–3.5 cm, pinnatisect; segments 7–10 pairs, oblong, pinnatifid, dentate, teeth callose. Inflorescences racemose, to 10 cm, interrupted basally; bracts leaflike, shorter than flowers. Pedicel 1–2 mm.

Calyx campanulate, 6–8 mm, membranous, densely white pilose; lobes 5, ± equal, serrate, ca. 2/5 as long as calyx. Corolla red or purplish red, with white or pale red throat, ca. 1.3 cm; tube ca. 9–10 mm, ± bent at a right angle medially, expanded apically; galea slightly falcate, 3–4 mm; lower lip longer than galea, ca. 8 mm × 1 cm, middle lobe rounded, smaller than lateral pair, projecting, slightly retuse. Anterior filaments pilose. Fl. Jun–Jul, fr. Aug.

• Shaded slopes; ca. 3700 m. S Xizang.

156. *Pedicularis brachycrania* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 307. 1948.

短盔马先蒿 duan kui ma xian hao

Herbs biennial or perennial, to 30 cm tall. Roots single, small, not fleshy, slightly robust. Stems numerous, erect, slender, unbranched, glabrous or pilose, internode to 12 cm. Basal leaf petiole 1.5–2 cm. Stem leaves in whorls of 3 or 4; petiole 2–7 mm; leaf blade ovate-oblong, ca. 2.5 × 1.3 cm, membranous, glabrous, pinnatisect or -partite; segments 5 or 6 pairs, ovate-oblong, pinnatifid. Inflorescences racemose, to 10 cm, interrupted basally; bracts ovate-oblong or oblong-lanceolate, pinnatisect or pinnatifid. Pedicel 2–3 mm. Calyx broadly ovate, ca. 4 mm, slightly cleft anteriorly, pilose; lobes 5, ± equal, triangular, barely 1 mm, entire or obscurely serrate. Corolla purple, ca. 1.6 cm, glabrous throughout; tube decurved in calyx, erect apically, 8–9 mm; galea ± erect, 3.5–4 mm, rounded in front, margin entire, apex truncate; lower lip 7–8 mm, lobes rounded, margin entire, middle lobe smaller than lateral pair, placed apically. Filaments glabrous. Fl. May.

• Near glacial lakes. SW Sichuan, NW Yunnan.

157. *Pedicularis flaccida* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 62(1): 8. 1893.

软弱马先蒿 ruan ruo ma xian hao

Herbs annual, 20–25 cm tall, glabrous. Roots ca. 2 cm. Stems ± ascending, slender, many branched basally and at middle; branches slender, weak. Basal leaves withering early. Stem leaves in whorls of 3 or 4; petiole ca. 5 mm; leaf blade ovate-oblong to ovate, 1–1.8 cm × 7–9 mm, pinnatifid; segments 5 or 6 pairs, incised-dentate. Inflorescences spicate, 2–4-flowered, fascicled, lax; bracts leaflike, proximal ones ca. as long as flowers, distal ones longer than calyx and shorter than corolla. Calyx campanulate, only 2.5 mm, glabrous throughout, slightly cleft anteriorly, with sparse reticulate veins; lobes 5, oblong, barely 1 mm, membranous, entire. Corolla 1.4–1.8 cm; tube ± bent at a right angle basally, slightly ascending at junction of tube and galea, 1–1.1 cm, expanded apically; galea ± falcate, 4–5 mm, not projecting in front; lower lip barely 5.5–7 mm, middle lobe obovate, ca. 1/2 as large as lateral lobes. Filaments glabrous.

• W Sichuan.

158. *Pedicularis minutilabris* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 407. 1963.

微唇马先蒿 wei chun ma xian hao

Herbs annual, (6–)25–30 cm tall, glabrous throughout, not drying black. Roots conical. Stems 1–8, erect or slightly ascending. Proximal leaves opposite, distal

ones whorled; petiole ca. 2 cm; leaf blade ovate to elliptic-ovate, ca. 1.5 × 1 cm, pinnatipartite; segments 3 or 4 pairs, obovate to oblong, incised-double dentate. Inflorescences nearly 2/3 height of stems, lax; proximal bracts leaflike, distal ones slender petiolate. Pedicel ca. 1 mm. Calyx ovate-campanulate, barely 3 mm, membranous, 2/5 cleft anteriorly; lobes 5, triangular, unequal, posterior one barely 0.7 mm, lateral lobes ca. 1 mm, serrate. Corolla barely 9–10 mm; tube decurved basally, ca. 6 mm; galea ca. 4 mm, ± narrow, apex truncate; lower lip shorter than galea, 2.5–3 mm, lobes emarginate, middle lobe obovate, smaller than lateral pair, projecting. Filaments glabrous. Capsule enclosed by calyx basally, compressed, triangular-ovoid, barely 8–9 mm, apex acute. Seeds oblong, ca. 3 mm. Fl. Jun–Jul, fr. Jul–Aug.

• *Abies* forests; 3300–3900 m. NW Sichuan.

159. *Pedicularis lineata* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 597. 1888.

条纹马先蒿 tiao wen ma xian hao

Pedicularis sparsissima P. C. Tsoong.

Herbs perennial, 20–35(–60) cm tall, not drying black. Roots often caespitose, ± conical, slender. Stems 1 to several, erect, with 2–4 lines of hairs to glabrescent, unbranched basally but branched apically; branches slender, opposite or whorled. Leaves in whorls of 4. Basal leaves withering early; petiole to 15 cm; leaf blade ovate, barely 7 mm, pinnatifid; segments ca. 3 pairs, dentate. Stem leaf petiole ca. 6 mm to ± absent; leaf blade elliptic-oblong to linear-oblong or ovate, 0.7–6 × 0.6–2.5 cm, abaxially sparsely white villous along veins, adaxially sparsely glandular pubescent, pinnatifid; segments 5–8 pairs, ovate to oblong-ovate, margin double dentate, teeth callose. Inflorescences lax, to 18 cm; bracts often leaflike. Calyx ovate, 4–5.5 mm, membranous, slightly cleft anteriorly, villous along veins; lobes 5, unequal, serrate. Corolla purple-red, 1.5–1.8 cm; tube decurved, slender, expanded apically; galea 3–4 mm, 1.2–1.5 mm wide apically, ± rounded in front, apex slightly convex; lower lip 6–8 × 8–10 mm, middle lobe obovate, slightly smaller than lateral pair, glabrous. Filaments glabrous. Capsule triangular-lanceolate, 1–1.3 cm, apex acute. Seeds elliptic, ca. 1 mm. Fl. Apr–Jul, fr. Jul–Sep.

Forests, alpine meadows; 1900–4600 m. Gansu, S Shaanxi, Sichuan, NW Yunnan [N Myanmar].

55. Ser. *Microchilae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 93. 1890.

后生轮叶系 hou sheng lun ye xi

Ser. *Metaverticillatae* P. C. Tsoong ex H. P. Yang.

Herbs annual or perennial. Leaves in whorls of 3 or 4, elliptic to lanceolate, pinnatisect to pinnatifid. Inflorescence spicate to capitate. Calyx lobes 5. Corolla ± S-shaped; tube deflexed in calyx; galea truncate or toothed at apex.

• Six species: endemic to China.

1a. Leaves pinnatipartite to pinnatisect.

2a. Leaves densely pubescent abaxially; apex of galea not toothed; 2 filaments pubescent 160. *P. stenotheca*

- 2b. Leaves not pubescent abaxially; apex of galea toothed; all 4 filaments pubescent apically 165. *P. lingelshheimiana*
- 1b. Leaves pinnatifid or occasionally pinnatipartite, not pinnatisect.
- 3a. Galea much longer than lower corolla lip; corolla strongly ascending at junction of tube and galea 164. *P. microchilae*
- 3b. Galea ca. as long as to shorter than lower corolla lip; corolla not strongly ascending at junction of tube and galea, ± straight or slightly curved apically.
- 4a. Apex of galea toothed 163. *P. metaszetschuanica*
- 4b. Apex of galea not toothed.
- 5a. Herbs annual; roots conical; basal leaves often withering early; inflorescences not purplish red pilose 161. *P. angularis*
- 5b. Herbs perennial; roots fascicled, filiform; basal leaves persistent; inflorescences purplish red pilose 162. *P. fragarioides*

160. *Pedicularis stenotheca* P. C. Tsoong, Acta Phytotax. Sin. 3: 312. 1955.

狭室马先蒿 xia shi ma xian hao

Herbs perennial, to 20 cm tall, drying slightly black. Roots ± woody. Stems 1 to several, with 4 lines of hairs. Leaves in whorls of 4. Basal leaf petiole ca. 2.5 cm, white villous. Stem leaves in 2 or 3 whorls; petiole 0.5–1.5 cm; leaf blade oblong-lanceolate to ovate-lanceolate, 1.8–2.2 cm × 8–10 mm, abaxially densely white scurfy and white pilose along veins, adaxially hoary along midvein, pinnatipartite to pinnatisect; segments 3–9 pairs, ovate to linear-lanceolate, pinnatifid or incised-double dentate. Inflorescences ± capitate, 1–2 cm, white pilose; bracts leaflike, proximal longer than flowers, distal shorter than flowers. Calyx ca. 5 mm, barely cleft anteriorly; lobes 5, unequal, posterior one smaller than lateral lobes, triangular and entire, lateral lobes ovate, serrate. Corolla 1.1–1.2 cm; tube slightly decurved basally, slightly expanded apically; galea barely 3 mm, only ca. 1/2 as long as lower lip, rounded in front, truncate at apex, not toothed; lower lip ca. 6 × 8 mm, lobes retuse and erose, middle lobe rounded, ca. 1/2 as large as lateral pair. 2 filaments pubescent, 2 glabrous. Capsule narrowly triangular-lanceolate, ca. 1.5 cm, apiculate. Fl. and fr. Jun–Jul.

• Grassy banks in coniferous forests; ca. 3900 m. C and E Xizang.

161. *Pedicularis angularis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 408. 1963.

角盔马先蒿 jiao kui ma xian hao

Herbs annual, 15(–40) cm tall, not drying black. Roots conical, small, ± woody. Stems single and erect, but several and ascending, often densely white or pale brown villous. Leaves in whorls of 4. Basal leaves often withering early; petiole 0.7–2 cm, densely villous. Stem leaves in 2(or 3) whorls, shorter petiolate; leaf blade ovate to ovate-oblong or narrowly oblong, 0.7–2 cm × 4–10 mm, abaxially densely strigose, adaxially densely villous along veins, pinnatifid; segments 6–10 pairs, margin lobed and double dentate. Inflorescences spicate, to 4 cm, interrupted basally; axis densely villous; proximal bracts leaflike. Calyx 4–5 mm, densely villous

along veins; lobes 5, unequal, posterior one smallest, triangular; lateral lobes long ovate, ca. 1.5 mm. Corolla pale red, ca. 1.5 cm; tube strongly decurved basally, expanded apically; galea barely 3.5–4 mm, shorter than lower lip, apex rounded, angulate in front, not toothed; lower lip ca. 6 × 8.5 mm, lobes obovate and retuse, middle lobe smallest. Filaments glabrous. Fl. Jun–Jul, fr. Aug.

• Slopes; ca. 3800 m. NW Sichuan.

162. *Pedicularis fragarioides* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 409. 1963.

草莓状马先蒿 cao mei zhuang ma xian hao

Herbs perennial, usually less than 10 cm tall, ± drying black. Roots fascicled, filiform, fleshy. Stems usually decumbent or ascending, often many branched basally and at middle, densely pale brown pilose. Basal leaves purple-black, persistent; petiole filiform, to 3 cm, 3–4 × as long as leaf blade; leaf blade broadly ovate-cordate to elliptic-cordate, pinnatifid; segments 3–6 pairs, broadly ovate, margin lobed or double dentate. Stem leaves often opposite or occasionally in whorls of 4, shorter petiolate; leaf blade narrow, abaxially white hirsute along veins, adaxially sparsely appressed pilose; segments ca. 5 pairs. Inflorescences capitate, densely purplish red pilose; bracts purplish red, much shorter than flowers, purplish villous. Calyx ca. 6 mm, membranous, 2.5–3 mm, scarcely cleft anteriorly, tinged with red, purplish villous; lobes 5, 1.7–2 mm, unequal. Corolla purplish red, 1.5–1.6 cm; tube decurved basally; galea ca. 4.5 mm, apex truncate, not toothed; lower lip ca. 6 mm × 1.1 cm, lobes ovate, ± equal, praemorse-serrate. Filaments glabrous. Fl. Aug–Sep, fr. Sep.

• Stony slopes; ca. 4700 m. NW Sichuan.

163. *Pedicularis metaszetschuanica* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 410. 1963.

后生四川马先蒿 hou sheng si chuan ma xian hao

Herbs annual, to 25 cm tall, ± drying black. Roots conical, woody. Stems 1–7, outer stems ± ascending,

white villous. Basal leaves \pm persistent; petiole 1–1.5 cm, slender, white villous; leaf blade oblong to lanceolate, to 1 cm \times 2.5–4 mm, pinnatifid; segments 4–6 pairs. Stem leaves in whorls of 4, shorter petiolate; leaf blade slightly larger than basal leaves, abaxially white villous along veins, adaxially appressed white crispate-pilose; segments ca. 6 pairs. Inflorescences spicate, 3–6 cm, interrupted basally; proximal bracts leaflike, densely villous. Calyx 4–6 mm, membranous, slightly cleft anteriorly; lobes 5, triangular, short, \pm unequal. Corolla red-purple, ca. 1.5 cm; tube decurved basally, expanded apically; galea 5.5–6.5 mm, apex rounded, with 1 marginal filiform tooth on each side; lower lip ca. 6 \times 7–9 mm, middle lobe broadly ovate, slightly smaller than lateral pair. Filaments glabrous. Fl. Jul–Aug, fr. Sep–Oct.

• Open meadows; 3200–3400 m. N Sichuan.

164. *Pedicularis microchilae* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 595. 1888.

小唇马先蒿 xiao chun ma xian hao

Herbs annual, to 40 cm tall, not drying black. Roots slender. Stems 1–5, erect or outer stems slightly ascending, weak, glabrescent. Leaves few; basal leaves withering early. Proximal stem leaves opposite; petiole to 2 cm, middle and distal ones in whorls of 4, short petiolate to sessile; leaf blade oblong to elliptic or ovate, 1–2(–3.5) cm, glabrous on both surfaces, pinnatifid; segments 6–10 pairs, ovate, incised-lobed or double dentate. Inflorescences spicate, interrupted; bracts

leaflike to ovate-flabellate, short petiolate. Calyx ca. 4.5 mm, slightly cleft anteriorly; lobes 5, \pm equal, triangular-ovate, obscurely serrate, pilose along veins and serrate. Corolla strongly ascending at junction of tube and galea, pale red, with purple galea, ca. 2 cm; galea slightly falcate, 9–10 mm, much longer than lower lip, apex toothed or not; lower lip ca. 7 mm.

Filaments glabrous. Capsule narrowly ovoid-triangular, to 1.4 cm, ca. 1/2 exceeding calyx, apiculate. Fl. Jun–Aug, fr. Jul–Sep.

• Alpine meadows, thicket margins by streams; 2800–4000 m. SW Sichuan, NW Yunnan.

165. *Pedicularis lingelsheimiana* H. Limpricht, Repert. Spec. Nov. Regni Veg. 18: 244. 1922.

凌氏马先蒿 ling shi ma xian hao

Herbs less than 30 cm tall, pilose. Stems branched apically, sparsely pilose. Proximal leaves in whorls of 3, middle and distal ones opposite or whorled, long petiolate; leaf blade lanceolate or elliptic, pinnatisect; segments ovate, pinnatifid, incised-dentate.

Inflorescences spicate; bracts pinnatisect. Calyx campanulate; lobes 5, unequal, 2 lobes larger than others, rounded, incised-serrate. Corolla rose; tube decurved in calyx, ca. 3 \times as long as calyx; galea slightly falcate, apex rounded, with 1 marginal subulate tooth on each side; lower lip slightly longer than galea, lobes obovate, middle lobe placed slightly apically.

Filaments pubescent apically.

• Mountains; 3800–3900 m. W Sichuan.

56. Ser. *Cheilanthifoliae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 524. 1888.

碎米蕨叶系 sui mi jue ye xi

Ser. *Ophiocephalae* Prain.

Herbs perennial. Roots \pm fleshy. Stems unbranched or with erect rigid branches. Basal leaves usually cespitose, persistent. Stem leaves in whorls of 4, pinnatisect. Inflorescences subcapitate to spicate or racemose. Calyx deeply cleft anteriorly, 3- or 5-lobed. Corolla yellow, white, or red; tube ca. as long as calyx or shorter, decurved in calyx; beak short.

Five species: Afghanistan, China, India, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Sikkim, Tajikistan; all five in China.

1a. Beak of corolla 0.6–1 mm 170. *P. anas*

1b. Beak of corolla relatively very short.

2a. Leaf segments 6–8(–13) pairs; calyx 1/2–2/3 cleft anteriorly; beak of galea to 1.8 mm wide 168. *P. latirostris*

2b. Leaf segments 8–18 pairs; calyx 1/3 cleft anteriorly; beak of galea less than 1 mm wide.

3a. Galea distinctly serrate crested in front 169. *P. globifera*

3b. Galea not serrate crested in front.

4a. Calyx distinctly 5-lobed, densely pilose along veins; lower corolla lip 8–10 mm \times 1–1.2 cm; leaf segments incised-dentate or double dentate 166. *P. cheilanthifolia*

4b. Calyx often obscurely 3-lobed, sparsely white pilose; lower corolla lip ca. 10 mm \times 1.3 cm; leaf segments shallowly crenate-dentate 167. *P. kawaguchii*

166. *Pedicularis cheilanthifolia* Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 2, 1: 79. 1843.

碎米蕨叶马先蒿 sui mi jue ye ma xian hao

Herbs perennial, 5–30 cm tall, drying slightly black. Roots fusiform. Stems single and erect or more than 10, unbranched, with 4 lines of hairs. Basal leaf petiole to 3–4 cm. Stem leaves in whorls of 4; petiole 0.5–2 cm; leaf blade linear-lanceolate, 0.7–4 cm \times 2.5–8 mm,

pinnatisect; segments 8–12 pairs, ovate-lanceolate to linear-lanceolate, pinnatifid, double dentate or incised-dentate. Inflorescences subcapitate or spicate and elongated to 10 cm, sometimes interrupted basally; bracts leaflike, ca. as long as flowers basally. Pedicel \pm sessile. Calyx 8–9 mm, ca. 1/3 cleft anteriorly, densely pilose along veins; lobes 5, unequal, posterior one triangular, entire, lateral lobes larger, serrate. Corolla purple-red to

white, sometimes yellow; tube almost erect when young, becoming bent at a right angle basally, to 1.1–1.4 cm; galea falcate, ca. 1 cm, apex with a short conical beak or beakless; lower lip 8–10 mm × 1–1.2 cm, lobes rounded. Filaments sparsely pubescent basally, glabrous apically. Capsule lanceolate-triangular, ca. 1.6 cm × 5.5 mm, ca. 1/2 exceeding calyx. Seeds ca. 2 mm. Fl. Jun–Aug, fr. Jul–Sep.

Stony and gravelly slopes near summits, grassy slopes and banks, damp sandy areas along streams, *Betula* forests; 2100–5200 m. E, SW, and W Gansu, Qinghai, Xinjiang, N and W Xizang [Afghanistan, India, Kazakstan, Kyrgyzstan, Mongolia, Tajikistan].

- 1a. Leaves with narrow segments; calyx lobes short; corolla limb without purplish dots
..... 166a. subsp. *cheilanthifolia*
- 1b. Leaves with wide segments; calyx lobes long; corolla limb often with purplish dots
..... 166b. subsp. *svenhedinii*

166a. *Pedicularis cheilanthifolia* subsp. *cheilanthifolia*
碎米蕨叶马先蒿(原亚种) sui mi jue ye ma xian hao
(yuan ya zhong)

Leaves with narrow segments. Calyx lobes short. Corolla purple-red to white or yellow; lower lip without purplish dots, ca. 8–10 mm × 1–1.2 cm, slightly shorter than galea.

Stony and gravelly slopes near summits, grassy slopes and banks, damp sandy areas along streams, *Betula* forests; 2100–4900 m. E, SW, and W Gansu, Qinghai, Xinjiang, N Xizang [Afghanistan, India, Kazakstan, Kyrgyzstan, Mongolia, Tajikistan].

This subspecies includes var. *isochila* Maximowicz with a yellow corolla, lower lip ca. 1 × 1.2 cm, ca. as long as galea.

166b. *Pedicularis cheilanthifolia* subsp. *svenhedinii*
(Paulsen) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 197. 1963.

斯文氏碎米蕨叶马先蒿 si wen shi sui mi jue ye ma xian hao

Pedicularis svenhedinii Paulsen in Hedin, S. Tibet 6: 44. 1921.

Leaves with wide segments. Calyx lobes long. Corolla purple-red to white; limb often with purplish dots; lower lip ca. 8 mm × 1 cm, slightly shorter than galea. 4500–5200 m. W Xizang [India].

167. *Pedicularis kawaguchii* T. Yamazaki, J. Jap. Bot. 55(10): 289. 1980.

喀瓦谷池马先蒿 ka wa gu chi ma xian hao
Herbs 20–30 cm tall. Stems erect, unbranched, with 4 lines of hairs. Leaves in whorls of 4; petiole 1–2 cm; leaf blade oblong-lanceolate, 2.5–4.5 cm × 5–10 mm, glabrous on both surfaces except adaxially short pubescent along midvein, pinnatisect; segments 10–15 pairs, oblong, shallowly crenate-dentate. Racemes 7–9 × 3–4 cm, many flowered; proximal bracts leaflike, distal ones lanceolate or linear, ca. as long as calyx, sparsely white pilose. Pedicel ca. 1.5 mm, sparsely pilose. Calyx tubular, ca. 7 × 3 mm, 1/3 cleft anteriorly, sparsely white pilose; lobes 3, unequal, 1.5–2 mm, posterior one oblanceolate, lateral pair larger, broadly

flabellate, apex 2-cleft, serrate. Corolla ca. 2 cm; tube decurved in calyx, expanded apically, ca. 2 × as long as calyx; galea incurved, ca. 8 mm, beak less than 1 mm wide; lower lip ca. 1 × 1.3 cm, middle lobe oblate, slightly smaller than lateral lobes. Filaments glabrous. Fl. Jun.

• S Xizang.

168. *Pedicularis latirostris* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 411. 1963.

宽喙马先蒿 kuan hui ma xian hao

Herbs perennial, 12–24 cm tall. Roots fusiform. Stems often single, with 4 lines of hairs. Basal leaf petiole ca. 2.5 cm. Stem leaves in whorls of 4; petiole to 1.3 cm, sparsely pilose or glabrous; leaf blade narrowly oblong to linear-oblong, 1–1.5 cm, pinnatisect; segments 6–8(–13) pairs, ovate to lanceolate, pinnatifid to incised-dentate. Inflorescences capitate to short spicate, 2–5 cm; bracts leaflike basally. Calyx ca. 8 mm, 1/2–2/3 cleft anteriorly; lobes 5, unequal, densely pilose along veins and ciliate. Corolla yellow, ca. 2 cm; tube slightly decurved at middle, ca. 1 cm; galea strongly falcate apically, ca. 1 cm; beak slightly truncate and rounded, to 1.8 mm wide; lower lip ca. 6 mm × 1.2 cm, middle lobe ovate-triangular, smaller than lateral pair. Filaments 2 sparsely pubescent near apex, 2 glabrous throughout; anthers apiculate. Fl. Jul, fr. Aug.

• Moist grassy meadows; ca. 3800 m. S Gansu.

169. *Pedicularis globifera* J. D. Hooker, Fl. Brit. India 4: 308. 1848.

球花马先蒿 qiu hua ma xian hao

Herbs perennial, ca. 10(–25) cm tall. Stems cespitose, to more than 10, central stem ± erect, outer stems strongly procumbent to ascending, with 4 lines of hairs. Basal leaf petiole 2–5 cm. Stem leaves in whorls of 4, short petiolate; leaf blade linear-lanceolate, smaller than basal leaves, to 3 × 1 cm, pinnatisect; segments 10–18 pairs, widely spaced, lanceolate to linear, lobed or dentate, teeth callose. Inflorescences often densely spicate, to 6 cm. Calyx oblong-campanulate, 8–9 mm, 1/3 cleft anteriorly, densely pilose along veins; lobes 5, unequal, posterior one triangular, entire, lateral lobes larger, serrate. Corolla red to white; tube ca. 1.2 cm; galea ± falcate or erect, 8–9 mm, rounded in front, distinctly serrate crested; beak short, apex truncate, less than 1 mm wide. Filaments glabrous. Capsule ovoid-lanceolate, ca. 1.4 cm × 5 mm, apiculate. Fl. and fr. Jun–Oct.

Swampy alpine *Kobresia* meadows, boggy places along rivers and streams, grassy areas, grass of parks and gardens; 3600–5400 m. S and SE Xizang [Nepal, Sikkim].

170. *Pedicularis anas* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 578. 1888.

鸭首马先蒿 ya shou ma xian hao

Herbs perennial, (4.5–)10–30(–40) cm tall, slightly pilose, drying black. Stems 1 to several, dark purple, usually unbranched, or occasionally branched distally,

with 4 lines of hairs. Basal leaves glabrous; petiole 1.5–2.5 cm. Stem leaves in whorls of 4, short petiolate or sessile; leaf blade oblong-ovate to linear-lanceolate, glabrous on both surfaces, pinnatisect; segments 7–11 pairs, pinnatifid, spinescent-dentate. Inflorescences capitate to spicate; proximal bracts leaflike. Calyx often with purplish dots or tinged with purple, glabrous or villous; lobes 5, unequal, posterior one 3-serrate apically, lateral lobes larger, serrate, densely downy-ciliate. Corolla purple, yellow, or purple with pale yellow lower lip and dark purplish red galea; tube ca. 7 mm, decurved through anterior slit of calyx, ascending distally near junction of limb, expanded apically; galea falcate, ca. 6 mm; beak ca. 1 × 0.6–1 mm, slender; lower lip ca. 7.5 mm × 1 cm, middle lobe rounded, slightly smaller than lateral pair. Filaments glabrous. Capsule 2/5 enclosed by calyx, triangular-lanceolate, to 1.8 cm, apiculate. Seeds oblong, ca. 2 mm. Fl. Jul–Sep, fr. Aug–Oct.

• Alpine meadows; 3000–4400 m. S and SW Gansu, N and W Sichuan, E Xizang.

1a. Corolla yellow 170c. var. *xanthantha*

1b. Corolla purple or with pale yellow lower lip and dark purple-red galea.

2a. Lower corolla lip large; beak of galea short 170a. var. *anas*

2b. Lower corolla lip smaller; beak of galea longer 170b. var. *tibetica*

170a. *Pedicularis anas* var. *anas*

鸭首马先蒿(原变种) ya shou ma xian hao (yuan bian zhong)

Corolla purple with dark purple-red galea and pale yellow lower lip; beak short; lower lip large. Fl. Jul–Sep, fr. Aug–Oct.

• Alpine meadows; 3000–4300 m. S Gansu, N and W Sichuan.

170b. *Pedicularis anas* var. *tibetica* Bonati, Bull. Herb. Boissier, Sér. 2, 7: 544. 1907.

西藏鸭首马先蒿 xi zang ya shou ma xian hao
Corolla purple with dark purple-red galea and pale yellow lower lip; beak long; lower lip small. Fl. and fr. Jul–Sep.

• 3600–4400 m. W Sichuan, E Xizang.

170c. *Pedicularis anas* var. *xanthantha* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 200. 1963.

黄花鸭首马先蒿 huang hua ya shou ma xian hao
Pedicularis xanthantha H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 332. 1948.

Corolla yellow; lower lip ca. 9 mm; beak to 2 mm. Fl. Jul–Aug.

• Alpine meadows; 3300–3700 m. SW Gansu.

57. Ser. *Caucasicae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 65. 1877.

高加索系 gao jia suo xi

Herbs low. Stem leaves few, opposite or whorled. Inflorescences elongated to capitate, densely flowered. Calyx large, 5-lobed. Corolla tube strongly curved apically; galea toothless or beaked. Anthers acuminate.

About eight species: Afghanistan, China, India, Kazakstan, Kyrgyzstan, Pakistan, Russia; one species in China.

171. *Pedicularis semenowii* Regel, Bull. Soc. Imp. Naturalistes Moscou 41: 108. 1868.

赛氏马先蒿 sai shi ma xian hao

Pedicularis pycnantha Boissier var. *semenowii* (Regel) Prain.

Herbs perennial, 2–5(–10) cm tall. Roots fleshy. Stems single to few, unbranched, sparsely lanulose. Proximal leaves opposite, with petiole longer than leaf blade, distal ones whorled, ± sessile, sparsely lanulose; leaf blade linear-lanceolate, pinnatisect; segments oblong, pinnatisect, serrulate-dentate. Inflorescences capitate;

proximal bracts leaflike, shorter than flowers. Pedicel ca. 1.5 cm. Calyx campanulate, inflated in fruit, 1–1.7 cm; lobes 5, lanceolate-linear, serrulate. Corolla purplish rose or white and rose, 2.2–3 cm; galea slightly S-shaped apically; lower lip ca. as long as galea, 7–10 mm, middle lobe rounded, slightly smaller than lateral pair. Filaments 2 sparsely pubescent, 2 glabrous. Capsule obliquely ovoid, 1.2–1.5 cm. Fl. May–Jun, fr. Jun–Jul.

Steppes, stony and rocky slopes; 2700–4500 m. Xinjiang, Xizang [Afghanistan, India, Kazakstan, Kyrgyzstan].

58. Ser. *Molles* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 245. 1995.

柔毛系 rou mao xi

Stems several together, erect or ascending, often branched apically. Leaves in whorls of 3–5, pinnatisect. Stem leaves numerous. Inflorescences long spicate, interrupted. Calyx lobes 5. Corolla small; tube slightly curved at middle; galea toothless or beaked.

One species: Bhutan, China, Nepal, Sikkim.

172. *Pedicularis mollis* Wallich ex Benth, Scroph. Ind. 53. 1835.

柔毛马先蒿 rou mao ma xian hao

Herbs annual, (15–)30–80 cm tall, villous, not drying black. Stems erect, leafy. Stem leaves in whorls of 3 or

4; proximal petioles short; leaf blade linear-lanceolate, 3–5 cm × 7.5–10 mm, pinnatisect; segments 10–15 pairs, lanceolate, pinnatifid, with ovate divisions, dentate. Inflorescences often interrupted basally; bracts leaflike. Pedicel short. Calyx campanulate, ca. 6 mm,

tomentose; lobes 5, lanceolate, serrulate. Corolla red, 7–9 mm; tube ca. 5 mm, pubescent; galea erect, slender, apex acute but beakless; lower lip shorter than galea, spreading, ca. 5.5 mm wide, lobes rounded, equal, ciliate. Filaments glabrous. Capsule ovoid-lanceolate,

ca. 1.2 cm × 5.5 mm, ca. 2 × as long as calyx, obliquely apiculate. Fl. and fr. Jul–Sep. $2n = 16$.

Sand dunes along beaches, field margins, dry ground; 3000–4500 m. S Xizang [Bhutan, Nepal, Sikkim].

59. Ser. Denudatae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 96. 1890.

秃裸系 tu luo xi

Herbs low. Stems flexuous or diffuse, slender. Stem leaves opposite or whorled, ovate-lanceolate to ovate-oblong, pinnatilobate to pinnatifid. Inflorescences lax. Calyx lobes 5, unequal. Corolla small, tube slightly longer than calyx, decurved apically; galea lacking marginal teeth, forming a very short obtuse beak apically.

Two species: Bhutan, China, Sikkim; one species in China.

173. Pedicularis polygaloides J. D. Hooker, Fl. Brit. India 4: 317. 1884.

远志状马先蒿 yuan zhi zhuang ma xian hao

Herbs 2–8 cm tall, drying slightly black. Roots filiform. Stems with 2 lines of hairs. Basal leaves clustered, withering early; petiole 5–10 mm. Stem leaves opposite or occasionally in whorls of 3 or 4; petiole 2.5–5 mm or sometimes sessile; leaf blade ovate to ovate-oblong, 7.5–10 × ca. 2.5 mm, pinnatifid to incised-dentate.

Flowers axillary, proximal ones lax, distal ones dense;

distal bracts pinnatifid. Pedicel to 8 mm. Calyx oblong-campanulate, tomentose; posterior one entire, lateral pair larger. Corolla small; tube longer than calyx, slightly curved, expanded apically; galea erect, wider than tube, apex rounded; beak short, 2-cleft apically; lower lip wider than long, spreading, base with colored dots. Filaments glabrous. Capsule narrowly ovoid, ca. 1/3 exceeding calyx, obliquely apiculate.

About 4000 m. S Xizang [Bhutan, Sikkim].

60. Ser. Abrotanifoliae H. Limpricht, Repert. Spec. Nov. Regni Veg. 20: 209. 1924.

蒿叶系 hao ye xi

Stems branched or not. Leaves whorled, proximal ones sometimes opposite, oblong to lanceolate, pinnatipartite to pinnatisect. Flowers laxly or compactly arranged in spikes. Calyx lobes 5. Corolla tube bent forward apically; galea ± truncate at apex, lacking marginal teeth, beakless to short beaked.

About six species: China, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; five species in China.

1a. Corolla tube bent in calyx tube, 12–14 mm 177. *P. brevilabris*

1b. Corolla tube bent forward apically, above calyx lobes, 6–8(–14) mm.

2a. Corolla tube much longer than galea.

3a. Corolla tube slightly longer than calyx; filaments glabrous; galea slightly protracted at apex, ± square short beaked 174. *P. abrotanifolia*

3b. Corolla tube more than 2 × as long as calyx; 2 filaments pubescent; galea conical, short beaked 178. *P. ludwigii*

2b. Corolla tube ca. as long as or slightly longer than galea.

4a. Lower corolla lip ciliate; filaments 2 pubescent 175. *P. densispica*

4b. Lower corolla lip not ciliate; filaments glabrous 176. *P. obscura*

174. Pedicularis abrotanifolia M. Bieberstein ex Steven, Mém. Soc. Imp. Naturalistes Moscou 6: 22. 1823.

蒿叶马先蒿 hao ye ma xian hao

Herbs perennial, to 40 cm tall, not drying black. Stems several, erect, unbranched, with 4 lines of hairs. Basal leaves withering early; petiole to 1.5 cm. Stem leaves in whorls of 4, short petiolate, narrowly oblong to oblong-lanceolate, to 5 × 1.8 cm, pinnatisect; segments 7–12 pairs, linear, pinnatifid to incised-dentate.

Inflorescences spicate, usually interrupted; proximal bracts leaflike, narrowly ovate, white long ciliate, distal ones entire. Pedicel short. Calyx to 1 cm, membranous, slightly cleft anteriorly; lobes 5, unequal, triangular, white villous ciliate. Corolla yellow; tube strongly curved apically, 1.2–1.4 cm; galea erect, slightly short beaked apically; lower lip ca. as long as galea, not ciliate. Filaments glabrous. Fl. Jul–Aug, fr. Sep–Oct.

Dry rocky slopes, grassy slopes, sometimes in moist meadows. Xinjiang [Kazakstan, Mongolia, Russia (W Siberia)].

175. Pedicularis densispica Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 594. 1888.

密穗马先蒿 mi sui ma xian hao

Herbs annual, erect, 15–60 cm tall, not drying black. Stems many branched basally or unbranched, with 4 lines of hairs. Leaves opposite or distal ones in whorls of 3 or 4, sessile or petiole to 5 mm, villous; leaf blade long ovate to ovate-oblong, 2–5 × 0.7–1.5 cm, pubescent on both surfaces, pinnatipartite to pinnatisect; segments 6–10 pairs, linear to linear-oblong, incised-dentate. Inflorescences spicate, very dense, to 6.5 cm, sometimes interrupted basally; proximal bracts leaflike, distal ones long ovate, shorter than to 1–3 × as long as flowers, entire. Calyx 5–8 mm, shallowly cleft anteriorly, membranous, densely pubescent along veins; lobes 5, unequal, densely pub-

escent; posterior one smallest, entire, others serrate. Corolla rose to pale purple, 1.3–1.6 cm; tube erect basally, slightly curved apically, 6–8 mm; galea sometimes yellowish green, 8–9 mm, apex acute; lower lip 6–10 mm, spreading, ciliate, middle lobe smaller than lateral pair, ovate. Anterior filament pair densely pubescent. Capsule ovoid, ± compressed, 0.8–1.2 cm, obliquely short apiculate. Fl. Apr–Sep, fr. Aug–Oct.

• Swampy or alpine meadows, forests; 1900–4400 m. W Sichuan, S and SE Xizang, NW Yunnan.

- 1a. Plants 15–40 cm tall; bracts shorter than flowers, ca. 8 mm; lower corolla lip ca. as long as galea
..... 175a. subsp. *densispica*
- 1b. Plants to 60 cm tall; bracts 2–3 × as long as flowers; lower corolla lip slightly longer than galea.
- 2a. Plants ± pubescent; corolla galea rose to purple 175b. subsp. *schneideri*
- 2b. Plants usually glabrous; corolla galea yellowish green 175c. subsp. *viridescens*

175a. *Pedicularis densispica* subsp. *densispica*

密穗马先蒿(原亚种) mi sui ma xian hao (yuan ya zhong)

Plants 15–40 cm tall. Bracts shorter than flowers, ca. 8 mm. Lower lip ca. as long as galea. Fl. Apr–Jul.

• Swampy meadows, forests; 1900–4400 m. W Sichuan, SE Xizang, NW Yunnan.

175b. *Pedicularis densispica* subsp. *schneideri* (Bonati) P. C. Tsoong, Acta Phytotax. Sin. 3: 297. 1955.

许氏密穗马先蒿 xu shi mi sui ma xian hao
Pedicularis densispica var. *schneideri* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 133. 1921.

Plants to 60 cm tall, ± pubescent. Bracts 2–3 × as long as flowers. Corolla 1.3–1.6 cm; galea rose to purple; lower lip slightly longer than galea. Fl. Jun–Aug.

• Alpine meadows; 2700–4300 m. W Sichuan, S and SE Xizang, NW Yunnan.

175c. *Pedicularis densispica* subsp. *viridescens* P. C. Tsoong, Acta Phytotax. Sin. 3: 297. 1955.

绿盔密穗马先蒿 lü kui mi sui ma xian hao
Plants to 60 cm tall, usually glabrous. Bracts 2–3 × as long as flowers. Corolla ca. 1.6 cm; galea yellowish green; lower lip slightly longer than galea. Fl. Jun–Jul.

• SE Xizang.

176. *Pedicularis obscura* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 149. 1926.

暗昧马先蒿 an mei ma xian hao
Herbs perennial, pubescent. Stems erect or ascending to repent, many branched; branches diffuse, 0.8–1.4 cm, with 2–4 lines of villous hairs or pubescent over entire surface. Basal leaves withering early. Proximal stem leaves opposite, distal ones in whorls of 4; petiole 0.5–2

cm, distal ones winged; leaf blade broadly elliptic-oblong, 2–3 cm × 5–8 mm, pinnatisect; segments broadly elliptic-oblong, pinnatifid, lobes 3–5 × ca. 1 mm. Inflorescences spicate, dense; bracts leaflike, 1.5–2.5 cm, longer than flowers, villous. Calyx 7–8 mm, deeply cleft anteriorly, densely pubescent; lobes 5, unequal, posterior one lanceolate and entire, lateral lobes broadly ovate and serrate. Corolla red; tube bent at a right angle forward apically, ca. as long as or slightly longer than calyx; galea erect, truncate at apex, beakless, glabrous; lower lip slightly longer than galea, glabrous. Filaments glabrous; anthers apiculate. Fl. Jun, fr. Jul–Aug.

• Alpine meadows; 3800–4100 m. NW Yunnan.

177. *Pedicularis brevilabris* Franchet, Bull. Soc. Bot. France 47: 33. 1900.

短唇马先蒿 duan chun ma xian hao

Herbs annual, 25–45 cm tall, not drying black. Stems single or 4 or 5 cespitose, erect or outer stems ascending, branched basally or unbranched, sparsely pubescent or with lines of white hairs. Proximal leaves opposite, distal ones in whorls of 4; petiole of proximal leaves slender, to 2.5–3 cm, distal leaves sessile or short petiolate; leaf blade long ovate to elliptic-oblong, 1.5–3 × 1.4–2 cm, pinnatifid; segments 4–8 pairs, ovate-oblong, incised-dentate. Inflorescences capitate or spicate, elongated to 8 cm, interrupted basally; proximal bracts leaflike, longer than flowers, distal ones ca. as long as to shorter than flowers. Calyx campanulate, slightly cleft anteriorly, white villous; tube 7–8 mm; lobes 5, unequal, triangular to ovate-oblong, entire to dentate. Corolla pale red, 1.5–2 cm; tube bent within calyx tube, 6–8 mm; galea ± falcate, 0.9–1.2 cm, apex with a short truncate beaklike tip; lower lip shorter than galea, 6–8 × 6–9 mm, finely ciliate. Filaments glabrous. Fl. Jul, fr. Aug.

• Alpine meadows, thickets; 2700–3500 m. SW Gansu, NW and W Sichuan.

178. *Pedicularis ludwigii* Regel, Bull. Soc. Imp. Naturalistes Moscou 41(1): 107. 1868.

小根马先蒿 xiao gen ma xian hao

Pedicularis leptorhiza F. Ruprecht.

Herbs annual, to 12 cm tall. Roots fusiform, slender. Stems single or 3–6 cespitose, erect, unbranched, with lines of hairs. Leaves opposite or in whorls of 3(–5); petiole 3–8 mm; leaf blade lanceolate to oblong-lanceolate, 1.5–2.2 cm × 3–5 mm, pinnatisect; segments 6 or 7 pairs, widely spaced, pinnatifid or incised-dentate. Inflorescences spicate, 1.8–3 cm, dense initially, becoming lax; proximal bracts leaflike, distal ones ca. as long as calyx apically, narrowly ovate. Calyx turgid campanulate, ca. 7.5 mm, membranous, hispidulous along veins; lobes 5, unequal, posterior one triangular and entire, lateral lobes serrate. Corolla purple, ca. 2 cm; tube erect basally, curved and expanded apically, more

than 2 × as long as calyx; galea with a broadly conical and truncate beaklike tip; lower lip shorter than galea, spreading, wider than long, serrulate, lobes rounded, middle lobe smaller than lateral pair and projecting.

Filaments 2 pubescent, 2 glabrous; anthers apiculate. Fl. Jul–Aug.

Subalpine regions. Xinjiang [Kazakstan, Kyrgyzstan, Tajikistan, Uzbekistan].

61. Ser. Simae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 97. 1890.

砒镁系 xi mei xi

Herbs not drying black, pubescent. Stems branched basally or unbranched. Leaves opposite or in whorls of 3, petiolate, oblong, pinnatipartite. Inflorescences spicate. Calyx lobes 5, unequal. Corolla tube ± erect; galea longer than lower lip, terminating in a very short obtuse beak, marginal teeth lacking.

• One species: endemic to China.

179. Pedicularis sima Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 27: 514. 1881.

砒镁马先蒿 xi mei ma xian hao

Herbs annual, to 30 cm tall. Roots slender. Stems with 4 lines of hairs. Proximal leaves opposite, distal ones in whorls of 3; petiole to 1.5 cm; leaf blade oblong, 1.5–2.5 × ca. 1 cm; segments 5–7 pairs, ovate to oblong-ovate, dentate, both surfaces densely lanulose.

Inflorescences interrupted basally, long pubescent; bracts leaflike basally, rhomboidal apically. Calyx short

cylindric, densely villous along veins; posterior lobe triangular, entire, lateral lobes larger, ovate, serrate. Corolla rose; tube shorter than calyx tube and galea; galea slightly falcate; lower lip shorter than galea, ciliate, middle lobe rounded, smaller than lateral pair. Filaments glabrous. Fl. Aug, fr. Sep.

• Alpine meadows, forests; 3500–4000 m. E and W Gansu, N Sichuan, E Xizang.

62. Ser. Myriophyllae Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 58. 1877.

万叶系 wan ye xi

Herbs slightly drying black or not. Stems erect or ascending. Leaves whorled, pinnatisect. Stem leaves numerous. Inflorescences racemose or spicate. Calyx lobes 5. Corolla tube erect; galea bent apically, apex producing a beak. Nine species: North America (Alaska), China, Japan, Mongolia, Russia (Siberia); eight species in China.

1a. Beak of corolla less than 1 mm; corolla only 1.4 cm, rose; lateral calyx lobes ± entire 180. *P. myriophylla*

1b. Beak of corolla 2–3(–5) mm; corolla 1.5–2.5 cm; lateral calyx lobes serrate, pinnatifid, or entire.

2a. Corolla tube erect; galea distinctly crested.

3a. Calyx lobes narrowly triangular-lanceolate; middle lobe of lower corolla lip not hoodlike apically 186. *P. cristatella*

3b. Calyx lobes ± flabellate; middle lobe of lower corolla lip hoodlike apically 187. *P. deqinensis*

2b. Corolla tube ± decurved; galea indistinctly crested.

4a. Corolla purplish red 184. *P. tatarinowii*

4b. Corolla yellow.

5a. At least proximal bracts distinct, longer than flowers; all filaments glabrous or 2 pubescent.

6a. Corolla 2–2.5 cm; anterior filaments villous 181. *P. alaschanica*

6b. Corolla ca. 1.5 cm; filaments glabrous or pubescent 185. *P. scolopax*

5b. All bracts shorter than flowers; filaments pubescent.

7a. Basal leaves persistent; stems herbaceous, unbranched apically; calyx at least 1/2 cleft anteriorly, densely brown ciliate 182. *P. pseudocurvituba*

7b. Basal leaves not persistent; stems ± woody, short branched throughout; calyx barely 1/3 cleft anteriorly, slightly ciliate 183. *P. curvituba*

180. Pedicularis myriophylla Pallas, Reise Russ. Reich. 3: 737. 1776.

万叶马先蒿 wan ye ma xian hao

Herbs annual, to 40 cm tall, not drying black. Roots conical, slender. Stems usually single, branched throughout, with 4 lines of hairs. Basal leaves withering early. Stem leaves in whorls of (3 or)4, rarely opposite; petiole to 1 cm; leaf blade lanceolate-oblong, ca. 3 × 1 cm, both surfaces glabrous, pinnatisect; segments 10–13 pairs, linear-lanceolate, pinnatipartite, few toothed. Inflorescences racemose, sometimes interrupted basally;

proximal bracts leaflike. Pedicel elongating to 2.5 mm in fruit. Calyx to 7 mm, glabrous, ca. 1/3 cleft anteriorly; lobes 5, slightly unequal, triangular, ± entire, ciliate. Corolla rose or purple, ca. 1.4 cm; tube equal to or longer than calyx, erect basally, slightly bent and expanded apically; galea barely bent apically, much wider than tube; beak pointing outward, not prominent, less than 1 mm; lower lip ca. 5 × 5 mm. Anterior filament pair villous, posterior pair glabrescent. Capsule lanceolate-ovoid, ca. 1.5 cm, apex acuminate. Fl. Jun–Jul, fr. Jul–Aug.

Forest clearings, meadows. NW Hebei, Xinjiang [Mongolia, Russia (Siberia)].

- 1a. Corolla rose, tube ca. as long as or slightly exceeding calyx 180a. var. *myriophylla*
1b. Corolla purple, tube slightly longer, exceeding calyx 180b. var. *purpurea*

180a. *Pedicularis myriophylla* var. *myriophylla*

万叶马先蒿(原变种) wan ye ma xian hao (yuan bian zhong)

Corolla rose; tube ca. as long as or slightly exceeding calyx.

Xinjiang [Mongolia, Russia (Siberia)].

180b. *Pedicularis myriophylla* var. *purpurea* Bunge in Walpers, Repert. Bot. Syst. 3: 410. 1844.

紫色万叶马先蒿 zi se wan ye ma xian hao

Corolla purple; tube slightly longer, exceeding calyx.

NW Hebei [Mongolia].

181. *Pedicularis alaschanica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 59. 1877.

阿拉善马先蒿 a la shan ma xian hao

Herbs perennial, to 35 cm tall, drying slightly black.

Roots short, stout. Stems usually numerous and branched basally, unbranched apically, densely rust colored tomentose. Basal leaves withering early. Proximal stem leaves opposite, distal ones in whorls of 3 or 4, sometimes all opposite; petiole to 3 cm, strongly winged, tomentose; leaf blade lanceolate-oblong to ovate-oblong, 2.5–3 × 1–1.5 cm, glabrescent on both surfaces, pinnatipartite; segments 7–9 pairs, widely spaced, linear, serrulate. Inflorescences spicate, to more than 2 cm, usually interrupted basally; bracts leaflike, proximal ones longer than flowers. Calyx oblong, to 1.3 cm, membranous, deeply cleft anteriorly, densely pubescent, some only villous along veins; lobes 5, unequal, posterior one triangular and entire, lateral lobes triangular-lanceolate, entire to obscurely serrate. Corolla yellow, 2–2.5 cm; tube slightly bent apically, ca. as long as calyx; galea slightly bent apically, indistinctly crested; beak ± horizontal, 2–3 mm; lower lip ca. as long as or slightly longer than galea, middle lobe smaller than lateral pair. Anterior filament pair villous apically, posterior pair glabrous. Fl. Jun–Aug, fr. Sep.

• Dry rocky slopes in river valleys, rocky grassy slopes, among stones of valley beds, open hillsides, thickets; 3900–5100 m. Gansu, Nei Mongol, Ningxia, Qinghai, Xizang.

- 1a. Leaves in whorls of 3 or 4 apically; calyx villous only along veins, lobes obscurely serrate to ± entire; beak of galea long 181a. subsp. *alaschanica*
1b. Leaves usually opposite; calyx densely pubescent throughout, lobes entire; beak of galea shorter 181b. subsp. *tibetica*

181a. *Pedicularis alaschanica* subsp. *alaschanica*

阿拉善马先蒿(原亚种) a la shan ma xian hao (yuan ya zhong)

Leaves of upper stem in whorls of 3 or 4. Calyx villous only along veins; lobes obscurely serrate to ± entire. Beak of galea long.

• Dry rocky slopes in river valleys, among stones of valley beds, open hillsides, thickets; 3900–5100 m. Gansu, Nei Mongol, Ningxia, Qinghai, NE and SE Xizang.

181b. *Pedicularis alaschanica* subsp. *tibetica* (Maximowicz) P. C. Tsoong, Acta Phytotax. Sin. 3: 298. 1954 (1955).

西藏阿拉善马先蒿 xi zang a la shan ma xian hao

Pedicularis alaschanica var. *tibetica* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 578. 1888. Leaves usually opposite. Calyx densely pubescent throughout; lobes entire. Beak of galea short. Fl. Jul–Aug.

• Rocky grassy slopes; 4000–4700 m. S and SW Xizang.

182. *Pedicularis pseudocurvituba* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 412. 1963.

假弯管马先蒿 jia wan guan ma xian hao

Pedicularis curvituba Maximowicz, p.p.

Herbs perennial, (8–)15(–30) cm tall, not drying black. Roots stout. Stems often several, central stem erect, outer ones usually procumbent to ascending, unbranched apically, herbaceous, with 4 lines of hairs. Basal leaves persistent; petiole to 2 cm, narrowly winged. Stem leaves in whorls of 4; petiole only ca. 5 mm on distal leaves; leaf blade oblong-lanceolate to linear, to 4 × 1.2 cm, pinnatisect; segments 5–9 pairs, widely spaced, linear to lanceolate, pinnatifid, few toothed. Inflorescences spicate, dense, sometimes in 1 or 2 slightly disjunct fascicles; proximal bracts leaflike, shorter than flowers. Calyx to 1 cm, often ca. 1/2 cleft anteriorly; lobes 5, unequal, densely brown ciliate, serrate. Corolla yellow, ca. 1.7 cm; tube decurved through anterior calyx cleft, stout, expanded apically; galea slightly bent apically, indistinctly crested; beak bent ± downward, ca. 3 mm; lower lip longer than galea. Filaments pubescent. Capsule obliquely ovoid, ca. 1.8 cm × 8 mm, ca. 1/3 exceeding calyx. Fl. Jul, fr. Jul–Aug.

• River banks, sandy soil; ca. 4300 m. Qinghai.

183. *Pedicularis curvituba* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 60. 1877.

弯管马先蒿 wan guan ma xian hao

Herbs annual, 30(–50) cm tall, not drying black. Roots ± woody. Stems several, short branched throughout, ± woody at anthesis, with 4 lines of hairs. Basal leaves withering. Stem leaves in whorls of 4, proximal ones to 1.5 cm, distal ones only 1.5–4 mm; leaf blade oblong-lanceolate to ovate-oblong or linear, to 2–4.5 × 0.9–1.7 cm, glabrescent on both surfaces, pinnatisect; segments 6–10 pairs, widely spaced, ovate-lanceolate to linear-lanceolate, incised-dentate. Flowers in ± interrupted

racemes, to 20 cm; bracts shorter than flowers, proximal ones leaflike. Pedicel short. Calyx ca. 1.1 cm, barely 1/3 cleft anteriorly; lobes 5, unequal, slightly ciliate, pinnatifid to serrate. Corolla yellow or white, ca. 2 cm; tube strongly bent in calyx, expanded apically; galea slightly bent apically, indistinctly crested; beak slightly bent downward, 2.5–3 mm; lower lip ca. 8 mm × 1.3 cm. Filaments pubescent. Fl. Jun–Jul, fr. Jul–Aug.

• Open slopes; ca. 1600 m. N, SE, and SW Gansu, N Hebei, E Nei Mongol, N Shaanxi.

1a. Corolla yellow, usually small; stems ± woody at base; leaf segments ovate-lanceolate to linear-lanceolate 183a. subsp. *curvituba*

1b. Corolla white, large; stems much woody; leaf segments linear 183b. subsp. *provitii*

183a. *Pedicularis curvituba* subsp. *curvituba*

弯管马先蒿(原亚种) wan guan ma xian hao (yuan ya zhong)

Stems ± woody at base. Leaf segments ovate-lanceolate to linear-lanceolate. Corolla yellow, usually small. Fl. Jun–Jul.

• N and SW Gansu.

183b. *Pedicularis curvituba* subsp. *provotii* (Franchet) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 215. 1963.

洛氏弯管马先蒿 luo shi wan guan ma xian hao

Pedicularis provotii Franchet, J. Bot. (Morot) 4: 318. 1890; *P. borodowskii* Palibin.

Stems woody. Leaf segments linear. Corolla white, large. Fl. Jun.

• Open slopes; ca. 1600 m. SE Gansu, N Hebei, E Nei Mongol, N Shaanxi.

184. *Pedicularis tatarinowii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 60. 1877.

塔氏马先蒿 ta shi ma xian hao

Pedicularis myriophylla Pallas var. *tatarinowii* (Maximowicz) Hurusawa.

Herbs annual, to 50 cm tall, usually ± woody, not drying black. Roots to 10 cm, woody. Stems 1 to several, erect or outer ones ± ascending or procumbent, often reddish purple, rigid, many branched apically, with 4 lines of hairs. Basal leaves withering early. Stem leaves in whorls of (3 or)4, rarely opposite, short petiolate; leaf blade ovate-oblong to oblong-lanceolate, 2–3.5(–7) × 0.8–1.5(–3) cm, pinnatisect; segments 5–10(–15) pairs, lanceolate, pinnatifid to pinnatifid, dentate. Inflorescences racemose; bracts leaflike, shorter than flowers. Calyx ca. 8 mm, membranous, slightly cleft anteriorly; lobes 5, narrowly lanceolate, serrate. Corolla purplish red; tube slightly bent apically, slightly longer than calyx; galea strongly bent apically, indistinctly crested; beak bent downward, ca. 2 mm; lower lip longer than galea. Filaments pubescent or posterior pair glabrescent. Capsule obliquely ovoid, ca. 1.6 cm × 7.5 mm, slightly exceeding calyx. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows; 2000–2300 m. N Hebei, S Nei Mongol, N Shanxi.

185. *Pedicularis scolopax* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 513. 1881.

鹞形马先蒿 yu xing ma xian hao

Herbs perennial, to more than 30 cm tall, not drying black. Roots fusiform, fleshy. Stems branched at base, central stem ± erect, outer stems procumbent to ascending, densely pubescent. Basal leaves few, withering early. Proximal stem leaves opposite or in whorls of 3, other ones in 4's; petiole to 2 cm, villous; leaf blade linear-oblong to oblong-lanceolate, 1.5–3 cm × 6–10 mm, glabrescent on both surfaces, pinnatifid; segments 6–8 pairs, widely spaced, linear, pinnatifid, serrulate. Inflorescences spicate, to 11 cm, flowers in whorls of 4–6, interrupted basally; proximal bracts longer than flowers, distal ones shorter than flowers, ciliate. Calyx 9–10 mm, membranous, slightly cleft anteriorly, pubescent along veins; lobes 5, unequal, serrate and ± entire. Corolla yellow, ca. 1.5 cm; tube slightly bent apically, ca. 1 cm, slender; galea slightly bent apically, indistinctly serrate; beak bent downward, ca. 3 mm; lower lip ca. 4 × 6.5 mm, glabrous. Filaments glabrous. Fl. Jun–Jul, fr. Aug.

• Alpine shrubby grasslands; 3500–4100 m. N Gansu, NE Qinghai.

186. *Pedicularis cristatella* Pennell & H. L. Li in H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 291. 1948.

具冠马先蒿 ju guan ma xian hao

Pedicularis cristata Maximowicz (1888), not Vitmann (1789).

Herbs annual, to 50 cm tall, woody basally, not drying black. Roots woody. Stems 1–6, erect or outer ones ascending, branched apically or unbranched, with 4 dense yellow lines of hairs. Leaves opposite or in whorls of 5; petiole to 1 cm, densely yellow villous; leaf blade oblong-lanceolate to narrowly lanceolate, 2–3 × 0.7–1.5 cm, abaxially villous along veins, adaxially short bristly, pinnatisect; segments 6–12 pairs, lanceolate, pinnatifid, serrate. Inflorescences long spicate, to 20 cm, with flowers in whorls of 3 or 4, often interrupted; proximal bracts leaflike. Calyx white, membranous, slightly cleft anteriorly; lobes 5, ± equal, narrowly triangular-lanceolate, entire. Corolla reddish purple; tube erect, 8–9 mm; galea bent apically, ca. 1 cm, distinctly crested; beak bent downward, ca. 6.5 mm; lower lip ca. 1.1 × 1.3 cm, middle lobe not hoodlike. Anterior filament pair densely pubescent. Capsule compressed, ovoid, ca. 1.4 cm × 6 mm, obliquely apiculate. Fl. Jun–Jul, fr. Jul.

• Cliffs, meadows in valleys, open or shrubby grasslands; 1900–3000 m. SW Gansu, N Sichuan.

187. *Pedicularis deqinensis* H. P. Yang, Acta Phytotax. Sin. 28: 137. 1990.

德钦马先蒿 de qin ma xian hao

Herbs annual, 20–35 cm tall, drying slightly black. Stems 1 to several, erect or outer stems ascending, with 4 lines of hairs, often branched apically, branches 2–4 per node, dark purple. Stem leaves often in whorls of 4; petiole 5–10 mm; leaf blade oblong to elliptic-oblong, 2.5–5 × 0.8–2.5 cm, abaxially sparsely pubescent, adaxially glabrescent, pinnatisect; segments 5–12 pairs, oblong-lanceolate, pinnatifid, dentate. Inflorescences racemose, to 18 cm, with whorled flowers, interrupted; bracts leaflike. Calyx cylindrical-campanulate, ca. 5 mm, slightly cleft anteriorly, glabrous; lobes 5, ± flabellate,

3- or 4-cleft, often reflexed, densely villous-ciliate. Corolla pale purple, with purple galea, 1.5–1.8 cm; tube erect; galea bent at a right angle apically, conspicuously crested; beak ca. 5 mm; lower lip ca. 8 mm × 1.2 cm, middle lobe hoodlike apically. Filaments glabrous. Capsule ovoid, ca. 1 cm, apex short acuminate. Fl. Jul–Aug, fr. Aug–Sep.

• *Quercus semecarpifolia* forests, river valleys; 2900–3400 m. NW Yunnan.

63. Ser. Semitortae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 70. 1890.

半扭卷系 ban niu juan xi

Ser. *Gyrorhynchae* Prain.

Herbs slightly drying black or not. Stems usually branched. Leaves opposite or in whorls of 3 or 4, pinnatipartite to pinnatisect. Inflorescences long spicate, interrupted basally; bracts usually narrow and serrate or pinnatifid. Calyx lobes 5, unequal or sometimes ± equal, ± serrate. Corolla tube erect; galea bent apically; beak long, coiled or twisted apically.

• Six species: endemic to China.

1a. Corolla purple-red; plants perennial.

2a. Calyx densely white villous, 1/2 cleft anteriorly; galea crested; filaments glabrous 192. *P. fetisowii*

2b. Calyx glabrous, slightly cleft anteriorly; galea not crested; filaments densely villous 193. *P. oliveriana*

1b. Corolla yellow; plants annual.

3a. Bracts usually ± palmately cleft apically; lower corolla lip not ciliate, middle lobe not hoodlike; calyx more than 1/2 cleft anteriorly.

4a. Beak of galea very long, twisted laterally into a circle; filaments 2 villous 191. *P. semitorta*

4b. Beak of galea slightly bent or coiled at apex, not twisted laterally; filaments glabrous 188. *P. roborowskii*

3b. Bracts not palmately cleft apically; lower corolla lip ciliate, middle lobe hoodlike; calyx slightly cleft anteriorly.

5a. Lateral calyx lobes ovate, distinctly serrate 189. *P. gyrorhyncha*

5b. Lateral calyx lobes lanceolate-linear, obscurely serrate 190. *P. duclouxii*

188. *Pedicularis roborowskii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 512. 1881.

劳氏马先蒿 lao shi ma xian hao

Herbs annual, to 50 cm tall, drying slightly black. Stems several, ± woody at base, with 4 lines of hairs. Basal leaves opposite; petiole to 2 cm. Stem leaves in whorls of 4; petiole to 3–5 mm; leaf blade broadly oblong to ovate-oblong, to 4 × 2 cm, pinnatisect; segments 5–7 pairs, lanceolate to linear, pinnatifid, dentate. Inflorescences usually long racemose, to 18 cm, interrupted; proximal bracts leaflike, longer than flowers, distal ones slightly enlarged at base, ± palmately 3–5-cleft, glabrescent. Pedicel short. Calyx 8–10 mm, more than 1/2 cleft anteriorly; lobes 5, ± equal, grouped posteriorly, slender. Corolla yellow, barely 1.3 cm; tube decurved through anterior calyx cleft; galea with deltoid marginal teeth; beak slightly bent or coiled at apex, ca. 5 mm; lower lip ca. 8 × 9 mm, glabrous, middle lobe subrounded. Filaments glabrous. Capsule triangular-ovoid, ca. 1.8 cm.

• *Picea* and *Betula* forests. W Gansu, E Qinghai, N Sichuan.

189. *Pedicularis gyrorhyncha* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 545. 1888.

旋喙马先蒿 xuan hui ma xian hao

Herbs annual, 23–110 cm tall, not drying black. Stems often many branched apically; branches slender, 1–4 per node. Basal leaves opposite. Stem leaves in whorls of 3 or 4; petiole to 3 cm basally; leaf blade ovate-oblong to lanceolate-oblong, 2–6 × 0.8–2.5 cm, abaxially sparsely long pubescent to glabrescent, adaxially sparsely pubescent, pinnatipartite to pinnatifid; segments 4–10 pairs, ovate to linear-oblong, incised-dentate. Inflorescences spicate, interrupted; proximal bracts leaflike, often longer than flowers. Calyx ca. 8 mm, scarcely cleft anteriorly, sparsely pubescent along veins; lobes 5, unequal, posterior one triangular, entire, lateral teeth larger, ovate, serrate. Corolla pale yellow, 0.9–1.7 cm; tube ca. 8 mm; beak semicircular, 8–9 mm; lower lip ca. 7 mm × 1.3 cm, ciliate, middle lobe subrounded, hoodlike. Filaments pubescent. Capsule enclosed by accrescent calyx, to 2 cm. Fl. Jul–Aug, fr. Aug–Sep.

• Moist ground, forest clearings; 2700–4000 m. NW Yunnan.

190. *Pedicularis duclouxii* Bonati, Bull. Soc. Bot. France 55: 245. 1908.

杜氏马先蒿 *du shi ma xian hao*

Pedicularis muliensis Handel-Mazzetti; *P. wangii* H. L. Li.

Herbs annual, 30–50(–70) cm tall, slightly woody basally, not drying black. Roots conical, slender. Stems single, branched or not, with 4 lines of hairs. Basal leaves withering early. Stem leaves opposite or in whorls of 3 or 4; petiole to 2 cm; leaf blade oblong-lanceolate, 1.3–8 × 0.5–3 cm, abaxially pubescent along veins, adaxially sparsely pubescent or glabrescent, pinnatifid to pinnatisect; segments 5–11 pairs, widely spaced, oblong-lanceolate, often not symmetrical, margin double dentate or pinnatifid. Inflorescences spicate, interrupted; proximal bracts leaflike, distal ones ovate. Pedicel short. Calyx scarcely cleft anteriorly, membranous; lobes 5, unequal, posterior one triangular, entire, lateral teeth larger, lanceolate-linear, obscurely serrate, ciliate. Corolla yellow, 1.3–1.5 cm; tube slightly bent apically, 6–8 mm; galea ± twisted; beak dark colored, semicircular, slender; lower lip ca. 7.5 mm × 1.1 cm, densely ciliate, middle lobe hoodlike. Filaments pubescent or 2 glabrous. Capsule compressed, ovoid, ca. 1.5 cm × 8 mm, obliquely apiculate. Fl. Aug–Sep, fr. Sep–Oct.

• Forests, alpine meadows, grassy slopes; 3400–4300 m. SW Sichuan, NW Yunnan.

191. *Pedicularis semitorta* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 546. 1888.

半扭卷马先蒿 *ban niu juan ma xian hao*

Herbs annual, to 60 cm tall, ± drying black. Roots conical, slender. Stems 1–5, unbranched or branched apically; branches slender, often 3–5 per node. Basal leaves withering early; petiole to 3 cm. Stem leaves in whorls of 3–5; petiole 1–3 cm, distal ones much shorter; leaf blade ovate-oblong to linear-oblong, 3.5(–10) cm × 1.5(–5) mm, abaxially glabrescent, adaxially sparsely pubescent or glabrescent, pinnatisect; segments 8–10 pairs, linear, pinnatifid, dentate. Inflorescences spicate, more than 20 cm, interrupted basally; bracts shorter than flowers, proximal ones leaflike, distal ones usually ± palmately cleft. Calyx 9–10 mm; more than 1/2 cleft anteriorly, glabrous; lobes 5, grouped posteriorly, linear. Corolla yellow, 1.4–1.8 cm; tube slightly enlarged and curved apically, 1–1.1 cm; beak twisted laterally usually into a circle, 5–7 mm; lower lip ca. 1.1 × 1.4–1.7 cm, glabrous. Filaments 2 villous, 2 glabrous. Capsule 3/4 enclosed by accrescent calyx, compressed, ovoid, ca. 1.7 cm × 6 mm, obliquely apiculate. Fl. Jun–Jul, fr. Jul–Aug.

• Alpine meadows; 2500–3900 m. C and SW Gansu, E Qinghai, N Sichuan.

192. *Pedicularis fetisowii* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 349. 1879.

费氏马先蒿 *fei shi ma xian hao*

Herbs perennial, 14–40 cm tall, not drying black. Roots densely fascicled, ± fleshy. Stems dark purplish, pubescent to glabrescent. Basal leaves withering early. Proximal stem leaves opposite, distal ones in whorls of 4; petiole of proximal leaves ca. 3.5 cm, distal ones to 2–3 mm; leaf blade oblong-lanceolate to linear-lanceolate, with narrowly winged and dentate midvein, 0.8–4.5 × 0.2–2.8 cm, abaxially sparsely white pubescent or glabrescent, adaxially glabrous, pinnatifid; segments 11 pairs, pinnatifid, few toothed. Inflorescences capitate to short spicate, to 12 cm, interrupted; bracts linear-lanceolate, shorter than flowers. Calyx 6–7 mm, membranous, densely white villous, ca. 1/2 cleft anteriorly; lobes 5, unequal, posterior one triangular, entire, lateral teeth larger, obscurely serrate. Corolla purple-red; tube 0.8–1.2 cm, slightly expanded near apex, finely pubescent; galea crested, marginally long ciliate; beak S-shaped, ca. 8 mm; lower lip 7–9.5 × 7–12 mm, lobes ± equal. Filaments glabrous. Fl. Jun, fr. Jul–Aug.

• Valleys; ca. 2000 m. E Xinjiang.

193. *Pedicularis oliveriana* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 257. 1889.

奥氏马先蒿 *ao shi ma xian hao*

Pedicularis oliveriana Prain subsp. *lasiantha* P. C. Tsong.

Herbs perennial, to 50 cm tall, ± drying black. Roots fascicled, fleshy. Stems several, dark, with 4 lines of sparse hairs. Basal leaves withering early. Stem leaves opposite or in whorls of 3 or 4, ± sessile to short petiolate; leaf blade oblong-lanceolate, to 4.5 × 1.5 cm, pinnatifid; segments 5–8 pairs, ovate to lanceolate, pinnatifid, ovate-triangular, incised-dentate. Inflorescences to 20 cm, interrupted; bracts leaflike, ca. as long as flowers. Calyx 5–6 mm, barely cleft anteriorly, glabrous; lobes 5, unequal, posterior one triangular and entire, lateral lobes serrate, ciliate. Corolla dark reddish purple, 1.4–1.6 cm; tube 6–7 mm; galea marginally ciliate, ± comose on abaxial suture; beak usually S-shaped, slender; lower lip 8.5–9.5 mm, ciliate. Filaments densely villous. Capsule compressed, oblong, ca. 1.1 cm × 3 mm, obliquely apiculate. Fl. Jun–Aug, fr. Jul–Sep.

• Dry rocky places, sand dunes along rivers, open grassy meadows; 3400–4000 m. E, S, and SE Xizang.

64. Ser. Pectinatae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 71. 1890.

籠齒系 *bi chi xi*

Herbs often drying black. Stems erect, often branched apically. Leaves in whorls of 4 or 5, ovate-lanceolate, 2-pinnatipartite. Inflorescences long spicate; bracts ovate and entire, at least distal ones. Calyx large, ca. 1 cm, 1/3 cleft anteriorly; lobes 5, entire. Corolla tube erect, shorter than calyx; beak semicircular or S-shaped, slender.

About six species: China, Himalayas; one species in China.

194. *Pedicularis rhynchotricha* P. C. Tsoong, Acta Phytotax. Sin. 3: 299. 1955.

喙毛马先蒿 hui mao ma xian hao

Herbs perennial to 60 cm tall, ± drying black. Roots ± fusiform, fleshy. Stems 1 to several, unbranched, glabrous basally, with 4 or 5 lines of hairs apically. Basal leaves withering early. Stem leaves in whorls of 4 or 5; ± sessile to short petiolate, glabrous; leaf blade lanceolate-oblong, to 7 × 3 cm, pinnatifid; segments 6–10 pairs, linear, adaxially pubescent along midvein, incised-dentate. Inflorescences centripetal, elongated, with 8–12 fascicles, interrupted; bracts linear, longer

65. Ser. *Sudeticae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 75. 1878.

苏台德系 su tai de xi

Ser. *Elatae* Prain.

Herbs erect. Roots fascicled, fibrous. Stems unbranched. Leaves alternate. Basal leaves often persistent, pinnatipartite to 1- or 2-pinnatisect or pinnatifid; segments lanceolate, only dentate. Inflorescences spicate, dense, elongated. Calyx lobes 5, equal. Corolla tube longer than calyx; galea marginally 2-toothed, sometimes slightly short beaked.

About eight species: North America, Asia, Europe; two species in China.

1a. Plants 30–60 cm tall; leaves mostly on stem, leaf blade to more than 12 cm; inflorescences long spicate, to 20 cm;

calyx to 5–6 mm, teeth triangular; corolla pale rose, galea much longer than lower lip; filaments pubescent 195. *P. elata*

1b. Plants 10–25 cm tall; leaves mostly basal, leaf blade to 5 cm; inflorescences short spicate, to 6 cm; calyx to

14 mm, teeth linear-lanceolate; corolla pale yellow, galea slightly longer than lower lip; filaments glabrous 196. *P. songarica*

195. *Pedicularis elata* Willdenow, Sp. Pl. 3: 210. 1800.

高升马先蒿 gao sheng ma xian hao

Herbs perennial, 30–60 cm tall, herbage subglabrous, not drying black. Stems erect, unbranched, with brown, lanceolate to linear-lanceolate scales at base. Basal leaves withering early; petiole to 5 cm. Stem leaves alternate; petiole 2.5 cm to barely sessile; leaf blade ovate-oblong, to 12 × 5.5 cm, pinnatipartite; segments 10–18 pairs, narrowly lanceolate, pinnatifid to dentate. Inflorescences long spicate, to 20 cm, bracts and calyces woolly; bracts 3–5-palmatisect. Calyx 5–6 mm, membranous, slightly cleft anteriorly; teeth triangular, entire. Corolla pale rose, 2.1–2.5 cm; tube ca. 1 cm; galea falcate, ca. 2 × as long as lower lip, apex very short beaked; lower lip sparsely ciliate and erose, middle lobe emarginate apically. Filaments pubescent. Fl. Jun, fr. Jul.

Xinjiang [Kazakhstan, Mongolia, Russia (Siberia)].

196. *Pedicularis songarica* Schrenk ex Fischer & C. Meyer, Enum. Pl. Nov. 2: 25. 1842.

准噶尔马先蒿 zhun ga er ma xian hao

than flowers. Calyx cylindrical, ca. 9 × 2.5 mm; lobes 5, unequal, posterior one smaller and narrower than lateral lobes, lateral lobes lanceolate, slightly serrate, densely ciliate. Corolla purple-red; tube ca. 9 mm, glabrous; galea bent apically, margin ciliate; beak S-shaped, to 1 cm, densely brown lanulose at middle; lower lip ciliate. Filaments glabrescent. Capsule 2/3 enclosed by accrescent calyx, long ovoid, ca. 1.2 cm. Fl. and fr. Jun–Aug.

• Moist ground; *Picea* woodlands, margins of burned forests, forest clearings; 2700–3700 m. SE Xizang.

Herbs perennial, 10–25 cm tall, subglabrous, drying black. Roots fascicled, ± fusiform, fleshy. Stems often single. Leaves mostly basal; petiole to 4 cm; leaf blade ± lanceolate, to 5 × 1.3 cm, glabrous on both surfaces, pinnatisect; segments 15–30 pairs, ovate-lanceolate to linear-lanceolate, pinnatifid or double dentate. Stem leaves few, similar to basal leaves but smaller and shorter petiolate. Inflorescences short spicate, to 6 cm, often dense; bracts longer than flowers basally, narrowly lanceolate to linear-lanceolate. Calyx tubular, to 1.4 cm; lobes 5, unequal, linear-lanceolate, ciliate, serrulate. Corolla pale yellow; tube ca. 1.6 cm, glabrous; galea slightly falcate, ca. 9 mm, apex short beaked; lower lip shorter than galea. Filaments glabrous. Capsule lanceolate-oblong, 1.5–1.6 cm. Fl. Jun–Jul, fr. Jul–Aug.

Xinjiang [Kazakhstan].

T. N. Popova and L. I. Ivanina (pers. comm.) suggest that the occurrence of this species in China is questionable, and that the plants described here may belong to *Pedicularis pubiflora* Vvedensky.

66. Ser. Comosae Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 85. 1877.

多毛系 duo mao xi

Ser. Dolichorrhizae Prain.

Herbs comose, usually more than 15 cm tall. Roots fascicled, fibrous. Leaves basal and on stem, alternate, oblong-lanceolate, usually 2-pinnatifid, sometimes 1-pinnatisect or pinnatifid. Inflorescences densely spicate and elongated, racemose, or subcapitate. Calyx slightly cleft anteriorly, 5-lobed. Corolla tube erect; galea 2-toothed, beakless or short beaked; lower lip spreading.

About 30 species: Asia, Europe; 11 species in China.

- 1a. Corolla ca. 1.4 cm 197. *P. breviflora*
- 1b. Corolla ca. 1.8 cm or more, if less, then yellow.
 - 2a. Flowers purple, rose, or white.
 - 3a. Leaves 2- or 3-pinnatisect; calyx with 2 pairs of lateral lobes connivent; corolla ca. 2.7 cm 202. *P. rubens*
 - 3b. Leaves 1-pinnatisect or pinnatifid; calyx lobes not connivent; corolla 2–2.5 cm.
 - 4a. Calyx 5–6 mm, lobes lanceolate, entire; capsule ovoid, 8–10 mm 198. *P. dasystachys*
 - 4b. Calyx 10–14 mm, lobes triangular-lanceolate, dentate; capsule oblong-lanceolate, 10–20 mm 200. *P. uliginosa*
 - 2b. Flowers yellow.
 - 5a. Calyx lobes narrowly triangular to lanceolate, longer than wide.
 - 6a. Lower corolla lip ca. as long as galea; inflorescences 4–15 cm; calyx to 1.4 cm 201. *P. flava*
 - 6b. Lower corolla lip shorter than galea; inflorescences to 25 cm; calyx ca. 1 cm 203. *P. achilleifolia*
 - 5b. Calyx lobes ± triangular (except *P. mariae*), wider than long (except *P. dolichorrhiza*).
 - 7a. Calyx lobes not connivent.
 - 8a. Corolla 2.6–3.5 cm; calyx 1.6–2 cm; filaments glabrous 199. *P. physocalyx*
 - 8b. Corolla 2–2.5 cm; calyx 8–10 mm; filaments 2 pubescent, 2 glabrous 204. *P. venusta*
 - 7b. Calyx lobes connivent in 2 lateral pairs.
 - 9a. Beak of galea distinct, longer than wide 207. *P. dolichorrhiza*
 - 9b. Beak of galea very short or ± absent, wider than long.
 - 10a. Capsule oblong, ca. 1 cm 205. *P. altaica*
 - 10b. Capsule obliquely oblong, 1.3–1.5 cm 206. *P. mariae*

197. *Pedicularis breviflora* Regel & C. Winkler, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 352. 1879.

短花马先蒿 duan hua ma xian hao

Herbs perennial, ca. 30 cm tall. Stems erect, unbranched, finely pubescent. Basal leaves long petiolate. Stem leaves alternate, short petiolate; leaf blade oblong-lanceolate, abaxially densely pubescent, adaxially sparsely minutely pubescent, pinnatisect; segments narrowly lanceolate, pinnatisect, dentate, teeth callose. Inflorescences spicate, densely gray pubescent; bracts longer than calyx. Calyx campanulate-tubular, 1–1.1 cm, pubescent; lobes 5, unequal, triangular, short, apex acute. Corolla purple, to 1.4 cm, glabrous; tube shorter than galea, broadly expanded apically. Galea falcate; beak short, apex truncate; lower lip ca. as long as galea. Filaments 2 pubescent, 2 glabrous; anthers apiculate. 1300–1800 m. Xinjiang [Kazakhstan, ?Kyrgyzstan].

198. *Pedicularis dasystachys* Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg, Sér. 2, 2: 195. 1844.

毛穗马先蒿 mao sui ma xian hao

Herbs perennial, 10–30 cm tall. Roots clustered, thickened. Stems 1 to several, erect, unbranched, glabrous or sparsely pubescent. Basal leaf petiole shorter than blade;

leaf blade elliptic-lanceolate, glabrous except for pubescent midvein, pinnatifid, dentate, teeth callose. Stem leaves alternate, short petiolate or distal ones sessile; leaf blade ovate-elliptic; segments incised-dentate. Inflorescences subcapitate, compact, elongating in fruit, to 15 cm, whitish lanate; bracts linear, longer than calyx. Calyx 5–6 mm; lobes 5, unequal, lanceolate, less than 1/2 as long as tube, entire. Corolla bright rose or white, 2.2–2.5 cm, glabrous; tube erect, slightly longer than lower lip; galea slightly falcate, beakless; lower lip glabrous, lobes denticulate. Filaments glabrous. Capsule ovoid, 8–10 mm, mucronate. Fl. May, fr. Jun. Alkaline swampy meadows. Xinjiang [Kazakhstan, Mongolia, Russia (European part, W Siberia)].

T. N. Popova and L. I. Ivanina (pers. comm.) suggest that the occurrence of this species in China is questionable.

199. *Pedicularis physocalyx* Bunge, Bull. Acad. Imp. Sci. Saint-Petersbourg 8: 251. 1841.

瓣萼马先蒿 gu e ma xian hao

Pedicularis fedschenkoi Bonati; *P. flava* Pallas var. *altaica* Bunge; *P. flava* var. *conica* Bunge.

Herbs perennial, 16–20 cm tall, not drying black. Roots filiform, fleshy. Stems ± ascending, few branched or unbranched, densely brown pubescent. Leaves basal

and on stem; petiole ca. 1/2 as long as leaf blade, brown pubescent; leaf blade lanceolate, pinnatipartite; segments oblong, pinnatilobate, dentate, subglabrous. Stem leaves shorter petiolate, pinnatifid. Inflorescences initially dense, oblong, elongating in fruit, pubescent; proximal bracts leaflike, 3-lobed at middle. Pedicel short. Calyx 1.6–2 cm, pubescent; lobes 5, triangular, wider than long. Corolla yellow, 2.6–3.5 cm, glabrous externally; tube erect, ca. as long as galea; galea 2-uncinate-toothed, beakless; lower lip slightly shorter than galea, long stipitate basally, glabrous. Filaments glabrous. Fl. May–Jun, fr. Jun–Jul.

Xinjiang [Kazakstan, Russia (European part, W Siberia)].

200. *Pedicularis uliginosa* Bunge, Del. Sem. Hort. Dorpat. 8. 1839.

水泽马先蒿 *shui ze ma xian hao*

Herbs perennial, 5–35 cm tall. Roots clustered, slightly thickened. Stems single, rigid, erect or ascending, with membranous scales at base. Basal leaf petiole slightly shorter than to 1/2 as long as leaf blade; leaf blade glabrous or abaxially floccose-pubescent along veins, pinnatisect; segments lanceolate, pinnatifid, dentate, teeth callose, apex acute. Stem leaves similar to basal leaves but shorter petiolate. Flowers initially in a dense raceme, later elongating to 17 cm in fruit; proximal bracts leaflike, distal ones linear. Pedicel ca. 1 cm basally. Calyx 1–1.4 cm, villous, densely reticulate-veined; lobes 5, unequal, triangular-lanceolate, ca. 1/3 as long as tube. Corolla purple-red, 2–2.5 cm; tube ca. 1.5 × longer than galea; galea ± falcate, beakless, apex marginally 2-uncinate toothed; lower lip shorter than galea. Filaments 2 pubescent and 2 glabrous or all 4 glabrous. Capsule oblong-lanceolate, 1–2 cm. Fl. Jul–Aug, fr. Aug–Sep.

Shaded glades in forests, shaded damp meadows along streams, summits of hills. Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

T. N. Popova and L. I. Ivanina (pers. comm.) suggest that the occurrence of this species in China is questionable.

201. *Pedicularis flava* Pallas, Reise Russ. Reich. 3: 736. 1776.

黄花马先蒿 *huang hua ma xian hao*

Herbs perennial, 8–25 cm tall, not drying black. Rootstock stout. Stems 1 to several, longitudinally striate or grooved, pubescent, with numerous persistent scales at base. Leaves basal and on stem, numerous, dense; petiole to 4.5 cm, pubescent; leaf blade lanceolate-oblong to linear-oblong, to 9 × 3 cm, abaxially whitish pubescent along midvein, adaxially sparsely lanulose, pinnatisect; segments 6–12 pairs, narrowly ovate to lanceolate or triangular, pinnatipartite, double dentate, teeth callose. Inflorescences compact spikes, 4–15 cm, densely whitish villous; proximal bracts leaflike, distal ones 3-lobed, whitish pubescent. Calyx to 1.4 cm, without reticulate venation, densely whitish villous; lobes 5, unequal, longer than wide.

Corolla yellow, 1.4–1.8 cm; tube erect; galea falcate, ca. as long as tube; beak short, apex truncate; lower lip ca. as long as galea. Filaments pubescent. Capsule long ovoid, compressed, ca. 1.5 cm × 7 mm, long apiculate. Fl. Jun–Jul, fr. Jul–Aug.

Rocky grassy slopes, slightly alkaline meadows; ca. 1500 m. N Nei Mongol [Mongolia, Russia (E Siberia)].

202. *Pedicularis rubens* Stephan ex Willdenow, Sp. Pl. 3: 219. 1800.

红色马先蒿 *hong se ma xian hao*

Herbs perennial, 10–35 cm tall, drying black or not. Roots clustered, linear, to 8 cm. Stems single, sulcate, with lines of whitish hairs, with ± persistent remnant scales at base. Leaves mostly basal; petiole to 7 cm, whitish pubescent; leaf blade narrowly oblong to oblong-lanceolate, to more than 10 × 3 cm, 2- or 3-pinnatisect; segments linear, incised-dentate, teeth callose. Inflorescences racemose, more than 10 cm; bracts leaflike, densely whitish villous. Calyx to 1.3 cm, densely whitish villous, with dense reticulate venation; lobes 5, unequal, 2 pairs of lateral lobes connivent, entire, apex 2-cleft. Corolla rose, ca. 2.7 cm; tube ca. 1.4 cm, glabrous; galea ± falcate apically, ca. as long as tube; beak short, apex obliquely truncate, marginally 2-subulate-toothed and with several small teeth; lower lip slightly shorter than galea. Filaments sparsely pubescent. Fl. Jun–Jul, fr. Jul–Aug. *2n* = 16.

Steppes, thinly wooded slopes. N Hebei, Heilongjiang, Jilin, Liaoning, NE Nei Mongol [Mongolia, Russia (E Siberia)].

203. *Pedicularis achilleifolia* Stephan ex Willdenow, Sp. Pl. 3: 219. 1800.

著草叶马先蒿 *shi cao ye ma xian hao*

Herbs perennial, 10–40 cm tall, drying ± black. Roots numerous, fascicled. Stems often single, striate, often with persistent scales and old petioles at base, whitish woolly. Leaves mostly basal, clustered; petiole to 5 cm, whitish woolly; leaf blade lanceolate-oblong, to 6 × 1.5 cm, pubescent on both surfaces, 2-pinnatisect; segments dentate, teeth callose. Stem leaves similar to basal ones but smaller. Inflorescences to 25 cm; axis whitish woolly; bracts linear, shorter than flowers, dentate. Calyx ca. 1 cm, whitish pubescent along midvein and lobes; tube membranous; lobes 5, unequal, 2 pairs of lateral lobes connivent. Corolla yellow, to 2.3 cm; tube ca. 1.3 cm, glabrous externally; galea falcate apically, slightly shorter than tube; beak very short, obliquely truncate apically, marginally 2-subulate-toothed; lower lip much shorter than galea, distinctly stipitate basally. Filaments 2 pubescent, 2 glabrous. Fl. Jun–Jul, fr. Jul–Aug. *2n* = 16.

Steppes, rocky gravelled slopes; 1000–2500 m. NE Xinjiang [Kazakstan, Kyrgyzstan, Mongolia, Russia (Siberia)].

204. *Pedicularis venusta* Schangin ex Bunge, Bull. Acad. Imp. Sci. Saint-Petersbourg 8: 251. 1841.

秀丽马先蒿 *xiu li ma xian hao*

Herbs perennial, 10–40 cm tall. Stems usually single, erect, unbranched, often slender, long woolly. Basal leaf petiole ca. 1/2 to as long as leaf blade, pubescent; leaf blade lanceolate, pinnatisect; segments oblong, pinnatipartite, dentate, teeth callose. Stem leaves similar to basal ones but smaller, distal ones shorter petiolate. Inflorescences oblong, dense or elongated spikes, often scabrously long woolly; proximal bracts ca. as long as calyx, leaflike, middle ones pinnately 3–5-lobed. Pedicel ± absent. Calyx campanulate, 8–10 mm, ± leathery; lobes 5, broadly triangular, wider than long. Corolla yellow, 2–2.5 cm; tube erect, falcate apically, shorter than galea; galea short, beakless; lower lip slightly shorter than galea, not ciliate. Filaments 2 pubescent, 2 glabrous. Capsule compressed, obliquely oblong, 1–1.2 cm, apiculate. Fl. Jun–Jul, fr. Jul–Aug. $2n = 16$.

Meadows, frequently in alkaline places. Heilongjiang, Nei Mongol, Xinjiang [Mongolia, Russia (Siberia, Far East)].

205. *Pedicularis altaica* Stephan ex Steven, Mém. Soc. Imp. Naturalistes Moscou 6: 48. 1823.

阿尔泰马先蒿 a er tai ma xian hao

Herbs perennial, 20–40 cm tall. Stems usually single, often ascending, slender, sparsely long woolly, often shiny. Basal leaves few; petiole ca. 1/2 as long as leaf blade, glabrous; leaf blade linear-lanceolate, pinnatisect; segments oblong-lanceolate or lanceolate, dentate, teeth callose. Stem leaves smaller than basal leaves, shorter petiolate to sessile; leaf blade pinnatipartite at base; lobes pectinate anteriorly. Inflorescences long, with laxly arranged flowers; bracts 3-lobed, proximal ones sometimes longer than calyx, middle ones shorter. Pedicel short. Calyx narrowly campanulate, 1–1.2 cm, ± leathery, tinged purple punctate, glabrous or sometimes gray pubescent; lobes 5, triangular, very short, wider than long, 2 pairs of lateral lobes connivent. Corolla yellow, 2.5–2.7 cm; tube erect; galea falcate apically, ca. as long as tube; beak very short or ± absent; lower lip ca. as long as galea, long stipitate basally, ± ciliate. Filaments 2 pubescent, 2 glabrous. Capsule oblong, ca. 1 cm, mucronulate. Fl. Jun–Jul, fr. Jul–Aug.

Alkaline meadows, *Salix* thickets. Xinjiang [Kazakstan, Mongolia, Russia].

67. Ser. Strobilaceae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 246. 1995.

球状系 qiu zhuang xi

Stems usually branched basally and at middle; branches alternate or sometimes pseudo-opposite. Leaves alternate or proximal ones often ± opposite, ± elliptic, pinnatipartite. Inflorescences capitate or racemose, short. Calyx deeply cleft anteriorly, 3–5-lobed. Corolla tube longer than calyx, some 2 × longer, galea often crested, twisted laterally; beak slender.

Five species: China, N Myanmar; all five in China.

1a. Middle lobe of lower corolla lip elliptic to oblong, to 7 mm; galea prominently crested 212. *P. pseudocephalantha*

206. *Pedicularis mariae* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 351. 1880.

玛丽马先蒿 ma li ma xian hao

Herbs perennial, ca. 20 cm tall. Stems erect, unbranched, sparsely pubescent. Leaves alternate, glabrous; basal and proximal stem leaves petiolate; leaf blade oblong, pinnatisect; segments ovate or oblong, pinnatilobate or pectinate-dentate. Inflorescences racemose, dense initially, becoming lax; bracts ovate basally, 3–5-lobed, long pubescent, serrate or entire, distal ones obovate-cuneate to oblong-cuneate; lobes 3, entire. Calyx tube 5-angular; lobes 5, unequal, lanceolate, less than 1/2 as long as tube, 2 pairs of lateral lobes connivent; entire or serrate. Corolla yellow, ca. 2 × as long as calyx; galea ± erect; beakless, apex rounded; lower lip ca. as long as galea, ciliate. Filaments glabrous. Capsule obliquely oblong, 1.3–1.5 cm. Fl. May–Aug, fr. Jun–Sep.

Xinjiang [Kazakstan].

207. *Pedicularis dolichorrhiza* Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg, Sér. 2, 1: 80. 1843.

长根马先蒿 chang gen ma xian hao

Herbs perennial, 20–100 cm tall, sparsely pubescent, not drying black. Roots ± fleshy, fusiform. Stems 1 to several, erect, unbranched, hollow, with lines of whitish hairs. Basal leaves clustered, withering in fruit, 10–45 cm; petiole to 27 cm; leaf blade narrowly lanceolate, to 25 × 6 cm, pinnatisect; segments to 25 pairs, lanceolate, pinnatipartite, dentate, teeth callose. Stem leaves smaller than basal leaves, distal ones shorter petiolate. Inflorescences long spicate, more than 20 cm; proximal bracts leaflike, distal ones 3-lobed. Calyx campanulate, to 1.3 cm, sparsely long pubescent, slightly cleft anteriorly; lobes 5, triangular, wider than long, 2 pairs of lateral lobes connected, ± triangular, ciliate. Corolla yellow; tube 1.3–1.6 cm; galea falcate apically, to 1.4 cm; beak distinct, ca. 3 mm, longer than wide, apex 2-cleft, lobes toothlike; lower lip ca. as long as galea, erose-dentate. Filaments pubescent. Capsule 1–1.5 cm. Seeds long ovoid. Fl. Jun–Jul, fr. Jul–Aug.

About 2000 m. NW Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Tajikistan].

- 1b. Middle lobe of lower corolla lip obovate or obovate-rounded, not more than 5 mm; galea inconspicuously crested or not crested.
- 2a. Corolla 1.7–1.8 cm; calyx 5–6.5 mm.
- 3a. Lower corolla lip not ciliate; all filaments villous apically; calyx 1/2 cleft anteriorly 208. *P. gracilicaulis*
- 3b. Lower corolla lip ciliate; filaments 2 glabrous, 2 pubescent; calyx 2/3 cleft anteriorly 210. *P. strobilacea*
- 2b. Corolla 2–2.2 cm; calyx 9–12 mm.
- 4a. Leaf blade 1.5–3 cm, segments 6–9 pairs; calyx 1/2 cleft anteriorly; lower corolla lip shorter than galea, middle lobe not emarginate 209. *P. dichrocephala*
- 4b. Leaf blade 3–8 cm, segments 10–18 pairs; calyx 1/3 cleft anteriorly; lower corolla lip ca. as long as galea, middle lobe emarginate 211. *P. lanpingensis*

208. *Pedicularis gracilicaulis* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 32. 1949.

细瘦马先蒿 xi shou ma xian hao

Herbs annual, 20–40 cm tall. Stems several, often ascending, usually branched basally and at middle, sparsely pubescent or glabrescent. Leaves alternate; petiole to 3.5 cm, slender; leaf blade oblong, ca. 3 × 1 cm, villous on both surfaces, pinnatipartite; segments 5 or 6 pairs, ovate or ovate-oblong, pinnatifid or dentate. Inflorescences subcapitate, dense with few flowers; bracts leaflike. Calyx oblong-ovate, 5–6.5 mm, pubescent, 1/2 cleft anteriorly; lobes 5, unequal, flabellate, 3-cleft. Corolla purple, 1.7–1.8 cm; tube ca. 1.5 cm; galea falcate near middle, inconspicuously crested; beak ca. 5 mm, slightly 2-cleft at apex; lobes of lower lip not ciliate, middle lobe slightly smaller than lateral pair and slightly projecting, obovate, emarginate. Filaments villous apically. Capsule compressed, ovoid, ca. 1.2 cm, apiculate. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows; 3000–3300 m. NW Yunnan.

209. *Pedicularis dichrocephala* Handel-Mazzetti, Symb. Sin. 7: 863. 1936.

重头马先蒿 chong tou ma xian hao

Herbs annual, 20–60 cm tall. Stems unbranched at base, with 2–4 lines of whitish hairs. Leaves alternate; petiole 0.5–3 cm, sparsely whitish villous; leaf blade ± lanceolate-oblong, 1.5–3 cm, whitish pubescent and scurfy on both surfaces, pinnatipartite; segments 6–9 pairs, oblong, margin double dentate. Inflorescences racemose, densely capitate; bracts leaflike, proximal ones petiolate and shorter than flowers, distal ones ± sessile, whitish scurfy and sparsely pubescent. Pedicel barely 1 mm. Calyx 9–10 mm, sparsely whitish pubescent, 1/2 cleft anteriorly; lobes 5, unequal, ± leaflike, barely 1 mm. Corolla purplish red, 2–2.2 cm; tube erect, bent at a right angle apically, ca. 1.5 cm, sparsely villous and yellow glandular punctate, villous abaxially; beak falcate, ca. 3 mm, bent downward; lower lip yellowish white, shorter than galea, ca. 8 mm, sparsely ciliate, middle lobe obovate, not emarginate. Filaments villous. Fl. Aug, fr. Sep.

• Alpine meadows; 3300–3500 m. NW Yunnan.

210. *Pedicularis strobilacea* Franchet ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 216. 1890.

球状马先蒿 qiu zhuang ma xian hao

Herbs annual, to 33 cm tall. Stems erect, often branching basally, sometimes branched at middle and apically; branches alternate or sometimes pseudo-opposite, whitish pubescent. Basal leaves withering early. Stem leaves alternate, widely spaced; petiole to more than 3 cm basally; leaf blade oblong to ovate-oblong, usually longer than petiole, to 4 × 2.2 cm, sparsely whitish pubescent and scurfy on both surfaces, pinnatipartite to pinnatisect; segments 5–9 pairs, oblong or triangular-ovate to obliquely triangular-ovate, triangular-dentate. Inflorescences subcapitate-racemose; proximal bracts leaflike. Pedicel 3–4 mm, pubescent. Calyx obliquely funnelform-campanulate, whitish villous, ca. 2/3 cleft anteriorly; tube 5–6 mm; lobes 5, leaflike, whitish pubescent internally. Corolla whitish yellow, with purple galea, ca. 1.8 cm; tube erect, longer than calyx; galea falcate, whitish villous, inconspicuously crested; beak filiform, ca. 5 mm, bent downward; lower lip ca. 8 mm × 1.2 cm, ciliate, middle lobe obovate. Filaments 2 pubescent, 2 glabrous. Capsule obliquely ovoid, apiculate. Fl. Jul–Aug, fr. Aug–Sep. Alpine meadows; ca. 3500 m. NW Yunnan [Myanmar].

211. *Pedicularis lanpingensis* H. P. Yang, Acta Bot. Yunnan. 6: 278. 1984.

兰坪马先蒿 lan ping ma xian hao

Herbs perennial, ca. 20 cm tall, drying ± black. Roots several, fusiform, fleshy. Stems single, erect, unbranched, with 2–6 lines of hairs. Leaves mostly basal; petiole 4–10 cm; leaf blade oblong to lanceolate-oblong, 3–8 cm, abaxially sparsely pubescent and whitish scurfy, adaxially glabrescent, pinnatipartite to pinnatisect; segments 10–18 pairs, oblong, margin double dentate. Stem leaves few, 2–4, alternate.

Inflorescences capitate, many flowered; proximal bracts

leaflike, longer than flowers. Pedicel 4–10 mm, slender. Calyx campanulate, ca. 1.2 cm, densely pubescent, 1/3 cleft anteriorly; lobes 5, unequal, to 2 mm. Corolla pale red, with purplish red galea, ca. 2 cm; tube erect, longer than calyx; galea bent at a right angle apically, narrowly crested; beak falcate, 4–5 mm; lower lip ca. as long as galea, ca. 1 cm, ciliate, middle lobe obovate, emarginate. Filaments densely pubescent. Fl. Jun–Jul, fr. Aug.

• Alpine meadows; ca. 3800 m. NW Yunnan.

212. *Pedicularis pseudocephalantha* Bonati, Bull. Soc. Bot. Genève, Sér. 2, 5: 314. 1913.

假头花马先蒿 *jia tou hua ma xian hao*

Pedicularis strobilacea Franchet ex F. B. Forbes & Hemsley var. *riparia* Bonati.

Herbs annual, 25–40 cm tall. Stems erect, usually many branched, sparsely pubescent. Leaves alternate; petiole to more than 5 cm, sparsely pubescent; leaf blade

oblong or ovate-oblong, to 6 × 2.7 cm, abaxially densely whitish scurfy, adaxially sparsely pubescent, pinnatifid; segments 6–9 pairs, obliquely triangular or oblong, margin double dentate. Inflorescences subcapitate-racemose; proximal bracts leaflike. Pedicel 2–3 mm, ± elongating in fruit. Calyx obliquely campanulate, ca. 8 mm, 1/3 cleft anteriorly, densely whitish villous; lobes 5, unequal, barely 1–1.5 mm.

Corolla yellowish white, with purplish red galea, ca. 2.2 cm; tube erect, ca. 1.2 cm, sparsely villous and glandular punctate; galea bent at a right angle apically, conspicuously crested, densely whitish villous, yellowish glandular punctate; beak filiform, ca. 5 mm, horizontal; lower lip long ciliate, middle lobe elliptic to oblong, to 7 mm. Filaments pubescent. Capsule broadly ovoid, 1.3–1.5 cm. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; 3000–3800 m. NW Yunnan.

68. Ser. *Oliganthae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 75. 1890.

少花系 *shao hua xi*

Stems usually many branched at base. Leaves basal and on stem, alternate, sometimes proximal ones ± opposite, long petiolate, oblong to lanceolate, pinnatisect or pinnatifid. Inflorescences short spicate, capitate, or racemose, few flowered. Calyx deeply cleft anteriorly, 2–5-lobed. Corolla purple or yellowish white; tube less than 2 × as long as calyx; galea purple, strongly twisted laterally, commonly with 1 or 2 reflexed marginal teeth; beak slender.

• Seven species: endemic to China.

1a. Stem leaves to 10 × 3.5 cm; filaments glabrous; corolla yellow 218. *P. oligantha*

1b. Stem leaves less than 4 × 1.5 cm; filaments 2 or 4 pubescent; corolla ± reddish purple or rose.

2a. Basal leaves many, linear-lanceolate, segments 15–24 pairs; galea 2-auricled at margin ... 219. *P. tachanensis*

2b. Basal leaves few or withering early, segments less than 15 pairs; galea not 2-auricled at margin.

3a. Leaf segments of main leaves 10–15 pairs; calyx lobes 2 or 5.

4a. Stems 12–20 cm; stem leaves 2–4; galea glandular pubescent abaxially 213. *P. cephalantha*

4b. Stems 25–70 cm; stem leaves 7–16; galea not glandular pubescent 214. *P. longipetiolata*

3b. Leaf segments of main leaves 5–7 pairs; calyx lobes (2 or)3.

5a. Beak of galea deeply 2-cleft at apex 215. *P. tahaiensis*

5b. Beak of galea slightly cleft at apex.

6a. Leaves mostly basal; galea conspicuously crested 216. *P. dissectifolia*

6b. Leaves mostly on stem; galea inconspicuously crested 217. *P. fengii*

213. *Pedicularis cephalantha* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 540. 1888.

头花马先蒿 *tou hua ma xian hao*

Herbs perennial, 12–20 cm tall, drying ± black. Stems single, sometimes to 6, central stem often ± ascending, outer stems usually procumbent at base, often branched basally, glabrous or sometimes with lines of hairs.

Leaves mostly basal; petiole 2–4 cm, glabrescent; leaf blade elliptic-oblong to lanceolate-oblong, 6–8 × 1.7–2 cm, abaxially sparsely whitish villous along midvein, adaxially glabrous, pinnatisect; segments 7–11 pairs, ovate to ovate-lanceolate, pinnatifid, spinescent-dentate. Stem leaves few, often only 1 or 2, similar to basal leaves but smaller; segments 5 pairs. Inflorescences subcapitate, few flowered; bracts leaflike. Pedicel ca. 4 mm. Calyx 8–10 mm, 2/3 cleft anteriorly, sparsely pubescent; lobes 2 or 5, unequal or when 2, equal, small. Corolla deep red, purple, or purplish red, 1.8–2.3 cm;

tube erect, ca. 1.4 cm, glabrous externally; galea falcate apically, glandular pubescent abaxially, with 1 distinct reflexed marginal tooth on one side; beak 5–6 mm; lower lip ca. 1.2 × 1.5–1.8 cm. Filaments 2 pubescent, 2 glabrous. Capsule long ovoid. Fl. Jun, fr. Aug.

• Alpine meadows, *Picea* forests; 2800–4900 m. S Sichuan, NW Yunnan.

1a. Calyx lobes 5, unequal, 2 larger lobes oblanceolate, dentate to pinnatifid, other 3 lobes

acicular, entire 213a. var. *cephalantha*

1b. Calyx lobes 2, equal, lanceolate, acute, dentate or pinnatifid 213b. var. *szetchuanica*

213a. *Pedicularis cephalantha* var. *cephalantha*

头花马先蒿(原变种) *tou hua ma xian hao* (yuan bian zhong)

Calyx lobes 5, unequal; 2 larger lobes oblanceolate, dentate to pinnatifid; other 3 lobes acicular, entire.

• Alpine meadows, *Picea* forests; 4000–4900 m. NW Yunnan.

213b. *Pedicularis cephalantha* var. *szetchuanica* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 118. 1921.

四川头花马先蒿 *si chuan tou hua ma xian hao*

Calyx lobes 2, equal, lanceolate, dentate or pinnatifid, apex acute. Fl. Jun–Jul.

• Alpine meadows; 2800–4500 m. S Sichuan, Yunnan.

214. *Pedicularis longipetiolata* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 541. 1888.

长柄马先蒿 *chang bing ma xian hao*

Herbs perennial, (25–)40–50(–70) cm tall. Roots fusiform, ± fleshy. Stems 1 to several, erect or branches ± ascending, often branched basally, unbranched apically, glabrous. Basal leaves often withering early; petiole to 10 cm. Stem leaves many, 7–16, alternate; proximal petioles to 3 cm, glabrescent; leaf blade lanceolate-oblong, 3–10 × 2–2.5 cm, glabrous on both surfaces, pinnatisect; segments 7–14 pairs, ovate-lanceolate, pinnatifid, spinescent-dentate. Inflorescences capitate; bracts leaflike. Pedicel 1–2 mm. Calyx 7.5–10 mm, deeply cleft anteriorly; lobes 5, unequal. Corolla purple, 2.3–3 cm, erect; tube ca. as long as calyx; galea ± bent at a right angle apically, eglandular pubescent, with 1 lanceolate reflexed marginal tooth on one side; beak ca. 6 mm; lower lip longer than galea, 1.1–1.4 × ca. 2 cm, sparsely ciliate. Filaments 2 densely villous, 2 glabrous. Capsule long ovoid, ca. 1.1 cm × 4.5 mm. Fl. Jul–Sep, fr. Aug–Oct.

• Swampy meadows; 2800–3600 m. SW Sichuan, NW Yunnan.

215. *Pedicularis tahaiensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 114. 1921.

大海马先蒿 *da hai ma xian hao*

Herbs annual, to 30 cm tall, drying black. Stems slender, branched basally or unbranched, with lines of hairs. Leaves pseudo-opposite, glabrescent; proximal petioles 0.8–2.5 cm, distal ones ± sessile; leaf blade ovate, 1.5–2 cm × 8–11 mm, abaxially whitish scurfy, pinnatifid to subpinnatisect; segments 5–7 pairs, ovate to ± oblong, pinnatifid or deeply dentate. Inflorescences short racemose. Calyx 4.5–5 mm, deeply cleft anteriorly, densely whitish long pubescent; lobes 3, unequal, posterior one smallest. Corolla rose, 1.7–2 cm; tube erect, 1.1–1.5 cm, villous exteriorly; galea ± bent at a right angle apically, with 1 reflexed marginal tooth on one side; beak 4–4.5 mm, deeply 2-cleft at apex; lower lip ca. 7 × 9 mm, sparsely ciliate, middle lobe emarginate apically. Filaments 2 villous, 2 glabrous. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; ca. 3200 m. NE Yunnan.

216. *Pedicularis dissectifolia* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 119. 1949.

细裂叶马先蒿 *xi lie ye ma xian hao*

Herbs perennial, 20–25 cm tall, drying black. Stems several, branched near base; branches erect or ascending, slender, glabrous or sparsely pubescent. Leaves mostly basal, alternate or proximal ones often pseudo-opposite. Petiole of basal leaves 5–9 cm, sparsely villous; leaf blade oblong-lanceolate to ovate-oblong, 3–7 × 1–1.8 cm, glabrous on both surfaces, sparsely whitish scurfy, pinnatisect; segments 5–7 pairs, ± oblong, pinnatifid, spinescent-dentate. Stem leaves few, smaller than basal leaves, shorter petiolate. Inflorescences subcapitate, 3–5-flowered; bracts leaflike. Pedicel barely 1 mm. Calyx to 7 mm, 1/2 cleft anteriorly; lobes 2 or 3, unequal, posterior one, when present, smallest. Corolla purplish red, 1.7–2.1 cm; tube erect, longer than calyx, glabrous; galea falcate, conspicuously crested, with 1 reflexed marginal tooth on one side; beak ca. 5 mm, slightly cleft at apex, ± horizontal; lower lip slightly longer than galea, sparsely pubescent. Filaments 2 pubescent, 2 glabrous.

• NW Yunnan.

217. *Pedicularis fengii* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 120. 1949.

国楣马先蒿 *guo mei ma xian hao*

Herbs 20–30 cm tall. Stems erect or ascending, often branched basally, glabrous. Leaves mostly on stem, alternate or sometimes pseudo-opposite; petiole to 3.5 cm, slender; leaf blade ovate or oblong-ovate, 4–5.5 × 1.5–3.2 cm, pinnatifid; segments 5–7 pairs, widely spaced, ovate, pinnatifid, crenate-dentate.

Inflorescences short compact racemes; bracts leaflike, to 2.5 cm. Pedicel to 5 mm. Calyx ca. 6 mm, glabrous, 1/2 cleft anteriorly; lobes 3, unequal, lateral pair flabellate, longer than posterior one. Corolla rose, ca. 1.7 cm; tube erect, longer than calyx; galea falcate, inconspicuously crested, with 1 reflexed marginal tooth on one or both sides; beak bent obliquely downward, ca. 6 mm, slender, slightly cleft at apex; lower lip nearly as long as galea, glabrous. Filaments 2 sparsely villous, 2 glabrous. Capsule barely completely enclosed by accrescent calyx, oblong-ovoid, compressed, ca. 1.2 cm × 6 mm, apex acute. Fl. Aug, fr. Sep.

• Open hillsides, alpine meadows. NW Yunnan.

218. *Pedicularis oligantha* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 542. 1888.

少花马先蒿 *shao hua ma xian hao*

Herbs perennial, 40–50 cm tall. Stems several, erect or ascending, many branched, glabrous. Basal leaves withering early. Stem leaves numerous, to 8–10, alternate; petiole to 3.5 cm, glabrous; leaf blade ovate-oblong to oblong-lanceolate, to 10 × 3.5 cm, glabrous on both surfaces, abaxially sparsely whitish scurfy, pinnatifid to pinnatisect; segments to 14 pairs, ovate-lanceolate to ± oblong, pinnatifid, spinescent double dentate. Inflorescences short racemose; bracts leaflike. Calyx ca. 8 mm; 1/2 cleft anteriorly; tube ca. 6

mm; lobes 3, unequal, posterior lobe smallest, lateral pair flabellate. Corolla yellow; tube erect, ca. as long as calyx; galea ± bent at a right angle apically, not crested, with 1 triangular reflexed marginal tooth on one side; lower lip ca. 6 × 7 mm, ciliate. Filaments glabrous. Fl. Jul, fr. Aug.

•NW Yunnan.

219. *Pedicularis tachanensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 116. 1921.

大山马先蒿 da shan ma xian hao

Herbs perennial, 20–32 cm, drying black. Roots ± fusiform, fleshy. Stems often single, erect, unbranched, pubescent apically. Leaves many, mostly basal; petiole to 3–7 cm; leaf blade linear-lanceolate, 5–9 × 1–1.3 cm,

pinnatisect to pinnatipartite; segments 15–24 pairs, ± ovate, incised-double dentate. Stem leaves few, often 3–5, smaller than basal leaves. Inflorescences subcapitate; bracts leaflike. Pedicel 2–3 mm. Calyx ca. 6 mm, slightly cleft anteriorly; lobes 3, unequal, posterior one smallest. Corolla rose, ca. 2 cm; tube erect, 1.2–1.4 cm, villous; galea ± bent at a right angle, prominently crested, with 1 linear reflexed marginal tooth on one or both sides; beak to 6 mm; lower lip ca. 9 × 10 mm. Filaments pubescent. Capsule oblong, 1–1.5 cm. Seeds ovoid, ca. 2 mm. Fl. Aug, fr. Aug–Sep.

•Swampy places; ca. 2200 m. E Yunnan.

69. Ser. Oxycarpae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 74. 1890.

尖果系 jian guo xi

Stems erect, branched near base or unbranched, rarely branched apically. Leaves basal and on stem, alternate or pseudo-opposite, oblong to lanceolate, often pinnatisect. Inflorescences racemose or spicate, usually elongated. Calyx lobes 3–5. Corolla tube longer than but less than 2 × as long as calyx; galea twisted or not; beak sometimes twisted, long, bent downward.

•Nine species: endemic to China.

1a. Beak of corolla straight or slightly bent, ± horizontal; galea not twisted.

2a. Leaf segments 5–7 pairs; corolla 1.1–1.3 cm; filaments glabrous 220. *P. macilentia*

2b. Leaf segments 7 or 8 pairs; corolla 1.4–2.2 cm; filaments pubescent.

3a. Leaves pinnatisect; stems simple or branched basally; calyx 4–5 mm, lobes equal, entire, glabrescent; corolla white, with purple beak, 1.4–1.8 cm 221. *P. oxycarpa*

3b. Leaves pinnatifid to pinnatipartite; stems single, unbranched; calyx 6–8 mm, lobes unequal, lateral lobes dentate, sparsely pubescent; corolla white to purple-red throughout, 1.8–2.2 cm 222. *P. monbeigiana*

1b. Beak of corolla semicircular or S-shaped; galea twisted.

4a. Plants 5–8 cm tall; filaments glabrous.

5a. Stems single, densely glandular pubescent; calyx short, tube barely 4 mm, 3-lobed .. 226. *P. subulatidens*

5b. Stems usually several, not glandular pubescent; calyx long, tube to 8 mm, 5-lobed 227. *P. longicalyx*

4b. Plants 15–40(–70) cm tall; filaments pubescent.

6a. Leaf segments 5–7 pairs; inflorescences elongated to only 5 cm; stems single 223. *P. stewardii*

6b. Leaf segments 9–16 pairs; inflorescences elongated to 10–18 cm; stems usually several.

7a. Corolla ca. 1 cm, beak of galea semicircular; flowers reddish, with white spots on lower lip 225. *P. tibetica*

7b. Corolla 1.2–2 cm, beak of galea often S-shaped; flowers without white spots.

8a. Flowers yellow, with purplish beak, 1.6–2 cm; calyx 6–7 mm, pubescent 224. *P. torta*

8b. Flowers purplish red or red throughout, 1.2–1.6 mm; calyx 3–6 mm, glabrescent ... 228. *P. davidii*

220. *Pedicularis macilentia* Franchet ex F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 212. 1890.

瘠瘦马先蒿 ji shou ma xian hao

Herbs annual or biennial, 20–30 cm tall, glabrescent, scarcely drying black. Stems 6–12, ascending, often short branched apically, with lines of hairs. Leaves mostly on stem, alternate or pseudo-opposite; petiole to 1 cm or distal ones ± sessile, glabrescent; leaf blade ovate-elliptic to narrowly oblong, 3–5 × 1–1.5 cm, glabrous on both surfaces, abaxially sparsely whitish scurfy, pinnatisect; segments 5–7 pairs, ovate to lanceolate-oblong, incised-pinnatifid or double dentate. Inflorescences racemose, to 10 cm; bracts leaflike. Pedicel ca. 2 mm. Calyx 6–7 mm, glabrous, 1/3 cleft

anteriorly; lobes 3, unequal, posterior one acicular, lateral pair larger, toothed. Corolla white, with reddish beak, 1.1–1.3 cm; tube erect, ca. 2 × as long as calyx; galea ± falcate, slightly crested, not twisted; beak straight, ca. 4 mm, slightly 2-cleft at apex, not ciliate; lower lip nearly as long as galea. Filaments glabrous. Capsule ovoid, ca. 1 cm × 5–6 mm. Seeds narrowly ovoid, ca. 2 mm. Fl. Jun–Jul, fr. Jul–Sep.

•Grassy slopes; ca. 2900 m. Sichuan, NW Yunnan.

221. *Pedicularis oxycarpa* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 540. 1888.

尖果马先蒿 jian guo ma xian hao

Herbs perennial, 20–40 cm tall, erect, sparsely pubescent, drying black. Roots fleshy. Stems 1 or 5–10, branched basally or unbranched, with lines of hairs.

Leaves alternate. Basal leaves withering early, petiolate or distal ones \pm sessile; petiole to 2 cm; leaf blade linear-oblong or lanceolate-oblong, 4–7(–10) \times 0.8–2 cm, abaxially glabrous and whitish scurfy, adaxially sparsely pubescent or glabrescent, pinnatisect; segments 7–15 pairs, linear-lanceolate, pinnate-double dentate. Inflorescences racemose, to 13.5 cm, lax; bracts leaflike. Proximal pedicels to 6 mm, slender. Calyx 4–5 mm, ca. 1/2 cleft anteriorly, glabrescent; lobes 3, equal, entire. Corolla white, with purplish beak, 1.4–1.8 cm; tube erect, ca. 2 \times as long as calyx, sparsely pubescent; galea bent at a right angle apically, distinctly crested, recurved; beak falcate, to 7 mm, slender, clearly crested; lower lip long ciliate. Filaments pubescent. Capsule lanceolate-oblong, ca. 1.3 cm \times 5 mm. Fl. May–Aug, fr. Aug–Oct.

• Alpine meadows; 2800–4400 m. SW Sichuan, NW Yunnan.

222. *Pedicularis monbeigiana* Bonati, Bull. Soc. Bot. Genève, Sér. 2, 5: 112. 1913.

蒙氏马先蒿 meng shi ma xian hao

Herbs perennial, 50–70(–90) cm tall, erect, pubescent, drying black. Roots \pm fleshy. Stems single, unbranched. Basal leaf petiole 5–10 mm; leaf blade oblong-lanceolate to linear-lanceolate, 8–14(–20) \times 2–4 cm, sparsely pubescent along veins on both surfaces, pinnatifid to pinnatipartite; segments 14–18 pairs, triangular-ovate to lanceolate, margin double dentate. Stem leaves 4–6, alternate, similar to basal leaves but smaller. Inflorescences racemose, to 35 cm, many flowered; bracts leaflike, proximal ones longer than flowers. Pedicel 1–3.5(–4) cm, elongating in fruit, slender, densely pubescent. Calyx 6–8 mm, sparsely long pubescent, 1/2 cleft anteriorly; lobes 3, unequal, ca. 1/4 as long as tube, posterior lobe small, entire, lateral lobes dentate, sparsely pubescent. Corolla white to purple-red, 1.8–2.2 cm; tube erect, 1.2–1.4 cm; galea \pm bent at a right angle apically, clearly crested; beak pointing forward and bent downward near apex; lower lip long ciliate. Filaments pubescent. Capsule oblique-ovoid, 8–10 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows; 2500–4200 m. SW Sichuan, NW Yunnan.

223. *Pedicularis stewardii* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 139. 1949.

斯氏马先蒿 si shi ma xian hao

Herbs ca. 30(–50) cm tall. Stems single, rigid, freely long branched apically, pubescent. Stem leaves alternate; petiole 1–1.5 cm, slender, sparsely pubescent; leaf blade ovate or ovate-oblong, ca. 2.5 \times 1.3 cm, abaxially glabrous, adaxially sparsely pubescent or glabrous, pinnatisect; segments 5–7 pairs, linear-oblong or lanceolate, pinnatifid, dentate. Inflorescences racemose, 2–3(–5) cm, 6- or 7(–10)-flowered; bracts 6–7 \times 5–6 mm, often deeply 3-cleft. Pedicel 1–2 mm, slender. Calyx 4–5 mm, 1/2 cleft anteriorly; lobes 3, unequal, ca. 1/2 as long as tube, posterior lobe triangular, entire,

lateral pair larger, palmately 3-lobed. Corolla rose, ca. 1 cm; tube erect, ca. 2 \times as long as calyx; galea twisted; beak often semicircular, ca. 4 mm; lower lip long ciliate. Filaments pubescent apically. Capsule oblong, ca. 1 cm. Fl. Jul, fr. Aug–Oct.

• Exposed moss-covered rocky slopes; 2200–2900 m. NE Guizhou.

224. *Pedicularis torta* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 538. 1888.

扭旋马先蒿 niu xuan ma xian hao

Herbs perennial, 20–40(–70) cm tall, not drying black. Roots \pm fleshy. Stems 1 or 3(–7), erect, unbranched apically, sparsely pubescent apically. Basal leaves numerous, often withering early. Stem leaves alternate or pseudo-opposite; proximal petioles to 5 cm, distal ones ca. 5 mm; leaf blade oblong-lanceolate to linear-oblong, 2–9.5 \times 0.7–2.5 cm, glabrous on both surfaces, pinnatisect; segments 9–16 pairs, lanceolate to linear-oblong, dentate. Inflorescences racemose, to 18 cm, many flowered; bracts leaflike, proximal ones longer than calyx. Pedicel 1–2.5 mm, slender, pubescent. Calyx 6–7 mm, 1/2 cleft anteriorly, pubescent; lobes 3, unequal, posterior one \pm entire, lateral pair larger, flabellate, dentate. Corolla yellow, with purple or purple-red galea, 1.6–2 cm; tube erect, ca. as long as calyx, pubescent; galea twisted; beak S-shaped, slender; lower lip ca. 1 \times 1.3 cm, long ciliate. Filaments pubescent. Capsule ovoid, 1.2–1.6 cm \times 4–6 mm. Fl. Jun–Aug, fr. Aug–Sep.

• Alpine meadows; 2500–4000 m. S Gansu, W Hubei, Shaanxi, E and N Sichuan.

225. *Pedicularis tibetica* Franchet, Bull. Soc. Bot. France 47: 24. 1900.

西藏马先蒿 xi zang ma xian hao

Pedicularis dielsiana H. Limpricht, not Bonati; *P. limprichtii* Fedde; *P. ludovicii* H. Limpricht.

Herbs perennial, to 25 cm tall, drying slightly black. Roots ca. 6 cm, \pm fleshy. Stems usually 4–10(–15), central stem erect, outer ones often procumbent to ascending, densely gray pubescent. Basal leaves few or withering early; petiole to 4 cm; leaf blade oblong-oblong to linear-oblong, 3–5 cm \times 7–12 mm, abaxially long pubescent along veins, adaxially sparsely long pubescent, pinnatipartite to pinnatisect; segments 9–13 pairs, ovate or long ovate, dentate. Stem leaves often pseudo-opposite, alternate apically, similar to basal leaves but smaller. Inflorescences racemose, 2–4(–10) cm; bracts leaflike, proximal ones shorter than pedicel. Pedicel to 1 cm, slender, densely pubescent. Calyx 6–7 mm, densely pubescent, 1/2 cleft anteriorly; lobes 3, \pm equal. Corolla reddish, with white spots on lower lip, ca. 1 cm; tube erect, ca. as long as calyx; galea twisted; beak semicircular, 5–6 mm; lower lip not ciliate. Filaments pubescent. Capsule ca. 8 mm. Seeds ca. 3.6 mm. Fl. Jun–Jul, fr. Aug.

• Alpine meadows; ca. 4600 m. W Sichuan, E Xizang.

226. *Pedicularis subulatidens* P. C. Tsoong, Acta Phytotax. Sin. 3: 296. 1955.

针齿马先蒿 zhen chi ma xian hao

Herbs perennial, low, less than 7 cm tall. Roots many, to 6 cm. Stems single, densely glandular pubescent. Basal leaf petiole to 2 cm, sparsely pubescent; leaf blade oblong-lanceolate, ca. 1.7 cm × 7 mm, abaxially whitish scurfy, adaxially glabrous, pinnatisect; segments 7 or 8 pairs, ovate-oblong to ovate, incised-dentate. Stem leaves 1 or absent. Inflorescences subcapitate, 5–8-flowered, pedicellate or distal flowers sessile. Pedicel to 7 mm. Calyx ca. 6 mm, 1/2 cleft anteriorly; tube barely 4 mm; lobes 3, unequal, posterior one entire and acuminate, lateral pair dentate. Corolla tube 1.1–1.4 cm, pubescent externally; galea twisted; beak semicircular or S-shaped, ca. 6 mm; lower lip ca. 1.1 × 1.3 cm. Filaments glabrous. Fl. Jul, fr. Aug.

• Alpine meadows; 4300–4700 m. SE Xizang.

227. *Pedicularis longicalyx* H. P. Yang, Acta Phytotax. Sin. 18: 243. 1980.

长萼马先蒿 chang e ma xian hao

Herbs perennial, ca. 8 cm tall, drying slightly black. Roots fusiform, fleshy. Stems usually numerous, outer ones often procumbent to ascending. Basal leaves numerous, fascicled; petiole 2–4 cm, glabrescent; leaf blade ovate-oblong, 1–2.5 cm, pinnatisect; segments 5–7 pairs, ovate to orbicular, incised-toothed. Stem leaves few, 1 or 2. Inflorescences capitate, 6–10-flowered; bracts leaflike. Pedicel 1–2 mm. Calyx oblong, 1/2 cleft anteriorly, glabrous, usually purplish spotted; tube to 8 mm; lobes 5, unequal. Corolla pale red, ca. 2 cm; tube barely exceeding calyx, sparsely villous; galea twisted; beak slightly S-shaped, ca. 7 mm, slender; lower lip ca. 1 × 1.3 cm. Filaments glabrous. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; ca. 4200 m. E Xizang.

228. *Pedicularis davidii* Franchet, Nouv. Arch. Mus. Hist. Nat., Sér. 2, 10: 67. 1888.

大卫氏马先蒿 da wei shi ma xian hao

Herbs perennial, 15–30(–50) cm tall, densely pubescent, drying slightly black. Roots fleshy. Stems single or usually 3 or 4, erect, few branched basally, densely rust colored pubescent. Basal leaves usually withering early.

70. Ser. Dissectae H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 10. 1949.

细裂系 xi lie xi

Stems branching basally or above. Leaves alternate or proximal ones pseudo-opposite, petiolate, ovate-oblong, pinnatisect. Inflorescence racemose. Flowers often long pedicellate. Calyx deeply cleft anteriorly, 3–5-lobed. Corolla often yellowish white; galea strongly twisted laterally at base; beak bent upward, S-shaped or semicircular, slender.

• Four species: endemic to China.

1a. Calyx lobes 5; middle lobe of lower corolla lip ca. 2 × 1.5 mm, neither prominently projecting nor stipitate at base

..... 229. *P. souliei*

Proximal stem leaves pseudo-opposite, distal ones alternate; proximal petioles to 5 cm; leaf blade ovate-oblong to lanceolate-oblong, 7(–13) × 2(–3.5) cm, abaxially whitish scurfy, adaxially glabrous or pubescent along veins, pinnatisect; segments 9–14 pairs, linear-oblong or ovate-oblong, pinnatifid, margin double dentate. Inflorescences racemose, 13(–19) cm, lax; bracts leaflike. Pedicel 1.5–3 mm, slender, densely pubescent. Calyx 5–6 mm, glabrescent, 1/2 cleft anteriorly; lobes 3 or 5, unequal, entire or dentate. Corolla purple or red, 1.2–1.6 cm; tube erect, ca. 2 × as long as calyx, sparsely pubescent externally; galea twisted; beak semicircular or slightly S-shaped apically, slender; lower lip 8–11 mm × 1.1–1.3 cm, ciliate. Filaments pubescent. Capsule ca. 1 cm × 4–5 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Grassy slopes and flats, thickets, woods, along streams, alpine meadows, roadsides; 1400–4400 m. SW Gansu, SW Shaanxi, Sichuan.

1a. Calyx lobes 5 228b. var. *pentodon*

1b. Calyx lobes 3.

2a. Calyx lobes longer than wide, entire

..... 228a. var. *davidii*

2b. Calyx lobes wider than long, distinctly

dentate 228c. var. *platyodon*

228a. *Pedicularis davidii* var. *davidii*

大卫氏马先蒿(原变种) da wei shi ma xian hao (yuan bian zhong)

Calyx lobes 3, longer than wide, margin entire.

• Grassy slopes and flats, thickets, woods, along streams; 1700–3500 m. SW Gansu, SW Shaanxi, Sichuan.

228b. *Pedicularis davidii* var. *pentodon* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 413. 1963.

五齿大卫氏马先蒿 wu chi da wei shi ma xian hao

Calyx lobes 5, longer than wide, margin entire.

• Alpine meadows; 3200–4400 m. NW Sichuan.

228c. *Pedicularis davidii* var. *platyodon* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 413. 1963.

宽齿大卫氏马先蒿 kuan chi da wei shi ma xian hao

Calyx lobes 3, wider than long, margin distinctly dentate.

• Roadsides; 1400–2300 m. E Sichuan.

- 1b. Calyx lobes 3; middle lobe of lower corolla lip ca. 5×4 mm, prominently projecting and narrowed to a stipitate base.
- 2a. Beak of corolla long, S-shaped; capsule ca. 10 mm 232. *P. petitmenginii*
- 2b. Beak of corolla shorter, semicircular; capsule 4–5 mm.
- 3a. Corolla purple-red, galea with a 2-auriculate protuberance; calyx lobes palmatipartite; pedicel to 1.4 cm 230. *P. honanensis*
- 3b. Corolla yellow, galea without a 2-auriculate protuberance; calyx lobes unequal, posterior lobe usually linear and entire; pedicel to 2.5 cm 231. *P. dissecta*

229. *Pedicularis souliei* Franchet, Bull. Soc. Bot. France 47: 23. 1900.

苏氏马先蒿 *su shi ma xian hao*

Herbs annual or biennial, 20–30 cm tall, drying slightly black. Stems usually branched basally; branches 6–10, weak, often ascending, sparsely pubescent. Proximal leaves pseudo-opposite, distal ones alternate; petiole 15–25 cm; leaf blade lanceolate-oblong or ovate-oblong, $3-4 \times 1-1.5$ cm, abaxially sparsely pubescent along midvein or glabrous, adaxially sparsely pubescent, pinnatisect; segments 9–11 pairs, long ovate or ovate-lanceolate, pinnatifid to pinnatipartite, incised-dentate. Inflorescences racemose, $1/3-1/2$ as long as branches, lax; bracts leaflike. Pedicel 1–2 cm, weak, densely pubescent. Calyx 3–5 mm, glabrous or pubescent along veins, $1/2$ cleft anteriorly; lobes 5, unequal, posterior one entire, lateral lobes larger, entire. Corolla reddish or whitish, ca. 1 cm; tube erect, longer than calyx; galea twisted; beak pointed upward, S-shaped, ca. 7 mm; lower lip ciliate, middle lobe ca. 2×1.5 mm. Filaments pubescent. Capsule ca. 5 mm.

• Swampy places. W Sichuan.

230. *Pedicularis honanensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 413. 1963.

河南马先蒿 *he nan ma xian hao*

Herbs perennial, 20–26 cm tall, glabrescent, drying ± black. Roots fleshy. Stems single or 3 or 4, many branched; branches slender, pubescent. Basal leaves usually withering early; petiole ca. 2 cm. Stem leaves alternate; petiole 6–10 mm; leaf blade long ovate or ovate-oblong, $3-5 \times 1.5-1.7$ cm, glabrous on both surfaces, pinnatisect; segments 7–9 pairs, widely spaced, lanceolate-oblong to linear-lanceolate, pinnate-dentate. Inflorescences racemose, more than $1/3$ as long as stems or branches, lax; bracts leaflike. Pedicel to 1.4 cm. Calyx 4–5 mm, densely downy, $1/2$ cleft anteriorly; lobes 3, ± equal, palmatipartite. Corolla purple-red, ca. 1 cm; tube 4–5 mm; galea falcate, with a 2-auriculate protuberance; beak semicircular, 5–6 mm; lower lip ca. 7×9 mm, ciliate, middle lobe ca. 5×4 mm, prominently projecting and narrowed to a stipitate base. Filaments villous. Capsule ca. 5 mm. Fl. Jul–Aug, fr. Aug.

• Thickets, margins of woods; ca. 1400 m. W Henan.

231. *Pedicularis dissecta* (Bonati) Pennell & H. L. Li in H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 142. 1949.

全裂马先蒿 *quan lie ma xian hao*

Pedicularis petitmenginii Bonati var. *dissecta* Bonati, Bull. Soc. Bot. France 55: 245. 1908; *P. davidii* Franchet var. *flaccida* Diels ex Bonati.

Herbs perennial, 20–35 cm tall, pubescent or glabrous, drying black. Roots fleshy. Stems usually 4–10, sometimes single, central stem erect, outer stems usually procumbent to ascending, branched or not, slender. Basal leaves withering early; petiole 3–3.5 cm, usually persistent. Stem leaves alternate; petiole 1.5–2 mm; leaf blade ovate-oblong, $3-3.5 \times 1.2-1.6$ cm, glabrous on both surfaces, pinnatisect; segments 6–9 pairs, widely spaced, ovate to linear-lanceolate, pinnatifid or incised-double dentate. Inflorescences racemose, to $1/2$ as long as branches, lax; bracts leaflike. Pedicel to 2.5 cm, slender, elongating and curving in fruit, densely pubescent. Calyx 4–6 mm, glabrous, $1/2$ cleft anteriorly; lobes 3, unequal, posterior one linear, entire, lateral pair palmatipartite. Corolla yellow, 1–1.2 cm; tube erect, slightly longer than calyx; galea bent at a right angle, lacking auriculate protuberance; beak semicircular, apex bent upward, ca. 6 mm; lower lip ciliate, middle lobe ca. 5×4 mm, prominently projecting and narrowed to a stipitate base. Filaments villous. Capsule 4–5 mm. Fl. Jun–Aug, fr. Aug.

• Rocks; ca. 3000 m. SW Shaanxi.

232. *Pedicularis petitmenginii* Bonati, Bull. Herb. Boissier, Sér. 2, 7: 542. 1907.

伯氏马先蒿 *bai shi ma xian hao*

Herbs perennial, 15–40(–60) cm tall, pubescent or glabrescent, drying black. Stems usually 4–6, branching basally or above. Basal leaves withering early. Proximal stem leaves pseudo-opposite, distal ones alternate; petiole 1.5–2.5 cm; leaf blade ovate-oblong to linear-oblong, $3-5.5 \times 1-1.7$ cm, abaxially villous along veins, adaxially sparsely pubescent or glabrescent, pinnatisect; segments 8–12 pairs, linear-lanceolate to narrowly oblong, pinnatifid, serrate. Inflorescences racemose, $1/2$ or $1/3$ as long as stems and branches; bracts leaflike. Pedicel 2–3 cm, slender, densely pubescent. Calyx 4–5 mm, white villous externally, $1/2$ cleft anteriorly; lobes 3, unequal, posterior lobe sub-entire, narrow, lateral pair larger, palmatilobate. Corolla whitish or yellowish with purple or purple-red galea, 1.1–1.5 cm; tube erect, 6–7 mm; galea bent at a right angle apically, twisted; beak linear, S-shaped pointing upward, 5–6 mm; lower lip ciliate, middle lobe ca. $5 \times$

4 mm, prominently projecting, narrowed to a stipitate base. Filaments villous. Capsule ca. 1 cm × 8 mm. Fl. May–Aug, fr. Jul–Sep.

• Forest understories, forest margins, meadows; 3100–3900 m. NW and W Sichuan.

71. Ser. Amplitubae H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 10. 1949.

丰管系 feng guan xi

Herbs erect, more than 10 cm tall, villous. Stems single, rigid or flexuous. Basal leaves numerous, long petiolate. Stem leaves few, alternate or ± opposite, smaller than basal leaves, linear-oblong, pinnatifid. Inflorescences short racemose, centripetal. Calyx deeply cleft anteriorly, 5-lobed. Corolla purple; tube ca. 2.5 × as long as calyx; galea falcate, marginally 2-toothed; beak straight.

• One species: endemic to China.

233. Pedicularis amplituba H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 129. 1949.

丰管马先蒿 feng guan ma xian hao

Herbs perennial, to 20 cm tall. Roots fascicled, filiform. Stems unbranched. Basal leaves numerous; petiole to 6 cm; leaf blade linear-oblong to 7 × 1.7 cm, abaxially villous along midvein, adaxially glabrous, pinnatisect; segments 12–16 pairs, oblong, crenately pinnatifid, denticulate. Stem leaves usually 2 or 4, similar to basal leaves but smaller and shorter petiolate. Inflorescences

to 6 cm, lax basally; bracts leaflike. Pedicel to 1 cm, villous. Calyx ca. 1.2 cm, slightly pubescent; lobes 5, unequal, posterior smallest, posterior-lateral pair largest, palmately incised-dentate. Corolla purple, ca. 3.5 cm; tube erect, ca. 2.8 cm, slightly pubescent; galea with 1 distinct reflexed marginal tooth on one side; beak ± filiform, straight, ca. 4 mm; lower lip ciliate. Filaments pubescent apically. Fl. Jul, fr. Aug.

• Rocky slopes; ca. 3500 m. NW Yunnan.

72. Ser. Rhinanthoides Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 67. 1890.

拟鼻花系 ni bi hua xi

Stems erect or spreading, branched basally or unbranched. Leaves basal and on stem. Basal leaves long petiolate, linear-oblong, pinnatisect. Stem leaves few, alternate. Inflorescences slightly capitate or racemose. Calyx lobes 5. Corolla purple, rose, or crimson, to 2.8 cm; tube ca. as long as calyx; galea bent at a right angle apically; beak semicircular or S-shaped, very long, slender.

Two species: China, India, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; both species in China.

1a. Calyx 1/2 cleft anteriorly, usually with purplish dots, posterior lobe entire, lateral lobes ovate, serrate; galea

± erect basally 234. *P. rhinanthoides*

1b. Calyx slightly cleft anteriorly, without purplish dots, lobes all serrate; galea curving from its base 235. *P. cyclorhyncha*

234. Pedicularis rhinanthoides Schrenk ex Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 22. 1841.

拟鼻花马先蒿 ni bi hua ma xian hao

Herbs perennial, 4–30(–40) cm tall, drying slightly black. Roots ± fusiform, fascicled, fleshy. Stems 1 to numerous, erect or flexuous, unbranched, glabrescent, shiny. Basal leaves usually densely fascicled; petiole 2–5 cm; leaf blade linear-oblong, pinnatisect; segments 9–12 pairs, ovate, glabrescent, dentate, teeth callose. Stem leaves few, shorter petiolate than basal leaves. Inflorescences short racemose, sometimes to 8 cm; bracts leaflike. Pedicel to 1(–1.5) cm, glabrous. Calyx long ovate, 1.2–1.5 cm, 1/2 cleft anteriorly, often with purplish dots; lobes 5, unequal, posterior one lanceolate and ± entire, lateral lobes ovate and serrate. Corolla rose to violet-purple, to 1.7–2.5(–3) cm, to ca. 2 × longer than calyx, pubescent; tube erect; galea erect basally, ± bent at a right angle apically; beak S-shaped to semicircular, 7–10 mm; lower lip 1.4–2.8 cm, wide, ciliate or not. Filaments 2 pubescent, 2 glabrous.

Capsule lanceolate-ovoid, ca. 1.9 cm × 6 mm. Seeds ca. 2 mm. Fl. May–Jul, fr. Jul–Sep. 2n = 16.

Moist alpine meadows, boggy places along streams, among small *Rhododendron* and other shrubs in moist locations on open hillsides; 2300–5000 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [India, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

1a. Beak of corolla to 7 mm, usually semicircular; lower lip 1.4–1.7 cm wide 234a. subsp. *rhinanthoides*

1b. Beak of corolla to 8–10 mm, usually S-shaped; lower lip 2.5–2.8 cm wide.

2a Bracts and upper petioles glabrous to slightly villous; lower corolla lip not ciliate 234b. subsp. *labellata*

2b. Bracts and upper petioles villous; lower corolla lip ciliate 234c. subsp. *tibetica*

234a. Pedicularis rhinanthoides subsp. *rhinanthoides*

拟鼻花马先蒿(原亚种) ni bi hua ma xian hao (yuan ya zhong)

Bracts and upper petioles glabrous to slightly ciliate. Corolla beak usually semicircular, to 7 mm; lower lip 1.4–1.7 cm wide, ± ciliate.

Moist meadows; 3000–5000 m. Xinjiang [India, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

234b. *Pedicularis rhinanthoides* subsp. *labellata* (Jacquemont) Pennell, *Monogr. Acad. Nat. Sci. Philadelphia* 5: 152. 1943.

大唇拟鼻花马先蒿 da chun ni bi hua ma xian hao

Pedicularis labellata Jacquemont, *Voy. Inde* 118. 1844; *P. biondiana* Diels; *P. rhinanthoides* subsp. *labellata* (Jacquemont) P. C. Tsoong; *P. rhinanthoides* var. *labellata* (Jacquemont) Prain.

Bracts and upper petioles glabrous to slightly villous. Corolla beak usually S-shaped, to 8–10 mm; lower lip 2.5–2.8 cm wide, not ciliate. Fl. Jul–Sep.

• Alpine moist meadows and boggy places along streams, among small *Rhododendron* and other shrubs in moist locations on open hillsides; 3000–4500 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [India].

234c. *Pedicularis rhinanthoides* subsp. *tibetica* (Bonati) P. C. Tsoong, *Fl. Reipubl. Popularis Sin.* 68: 263. 1963.

西藏拟鼻花马先蒿 xi zang ni bi hua ma xian hao
Pedicularis rhinanthoides var. *tibetica* Bonati, *Bull. Soc. Bot. Genève, Sér.* 2, 5: 113. 1913.

73. Ser. *Binariae* P. C. Tsoong ex H. B. Yang, *Acta Phytotax. Sin.* 33: 246. 1995.

双生系 shuang sheng xi

Herbs low. Stems 1 to several, erect or ascending, unbranched. Leaves opposite, oblong-lanceolate, pinnatipartite. Inflorescences short racemose. Calyx lobes 5. Corolla purplish red with yellow galea; tube ca. 2 × as long as calyx; galea falcate; beak short, slender, usually S-shaped; middle lobe of lower lip hoodlike at apex.

• One species: endemic to China.

236. *Pedicularis binaria* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg* 32: 579. 1888.

双生马先蒿 shuang sheng ma xian hao

Herbs annual, to 15 cm tall, not drying black. Stems woody, whitish pubescent. Leaves 1–3 pairs, opposite; petiole to 1.5 cm basally, whitish long pubescent; leaf blade 1–1.8 cm × 5–8 mm, pinnatipartite; segments 5–8 pairs, narrowly oblong, incised-dentate. Inflorescences 3–6-flowered; bracts leaflike. Pedicel ca. 2 mm. Calyx tube 5–8 mm, membranous, whitish villous along veins;

Bracts and upper petioles villous. Corolla beak usually S-shaped, to 8–10 mm; lower lip 2.5–2.8 cm wide, ciliate. Fl. May–Jul, fr. Aug–Sep.

• Alpine meadows; 3000–4000 m. SW Sichuan, NW Yunnan.

235. *Pedicularis cyclorhyncha* H. L. Li, *Proc. Acad. Nat. Sci. Philadelphia* 101: 128. 1949.

环喙马先蒿 huan hui ma xian hao

Herbs to 40 cm tall, glabrescent except for inflorescences, drying black. Stems single, erect or slightly flexuous, usually branched basally. Leaves alternate, mostly basal, short petiolate or sessile; proximal petioles to 7 cm, slender; leaf blade linear-lanceolate, 2–6 cm × 7–9 mm, pinnatisect; segments 10–14 pairs, ovate, pinnatifid and incised-double dentate. Inflorescences racemose, to 10 cm, lax basally; bracts leaflike, longer than calyx. Pedicel erect, ca. 5 mm. Calyx to 1.2 cm, sparsely pubescent, shallowly cleft anteriorly; lobes 5, unequal, all serrate, lateral ones often deeply divided. Corolla crimson, 2.5–2.8 cm; tube erect, ca. as long as calyx, sparsely pubescent; galea curving from base ± in a circle; beak linear, ca. 8 mm, curved, forming a complete circle with galea; lower lip ca. 1 × 2 cm, slightly ciliate. Filaments 2 pubescent apically, 2 glabrous throughout. Fl. Jun–Jul, fr. Aug.

• Moist meadows. NW Yunnan.

teeth unequal, ciliate. Corolla purplish red, with ± yellow galea basally; tube straight, ca. 1.4 cm, to more than 2 × as long as calyx tube, pubescent; galea falcate, nearly as long as tube; beak ca. 3.5 mm; lower lip ca. 1.1 × 1.8 cm, ciliate, middle lobe broadly ovate, hoodlike at apex. Filaments 2 villous, 2 glabrous. Fl. Aug, fr. Sep.

• Alpine meadows; ca. 4000 m. N Sichuan.

74. Ser. *Pectinatiformes* P. C. Tsoong ex H. B. Yang, *Acta Phytotax. Sin.* 33: 246. 1995.

拟篋齿系 ni bi chi xi

Stems branched or not. Leaves in whorls of 4; leaf blade ovate-lanceolate to linear-oblong, pinnatipartite to pinnatisect. Inflorescences racemose. Calyx lobes 5. Corolla tube as long as or slightly exceeding calyx; galea bent apically; beak semicircular or S-shaped, long; lower lip with hoodlike middle lobe.

Three species: China, C Asia; two species in China.

1a. Plants to 40 cm tall; calyx lobes linear, ± entire; corolla purplish red; filaments glabrous . 237. *P. pectinatiformis*

1b. Plants barely 20 cm tall; calyx lobes 1 entire and other 4 flabellate, serrate; corolla yellow; filaments

densely pubescent 238. *P. weixiensis*

237. *Pedicularis pectinatiformis* Bonati, *Bull. Soc. Bot. France* 54: 372. 1907.

拟篋齿马先蒿 ni bi chi ma xian hao

Herbs perennial, to 40 cm tall, scarcely drying black. Stems 1 to several, erect or ± ascending, branched

basally or unbranched; branches whorled, short, slender, with lines of hairs. Leaves in whorls of 4; petioles to 4 cm, winged, pubescent; leaf blade ovate-lanceolate to linear-oblong, ca. 5 cm, glabrescent on both surfaces, pinnatisect; segments 6–8 pairs, pinnatipartite, dentate. Inflorescences interrupted; bracts leaflike basally, broadly ovate apically. Pedicel barely 1–2 mm. Calyx to 1 cm, membranous, slightly cleft anteriorly, whitish villous along veins; lobes 5, unequal, linear, ± entire, posterior one smaller than lateral lobes. Corolla purplish red, with yellowish tube apex and lower lip base; tube erect, ca. 1 cm; galea bent at a right angle; beak semicircular or S-shaped, ca. 1 cm, slender; lower lip ca. 1.1 × 1.4 cm, ciliate, middle lobe smaller than lateral lobes, hoodlike. Filaments glabrous. Fl. Aug, fr. Sep.

• W Sichuan.

238. *Pedicularis weixiensis* H. P. Yang, Acta Phytotax. Sin. 28: 139. 1990.

维西马先蒿 *wei xi ma xian hao*

Herbs perennial, 20 cm tall, not drying black. Stems usually single, branched basally, pubescent, with 3 or 4 internodes. Leaves in whorls of 4, petiolate or distal leaves often sessile; petiole ca. 5 mm; leaf blade narrowly oblong to linear-oblong, 1–1.5 cm, abaxially whitish scurfy, adaxially pubescent, pinnatipartite to pinnatisect; segments 6–8 pairs, ovate, dentate, teeth callose. Inflorescence racemose; bracts leaflike. Calyx ca. 1 cm, 1/2 cleft anteriorly, whitish pubescent; lobes 5, unequal, posterior one smallest and entire, lateral lobes flabellate and serrate. Corolla yellow, ca. 1.6 cm; tube erect, slightly exceeding calyx; galea bent at a right angle distally, beak slightly S-shaped, ca. 8 mm, slender; lower lip ca. 1 × 1.5 cm, ciliate, middle lobe smaller than lateral pair, apex strongly hoodlike. Filaments densely pubescent. Fl. Jul, fr. Aug.

• Subalpine meadows on ridges; ca. 3600 m. NW Yunnan (Weixi).

75. Ser. *Urceolatae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 247. 1995.

坛萼系 *tan e xi*

Herbs low, ± woody. Stems short, erect. Leaves opposite, pinnatifid to pinnatipartite; segments few. Calyx urceolate-ovate. Corolla rose-red, with yellow at tube apex and galea base; tube 3–4 × as long as calyx; beak slightly recurved, slender; middle lobe of lower lip slightly hoodlike at apex.

Two species: Bhutan, China; one species in China.

239. *Pedicularis urceolata* P. C. Tsoong, Fl. Reipubl. Popul. Sin. 68: 414. 1963.

坛萼马先蒿 *tan e ma xian hao*

Herbs annual, 10–20 cm tall, ± woody at base when old, not drying black. Stems numerous, fascicled, central stem erect, outer ones ascending, unbranched, with 2 lines of hairs. Basal leaves few, withering early; petiole to 2.5 cm. Stem leaves often only 1 pair or absent; petiole 0.6–1.5 cm; leaf blade elliptic-oblong to lanceolate-oblong, 0.7–1.8 cm × 2–8 mm, glabrescent on both surfaces, pinnatipartite, segments ca. 5 pairs, ovate, incised-dentate. Inflorescences to 9 cm, with 1–6 flower pairs; bracts leaflike. Pedicel ca. 6 mm,

elongated to 1.1 cm in fruit, glabrescent. Calyx urceolate-ovate, ca. 1 cm × 3.5–4 mm, sparsely whitish pubescent along veins; lobes 5, unequal. Corolla rose-red, with yellow at tube apex and galea base; tube 2.7–3 cm, pubescent; galea falcate apically, shorter than tube; beak 5–6 mm, slightly recurved, slender; lower lip 8–9 mm × ca. 1.4 cm, ciliate, middle lobe smaller than lateral pair, hoodlike. Filaments glabrous. Capsule ca. 1.3 cm × 6.5 mm, slightly exceeding calyx, apex acuminate. Fl. Jul, fr. Jul–Aug.

• Alpine meadows; ca. 3800 m. W Sichuan.

76. Ser. *Lyratae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 524, 603. 1888.

琴盔系 *qin kui xi*

Stems ± procumbent or erect, branched or not. Leaves usually opposite, occasionally in whorls of 3 or 4; leaf blade often ovate-oblong, pinnatifid. Calyx 5-lobed. Corolla tube erect; galea often bent apically, longer than lower lip, beakless, with 1 or several marginal teeth near apex, beakless.

Eleven species: China, Sikkim; all 11 species in China.

1a. Galea with several distinct marginal teeth on each side; lower corolla lip margin serrulate.

2a. Galea acute or pointed at apex; lateral calyx lobes elliptic or broadly ovate, distinctly serrate.

3a. Stems usually fascicled, many branched apically; inflorescences compact; corolla pale yellow;

calyx

slightly cleft anteriorly; leaves 20–50 × 11–22 mm 247. *P. lutescens*

3b. Stems single, unbranched; inflorescences interrupted; corolla purplish red; calyx slightly cleft anteriorly;

leaves 8–11 × 4–6 mm 248. *P. laxispica*

2b. Galea rounded at apex, not pointed or acute; lateral calyx lobes narrowly long, obscurely serrate.

- 4a. Plants (6–)10–20 cm tall; inflorescences to 9.5 cm; corolla 2.2–2.5 cm; filaments pubescent basally 249. *P. polyodonta*
- 4b. Plants 2–6 cm tall; inflorescences 2–2.5 cm; corolla 1.9–2 cm; filaments glabrous 250. *P. lyrata*
- 1b. Galea with 1 marginal tooth or sometimes additionally obscurely denticulate on each side; lower corolla lip margin entire or slightly praemorse.
- 5a. Corolla with dark colored spots; lower lip margin entire.
- 6a. Plants (10–)20–30(–50) cm tall; roots few, fusiform, fleshy; leaves in whorls of 3 or 4 240. *P. stenocorys*
- 6b. Plants less than 7 cm tall; roots numerous, slender; leaves opposite 241. *P. dolichoglossa*
- 5b. Corolla without spots; lower lip margin ± praemorse.
- 7a. Stems and branches glabrous or barely with 2 lines of hairs.
- 8a. Leaves to 12 × 10 mm; stems 4–15 cm tall; middle lobe of lower corolla lip ca. as long as lateral lobes 242. *P. cymbalaria*
- 8b. Leaves 2–6 × 1.5–4 mm; stems 3.5–4.5 cm tall; middle lobe of lower corolla lip ca. 2 × as long as lateral lobes 243. *P. inaequilobata*
- 7b. Stems and branches densely pubescent.
- 9a. Corolla yellow; lobes of lower lip nearly equal 244. *P. tomentosa*
- 9b. Corolla red to rose; lobes of lower lip unequal, middle lobe distinctly largest.
- 10a. Leaves ovate to oblong-ovate, 1.5–2.5 cm × 8–12 mm, crenate-dentate; filaments glabrous 245. *P. rizhaoensis*
- 10b. Leaves triangular or triangular-ovate, 0.8–1.2 cm × 6–8 mm, pinnatifid; filaments sparsely pubescent basally 246. *P. deltoidea*

240. *Pedicularis stenocorys* Franchet, Bull. Soc. Bot. France 47: 32. 1900.

狭盔马先蒿 xia kui ma xian hao

Herbs perennial, (10–)20–30(–50) cm tall, not drying black. Roots few, fusiform, fleshy. Stems 1 to several, erect, branched basally or unbranched, pubescent, with 4 lines of hairs. Leaves in whorls of 3 or 4; petiole to 2–2.8 cm, slender, sparsely pubescent; leaf blade oblong-lanceolate to ovate-oblong, 0.5–6 × 0.6–2 cm, abaxially whitish scurfy, adaxially glabrescent, pinnatisect to pinnatipartite; segments 4–14 pairs, ovate to oblong-ovate, few incised-dentate. Inflorescences spicate, 4–10 cm, sometimes interrupted basally; bracts leaflike, whitish long ciliate. Calyx obovate, ca. 1 cm, slightly cleft anteriorly, whitish villous; lobes 5, unequal, posterior one smallest, triangular, entire, others ovate and serrate. Corolla pink to rose, usually with dark colored spots, 2–2.5(–3) cm; tube erect, slightly longer than calyx; galea slightly bent at middle, to 1.4–1.7(–1.9) cm × 1.8–3 mm, slender, sometimes with 1 marginal tooth or obscurely denticulate on each side; lower lip shorter than galea, densely long ciliate, entire. Filaments glabrous or 2 pubescent. Capsule obliquely lanceolate-ovoid, 1/4–1/3 exceeding calyx. Fl. and fr. Jul–Aug.

• Alpine meadows, slopes; 3300–4400 m. N and W Sichuan.

1a. Plants to 50 cm tall; stems sparsely pubescent; leaf blade oblong-lanceolate to

ovate-oblong, 3–4(–6) cm, segments 10–14 pairs 240a. subsp. *stenocorys*

1b. Plants barely 10 cm tall; stems pubescent with long blackish rust colored hairs; leaf blade ovate, 5–16 mm, segments 4–8 pairs 240b. subsp. *melanotricha*

240a. *Pedicularis stenocorys* subsp. *stenocorys*

狭盔马先蒿(原亚种) xia kui ma xian hao (yuan ya zhong)

Pedicularis porphyrantha H. L. Li; *P. pseudostenocorys* Bonati.

Plants to 50 cm. Stems sparsely pubescent. Leaf blade oblong-lanceolate to ovate-oblong, 3–4(–6) cm; segments 10–14 pairs.

• Alpine meadows, slopes; 3300–4400 m. N and W Sichuan.

This subspecies includes two varieties: var. *stenocorys* with galea 1.4–1.7 cm × ca. 3 mm, and var. *angustissima* P. C. Tsoong with galea ca. 1.9 cm × 1.8 mm.

240b. *Pedicularis stenocorys* subsp. *melanotricha* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 415. 1963.

黑毛狭盔马先蒿 hei mao xia kui ma xian hao

Plants low, barely 10 cm. Stems pubescent with long, blackish, rust colored hairs. Leaf blade ovate, 0.5–1.6 cm; segments 4–8 pairs.

• Alpine meadows; ca. 3900 m. W Sichuan.

241. *Pedicularis dolichoglossa* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 356. 1948.

长舌马先蒿 *chang she ma xian hao*

Herbs perennial, to 7 cm tall, drying \pm black. Roots numerous, slender. Stems single, black, with 2–4 internodes, long pubescent with dark brown hairs. Leaves few, opposite; petiole 1.5–3 cm, rust colored pubescent; leaf blade elliptic-ovate, (0.4–)1.5 cm \times ca. 8 mm, abaxially whitish scurfy, adaxially glabrous, pinnatipartite; segments 2–4 pairs, few segments incised-dentate. Inflorescences to 4 cm, subcapitate, many flowered; bracts leaflike, proximal ones to 1.3 cm. Calyx ca. 1 cm; lobes 5, unequal, posterior lobe triangular, entire, others larger, dentate. Corolla yellow, with dull colored spots, 2.3–2.5 cm; tube erect, exceeding calyx; galea falcate apically, to 2 cm, with 1 marginal tooth or margin obscurely denticulate on each side; lower lip to 4.5 \times 8 mm, long ciliate, entire, middle lobe rounded, smaller than lateral lobes, projecting. Filaments pubescent basally.

• NW Yunnan.

242. *Pedicularis cymbalaria* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 136. 1921.

舟型马先蒿 *zhou xing ma xian hao*

Herbs annual or biennial, 4–15 cm tall, drying \pm black. Stems several, diffuse or procumbent, many branched basally; branches opposite, glabrous or with 2 lines of hairs. Leaves opposite; petiole 4–6(–20) mm, sparsely long pubescent; leaf blade reniform to cordate-ovate, sometimes orbicular, to 1.2 \times 1 cm, abaxially whitish scurfy, adaxially densely glandular pubescent, pinnate to palmately lobed or parted; segments 6–10 pairs, ovate-oblong, crenate-dentate. Flowers axillary, opposite, widely spaced. Pedicel 5–10(–20) mm, slender. Calyx 0.9–1.2 cm, densely pubescent, slightly cleft anteriorly; lobes 5, unequal, posterior lobe smallest, entire, lateral lobes dentate. Corolla yellowish white to rose, 2–2.5 cm; tube erect, to 1.2 cm; galea falcate apically, margin 2-toothed, apex navicular; lower lip shorter than galea, margin \pm praemorse, middle lobe ca. as long as lateral lobes. Filaments glabrous or pubescent basally. Capsule obliquely lanceolate-oblong, 1.2–1.3 cm, ca. 1/3 exceeding calyx. Fl. Aug, fr. Sep.

• Alpine meadows, rocky soils, shaded banks; 3400–4000 m. SW Sichuan, NW Yunnan.

243. *Pedicularis inaequilobata* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 415. 1963.

不等裂马先蒿 *bu deng lie ma xian hao*

Herbs annual, 3.5–4.5 cm tall, diffuse, not drying black. Stems slender, many branched, with 1 or 2 internodes and with 2 lines of hairs; branches opposite. Basal leaves withering early. Stem leaves few, opposite; petiole 4–9 mm; leaf blade ovate to oblong-ovate, 2–6

\times 1.5–4 mm, abaxially sparsely whitish scurfy, adaxially densely glandular pubescent, pinnatipartite; segments 3 or 4 pairs, broadly ovate, incised-dentate. Inflorescences with only 1 or 2 flower pairs. Pedicel to 6 mm, slender, sparsely pubescent. Calyx ca. 8 mm, whitish long pubescent; lobes 5, unequal. Corolla yellow; tube erect, 9–10 mm; galea falcate apically, margin 2-toothed, ca. 1.4 cm; lower lip shorter than galea, margin \pm praemorse, middle lobe ca. 2 \times as long as lateral lobes, with ca. 1.5 mm stipitate base. Filaments pubescent basally.

• NW Yunnan.

244. *Pedicularis tomentosa* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 357. 1948.

绒毛马先蒿 *rong mao ma xian hao*

Herbs annual, to 12 cm tall, tomentose throughout, not drying black. Stems usually 2–6, erect, slender, sometimes short branched apically. Leaves opposite or in whorls of 4, sessile, oblong-ovate to triangular-ovate, 1–1.3 cm \times 5–7 mm, densely tomentose on both surfaces; segments 5–9 pairs, crenate-dentate or lobulate. Inflorescences short racemose, to 4 cm; bracts leaflike. Pedicel barely 1–2 mm. Calyx ca. 6 mm, membranous, tomentose; lobes 5, unequal, posterior lobe smallest, dentate. Corolla yellow, 2.2–2.5 cm; tube erect, slightly longer than calyx; galea falcate apically, 1.2–1.3 cm, with 1 marginal tooth on each side; lower lip ca. as long as galea, middle lobe nearly as long as lateral lobes, emarginate. Filaments glabrous.

• NW Yunnan.

245. *Pedicularis rizhaoensis* H. P. Yang, Acta Phytotax. Sin. 28: 141. 1990.

日照马先蒿 *ri zhao ma xian hao*

Herbs perennial, barely 6 cm tall. Stems single or few, erect, unbranched, slightly pubescent with lines of dense rust colored hairs. Leaves sparse, opposite; petiole 5–10 mm, pubescent; leaf blade ovate to oblong-ovate, 1.5–2.5 \times 0.8–1.2 cm, abaxially sparsely whitish scurfy, adaxially densely rust colored villous, crenate-dentate. Inflorescences racemose, 2–4-flowered; bracts leaflike. Pedicel ca. 3 mm. Calyx ca. 1 cm, slightly cleft anteriorly, densely villous; lobes 5, unequal, posterior one subulate, lateral lobes rounded and serrate. Corolla reddish, 2.4–2.7 cm; tube erect, slightly longer than calyx; galea falcate, with 1 marginal tooth on each side; lower lip 1.3–1.5 \times 0.9–1.1 cm, \pm praemorse, lobes rounded, middle lobe larger than lateral pair, erose-denticulate. Filaments glabrous. Fl. Aug, fr. Sep.

• Grass on hillsides; ca. 4200 m. SW Sichuan.

246. *Pedicularis deltoidea* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 604. 1888.

三角叶马先蒿 *san jiao ye ma xian hao*

Herbs annual or biennial, 8–20 cm tall, densely gray pubescent throughout, drying \pm black. Stems erect,

single or many branched basally, sometimes branched apically; branches slender, rigid, hollow. Leaves opposite or in whorls of 3 or 4, petiolate or distal ones sessile; petiole to 5 mm, villous; leaf blade triangular or triangular-ovate, 0.8–1.2 cm × 6–8 mm, abaxially rust colored and gray scurfy, adaxially glabrescent, pinnatifid; segments 4 or 5 pairs, broadly ovate, margin double dentate. Inflorescences racemose, to 9 cm, many flowered; bracts leaflike, ca. as long as calyx. Pedicel 3–4 mm, slender, villous. Calyx 8–10 mm, pubescent; lobes 5, unequal. Corolla rose, 1.7–2.2(–2.4) cm; tube erect, ca. as long as calyx; galea falcate apically, with 1 marginal tooth on each side; lower lip shorter than galea, slightly praemorse, middle lobe larger than lateral pair. Filaments sparsely pubescent basally. Capsule obliquely lanceolate, ca. 1.2 cm. Fl. Aug–Sep, fr. Sep–Oct.

•Grassy slopes; 2600–3500 m. SW Sichuan, NW Yunnan.

247. *Pedicularis lutescens* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 605. 1888.

浅黄马先蒿 qian huang ma xian hao

Herbs perennial, 10–40 cm tall, pubescent, ± drying black. Stems usually 3–10-clustered, erect, many branched apically, with 4 lines of hairs. Basal leaves often withering early; petiole 1.2–1.5 cm. Stem leaves usually in whorls of 4, sessile or petiole to 2.2 cm, densely villous; leaf blade long ovate or ovate-oblong, 2–5 × 1.1–2.2 cm, abaxially whitish scurfy, adaxially sparsely pubescent, pinnatifid; segments triangular-ovate to long ovate, dentate. Inflorescences racemose, 3–6 cm, compact; proximal bracts leaflike, longer than calyx. Pedicel ca. 1 mm. Calyx 8–10 mm, slightly cleft anteriorly, membranous, villous; lobes 5, unequal, lateral lobes elliptic, serrate. Corolla pale yellow, usually with purplish dots on lower lip, 2.1–2.5 cm; tube erect, nearly as long as calyx; galea slightly falcate, with 4–10 marginal teeth near apex on each side, apex acute; lower lip ca. 1/2 as long as galea, serrulate. Filaments glabrous or pubescent basally. Capsule oblique-lanceolate, to 1.4 cm × 4 mm. Fl. Jul–Aug, fr. Aug–Sep.

•Thickets, alpine meadows; 3000–4000 m. SW and W Sichuan, E, NW, and SW Yunnan.

1a. Plants 20–40 cm tall; leaves 2–5 cm.

2a. Leaves distinctly petiolate, petiole 1–2.2 cm; galea with 4–6 marginal teeth on each side 247a. subsp. *lutescens*

2b. Leaves ± sessile or petiole to 2–3 mm; galea with 8–10 marginal teeth on each side 247b. subsp. *tongtchuanensis*

1b. Plants 10–20(–30) cm tall; leaves ca. 2 cm.

3a. Branches of stems slender; leaves long petiolate, petiole to 2–2.5 cm 247e. subsp. *longipetiolata*

3b. Branches of stems stout and rigid; leaves ± sessile or petiole 1–5 mm.

4a. Stems few branched basally or unbranched; leaves ± sessile or petiole to 1–2 mm 247c. subsp. *brevifolia*

4b. Stems many branched basally; petiole of leaves to ca. 5 mm 247d. subsp. *ramosa*

247a. *Pedicularis lutescens* subsp. *lutescens*

浅黄马先蒿(原亚种) qian huang ma xian hao (yuan ya zhong)

Pedicularis truchetii Bonati.

Plants 20–40 cm. Leaf petiole 1–2.2 cm; leaf blade 2–5 cm. Galea with 4–6 marginal teeth on each side.

•Thickets, alpine meadows; 3000–4000 m. NW Yunnan.

247b. *Pedicularis lutescens* subsp. *tongtchuanensis* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 276. 1963.

东川浅黄马先蒿 dong chuan qian huang ma xian hao

Pedicularis lutescens var. *tongtchuanensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 135. 1921.

Plants 20–40 cm, simple or few branched. Leaves ± sessile or petiole to 2–3 mm; leaf blade 2–5 cm. Galea with 8–10 marginal teeth on each side.

•E Yunnan.

247c. *Pedicularis lutescens* subsp. *brevifolia* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 277. 1963.

短叶浅黄马先蒿 duan ye qian huang ma xian hao

Pedicularis lutescens var. *brevifolia* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 135. 1921.

Plants 10–20(–30) cm. Stems few branched basally or unbranched; branches rigid, stout. Leaves ± sessile or petiole to 1–2 mm; leaf blade ca. 2 cm. Galea with 4–6 marginal teeth on each side.

•NW Yunnan.

247d. *Pedicularis lutescens* subsp. *ramosa* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 277. 1963.

多枝浅黄马先蒿 duo zhi qian huang ma xian hao

Pedicularis lutescens var. *ramosa* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 135. 1921.

Plants low, 10–20(–30) cm. Stems many branched basally; branches rigid, stout. Leaves ± sessile or petiole to ca. 5 mm; leaf blade ca. 2 cm. Galea with 4–6 marginal teeth on each side.

•SW Sichuan, NW Yunnan.

247e. *Pedicularis lutescens* subsp. *longipetiolata* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 277. 1963.

长柄浅黄马先蒿 chang bing qian huang ma xian hao

Pedicularis lutescens var. *longipetiolata* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 361. 1948.

Plants low, 10–20(–30) cm. Stem simple or branched; branches slender. Leaf petiole to 2–2.5 cm; leaf blade ca. 2 cm. Galea with 4–6 marginal teeth on each side.

• W Sichuan.

248. *Pedicularis laxispica* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 362. 1948.

疏穗马先蒿 *shu sui ma xian hao*

Herbs annual, 7–15 cm tall, pubescent, drying ± black. Stems single, erect, unbranched, slender, with 4 lines of hairs. Basal leaves often withering early; petiole to 1 cm. Stem leaves few, in whorls of 4, sometimes opposite; petiole ca. 5 mm, villous; leaf blade ovate-oblong, 8–11 × 4–6 mm, pubescent on both surfaces, abaxially sparsely scurfy, pinnatifid; segments 6 or 7 pairs, oblong, margin ± entire. Inflorescences spicate, 3–6 cm, 5–11-flowered, flowers opposite, interrupted; bracts leaflike, slightly longer than calyx. Pedicel ca. 2 mm. Calyx 8–10 mm, membranous, slightly cleft anteriorly; lobes 5, unequal, posterior lobe triangular, entire, others ovate, dentate. Corolla purplish red, ca. 2.5 cm; tube erect, slightly exceeding calyx; galea falcate apically, ca. as long as tube, with 3 or 4 marginal teeth on each side near acute apex; lower lip shorter than galea, margin serrulate, middle lobe emarginate. Filaments glabrous.

• NW Yunnan.

249. *Pedicularis polyodonta* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 358. 1948.

多齿马先蒿 *duo chi ma xian hao*

Pedicularis lyrata Prain ex Maximowicz var. *cordifolia* Franchet.

Herbs annual, (6–)10–20 cm tall, densely pubescent throughout, not drying black. Stems erect. Leaves opposite, distal ones sometimes in whorls of 3; petiole

77. Ser. Reptantes P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 247. 1995.

爬行系 *pa xing xi*

Herbs low, repent. Stem leaves opposite, petiolate, rounded, small; segments 3 or 4 pairs. Flowers axillary. Calyx lobes 5. Corolla tube ± elongated, ca. 2 × as long as calyx; beak straight, short.

• One species: endemic to China.

251. *Pedicularis reptans* P. C. Tsoong, Acta Phytotax. Sin. 3: 290. 1955.

爬行马先蒿 *pa xing ma xian hao*

Herbs annual, slender, soft. Stems numerous, repent, ca. 20 cm, densely hirsute. Leaves opposite; petiole 1.5–10 mm, hirsute; leaf blade rounded, elliptic or elliptic-oblong, to 8 × 7(–8) mm, base truncate or slightly cordate, pinnatifid to pinnatipartite; segments 3 or 4 pairs, margin double dentate. Flowers

of basal leaves to 1.7 cm, densely whitish villous. Stem leaves ± sessile or petiole ca. 5 mm; leaf blade ovate to ovate-lanceolate, sometimes long triangular-ovate, 1–3 cm × 5–11 mm, pubescent on both surfaces, pinnatifid; segments ovate or orbicular, crenate dentate.

Inflorescences spicate, to 9.5 cm, many flowered; bracts leaflike. Calyx 1.2–1.5 cm, densely pubescent, slightly cleft anteriorly; lobes 5, unequal, posterior lobe shortest, entire, others obscurely dentate. Corolla yellow, 2.2–2.5 cm; tube erect, 1–1.2 cm; galea falcate apically, with 3–6 marginal teeth on each side near rounded apex; lower lip shorter than galea, middle lobe larger than lateral pair. Filaments pubescent basally. Capsule triangular to narrowly ovoid, to 1.4 cm. Fl. Jun–Aug, fr. Aug–Sep.

• Alpine meadows, open forests; 2700–4200 m. NW and W Sichuan.

250. *Pedicularis lyrata* Prain ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 606. 1888.

琴盔马先蒿 *qin kui ma xian hao*

Herbs annual, 2–6 cm tall, densely pubescent, ± drying black. Stems single, erect, unbranched. Leaves opposite. Petiole of basal leaves 0.7–1.5 cm, sparsely pubescent. Stem leaves ± sessile or petiole 2–3 mm; leaf blade oblong-lanceolate or ovate-oblong, 0.5–1.5 cm × 2–6 mm, pubescent on both surfaces, widely spaced crenate-dentate. Inflorescences racemose, 2–2.5 cm, few flowered; bracts leaflike, ± sessile. Pedicel 1–2 mm. Calyx 7–10 mm, slightly cleft anteriorly, densely villous; lobes 5, unequal, posterior lobe entire, others narrowly elliptic, obscurely serrate. Corolla yellow, 1.9–2 cm; tube erect, ca. as long as calyx; galea ± falcate at middle, ca. 1.1 cm, with 3–5 marginal teeth on each side near rounded apex; lower lip ca. 1/2 as long as galea, middle lobe largest. Filaments glabrous. Capsule obliquely lanceolate-ovoid. Fl. Jul–Aug, fr. Sep.

Alpine meadows; 3600–4200 m. Qinghai, W Sichuan, Xizang [Sikkim].

solitary in axils. Pedicel ca. 5 mm. Calyx cylindrical, ca. 5.5 × 2 mm, densely pubescent, slightly cleft anteriorly; lobes 5, ± equal, with long stipitate bases, dentate.

Corolla 2–2.3 cm; tube ca. 1.6 cm; galea bent at a right angle apically; beak slightly 2-cleft at apex; lower lip ca. 6.5 × 7.5 mm, glabrous. Fl. May–Jun, fr. Jul–Aug.

• Swampy meadows; ca. 2300 m. E Xizang.

短叶系 duan ye xi

Ser. *Alopecuroides* H. L. Li.

Herbs usually low. Stems several or single, unbranched. Basal leaves small or not persistent, ± elliptic to ovate; segments few. Stem leaves in whorls of 3 or 4 or sometimes opposite, long petiolate or some sessile; leaf blade ± oblong, pinnatifid to pinnatipartite. Inflorescences short or elongated. Calyx lobes 5, posterior one smallest. Corolla tube slightly longer than 2 × as long as calyx; galea with a long beak.

About six species: China, India (Himachal Pradesh), Kashmir, Nepal, Pakistan, Sikkim; four species in China.

1a. Lower corolla lip ciliate.

2a. Herbs perennial, 20–50 cm tall; calyx 5–8 mm; middle lobe of lower corolla lip not hoodlike; leaf segments

4–6 pairs 252. *P. verbenifolia*

2b. Herbs annual, 55–70 cm tall; ca. 10 mm; middle lobe of lower corolla lip ± hoodlike; leaf segments

6–8 pairs 254. *P. tsaii*

1b. Lower corolla lip glabrous.

3a. Leaves petiolate, ovate-oblong to lanceolate-oblong or ovate, to 12 × 3(–4) cm, segments 6–10 pairs

253. *P. smithiana*

3b. Leaves sessile, linear-lanceolate to lanceolate, to 5.5 × 1.4 cm, segments 12–14 pairs 255. *P. alopecuros*

252. *Pedicularis verbenifolia* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 549. 1888.

马鞭草叶马先蒿 ma bian cao ye ma xian hao

Herbs perennial, 20–50 cm tall, sparsely pubescent, drying black. Lateral roots 4–8, fleshy. Stems 1–7, erect, often unbranched, with 4 lines of hairs. Basal leaves often withering early, petiole to 4 cm. Stem leaves opposite or in whorls of 3(or 4); petiole 0.5–1.5(–3) cm; leaf blade ovate or ovate-oblong, 2–4(–6) × 1–1.5 cm, adaxially sparsely pubescent along midvein, pinnatifid; segments 4 or 6 pairs, ovate-oblong to triangular-ovate, dentate. Inflorescences spicate, 3–9(–17) cm; proximal bracts leaflike, distal ones lanceolate. Calyx 5–8 mm, slightly cleft anteriorly, villous along veins; lobes 5, unequal. Corolla purple, 1.6–2 cm; tube erect, ca. 2 × as long as calyx, glabrous; galea bent at a right angle; beak 5–6 mm, slender; lower lip ca. as long as or slightly longer than galea, ciliate, middle lobe not hoodlike. Filaments glabrous. Capsule narrowly ovoid, 1.4–1.8 cm × 5–7 mm. Fl. Jul–Sep, fr. Aug–Oct.

• Alpine meadows, shrubs, cliff faces; 3100–4000 m. S Sichuan, NW Yunnan.

253. *Pedicularis smithiana* Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 83. 1911.

史氏马先蒿 shi shi ma xian hao

Pedicularis praealta Bonati.

Herbs perennial, 25–50(–100) cm, glabrescent, ± drying black. Lateral roots 5–15, fleshy. Stems single or 2–4, erect, unbranched apically, with lines of hairs. Basal leaves withering early. Stem leaves in whorls of 3 or 4; petiole 1.3–3 cm; leaf blade ovate-oblong to lanceolate-oblong or ovate, to 12 × 3(–4) cm, adaxially sparsely pubescent and densely ciliate along midvein, pinnatifid to pinnatipartite; segments 6–10 pairs, tri-

angular-ovate to lanceolate-oblong, margin double dentate. Inflorescences spicate, 4–13 cm; bracts sessile, proximal ones leaflike, longer than flowers. Calyx 6–9 mm, villous, slightly cleft anteriorly; lobes 5, unequal. Corolla pale yellow, with purple galea and beak, 1.8–2.1 cm; tube erect, 8–10 mm; galea bent at a right angle apically; beak ca. 4 mm, slender; lower lip ca. as long as galea, glabrous. Filaments glabrous. Capsule obliquely oblong, ca. 1.3 cm. Fl. May–Aug, fr. Jul–Aug.

• Alpine meadows, shrubs; 3000–4000 m. SW Sichuan, N Yunnan.

254. *Pedicularis tsaii* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 299. 1948.

蔡氏马先蒿 cai shi ma xian hao

Herbs annual, 55–70 cm tall, glabrescent, ± drying black. Stems single or few, erect, stout. Basal leaves withering early. Stem leaves in whorls of 4; petiole 4–10 mm, glabrous; leaf blade ovate-oblong, ca. 4.5 × 3 cm, glabrous on both surfaces, pinnatifid to pinnatipartite; segments 6–8 pairs, ovate or oblong, deeply dentate. Inflorescences spicate, 6–8 cm; proximal bracts leaflike, distal ones ovate. Calyx ca. 1 cm, slightly cleft anteriorly, villous along veins; lobes 5, unequal. Corolla rose to purple throughout, ca. 2 cm; tube erect, ca. 1.5 × as long as calyx; galea bent at a right angle; beak decurved, ca. 6 mm, slender; lower lip 6–7 mm, ciliate, middle lobe ± hoodlike. Filaments glabrous. Capsule compressed, ovoid, 1.2–1.4 cm × 5–6 mm. Seeds 1.5–1.8 × ca. 0.8 mm. Fl. Aug, fr. Aug–Sep.

• Alpine meadows; 4000–4300 m. NW Yunnan.

255. *Pedicularis alopecuros* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 548. 1888.

狐尾马先蒿 hu wei ma xian hao

Herbs annual, 50–80 cm tall, stout, pubescent, not drying black. Roots ± fleshy. Stems single or few, erect,

often branched; branches opposite, slender. Stem leaves opposite or in whorls of 4, sessile; leaf blade lanceolate to linear-lanceolate, to 5.5 × 1–1.4 cm, both surfaces woolly, abaxially densely whitish scurfy, pinnatifid to pinnatipartite; segments 12–14 pairs, triangular to linear-oblong, crenate-dentate.

Inflorescences spicate; proximal bracts longer than calyx, short petiolate, ovate-lanceolate. Calyx 8–10 mm, densely villous, deeply cleft anteriorly; lobes 5, unequal. Corolla yellow, with purple-red galea, 1.8–2 cm; tube erect, to 2 × as long as calyx; galea bent at a right angle apically, slender; beak slender; lower lip shorter than galea, glabrous, apex of middle lobe hoodlike. Filaments glabrous or pubescent apically. Capsule barely enclosed by accrescent calyx, obliquely long ovoid, ca. 1 cm. Fl. May–Aug, fr. Aug–Sep.

• Alpine meadows; 2300–4000 m. Sichuan, N Yunnan.

- 1a. Filaments glabrous 255a. var. *alopeurosus*
1b. Filaments pubescent apically . 255b. var. *lasiandra*

255a. *Pedicularis alopecurosus* var. *alopeurosus*

狐尾马先蒿(原变种) hu wei ma xian hao (yuan bian zhong)

Filaments glabrous.

• Alpine meadows; 2300–4000 m. SW Sichuan, N Yunnan.

255b. *Pedicularis alopecurosus* var. *lasiandra* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 416. 1963.

毛药狐尾马先蒿 mao yao hu wei ma xian hao

Filaments pubescent apically.

• Sichuan.

79. Ser. *Debiles* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 72. 1890.

弱小系 ruo xiao xi

Ser. *Parvifoliae* H. Limpricht.

Herbs usually low. Stems erect, branched basally or unbranched. Leaves basal and on stem, opposite, rarely in whorls of 3, lanceolate to ovate, pinnatifid to pinnatisect. Inflorescences often capitate. Calyx lobes 5, posterior lobe smallest. Corolla tube longer than calyx but not exceeding 2 ×; beak straight or bent downward, long; galea margin toothless.

About 15 species: Bhutan, China, Myanmar, Nepal, Sikkim; nine species in China.

1a. Leaves lanceolate to linear-lanceolate, segments (7–)16–20 pairs 260. *P. pheulpinii*
1b. Leaves ovate to oblong or orbicular, sometimes lanceolate in *P. maxonii*, segments usually less than 10 pairs.

2a. Leaves on stem, ± sessile.

3a. Plants with short internodes, usually less than 3 cm; lower corolla lip ciliate, middle lobe hoodlike 261. *P. maxonii*

3b. Plants with long internodes, to 8 cm; lower corolla lip glabrous, middle lobe not hoodlike.

4a. Leaf blade broadly ovate or triangular-ovate, segments 3 or 4 pairs; calyx ca. 8 mm 262. *P. lamioides*

4b. Leaf blade orbicular, segments 8–10 pairs; calyx 4–5 mm 263. *P. rotundifolia*

2b. Leaves both basal and on stem, usually petiolate or stem leaves sometimes ± sessile.

5a. Corolla tube ca. 3 × as long as calyx 264. *P. chumbica*

5b. Corolla tube less than 2 × as long as calyx.

6a. Galea with auriculate marginal protuberance on one side 257. *P. sphaerantha*

6b. Galea without auriculate marginal protuberance.

7a. Middle lobe of lower corolla lip not hoodlike 259. *P. tenuicaulis*

7b. Middle lobe of lower corolla lip hoodlike.

8a. Lateral calyx lobes 3-parted 258. *P. confertiflora*

8b. Lateral calyx lobes ± entire or 1–3-toothed 256. *P. debilis*

256. *Pedicularis debilis* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 549. 1888.

弱小马先蒿 ruo xiao ma xian hao

Herbs annual, to 20 cm, some only 5–8 cm, finely pubescent, drying black. Roots fascicled, fibrous. Stems single, unbranched, with 2 lines of hairs. Leaves opposite, both basal and on stem; petiole slender, proximal ones 2–4.5 cm and wider, distal ones to 1–1.7 cm; leaf blade orbicular or ovate to oblong, 1.4–2.2 × 0.8–1.5 cm, abaxially glabrous, adaxially glabrescent,

pinnatifid to pinnatipartite; segments 3–7 pairs, broadly ovate to lanceolate-ovate, pinnatifid or incised-double dentate. Inflorescences subcapitate; proximal bracts leaflike, distal ones triangular-ovate. Pedicel 4–8 mm. Calyx usually tinged with purplish red, 5.5–7 mm, sparsely pubescent, membranous; lobes 5, unequal, lateral lobes ± entire or 1–3-toothed. Corolla red, with dark purplish red galea; tube ca. 8.5 mm; galea bent at a right angle apically; beak horizontal, ± straight, 5.5–6.5 mm, slender; lower lip ca. 1 × 1–1.4 cm, long ciliate or

glabrous, ± erose, middle lobe hoodlike. Filaments glabrous throughout.

Forest margins; ca. 4000 m. NW Yunnan.

- 1a. Plants to 20 cm tall; leaf blade ovate to oblong, usually pinnatipartite; lower corolla lip long ciliate 256a. subsp. *debilis*
1b. Plants scarcely 5–8 cm tall; leaf blade orbicular, usually pinnatifid; lower corolla lip glabrous 256b. subsp. *debilior*

256a. *Pedicularis debilis* subsp. *debilis*

弱小马先蒿(原亚种) ruo xiao ma xian hao (yuan ya zhong)

Plants to 20 cm tall. Leaf blade ovate to oblong, usually pinnatipartite. Lower corolla lip long ciliate.

• Forest margins; ca. 4000 m. NW Yunnan.

256b. *Pedicularis debilis* subsp. *debilior* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 416. 1963.

极弱弱小马先蒿 ji ruo ruo xiao ma xian hao

Pedicularis liana Pennell ex H. L. Li.

Plants scarcely 5–8 cm tall. Leaf blade orbicular, usually pinnatifid. Lower corolla lip glabrous.

• NW Yunnan.

257. *Pedicularis sphaerantha* P. C. Tsoong, Acta Phytotax. Sin. 3: 291. 1955.

团花马先蒿 tuan hua ma xian hao

Herbs perennial, 4–10 cm, densely long pubescent.

Roots fibrous. Stems 1 to several, central stem erect, outer stems usually ascending. Basal leaf petiole long, to 1 cm, sparsely pubescent; leaf blade elliptic to oblong, 1–2 cm × 5–8 mm, pinnatisect; segments 5–7 pairs, oblong, pinnatifid, dentate. Stem leaves in whorls of 3 or 4, widely spaced; leaf blade similar to basal leaves but shorter petiolate. Inflorescences compact, globose; proximal bracts strongly inflated, distal ones palmately lobed. Calyx ca. 6 mm, membranous; lobes 5, unequal, posterior one triangular-lanceolate and entire, lateral lobes leaflike and serrate. Corolla red, with dark red galea; tube erect, ca. 7.5 mm, glabrous; galea bent at a right angle apically, with an auriculate marginal protuberance on one side; beak ± bent downward, ca. 8 mm, slender; lower lip long ciliate, middle lobe hoodlike apically, ca. less than 2 × as long as lateral lobes. Anterior filaments sparsely pubescent. Fl. Jul–Aug, fr. Sep.

• Swampy meadows, grassy slopes; 3900–4800 m. E Xizang.

258. *Pedicularis confertiflora* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 258. 1889.

聚花马先蒿 ju hua ma xian hao

Herbs annual, 1–18(–25) cm tall, ± villous, not drying black. Roots woody. Stems single or numerous, ± dark purplish, sometimes branched basally, pubescent; central stem erect, outer stems procumbent to ascending. Basal leaves clustered, withering early; petiole to 3 cm. Stem leaves absent or 1 or 2(–4) pairs, opposite, ±

sessile; leaf blade ovate-oblong, usually less than 3 cm, pinnatisect; segments 5–7 pairs, ovate, incised-dentate. Flowers opposite or in whorls of 4 apically; bracts ± leaflike. Pedicel short. Calyx to 6 mm, membranous, usually tinged with red, hispid; lobes 5, unequal, posterior lobe entire, lateral lobes 3-parted. Corolla rose to purplish red; tube ca. 2 × as long as calyx; galea bent at a right angle apically; beak bent slightly downward, straight, ca. 7 mm, slender; lower lip ca. as long as galea, glabrous or minutely ciliate, middle lobe hoodlike. Anterior filaments densely pubescent, other filaments sparsely pubescent or glabrous. Capsule obliquely ovoid, ca. 1/2 exceeding calyx, apiculate. Fl. Jul–Sep, fr. Aug–Oct.

Open stony pastures, grassy slopes; 2700–4900 m. SW Sichuan, S Xizang, Yunnan [Bhutan, Nepal, Sikkim].

- 1a. Plants 5–18(–25) cm tall, ± densely villous; stems branched basally or unbranched; leaf blade ca. 10 mm 258a. subsp. *confertiflora*
1b. Plants 1–2(–6) cm tall, glabrescent throughout; stems usually unbranched; leaf blade scarcely 5–6 mm 258b. subsp. *parvifolia*

258a. *Pedicularis confertiflora* subsp. *confertiflora*

聚花马先蒿(原亚种) ju hua ma xian hao (yuan ya zhong)

Pedicularis handel-mazzettii Bonati; *P. villosula* Franchet ex F. B. Forbes & Hemsley.

Plants 5–18 cm, sometimes to 25 cm tall, ± densely villous. Stems branched basally or unbranched. Leaf blade 1–3 cm.

Open stony pastures, grassy slopes; 2700–4400 m. SW Sichuan, S Xizang, Yunnan [Bhutan, Nepal, Sikkim].

258b. *Pedicularis confertiflora* subsp. *parvifolia* (Handel-Mazzetti) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 290. 1963.

小叶聚花马先蒿 xiao ye ju hua ma xian hao

Pedicularis parvifolia Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 88. 1920; *P. subacaulis* Bonati; *P. villosula* Franchet var. *parvifolia* (Handel-Mazzetti) Handel-Mazzetti.

Plants 1–2(–6) cm tall, glabrescent throughout. Stems usually unbranched. Leaf blade scarcely 5–6 mm.

• 3800–4900 m. NW Yunnan.

259. *Pedicularis tenuicaulis* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 259. 1889.

纤茎马先蒿 xian jing ma xian hao

Herbs 5–30 cm tall, glabrous. Roots fibrous or fusiform, fleshy. Stems clustered, unbranched, slender, flexuous. Basal leaves cespitose, petiole to 8 cm. Stem leaves opposite; petiole 2–4 cm; leaf blade ovate-oblong, 2–3 × ca. 1 cm, pinnatisect; segments 6–8 pairs, ovate-lanceolate, pinnatifid, dentate. Flowers axillary. Pedicel 4–6 mm. Calyx campanulate, glabrous, 1/3 cleft anteriorly, ca. 7.5 × 3 mm; lobes 5, entire, posterior one subulate, lateral lobes lanceolate or ovate. Corolla tube slightly longer than calyx, 8–9 mm; galea bent at a right

angle apically; beak bent \pm downward, straight, to 5 mm, slender; lower lip ca. 1.1 cm wide, glabrous, lobes rounded, middle one ca. 1/2 as long as lateral pair, not hoodlike. Anterior filament pair long pubescent. Capsule lanceolate, 1–1.3 cm \times ca. 4 mm, apex acute. Seeds ovoid, ca. 1.5 \times 0.75 mm. Fl. Jul–Aug, fr. Aug–Sep.

About 4000 m. S Xizang [Bhutan, Nepal, Sikkim].

260. *Pedicularis pheulpinii* Bonati, Bull. Soc. Bot. France 55: 247. 1908.

费尔氏马先蒿 fei er shi ma xian hao

Herbs annual, 5–20 cm tall. Stems single, erect, densely long pubescent. Leaves opposite or whorled; proximal ones long petiolate and distal ones sessile, ciliate; leaf blade lanceolate to linear-lanceolate, 1–2 cm, glabrous or glabrescent, pinnatifid to pinnatisect; segments 7–20 pairs, rounded, margin entire. Inflorescences spicate, few flowered, interrupted basally; bracts palmatilobate, ciliate. Proximal pedicels ca. 2 mm, distal flowers sessile. Calyx ovate-cylindric, ca. 7 mm; lobes 5, unequal, posterior one subulate, very small, lateral lobes \pm narrowly ovate, whitish long pubescent, serrate. Corolla red-purple, with dark purple galea; tube ca. as long as calyx; galea bent at a right angle apically; beak bent \pm downward, straight, ca. 5 mm, slender; lower lip shorter than galea, ca. 5–7 \times 4–10 mm, middle lobe broadly triangular-ovate, much projecting, slightly hoodlike apically. Filaments glabrous throughout. Fl. Jul–Aug.

• Alpine or swampy meadows, damp soil by stream and gully margins, *Picea* woodlands. NE Qinghai, W Sichuan.

- 1a. Plants 10–20 cm tall; leaf segments 16–20 pairs; lower corolla lip ca. 5 \times 4 mm
..... 260a. subsp. *pheulpinii*
- 1b. Plants 5–15 cm tall; leaf segments 7–14 pairs; lower corolla lip ca. 7 \times 10 mm
..... 260b. subsp. *chilienensis*

260a. *Pedicularis pheulpinii* subsp. *pheulpinii*

费尔氏马先蒿(原亚种) fei er shi ma xian hao (yuan ya zhong)

Plants 10–20 cm tall. Leaf segments 16–20 pairs.

Lower corolla lip ca. 5 \times 4 mm.

• W Sichuan.

260b. *Pedicularis pheulpinii* subsp. *chilienensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 416. 1963.

祁连费尔氏马先蒿 qi lian fei er shi ma xian hao

Plants 5–15 cm tall. Leaf segments 7–14 pairs. Lower corolla lip ca. 7 mm \times 1 cm. Fl. Jul–Aug.

• Alpine or swampy meadows, damp soil by stream and gully margins, *Picea* woodlands. NE Qinghai.

261. *Pedicularis maxonii* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 166. 1926.

马克逊马先蒿 ma ke xun ma xian hao

Pedicularis sabaensis Bonati; *P. trigonophylla* Handel-Mazzetti.

Herbs annual, 12–16 cm tall. Stems erect, many branched, with short internodes usually less than 3 cm, glabrous except for inflorescences. Stem leaves opposite, \pm sessile throughout, glabrous; leaf blade ovate to lanceolate, 6–8 \times 5–6 mm, pinnatifid; segments linear, incised-dentate. Inflorescences spicate, usually many flowered, dense; bracts triangular or flabellate, palmatilobate. Calyx 5–6 mm, pubescent; lobes 5, unequal, posterior one lanceolate and shorter, lateral lobes deeply serrate lobed. Corolla purple; tube ca. 1 cm, glabrous or finely pubescent; galea bent at a right angle apically; beak linear, 8–10 mm; lower lip ca. as long as galea, long ciliate, middle lobe ovate, much projecting, hoodlike apically. Filaments glabrous throughout. Fl. Aug–Sep, fr. Sep–Oct.

• Alpine meadows; ca. 3000 m. NW Yunnan.

262. *Pedicularis lamioides* Handel-Mazzetti, Symb. Sin. 7: 869. 1936.

元宝草马先蒿 yuan bao cao ma xian hao

Herbs annual, 7–15 cm tall. Stems 1 to several, erect or outer stems ascending, with 2 lines of hairs. Basal leaves few, small. Stem leaves barely 1 pair, sessile or petiolate; petiole 2–5 mm, whitish long pubescent; leaf blade broadly ovate or triangular-ovate, 0.7–3 \times 0.5–2.5 cm, adaxially tinged with purple, pinnatifid; segments 3 or 4 pairs, rounded, crenulate. Inflorescences racemose, short, dense, to 10-flowered; bracts leaflike, much inflated. Pedicel 2–5 mm. Calyx campanulate, ca. 8 mm, long pubescent along veins; lobes 5, unequal, posterior one acute, lateral lobes rounded, shallowly crenate. Corolla dark rose, 1.8–2.2 cm; tube ca. 2 \times as long as calyx, slender; galea bent at a right angle apically; beak bent slightly downward, 5–7 mm, slender; lower lip ca. as long as galea, middle lobe hoodlike, others rounded, glabrous. Filaments glabrous throughout. Capsule slightly exceeding calyx, wide, apex short acuminate. Fl. Aug–Sep, fr. Sep–Oct.

• Alpine meadows, forests, among *Rhododendron*; 3400–4200 m. NW Yunnan.

263. *Pedicularis rotundifolia* C. Fischer, Bull. Misc. Inform. Kew 1940: 190. 1940.

圆叶马先蒿 yuan ye ma xian hao

Herbs annual, 10–15 cm tall, not drying black. Roots fusiform. Stems several, woody, with 2 lines of fine hairs. Stem leaves opposite, short petiolate or sessile, barely 2 pairs; leaf blade orbicular, 4–7 mm wide, scurfy-pubescent on both surfaces; segments 8–10 pairs, pinnatifid, oblong or flabellate, few lobulate. Inflorescences capitate, usually dense; bracts leaflike. Pedicel short. Calyx tubular, 4–5 mm, slightly cleft anteriorly, long pubescent, pubescent on both surfaces; lobes 5, unequal, posterior one ensiform, lateral lobes rounded, serrate. Corolla red; tube 1.1–1.3 cm, slender, sparsely pubescent; galea \pm bent at a right angle apically; beak bent slightly downward or horizontal, 6.2–7.2 mm, slender; lower lip ca. 7.5 \times 6.7 mm, gla-

brous, middle lobe oblong, ca. 3.5 mm. Filaments glabrous throughout. Fl. Jul, fr. Aug.

Alpine meadows, pastures; ca. 3300 m. SE Xizang [Myanmar].

264. *Pedicularis chumbica* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 259. 1889.

春丕马先蒿 *chun pi ma xian hao*

Herbs perennial, 4–6 cm tall, glabrous. Roots fascicled, fusiform, fibrous. Stems numerous, cespitose, slender. Basal leaves in a dense rosette; petiole to 1.5 cm. Stem leaves only 1 pair or absent, petiole ca. 5 mm; leaf blade ca. 1 cm × 3.5 mm, pinnatisect; segments 8–10 pairs, ovate, dentate. Inflorescence few flowered;

flowers fascicled; bracts leaflike. Pedicel 4–6 mm.

Calyx cylindrical-campanulate, ca. 6 × 3 mm, 1/3 cleft anteriorly, glabrous; lobes 5, unequal, posterior one linear and entire, lateral lobes lanceolate, serrate.

Corolla tube ca. 3 × as long as calyx; galea falcate; beak bent downward, ca. 6.5 mm, slender; lower lip ca. 1.4 cm wide, lobes rounded, middle lobe slightly smaller than lateral pair. Filaments glabrous throughout.

Capsule lanceolate, ca. 2 × as long as calyx, apiculate. Seeds few, ovoid. Fl. and fr. Jul.

S Xizang [Sikkim].

80. Ser. *Integrifoliae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 70. 1890.

全叶系 *quan ye xi*

Herbs low. Roots fleshy. Stems erect. Basal leaves in a rosette. Stem leaves few, opposite, narrowly lanceolate to linear-lanceolate. Flowers few, opposite. Calyx 1/3 cleft anteriorly, 5-lobed. Corolla tube more than 2 × as long as calyx; galea longer than lower lip; beak S-shaped, slender.

One species: Bhutan, China, Nepal, Sikkim.

265. *Pedicularis integrifolia* J. D. Hooker, Fl. Brit. India 4: 308. 1884.

全叶马先蒿 *quan ye ma xian hao*

Herbs perennial, 4–7 cm tall, drying black. Roots fusiform, fleshy. Stems 1 to several, ascending. Basal leaves in a rosette; petiole 3–5 cm; leaf blade narrowly lanceolate to linear-lanceolate, 3–5 cm × ca. 5 mm.

Stem leaves 2–4 pairs, sessile, narrowly oblong, 1.3–1.5 cm × 7.5–10 mm, ± entire to crenate or serrate.

Inflorescences spicate, 1–3-fascicled, sometimes interrupted basally; bracts leaflike, longer than or ca. as long as calyx. Calyx cylindrical-campanulate, ca. 1.2 cm, glandular pubescent, 1/3 cleft anteriorly; lobes 5, unequal, posterior one smallest, lateral lobes oblong, crenate. Corolla dark purple; tube erect, ca. 2 cm, slender; galea bent at a right angle apically; beak S-shaped, ca. 1.5 cm, slender; lower lip ca. 1.8 cm wide, glabrous, middle lobe rounded, ca. 1/2 as long as lateral pair. Filaments pubescent throughout. Capsule enclosed by persistent calyx, compressed, ovoid, ca. 1.5 cm × 7 mm. Fl. Jun–Jul, fr. Jul–Sep.

Alpine rocky meadows, *Picea* forests; 2700–5100 m. W Qinghai, SW and W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, Nepal, Sikkim].

1a. Plants relatively low; leaves crenate

..... 265a. subsp. *integrifolia*

1b. Plants to 7 cm; leaves serrulate to ±

entire 265b. subsp. *integerrima*

265a. *Pedicularis integrifolia* subsp. *integrifolia*

全叶马先蒿(原亚种) *quan ye ma xian hao* (*yuan ya zhong*)

Plants low. Leaf blade narrowly oblong, crenate.

• Alpine rocky meadows; 2700–5100 m. W Qinghai, SE Xizang [Bhutan, Nepal, Sikkim].

265b. *Pedicularis integrifolia* subsp. *integerrima* (Pennell & H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 296. 1963.

全缘全叶马先蒿 *quan yuan quan ye ma xian hao*

Pedicularis integerrima Pennell & H. L. Li in H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 351. 1948.

Plants to 7 cm tall. Leaf blade linear-lanceolate, serrulate to ± entire.

• *Picea* forests, alpine meadows; 2700–4200 m. SW and W Sichuan, SE Xizang, NW Yunnan.

81. Ser. *Pilostachyae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 95. 1890.

绵穗系 *mian sui xi*

Leaves opposite or in whorls of 3 or 4. Basal leaves numerous, persistent, long petiolate, lanceolate, pinnatipartite to pinnatisect. Inflorescences tomentose. Calyx 5-lobed. Corolla tube decurved apically; galea without marginal teeth near apex, beakless.

• Two species: endemic to China.

1a. Plants 12–20 cm tall; stem leaves opposite or in whorls of 3, ± sessile; flowers compactly arranged in a densely whitish tomentose spike; calyx lobes short

..... 266. *P. pilostachya*

1b. Plants often 30–50 cm tall; stem leaves in whorls of 3 or 4, petiole 1–1.6 cm; flowers ± laxly arranged,

grayish tomentose; calyx lobes longer 267. *P. ternata*

266. *Pedicularis pilostachya* Maximowicz, Bull. Acad. Imp.

Sci. Saint-Petersbourg 24: 64. 1877.

绵穗马先蒿 *mian sui ma xian hao*

Herbs perennial, cespitose, 12–20 cm tall, pubescent.

Rootstock fleshy. Basal leaves in a rosette; petiole 1–4

cm; leaf blade lanceolate-oblong, abaxially tomentose,

pinnatipartite; segments to 15 pairs, pinnatifid, serrulate. Stem leaves in only 2 whorls, proximal ones opposite, distal ones in whorls of 3, ± sessile. Inflorescences spicate, compactly arranged, with dense whitish tomentum, ca. 15-flowered; bracts ovate or lanceolate, distal ones smaller, abaxially densely tomentose. Calyx 1.1–1.7 cm, densely whitish tomentose; lobes 5, unequal, short, entire, triangular. Corolla deep carmine; tube slightly longer than calyx, straight in calyx, bent at a right angle apically; galea rounded, truncate at apex; lower lip ca. as long as galea. Filaments glabrous. Fl. Jun–Jul, fr. Jul–Aug.

• Gravelly slopes on mountain summits; 4700–5100 m. W Gansu, E Qinghai.

267. *Pedicularis ternata* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 64. 1877.

三叶马先蒿 san ye ma xian hao

Herbs perennial, 30–50 cm tall, pubescent, drying ± black. Rootstock stout, fleshy. Stems often several, erect or ± curved. Basal leaves in a rosette; petiole to 7 cm, glabrous; leaf blade ± lanceolate, to 9 cm, glabrous on both surfaces, pinnatipartite to pinnatisect; segments to 14 pairs, incised-dentate. Stem leaves in 2 or 3 or 4 whorls, smaller than basal leaves; petiole 1–1.6 cm. Flowers laxly arranged in spikes, only 1–3 whorls, grayish tomentose; bracts leaflike, proximal ones longer than flowers, sparsely pubescent. Calyx arachnoid; lobes 5, unequal, posterior lobe smallest, all oblong-triangular, entire. Corolla violet, small; tube slightly longer than calyx, bent forward apically near calyx lobes; galea truncate at apex; lower lip ca. as long as galea. Filaments glabrous. Capsule compressed, ovoid, to 2 × 1 cm, apex acute. Seeds to 3.5 mm. Fl. Jul, fr. Jul–Aug.

• Thickets; 3200–4600 m. W Gansu, Nei Mongol, Qinghai.

82. Ser. Tantalorhynchae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 247. 1995.

颤喙系 chan hui xi

Herbs low. Stems single or numerous, unbranched. Basal leaves persistent, long petiolate, ± lanceolate or narrowly oblong, large, pinnatifid, with many segments. Stem leaves in whorls of 3. Inflorescences spicate. Corolla tube erect, ca. as long as calyx; beak of galea long, horizontal or slightly decurved.

• One species: endemic to China.

268. *Pedicularis tantalorhyncha* Franchet ex Bonati, Bull. Soc. Bot. France 56: 466. 1909.

颤喙马先蒿 chan hui ma xian hao

Herbs annual, 4–15 cm tall. Stems numerous, erect or flexuous, unbranched, pubescent. Basal leaf petiole 2–5 cm, pubescent; leaf blade lanceolate, 3–5 × 1–1.4 cm, fleshy, pinnatifid; segments 15–20 pairs, ovate, pinnatifid, dentate. Stem leaves only in 1 or 2 whorls, similar to basal leaves but smaller. Inflorescences spicate, interrupted basally, flowers in whorls of 3;

bracts leaflike, longer than calyx. Calyx ca. 1 cm, slightly cleft anteriorly, pubescent; lobes 5, unequal, ca. as long as tube, posterior lobe smallest, posterior-lateral pair largest. Corolla purple; tube ca. 1 cm, glabrous; galea ± bent at a right angle, 5–6 mm, crested; beak horizontal or slightly decurved, 4–6 mm, slender; lower lip 7–8 mm, minutely ciliate. Filaments glabrous. Capsule cylindrical, ca. 1 cm. Fl. Jun–Jul, fr. Jul–Aug.

• Shaded areas, valleys; 3000–4000 m. ?SE Xizang, NW Yunnan.

83. Ser. Meteororhynchae H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 258. 1948.

翘喙系 qiao hui xi

Stems single. Basal leaves numerous, long petiolate, often lanceolate. Stem leaves few, opposite or in whorls of 4. Inflorescences long spicate, interrupted. Corolla tube bent at a right angle apically, ca. 1.5 × as long as calyx; galea often twisted; beak S-shaped, long.

• One species: endemic to China.

269. *Pedicularis meteororhyncha* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 376. 1948.

翘喙马先蒿 qiao hui ma xian hao

Herbs perennial, to 40 cm tall, drying ± black. Roots fleshy. Stems erect, unbranched, sparsely pubescent. Basal leaf petiole 7–9 cm, glabrescent; leaf blade linear-oblong to linear-lanceolate, 8–12 × 1.5–2.2 cm, abaxially sparsely pubescent along veins, adaxially sparsely pubescent, pinnatipartite to pinnatisect; segments 18–22 pairs, ovate-oblong to ovate-lanceolate, pinnatifid, margin double dentate. Stem leaves few, similar to basal leaves but smaller and shorter petiolate.

Inflorescences 15–20 cm; bracts 1–1.5 cm × ca. 6 mm, sparsely pubescent. Flowers in whorls of 4. Calyx cylindrical, ca. 1.2 cm, 1/3 cleft anteriorly; lobes 5, unequal, posterior lobe smallest, glabrescent or pubescent along veins, serrate. Corolla purplish red, glandular pubescent; tube ca. 1.8 cm, bent at a right angle apically; galea often twisted; beak to 1.5 cm, slender, S-shaped; lower lip shorter than galea, middle lobe prominent. Filaments villous. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; 4000–4200 m. NW Yunnan.

84. Ser. Atrovirides P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 247. 1995.

深绿系 shen lü xi

Herbs low. Stems often several, ascending or diffuse, usually weak. Basal leaves persistent, often oblong. Stem leaves often opposite. Inflorescences often few flowered. Calyx lobes leaflike, serrate. Corolla tube decurved apically; galea with 1 marginal tooth on each side, beakless; lower lip spreading.

• Two species: endemic to China.

1a. Corolla tube sparsely pubescent; leaves large, petiole of basal leaves to 4 cm, leaf blade to 3 × 1.6 cm; corolla

ca. 2.5 cm 270. *P. sherriffii*

1b. Corolla tube densely long white pubescent; leaves smaller, petiole of basal leaves to 2.3 cm, leaf blade

ca. 12 × 8 mm; corolla ca. 1.9 cm 271. *P. atroviridis*

270. Pedicularis sherriffii P. C. Tsoong, Acta Phytotax. Sin. 3: 286. 1955.

休氏马先蒿 xiu shi ma xian hao

Herbs perennial, barely to 9 cm tall, drying black. Stems several, often ascending, pubescent. Basal leaves numerous; petiole to 4 cm; leaf blade oblong-elliptic to elliptic, ca. 3 × 1.6 cm, pinnatisect; segments 4 or 5 pairs, ovate-elliptic, incised-dentate. Stem leaves opposite, similar to basal leaves but smaller and shorter petiolate. Inflorescences short or ± elongated, often interrupted basally, few flowered. Calyx 0.9–1.1 cm, sparsely long pubescent; tube ca. as long as lobes; lobes 5, unequal, leaflike. Corolla purple-red, with dark purple galea, ca. 2.5 cm; tube falcate apically, ca. 1.6 cm, sparsely pubescent; galea barely straight, ca. 9 mm, apex rounded, marginally 2-toothed; lower lip slightly longer than galea, ca. 1.1 × 1.1 cm. Filaments 2 pubescent, 2 glabrous. Fl. Jun.

• Open earthy slopes; 4100–4300 m. SE Xizang.

271. Pedicularis atroviridis P. C. Tsoong, Acta Phytotax. Sin. 3: 287. 1955.

深绿马先蒿 shen lü ma xian hao

Herbs perennial, barely 7 cm tall, drying black. Stems clustered, often diffuse or ascending, slender, densely brown long pubescent. Basal leaf petiole to 2.3 cm, glabrous; leaf blade ovate to ovate-elliptic, ca. 1.2 cm × 8 mm, pinnatisect; segments ca. 4 pairs, irregularly pinnatifid, incised-dentate. Stem leaves few, opposite or sometimes ± alternate; petiole ca. 6 mm; leaf blade ovate or rounded, glabrous on both surfaces, 3–5-lobed. Inflorescences sometimes interrupted basally, 2–6-flowered. Calyx glabrous; tube ca. 4.5 mm, densely long white pubescent; lobes 5, unequal, leaflike. Corolla bright purple-red, with paler throat, ca. 1.9 cm; tube falcate apically, ca. 1.2 cm, densely white long pubescent; galea barely straight, ca. 6.5 mm, apex protruding, marginally 2-toothed; lower lip longer than galea, ca. 1 × 1 cm, margin erose. Filaments 2 pubescent, 2 glabrous. Fl. Jul, fr. Aug–Sep.

• Open moss-covered slopes; ca. 4100 m. SE Xizang.

85. Ser. Remotilobae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 248. 1995.

疏裂系 shu lie xi

Herbs low. Stems often several, ascending or procumbent, unbranched. Leaves mostly basal, long petiolate, small, rounded. Stem leaves opposite. Corolla tube ca. 2 × as long as calyx; galea marginally 2-toothed; beak slender.

• One species: endemic to China.

272. Pedicularis remotiloba Handel-Mazzetti, Symb. Sin. 7: 868. 1936.

疏裂马先蒿 shu lie ma xian hao

Herbs low, 6–7 cm, sometimes barely 1.5 cm tall, drying black. Stems often several, ascending or procumbent, slender, ciliolate or glabrescent. Leaves mostly in a basal rosette; petiole to 2 cm, glabrous; leaf blade ovate-elliptic to ovate-oblong, 1–3 cm × ca. 8 mm, glabrous on both surfaces, pinnatisect; segments 2–5 pairs, ovate to orbicular, incised-double dentate. Stem leaves few or absent, similar to basal leaves but smaller

and shorter petiolate. Inflorescences short racemose; bracts leaflike. Calyx cylindrical, 3–4 mm, membranous; lobes 5, ± equal, triangular, entire. Corolla rose; tube erect, ca. 2 × as long as calyx; galea strongly bent apically, marginally 2-toothed below curve; beak ± horizontal, straight, 3–3.5 mm; lower lip ca. 6 × 9 mm, glabrous, lobes rounded. Filaments glabrous. Fl. Aug, fr. Sep.

• Grassy slopes in alpine regions; 3700–4200 m. NW Yunnan.

86. Ser. Sikkimenses P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 248. 1995.

锡金系 xi jin xi

Stems often several, herbaceous, weak, ascending. Leaves opposite or in whorls of 4, pinnatisect. Calyx lobes shorter than calyx tube. Corolla tube 2–2.5 × as long as calyx; galea without marginal teeth; beak ± straight.

• Two species: endemic to China.

1a. Corolla tube 7–8 mm; lower lip ciliate, middle lobe ± hoodlike at apex; filaments glabrous ... 273. *P. atuntsiensis*

1b. Corolla tube to 25 mm; lower lip not ciliate, middle lobe rounded, not hoodlike; filaments 2 pubescent,

2 glabrous 274. *P. elliotii*

273. *Pedicularis atuntsiensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 8: 135. 1913.

阿墩子马先蒿 a dun zi ma xian hao

Herbs perennial, 10–20 cm tall, drying black. Roots fibrous, fascicled. Stems glabrescent. Leaves in whorls of 4 or sometimes proximal ones opposite, petiolate or distal ones ± sessile; petiole 2.5–4.5 cm; leaf blade ovate-oblong or ovate, 1.5–2.5 cm, pinnatisect; segments 9–13 pairs, ovate, pinnatifid, incised-dentate. Flowers in whorls of 4; bracts leaflike basally. Pedicel ca. 2 mm. Calyx tube ca. 3.5 mm, membranous; lobes 5, unequal, posterior one entire, lateral lobes larger, serrate. Corolla purple; tube erect, 7–8 mm; galea strongly bent apically; beak horizontal, ± straight, ca. 5 mm, slender; lower lip ca. 7 × 9 mm, ciliate, middle lobe smaller than lateral pair. Filaments glabrous. Fl. Jul, fr. Aug.

• 4300–4500 m. NW Yunnan.

274. *Pedicularis elliotii* P. C. Tsoong, Acta Phytotax. Sin. 3: 287. 1955.

爱氏马先蒿 ai shi ma xian hao

Herbs perennial, less than 15 cm tall, drying black. Roots few, fascicled, ± fleshy. Stems many branched; branches diffuse basally. Leaves opposite; petiole to 4.5 cm; leaf blade linear-oblong to elliptic-oblong, to 5 × 2 cm, pinnatisect; segments 2–4 pairs, pinnatisect, dentate. Flowers axillary. Pedicel ca. 8 mm, sparsely long pubescent. Calyx ca. 1 cm, slightly cleft anteriorly; lobes 5, unequal, posterior tooth linear and entire, lateral lobes larger, ovate, serrate. Corolla light purple with whitish purple tube; tube to 2.5 cm, slender, glabrous; galea bent at a right angle apically; beak straight, ca. 3.5 mm; lower lip not ciliate, middle lobe rounded, not hoodlike. Filaments 2 pubescent, 2 glabrous. Fl. Jun.

• Riversides, damp places; ca. 4000 m. E Xizang.

87. Ser. *Collatae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 97. 1890.

铺地系 pu di xi

Plants less than 10 cm tall. Stems low, cespitose. Leaves mostly basal; petiole 3–4 × as long as leaf blade; leaf blade oblong to ovate, pinnatipartite. Flowers few. Galea with 2 marginal teeth near apex, beakless.

Two species: Bhutan, China, Nepal, Sikkim; one species in China.

275. *Pedicularis bietii* Franchet, Bull. Soc. Bot. France 47: 34. 1900.

皮氏马先蒿 pi shi ma xian hao

Herbs low, 2–4 cm tall, not drying black. Stems glabrous. Leaves mostly basal; petiole to more than 2 cm; leaf blade ovate-elliptic, less than 1 cm, sparsely pubescent; segments 3–5 pairs, crenate. Stem leaves often only 1 pair, shorter petiolate. Flowers axillary, few. Pedicel to 6 mm, glabrous. Calyx ca. 8 mm,

membranous, sparsely pubescent along midvein; lobes 5, unequal, ± leaflike. Corolla rose, 2.5–3 cm, glabrous; tube slightly bent at middle, ca. 1.5 cm, slightly expanded apically; galea slightly falcate, ca. 1.1 cm, apex truncate; lower lip large, slightly longer than galea. Filaments glabrous.

• Alpine regions. W Sichuan, SE Xizang.

88. Ser. *Pseudoasplenifoliae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 84. 1890.

假铁角蕨叶系 jia tie jiao jue ye xi

Ser. *Pseudorostratae* H. Limpricht.

Herbs low. Stems unbranched. Leaves mostly basal, in a rosette, long petiolate; leaf blades lanceolate, pinnatipartite or pinnatisect. Stem leaves few or absent. Inflorescences short, few flowered. Calyx lobes 5, unequal, serrate. Corolla tube longer than calyx but less than 2 × as long; galea with 1 auricle on each margin; beak straight, erose-denticulate at apex.

One species: Bhutan, China, E Nepal, Sikkim.

276. *Pedicularis schizorrhyncha* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 260. 1889.

裂喙马先蒿 lie hui ma xian hao

Herbs perennial, 3–5 cm tall, glabrous, drying black or not. Stems numerous, slender, soft. Leaves mostly basal; petiole to 2 cm; leaf blade ca. 9 × 3–4 mm, pinnatisect; segments 6–8 pairs, ovate, dentate. Stem leaves few or absent, long petiolate. Inflorescences racemose, 3- or 4-flowered; bracts leaflike. Pedicel 2–3 mm. Calyx oblong, ca. 9 mm, slightly cleft anteriorly, pubescent

89. Ser. *Cernuae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 258. 1948.

俯垂系 fu chui xi

Herbs low, usually more than 10 cm tall. Stems unbranched, robust, often several. Leaves mostly basal, long petiolate. Stem leaves few, opposite, ± elliptic, pinnatipartite to pinnatisect. Inflorescences short racemose. Calyx unequally 5-lobed. Corolla tube slightly longer than calyx; galea falcate, with or without marginal protuberances.

Three species: Bhutan, China; two species in China.

1a. Calyx lobes unequal, posterior one entire, lateral lobes serrate; galea with 1 distinct marginal

protuberance on each side; lower corolla lip sinuate-crenulate 277. *P. cernua*

1b. Calyx lobes unequal, but all serrate; galea without marginal protuberance on each side, but apex denticulate;

lower corolla lip not sinuate-crenulate 278. *P. gongshanensis*

277. *Pedicularis cernua* Bonati, Bull. Soc. Bot. France 54: 373. 1907.

俯垂马先蒿 fu chui ma xian hao

Herbs perennial, 4.5–22 cm tall, glabrous, drying black. Stems fleshy, unbranched. Basal leaves in a rosette; petiole 3–12 cm, slender, glabrous; leaf blade ovate-oblong, 4–5.5 × 2–4.5 cm, pinnatisect to pinnatipartite; segments 5–9 pairs, linear-lanceolate to oblong-lanceolate, pinnatifid, serrulate. Stem leaves opposite, shorter petiolate, pinnatifid. Inflorescences centrifugal, 4–7 cm, many flowered; bracts leaflike, shorter than flowers. Calyx ca. 1 cm, slightly cleft anteriorly; lobes 5, unequal, posterior one linear, entire, lateral lobes larger, serrate. Corolla red; tube slightly longer than calyx, ca. 1.3 cm; galea erect basally, with a central marginal protuberance on each side, apex truncate, 1-toothed on each side, these sometimes inconspicuous; lower lip to 1.4 cm, ciliate, sinuate-crenulate, middle lobe smallest. Filaments villous. Capsule long ovoid, 1.2–1.5 cm × 5–7 mm, oblique, short apiculate. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows and grasslands; 3800–4200 m. SW Sichuan, Yunnan.

1a. Leaves ovate-oblong, 4–5.5 × 2–4.5 cm, pinnatisect to pinnatipartite, segments 5–9 pairs, linear-lanceolate to oblong-lanceolate, pinnatifid, serrulate 277a. subsp. *cernua*

1b. Leaves broadly ovate, 3–4 × 2.5–3.5 cm, pinnatifid, segments 3–5 pairs, ovate, sinuate-dentate 277b. subsp. *latifolia*

277a. *Pedicularis cernua* subsp. *cernua*

俯垂马先蒿(原亚种) fu chui ma xian hao (yuan ya zhong)

along veins; lobes 5, unequal, serrate. Corolla tube 1.6–1.8 cm; galea falcate, ca. 1.5 cm, dilated; beak straight, ca. 3 mm, apex truncate; lower lip slightly longer than galea, ciliate. Filaments 2 long pubescent, 2 glabrous. Capsule ovoid, ca. 1.1 cm × 6 mm, slightly exceeding calyx, short apiculate. Fl. Aug–Sep, fr. Sep.

Humus-clad boulders of forest understories, open hillsides; ca. 3800 m. S Xizang [Bhutan, E Nepal, Sikkim].

Leaves ovate-oblong, 4–5.5 × 2–4.5 cm, pinnatisect to pinnatipartite; segments 5–9 pairs, linear-lanceolate to oblong-lanceolate, pinnatifid, serrulate. Galea with distinct teeth. Fl. Jul–Aug.

• Alpine meadows; 3800–4000 m. SW Sichuan, NW Yunnan.

277b. *Pedicularis cernua* subsp. *latifolia* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 306. 1963.

宽叶俯垂马先蒿 kuan ye fu chui ma xian hao

Pedicularis cernua Bonati var. *latifolia* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 373. 1948.

Leaves broadly ovate, 3–4 × 2.5–3.5 cm, pinnatifid; segments 3–5 pairs, ovate, sinuate-dentate. Galea with inconspicuous teeth. Fl. Aug.

• Alpine grasslands; ca. 4200 m. Yunnan (upper Kiukiang Valley).

278. *Pedicularis gongshanensis* H. P. Yang, Acta Phytotax. Sin. 28: 143. 1990.

贡山马先蒿 gong shan ma xian hao

Herbs perennial, to 30 cm tall, drying ± black. Stems clustered, basally with remnants of previous year's stems and scales. Basal leaf petiole to 10 cm, sparsely pubescent; leaf blade oblong, 4–8 cm, pinnatisect; segments 7–12 pairs, oblong, sparsely pubescent on both surfaces, dentate. Stem leaves few, opposite or in whorls of 4, smaller than basal leaves. Inflorescences 16–24-flowered; bracts leaflike. Pedicel ca. 3 mm, slender. Calyx ca. 1.5 cm, 1/3 cleft anteriorly, sparsely whitish pubescent; lobes 5, unequal, serrate. Corolla red, 3–4 cm; tube ca. 1.5 cm, glabrous; galea without marginal protuberance, but subapically toothed; lower lip shorter than galea, 1–1.2 cm, ciliate, entire. Filaments pubescent. Capsule ovoid-oblong, slightly compressed, 1.5–2 cm, mucronate. Fl. Jul–Jun, fr. Jun–Aug.

• Shrubby grass of hillsides; ca. 3600 m. NW Yunnan (Gongshan).

90. Ser. *Tatsienenses* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 248. 1995.

打箭系 da jian xi

Herbs low. Stems often single or 2 or 3, unbranched. Leaves in whorls of 3 or opposite, small. Stem leaves in 1 or 2 whorls, sometimes opposite. Inflorescences short, often capitate. Calyx 5-lobed. Corolla tube erect, slightly longer than calyx; galea resembling goose head, short beaked.

• Two species: endemic to China.

1a. Corolla ca. 2.8 cm; beak of galea scarcely 1.5 mm 279. *P. chenocephala*

1b. Corolla ca. 2.5 cm; beak of galea ca. 2.5 mm 280. *P. tatsienensis*

279. *Pedicularis chenocephala* Diels, Notizbl. Bot. Gart.

Berlin-Dahlem 10: 892. 1930.

鹅首马先蒿 e shou ma xian hao

Herbs perennial, 7–13 cm tall, not drying black. Roots sparsely fascicled, ± fleshy. Stems pubescent or glabrescent. Leaves opposite or whorled; petiole to 5 cm basally, glabrous; leaf blade linear-oblong, to 3 cm × 8 mm, pinnatisect; segments 4–10 pairs, ovate-oblong, pinnatifid, dentate. Inflorescences capitate, 3–4 cm; bracts leaflike. Pedicel to 6 mm wide, long ciliate, sparsely pubescent. Calyx to 9 mm, membranous, without reticulate veins; lobes 5, unequal, serrate. Corolla rose, ca. 2.8 cm; tube nearly straight, ca. 1 cm; galea deep purple, slightly falcate apically, longer than tube; beak scarcely 1.5 mm; lower lip ca. as long as galea, lobes slightly acute at apex, ciliate, praemorse. Filaments 2 sparsely pubescent, 2 glabrous. Fl. Jul, fr. Aug.

• Swampy alpine meadows; 3600–4300 m. SW Gansu, N Sichuan.

280. *Pedicularis tatsienensis* Bureau & Franchet, J. Bot.

(Morot) 5: 108. 1891.

打箭马先蒿 da jian ma xian hao

Herbs perennial, 10–27 cm tall, glabrescent, not drying black. Stems purplish black, shiny, erect or ± bent, with 1–3 internodes. Leaves mostly basal, in a rosette; petiole 2.5–7 cm, slender; leaf blade ovate-oblong to linear-oblong, to 3 × 1.4 cm, pinnatisect; segments 2–4 pairs, ovate to oblong, pinnatifid, margin double dentate. Stem leaves smaller than basal leaves, shorter petiolate; leaf blade 5–10 mm. Inflorescences capitate, 2–3.5 cm, many flowered; bracts leaflike. Calyx tube 6–7 mm; lobes 5, unequal. Corolla purplish red, with nearly blackish purple galea, ca. 2.5 cm; tube ca. 1.2 cm; galea falcate apically; beak straight, ca. 2.5 mm, slender; lower lip ca. 1 cm × 3.5 mm, slightly shorter than galea. 2 filaments sparsely long pubescent, 2 glabrous. Fl. May–Jun, fr. Jul–Aug.

• Alpine meadows; 4100–4400 m. W Sichuan, NW Yunnan.

91. Ser. *Roseae* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 525, 617. 1888.

玫瑰系 mei gui xi

Herbs low, ± scapose. Leaves alternate. Inflorescences short and capitate, or flowers few, not distinctly centrifugal. Calyx slightly cleft anteriorly, 5-lobed. Corolla tube bent apically, toothless; galea beakless; lower lip spreading. Capsule oblique.

Three species: China, Europe; one species in China.

281. *Pedicularis muscoides* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 91. 1949.

瓣状马先蒿 xian zhuang ma xian hao

Herbs low, less than 4 cm tall, drying black. Roots fascicled, fleshy. Stems scapelike, erect, usually to 1 cm. Basal leaf petiole 1–1.5 cm, slender, pubescent; leaf blade oblong-lanceolate, ca. 1 cm × 2–3 mm, pinnatisect or pinnatifid; segments 8–10 pairs, ovate, glabrescent, dentate. Flowers 2 or 3; bracts leaflike, ca. 1 cm. Pedicel 2–3 mm. Calyx oblong-ovate, ca. 8 × 3–4 mm, pubescent; lobes 5, subequal, narrowly triangular, 2–2.5 mm, ± entire or dentate. Corolla cream colored or bright rose, 1.2–2.3 cm; tube slightly bent and expanded apically, ca. 1.1 cm; galea ± bent, ca. 1.2 cm, apex ± acute; lower lip ca. 9 mm, lobes rounded, middle one projecting. 2 filaments pubescent apically, 2 glabrous throughout. Capsule oblong-ovoid,

compressed, ca. 1.1 cm × 4 mm, slightly oblique, apex acute. Fl. Jun–Aug, fr. Jul–Sep.

• Moist alpine meadows; 3900–5300 m. W Sichuan, SE Xizang, NW Yunnan.

1a. Corolla cream colored, ca. 2.3 cm 281a. var. *muscoides*

1b. Corolla bright rose, 1.2–1.8 cm 281b. var. *rosea*

281a. *Pedicularis muscoides* var. *muscoides*

瓣状马先蒿(原变种) xian zhuang ma xian hao (yuan bian zhong)

Corolla cream colored, ca. 2.3 cm. Fl. Jun.

• 3900–5300 m. W Sichuan, SE Xizang.

281b. *Pedicularis muscoides* var. *rosea* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 92. 1949.

玫瑰色瓣状马先蒿 mei gui se xian zhuang ma xian hao

Corolla bright rose, 1.2–1.8 cm. Fl. Jul.

• Moist alpine meadows; 4300–4600 m. NW Yunnan.

92. Ser. *Merrillianae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 248. 1995.

迈氏系 mai shi xi

Herbs low, ± stemless. Leaves alternate, mostly basal, in a rosette, old withered leaf bases persistent. Inflorescences short spicate or capitate, few flowered. Calyx 5-lobed. Corolla large; tube erect; galea with 1 marginal tooth on each side, with a beaklike apex.

Two species: Bhutan, China, SW Asia; one species in China.

282. *Pedicularis merrilliana* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 96. 1949.

迈氏马先蒿 mai shi ma xian hao

Herbs perennial ca. 4(–8) cm tall, drying black. Roots ± fleshy. Stems 1–5, unbranched, shiny, with membranous scales at base. Leaves mostly basal; petiole 1.5–3 cm, slender, glabrescent; leaf blade oblong, 1–1.7 cm × 3–5 mm, abaxially rust colored pubescent, adaxially glabrous, pinnatisect; segments 8–12 pairs, oblong to ovate-oblong, dentate. Inflorescences ca. 3-flowered; bracts leaflike, 0.8–1.5

cm. Pedicel 2–4(–7) mm, slender, sparsely villous. Calyx ca. 1 cm × 2.5–3 mm, slightly cleft anteriorly, pubescent; lobes 5, unequal, serrate. Corolla purple-red, ca. 2.3 cm; tube ± erect, 1–1.2 cm; galea slightly falcate, with a short, wide beaklike apex, truncate, with 1 distinct subapical, marginal tooth on each side; lower lip ca. 7 mm, glabrous. Filaments glabrous. Capsule oblong-ovoid, 1.1–1.3 cm, slightly oblique, apex acute. Fl. Jun–Jul, fr. Jul–Aug.

Alpine meadows; 3200–4900 m. SW Gansu, NW Sichuan [?Bhutan].

93. Ser. *Asplenifoliae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 79. 1890.

铁角蕨叶系 tie jiao jue ye xi

Herbs low, without a distinct main stem. Leaves alternate, numerous, almost all basal, persistent. Inflorescences short spicate or subcapitate, few flowered, long pedicellate. Calyx 5-lobed. Corolla tube less than 2 × as long as calyx; beak straight or bent slightly downward.

About seven species: Bhutan, China, Europe, Nepal, North America, Sikkim; three species in China.

1a. Stems glabrescent; leaf segments 4 or 5 pairs; corolla 1.8–2 cm, tube ca. 2 × as long as calyx 285. *P. yui*

1b. Stems with lines of rust colored hairs; leaf segments 5–12 pairs; corolla 1.2–1.8 cm, tube slightly longer than calyx.

2a. Corolla 1.5–1.8 cm, lower lip glabrous; all filaments glabrous 283. *P. mayana*

2b. Corolla 1.2–1.5 cm, lower lip long ciliate; filaments 2 sparsely pubescent, 2 glabrous 284. *P. tenacifolia*

283. *Pedicularis mayana* Handel-Mazzetti, Symb. Sin. 7: 858. 1936.

迈亚马先蒿 mai ya ma xian hao

Herbs perennial, 4–9 cm tall, marcescent leaves with petioles and scales persistent at base, drying black. Stems usually 3–7, erect or ascending, slender, with lines of rust colored hairs. Leaves alternate; basal leaves in a rosette; petiole 4–5 cm, slender, sparsely villous; leaf blade ovate-lanceolate to ovate-oblong, 0.8–1.5 cm × 4–5 mm, abaxially sparsely pubescent, scurfy, adaxially glabrous, pinnatisect; segments 6–12 pairs, lanceolate, crenate. Inflorescences subcapitate, usually 4–8-flowered; bracts leaflike. Calyx 7–9 mm, slightly cleft anteriorly, rust colored villous; lobes 5, unequal, oblanceolate, crenate. Corolla purple, 1.5–1.8 cm; tube erect, 0.9–1.2 cm, glabrous; galea falcate apically, usually slightly crested; beak 3–4 mm, slender; lower lip 6–9 mm, distinctly praemorse, glabrous. Filaments glabrous. Capsule lanceolate-oblong, 1.3–1.4 cm × ca. 5 mm, slightly oblique, apex acute. Fl. May–Aug, fr. Aug–Sep.

• Alpine meadows; 3700–4600 m. NW Yunnan.

284. *Pedicularis tenacifolia* P. C. Tsoong, Fl. Reipubl. Popul. Sin. 68: 416. 1963.

宿叶马先蒿 su ye ma xian hao

Herbs perennial, 5–7 cm tall, marcescent stems and leaves of preceding year persistent at base, drying black. Stems 3–5, unbranched, stout, sparsely pubescent, with densely rust colored villous lines. Leaves mostly basal; petiole 2–3 cm, margin densely villous; leaf blade ovate-oblong or long ovate, 1–1.5 cm × 5–6 mm, sparsely rust colored pubescent on both surfaces, pinnatisect; segments 5 or 6 pairs, broadly ovate, minutely crenulate. Inflorescences subcapitate, 3–5-flowered; bracts ca. as long as calyx. Pedicel 2–3 mm, pubescent. Calyx ca. 7 mm, slightly cleft anteriorly, long pubescent; lobes 5, unequal. Corolla purple-red, 1.2–1.5 cm; tube erect, slightly exceeding calyx; galea ± falcate apically; beak bent slightly downward, straight, ca. 5 mm; lower lip ca. 1 cm, long ciliate. 2 filaments sparsely pubescent, 2 glabrous. Fl. Jun–Aug, fr. Aug–Sep.

• Alpine meadows; 4500–4900 m. SE Xizang.

285. *Pedicularis yui* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 102. 1949.

季川马先蒿 ji chuan ma xian hao

Herbs 6–7 cm tall, glabrescent, drying black. Stems usually single, erect, unbranched, slender, marcescent leaves and petioles of preceding year and lanceolate scales persistent at base. Leaves alternate, mostly basal; petiole 1.5–3 cm; leaf blade long ovate to ovate-oblong, 5–10 × 3–5 mm, abaxially usually white villous along

midvein, adaxially glabrous, pinnatisect; segments 4 or 5 pairs, short ovate, minutely crenulate. Inflorescences racemose or subcapitate, 4–6-flowered; bracts leaflike. Pedicel 3–6(–11) mm, filiform. Calyx 8–10 mm, sparsely long pubescent or glabrous, slightly cleft anteriorly; lobes 5, unequal, ovate, serrate. Corolla purple, 1.8–2 cm; tube erect, ca. 2 × longer than calyx; galea bent at a right angle apically; beak bent slightly downward, straight, 4–5 mm; lower lip ca. 1.1 cm, glabrous or ciliate, minutely crenulate. Filaments glabrous or 2 pubescent. Fl. Jun–Jul, fr. Jul.

• Alpine swamps; ca. 4100 m. NW Yunnan.

1a. Lower corolla lip not ciliate; all filaments glabrous 285a. var. *yui*

94. Ser. Odontophorae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 249. 1995.
具齿系 *ju chi xi*

Herbs perennial, low. Leaves few, alternate, pinnatipartite or pinnatisect. Flowers few, axillary. Calyx 5-lobed. Corolla tube ca. 2 × as long as calyx; galea falcate, with marginal teeth, beaked.

One species: China, Sikkim.

286. *Pedicularis odontophora* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 275. 1889.

具齿马先蒿 *ju chi ma xian hao*

Herbs 2.5–6 cm tall. Rhizomes creeping, 5–7 cm. Stems minutely pubescent. Basal leaves withering early; petiole 2.5–3 cm. Stem leaf petiole 5–10 mm; leaf blade ovate, 2–3 × 2–2.5 cm, pinnatipartite or pinnatisect; segments 3–5 pairs, pinnatifid, dentate. Flowers axillary. Pedicel 2–4 mm. Calyx cylindrical-campanulate, ca. 7

1b. Lower corolla lip ciliate; filaments 2 pubescent, 2 glabrous 285b. var. *ciliata*

285a. *Pedicularis yui* var. *yui*

季川马先蒿(原变种) *ji chuan ma xian hao* (*yuan bian zhong*)

Lower corolla lip not ciliate. Filaments glabrous.

• Alpine swamps; ca. 4100 m. NW Yunnan.

285b. *Pedicularis yui* var. *ciliata* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 417. 1963.

缘毛季川马先蒿 *yuan mao ji chuan ma xian hao*

Lower corolla lip ciliate. Filaments 2 pubescent, 2 glabrous.

• Alpine swamps; ca. 4100 m. NW Yunnan.

• Alpine swamps; ca. 4100 m. NW Yunnan.

Acta Phytotax. Sin. 33: 249. 1995.

具齿系 *ju chi xi*

mm, slightly cleft anteriorly; lobes 5, unequal, entire. Corolla tube ca. 1.3 cm, slightly expanded apically; galea falcate, ca. 1 cm, with 1 pair of triangular marginal teeth; beak straight, ca. 3.5 mm, slender; lower lip ca. 1.1 cm, wide, lobes ovate, middle lobe ca. 1/2 as long as lateral lobes. Filaments pubescent, anterior filaments more densely so.

S Xizang [Sikkim].

95. Ser. Paucifoliae Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 80. 1890.

少叶系 *shao ye xi*

Herbs low to moderately tall, without a distinct main stem. Roots numerous. Stems rigid, mostly unbranched. Leaves basal or basal and on stem, persistent, alternate, pinnatifid to pinnatipartite. Inflorescences short racemose or capitate; bracts petiolate. Calyx slightly cleft anteriorly or not, 5-lobed. Corolla tube ca. as long as or longer than calyx; beak slender.

• Six species: endemic to China.

1a. Leaves almost all basal; leaf blade pinnatipartite to pinnatisect.

2a. Corolla tube ca. 12 mm; filaments glabrous; plants 9–22 cm tall 290. *P. tsarungensis*

2b. Corolla tube 8–9 mm; filaments pubescent; plants to 4–13(–19) cm tall.

3a. Leaf blade ovate-elliptic to oblong-lanceolate, 1.5–2.2 cm, segments 5–7 pairs; 2 filaments pubescent,

2 glabrous; lower corolla lip ca. 10 × 8 mm 287. *P. umbelliformis*

3b. Leaf blade lanceolate to linear-lanceolate, 1–6 cm, segments 7–14 pairs; filaments densely pubescent;

lower corolla lip 8–10 × 12–15 mm 289. *P. praeruptorum*

1b. Leaves basal and on stem; leaf blade pinnatifid to pinnatipartite.

4a. Flowers axillary, lax or in a lax raceme to 20 cm; calyx lobes equal, flabellate, all dentate 292. *P. forrestiana*

4b. Inflorescences short racemose; calyx lobes unequal, neither flabellate nor all dentate.

5a. Leaf blade pinnatipartite; calyx 1/3 cleft anteriorly; roots fusiform 288. *P. yunnanensis*

5b. Leaf blade pinnatifid; calyx slightly cleft anteriorly; roots filiform 291. *P. micrantha*

287. *Pedicularis umbelliformis* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 100. 1949.

伞花马先蒿 *san hua ma xian hao*

Herbs perennial, 6–13 cm tall, ± drying black. Roots linear. Stems 2 or 3(–6), unbranched, minutely

pubescent. Leaves almost all basal, 5 or 6(–8); petiole to 2.5 cm, slender, pubescent; leaf blade ovate-elliptic to oblong-lanceolate, 1.5–2.2 cm × 7–8 mm, abaxially sparsely pubescent, scurfy, adaxially glabrous, pinnatisect or pinnatipartite; segments 5–7 pairs, ovate, pinnatifid, dentate. Inflorescences short racemose or umbelliform, 5–10-flowered; bracts leaflike, ca. as long as calyx. Pedicel 2–3 mm. Calyx ca. 6 mm, sparsely pubescent; lobes 5, ± equal, dentate. Corolla red-purple, ca. 1.6 cm; tube erect, ca. 8 mm; galea bent at a right angle apically; beak ca. 5 mm; lower lip ca. 1 cm × 8 mm, sparsely ciliate, middle lobe smaller than lateral pair, lateral lobes nearly fully projecting. Filaments 2 pubescent, 2 glabrous.

• Grassy slopes; ca. 3400 m. NW Yunnan.

288. *Pedicularis yunnanensis* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 572. 1888.

云南马先蒿 *yun nan ma xian hao*

Herbs perennial, to 25 cm tall, not drying black. Roots fascicled, fusiform. Stems erect, glabrous except for lines of hairs. Leaves mostly basal; petiole 4–7 cm, glabrous; leaf blade ovate-oblong to oblong-lanceolate, 2–4.5 cm, abaxially sparsely pubescent along veins, adaxially glabrous, pinnatipartite; segments 5–12 pairs, triangular-ovate to ovate-oblong, pinnatifid or incised-dentate. Inflorescences short racemose; bracts leaflike, proximal ones longer than flowers. Pedicel 5–10 mm. Calyx 7–8 mm, 1/3 cleft anteriorly; tube ca. 5 mm; lobes 5, unequal, posterior one smallest, entire, others serrate. Corolla red, 1.8–2 cm; tube slightly longer than calyx; galea ± bent at a right angle apically, slightly crested; beak bent downward, ca. 4.5 mm; lower lip ca. 9 mm × 1.4 cm, lobes ± equal, rounded, ciliate. Filaments sparsely pubescent. Capsule ovoid-lanceolate, ca. 1.2 cm, short apiculate. Fl. Jun–Aug, fr. Jul–Sep.

• Alpine meadows; 3000–4000 m. W Yunnan.

289. *Pedicularis praeruptorum* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 126. 1921.

悬岩马先蒿 *xuan yan ma xian hao*

Pedicularis aphyllorcaulis Handel-Mazzetti.

Herbs perennial, (4–)10(–19) cm tall, drying black. Roots fascicled, fusiform. Stems erect, densely glandular pubescent. Leaves almost all basal; petiole 1–6.5 cm; leaf blade lanceolate to linear-lanceolate, 1–6 cm, abaxially white pubescent along veins, adaxially glabrous, pinnatipartite to pinnatisect; segments 7–14 pairs, ovate to lanceolate, pinnatifid or double dentate. Inflorescences short racemose; bracts leaflike. Pedicel 2–6 mm, densely pubescent. Calyx to 8 mm, 1/3–1/2 cleft anteriorly, with long hairs along midvein; lobes 5, unequal, posterior lobe smallest, ± entire, others dentate. Corolla purple, ca. 1.6 cm; tube ca. 9 mm, glabrous; galea bent at a right angle apically, densely minutely pubescent; beak straight or bent slightly downward, 4–5 mm; lower lip 8–10 mm × 1.2–1.5 cm, ciliate. Filaments densely pubescent. Fl. Jun–Aug, fr. Sep–Oct.

• On rocks, alpine meadows; 3600–4200 m. NW Yunnan.

290. *Pedicularis tsarungensis* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 100. 1949.

察郎马先蒿 *cha lang ma xian hao*

Herbs, 9–22 cm tall. Roots fascicled, filiform. Stems 1 to numerous, erect, woolly-villous. Leaves almost all basal; petiole 2–5 cm, slender, sparsely pubescent; leaf blade ovate-oblong, 2–3 × 1–1.2 cm, long pubescent on both surfaces, pinnatisect or pinnatipartite; segments 6 or 7 pairs, widely spaced, oblong-ovate or oblong, pinnatifid or dentate. Inflorescences 2–3 cm, 6–8-flowered; bracts leaflike. Calyx cylindrical, sparsely pubescent; lobes 5, ± equal, dentate. Corolla purplish red, ca. 1.8 cm; tube erect, slightly expanded apically, ca. 1.2 cm; galea ± bent at a right angle; beak straight or bent slightly downward, 4–5 mm; lower lip ca. as long as galea, sparsely ciliate, lobes ± equal, rounded. Filaments glabrous. Fl. May–Jun, fr. Jul–Aug.

• Alpine meadows; ca. 4000 m. SE Xizang, Yunnan.

291. *Pedicularis micrantha* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 106. 1949.

小花马先蒿 *xiao hua ma xian hao*

Herbs perennial, ca. 20 cm tall, glabrous. Roots filiform. Stems single, erect, unbranched, rigid. Basal leaves numerous; petiole 7(–15) cm, slender; leaf blade oblong-ovate, 6–7.5 × 2–2.7 cm, pinnatifid; segments 6–8 pairs, ovate, crenate-pinnatifid, dentate. Stem leaves 1 or 2, alternate, widely spaced, similar to basal leaves but smaller. Inflorescences short racemose, less than 3 cm, lax basally, many flowered; bracts leaflike, shorter than flowers. Pedicel erect, ca. 3 mm. Calyx ca. 7 mm, sparsely pubescent, slightly cleft anteriorly; lobes 5, unequal. Corolla pink, barely 1.2 cm; tube erect, slightly longer than calyx, expanded apically; galea falcate; beak straight or bent slightly downward, linear, to 5 mm; lower lip ca. as long as galea, ciliate. Filaments long pubescent apically. Fl. Jul, fr. Aug.

• Thicket margins; ca. 3100 m. W Yunnan.

292. *Pedicularis forrestiana* Bonati, Notes Roy. Bot. Gard. Edinburgh 5: 86. 1911.

福氏马先蒿 *fu shi ma xian hao*

Herbs perennial, 15–20 cm tall or more, drying black. Roots fleshy. Stems numerous, ascending or erect, unbranched, minutely pubescent. Basal leaves numerous; petiole 5–6 cm, ciliate; leaf blade linear-oblong, 3–5 × 1–2 cm, pinnatifid; segments 8–10 pairs, 4–6 × 2–4 mm, ± incised-dentate. Stem leaves and bracts similar to basal leaves but shorter petiolate. Flowers axillary and lax or in lax racemes to 20 cm; bracts flabellate to linear-oblong, petiolate. Pedicel erect, 5–8 mm, slender. Calyx tube 7–8 mm, glabrous; lobes 5, 1–2 mm, equal, flabellate and incised-dentate. Corolla rose, 1.6–2 cm; tube nearly 2 × as long as calyx; galea ± bent at a right angle; beak falcate, ca. 5 mm; lower lip ca. as long as galea, 7–10 mm × 1–1.4 cm,

middle lobe emarginate, slightly hoodlike. Filaments pubescent. Fl. Jul–Aug, fr. Sep.

• Alpine meadows, open areas, thick grass and scrubs; 3300–4000 m. NW Yunnan.

1a. Flowers axillary, lax; bracts linear-oblong, short petiolate 292a. subsp. *forrestiana*

1b. Flowers in lax racemes, to 20 cm; bracts flabellate, long petiolate .. 292b. subsp. *flabellifera*

292a. *Pedicularis forrestiana* subsp. *forrestiana*

福氏马先蒿(原亚种) fu shi ma xian hao (yuan ya zhong)

Flowers axillary, lax; bracts linear-oblong, short petiolate.

• Alpine meadows, open areas; 3300–4000 m. NW Yunnan.

292b. *Pedicularis forrestiana* subsp. *flabellifera* P. C. Tsoong, Bull. Misc. Inform. Kew 1954: 449. 1954.

扇苞福氏马先蒿 shan bao fu shi ma xian hao

Flowers in lax racemes, to 20 cm; bracts flabellate, long petiolate.

• Thick grass and scrubs. NW Yunnan.

96. Ser. *Mychophilae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 249. 1995.

菌生系 jun sheng xi

Herbs ± stemless. Roots few. Stems weak, flexuous. Leaves mostly or all basal. Stem leaves when present, few, alternate or often pseudo-opposite throughout. Flowers few, often pseudo-opposite; long pedicellate. Calyx slightly cleft anteriorly or not, 5-lobed. Corolla tube slightly longer than calyx; beak usually straight, slender.

• One species: endemic to China.

293. *Pedicularis mychophila* Marquand & Shaw, J. Linn. Soc., Bot. 48: 212. 1929.

菌生马先蒿 jun sheng ma xian hao

Herbs perennial, 5–9 cm tall, densely gray tomentose, drying ± black. Roots 1–5, fusiform, fleshy. Stems usually 2–4, slender, ascending, glandular pubescent, with brown hairs. Leaves mostly or all basal; petiole 2–5.5 cm, densely rust colored pubescent; leaf blade ovate-oblong to lanceolate-oblong, 0.7–3.5 cm × 3–13 mm, densely pubescent on both surfaces, pinnatisect; segments 5–13 pairs, triangular-ovate to oblong, incised-crenate. Stem leaves few if any. Flowers axillary or pseudo-opposite; proximal bracts leaflike,

others very small, densely tomentose. Pedicel usually curved, to 1.3 cm, densely tomentose. Calyx ca. 1 cm, slightly cleft anteriorly or not, densely tomentose; lobes 5, unequal, short. Corolla purplish red, ca. 2.5 cm; tube erect, 1.1–1.3 cm, glabrous; galea bent at a right angle apically; beak straight or ± curved downward, ca. 5 mm; lower lip ca. 1.5 × 2 cm, glabrous but praemorse-dentate. Filaments 2 slightly pubescent, 2 glabrous. Capsule ovoid, ca. 1 cm × 4–5 mm, short mucronate. Fl. Jun–Jul, fr. Jul–Aug.

• Moss-covered rocks; 4200–4500 m. SE Xizang.

97. Ser. *Franchetianae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 70. 1890.

佛氏系 fo shi xi

Herbs low. Leaves alternate or often pseudo-opposite throughout, large. Pedicel to 2.5–8 cm. Flowers axillary. Calyx deeply cleft anteriorly, 2- or 3(–5)-lobed. Corolla tube slightly longer than calyx or not; galea usually crested; beak curved, slender.

• Two species: endemic to China.

1a. Stems branched; calyx lobes 2, 3-cleft and incised-dentate; beak of corolla pendant, parallel to calyx, curved apically

..... 294. *P. franchetiana*

1b. Stems unbranched; calyx lobes 2 or 3(–5), posterior one much smaller or absent, entire or dentate, lateral

lobes incised-dentate; beak of corolla semicircular 295. *P. mussotii*

294. *Pedicularis franchetiana* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 553. 1888.

佛氏马先蒿 fo shi ma xian hao

Stems branched, sparsely long pubescent. Leaves opposite; petiole to 2.5 cm; leaf blade ca. 2 cm × 5 mm, pinnatipartite; segments ovate, dentate. Pedicel to 4 cm, exceeding leaves. Flowers axillary. Calyx ca. 6 mm, membranous, sparsely scabrous pubescent, reticulate near apex, 2-lobed, 3-cleft and incised-dentate. Corolla purple, ca. 1 cm; tube not exceeding calyx and shorter

than galea, pubescent; galea falcate, usually crested; beak pendant, parallel to calyx, curved apically; lower lip ca. 1.2 × 1.6 cm, long ciliate, lobes ± equal, middle lobe rounded, scarcely exerted. Filaments 2 long pubescent, 2 glabrous.

• W Sichuan.

295. *Pedicularis mussotii* Franchet, Bull. Soc. Bot. France 47: 24. 1900.

谬氏马先蒿 miu shi ma xian hao

Herbs perennial, to 15 cm tall, drying slightly black. Roots slender, several, fusiform, ± fleshy. Stems usually 4 or 5, often procumbent or ascending, unbranched, densely fine pubescent and striate. Leaves mostly basal; petiole 2.5–10 cm, narrowly winged, sparsely pubescent; leaf blade 2–10.5 × 0.5–2.5 cm, abaxially sparsely pubescent along veins, adaxially glabrous or sparsely pubescent and finely pubescent along midvein, pinnatipartite to nearly pinnatisect; segments 6–13 pairs, triangular-ovate to ovate, margin double dentate or pinnatifid. Stem leaves usually nearly opposite, distal ones alternate, similar to basal leaves but smaller, shorter petiolate. Pedicel 3–11.5 cm, usually curved, finely pubescent. Flowers axillary. Calyx tube 5.5–10 mm, 2- or 3(-5)-lobed; posterior one smallest, entire or dentate, sometimes absent, lateral lobes incised-dentate. Corolla red; tube 7–10 mm, pubescent externally; galea ± bent at a right angle, with or without auriculate protrusion (crest); beak semi-circular, 7–11 mm; lower lip 0.8–1.5 × 1.6–2.6 cm, long ciliate, middle lobe emarginate. Filaments pubescent. Capsule semi-globose, ca. 1.2 cm × 6.5 mm. Fl. Jul–Aug, fr. Aug.

- Alpine meadows; 3600–4900 m. SW and W Sichuan, NW Yunnan.
- 1a. Calyx lobes 5, posterior one small, lateral lobes leaflike 295c. var. *mutata*
- 1b. Calyx lobes 2 or 3, posterior one small or absent, lateral pair leaflike.
 - 2a. Galea not crested in front .. 295a. var. *mussotii*

98. Ser. Pseudomacranthae P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 249. 1995.
假大花系 jia da hua xi

Herbs ± stemless or stems scapelike. Leaves mostly basal, persistent, often pinnatisect. Stem leaves alternate or pseudo-opposite. Inflorescences capitata or short racemose. Calyx lobes 2–5. Corolla more than 3 cm; tube usually not exceeding calyx; beak wide; lower lip often enveloping galea.

Four species: Bhutan, China, N Myanmar, Nepal, Sikkim; all four in China.

- 1a. Inflorescences corymbiform; corolla yellow, 4–5 cm 299. *P. corymbifera*
- 1b. Inflorescences racemose; corolla purple or white, 2–3 cm.
 - 2a. Lower corolla lip long ciliate, middle lobe reniform and cordate basally 296. *P. elwesii*
 - 2b. Lower corolla lip glabrous, middle lobe oblong and not cordate basally.
 - 3a. Beak of galea entire, not 2-cleft 297. *P. aschistorrhyncha*
 - 3b. Beak of galea deeply 2-cleft 298. *P. fletcheri*

296. *Pedicularis elwesii* J. D. Hooker, Fl. Brit. India 4: 312. 1884.

哀氏马先蒿 ai shi ma xian hao

Herbs perennial, 1.5–32 cm tall, densely pubescent, drying nearly black. Roots 2 or 3, ± fusiform, fleshy. Stems 1–4, erect or slightly spreading at base, unbranched, densely pubescent. Basal leaves sparsely cespitose; petiole 2–12 cm, densely tomentose; leaf blade ovate-oblong to lanceolate-oblong, 3.5–9.5(-18) × 1–2.5 cm, abaxially glabrous except for finely tomentose midvein, abaxially densely tomentose, pinnatipartite; segments 10–20(-30) pairs, ovate to ovate-oblong, pinnatifid, margin double dentate. Stem leaves few, alternate or sometimes ± opposite, smaller

2b. Galea prominently crested in front

..... 295b. var. *lophocentra*

295a. *Pedicularis mussotii* var. *mussotii*

缪氏马先蒿(原变种) miu shi ma xian hao (yuan bian zhong)

Calyx lobes 2 or 3, posterior one small or absent, lateral pair leaflike, dentate. Galea not crested in front.

• W Sichuan, NW Yunnan.

295b. *Pedicularis mussotii* var. *lophocentra* (Handel-Mazzetti) H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 180. 1949.

刺冠缪氏马先蒿 ci guan miu shi ma xian hao

Pedicularis lophocentra Handel-Mazzetti, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 59: 251. 1922.

Calyx lobes 2 or 3, posterior one small or absent, lateral pair leaflike, profoundly dentate. Galea prominently crested in front, appendage long filiform, spinescent.

• Alpine meadows; 3600–4900 m. SW and W Sichuan, NW Yunnan.

295c. *Pedicularis mussotii* var. *mutata* Bonati, Bull. Soc. Bot. France 54: 375. 1907.

变形缪氏马先蒿 bian xing miu shi ma xian hao

Calyx lobes 5, posterior one small, lateral lobes leaflike, dentate.

• W Sichuan, NW Yunnan.

than basal leaves, shorter petiolate. Racemes 5–8(-15) cm; bracts leaflike. Pedicel 0.7–1.5 cm. Calyx 1–1.2 cm, 1/2 cleft anteriorly; lobes 3 or 5, unequal, posterior lobe smallest, all dentate. Corolla purple to purplish red, 2.6–3 cm; tube erect, 8–10 mm; galea strongly curved; beak uncinata, 5–6 mm, 2-cleft or entire; lower lip completely enveloping galea, ca. 1.7–2 × 2–2.3 cm, long ciliate, middle lobe reniform and cordate basally. Filaments long pubescent. Capsule oblong-lanceolate, 1.7–2 cm × 5–6 mm. Fl. Jun–Aug, fr. Aug–Sep.

Alpine meadows; 3200–4600 m. E, S, and SE Xizang, NW Yunnan [Bhutan, N Myanmar, Nepal, Sikkim].

- 1a. Plants scarcely 1.5 cm tall; calyx lobes 5 296b. subsp. *minor*
- 1b. Plants 8–32 cm tall; calyx lobes 3.

- 2a. Stems slightly spreading basally, 8–20 cm tall; petiole of basal leaves to 5 cm; racemes 5–8 cm, usually compactly flowered 296a. subsp. *elwesii*
- 2b. Stems erect, to 32 cm tall; petiole of basal leaves to 12 cm; racemes to 15 cm, flowers lax basally 296c. subsp. *major*

296a. *Pedicularis elwesii* subsp. *elwesii*

哀氏马先蒿(原亚种) ai shi ma xian hao (yuan ya zhong)

Plants 8–20 cm tall. Stems slightly spreading basally. Petiole of basal leaves to 5 cm. Racemes usually compactly flowered, 5–8 cm. Calyx lobes 3.

Alpine meadows; 3200–4600 m. S and SE Xizang, NW Yunnan [Bhutan, N Myanmar, Nepal, Sikkim].

296b. *Pedicularis elwesii* subsp. *minor* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 324. 1963.

矮小哀氏马先蒿 ai xiao ai shi ma xian hao

Pedicularis elwesii var. *minor* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 145. 1949.

Plants scarcely 1.5 cm tall. Stems strongly spreading at base. Calyx lobes 5.

• Alpine meadows; ca. 3800 m. E Xizang.

296c. *Pedicularis elwesii* subsp. *major* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 324. 1963.

高大哀氏马先蒿 gao da ai shi ma xian hao

Pedicularis elwesii var. *major* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 145. 1949.

Plants to 32 cm tall. Stems erect. Petiole of basal leaves to 12 cm. Racemes laxly flowered basally, long, to 15 cm. Calyx lobes 3.

• SE Xizang, NW Yunnan.

297. *Pedicularis aschistorrhyncha* Marquand & Shaw, J. Linn. Soc., Bot. 48: 210. 1929.

全喙马先蒿 quan hui ma xian hao

Herbs ca. 17 cm tall. Stems erect, glabrous. Basal leaves few, to 12 cm; petiole long, narrowly winged; leaf blade ovate, abaxially sparsely scabrous pubescent, adaxially glabrous, pinnatifid; segments incised-dentate. Stem leaves few, alternate, similar to basal leaves but smaller. Inflorescences short racemose, 10–12-flowered; bracts leaflike, to 1 cm, glabrous. Calyx 1/2 cleft anteriorly, sparsely scabrous pubescent; tube cylindrical, 2-lobed, 6–8 mm, leaflike, pinnatifid. Corolla white, with purple galea, large; tube slender, to 2 cm, not exceeding calyx; galea ± falcate, 3–4 mm wide; beak decurved, relatively short, entire; lower lip not ciliate,

middle lobe oblong. Filaments 2 pubescent, 2 glabrous. Fl. Jul.

• Marshy meadows; 3400–3600 m. SE Xizang.

298. *Pedicularis fletcheri* P. C. Tsoong, Acta Phytotax. Sin. 3: 294. 1955.

阜莱氏马先蒿 fu lai shi ma xian hao

Pedicularis fletcheriana P. C. Tsoong.

Herbs annual, to 40 cm tall, not drying black. Stems single or to 10, erect, outer stems usually ascending, glabrous. Basal leaves few, usually withering early. Stem leaves only 1 or 2, alternate or sometimes pseudo-opposite; petiole to 2.5 cm, long glandular ciliate; leaf blade oblong-lanceolate, to 5 × 2 cm, glabrous on both surfaces, pinnatisect; segments ca. 7 pairs, ovate-oblong, incised-dentate. Inflorescences racemose, to 15 cm; bracts leaflike, proximal ones larger than leaves. Pedicel to 1.5 cm. Calyx ca. 2.3 cm, 1/4 cleft anteriorly, long pubescent; lobes 2 or 4, unequal, leaflike. Corolla white, with red-tinged center to lower lip, ca. 2.8 cm; tube ca. 2.2 cm, glabrous; galea slightly falcate, to 2.5 mm wide; beak bent downward, ca. 3 mm, 2-cleft; lower lip completely enveloping galea, ca. 1.6 × 2 cm, finely ciliate or glabrous, middle lobe emarginate. Filaments 2 pubescent, 2 glabrous. Capsule to 1.5 cm × 9 mm. Seeds ca. 2.3 × 1.2 mm. Fl. Jul.

Alpine meadows; 3500–4200 m. SE Xizang [Bhutan].

299. *Pedicularis corymbifera* H. P. Yang, Acta Phytotax. Sin. 18: 244. 1980.

伞房马先蒿 san fang ma xian hao

Herbs perennial, 10–20 cm tall, drying black. Roots conical, fleshy, to 12 cm. Stems usually numerous, procumbent or ascending. Basal leaves laxly cespitose; petiole to 7 cm, broadly winged, densely pubescent; leaf blade ovate to ovate-oblong, 4–7 × 1–3 cm, pinnatipartite to pinnatisect; segments 7–12 pairs, ovate to rounded, dentate. Stem leaves few. Inflorescences corymbiform, 5–8-flowered; bracts leaflike. Calyx oblong, 18–20 cm, pilose, 1/2 cleft anteriorly; lobes 3, unequal. Corolla yellow with red beak, 4–5 cm; tube erect, slightly longer than calyx; galea slightly falcate, ± twisted; beak bent downward, 3–4 mm, 2-cleft; lower lip usually enveloping galea, ciliate, middle lobe emarginate. Anterior filaments densely pubescent. Fl. Jul, fr. Aug.

• Open rocky slopes, open forests; ca. 3400 m. E Xizang.

99. Ser. *Albiflorae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 249. 1995.

白花系 bai hua xi

Herbs low or some stemless. Leaves basal. Flowers few, often capitate. Pedicel long. Calyx (3–)5-lobed. Corolla ± red-purple; tube long, often more than 2 × as long as calyx; beak slender; lower lip less than 2 cm wide.

About four species: China, Nepal; three species in China.

- 1a. Corolla tube ca. 1 cm; glabrous; filaments 2 pubescent, 2 glabrous 300. *P. rhizomatosa*
 1b. Corolla tube 2.2–2.5 cm, sparsely pubescent; all filaments pubescent.
 2a. Galea not 2-auriculate protuberant, beak 5–5.5 mm; plants drying dark black 301. *P. tayloriana*
 2b. Galea 2-auriculate protuberant, beak ca. 4 mm; plants not drying black 302. *P. tapaoensis*

300. *Pedicularis rhizomatosa* P. C. Tsoong, Acta Phytotax. Sin. 3: 281. 1955.

根茎马先蒿 gen jing ma xian hao

Herbs perennial, less than 7 cm tall, not drying black. Rootstock slender. Stems 1, 3, or 4, sparsely pubescent. Leaves basal; petiole to 3 cm, glabrous; leaf blade ovate-oblong, 6–11 × 3–5 mm, pinnatipartite to pinnatisect; segments 3 or 4 pairs, ovate, pinnatifid to coarsely dentate. Inflorescences capitate, ± umbel; bracts leaflike, sparsely long white pubescent. Calyx ca. 6–7 mm; tube ca. 4 mm, lobes 5, unequal. Corolla tube ca. 1 cm, glabrous; galea falcate apically; beak straight or bent slightly downward, 5–6 mm; lower lip triangular, ca. 8 × 7 mm, glandular ciliate, middle lobe broadly ovate, ca. 2.5 × 3.5–4 mm, ± hoodlike. Anterior filaments minutely pubescent. Fl. Jun, fr. Jul.

• Avalanche-disturbed slopes; ca. 3900 m. SE Xizang.

301. *Pedicularis tayloriana* P. C. Tsoong, Acta Phytotax. Sin. 3: 283. 1955.

泰氏马先蒿 tai shi ma xian hao

Pedicularis taylorii P. C. Tsoong.

Herbs perennial, less than 7 cm tall, shiny, barely glabrous throughout, drying dark black. Rootstock short. Stems usually 2–4. Leaves almost all basal; petiole 1–1.5 cm, membranously winged; leaf blade 5–10 × 2.5–4.5 mm, pinnatipartite to pinnatisect; segments 5 or 6 pairs, ovate, incised-dentate. Flowers 1–4, single or pseudo-opposite; bracts leaflike, small. Pedicel to 4–10 mm, with 2 lines of hairs. Calyx ca. 7 mm, usually glandular pubescent basally, more than 1/2 cleft

100. Ser. *Wilsoniae* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 148. 1949.

魏氏系 wei shi xi

Herbs low, ± stemless. Leaves long petiolate, shallowly crenate lobed to pinnatipartite. Flowers axillary. Calyx deeply cleft anteriorly, 2- or 3-lobed. Corolla tube longer than calyx, mostly more than 2 × as long, expanded apically; beak long; lower lip large.

• Four species: endemic to China.

- 1a. Leaves shallowly crenate lobed; corolla with purple galea and yellowish lower lip; calyx 2-lobed; beak of galea S-shaped 306. *P. bicolor*
 1b. Leaves pinnatipartite or pinnatisect; corolla red throughout or red with a purple-red galea; calyx 3- or 5-lobed; beak of galea not S-shaped.
 2a. Calyx 5-lobed; petiole of basal leaves to 3 cm 305. *P. dulongensis*
 2b. Calyx 3-lobed; petiole of basal leaves to 2 cm.
 3a. Calyx 2/3 cleft anteriorly; corolla red throughout, tube 3–4 cm; beak of galea ca. 4 mm; lower lip 1.5–2 × 2.5–3 cm 303. *P. wilsonii*

anteriorly; lobes 3–5, unequal, posterior one small, linear and entire, sometimes absent, lateral lobes distinctly serrate apically. Corolla red, with white dots on throat; tube ca. 2.2 cm, pubescent; galea bent at a right angle; beak 5–5.5 mm; lower lip ca. 9 mm × 1.4 cm, ciliate. Filaments pubescent. Fl. Jun.

• Open grassy hillsides. E Xizang.

302. *Pedicularis tapaoensis* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 417. 1963.

大炮马先蒿 da pao ma xian hao

Herbs perennial, to 6 cm tall, not drying black. Rootstock short. Stems cespitose, less than 1 cm or barely stemless. Leaves many, densely tufted; petiole 0.8–2.2 cm, broadly winged, glabrous; leaf blade elliptic-ovate to oblong, ca. 1 cm × 4.5–7 mm, glabrous on both surfaces, pinnatisect; segments 4–6 pairs, ovate, pinnatifid or coarsely dentate. Flowers solitary in leaf axils. Pedicel to 1 cm. Calyx ca. 7–9 mm, subglabrous, ciliate, tube ca. 5 mm, more than 1/3 cleft anteriorly; lobes 5, unequal, serrate. Corolla purple-red; tube ca. 2.5 cm, sparsely pubescent; galea ± bent at a right angle, with 2-auriculate protuberances; beak straight or bent slightly downward, ca. 4 mm. Filaments pubescent. Fl. Jul–Aug, fr. Aug–Sep.

• Open alpine meadows; ca. 4700 m. W Sichuan.

- 3b. Calyx 1/3 cleft anteriorly; corolla red with purple-red galea, tube ca. 5 cm; beak of galea 5.5–7 mm;
lower lip ca. 1 × 1.5 cm 304. *P. yanyuanensis*

303. *Pedicularis wilsonii* Bonati, Bull. Soc. Bot. France 54: 184, 376. 1907.

魏氏马先蒿 wei shi ma xian hao

Herbs perennial, to 9 cm tall, drying ± black. Roots fusiform, ± fleshy. Stems 2 or 3, 2–3 cm, or ± absent, pubescent. Basal leaves few; petiole 1.5–2 cm; leaf blade elliptic to oblong-ovate, to 9 cm, glabrous on both surfaces, pinnatifid; segments ca. 13 pairs, ovate-oblong. Stem leaves usually pseudo-opposite, smaller than basal leaves. Flowers few. Pedicel 1–2.5 cm, glabrescent. Calyx 1–1.5 cm, 2/3 cleft anteriorly, pubescent; lobes 3, unequal, posterior one linear, entire, lateral lobes larger, leaflike. Corolla red throughout; tube 3–4 cm, slender; galea falcate apically; beak bent downward, straight or cylindrical, ca. 4 mm; lower lip 1.5–2 × 2.5–3 cm, middle lobe ca. 1/2 size of lateral lobes, sparsely ciliate. Filaments glabrous or pubescent.

• Sichuan.

304. *Pedicularis yanyuanensis* H. P. Yang, Acta Phytotax. Sin. 27: 224. 1989.

盐源马先蒿 yan yuan ma xian hao

Herbs perennial, 5–8 cm tall, pubescent, drying slightly black. Roots fleshy. Stems usually 3–5, short or ± absent, spreading to ascending. Leaves mostly basal; petiole to 2 cm, pubescent; leaf blade lanceolate-oblong, 1–3 cm, pubescent along veins, pinnatisect; segments 5–8 pairs, ovate to oblong, margin double dentate. Stem leaves usually pseudo-opposite, smaller than basal leaves. Pedicel 1–2 mm. Calyx oblong, 1/3 cleft anteriorly, densely white villous; lobes 3, unequal. Corolla red, with purple-red galea, ca. 6 cm; tube ca. 5 cm, villous with multicellular hairs; galea nearly falcate, much expanded, ca. 5 mm; beak ± incurved, 5.5–7 mm; lower lip ca. 1 × 1.5 cm, ciliate, middle lobe smaller than lateral lobes, emarginate. Anterior filaments pubescent. Fl. Aug, fr. Sep.

• *Abies fabri* forests on slopes; ca. 3900 m. SW Sichuan.

101. Ser. *Neolatitubae* P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 249. 1995.

新粗管系 xin cu guan xi

Herbs less than 10 cm tall. Stems scarcely present, weak, curved. Leaves mostly basal. Pedicel to 4 cm. Flowers axillary. Calyx deeply cleft anteriorly, 3-lobed. Corolla ± red-purple; tube 5–6 × as long as calyx; galea circinate-incurved basally; beak semicircular; lower lip large.

• One species: endemic to China.

307. *Pedicularis neolatituba* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 418. 1963.

新粗管马先蒿 xin cu guan ma xian hao

Herbs perennial, usually less than 10 cm tall, drying ± black. Roots fleshy. Stems scarcely present to 2–4 cm, glabrous. Basal leaves numerous; petiole to 2.3 cm; leaf blade lanceolate-oblong to narrowly lanceolate, 1–2 cm × 3.5–7 mm, long pubescent along midvein when young, glabrescent, pinnatisect; segments 6–8 pairs, ovate to oblong, margin double dentate. Stem leaves

305. *Pedicularis dulongensis* H. P. Yang, Acta Phytotax. Sin. 28: 143. 1990.

独龙马先蒿 du long ma xian hao

Herbs perennial, to 10 cm tall, drying ± black. Stems ca. 1 cm tall or ± absent. Basal and stem leaves densely clustered; petiole 1–3 cm, slender, glabrous; leaf blade elliptic-oblong to oblong, ca. 3 cm, abaxially pubescent, adaxially glabrous, pinnatisect; segments 5–9 pairs, ovate, pinnatifid or coarsely serrate. Pedicel 1–1.5 cm. Calyx cylindrical-campanulate, ca. 1.8 cm, 2/3 cleft anteriorly, densely white villous with multicellular hairs; lobes 5, unequal, leaflike, posterior one smaller than lateral lobes. Corolla red, obscure, 6–7 cm; tube erect, 4–5 cm, villous with multicellular hairs; galea nearly falcate, very enlarged; beak incurved, 5–6 mm; lower lip 1.2–1.4 × 3–3.5 cm, middle lobe smaller than lateral pair. Filaments pubescent. Capsule ovoid-oblong, 1–1.5 cm. Fl. Jul, fr. Jul–Aug.

• Moist meadows on mountain slopes; 3500–3600 m. NW Yunnan.

306. *Pedicularis bicolor* Diels, Bot. Jahrb. Syst. 29: 570. 1900.

二色马先蒿 er se ma xian hao

Herbs 5–6 cm tall, pubescent. Stems ± absent. Leaves nearly all basal; petiole 1–1.5 cm; leaf blade elliptic, 1–1.5 cm × 5–6 mm, shallowly crenate lobed; segments ± crenulate. Pedicel 1–1.5 cm. Calyx cylindrical; tube ca. 1.2 cm × 4 mm, 1/3 cleft anteriorly; lobes 2, ca. 5 mm, leaflike, dentate. Corolla with purple galea and yellowish lower lip, 2–2.4 cm; tube ca. 1.5 × as long as calyx, sparsely pubescent; galea erect basally, bent apically, ca. 8 mm; beak S-shaped, 4–5 mm; lower lip ca. 1.5 cm wide, glabrous, middle lobe much smaller than lateral pair, 5–6 × ca. 5 mm, emarginate. Filaments pubescent. Fl. Jul.

• SE Shaanxi.

usually pseudo-opposite, slightly smaller than basal leaves. Flowers few, axillary, pseudo-opposite or from basal leaves. Pedicel black, to 4 cm, glandular pubescent. Calyx 7–9 mm, 3/4 cleft anteriorly; lobes 3, unequal, posterior one spinescent and entire, lateral pair larger, incised-serrate. Corolla reddish purple; tube to 5 cm, pale purple pubescent; galea with auriculate protuberance near margin; beak semicircular, 6–7 mm; lower lip ca. 2 × 2.4 cm. Filaments pubescent. Fl. Jul–Aug, fr. Sep.

• Alpine meadows; ca. 4700 m. N Sichuan.

102. Ser. **Flammeae** Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 100. 1890.

火焰系 huó yán xì

Herbs low. Roots fusiform, fleshy. Leaves long, ± narrow, pinnatifid to pinnatisect. Inflorescences spicate, centrifugal, usually very long, with dense flowers. Pedicel long. Calyx 5-lobed. Corolla tube decurved distally; galea toothless; beakless; lower lip spreading. Capsule oblique.

About five species: Asia, Europe, North America; three species in China.

1a. Bracts rhombic-ovate to broadly ovate; plants usually less than 4 cm tall 310. *P. orthocoryne*

1b. Bracts linear-lanceolate to linear; plants usually 5–10 cm tall.

2a. Galea rounded in front; stigma included or very short exerted 308. *P. oederi*

2b. Galea not rounded in front, distinctly obliquely truncate at apex; stigma long exerted, to 4 mm 309. *P. stylosa*

308. *Pedicularis oederi* Vahl in Hornemann, Dansk Oekonom. Plantel. ed. 2, 580. 1806.

欧氏马先蒿 ou shi ma xian hao

Herbs perennial, 5–10(–20) cm tall, drying black. Stems usually scapellike, woolly. Leaves mostly basal; petiole to 5 cm, pubescent; leaf blade linear-lanceolate to linear, 1.5–7 cm, abaxially sometimes pubescent along veins, adaxially usually glabrous, pinnatisect; segments 10–30 pairs, ovate to oblong, dentate. Stem leaves 1 or 2, similar to basal leaves but smaller. Inflorescences ca. 5(–10) cm; bracts linear-lanceolate to linear, ca. as long as to shorter than flowers, usually woolly. Calyx 0.9–1.2 cm; lobes 5, ± equal. Corolla yellow, with purple galea, occasionally lower lip purple-spotted, more than 2 cm; tube falcate apically, 1.2–1.6 cm, apex obtuse or ± acute; galea 0.7–1.4 cm, rounded in front; lower lip 5–7 mm × 0.7–1.4 cm, middle lobe rounded, smaller than lateral lobes. Anterior filament pair pubescent. Stigma included or slightly exerted. Capsule long ovoid to ovoid-lanceolate, to 1.8 cm × 7 mm. Fl. Jun–Sep, fr. Jul–Oct. $2n = 16$.

Alpine meadows, pastures, damp limestone rocks, tundra, grassy slopes; 2600–5400 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, Japan, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; C and N Europe, N North America].

1a. Leaf segments 10–20 pairs 307a. subsp. *oederi*

1b. Leaf segments 25–30 pairs 307b. subsp. *multipinna*

308a. *Pedicularis oederi* subsp. *oederi*

欧氏马先蒿(原亚种) ou shi ma xian hao (yuan ya zhong)

Pedicularis versicolor Wahlenberg.

Leaf segments 10–20 pairs. Calyx lobes broadly lanceolate, entire to dentate apically. Corolla galea 0.7–1.4 cm × ca. 3.5 mm, shorter than tube; middle lobe of lower lip not projected.

Alpine meadows, pastures, moist meadows of mountain slopes, damp limestone rocks, tundra; 4000–5400 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, S, SE, and W Xizang, Yunnan [Bhutan, Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; C and N Europe, N North America].

Four varieties were treated in the Fl. Reipubl. Popularis Sin.: var. *oederi* with a 7–9 × 3–3.5 mm galea and broadly lanceolate, entire to distally dentate calyx lobes; var. *heteroglossa* Prain with a 1.1–1.4 cm galea; var. *sinensis* (subsp. *branchyophylla* (Pennell) P. C. Tsoong is

here treated as a synonym) with a 7–9 mm galea and calyx lobes with spatulate dentate-lobulate tips; and var. *angustiflora* (H. Limpricht) P. C. Tsoong with a 2 mm wide galea. Variety *oederi* includes two forms: f. *oederi* with a yellow corolla and sometimes a purple galea or lower lip with purple spots, and f. *rubra* (Maximowicz) P. C. Tsoong with a dark red corolla.

T. Yamazaki (Fl. Japan IIIa: 369–370. 1993) treated the plants occurring in Japan as *Pedicularis oederi* subsp. *heteroglossa* (Prain) Pennell.

308b. *Pedicularis oederi* subsp. *multipinna* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 334. 1963.

多羽片欧氏马先蒿 duo yu pian ou shi ma xian hao

Pedicularis oederi Vahl var. *multipinna* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 89. 1949.

Leaf segments 25–30 pairs, horizontal. Calyx and corolla tube slightly short. Corolla yellow, sometimes with purple galea or lower lip purple spotted, slightly shorter than galea; galea ca. as long as tube, middle lobe of lower lip projected.

• Grassy slopes; ca. 4200 m. W Sichuan.

309. *Pedicularis stylosa* H. P. Yang, Acta Phytotax. Sin. 18: 242. 1980.

长柱马先蒿 chang zhu ma xian hao

Herbs perennial, 8–10 cm tall, drying black. Roots numerous. Stems scapellike, white woolly. Basal leaves usually in a rosette; petiole 1–5 cm, pubescent; leaf blade linear-lanceolate to linear, 2–7 cm × 5–10 mm, abaxially white scurfy, adaxially pilose, pinnatisect; segments 15–25 pairs, ovate to oblong, dentate. Stem leaves 1 or 2. Inflorescences racemose; bracts linear. Pedicel 2–4 mm. Calyx oblong, ca. 1 cm, slightly cleft anteriorly, white woolly, 5-lobed. Corolla yellow, ca. 2.3 cm; tube erect, longer than calyx; galea not rounded in front, distinctly obliquely truncate at apex; lower lip shorter than galea, ca. 6 × 8 mm, middle lobe rounded, smaller than lateral pair. Anterior filament pair pubescent. Stigma long exerted, to 4 mm. Fl. Jun.

• About 4300 m. S Xizang.

310. *Pedicularis orthocoryne* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 89. 1949.

直盔马先蒿 zhi kui ma xian hao

Pedicularis oederi Vahl var. *bracteosa* Bonati, Notes Roy. Bot. Gard. Edinburgh 8: 142. 1913.

Herbs perennial, less than 4 cm tall, drying black. Roots numerous, fleshy. Stems unbranched, puberulent. Basal

leaf petiole 1–1.5 cm, slender, puberulent; leaf blade oblong-lanceolate, ca. 2.2 cm × 8 mm, puberulent to glabrescent, pinnatisect to pinnatipartite; segments 8–10 pairs, dentate. Inflorescences ca. 2 cm, few flowered; distal bracts rhombic-ovate to broadly ovate, crenate-serrate. Pedicel 2–3 mm. Calyx ca. 8 × 3–4 mm; lobes 5, unequal, posterior one triangular and entire, lateral lobes larger, ovate, serrate. Corolla yellow throughout,

to ca. 2.3 cm; tube ca. 1.1 cm. Galea straight, rounded apically; lower lip ca. 9 mm, erose, middle lobe smaller than lateral pair, projecting. Anterior filament pair villous apically. Capsule oblong-ovoid, ca. 1.1 cm × 4 mm. Fl. Jun, fr. Jul–Aug.

• Grassy slopes; 4000–5300 m. W Sichuan, NW Yunnan.

103. Ser. Corydaloides H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 148. 1949.

拟紫堇系 ni zi jin xi

Stems and branches often procumbent to ascending. Leaves alternate or pseudo-opposite, pinnatisect. Inflorescences terminal, usually distinctly centrifugal, or flowers axillary. Calyx 5-lobed. Corolla tube decurved distally; galea toothless, beakless; lower lip spreading.

• Three species: endemic to China.

1a. Galea straight, ca. 6 mm; leaf segments usually 4–6 pairs 311. *P. corydaloides*

1b. Galea falcate, 7–9 mm; leaf segments usually 7–12 pairs.

2a. Roots ± fusiform, fleshy; middle lobe of lower corolla lip entire, slightly projecting 312. *P. cryptantha*

2b. Roots slender; middle lobe of lower corolla lip emarginate, much projecting 313. *P. nyingchiensis*

311. Pedicularis corydaloides Handel-Mazzetti, Symb. Sin. 7: 851. 1936.

拟紫堇马先蒿 ni zi jin ma xian hao

Herbs perennial, to 16 cm tall, slender. Stems erect, short, slender, sparsely long branched apically, with remote scales basally, outer stems usually procumbent to ascending, sometimes branched, pubescent. Basal leaves numerous, petiole to 4 cm, slender, puberulent; leaf blade ovate-elliptic to ovate-oblong, 1–4 × ca. 1.8 cm, abaxially white scurfy, adaxially glabrous; segments usually 4–6 pairs, ovate to oblong, pinnatifid or incised-dentate. Stem and leaves usually pseudo-opposite, smaller than basal leaves. Flowers axillary, usually racemose apically, centrifugal. Pedicel 2–10(–14) mm. Calyx 5–6 mm, pubescent; lobes 5, unequal, posterior one usually lanceolate and entire, lateral lobes larger, serrate. Corolla yellow; tube cylindrical, longer than calyx; galea straight, ca. 6 mm, sparsely glandular pilose apically, rounded in front, minutely apiculate at apex; lower lip ca. as long as galea, ciliate, lobes ± equal, rounded. Filaments pubescent. Capsule ca. 5 × 4–4.5 mm. Fl. Jul–Aug, fr. Aug–Sep.

• Forests, shrubby grass of hillsides, alpine meadows; 3200–3800 m. SE Xizang, NW Yunnan.

312. Pedicularis cryptantha Marquand & Shaw, J. Linn. Soc., Bot. 48: 211. 1929.

隐花马先蒿 yin hua ma xian hao

Herbs perennial, to 12(–14) cm tall, drying ± black. Roots ± fusiform, fleshy. Stems usually procumbent to ascending, short, pubescent; branches densely clustered. Basal leaves numerous; petiole to 6 cm, sparsely pubescent; leaf blade ovate-oblong to ovate, 3.5–7 × ca. 1.8 cm, adaxially sparsely pubescent to glabrous; segments 8–12 pairs, linear-lanceolate, margin double dentate. Flowers axillary, 10–20-flowered, sometimes racemose apically, centrifugal; bracts leaflike, lanceolate. Pedicel more than 2 cm, slender. Calyx tube

cylindric, ca. 4 mm, sparsely to densely pubescent; lobes 5, unequal. Corolla yellow, 1.6–2 cm, tube expanded, curved apically; galea ± falcate, 7–9 mm, front rounded, apex slightly acute; lower lip with middle lobe rounded, smaller than lateral lobes, entire, slightly projecting. Filaments glabrous. Fl. May–Aug, fr. Sep–Oct.

Grassy stream banks, woods and *Pinus* forests; 2700–4700 m. SE Xizang [Bhutan].

1a. Stems usually procumbent to ascending, ca. 10 cm tall; leaves to 12(–14) cm; calyx

usually sparsely pubescent 312a. subsp. *cryptantha*

1b. Stems erect, ca. 7 cm tall; leaves barely 4.5

cm; calyx usually densely pubescent 312b. subsp. *erecta*

312a. Pedicularis cryptantha subsp. *cryptantha*

隐花马先蒿(原亚种) yin hua ma xian hao (yuan ya zhong)

Stems usually procumbent to ascending, ca. 10 cm tall. Leaves to 12(–14) cm. Calyx usually sparsely pubescent.

• Grassy streambanks, woods; 2700–4700 m. SE Xizang.

312b. Pedicularis cryptantha subsp. *erecta* P. C. Tsoong, Acta Phytotax. Sin. 3: 275. 1955.

直立隐花马先蒿 zhi li yin hua ma xian hao

Stems erect, ca. 7 cm tall. Leaves barely 4.5 cm. Calyx usually densely pubescent.

• *Pinus* forests. SE Xizang.

313. Pedicularis nyingchiensis H. P. Yang & Y. Tateishi, Acta Phytotax. Sin. 31: 288. 1993.

林芝马先蒿 lin zhi ma xian hao

Herbs perennial, ca. 12–15 cm tall, drying ± black. Roots slender. Stems usually 8–10, cespitose; lateral branches procumbent to ascending, sparsely white

villous. Leaves alternate; petiole 1–5 cm; leaf blade ovate-oblong to oblong, 2–5 × 1–2 cm, adaxially white villous; segments 7–9 pairs, ovate to oblong, coarsely dentate. Inflorescences short racemose; bracts leaflike. Pedicel 0.3–2 cm. Calyx cylindric, 7–8 mm, sparsely white villous; lobes 5, unequal. Corolla cream colored, 1.6–2 cm; tube expanded and slightly curved apically;

galea falcate, 7–9 mm, rounded in front, apex sometimes acute; lower lip ca. 1 cm, erose, middle lobe emarginate, much projecting. Anterior filament pair pubescent. Fl. May–Jun, fr. Jul–Aug.

•Rocks at streamsides, *Quercus* thickets; 3000–3300 m. E Xizang.

104. Ser. Pseudo-oederianae H. Limpricht, Repert. Spec. Nov. Regni Veg. 20: 217. 1924.

假欧氏系 jia ou shi xi

Herbs less than 15 cm tall. Roots fusiform, fleshy. Leaves alternate. Basal leaves numerous; petiole long; leaf blade pinnatisect. Inflorescences more than 1/2 height of plant, centrifugal. Calyx lobes 5. Corolla tube decurved; galea with 1 marginal tooth near apex, beakless.

•Two species: endemic to China.

1a. Corolla yellow with purple-red galea; filaments 2 pubescent, 2 glabrous 314. *P. pseudoversicolor*
1b. Corolla red throughout; filaments 2 densely pubescent, 2 glabrous 315. *P. habachanensis*

314. *Pedicularis pseudoversicolor* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 57: 104. 1920.

假多色马先蒿 jia duo se ma xian hao

Herbs perennial, 10(–15) cm tall, drying black. Roots numerous. Stems usually single, stout, pubescent. Basal leaf petiole to 5.5 cm; leaf blade lanceolate, 2–6 × ca. 1.2 cm, abaxially white scurfy, tinged with purple along veins, pinnatisect; segments 11–18 pairs, oblong or obovate, sparsely ciliate, incised-dentate. Stem leaves 1–3 or absent, alternate. Inflorescences 3–10 cm, dense; proximal bracts leaflike, pubescent. Pedicel to 4 mm or almost absent, wide. Calyx 1–1.2 cm; lobes 5, lateral lobes ca. 1/2 as long as tube, unequal. Corolla yellow, with purple-red galea, 2.3–2.8 cm; tube slightly bowed and expanded apically, slightly longer than calyx; galea bent apically, 1–1.4 cm; lower lip shorter than galea, sparsely ciliate. Filaments 2 pubescent apically, 2 glabrous throughout. Fl. Jun–Aug, fr. Sep.

Alpine meadows; (3600–)4300–4500 m. S Xizang (Chumbi Xian), NW Yunnan [Bhutan].

315. *Pedicularis habachanensis* Bonati, Notes Roy. Bot. Gard. Edinburgh 15: 151. 1926.

哈巴山马先蒿 ha ba shan ma xian hao

Herbs perennial, 3.5–15 cm tall, drying black. Stems 1 to several, erect, unbranched, with lines of hairs. Basal leaf petiole 2.5–4 cm, fleshy, glabrous; leaf blade linear to elliptic-oblong, 3–4 × ca. 1 cm, pinnatisect; segments 8–23 pairs, triangular or ± ovate-oblong, pinnatifid, incised-dentate. Stem leaves few, alternate.

Inflorescences dense; proximal bracts linear. Flowers short pedicellate. Calyx 1–1.2 cm; lobes 5, unequal, long ciliate. Corolla red throughout; tube ca. 1.2 cm; galea ca. as long as tube, slightly falcate; lower lip much shorter than galea. Filaments 2 densely pubescent, 2 glabrous. Fl. Jul, fr. Aug.

•Alpine swampy meadows; 4100–4600 m. NW Yunnan.

1a. Leaf segments 8–10 pairs 315a. subsp. *habachanensis*
1b. Leaf segments 12–23 pairs 315b. subsp. *multipinnata*

315a. *Pedicularis habachanensis* subsp. *habachanensis*

哈巴山马先蒿(原亚种) ha ba shan ma xian hao (yuan ya zhong)

Plants low. Leaf segments 8–10 pairs.

•Alpine swampy meadows; 4100–4600 m. NW Yunnan.

315b. *Pedicularis habachanensis* subsp. *multipinnata* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 419. 1963.

多羽片哈巴山马先蒿 duo yu pian ha ba shan ma xian hao

Plants tall. Leaf segments 12–23 pairs.

•NW Yunnan.

105. Ser. Rhynchodontae Prain in Hooker's Icon. Pl. 23: t. 2290. 1894.

喙齿系 hui chi xi

Herbs moderately tall. Roots fusiform. Leaves almost all basal; leaf blade pinnatisect. Inflorescences centrifugal. Calyx lobes 5. Corolla large; galea projected into a broad beaklike apex, with several marginal teeth on each side.

•One species: endemic to China.

316. *Pedicularis rhynchodonta* Bureau & Franchet, J. Bot. (Morot) 5: 108. 1891.

喙齿马先蒿 hui chi ma xian hao

Pedicularis rhynchodonta Bureau & Franchet f. *maxima* Bonati.

Herbs perennial, 10–20(–30) cm tall, drying black. Roots fascicled. Stems dark purple, shiny, pubescent when young, glabrescent. Leaves mostly basal, in a rosette; petiole 2–4(–7) cm; leaf blade linear-oblong to lanceolate-oblong, 3–5 (–11) cm, abaxially sparsely long pubescent, adaxially glabrous, pinnatisect; segments 12–26 pairs, triangular to ovate-

oblong, pinnatifid to incised-dentate. Stem leaves few, alternate, smaller than basal leaves. Inflorescences 3–7(–9) cm; bracts slightly longer than calyx. Pedicel short, sparsely pubescent. Calyx ca. 1.1 cm, slightly cleft anteriorly; lobes 5, ± equal, serrate. Corolla purple-red, 2–2.2 cm; tube ca. as long as calyx; galea bent apically, 1–1.2 cm, truncate, proximal teeth most

distinct and longest; lower lip slightly shorter than galea, praemorse-serrulate and ciliate. Filaments 2 pubescent, 2 glabrous. Capsule lanceolate-ovoid, ca. 1.4 cm. Fl. May–Jun, fr. Jun–Aug.

- Alpine meadows, grassy slopes; 3700–4700 m. SW and W Sichuan.

106. Ser. Filiculae H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 9. 1949.

拟蕨系 ni jue xi

Herbs mostly low. Roots fleshy. Leaves almost all basal; stem leaves alternate; petiole long; blade pinnatifid to pinnatisect. Inflorescences racemose, centrifugal, or flowers axillary. Calyx 5-lobed. Corolla large; tube less than 2 × as long as calyx; beak short, sometimes dentate apically; lower lip often less than 1.2 cm wide.

Nine species: Bhutan, China, Nepal, Sikkim; eight species in China.

1a. Corolla purple-red to red throughout.

2a. Leaf segments 10–25 pairs; beak of corolla dentate apically; calyx 1.1–1.3 cm.

3a. Leaves 2–3 cm, pinnatifid; lower corolla lip not ciliate; filaments pubescent; capsule lanceolate, ca. 2 cm

..... 318. *P. wallichii*

3b. Leaves 2–6 cm, pinnatisect; lower corolla lip ciliate; filaments 2 pubescent, 2 glabrous; capsule oblong, ca. 1.2 cm

..... 319. *P. filicula*

2b. Leaf segments 5–11 pairs; beak of corolla 2-cleft apically; calyx 5–11 mm.

4a. Corolla ca. 2.5 cm; lower lip not ciliate; leaves pinnatifid to pinnatipartite 321. *P. tsangchanensis*

4b. Corolla ca. 1.6 cm; lower lip ciliate; leaves pinnatipartite to pinnatisect 322. *P. anomala*

1b. Corolla white to yellow at least on throat.

5a. Corolla yellowish white; leaf segments 3–5 pairs; filaments pubescent 320. *P. potaninii*

5b. Corolla bicolored; leaf segments 6–20 pairs; filaments 2 pubescent.

6a. Corolla yellow with purple beak; leaf segments 10–20 pairs 319. *P. lecomtei*

6b. Corolla red with yellowish white throat; leaf segments 6–13 pairs.

7a. Leaf blade oblong, 1.5–3 cm, pinnatisect; inflorescences ca. 10-flowered 323. *P. filiculiformis*

7b. Leaf blade lanceolate-oblong, 0.7–1.5 cm, pinnatipartite; inflorescences ca. 7- or 8-flowered 324. *P. takpoensis*

317. *Pedicularis lecomtei* Bonati, Bull. Soc. Bot. France 55: 543. 1908.

勒公氏马先蒿 le gong shi ma xian hao

Herbs perennial, 5–12 cm tall, drying black. Roots fascicled, fusiform. Stems unbranched, rust colored villous. Leaves barely all basal; petiole 3–4 cm, pubescent; leaf blade oblong-lanceolate to linear-lanceolate, 3–5.5 cm × 6–11 mm, abaxially densely white scurfy, adaxially glabrescent, pinnatipartite; segments 10–20 pairs, ovate to long ovate, pinnatifid or incised-dentate. Inflorescences racemose, 4–5 cm; proximal bracts leaflike. Pedicel 1–1.5 cm, slender, densely rust colored villous. Calyx 1–1.5 cm, villous, slightly cleft anteriorly; lobes 5, unequal, leaflike. Corolla yellow, with purple beak, 3–3.5 cm; tube straight, 1.2–2.2 cm, glabrous; galea ± falcate apically; beak 2–2.5 mm, indistinctly marginally 1- or 2-toothed near apex; lower lip ca. 1.1 × 1.6 cm, not ciliate. Anterior filament pair densely villous. Fl. Jun–Jul, fr. Jul–Aug.

- Rocky slopes; ca. 3500 m. NW Yunnan.

318. *Pedicularis wallichii* Bunge in Walpers, Repert. Bot. Syst. 3: 415. 1844.

瓦氏马先蒿 wa shi ma xian hao

Herbs perennial, 3.5–12 cm tall, drying black. Roots fleshy, fusiform. Stems single, unbranched. Basal leaves few, 1–4. Petiole 2–6 cm. Stem leaves 1–3, linear-lanceolate, 2–3 cm × 2.5–5 mm, pinnatifid; segments 12–25 pairs, ovate-lanceolate, sinuate-dentate. Inflorescences racemose, 2–5-flowered; bracts leaflike, ca. 1.6 cm. Pedicel short. Calyx ca. 1.3 cm, glabrous, slightly cleft anteriorly; lobes 5, lanceolate, equal. Corolla purple-red; tube 1.6–1.8 cm; galea falcate; beak ca. 3.5 mm, truncate apically, denticulate; lower lip ca. 1.6 cm wide, glabrous, sinuate-dentate. Filaments pubescent apically. Capsule obliquely lanceolate, ca. 2 cm × 7.5 mm. Fl. Jun–Aug, fr. Aug.

Alpine meadows; 3800–4800 m. S and SE Xizang [Bhutan, Nepal]. This might be *Pedicularis tantalorhynchoides* T. Yamazaki, since *P. wallichii* is W Himalayan. Further study is needed on Chinese specimens labelled as *P. wallichii*.

319. *Pedicularis filicula* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 573. 1888.

拟蕨马先蒿 ni jue ma xian hao

Herbs perennial, 5–18 cm tall, drying dark black. Roots fleshy, fusiform, fascicled. Stems 3 or 4(–6), unbranched, with 2 or 3 lines of densely rust colored hairs. Leaves mostly basal, usually in a dense rosette; petiole 2–4 cm, sparsely pubescent apically; leaf blade linear-lanceolate, 2–6 cm × 5–13 mm, abaxially white scurfy, adaxially glabrous, pinnatisect; segments 10–25 pairs, lanceolate-ovate, margin double dentate. Stem leaves few, smaller than basal leaves or absent. Inflorescences 2–3(–10) cm, centrifugal, usually densely pubescent, with long rust colored hairs. Pedicel 1–3 mm. Calyx 1.1–1.3 cm; lobes 5, unequal, leaflike. Corolla purple-red; tube ca. as long as calyx; galea bent at a right angle apically; beak 3–4 mm, truncate apically, denticulate; lower lip ca. 1 cm, ciliate, erose. Filaments glabrous or anterior pair sparsely pubescent. Capsule oblong, ca. 1.2 cm × 5 mm. Fl. May–Jul, fr. Jul–Aug.

• Alpine meadows; 2800–4900 m. SW Sichuan, Yunnan.

- 1a. Beak of corolla 3–4 mm; middle lobe of lower lip smaller than lateral lobes; anterior filament pair sparsely pubescent, posterior pair glabrous 319a. var. *filicula*
1b. Beak of corolla less than 3 mm; middle lobe of lower lip larger than lateral lobes; filaments glabrous 319b. var. *saganaica*

319a. *Pedicularis filicula* var. *filicula*

拟蕨马先蒿(原变种) ni jue ma xian hao (yuan bian zhong)

Corolla beak 3–4 mm; middle lobe of lower lip smaller than lateral lobes. Anterior filament pair sparsely pubescent.

• Alpine meadows; 2800–4900 m. NW Yunnan.

319b. *Pedicularis filicula* var. *saganaica* Handel-Mazzetti, Symb. Sin. 7: 858. 1936.

木里拟蕨马先蒿 mu li ni jue ma xian hao

Corolla beak less than 3 mm; middle lobe of lower lip larger than lateral lobes. Filaments glabrous.

• SW Sichuan, Yunnan.

320. *Pedicularis potaninii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 570. 1888.

波氏马先蒿 bo shi ma xian hao

Herbs perennial, 5–8 cm tall, glabrous except for ciliate leaf sheath and calyx. Roots fleshy. Stem single, unbranched, drying black. Leaves almost all basal, ca. as long as stems; petiole several × as long as leaf blade, sulcate; leaf blade ovate, 2–3.5 × 0.8–1.3 cm; segments 3–5 pairs, obovate, incised-dentate. Inflorescence subcapitate, glabrous; bracts opposite, leaflike, with short dilated petioles. Calyx oblong, 0.9–1.1 mm, thin; lobes 5, unequal, rounded, short, incised-serrate. Corolla yellowish white, 1.8–2 cm; tube erect, longer than calyx; galea bent at a right angle; beak falcate, conical, short, 4–6 mm; lower lip rounded, ca. as long as galea, wider than long, middle lobe smaller than

lateral pair, slightly projecting. Filaments pubescent, anterior pair densely so. Fl. Jun.

• Forests. S Gansu.

321. *Pedicularis tsangchanensis* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 571. 1888.

苍山马先蒿 cang shan ma xian hao

Herbs perennial, 8–15 cm tall, drying black. Roots linear, slightly fleshy. Stems usually 2 or 3, ascending, unbranched, ± pubescent, with 1 or 2 lines of hairs. Basal leaf petiole ca. 3 cm, pubescent; leaf blade ovate-oblong to lanceolate-oblong, ca. 4 × 1.3 cm, abaxially densely long pubescent along midvein, adaxially slightly pubescent, pinnatifid to pinnatipartite; segments 6–11 pairs, crenate-dentate. Stem leaves alternate, sometimes pseudo-opposite, shorter petiolate; leaf blade ca. 3.5 × 1.5 cm. Inflorescences racemose, centrifugal; proximal bracts leaflike, distal ones linear, ca. as long as calyx. Pedicel ca. 1 cm basally, slender, pubescent. Calyx 1–1.1 cm, slightly cleft anteriorly, densely pubescent; lobes 5, unequal, dentate. Corolla red, ca. 2.5 cm; tube erect, ca. 1.6 cm, sparsely pubescent; galea bent apically; beak ca. 5 mm, 2-cleft apically; lower lip ca. 1.3 × 1.2 cm, glabrous, erose-dentate. Anterior filament pair pubescent.

• About 4000 m. NW Yunnan.

322. *Pedicularis anomala* P. C. Tsoong & H. P. Yang, Acta Phytotax. Sin. 18: 243. 1980.

奇异马先蒿 qi yi ma xian hao

Herbs perennial, ca. 30 cm tall, ± drying black. Roots conical. Stems 1, 3, or 4, branched. Basal leaves withering early, long petiolate. Stem leaves alternate; petiole 0.5–1.5 cm; leaf blade oblong to oblong-ovate, 1–4 cm, abaxially densely white scurfy, pinnatipartite to pinnatisect; segments 5–9 pairs, obliquely ovate to oblong, serrate. Inflorescences centrifugal, subcapitate, lax basally; bracts leaflike. Pedicel 4–8 mm. Calyx 5–8 mm, densely white villous, 1/3 cleft anteriorly; lobes 5, unequal, ± flabellate, 3–5-cleft. Corolla bright red, ca. 1.6 cm; tube erect, longer than calyx; galea falcate apically; beak bent downward, straight, ca. 4 mm, slightly 2-cleft; lower lip ciliate. Anterior filament pair villous. Capsule ovoid, ca. 1.2 cm. Fl. Jul–Aug, fr. Aug–Sep.

• *Abies* forests; 3200–3800 m. E Xizang.

323. *Pedicularis filiculiformis* P. C. Tsoong, Acta Phytotax. Sin. 3: 275. 1955.

假拟蕨马先蒿 jia ni jue ma xian hao

Herbs perennial, ca. 12 cm tall, glabrous, drying black. Roots numerous, fleshy. Stems 1 to several, with dense, lanceolate, membranous scales at base. Leaves mostly basal; petiole to 4 cm, glabrous; leaf blade oblong, 1.5–3 cm × 5–11 mm, abaxially white scurfy, adaxially glabrous, pinnatisect; segments 6–13 pairs, oblong, margin double dentate. Stem leaves 3 or 4, shorter petiolate and smaller than basal leaves. Inflorescences racemose, to more than 6 cm, ca. 10-flowered, centrifugal; bracts leaflike. Calyx ca. 7 mm; lobes 5,

unequal. Corolla red, with deep red galea and yellowish white throat, 2–2.2 cm; tube erect, bent at a right angle apically, 1.4–1.5 cm; beak ca. 4 mm, slightly 2-cleft apically; lower lip ca. 9 × 9 mm. Anterior filament pair pubescent. Fl. Jul, fr. Aug.

Shaded or damp places, rocky hillsides; ca. 4700 m. SE Xizang [Bhutan].

Chinese plants belong to var. *filiculiformis* (endemic); var. *dolichorhyncha* P. C. Tsoong is endemic to Bhutan.

324. *Pedicularis takpoensis* P. C. Tsoong, Acta Phytotax. Sin. 3: 276. 1955.

塔布马先蒿 ta bu ma xian hao

Herbs perennial, to 9 cm tall, drying black. Roots fleshy. Stems usually numerous, red, with 2 or 3 lines of sparse hairs. Basal leaves long petiolate, glabrous; leaf blade

lanceolate-oblong, 0.7–1.5 cm × 3–5 mm, abaxially white scurfy, adaxially glabrous, pinnatifid; segments 7 or 8 pairs, crenate-dentate. Stem leaves smaller than basal leaves; segments 3–5 pairs.

Inflorescences racemose, 7- or 8-flowered, centrifugal;

bracts leaflike. Calyx tube ca. 5 mm, slightly cleft anteriorly, pubescent; lobes 5, unequal. Corolla red, with deeply red galea apically and white throat, 1.8–2 cm; tube ca. 1.5 cm, glabrous; galea ± bent at a right angle apically; beak bent downward, straight, 5–5.5 mm, slender; lower lip 9–10 mm × ca. 1.2 cm. Anterior filament pair slightly pubescent. Fl. Jun, fr. Jul.

• Open rocky slopes; ca. 4500 m. SE Xizang.

107. Ser. *Macrorhyncha* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 9. 1949.

长喙系 chang hui xi

Stems single or few. Leaves often almost all basal. Inflorescences long spicate, centrifugal. Calyx 5-lobed. Corolla tube slightly less than 2 × as long as calyx; galea erect, more than 3 × as long as lower lip; beak long, more than 3 × as long as lower lip, slender, often S-shaped; lower lip very small.

• One species: endemic to China.

325. *Pedicularis macrorhyncha* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 108. 1949.

长喙马先蒿 chang hui ma xian hao

Herbs perennial, 15–25 cm tall, drying black. Roots fleshy. Stems usually single, puberulent. Basal leaves few; petiole 1–2 cm; leaf blade lanceolate-linear to lanceolate-oblong, 2.5–9 × 0.4–2 cm, abaxially pubescent along veins, adaxially puberulent, pinnatisect; segments 10–18 pairs, ovate-lanceolate to lanceolate, margin double dentate. Stem leaves few or absent, alternate or sometimes pseudo-opposite. Inflorescences

centrifugal, 7–18 cm; bracts leaflike. Pedicel 1–3 mm. Calyx tubular, ca. 1.1 cm, ca. 1/4 cleft anteriorly, pubescent; lobes 5, equal or slightly unequal, dentate. Corolla purplish red, ca. 3.2 cm; tube erect basally, ± bent at a right angle apically, ca. 1.8 cm; galea erect; beak 1.6–1.8 cm, S-curved; lower lip shorter than galea, glabrous. Filaments pubescent. Capsule narrowly triangular-ovoid, 1.4–1.7 cm. Fl. May–Sep, fr. Sep–Oct.

• Alpine meadows, open hillsides; 3500–3800 m. NW Yunnan.

108. Ser. *Robustae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 69. 1890.

壮健系 zhuang jian xi

Herbs low, sometimes ± stemless. Leaves alternate, pinnatifid. Inflorescences racemose. Calyx 1/3 cleft anteriorly, 5-lobed. Corolla tube not or slightly longer than calyx; beak straight or ± coiled, usually downward uncinat, 2-cleft apically; lower lip large, often wider than long.

Four species: Bhutan, China, Sikkim; three species in China.

1a. Beak of corolla coiled, ca. 7.5 mm; corolla tube 2.2–3 cm; leaf blade 3.5–6 cm 328. *P. garckeana*

1b. Beak of corolla straight, 4–5 mm; corolla tube 1–1.6 cm; leaf blade 2–3 cm.

2a. Stems erect; leaf blade linear, segments 12–20 pairs; pedicel 25–60 mm 326. *P. daltonii*

2b. Stems ascending; leaf blade narrowly oblong, segments 8–10 pairs; pedicel 4–9 mm 327. *P. robusta*

326. *Pedicularis daltonii* Prain, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 270. 1889.

道氏马先蒿 dao shi ma xian hao

Herbs perennial, 2–6 cm tall, densely pubescent, drying ± black. Stems 2–20, erect, unbranched. Leaves alternate; petiole 2–4 cm; leaf blade linear, ca. 2.5 cm × 5 mm, pinnatifid; segments 12–20 pairs, ovate, apiculate-dentate. Inflorescences racemose, dense.

Pedicel to 2.5–6 cm. Calyx 1–1.2 cm, 1/3 cleft anteriorly, densely pubescent; lobes 5, unequal, serrate. Corolla tube ca. 1.6 cm, externally puberulent; galea

strongly bent apically; beak straight, ca. 5 mm, slender, bent slightly downward apically, 2-cleft at apex; lower lip 1.8–2 cm wide, lobes rounded, erose-serrulate.

Filaments pubescent. Capsule obliquely oblong, ca. 2 cm × 6 mm, exceeding calyx, apiculate. Seeds ovoid. Fl. Jul–Aug, fr. Aug.

Alpine meadows; 4500–5500 m. S and SE Xizang [Bhutan, Sikkim].

327. *Pedicularis robusta* J. D. Hooker, Fl. Brit. India 4: 306. 1884.

壮健马先蒿 zhuang jian ma xian hao

Herbs perennial, 2–6 cm tall, densely pubescent, drying black. Stems ascending. Leaves alternate; petiole 1–2 cm; leaf blade narrowly oblong, 2–3 cm × ca. 5 mm,

pinnatifid; segments 8–10 pairs, ovate, crenate-dentate. Inflorescences dense. Pedicel 4–9 mm. Calyx ca. 1 cm × 4.5 mm, pubescent; lobes 5, equal, oblong, serrate. Corolla tube not exceeding calyx; galea falcate, ca. 1.2 cm; beak barely 4 mm, apex pointing downward, 2-cleft; lower lip 1.5–1.6 cm wide, lobes rounded, ± equal. Filaments long pubescent. Capsule obliquely oblong, ca. 1.8 cm × 5 mm, short apiculate. Seeds ovoid. Fl. and fr. Aug–Sep.

About 5300 m. S and SE Xizang [Sikkim].

328. *Pedicularis garckeana* Prain ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 32: 529. 1888.

嘎克什马先蒿 ga ke shi ma xian hao

Herbs perennial, 6–16 cm tall, drying black. Roots fusiform, fleshy. Stems erect, slender, leafy. Leaves alternate; petiole 2–3 cm, sheathlike, enlarged basally; leaf blade linear, 3.5–6 cm × ca. 5 mm, pinnatifid; segments 12–20 pairs, ovate, apiculate-dentate.

Inflorescences centrifugal, dense. Pedicel 0.8–1.8 cm. Calyx cylindrical-campanulate, hirsute; tube 1.4–1.6 cm; lobes 5, unequal, serrate. Corolla purple, red, rose, or pink; tube 2.2–3 cm, externally minutely pubescent; beak of galea coiled, ca. 7.5 mm, slender; lower lip 1.8–2 cm, middle lobe oblong, smaller than lateral lobes, placed slightly apically. Filaments pubescent, anterior pair denser. Capsule obliquely oblong, ca. 2.2 cm, ca. 1/2 as long as calyx. Fl. Jul. $2n = 16$.

S Xizang [Sikkim].

109. Ser. *Macranthae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 69. 1890.

大花系 da hua xi

Leaves mostly pseudo-opposite, lanceolate; petiole long. Calyx deeply cleft anteriorly, 5-lobed. Corolla tube short, slightly exceeding calyx; beak ± coiled, long, usually deeply 2-cleft; lower lip usually more than 1.5 cm wide.

Four species: China, Himalayas; one species in China.

329. *Pedicularis insignis* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 109. 1921.

显著马先蒿 xian zhu ma xian hao

Herbs perennial, to 18 cm tall, densely gray downy throughout, drying black. Stems 1 to several, cespitose, unbranched. Basal leaves forming a sparse rosette. Petiole 1.5–5 cm; leaf blade lanceolate-oblong to linear-lanceolate or ovate-oblong, 5–7 × 0.7–2 cm, abaxially densely brown villous along veins, adaxially densely ciliolate, pinnatifid; segments 9–19 pairs, ovate-triangular to triangular, crenate-dentate. Stem leaves few, usually pseudo-opposite, smaller than basal leaves. Inflorescences racemose, 4–11 cm; proximal bracts

leaflike, shorter than flowers. Pedicel erect, 1–1.5 cm, densely villous. Calyx cylindrical, 0.8–1.2 cm, cleft 1/2 anteriorly, densely villous; lobes 5, unequal. Corolla purple-red; tube slightly expanded and curved apically, ca. 1.4 cm, pubescent; galea prominently crested, marginally 1-toothed on each side; beak strongly curved; lower lip ca. 9 mm × 1.7 cm, lobes rounded. Filaments pubescent. Capsule ovoid. Fl. Jul–Aug, fr. Aug–Sep.

• Alpine meadows; 4200–4700 m. SE Xizang, NW Yunnan.

110. Ser. *Pumiliones* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 69. 1890.

低矮系 di ai xi

Herbs low, some stemless, pubescent. Leaves in a rosette, narrowly oblong, ± entire or mostly pinnatifid. Calyx tube very narrow, long, 2-, 3-, or 5-lobed. Corolla tube very long; galea beaked; lower lip large.

Two species: Bhutan, China, Sikkim; both species in China.

1a. Middle lobe of lower corolla lip rounded, emarginate; beak of galea straight, 5–6 mm, 2-cleft; leaves 1.5–4 cm,

with segment pairs 9–30 330. *P. przewalskii*

1b. Middle lobe of lower corolla lip oblong-ovate; beak of galea ± S-shaped, ca. 8 mm, entire; leaves 1–1.5 cm, with

segment pairs 3–9 or entire 331. *P. bella*

330. *Pedicularis przewalskii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 55. 1877.

普氏马先蒿 pu shi ma xian hao

Herbs perennial, 6–12 cm tall, slightly drying black or not. Roots numerous, fascicled, ± fusiform. Stems 1–3, 1–2 cm tall or absent. Leaves mostly basal; petiole 0.1–2.5 cm, glabrous; leaf blade lanceolate-linear, 1.5–4 cm × 1.5–8 mm, adaxially glabrous to densely pubescent, sometimes glandular pubescent, pinnatifid; segments 9–30 pairs, crenate-dentate. Inflorescences centrifugal, 3-

to more than 20-flowered. Calyx ca. 1.1 cm, 2/5 cleft anteriorly; lobes 2, 3, or 5, unequal, grouped posteriorly, serrate apically, long ciliate. Corolla purple-red throughout or with yellowish white throat or white to cream with purple beak; tube 3–3.5 cm, long pubescent; galea bent at a right angle apically, stout, crested or not in front; beak straight, 5–6 mm, slender, deeply 2-cleft with linear lobes, to 3 mm; lower lip deeply lobed, lobes ± equal, middle lobe rounded to emarginate.

Filaments pubescent. Capsule obliquely oblong, ca. as long as calyx, apiculate. Fl. Jun–Jul, fr. Jul–Sep.

• Alpine meadows; 4000–5300 m. S Gansu, E Qinghai, W Sichuan, S and SE Xizang, NW Yunnan.

- 1a. Leaf blade sparsely pubescent to glabrous adaxially 330a. subsp. *przewalskii*
- 1b. Leaf blade densely pubescent.
 - 2a. Calyx lobes usually 2 or 3; leaf blade glandular pubescent 330d. subsp. *microphyton*
 - 2b. Calyx lobes 5; leaf blade not glandular pubescent.
 - 3a. Leaf blade ca. 1.5 cm × 5 mm; corolla purple-red throughout 330b. subsp. *australis*
 - 3b. Leaf blade ca. 2.2 cm × 8 mm; corolla purple-red, except beak of galea, becoming pale when dry 330c. subsp. *hirsuta*

330a. *Pedicularis przewalskii* subsp. *przewalskii*
普氏马先蒿(原亚种) pu shi ma xian hao (yuan ya zhong)

Leaf blade 3–3.5 cm × 4–8 mm, sparsely pubescent to glabrous adaxially, sparsely glandular. Calyx lobes 5. Corolla purple; tube partly long pubescent or glabrous or minutely glandular.

• Alpine meadows; 4000–5000 m. S Gansu, E Qinghai, W Sichuan, S Xizang.

This subspecies includes two varieties: var. *przewalskii* with a purple-red corolla, usually yellowish white throat, and uncrested galea; and var. *cristata* (H. L. Li) P. C. Tsoong with a white to cream colored corolla, a purple beak, and usually crested galea.

330b. *Pedicularis przewalskii* subsp. *australis* (H. L. Li) P. C. Tsoong, Acta Phytotax. Sin. 3: 277. 1955.
南方普氏马先蒿 nan fang pu shi ma xian hao
Pedicularis przewalskii var. *australis* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 113. 1949.

Leaf blade ca. 1.5 cm × 5 mm, densely pubescent, eglandular. Calyx lobes 5. Corolla purple-red throughout; tube long pubescent.

• Alpine meadows; 4300–5300 m. SE Xizang, NW Yunnan.

330c. *Pedicularis przewalskii* subsp. *hirsuta* (H. L. Li) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 352. 1963.

粗毛普氏马先蒿 cu mao pu shi ma xian hao

Pedicularis przewalskii var. *hirsuta* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 113. 1949.

Leaf blade ca. 2.2 cm × 8 mm, densely pubescent, eglandular. Calyx lobes 5. Corolla purple-red except beak, becoming pale when dry.

• Alpine meadows; ca. 4100 m. NW Yunnan.

330d. *Pedicularis przewalskii* subsp. *microphyton* (Bureau & Franchet) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 353. 1963.

矮小普氏马先蒿 ai xiao pu shi ma xian hao

Pedicularis microphyton Bureau & Franchet, J. Bot. (Morot) 5: 107. 1891; *P. przewalskii* var. *microphyton* (Bureau & Franchet) P. C. Tsoong.

Leaf blade ca. 2 cm × 2–4 mm, densely glandular pubescent. Calyx lobes usually 2 or 3. Corolla with purple-red galea and white to pale yellow lower lip, not ciliate; tube appressed hirsute; lower lip not ciliate.

• Alpine meadows; 4200–4800 m. W Sichuan, SE Xizang.

This subspecies includes two varieties: var. *microphyton* (Bureau & Franchet) P. C. Tsoong with a purple-red galea and white to pale yellow lower corolla lip that is not ciliate; and var. *purpurea* (Bonati) P. C. Tsoong with a purple corolla and ciliate lower lip.

331. *Pedicularis bella* J. D. Hooker, Fl. Brit. India 4: 313. 1884.

美丽马先蒿 mei li ma xian hao

Herbs annual, barely 8 cm tall, not drying black. Roots long conical, ± woody. Stems 0.1–3 cm tall, numerous, cespitose, white pubescent. Leaves mostly basal; petiole 0.5–2 cm, sheathlike dilated base, slightly pubescent; leaf blade ovate-lanceolate, 1–1.5 cm, pinnatifid or entire; segments 3–9 pairs, crenate-dentate, abaxially whitish pubescent, adaxially densely pubescent. Flowers axillary, 1–14. Pedicel 3–7 mm, densely long whitish pubescent. Calyx 1.2–1.5 cm × ca. 5 mm, densely white pubescent, 1/3 cleft anteriorly; lobes 5, unequal. Corolla dark purple throughout or some with pale yellow tube, purple galea, and white lower lip; tube 2.8–3.4 cm, pubescent; galea falcate; beak ± S-shaped, ca. 8 mm, not 2-cleft at apex; lower lip 2–2.4 cm wide, middle lobe oblong-ovate, much smaller than lateral pair. Filaments pubescent. Capsule obliquely oblong, ca. 2 × as long as calyx. Fl. Jun–Jul, fr. Jul–Sep.

Meadows, steep rocky slopes among dwarf *Rhododendron*, cliff faces; 3600–4900 m. S and SE Xizang [Bhutan, Sikkim].

- 1a. Leaf blade pinnatifid 331a. subsp. *bella*
- 1b. Leaf blade ± entire 331b. subsp. *holophylla*

331a. *Pedicularis bella* subsp. *bella*

美丽马先蒿(原亚种) mei li ma xian hao (yuan ya zhong)

Leaf blade pinnatifid.

Moist meadows; 4200–4900 m. S Xizang [Bhutan, Sikkim].

331b. *Pedicularis bella* subsp. *holophylla* (Marquand & Shaw) P. C. Tsoong, Acta Phytotax. Sin. 3: 277. 1955.

全叶美丽马先蒿 quan ye mei li ma xian hao

Pedicularis bella J. D. Hooker var. *holophylla* Marquand & Shaw, J. Linn. Soc., Bot. 48: 211. 1929.

Leaf blade ± entire.

• Steep rocky slopes among dwarf *Rhododendron*, cliff faces, alpine meadows; 3600–4400 m. SE Xizang.

This subspecies includes var. *holophylla* with a dark purple or rarely pale red corolla, and var. *crisifrons* P. C. Tsoong with a pale yellow corolla tube, purple galea, and white lower lip.

sometimes ± opposite; petiole 1–2.5 cm, pubescent; leaf blade lanceolate-linear to ± ovate-oblong, 2–4.5 cm × 5–10 mm, glabrous except for pubescent midvein, pinnatisect; segments 9–12 pairs, ovate-triangular to oblong-lanceolate, margin double dentate. Flowers axillary; bracts pubescent. Pedicel 1–1.8 mm, long pubescent. Calyx 1–1.3 cm, 1/3 cleft anteriorly, long pubescent; lobes (2 or)3, unequal, posterior one smallest, lateral pair incised-double dentate. Corolla yellow, 3.3–4 cm; tube 2.5–3 cm, sparsely pubescent; galea falcate apically, conspicuously crested in front; beak ± coiled, ca. 5 mm; lower lip 0.9–1.5 × 1.5–2.1 cm, ciliate, lobes ± equal, emarginate. Filaments densely pubescent apically. Fl. Jul–Aug, fr. Aug–Sep.

• *Pinus* forests; alpine meadows; 3700–4200 m. SW Sichuan, SE Xizang.

333. *Pedicularis cranolopha* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 55. 1877.

凸额马先蒿 tu e ma xian hao

Herbs perennial, 5–23 cm tall, ± pubescent, not drying black. Stems usually cespitose, spreading, unbranched, with 1 or 2 lines of hairs. Basal leaves sometimes withering early; petiole to 3 cm; leaf blade oblong-lanceolate to lanceolate-linear, to 6 × 1.5 cm, pinnatisect; segments to 15 pairs, ovate to lanceolate-oblong, pinnatifid to double dentate. Stem leaves alternate or sometimes proximal ones pseudo-opposite. Inflorescences racemose, few-flowered; bracts leaflike. Calyx 1.2–2 cm, 2/5–1/2 cleft anteriorly, glabrous or slightly pubescent; lobes 3, subequal to unequal, posterior ones sometimes smallest, entire, lateral pair leaflike. Corolla yellow, 4–5 cm, pubescent; tube less than 3 × as long as calyx; galea falcate apically; beak slightly semicircular, 7–8 mm; lower lip ca. 1.3 × 2 cm, densely ciliate, middle lobe emarginate. Filaments densely pubescent. Fl. Jun–Jul, fr. Aug.

• Alpine meadows; 2600–4200 m. SW Gansu, NE Qinghai, Sichuan, NW Yunnan.

1a. Calyx tube ± reticulate veined apically, posterior lobe very small 333a. var. *cranolopha*

1b. Calyx tube not reticulate veined, posterior lobe usually larger.

2a. Crest on galea modified into a prominent, slender, attenuate process 333b. var. *longicornuta*

2b. Crest on galea smaller, a mere bulge, not elongated into a pointed process 333c. var. *garnieri*

333a. *Pedicularis cranolopha* var. *cranolopha*

凸额马先蒿(原变种) tu e ma xian hao (yuan bian zhong)

Calyx tube ± reticulate veined apically; posterior lobe very small.

• Alpine meadows; ca. 3800 m. SW Gansu, NE Qinghai, N Sichuan.

333b. *Pedicularis cranolopha* var. *longicornuta* Prain, Hooker's Icon. Pl. 23: t. 2208B. 1894.

长角凸额马先蒿 chang jiao tu e ma xian hao

Pedicularis birostris Bureau & Franchet.

Calyx tube not reticulate veined; posterior lobe usually large. Galea crest modified into a slender attenuate process.

• Alpine meadows; 2600–4200 m. SW Gansu, NE Qinghai, Sichuan, NW Yunnan.

333c. *Pedicularis cranolopha* var. *garnieri* (Bonati) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 359. 1963.

格氏凸额马先蒿 ge shi tu e ma xian hao

Pedicularis garnieri Bonati, Bull. Soc. Bot. France 55: 243. 1908.

Calyx tube not reticulate veined; posterior lobe usually large. Galea crest short, not elongated into a prominent pointed process.

• W Sichuan.

334. *Pedicularis tricolor* Handel-Mazzetti, Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 59: 250. 1922.

三色马先蒿 san se ma xian hao

Herbs annual, less than 5 cm tall. Stems 1 to several, unbranched, central stem erect, outer stems procumbent, longer, glabrous. Basal leaves numerous; petiole 1.5–4 cm; leaf blade lanceolate, 2.5–4.5 × 0.7–1.2 cm, glabrous, abaxially sparsely white scurfy, pinnatipartite; segments 11–14 pairs, lanceolate, incised-dentate. Stem leaves usually 2, opposite. Inflorescences racemose, to 15-flowered; bracts leaflike. Pedicel 2–8 mm, glabrous. Calyx tube ovate, 0.8–1.2 cm, to 4/5 cleft anteriorly, densely long white pubescent; lobes 3, equal, leaflike. Corolla yellow, with red galea, and white margin on lower lip; tube 3.5–5 cm, pubescent basally; galea and beak circular, ± crested, 1.5–1.7 cm; lower lip ca. 1.7 × 3 cm, glabrous, middle lobe emarginate, lateral lobes rounded or emarginate. Filaments pubescent. Fl. Aug–Sep, fr. Sep–Oct.

• Alpine meadows; 3000–3600 m. NW Yunnan.

1a. Lateral lobes of lower corolla lip rounded, not emarginate 334a. var. *tricolor*

1b. All 3 lobes of lower corolla lip emarginate 334b. var. *aequiretusa*

334a. *Pedicularis tricolor* var. *tricolor*

三色马先蒿(原变种) an se ma xian hao (yuan bian zhong)

Lower corolla lip with lateral lobes rounded, not emarginate.

• Alpine meadows; 3000–3600 m. NW Yunnan.

334b. *Pedicularis tricolor* var. *aequiretusa* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 419. 1963.

等凹三色马先蒿 deng ao san se ma xian hao

Lower corolla lip with all 3 lobes emarginate.

• NW Yunnan.

335. *Pedicularis chinensis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 24: 57. 1877.

中国马先蒿 zhong guo ma xian hao

Herbs annual, to 30 cm tall, not drying black. Stems 1 to several, erect or outer stems ascending to procumbent, sometimes branched apically, with lines of hairs or glabrescent. Leaves basal and on stem; petiole to 4 cm, distal ones shorter, long pubescent; leaf blade lanceolate-oblong to linear-oblong, to 7 × 1.8 cm, glabrous on both surfaces, pinnatifid; segments 7–13 pairs, ovate, margin double dentate. Inflorescences long racemose; bracts leaflike, densely ciliate. Pedicel to 1 cm, pubescent. Calyx tubular, 1.5–1.8 cm, densely pubescent, sometimes with purplish dots, 2/5 cleft anteriorly; lobes 2, leaflike, incised-double dentate. Corolla yellow; tube 4.5–5 cm, pubescent; galea slightly bent apically, forming nearly a circle, not crested; beak semicircular, 9–10 mm; lower lip wider than long, ca. 2 cm wide, lobes rounded, densely ciliate. Filaments densely pubescent. Capsule oblong-lanceolate, ca. 1.9 cm × 7 mm. Fl. Jul, fr. Aug.

• Alpine meadows; 1700–2900 m. C and S Gansu, Hebei, Nei Mongol, NE Qinghai, Shaanxi, Shanxi.

This species includes two forms: *f. chinensis* with a yellow corolla and *f. erubescens* P. C. Tsoong with a pale purple-red corolla.

336. *Pedicularis longiflora* Rudolph, Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 4: 345. 1811.

长花马先蒿 *chang hua ma xian hao*

Herbs annual, 10–18 cm tall. Stems usually short, glabrescent. Basal leaves in a rosette; petiole 1–2 cm, sparsely long ciliate; leaf blade lanceolate to narrowly oblong, glabrous on both surfaces, pinnatifid to pinnatipartite; segments 5–9 pairs, margin double dentate. Stem leaves alternate or pseudo-opposite, with shorter petioles. Flowers axillary. Pedicel short. Calyx tubular, 1.1–1.5 cm, 2/5 cleft anteriorly, glabrous except for fine ciliate lobes; lobes 2 or 3, ± palmatipartite. Corolla yellow, some with a narrow maroon stripe on each antero-lateral ridge of palate, 5–8 cm; tube pubescent; galea gradually curving into beak; beak semicircular, ca. 6 mm, 2-cleft at apex; lower lip 1.1–1.2 × ca. 2 cm, long ciliate, all lobes emarginate. Filaments densely pubescent. Capsule lanceolate, to 2.2 cm × 6 mm. Seeds narrowly ovoid, ca. 2 mm. Fl. Jul–Sep, fr. Aug–Oct. $2n = 16$.

Alpine meadows, along streams, springs, seeps; 2100–5300 m. Gansu, Hebei, Nei Mongol, Qinghai, W Sichuan, SE Xizang, NW Yunnan [India, Kazakstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia), Sikkim, Tajikistan, Turkmenistan, Uzbekistan].

Kharkevich (pers. comm.) indicated that further study is necessary since Russian plants are perennial.

1a. Corolla large, lower lip without a maroon stripe 336a. var. *longiflora*

1b. Corolla smaller, lower lip with a narrow maroon stripe on each antero-lateral ridge of palate.

2a. Leaves alternate; calyx lobes 2

..... 336b. var. *tubiformis*

2b. Leaves pseudo-opposite; calyx

lobes 3 336c. var. *yingshanensis*

336a. *Pedicularis longiflora* var. *longiflora*

长花马先蒿(原变种) *hang hua ma xian hao* (yuan bian zhong)

Corolla large; lower lip without a maroon stripe.

Alpine moist meadows, along streams; 3300–3500 m. Gansu, Hebei, Qinghai [Kazakstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

336b. *Pedicularis longiflora* var. *tubiformis* (Klotzsch) P. C. Tsoong, Bull. Brit. Mus. (Nat. Hist.) Bot. 1: 7. 1955.

管状长花马先蒿 *guan zhuang chang hua ma xian hao*

Pedicularis tubiformis Klotzsch in Klotzsch & Garcke, Bot. Ergebn. Reise Waldemar 106. 1862; *P. longiflora* subsp. *tubiformis* (Klotzsch) Pennell.

Leaves alternate. Calyx lobes 2. Corolla small; lower lip with a narrow maroon stripe on each antero-lateral ridge of palate. Fl. and fr. May–Oct.

Alpine meadows, springs, seeps, along streams; 2700–5300 m. W Sichuan, SE Xizang, NW Yunnan [Nepal, Pakistan, Sikkim].

336c. *Pedicularis longiflora* var. *yingshanensis* Z. Y. Chu & Y. Z. Zhao, Acta Sci. Nat. Univ. Intramongol. 19: 175. 1988.

阴山长花马先蒿 *yin shan chang hua ma xian hao*

Leaves pseudo-opposite. Calyx lobes 3. Corolla small; lower lip with a narrow maroon stripe on each antero-lateral ridge of palate. Fl. Aug.

• Alpine marshy meadows; ca. 2100 m. Nei Mongol (Yingshan).

337. *Pedicularis bidentata* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 533. 1888.

二齿马先蒿 *er chi ma xian hao*

Herbs 6–8 cm tall, gray pubescent throughout. Roots fusiform, slender. Stems nearly absent, tufted. Leaves basal; petiole to 2–3.5 cm; leaf blade linear-oblong, ca. 5 × 1 cm, base attenuate, undulate-lobed; segments subrounded, shallowly undulate-dentate. Flowers axillary, 2–4. Pedicel short. Calyx cylindrical, ca. 1.5 cm, with reticulate veins; lobes 2, elliptic, ca. 5 mm, incised-serrate. Corolla yellow; tube ca. 7.5 cm × 1.5 mm, more than 4 × as long as calyx, pubescent; galea curving downward into a horseshoe-shape; beak nearly straight, ca. 7 mm, ca. as long as galea; lower lip ca. 1.7 × 2.5 cm, middle lobe rounded, ca. 6 × 8 mm, ca. 1/3 as large as lateral lobes. Filaments red pubescent.

• N Sichuan.

338. *Pedicularis armata* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 56. 1877.

刺齿马先蒿 *ci chi ma xian hao*

Herbs perennial, 8–16 cm tall, not drying black. Stems usually tufted, central stem erect, outer stems ascending to procumbent, usually longer than central stem, densely fine pubescent. Basal leaf petiole to 4 cm. Stem leaf petiole barely 1–2 cm, narrowly winged, white long ciliate; leaf blade linear-oblong, 2–4 cm × 4–10 mm, abaxially glabrous but with sparse scurfy dots, adaxially densely pubescent along midvein, pinnatipartite; segments 4–9 pairs, triangular-ovate to ovate, margin double dentate. Flowers axillary, many. Pedicel to 1 cm, densely pubescent. Calyx 1.6–2 cm; tube cylindric, 1/3 cleft anteriorly, densely pubescent, reticulate-veined; lobes 2, ± palmately 3–5-divided. Corolla yellow throughout or lower lip with 3 crimson or maroon spots, pubescent, 5–9 cm; galea bent at a right angle apically; beak pointing forward, semicircular, ca. 1.5 cm; lower lip large, less than 2.6 cm wide, long ciliate. Filaments densely pubescent. Fl. Aug–Sep, fr. Sep.

• Alpine meadows, sunny slopes, turf; 3000–4600 m. Gansu, Qinghai, N Sichuan.

1a. Lower lip of corolla not spotted 338a. var. *armata*

1b. Lower lip of corolla with 3 spots 338b. var. *trimaculata*

338a. *Pedicularis armata* var. *armata*

刺齿马先蒿(原变种) *ci chi ma xian hao* (*yuan bian zhong*)

Corolla yellow throughout, not spotted.

• Alpine meadows; 3700–4600 m. SW Gansu, N Sichuan.

338b. *Pedicularis armata* var. *trimaculata* X. F. Lu in T. N.

Ho, B. Bartholomew, & M. G. Gilbert, *Novon* 6: 190. 1996.

三斑刺齿马先蒿 *san ban ci chi ma xian hao*

Lower corolla lip with 3 crimson or maroon, linear or narrowly elliptic spots.

• Alpine meadows in moist areas or sunny slopes and in turf; 3000–4000 m. Gansu, Qinghai.

339. *Pedicularis latituba* Bonati, *Bull. Soc. Bot. France* 55: 243. 1908.

粗管马先蒿 *cu guan ma xian hao*

Herbs perennial, barely 10 cm tall, drying black or not. Stems 1 to several, 1–2(–5) cm, with lines of hairs.

Basal leaves usually in a rosette; petiole 1–2 cm, winged, pubescent; leaf blade lanceolate-oblong, 1–2 cm, glabrescent on both surfaces, pinnatipartite to pinnatisect; segments 5–11 pairs, triangular-ovate to ovate. Stem leaves alternate, sometimes pseudo-opposite on lateral branches. Flowers few, axillary, dense. Pedicel to 1–2 cm, with 2 lines of dense hairs. Calyx ± tubular, 1/3–1/2 cleft anteriorly; tube 8–10 mm; lobes (2 or) 3, deeply pinnatipartite. Corolla purple-red; tube 3–4.5 cm × ca. 2 mm, purple pubescent; galea twisted falcate, ± crested in front; beak ± semicircular, ca. 5 mm; lower lip 8–10 mm × 1.8–2 cm, short ciliate, lobes emarginate. Filaments pubescent.

• W Sichuan, SE Xizang.

340. *Pedicularis decorissima* Diels, *Notizbl. Bot. Gart. Berlin-Dahlem* 10: 891. 1930.

极丽马先蒿 *ji li ma xian hao*

Herbs perennial, to 15 cm tall, drying dark brown.

Stems usually several, densely tufted, outer stems usually procumbent to ascending, longer than central stem. Leaves basal and on stem; petiole 1–3(–6) cm, ± long pubescent; leaf blade linear to lanceolate-oblong, 2–7 × ca. 1.8 cm, glabrous except finely pubescent along midvein adaxially, usually pinnatipartite; segments 6–9 pairs, triangular to triangular-ovate, margin double dentate. Stem leaves sometimes pseudo-opposite. Flowers axillary. Pedicel short. Calyx more than 2 cm, densely long pubescent, ca. 1/2 cleft anteriorly; lobes 2, shallowly pinnatifid. Corolla rose-pink; tube to 12 cm, sparsely pubescent; galea slightly twisted, densely pubescent at middle, prominently crested in front; beak curved below; lower lip to 2.8 cm wide, long ciliate, rounded. Filaments densely pubescent. Fl. Jun–Aug, fr. Aug–Sep.

• Alpine meadows; 2900–3500 m. SW Gansu, E Qinghai, W Sichuan.

341. *Pedicularis humilis* Bonati, *Notes Roy. Bot. Gard. Edinburgh* 13: 106. 1921.

矮马先蒿 *ai ma xian hao*

Herbs perennial, low, with 5–15 cm stems. Roots numerous, fusiform. Stems numerous, creeping, slightly branched or unbranched, glabrescent. Basal leaf petiole ca. 2 mm, glabrous; leaf blade ca. 1.5 cm × 7–10 mm, pinnatisect; segments 5 or 6 pairs, ovate, pinnatifid, incised-dentate. Stem leaves alternate or rarely ± opposite, similar to basal leaves but smaller and shorter petiolate; bracts leaflike. Flowers axillary, few. Pedicel erect, 3–10 mm, glabrous. Calyx 5–6 mm, membranous, puberulent when young, glabrescent, deeply cleft anteriorly; lobes 2, palmately cleft distally, ciliate.

Corolla rose; tube 1–2.5 cm, pubescent; galea twisted basally, glandular pubescent, slightly crested; beak S-shaped, slender, 7–8 mm; lower lip 9–10 mm × ca. 1.5 cm, lobes emarginate, densely ciliate. Filaments 2 pubescent, 2 glabrous. Fl. Jul, fr. Aug.

• Alpine meadows; 3000–3100 m. NW Yunnan.

342. *Pedicularis variegata* H. L. Li, *Proc. Acad. Nat. Sci. Philadelphia* 101: 193. 1949.

变色马先蒿 *bian se ma xian hao*

Herbs perennial, less than 15 cm tall. Stems numerous, cespitose, diffuse or erect, unbranched, pubescent. Leaves basal and on stem, alternate; petiole to 2.5(–6.5) cm, pubescent; leaf blade oblong-ovate or oblong, to 4 × 1.4 cm, scabrous pubescent on both surfaces, pinnatisect; segments 9–12 pairs, ovate, dentate. Flowers axillary, ± sessile. Calyx campanulate, 7–9 mm, enlarged apically, to 6 mm wide, sparsely long pubescent, deeply cleft anteriorly; lobes 3, unequal, lateral pair larger, margin double dentate. Corolla white, with purple galea; tube erect, 3.5–4.5 cm, usually sparsely pubescent; galea strongly twisted, glandular

pubescent, inconspicuously crested; beak S-shaped, 9–10 mm; lower lip 8–9 mm × 1.8–1.9 cm, minutely ciliate, middle lobe ca. 1/3 as long as lateral lobes or smaller, entire, truncate or rounded. Anterior filament pair sparsely pubescent apically. Fl. Aug, fr. Sep.

• Swampy meadows; 4100–4200 m. SW Sichuan, Yunnan.

343. *Pedicularis fastigiata* Franchet, Bull. Soc. Bot. France 47: 25. 1900.

帚状马先蒿 zhou zhuang ma xian hao

Herbs ca. 30 cm tall. Stems erect, unbranched, glabrescent, striate, leafy throughout. Proximal leaves alternate, distal ones ± opposite; petiole long, glabrous; leaf blade linear, ca. 1 cm wide, abaxially sparsely white scurfy, pinnatisect; segments lanceolate, serrulate. Flowers axillary, proximal ones widely spaced, distal ones dense and fastigiata; sessile. Calyx ovate-oblong, ca. 1 cm, deeply cleft anteriorly; lobes 3, leaflike.

Corolla rose, with a deep red galea; tube 3.5–4 cm, slender, minutely pubescent; galea twisted, narrowly crested; beak semicircular; lower lip ca. 1 cm wide, middle lobe ca. 1/2 as large as lateral lobes, rounded. Filaments glabrous.

• NW Yunnan.

344. *Pedicularis leptosiphon* H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 194. 1949.

纤管马先蒿 xian guan ma xian hao

Herbs perennial, to 20 cm tall. Stems numerous, erect or ± diffuse, long pubescent when young, glabrescent. Leaves basal and on stem, alternate; petiole to 4 cm, long pubescent; leaf blade oblong or linear-oblong, to 3.5 × 1.1 cm, pinnatisect; segments 8–11 pairs, widely spaced, ovate, becoming glabrous or sparsely pubescent, dentate. Proximal flowers axillary, distal ones dense, ± sessile; bracts leaflike. Calyx ca. 1 cm × 3 mm, sparsely long pubescent, deeply cleft anteriorly; lobes 3–5, unequal, posterior-lateral pair largest, pinnatifid. Corolla white; tube erect, slender, 6.5–7.5 cm × ca. 1 mm; galea strongly twisted, 9–10 mm, glandular pubescent; beak S-shaped; lower lip ca. 8 mm × 1.7 cm, finely ciliate, middle lobe truncate. Anterior filament pair sparsely pubescent apically. Fl. Jul, fr. Aug.

• Alpine meadows; ca. 4000 m. SW Sichuan, Yunnan.

345. *Pedicularis paxiana* H. Limpricht, Repert. Spec. Nov. Regni Veg. Beih. 12: 483. 1922.

派氏马先蒿 pai shi ma xian hao

Herbs perennial, low, mostly stemless. Roots fleshy, fascicled. Leaves basal, barely in a rosette, glabrous; petiole flat, winged; leaf blade ca. 10 × 1 cm, pinnatipartite; segments semirounded, crenate-dentate. Calyx campanulate, white long woolly, 2-lobed. Corolla white; tube 8–9(–10) × as long as calyx; galea twisted, circular; lobes of lower lip with rounded lateral lobes, very large. Filaments pubescent. Stigma long exerted.

• About 4300 m. W Sichuan.

346. *Pedicularis dolichantha* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 107. 1921.

疏花马先蒿 shu hua ma xian hao

Herbs perennial, 15–30 cm tall, drying slightly black. Roots fleshy. Stems single, erect, unbranched, sparsely long pubescent. Basal leaves withering early. Stem leaves numerous, alternate, pubescent; petiole 1.5–4 cm, narrowly winged, ciliate; leaf blade linear to oblong, 2.5–6 × ca. 1 cm, pinnatisect or pinnatipartite; segments 10–18 pairs, ovate or triangular, incised-dentate. Flowers axillary. Pedicel erect, ca. 5 mm, slender. Calyx cylindrical, 1.2–1.8 cm, papery, scabrous pubescent, deeply cleft anteriorly, usually 2-lobed, pinnatifid to ± palmately lobed. Corolla rose; tube 3–5 cm, pubescent; galea strongly twisted, narrowly crested, glabrous; beak S-shaped, ca. 1 cm, slender; lower lip ciliate, middle lobe entire, ± rounded. Filaments 2 pubescent, 2 glabrous. Fl. Jul–Aug, fr. Sep.

• Meadows, beside ponds; ca. 3200 m. E Yunnan.

347. *Pedicularis tenuituba* Pennell & H. L. Li in H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 101: 195. 1949.

狭管马先蒿 xia guan ma xian hao

Herbs perennial, to 30 cm tall. Stems numerous, unbranched, glabrous or sparsely long pubescent. Leaves basal and on stem; petiole to 4 cm, narrowly winged, long pubescent; leaf blade oblong or linear, ca. 9 × 1.6 cm, glabrescent or sparsely pubescent, pinnatisect; segments 10–15 pairs, ovate, dentate. Stem leaves alternate, rarely ± opposite, similar to basal leaves but slightly smaller. Flowers axillary, proximal ones lax, ± sessile or short pedicellate. Calyx cylindrical, 7–8 mm, deeply cleft anteriorly; lobes 3, unequal. Corolla purple; tube slender, erect, 8–11 cm × 6–8 mm, glabrous or sparsely pubescent; galea strongly twisted, inconspicuously crested, glandular pubescent; beak S-shaped, 8–10 mm; lower lip 8–9 mm × 1.4–1.6 cm, ciliate, middle lobe truncate. Anterior filament pair pubescent apically. Capsule oblong, ca. 1.7 cm × 6 mm. Fl. Jul–Aug, fr. Aug.

• Alpine meadows; 3000–3200 m. SW Sichuan, Yunnan.

348. *Pedicularis sigmoidea* Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 32: 535. 1888.

之行喙马先蒿 zhi xing hui ma xian hao

Herbs perennial, to 30 cm tall, stout, drying slightly black. Stems numerous, central one erect, outer stems procumbent to ascending, usually longer, striate, ± pubescent. Leaves mostly on stem, usually pseudo-opposite to pseudo-whorled; proximal petioles to 2.5 cm, narrowly winged, pubescent; leaf blade ovate-lanceolate to linear-lanceolate, to 5 × 1.6 cm, abaxially sparsely long pubescent along veins, densely gray scurfy throughout, adaxially pubescent, pinnatisect;

segments 5–11 pairs, ovate to lanceolate, pinnatifid, incised double dentate. Inflorescences 2/3–5/6 as long as stems; flowers numerous, dense apically; bracts leaflike. Calyx ca. 1.6 cm, ca. 1/2 cleft anteriorly, pubescent; lobes 3, pinnatifid to ± palmately lobed, posterior one smallest. Corolla purple-red; tube slender, 3.2–5.5 cm × ca. 1.2 mm, densely pubescent; galea strongly twisted apically; beak bent upward, S-shaped, to 1–1.5 cm; lower lip 1.8–2.4 cm wide, densely ciliate, middle lobe shallowly 2-lobed. Filaments densely pubescent. Fl. Aug–Sep, fr. Sep–Oct.

• Open stony pastures; 3000–3600 m. NW Yunnan.

349. *Pedicularis siphonantha* D. Don, Prodr. Fl. Nepal. 95. 1825.

管花马先蒿 *guan hua ma xian hao*

Herbs perennial, low to tall. Roots to 7 cm, usually cylindrical. Stems single and ± erect, or sometimes numerous and outer stems procumbent, striate, glabrescent. Leaves basal and on stem; petiole to 3.5 cm, winged, glabrescent or sparsely long pubescent; leaf blade lanceolate-oblong to linear-oblong, rarely ovate-elliptic, 1–6 × 0.7–1.6 cm, abaxially sparsely long pubescent along midvein, adaxially sparsely pubescent, pinnatisect; segments 6–15 pairs, somewhat lanceolate to broadly ovate or triangular, pinnatifid, or double dentate. Flowers axillary, dense; bracts leaflike, glabrescent or long ciliate. Calyx pubescent; tube to 1.2 cm, 1/3 cleft anteriorly; lobes 2(or 3 or 5), posterior one smallest. Corolla rose-red; tube 4–7 cm, finely pubescent; galea strongly twisted apically, with or without a conspicuously auriculate protrusion; beak semicircular or slightly S-shaped, to 1.1 cm, slender;

lower lip 1.1–1.5 × 1.5–1.8 cm, lobes emarginate or shallowly 2-lobed. Anterior filament pair pubescent. Capsule ovoid-oblong. Fl. Jun–Jul, fr. Jul–Aug. $2n = 16$.

Alpine meadows, swampy places; 3000–4600 m. W Sichuan, S and SE Xizang, NW Yunnan [Bhutan, India, Nepal, Sikkim].

- 1a. Auriculate protrusion of galea conspicuous; calyx lobes 2(or 3); roots ± cylindric or sometimes slightly fusiform 349a. var. *siphonantha*
 1b. Auriculate protrusion of galea inconspicuous or nearly absent; calyx lobes usually 5; roots usually strongly fusiform 349b. var. *delavayi*

349a. *Pedicularis siphonantha* var. *siphonantha*

管花马先蒿(原变种) *guan hua ma xian hao* (yuan bian zhong)

Roots ± cylindric or sometimes slightly fusiform. Calyx lobes 2(or 3). Galea with conspicuous auriculate protrusion.

Alpine meadows, swampy places; 3500–4500 m. S and SE Xizang [Bhutan, India, Nepal, Sikkim].

349b. *Pedicularis siphonantha* var. *delavayi* (Franchet ex Maximowicz) P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 374. 1963.

台氏管花马先蒿 *tai shi guan hua ma xian hao*
Pedicularis delavayi Franchet ex Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 531. 1888.
 Roots usually strongly fusiform. Calyx lobes usually 5. Galea with inconspicuous auriculate protrusion or nearly none.

• Alpine moist meadows; 3000–4600 m. W Sichuan, NW Yunnan.

112. Ser. *Megalanthae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 68. 1890.

硕花系 *shuo hua xi*

Herbs ± tall. Stems erect, unbranched. Leaves alternate, ovate-lanceolate to linear-oblong. Inflorescence racemose, centrifugal. Calyx 5-lobed. Corolla tube very long; galea toothless; lower lip large, usually enveloping galea; beak curved, slender.

About four species: Bhutan, China, India, Myanmar, Nepal, Pakistan, Sikkim; three species in China.

1a. Herbs annual, to more than 45 cm tall; roots not fusiform; calyx less than 1/3 cleft anteriorly 352. *P. megalantha*

1b. Herbs perennial, less than 15 cm tall; roots ± fusiform; calyx 1/2–2/3 cleft anteriorly.

2a. Corolla mainly yellow, with red beak or brown-red galea, some red throughout; corolla tube 1.5–3.8 cm;

leaf blade 2–5.5 cm, pinnatipartite or pinnatifid; calyx 2/3 cleft anteriorly 350. *P. megalochila*

2b. Corolla yellow throughout; corolla tube 5–6.5 cm; leaf blade 1–2.5 cm, pinnatisect; calyx 1/2 cleft anteriorly 351. *P. zhongdianensis*

350. *Pedicularis megalochila* H. L. Li, Taiwania 1: 91. 1948.

大唇马先蒿 *da chun ma xian hao*

Herbs perennial, less than 15 cm tall, not drying black. Roots fascicled, ± fusiform. Stems single or cespitose, white strigose. Leaves mostly basal; petiole to 2 cm; leaf blade oblong-lanceolate, 2–5.5 × 0.8–1.3 cm, abaxially glabrescent, adaxially pubescent along

midvein, pinnatifid to pinnatipartite; segments 6–14 pairs, triangular-ovate to ovate-oblong, margin double dentate. Stem leaves few, smaller than basal leaves; segments only 5 or 6 pairs. Inflorescences centrifugal, usually more than 1/2 as long as stems; bracts leaflike, much shorter than flowers. Pedicel to 1 cm, densely long pubescent apically. Calyx usually with purplish

dots, 2/3 cleft anteriorly; tube to 8–9 mm; lobes 5, unequal, long white ciliate. Corolla yellow, with brown-red or purple beak or corolla red throughout; tube ± erect, 1.5–3.8 cm, pubescent; galea falcate apically; beak semicircular, to 1 cm; lower lip ca. 2 × 2.5 cm, middle lobe obcordate, emarginate or ligulate, not placed apically. Filaments pubescent or anterior pair densely villous and posterior pair glabrous. Fl. Jul–Aug, fr. Aug–Sep.

Grassy slopes, among *Rhododendron*, alpine meadows, thickets; 3800–4600 m. SE and SW Xizang [Bhutan, Myanmar].

- 1a. Corolla red throughout, mainly yellow with purple beak or red galea, or yellow with a red beak; corolla tube ca. 1.5 cm; middle lobe of lower lip obcordate; all filaments pubescent 350a. var. *megalochila*
1b. Corolla yellow with brown-red galea; corolla tube to 3.8 cm; middle lobe of lower lip ligulate; anterior filament pair densely villous, posterior pair glabrous . 350b. var. *ligulata*

350a. *Pedicularis megalochila* var. *megalochila*

大唇马先蒿(原变种) da chun ma xian hao (yuan bian zhong)

Corolla red throughout, mainly yellow with purple beak or red galea, or yellow with a red beak; corolla tube ca. 1.5 cm; middle lobe of lower lip obcordate. Filaments pubescent.

Grassy slopes, among *Rhododendron*; ca. 4200 m. SE and SW Xizang [Bhutan, Myanmar].

This variety includes two forms: f. *megalochila* with a yellow corolla but with a red beak, and f. *rhododantha* P. C. Tsoong with an entirely red corolla.

350b. *Pedicularis megalochila* var. *ligulata* P. C. Tsoong, Acta Phytotax. Sin. 3: 279. 1955.

舌状大唇马先蒿 she zhuang da chun ma xian hao

Corolla yellow with brown-red galea; tube to 3.8 cm; middle lobe of lower lip ligulate. Anterior filament pair densely villous, posterior pair glabrous.

• Alpine meadows, thickets; 4200–4300 m. SE Xizang.

351. *Pedicularis zhongdianensis* H. P. Yang, Acta Bot. Yunnan. 6: 277. 1984.

中甸马先蒿 zhong dian ma xian hao

Herbs perennial, ca. 10 cm tall. Roots filiform, ± fusiform, slightly fleshy. Stems usually 3–5 cespitose, ca. 1 cm tall or nearly rudimentary. Basal leaves in a rosette; petiole ca. 1 cm, densely ciliate; leaf blade ovate-oblong to oblong, 1–2.5 cm, abaxially white scurfy, adaxially glabrescent, pinnatisect; segments 4–14 pairs, ovate-oblong, dentate. Flowers axillary. Pedicel ca. 2 mm. Calyx ca. 2 cm, densely white villous, 1/2 cleft anteriorly; lobes 5, unequal, leaflike. Corolla yellow, ca. 6.5 cm; tube 5–6.5 cm, pubescent; galea nearly falcate; beak curved to reflexed, 5–6 mm; lower lip usually enveloping galea, 1.5–1.8 × 2.5–3 cm, ciliate. Anterior filament pair pubescent. Fl. Aug, fr. Sep.

• *Pinus* forests on slopes; ca. 3300 m. NW Yunnan.

352. *Pedicularis megalantha* D. Don, Prodr. Fl. Nepal. 94. 1825.

硕花马先蒿 shuo hua ma xian hao

Herbs annual, (6–)45 cm tall, not drying black. Roots fibrous. Stems cespitose or single, glabrescent. Basal leaves usually withering early. Stem leaves few; petiole 4–6 cm; leaf blade linear-oblong, 5–7 × 2–3.5 cm, abaxially sparsely white scurfy, adaxially sparsely puberulent, pinnatipartite; segments 7–12 pairs, oblong-ovate to triangular-lanceolate, sinuate-dentate.

Inflorescences centrifugal, to more than 30 cm; bracts leaflike. Pedicel 5–12 mm. Calyx oblong, pubescent, less than 1/3 cleft anteriorly; lobes 5, unequal. Corolla usually red-rose; tube 3–6 cm, 2–4 × as long as calyx; galea bent at a right angle apically; beak circular, 1.2–1.4 cm; lower lip completely enveloping galea, 2.5–3.5 cm wide, ciliate. Anterior filament pair pubescent. Capsule ovoid-lanceolate, ca. 3 cm × 9 mm. Fl. Jun–Aug, fr. Jul–Sep. $2n = 16$.

Swampy places at forest margins, damp grassy slopes; 2300–4200 m. S and SE Xizang [Bhutan, India (Darjeeling), Nepal, Pakistan, Sikkim].

Additional Entities Described from China

The following (reportedly in Xinjiang) are of uncertain status in China so they are listed here for convenience:

Pedicularis maximowiczii Krassnow, *P. albertii* Regel, and *P. chorgossica* Regel & Winkler (see Novon 7: 373–375. 1998); also *P. geniculata* T. Yamazaki, *P. karakorumiensis* T. Yamazaki, and *P. mustanghatana* T. Yamazaki (see J. Jap. Bot. 68(3): 142–148. 1993).

58. PTERYGIELLA Oliver in W. J. Hooker, Icon. Pl. 25: t. 2463. 1896.

翅茎草属 chi jing cao shu

Herbs, or shrubs, annual or perennial, erect, sometimes with long rhizomes. Stems basally woody, narrowly 4-winged or terete and wingless. Leaves opposite, decussate, sessile or subsessile; leaf blade mostly lanceolate, margin entire or serrate. Racemes terminal; bracts foliaceous. Flowers opposite, few. Pedicel short. Bracteoles 2, at pedicel apex. Calyx tube broadly campanulate, 5-veined, somewhat 2-lipped; lobes 5, 2 upper lobes shorter than other lobes, margin entire. Corolla 2-lipped, slightly longer than calyx; tube funnelliform; lower lip usually nearly as long as upper, 3-lobed, lobes subequal, with 2 raised folds; upper lip 2-lobed, lobes arched, recurved at margin. Stamens didynamous; filaments inserted below middle of corolla tube; anthers 2-loculed, dorsifixed; anther locules parallel,

longitudinally dehiscent, densely white villous. Ovary usually ovoid, 2-loculed, densely hirsute. Style densely villous; stigma 2-lobed. Capsule black-brown. Seeds numerous, small; seed coat scrobiculate-reticulate or seed enclosed in large bladderly loose hyaline reticulated appendage.

• Five species: endemic to China.

1a. Shrubs, ca. 100 cm tall 5. *P. suffruticosa*

1b. Herbs, 14–60 cm tall.

2a. Leaves orbicular-ovate, margin subentire to serrate; seeds 1–1.2 mm, enclosed in a bladderly loose hyaline

reticulate appendage; corolla dark brown 4. *P. bartschioides*

2b. Leaves often linear, sometimes lanceolate to narrowly lanceolate, margin entire to rarely subundulate; seeds

usually less than 0.5 mm, without a reticulate appendage; corolla yellow.

3a. Stems terete, wingless; leaves 3-veined 3. *P. cylindrica*

3b. Stems quadrangular, winged along ribs; leaves 1-veined.

4a. Leaf blade densely glandular pubescent, apex obtuse or subacute; corolla 1.6–1.8 cm 1. *P. nigrescens*

4b. Leaf blade subglabrous to sparsely pubescent, apex narrowly acute; corolla 1.4–1.6 cm 2. *P. duclouxii*

1. *Pterygiella nigrescens* Oliver in W. J. Hooker, Icon. Pl. 25: t. 2463. 1896.

翅茎草 *chi jing cao*

Herbs, 25–35(–50) cm tall, glandular pubescent. Stems 1, rigid, to 3.5 mm in diam., quadrangular, winged along ribs, unbranched or with 1–4 pairs of opposite branches. Leaves below smaller than others and often deciduous; leaf blade lanceolate to narrowly so, 1.5–3 cm × 3–5 mm, densely brown glandular pubescent, base broadly cuneate, subamplexicaul, decurrent into stem wing, margin entire, apex obtuse to subacute, 1-veined. Racemes 1/3–1/2 of stem length; bracts longer than flowers. Pedicel 1–1.5 mm, slender. Bracteoles ca. 4 mm. Calyx 1.2–1.5 cm × 7–9 mm; lobes triangular-ovate. Corolla yellow, 1.6–1.8 cm, pubescent; tube 1–12 mm; upper lip ± galeate, 6–7 mm, emarginate. Stamens included; anther locules ca. 1.5 mm. Capsule ovoid, 8–10 mm. Seeds black, less than 0.5 mm. Fl. Jul–Oct, fr. Sep–Oct.

• Scrub; 1700–2600 m. Yunnan.

2. *Pterygiella duclouxii* Franchet, Bull. Soc. Bot. France 67: 22. 1900.

杜氏翅茎草 *du shi chi jing cao*

Annuals, 20–35(–55) cm tall, black when dry, subglabrous to sparsely villous, mostly with eglandular hairs. Stems 1 or 2–7-fascicled, quadrangular, winged along ribs. Leaves early deciduous below, sessile, linear, rarely linear-lanceolate, 1.5–4.5 cm × 2–6 mm, herbaceous, subglabrous to sparsely pubescent, base cuneate, margin entire, apex narrowly acute; midvein abaxially raised. Racemes 1/4–1/2 of stem length. Flowers 4–6, often paired. Bracteoles linear. Calyx 1.2–1.5 cm × 6–9 mm; lobes 5, subtriangular. Corolla yellow, 1.4–1.6 cm, outside sparsely pubescent; tube 8–10 mm; lower lip 4–5 mm, lobes suborbicular; upper lip emarginate. Stamens included; anther locules narrowly ovate, ca. 1.5 mm. Capsule ovoid-globose, 8–10 mm. Seeds black, reniform, less than 0.5 mm. Fl. Jul–Oct.

• Edge of forests, grassland on mountain slopes, trailsides; 1000–2800 m. Guangxi, Sichuan, Yunnan.

3. *Pterygiella cylindrica* P. C. Tsoong, Fl. Reipubl. Popularis Sin. 68: 419. 1963.

圓茎翅茎草 *yuan jing chi jing cao*

Annuals, 25–60 cm tall, densely hairy. Stems usually 1, terete, unribbed and wingless, 2–2.5 mm in diam., densely with grayish yellow-brown straight hairs, often apically branched. Leaves sessile; leaf blade linear to linear-lanceolate, 2.5–3.5 cm × ca. 4 mm, subleathery, with gray-brown appressed fine hairs, margin revolute and entire or subundulate; veins 3, abaxially raised, adaxially impressed. Racemes to 12 cm; bracts yellow-brown pubescent. Pedicel ca. 3 mm. Calyx 1.3–1.6 cm × ca. 8 mm, herbaceous, densely pubescent; lobes triangular-ovate, 1/3–1/2 as long as tube, apex acuminate. Corolla yellow, 1.2–1.5 cm, included in calyx, sparsely pubescent; lower lip as long as or slightly shorter than upper lip; lobes ovate-oblong, ca. 1.5 mm, yellow-brown hirsute. Style ca. 8 mm; stigma ovate. Capsule ovoid-globose, ca. 8 mm. Fl. Sep–Oct, fr. Oct–Nov.

• Grassland, mountain slopes; 1800–2100 m. Sichuan (Muli Zangzu Zizhixian), Yunnan.

4. *Pterygiella bartschioides* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 60: 186. 1923.

齿叶翅茎草 *chi ye chi jing cao*

Annuals or perennials, 14–50 cm tall, black when dry, hairy, glabrescent. Stems 1, quadrangular to narrowly 4-winged, unbranched or with 1 or 2 branches, apically glandular pubescent. Leaves sessile; lower leaves orbicular-ovate, smaller than upper leaves, margin subentire to serrulate; upper leaves broadly ovate to rhomboid-ovate, 1–2.5 × 0.7–1.2 cm, margin excluding basal portion serrate; veins 5–7, palmate. Racemes to 12 cm. Pedicel ca. 3 mm, densely glandular hairy. Calyx 0.8–1.4 cm, densely glandular hairy; lobes subtriangular. Corolla dark brown, 1.6–1.8 cm, exerted from calyx, outside densely glandular hairy; lower lip 2–3 mm, lobes oblong and equal; upper lip emarginate.

Capsule ovoid, ca. 1 cm. Seeds black-brown, oblong-ovoid, 1–1.2 mm, enclosed in a large, bladderly, loose, hyaline reticulate appendage ca. 2.2 × 1 mm, base with a narrow caruncle ca. 0.3 mm, apex beaked. Fl. Aug–Sep, fr. Sep–Oct.

• Thickets, grassy fields; 2700–3400 m. NW Yunnan.

This species may well be conspecific with *Xizangia serrata* Hong, but adequate flowering material is needed before a final decision can be made. If conspecific, the species should be transferred to *Xizangia*.

5. *Pterygiella suffruticosa* D. Y. Hong, *Novon* 6: 372. 1996.
川滇翅茎木 *chuan dian chi jing mu*

Shrubs, ca. 1 m tall. Stems terete, ca. 5 mm in diam., shoots densely pilose. Leaves sessile, linear-elliptic, 3–

5 × 0.3–1 cm, densely puberulent, base cuneate, margin entire, apex acute. Lower bracts similar to upper leaves, gradually decreasing in size upward. Pedicel to 3 mm, pilose. Calyx 1.3–1.5 cm, puberulent, lobed to middle; lobes subulate-deltoid. Corolla yellow or pale pink, ca. 2 mm longer than calyx; middle lobe of lower lip acute at apex, lateral lobes lanose in 2 vertical patches and apex rounded; upper lip galeate, margin entire. Ovary ellipsoid. Style hairy.

• Ravines; 1400–2000 m. Yunnan (Lijiang Naxizu Zizhixian), Sichuan (Muli Zangzu Zizhixian).

59. SIPHONOSTEGIA Benth in Hooker & Arnott, Bot. Beechey Voy. 203. 1838.

阴行草属 *yin xing cao shu*

Herbs, annual. Stems erect, basally woody, apically much branched. Leaves opposite, sessile or short petiolate; leaf blade pinnately parted or dissected. Racemes terminal; bracts foliaceous, parted to entire. Flowers opposite, sparse. Pedicel short. Bracteoles 2, linear. Calyx tube campanulate, 4–8 × longer than wide, membranous, 10-veined; lobes 5, subequal, sublanceolate. Corolla tube slender, straight, as long as or slightly longer than calyx tube; limb 2-lipped; lower lip as long as upper, 3-lobed; lobes ovate-triangular, subequal, apex acute, with 2 petaloid plaits; upper lip galeate, bowed. Stamens didynamous, slightly exerted. Ovary 2-loculed. Style slightly exerted. Capsule black to black-brown, enclosed by persistent calyx. Seeds numerous, oblong-ovoid; seed coat reticulate; wing thick, fleshy, hyaline.

About four species: Asia; two species in China.

- 1a. Plants densely eglandular hairy; leaves broadly ovate, 2-pinnatisect; calyx lobes 2.2–2.5 mm; filaments basally ciliate 1. *S. chinensis*
- 1b. Plants densely glandular hairy; leaves narrowly triangular-ovate, nearly palmately 3-parted; calyx lobes 6–10 mm; filaments entirely hairy 2. *S. laeta*

1. *Siphonostegia chinensis* Benth in Hooker & Arnott, Bot. Beechey Voy. 203. 1837.

阴行草 *yin xing cao*

Annuals, 30–60(–80) cm tall, black when dry, densely tawny hairy. Branches ± angled, densely pubescent. Leaves sessile or short petiolate; leaf blade broadly ovate, 0.8–5.5 × 0.4–6 cm, densely pubescent, 2-pinnatisect; pinnae 3 pairs, lowermost pair 2-pinnately parted; pinnules 1–3, linear to linear-lanceolate, 1–2 mm wide, margin entire. Racemes few flowered; bracts pinnately parted or pinnatisect. Calyx tube 1–1.5 cm, densely pubescent; lobes green, subequal, linear-lanceolate to oblong, 2.2–2.5 mm, outside densely pilose, inside pubescent, margin entire or 1- or 2-toothed. Corolla tube 1.2–1.4 cm; lower lip yellow, lobes ovate; upper lip red-purple, apex truncate. Filaments basally ciliate. Ovary narrowly ovoid, ca. 4 mm. Capsule ovoid-oblong, ca. 1.5 cm × 2.5 mm, apex suboblique and apiculate. Seeds black, ca. 0.8 mm. Fl. Jun–Aug.

Dry mountain slopes and grassland; 800–3400 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea, Russia].

2. *Siphonostegia laeta* S. Moore, J. Bot. 18: 5. 1880.

腺毛阴行草 *xian mao yin xing cao*

Herbs, 30–70 cm tall, erect, blackish when dry, densely glandular hairy. Branches 3–5 pairs. Leaves short petiolate; leaf blade narrowly triangular-ovate, 1.5–2.5 × 0.8–1.5 cm, densely glandular hairy, nearly palmately 3-parted; median pinna larger than others, rhomboid-ovate, pinnately parted, with 3–6 ovate pinnules; lateral pinnae oblique triangular-ovate. Bracts foliaceous, as long as or shorter than calyx, rhomboid-ovate to ovate-lanceolate, densely glandular hairy, margin ± pinnately parted to subentire, apex acuminate. Pedicel 2–3 mm. Bracteoles 3–5 mm. Calyx tubular-campanulate; tube 1–1.5 cm; lobes 6–10 mm, margin entire. Corolla yellow, sometimes galea purplish; lower lip as long as galea, lobes triangular-ovate, ciliate with long multicellular hairs. Filaments densely pubescent. Ovary narrowly ovoid, 2–3 mm. Capsule 1.2–1.3 cm × ca. 3.5 mm. Seeds yellow-brown, 1–1.5 mm. Fl. Jun–Sep, fr. Sep–Oct.

• Grassland, scrub; 200–500 m. Anhui, Fujian, Guangdong, Hunan, Jiangsu, Jiangxi, Zhejiang.

60. CYMBARIA Linnaeus, Gen. Pl. ed. 2, 282. 1742.

芯苞属 xin bao shu

Herbs, perennial. Stems numerous. Leaves sessile, apex apiculate. Inflorescences racemose; flowers 1–4 per stem, pedicellate. Bracteoles 2, linear-lanceolate, herbaceous, margin entire or sometimes 1- or 2-toothed. Calyx tube cylindrical, hairy; lobes 5, subulate to linear-lanceolate, subequal, margin 1–3-toothed between lobes. Corolla yellow, outside sparsely pilose, 2-lipped; lower lip 3-lobed, lobes obovate; upper lip erect, 2-lobed. Stamens 4, didynamous; filaments inserted near base of corolla tube; anthers scarcely exerted, dorsifixed, basally mucronulate. Style exerted. Capsule narrowly ovoid, leathery. Seeds flattened or somewhat trigonous, narrowly winged.

Four or five species: China, Russia; two species in China.

1a. Plants densely white sericeous; anthers 4–4.5 mm, apically pilose 1. *C. daurica*

1b. Plants pilose; anthers 3–3.6 mm, glabrous or sometimes apically with few hairs 2. *C. mongolica*

1. *Cymbaria daurica* Linnaeus, Sp. Pl. 2: 618. 1753.

达乌里芯苞 da wu li xin bao

Herbs, 6–23 cm tall, densely white sericeous. Leaves opposite, linear to linear-lanceolate, usually 1–2 cm × 2–3 mm, densely white sericeous, margin entire or rarely 2- or 3-lobed, apex acuminate and apiculate. Flowers axillary, solitary. Bracteoles inserted at calyx and pedicel junction, 1.1–2 cm × 2–4 mm. Corolla 3–4.5 cm, outside white hairy, inside glandular. Anther locules 4–4.5 mm, apically pilose. Capsule 1–1.3 cm × 8–9 mm. Seeds ovoid, 3–4 × 2–2.5 mm. Fl. Jun–Aug, fr. Jul–Sep.

Dry mountain slopes, sandy grassland; 600–1100 m. Hebei, Heilongjiang, Jilin, Nei Mongol [Mongolia, Russia (E Siberia)].

2. *Cymbaria mongolica* Maximowicz, Mém. Acad. Imp. Saint Pétersbourg 29: 66. 1881.

蒙古芯苞 meng gu xin bao

Cymbaria linearifolia Hao.

Herbs, 5–20 cm tall, pilose. Leaves opposite below, occasionally ± alternate and gradually increasing in size and becoming narrower upward. Leaf blade oblong-lanceolate, ca. 1.2 cm × 3–4 mm. Bracteoles entire or with 1 or 2 small teeth near tip of pedicels. Corolla 2.5–3.5 cm. Anther locules 3–3.6 mm, glabrous or occasionally apically with few hairs. Capsule 1–1.1 cm × ca. 5 mm. Seeds narrowly ovoid, 4–4.5 × ca. 2 mm. Fl. Apr–Aug.

• Dry mountain slopes; 800–2000 m. Gansu, Hebei, Nei Mongol, Qinghai, Shaanxi, Shanxi.

61. MONOCHASMA Maximowicz ex Franchet & Savatier, Enum. Pl. Jap. 2: 458. 1876.

鹿茸草属 lu rong cao shu

Herbs, perennial or ?annual. Stems numerous, herbaceous or ± woody, woolly, glandular pilose, or pilose. Leaves opposite, scalelike below, gradually increasing in size upward, sessile, margin entire. Racemes terminal or flowers solitary and axillary. Bracteoles 2, linear-lanceolate, adnate to base of calyx tube. Calyx tubular; lobes 4 (5 in *M. monantha*), linear-lanceolate. Corolla 2-lipped; upper lip somewhat reflexed or ± galeate. Stamens 4, didynamous; anthers dorsifixed, 2-loculed; locules oblong, divergent, mucronate. Ovary incompletely 2-loculed. Capsule ovoid, 4-furrowed, dehiscing along dorsal suture of carpel, usually enclosed by persistent calyx. Seeds numerous.

Two species: China, Japan; both in China.

According to Hemsley (Forbes & Hemsley, J. Linn. Soc., Bot. 26: 203. 1889) there is a third species in Guangdong, *Monochasma monantha* Hemsley, with 5-lobed calyx and solitary, terminal or pseudo-terminal flowers, but we have not seen any specimens.

1a. Calyx shorter than corolla, tube usually not inflated with age; plants stout, basally ± woody, white woolly

throughout, glandular pilose above 1. *M. savatieri*

1b. Calyx longer than corolla, tube inflated with age; plants slender, herbaceous, sparsely woolly below middle, not glandular pilose 2. *M. shearerii*

1. *Monochasma savatieri* Franchet ex Maximowicz, Mém. Acad. Imp. Saint Pétersbourg 29: 58. 1881.

白毛鹿茸草 bai mao lu rong cao

Perennials, 15–23 cm tall, basally woody, densely white woolly throughout, glandular pilose above. Stems narrowly ribbed below leaf insertion. Leaf blade oblong-lanceolate to linear-lanceolate, 1–2(–2.5) cm × 2–3 mm, base tapered and decurrent, apex acute. Pedicel 2–7 mm. Bracteoles 0.9–1.5 cm × 1–2 mm,

foliaceous. Calyx tube membranous, glandular pilose or with a mixture of woolly and glandular pilose hairs; tube as long as or slightly shorter than lobes; lobes 4, 5–6 × 1–2 mm, occasionally ca. 10 × 3 mm, herbaceous, apex acuminate. Corolla purplish to nearly white, 1.5–1.8 cm, ca. 2 × as long as calyx. Capsule oblong, ca. 9 × 3 mm, apex acuminate and apiculate. Fl. Mar–Apr.

Grassland on sunny slopes, pine forests; 200–1100 m. Fujian, Jiangxi, Zhejiang [Japan].

2. *Monochasma sheareri* (S. Moore) Maximowicz ex Franchet & Savatier, Enum. Pl. Jap. 2: 458. 1876.

鹿茸草 lu rong cao

Bungea sheareri S. Moore, J. Bot. 13: 229. 1875.

Annuals (?), sparsely woolly below middle, apically pubescent to subglabrous and green. Leaves subalternate apically on stem; leaf blade linear or linear-lanceolate, usually 2–3 cm × 2–3 mm, ca. 2 × 1 mm below. Pedicel 2–5 mm. Calyx cylindric; tube 4–5 mm, after flowering inflated to 6–10 mm and 4-winged; lobes 4, 8–10 × 1–1.5 mm, subequal, after flowering to 1.4–2 cm × ca. 3 mm. Corolla purplish; tube ca. 5 mm. Stamens included to scarcely exerted. Capsule 6–8 × 3–5 mm.

Sandy mountain slopes, grassland; above 100 m. Anhui, Guangxi, Hubei, Jiangsu, Jiangxi, Zhejiang [Japan].

