

20. TRIGONOTIS Steven, Bull. Soc. Imp. Naturalistes Moscou 24(1): 603. 1851.

附地菜属 fu di cai shu

Herbs perennial, biennial, or rarely annual. Stems single or several and cespitose, erect to diffuse, hispid or pilose, rarely glabrous. Cymes solitary or dichotomously branched, ebracteate or lower pedicels bracteate, rarely all bracteate (flowers extra-axillary). Calyx 5-lobed or 5-parted, not enlarged or slightly enlarged in fruit. Corolla blue or white; tube usually shorter than calyx; throat appendages 4, lunate or trapeziform; lobes 5, spreading, overlapping. Stamens included; anthers oblong to elliptic. Ovary 4-parted. Style linear, usually shorter than corolla tube; stigma included, capitate. Gynobase flat. Nutlets 4, semiglobose-tetrahedral or subulate trigonous-tetrahedral, shiny, glabrous or pubescent, rarely tuberculate, adaxial 3 surfaces subequal in size or bottom smaller than 2 lateral surfaces, longitudinal vein at juncture of 2 lateral surfaces, sessile or with a short carpophore from corner of 3 adaxial surfaces, abaxial surfaces flattened or convex, acute or obtuse ribbed, rarely narrow winged; attachment scar at bottom of carpophore or at corner of 3 adaxial surfaces when sessile. Embryo vertical; cotyledon ovate.

About 58 species: Asia, E Europe; 39 species in China, of which 34 are endemic.

1a. Nutlets semiglobose-tetrahedral.

2a. Nutlet tuberculate, adaxially crustaceously obtuse ribbed.

3a. Corolla white; bracts present on lowermost 1 or 2 flowers of inflorescences 12. *T. nandanensis*

3b. Corolla blue to purple; bracts absent.

4a. Inflorescences sessile 11. *T. macrophylla*

4b. Inflorescences conspicuously pedunculate.

5a. Peduncle 1–4 cm; leaf blade lanceolate, densely strigose 8. *T. compressa*

5b. Peduncle to 1 cm; leaf blade broadly ovate to elliptic or orbicular, sparsely strigose.

6a. Leaf blade ovate to broadly elliptic, apex obtuse to emarginate; calyx lobes oblanceolate; corolla 3.5–4 mm wide 9. *T. mairei*

6b. Leaf blade orbicular to broadly elliptic, apex retuse, mucronate; calyx lobes narrowly ovate; corolla 5–6 mm wide 10. *T. orbicularifolia*

2b. Nutlet smooth, glabrous, shiny, neither tuberculate nor ribbed.

7a. Corolla appressed puberulent; leaf blade to 6 cm; lateral veins prominent adaxially 13. *T. heliotropifolia*

7b. Corolla glabrous; leaf blade less than 5 cm; lateral veins not prominent.

8a. Inflorescences bracteate throughout; pedicel twisted or recurved 1. *T. delicatula*

8b. Inflorescences ebracteate or only lower half or lowermost 2 or 3 flowers bracteate; pedicel usually ascending.

9a. Plants gray-white villous.

10a. Leaf blade broadly ovate to rotund; corolla limb ca. 2.5 mm wide; calyx lobes obtuse at apex; stipe of nutlet straight 6. *T. mollis*

10b. Leaf blade narrowly elliptic; corolla limb 5–6 mm wide; calyx lobes acuminate at apex; stipe of nutlet curved 7. *T. vestita*

9b. Plants hispid.

11a. Corolla limb ca. 7 mm wide; leaf blade orbicular to reniform; nutlet ± sessile 2. *T. rotundata*

11b. Corolla limb 4–6 mm wide; leaf blade oblong to elliptic; stipe of nutlet 0.2–0.3 mm.

12a. Stems densely gray hispid; leaves sessile; corolla 5–6 mm wide 5. *T. barkamensis*

12b. Stems sparsely hispid or minutely strigose; leaves petiolate; corolla 3.5–4 mm wide.

13a. Stems much branched at base, strigose; stem leaves oblong; inflorescences with leaflike bracts to middle; angle at inner surface of nutlet indistinct 3. *T. corispermoides*

13b. Stems unbranched or with 1 lateral branch, minutely strigose; stem leaves narrowly ovate to elliptic; inflorescences with 1 or 2 basal bracts only; angle at inner surface of nutlet obtuse 4. *T. chengkouensis*

1b. Nutlets trigonous-tetrahedral, inverted to oblique, subulate.

14a. Nutlets with adaxial 3 surfaces subequal in size, sessile, attachment scar basal, abaxial surfaces triangular; inflorescences ebracteate.

15a. Leaf blade broadly ovate to broadly elliptic.

16a. Stems with sterile branches to 75 cm; leaf blade elliptic to rotund; pedicel ca. as long as calyx 16. *T. omeiensis*

16b. Stems without sterile branches; leaf blade broadly ovate to broadly lanceolate; pedicel 1–2 × as long as calyx.

17a. Calyx lobes broadly ovate, obtuse, ca. 2 mm; inflorescences dichotomously branched 14. *T. cavaleriei*

- 17b. Calyx lobes oblanceolate, acute, 2–3 mm; inflorescences with cymes 2- or 3-fascicled 39. *T. funingensis*
- 15b. Leaf blade lanceolate to oblong.
- 18a. Corolla white.
- 19a. Corolla 5–6 mm wide; calyx lobes lanceolate, apex acute; pedicel 3–7 mm 19. *T. nankotaizanensis*
- 19b. Corolla 4–5 mm wide; calyx lobes obovate-spatulate, apex obtuse; pedicel 1–3 mm 18. *T. elevatovenosa*
- 18b. Corolla blue.
- 20a. Corolla deep blue 15. *T. leyeensis*
- 20b. Corolla light blue.
- 21a. Plants with runners 17. *T. formosana*
- 21b. Plants without runners.
- 22a. Leaf blade lanceolate, apex acuminate; middle and upper stem leaves ± sessile; pedicel 5–6 mm; nutlets abaxially slightly convex, acutely 3-ribbed 20. *T. giraldii*
- 22b. Leaf blade elliptic to elliptic-ovate, apex obtuse to acute; middle and upper stem leaves short petiolate; pedicel 2–4 mm; nutlets abaxially flattened or slightly concave, narrowly ribbed or winged.
- 23a. Nutlet cluster fastigiate, acute; corolla (2–)4–5 mm wide 22. *T. laxa*
- 23b. Nutlet cluster cross-shaped; corolla 2–2.5 mm wide 21. *T. floribunda*
- 14b. Nutlets with adaxial bottom surfaces and abaxial ones usually arcuate-convex, adaxial bottom surface smaller, 2 lateral surfaces equal in size; inflorescences bracteate at least basally.
- 24a. Inflorescences bracteate.
- 25a. Stems single, erect to spreading, without runners; nutlets glabrous, ca. 1 mm 23. *T. bracteata*
- 25b. Stems usually cespitose, erect becoming creeping; nutlets pubescent, ca. 2 mm 24. *T. radicans*
- 24b. Inflorescences bracteate only at base.
- 26a. Plants annual or biennial; corolla white or light blue.
- 27a. Corolla white or light blue, ca. 3 mm wide; carpophore of nutlet curved 37. *T. tibetica*
- 27b. Corolla white, ca. 4 mm wide; carpophore absent 38. *T. leucantha*
- 26b. Plants perennial, rarely ?biennial; corolla blue or purple.
- 28a. Junction of calyx tube with pedicel distinctly thickened, clavate in fruit 36. *T. peduncularis*
- 28b. Junction of calyx tube and pedicel not clavate.
- 29a. Corolla 7–8 mm wide 35. *T. rockii*
- 29b. Corolla not exceeding 6 mm wide.
- 30a. Nutlet ca. 2 mm, without carpophore; corolla ca. 6 mm wide 25. *T. myosotidea*
- 30b. Nutlet 1–1.3 mm, with or without carpophore; corolla 3–5 mm wide.
- 31a. Plants cespitose, ca. 20 cm.
- 32a. Corolla 1.7–2.2 mm wide 28. *T. harrismithii*
- 32b. Corolla ca. 3 mm wide.
- 33a. Leaf blade cordate to orbicular-ovate, apex acute; calyx lobes lanceolate; stipes of nutlets ± straight to ± curved 26. *T. tenera*
- 33b. Leaf blade oblong to rotund, apex rounded, mucronate; calyx lobes ovate; stipes of nutlets distinctly curved, short 27. *T. petiolaris*
- 31b. Plants not cespitose, 20–60 cm.
- 34a. Stems gray strigose; leaves subleathery 34. *T. cinereifolia*
- 34b. Stems green strigose; leaves herbaceous.
- 35a. Corolla purple; fruiting pedicel 0.9–1.6 cm; stems branched from base upward 29. *T. longipes*
- 35b. Corolla bluish; fruiting pedicel to 1 cm, if longer then stems simple or branched near base only.
- 36a. Fruiting pedicel to 2 cm 30. *T. gracilipes*
- 36b. Fruiting pedicel to 0.8 cm.
- 37a. Nutlets ca. 1.2 mm; lateral leaf veins indistinct 31. *T. muliensis*
- 37b. Nutlets ca. 1 mm; lateral leaf veins distinct at least adaxially.
- 38a. Lateral leaf veins 3 pairs, prominent, strigose abaxially; branches short 32. *T. microcarpa*
- 38b. Lateral leaf veins 2 pairs, visible abaxially, scarcely prominent, pubescent; branches elongated 33. *T. longiramosa*

1. *Trigonotis delicatula* Handel-Mazzetti, Anz. Akad. Wiss. Wien Math.-Nat. Kl. 62: 26. 1925.

扭梗附地菜 niu geng fu di cai

Trigonotis contortipes I. M. Johnston.

Herbs biennial, gray-white strigose. Stems numerous, cespitose, branched below, 15–35 cm tall. Basal leaves withered at anthesis; petiole of lower leaves 0.6–2 cm; stem leaves oblong to oblong-obovate, 0.6–2 cm × 6–10 mm, strigose, abaxially pallid, base decurrent to petiole, margin entire, apex rounded, mucronate; midvein prominent; upper leaves sessile. Inflorescences extra-axillary, bracteate. Pedicel thin, frequently twisted or recurved, 3–15 mm, strigose. Calyx lobes oblong, ca. 1.5 mm, gray strigose, apex obtuse. Corolla blue; tube ca. 1.5 mm; throat appendages fleshy, sparsely pubescent; limb ca. 5 mm wide; lobes 5, divaricate, orbicular, ca. 2.5 mm. Stamens inserted at middle of corolla tube; filaments ca. 0.8 mm; anthers oblong, ca. 0.5 mm. Nutlets pallid or brown, semiglobose-tetrahedral, appressed, 1.5–2 mm, smooth, glabrous, shiny, adaxial bottom surface protruding and prominent, 2 lateral surfaces slightly concave, with a longitudinal rib on border line, abaxial surfaces triangular, center line adaxially obscure, without stipe. Fl. Jul–Aug, fr. Aug–Sep.

• Open forests, alpine meadows, rocky crevices; 3000–4200 m. Sichuan (Muli Xian), N Yunnan.

2. *Trigonotis rotundata* I. M. Johnston, J. Arnold Arbor. 18: 7. 1937.

圆叶附地菜 yuan ye fu di cai

Herbs perennial, strigose. Rhizomes prostrate. Stems 7–20 cm tall. Petiole of basal and lower stem leaves 3–4 cm, base expanded; leaf blade orbicular to subreniform, 0.7–1.7 cm wide, finely strigose, base rounded to cordate, apex rounded to retuse, mucronate; middle and upper stem leaves short petiolate, smaller. Inflorescences terminal, lowermost 1 or 2 flowers bracteate. Pedicel ascending, 5–10 mm. Calyx 5-lobed to above middle; lobes lanceolate, ca. 2 mm, strigose. Corolla light blue; throat appendages retuse, pubescent at apex; limb 5-lobed, ca. 7 mm wide; lobes broadly obovate, ca. 3 mm. Anthers elliptic, ca. 0.6 mm, apex obtuse. Nutlets semiglobose-tetrahedral, ca. 1 × 1 mm, ± sessile, smooth, glabrous, shiny.

• Alpine meadows, subalpine thickets, forest margins; 3000–4000 m. Sichuan, N Yunnan.

3. *Trigonotis corispermoides* C. J. Wang, Acta Bot. Yunnan. 4: 35. 1982.

虫实附地菜 chong shi fu di cai

Herbs perennial, cespitose. Stems ascending to erect, much branched at base, to 40 cm tall, strigose. Basal and lower stem leaves usually withered at anthesis; petiole 1.5–5 cm; leaf blade oblong to elliptic, 1–1.5 cm × 4–6 mm, densely strigose, base cuneate to rounded, apex obtuse, mucronate; middle and upper stem leaves short petiolate or subsessile, oblong, smaller. Inflorescences basal; middle and lower parts

with leaflike bracts. Pedicel obliquely spreading, 3–8 mm in fruit. Calyx 5-parted; lobes lanceolate, ca. 1 mm, to 2 mm in fruit, strigose. Corolla light red; tube ca. 1.5 mm, ca. 2 mm wide; throat appendages ca. 0.4 mm, apex retuse; limb 3.5–4 mm wide; lobes 5, obovate. Anthers elliptic, ca. 0.5 mm. Nutlets gray-brown, semiglobose-tetrahedral, ca. 1.3 mm, smooth, glabrous, shiny, adaxial bottom surface smaller than 2 lateral surfaces, abaxial surfaces ovate and convex, narrowly ribbed around margin, apex rounded, obtuse.

• Meadows, roadsides; ca. 2900 m. Sichuan, Yunnan.

Trigonotis corispermoides closely resembles *T. gracilipes* I. M. Johnston but differs by having nutlets with rhomboid-ovate abaxial surfaces, more broadly ribbed margins, and the 3 adaxial surfaces equal in size.

1a. Nutlets stipitate, stipe ca. 0.2

mm 3a. var. *corispermoides*

1b. Nutlets sessile 3b. var. *sessilis*

3a. *Trigonotis corispermoides* var. *corispermoides*

虫实附地菜 (原变种) chong shi fu di cai (yuan bian zhong)

Nutlets stipitate, stipe ca. 0.2 mm.

• Hillside meadows, roadsides; ca. 2900 m. Sichuan (Barkam Xian), NW Yunnan.

3b. *Trigonotis corispermoides* var. *sessilis* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 81. 1986.

无柄虫实附地菜 wu bing chong shi fu di cai

Nutlets without stipe.

• Sichuan.

4. *Trigonotis chengkouensis* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 81. 1986.

城口附地菜 cheng kou fu di cai

Stems unbranched or with 1 lateral branch, slender, 10–28 cm tall, minutely strigose. Petiole of basal leaves slender, 1.2–3.8 cm; leaf blade ovate, 6–13 × 4–10 mm, abaxially sparsely minute strigose, adaxially densely minute strigose, base rounded-truncate, apex obtuse or apiculate; lateral veins obscure; stem leaves long or short petiolate; leaf blade narrowly ovate to elliptic, base rounded or broadly cuneate. Inflorescences 2.5–7 cm, to 7–19 cm in fruit, 9–18-flowered; bracts subtending lowermost 1 or 2 flowers only. Pedicel slender, 1.5–8 mm. Calyx lobes linear-obovate, ca. 0.9 mm, minutely strigose outside, apex obtuse. Corolla blue, glabrous; tube ca. 1 mm, faucal appendages low trapeziform, ca. 0.5 mm; limb ca. 4 mm wide; lobes 5, suborbicular. Anthers ca. 0.4 mm. Pistil ca. 0.9 mm. Nutlets blackish brown, bifacial-tetrahedral, smooth, glabrous, shiny, lateral surfaces forming an obtuse angle; abaxial surfaces ca. 0.8 mm, deltate-ovate; stipe indistinct, ca. 0.2 mm. Fl. and fr. Aug.

• In rock crevices; ca. 1900 m. Sichuan.

5. *Trigonotis barkamensis* C. J. Wang, Acta Bot. Yunnan. 4: 36. 1982.

金川附地菜 jin chuan fu di cai

Herbs biennial. Stems single, much branched below, 20–28 cm tall; branches ascending, densely gray hispid. Basal leaves withered at anthesis; stem leaves sessile, oblong to long elliptic, 1.5–3.5 cm × 3–10 mm, densely strigose, base attenuate, decurrent to petiole, margin entire, apex obtuse. Inflorescences terminal, only basal 1 or 2 flowers bracteate. Pedicel 3–4 mm, divaricate. Calyx 5-parted; lobes vertical, linear-oblong, ca. 2 mm, slightly enlarged in fruit, tightly enclosing nutlets, ca. 1/3 longer than nutlets. Corolla light blue, 5–6 mm wide; tube ca. 2 mm, ca. as long as calyx; throat appendages trapeziform, ca. 0.7 mm, apex emarginate; lobes of limb obovate, ca. 2.5 × 2 mm. Anthers elliptic, ca. 0.7 mm. Nutlets gray-brown, semiglobose-tetrahedral, ca. 1 mm, smooth, glabrous, shiny, narrowly ribbed, adaxial bottom surface smaller than 2 lateral surfaces, 2 lateral surfaces longitudinally ribbed along border line, abaxial surfaces ovate and convex, apex obtuse; stipe ca. 0.3 mm.

- Hillside meadows; ca. 2200 m. Sichuan (Jinchuan Xian).

6. *Trigonotis mollis* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 153. 1890.

湖北附地菜 hu bei fu di cai

Herbs perennial, densely gray pubescent. Stems densely caespitose, ascending, 15–20 cm tall, spreading pubescent. Petiole of basal leaves 3–4 cm; leaf blade broadly ovate to rotund, 0.5–1.5 × 0.5–1.5 cm, submembranous, densely gray pubescent, base rounded to broadly cuneate, apex rounded or shallowly retuse, less often ± acute; stem leaves short petiolate, smaller. Inflorescences terminal, ca. 7 cm, only lower 1 or 2 flowers bracteate. Pedicel filiform, 2–6 mm, frequently horizontal. Flowers widely spaced. Calyx lobes obovate-spatulate, ca. 1.5 mm, slightly enlarged after anthesis, apex obtuse. Corolla light blue; limb ca. 2.5 mm wide; lobes suborbicular. Anthers elliptic, apex mucronate. Ovary glabrous. Style included. Nutlets gray-brown, semiglobose-tetrahedral, ca. 0.6 mm, smooth, glabrous, shiny, 2 lateral surfaces subequal in size, longitudinally ribbed at their juncture; abaxial surfaces convex, broadly ovate, 0.5–0.6 mm, apex acute.

- Rocky slopes, river banks; 900–1100 m. Hubei, Shaanxi.

7. *Trigonotis vestita* (Hemsley) I. M. Johnston, Contr. Gray Herb. 75: 47. 1925.

灰毛附地菜 hui mao fu di cai

Trigonotis peduncularis (Trevisan) Benth. ex Baker & S. Moore var. *vestita* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 154. 1890.

Herbs biennial. Stems caespitose, ca. 15 cm tall, densely gray-white villous. Basal leaves numerous; petiole to 6 cm; leaf blade narrowly elliptic, 0.5–3 cm × 3–10 mm, densely

gray-white villous, abaxially with prominent midvein, base narrowly cuneate, apex mucronate; stem leaves similar to basal leaves, sessile or extremely short petiolate. Inflorescences terminal, to 14 cm in fruit, only lower 2 or 3 flowers bracteate. Pedicel obliquely spreading, linear, 7–10 mm. Calyx 5-parted; lobes oblanceolate, ca. 2 mm, densely villous, apex acuminate. Corolla light blue; tube ca. 2.5 mm wide; throat appendages ca. 0.8 mm, papillate; limb 5–6 mm wide; lobes horizontal, suborbicular, ca. 2.5 mm. Anthers broadly elliptic, ca. 0.6 mm; apex obtuse. Nutlets dark brown, semiglobose-tetrahedral, ca. 1 mm, smooth, glabrous, shiny, adaxial bottom surface smaller than 2 lateral surfaces, abaxial surfaces ovate and convex; stipe slightly curved, ca. 0.2 mm.

- Alpine or subalpine meadows, thickets. Hubei, Shaanxi, Sichuan, Yunnan.

8. *Trigonotis compressa* I. M. Johnston, J. Arnold Arbor. 18: 4. 1937.

狭叶附地菜 xia ye fu di cai

Herbs perennial. Rhizomes ascending, dark brown; roots numerous, fibrous; crown covered by persistent petioles. Stems erect, 20–35 cm tall, sparsely strigose. Basal leaves withered at anthesis; petiole 0.5–5 cm; stem leaves lanceolate, 3–8 × 1.5–3 cm, abaxially densely strigose, slightly purplish, base cuneate to rounded, apex acuminate. Inflorescences solitary or paired, basal; peduncle 1–4 cm; middle and lower parts with leaflike bracts. Pedicel obliquely spreading, 3–8 mm in fruit. Calyx 5-parted; lobes lanceolate, ca. 1 mm, slightly enlarged, to 2 mm, strigose. Corolla light red; tube ca. 1.5 mm, ca. 2 mm wide; throat appendages ca. 0.4 mm, apex retuse; limb 3.5–4 mm wide; lobes obovate. Anthers elliptic, ca. 0.5 mm. Nutlets gray-brown, semiglobose-tetrahedral, ca. 1.3 mm, tuberculate, adaxial bottom surface smaller than 2 lateral surfaces, abaxial surfaces ovate and convex, narrowly ribbed around margin, apex rounded and obtuse; stipe ca. 0.2 mm.

- Hillside meadows, roadsides; ca. 2900 m. Sichuan (Barkam Xian), NW Yunnan.

Trigonotis compressa closely resembles *T. gracilipes*, but the latter has nutlets with broadly ribbed margins and equal, rhomboid-ovate adaxial surfaces.

9. *Trigonotis mairei* (H. Léveillé) I. M. Johnston, J. Arnold Arbor. 18: 4. 1937.

长梗附地菜 chang geng fu di cai

Omphalodes mairei H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 188. 1913; *Trigonotis muriculata* I. M. Johnston.

Herbs perennial. Rhizomes blackish. Stems erect, 40–50 cm tall, strigose; stem leaves widely spaced; petiole 2–7 cm; leaf blade ovate to broadly elliptic, 4–6 × 2.5–5 cm, sparsely strigose, apex obtuse to emarginate, mucronate. Inflorescences with distinct peduncles, to 10 cm, ebracteate. Pedicel obliquely spreading, to 4 mm in fruit. Calyx lobes oblanceolate, ca. 2.5 mm, strigose, apex acute. Corolla blue-purple; tube ca. 1.8 mm; throat appendages narrow, thin; limb

3.5–4 mm wide; lobes suborbicular, ca. 1.8 mm. Anthers elliptic, ca. 0.8 mm., apex rounded. Mature nutlets dark brown, semiglobose-tetrahedral, ca. 1 mm, dorsiventrally compressed, tuberculate, adaxial bottom surface convex, juncture of 2 lateral surfaces prominent; abaxial surfaces convex, crustaceous, narrowly ribbed around margin, sessile.

• Forests, meadows; 700–1300 m. Sichuan (Mabian Xian), Yunnan.

10. *Trigonotis orbicularifolia* C. J. Wang, Acta Bot. Yunnan., Suppl. 4: 37. 1982.

厚叶附地菜 *hou ye fu di cai*

Herbs perennial. Rhizomes ascending, dark brown; roots numerous, fibrous. Stems erect, 20–40 cm tall, short strigose. Basal leaves mostly withered at anthesis. Petiole 2–3 cm; stem leaves orbicular to broadly elliptic, 3–7 × 3–6.5 cm, abaxially gray-green, sparsely short strigose, hairs discoid at base, adaxially green, base rounded, decurrent, margin entire, apex retuse, mucronate; veins conspicuous. Inflorescences axillary, branched, to 28 cm in fruit, ebracteate. Pedicel divaricate, ca. 2 mm, 4–5 mm in fruit. Calyx parted nearly to base; lobes narrowly ovate, 2–2.5 mm, slightly enlarged in fruit, strigose, apex acuminate. Corolla light blue or white; tube ca. 2 mm; throat appendages ca. 0.4 mm; limb 5–6 mm wide; lobes rotate-horizontal, suborbicular, margin denticulate. Anthers elliptic, ca. 1 mm, apex obtuse. Style shorter than nutlets. Mature nutlets black, semiglobose-tetrahedral, ca. 1.5 mm, sparsely spinescent-tuberculate, 2 lateral surfaces equal in size and longitudinally ribbed at their juncture; abaxial surfaces convex becoming white, ovate, obtuse ribbed around margin, sessile. Fl. Jun-Jul, fr. Jul-Aug.

• Hillside meadows, forests, moist shaded valleys; 700–1800 m. Sichuan.

11. *Trigonotis macrophylla* Vaniot, Monde Pl. 7: 42. 1905.

大叶附地菜 *da ye fu di cai*

Herbs perennial. Stems ascending, ca. 35 cm tall, sparsely short strigose or glabrescent. Petiole to 5 cm; leaf blade narrowly lanceolate to broadly ovate, 3.5–9 × 2.5–6.5 cm, sparsely strigose, base rounded to cuneate, apex mucronate. Upper stem leaves short petiolate, smaller. Inflorescences sessile, in axils of upper leaves, much branched, to 19 cm in fruit, strigose, ebracteate. Pedicel obliquely spreading, to 4 mm in fruit. Flowers widely spaced. Calyx lobes vertical, oblanceolate, ca. 2.5 mm. Corolla blue, light blue, or light purple. Mature nutlets black, vertical, semiglobose-tetrahedral, ca. 1 mm, adaxial bottom surface smaller, convex, 2 lateral surfaces subequal in size; abaxial surfaces extremely convex, margin crustaceous, obtuse ribbed, sessile.

• Forest margins, meadows, moist valleys. Guangdong, Guangxi, Guizhou, Sichuan.

1a. Leaf blade narrowly lanceolate to elliptic-lanceolate 11b. var. *trichocarpa*

1b. Leaf blade broadly ovate.

2a. Calyx lobes ca. 2.5 mm; corolla blue

or light blue 11a. var. *macrophylla*
2b. Calyx lobes ca. 2 mm; corolla light purple 11c. var. *verrucosa*

11a. *Trigonotis macrophylla* var. *macrophylla*

大叶附地菜 (原变种) *da ye fu di cai* (yuan bian zhong)

Trigonotis pedunculata var. *macrophylla* (Vaniot) H. Lévillé.

Leaf blade broadly ovate. Calyx lobes ca. 2.5 mm, oblanceolate. Corolla blue or light blue. Nutlets not bristly or punctate.

• Forest margins, meadows. Guizhou, Sichuan.

11b. *Trigonotis macrophylla* var. *trichocarpa* Handel-Mazzetti, Sinensia 5: 18. 1934.

毛果大叶附地菜 *mao guo da ye fu di cai*

Leaf blade narrowly lanceolate to elliptic-lanceolate. Calyx parted to base; lobes linear. Corolla blue or light blue. Nutlets sparsely bristly, not punctate.

• Hillside meadows, forest margins. N Guizhou, Sichuan (Jinfo Shan).

11c. *Trigonotis macrophylla* var. *verrucosa* I. M. Johnston, J. Arnold Arbor. 18: 4. 1937.

瘤果大叶附地菜 *liu guo da ye fu di cai*

Leaf blade broadly ovate. Calyx parted to base; lobes oblong, apex mucronate. Corolla light purple. Nutlets with fine granular punctations, not bristly.

• Hillside meadows, moist valleys, forest margins; 800–1500 m. NW Guangdong, NW Guangxi, S Guizhou.

The plants are used medicinally.

12. *Trigonotis nandanensis* C. J. Wang, Acta Bot. Yunnan., Suppl. 4: 38. 1982.

南丹附地菜 *nan dan fu di cai*

Herbs perennial. Rhizomes 3–4 cm, ca. 3 mm in diam., with numerous fibrous roots. Stems erect, 20–25 cm tall, densely spreading pubescent. Basal leaves numerous; petiole to 7 cm, densely pubescent; leaf blade ovate to oblong-ovate, 2–3.5 × 1–2.2 cm, abaxially more densely pubescent, adaxially sparsely pubescent, base rounded or somewhat cordate, apex rounded, mucronate; midvein raised abaxially; stem leaves widely spaced, petiole 1.5–3 cm. Inflorescences terminal, ca. 10 cm, only basal 1 or 2 flowers bracteate. Pedicel usually divaricate, filiform, 3–5 mm. Calyx lobes oblanceolate, ca. 2 mm, pubescent; apex acute. Corolla white; tube ca. 1.5 mm; limb 4–5 mm wide; lobes suborbicular, ca. 2 mm wide. Anthers elliptic, ca. 0.5 mm. Style longer than nutlets. Mature nutlets dark brown, semiglobose-tetrahedral, ca. 1.3 mm, sparsely spinescent-tuberculate, adaxial bottom surface smaller, 2 lateral surfaces subequal in size; abaxial surfaces convex, becoming ovate, obtuse ribbed at margin, sessile; attachment scar at juncture of 3 ribs adaxially.

- Shaded moist rocky hills. Guangdong (Nan'ao Xian).

13. *Trigonotis heliotropifolia* Handel-Mazzetti, Anz. Akad. Wiss. Wien Math.-Nat. 66: 165. 1924.

毛花附地菜 mao hua fu di cai

Trigonotis chuxiongensis H. Chuang.

Herbs perennial, densely strigose. Rhizome crowns covered by persistent petioles. Stems erect to ascending, not branched or branched above, 20–50 cm tall. Basal leaves and lower stem leaves withered at anthesis; petiole 3–20 mm; stem leaves ovate to elliptic, 2–6 × 1–3 cm, abaxially sparsely short strigose, adaxially densely strigose, with sunken veins, base rounded, apex acute; lateral veins 4–7 pairs, 2 or 3 originating from base. Inflorescences terminal, to 10 cm, ebracteate or with 1–3 leaflike bracts below. Pedicel subdivaricate in fruit, 3–5 mm. Calyx funnelform, parted to middle; lobes lanceolate, ca. 3 mm, apex acuminate. Corolla blue; tube ca. 2 mm; throat appendages ca. 1 mm, short hairy, apex retuse; limb 5–7 mm wide; lobes horizontal, obovate, ca. 2 mm, appressed puberulent outside. Stamens reaching corolla throat; anthers elliptic, ca. 0.5 mm, apex obtuse. Mature nutlets dark brown, semiglobose-tetrahedral, dorsiventrally compressed, ca. 1 mm, glabrous, smooth, shiny, adaxial lateral surfaces subequal in size, longitudinally ribbed at juncture, abaxial surfaces extremely convex, narrowly ribbed at margin, apex acute; stipe present.

- Hillside meadows, forest margins, stream banks; 1500–3000 m. Sichuan (Muli Xian), Yunnan.

14. *Trigonotis cavaleriei* (H. Léveillé) Handel-Mazzetti, Symb. Sin. 7: 819. 1936.

西南附地菜 xi nan fu di cai

Herbs perennial. Rhizomes with many fibrous roots. Stems erect, usually not branched, slightly flexuous-curved, 20–50 cm tall, hirsute. Basal leaves withered after anthesis; petiole persistent, 3–10 cm, densely hirsute, base expanded, becoming sheath-shaped; leaf blade broadly ovate to elliptic, 3–10 × 1.5–5.5 cm, strigose, hairs discoid at base, abaxially with prominent midvein and obscure lateral veins, base cuneate to subcordate, margin ciliate, apex acute to acuminate; upper stem leaves short petiolate, smaller, usually narrowly ovate. Inflorescences terminal or axillary in upper stems, to 23 cm in fruit, ebracteate; peduncle long, usually dichotomously branched, strigose. Pedicel vertical, 3–4 mm. Calyx lobes broadly ovate, ca. 2 mm, densely short strigose on lower part, margin finely ciliate, apex obtuse; longitudinal veins prominent. Corolla blue or white; tube ca. 2 mm; throat appendages ca. 1 mm, short hairy, apex retuse; limb ca. 6 mm wide; lobes suborbicular, ca. 3 mm wide. Anthers oblong, ca. 1 mm, reaching throat. Mature nutlets dark brown, inverted subulate, trigonous-tetrahedral, ca. 1 mm, glabrous, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces flat, acutely 3-ribbed, sessile. Fl. and fr. May-Aug.

- Forests, forest margins, moist areas, roadsides; 700–2000 m. Guizhou, Hunan, Sichuan, Yunnan.

- 1a. Leaf blade broadly ovate to elliptic, 3–10 × 2–5.5 cm, base rounded to subcordate, apex acute 14a. var. *cavaleriei*
- 1b. Leaf blade lanceolate, 4.5–8 × 1.5–3 cm, base cuneate, apex acuminate 14b. var. *angustifolia*

14a. *Trigonotis cavaleriei* var. *cavaleriei*

西南附地菜 (原变种) xi nan fu di cai (yuan bian zhong)

Omphalodes cavaleriei H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 188. 1913; *O. esquirolii* H. Léveillé; *O. vaniotii* H. Léveillé; *Trigonotis faberi* Handel-Mazzetti.

Leaf blade broadly ovate to elliptic, 3–10 × 2–5.5 cm, base rounded to subcordate, apex acute.

- Forests, forest margins, moist valley areas, roadsides; 700–2000 m. Guizhou, Sichuan, Yunnan.

14b. *Trigonotis cavaleriei* var. *angustifolia* C. J. Wang, Acta Bot. Yunnan, Suppl. 4: 39. 1982.

窄叶西南附地菜 zhai ye xi nan fu di cai

Leaf blade lanceolate, 4.5–8 × 1.5–3 cm, base cuneate, apex acuminate.

- Forests, forest margins, shaded moist areas. Hunan, Sichuan, C Yunnan.

15. *Trigonotis leyeensis* W. T. Wang, Acta Phytotax. Sin. 31: 65. 1993.

乐叶附地菜 yue ye fu di cai

Herbs perennial. Stems erect, branched, ca. 55 cm tall, spreading hispidulous. Basal leaves solitary; petioles long; basal leaf blades narrowly ovate, ca. 4.8 × 2.5 cm, papery, strigose, base truncate-rounded, margin entire, apex truncate-obtuse, apiculate; veins 3, inconspicuous. Cauline leaves short petiolate, oblong, gradually reduced upward, apex acute. Inflorescences terminal or axillary, 8–24 cm; rachis slender, sparsely strigulose, without bracts. Pedicel 0.8–2 mm, strigulose. Calyx campanulate, ca. 1.1 mm; lobes narrowly oblong, ca. 2 mm wide, outside strigulose, apex acute. Corolla deep blue, glabrous; tube ca. 0.8 mm; throat appendages crescent-shaped; limb ca. 1.6 mm in diam.; lobes ovate-quadrangular, ca. 0.7 mm. Anthers oblong, ca. 0.25 mm; filaments subequal. Pistil included, ca. 0.7 mm. Nutlets black, inverted subulate trigonous-tetrahedral, ca. 1 mm, glabrous, shiny, acute ribbed.

- Margins of evergreen forests; ca. 1000 m. Guangxi.

16. *Trigonotis omeiensis* Matsuda, Bot. Mag. (Tokyo) 33: 148. 1919.

峨眉附地菜 e mei fu di cai

Herbs perennial, rhizomatous. Stems not branched, 16–35 cm tall, short strigose; sterile branches to 75 cm, with few leaves. Basal leaves 2 or 3; petiole ca. 6 cm, base expanded becoming sheathlike; leaf blade elliptic to rotund, 3–8 × 2–6 cm, subleathery, sparsely strigose, base rounded, margin

ciliate, apex rounded to obtuse, mucronate; veins conspicuous, lateral veins 5–7 pairs; stem leaves 2–5 at stem apex, nearly whorled, smaller. Inflorescences terminal, ebracteate; peduncle branched, ca. 8 cm, to 11 cm in fruit, strigose. Pedicel ca. 1 mm in fruit, densely strigose. Calyx lobed nearly to middle, with 5 slightly raised veins; lobes triangular-ovate, ca. 2 mm, slightly enlarged after anthesis, finely ciliate. Corolla blue-purple; tube ca. 2 mm; throat appendages ca. 0.3 mm; limb 4–5 mm wide; lobes suborbicular, ca. 2 mm wide. Anthers elliptic, ca. 0.3 mm, reaching throat, apex obtuse. Style extending 1–1.5 mm above nutlets. Mature nutlets dark brown, inverted subulate, trigonous-tetrahedral, 1–1.2 mm, glabrous, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces flat, triangular, obtusely 3-ribbed, subsessile. Fl. and fr. May-Jul.

• Forests, thickets, shaded moist stream banks and ravines; 1000–1500 m. Sichuan.

17. *Trigonotis formosana* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 171. 1908.

台湾附地菜 tai wan fu di cai

Herbs perennial, runners usually floriferous. Stems not branched, 10–20 cm tall, usually strigose. Basal leaves long elliptic to lanceolate, 2–5 cm, base narrowly cuneate and decurrent to petiole, apex rounded, mucronate; stem leaves short petiolate, shorter, wider than basal leaves. Inflorescences (1 or) 2 or 3(–5), terminating branches, 5–15 cm, many flowered, ebracteate. Pedicel erect, 1–3 mm. Flowers crowded. Calyx lobes ovate-triangular, 0.5–1.5 mm, apex ± acute. Corolla tube ca. 1 mm; limb 2–3 mm wide; lobes broadly elliptic, 1–1.5 mm. Stamens inserted at middle of corolla; anthers ca. 0.3 mm. Mature nutlets black, inverted subulate, trigonous-tetrahedral, ca. 1 mm, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces triangular, flat, glabrous, sometimes with 1–3 bristles near inside corner, sessile. $2n = 48^*$.

• Mountains. Taiwan.

18. *Trigonotis elevatovenosa* Hayata, Icon. Pl. Formosan. 6: 32. 1916.

凸脉附地菜 tu mai fu di cai

Herbs perennial, with thin runners, 15–20 cm tall. Stems erect, not branched, 10–20 cm tall, spreading hispid and strigose at base. Petiole of basal leaves long, 3–4 cm, red-brown hirsute; leaf blade elliptic, 2–2.5 × 1–1.3 cm, with 4 or 5 pairs of lateral veins, abaxially pallid, appressed pubescent, adaxially green, convex, base obtuse, margin entire or crispate, apex rounded, ± emarginate, mucronate; stem leaves of runners short petiolate, smaller, orbicular, ca. 8 mm. Inflorescences erect, racemelike, dichotomously branched or single, long, ca. 8 cm, thin; bracts absent. Pedicel erect, 1–3 mm. Calyx lobes obovate-spatulate, ca. 1.5 mm, apex obtuse. Corolla white; tube ca. 1.5 mm; limb 4–5 mm wide; lobes ovate, 1.5–2 mm. Stamens inserted on upper 2/3 of corolla tube; anthers elliptic, 0.5–0.7 mm. Mature nutlets black-brown, inverted subulate, trigonous-tetrahedral, 0.8–1 mm, glabrous, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces triangular, acutely 3-ribbed, sessile.

• Mountains. N Taiwan.

19. *Trigonotis nankotaizanensis* (Sasaki) Masamune & Ohwi, Trans. Nat. Hist. Soc. Taiwan 23: 210. 1933.

白花附地菜 bai hua fu di cai

Myosotis nankotaizanensis Sasaki, Trans. Nat. Hist. Soc. Taiwan 21: 155. 1931; *Omphalodes formosana* Masamune.

Herbs perennial, caespitose, strigose, with obliquely spreading rhizomes. Stems erect, 10–15 cm. Basal leaves petiolate; upper stem leaves sessile; leaf blade oblanceolate to long elliptic, 7–15 cm, base attenuate, apex obtuse to ± acute. Inflorescences 1 or 2, terminal, racemose, 3–7 cm, 7–15-flowered; ebracteate or only upper part with 1 or 2 bracts. Pedicel erect, 3–7 mm. Flowers widely spaced. Calyx lobes lanceolate, 2–4 mm, apex acute. Corolla white; tube ca. 2 mm; limb 5–6 mm wide; lobes obovate, ca. 2 mm. Stamens inserted on upper 2/3 of corolla tube; anthers long elliptic, ca. 3 mm, apex obtuse. Nutlets brown, subulate, trigonous-tetrahedral, ca. 1.5 mm, smooth.

• E Taiwan (Nanhu Dashan).

20. *Trigonotis giraldii* Brand, Repert. Spec. Nov. Regni Veg. 26: 171. 1929.

秦岭附地菜 qin ling fu di cai

Herbs perennial. Stems erect, not branched, 30–50 cm tall, longitudinally ribbed, sparsely short strigose. Lower stem leaves mostly withered at anthesis, small; middle and upper stem leaves ± sessile, lanceolate, 2.5–6 cm × 5–12 mm, abaxially finely short strigose, base narrowly cuneate, decurrent, apex acuminate; midvein prominent. Inflorescences dichotomously branched, 4–5 cm, to 6–7 cm in fruit, densely strigose, ebracteate. Pedicel 5–6 mm in fruit. Calyx 5-lobed; lobes oblong-obovate, ca. 2 mm, 1 frequently black orbicular spotted, short strigose, apex rounded. Corolla blue-purple; tube ca. 1.5 mm; throat appendages lunate, pubescent, ca. 0.6 mm, apex emarginate; limb ca. 5 mm wide; lobes divaricate, oblong, ca. 2.8 × 2 mm. Anthers elliptic, ca. 0.7 mm, exerted to throat. Nutlets dark brown, inverted subulate, trigonous-tetrahedral, ca. 1 mm, glabrous, adaxial 3 surfaces subequal in size; abaxial surfaces convex, triangular, acutely 3-ribbed, sessile. Fl. and fr. May-Jul.

• Thickets, forest margins, hillside meadows; 2400–2900 m. Shaanxi.

21. *Trigonotis floribunda* I. M. Johnston, J. Arnold Arbor. 33: 70. 1952.

多花附地菜 duo hua fu di cai

Herbs perennial, with long thin rhizomes. Stems erect to spreading; branches widely spaced at apex, 20–45 cm tall, sparsely short strigose. Petiole 3–12 mm; leaf blade elliptic or ovate-lanceolate, 2–5 × 1–2 cm, abaxially finely strigose, base cuneate, decurrent to petiole, apex acute to rounded; midvein conspicuous, lateral veins obscure; uppermost stem leaves short petiolate, smaller. Inflorescences terminal or axillary on upper stems, ebracteate; peduncle ca. 4 cm, to 11

cm in fruit, strigose. Pedicel ca. as long as calyx. Calyx lobes narrowly oblong, ca. 1.5 mm, to 2–3 mm in fruit; tube somewhat inflated, becoming cupular, pallid outside. Corolla blue-purple; tube ca. 1 mm; limb 2–2.5 mm wide; lobes suborbicular, 0.8–1 mm. Stamens inserted slightly above middle of corolla tube; anthers ca. 0.5 mm, connectives mucronate at apex. Mature nutlets dark brown, inverted subulate, trigonous-tetrahedral, cross-shaped, ca. 1 mm, glabrous, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces triangular, flat or slightly concave, margin narrowly ribbed, angles curved upward, with an erect bristle at inside angle near style, sessile. Fl. Apr–Jun, fr. Jun–Jul.

• Forest margins, thickets, meadows, shaded moist stream banks and ravines; 600–1400 m. Sichuan.

22. *Trigonotis laxa* I. M. Johnston, J. Arnold Arbor. 33: 71. 1952.

南川附地菜 *nan chuan fu di cai*

Herbs perennial, with thin rhizomes. Stems erect to obliquely spreading, to 45 cm tall, sparsely short strigose; branches few and widely spaced or not branched. Petiole 0.3–7 cm; leaf blade elliptic to broadly lanceolate, 2.5–8 × 1–3.5 cm, abaxially sparsely short strigose, adaxially sparsely short strigose near apex, base rounded, decurrent into a narrowly winged petiole, apex rounded to obtuse, mucronate; midvein prominent, lateral veins obscure. Inflorescences terminal or from upper leaf axils, to 10 cm in fruit, sparsely short strigose, ebracteate. Pedicel 3–4 mm. Calyx lobes obovate, ca. 2 mm, slightly enlarged in fruit, short strigose, apex obtuse. Corolla light blue; tube ca. 1.5 mm, apex slightly expanded, ca. 2 mm wide; throat appendages ca. 0.5 mm, apex retuse; limb 4–5 mm wide; lobes suborbicular, ca. 2 mm wide. Stamens inserted at middle of corolla tube; anthers ca. 0.4 mm. Mature nutlets brown, inverted subulate, trigonous-tetrahedral, ca. 1 mm, together fastigiate, glabrous, shiny, adaxial 3 surfaces subequal in size; abaxial surfaces triangular-ovate, narrowly 3-winged on ribs, apex acute, sessile. Fl. May–Jun, fr. Jun–Jul.

• Forest, forest margins, thickets, ravines, stream banks, mountain roadsides and valleys; 500–1600 m. Guizhou, Hunan, Jiangxi, Sichuan, Yunnan.

- 1a. Basal leaves ca. 8 × 3.5 cm, petiole to 7 cm 22c. var. *xichougensis*
- 1b. Basal leaves 2.5–5 × 1–2.5 cm, petiole 0.3–2.5 cm.
 - 2a. Stems sparsely short strigose; nutlets glabrous 22a. var. *laxa*
 - 2b. Stems spreading hirsute; nutlets sometimes sparsely pubescent 22b. var. *hirsuta*

22a. *Trigonotis laxa* var. *laxa*

南川附地菜 (原变种) *nan chuan fu di cai* (yuan bian zhong)

Stems sparsely short strigose. Petiole 0.3–2.5 cm; leaf blade 2.5–5 × 1–2.5 cm. Nutlets glabrous.

• Forest margins, thickets, shaded moist stream banks and ravines; 1500–1600 m. Sichuan (Nanchuan Xian).

22b. *Trigonotis laxa* var. *hirsuta* W. T. Wang ex C. J. Wang, Acta Bot. Yunnan 4: 39. 1982.

硬毛南川附地菜 *ying mao nan chuan fu di cai*

Stems and petioles spreading hirsute, hairs 0.5–1(–1.5) mm. Petiole 0.3–2.5 cm; leaf blade 2.5–5 × 1–2.5 cm. Nutlets sometimes sparsely pubescent.

• Thickets, forests, forest margins, streamsides and mountain roadsides; 500–1600 m. Guizhou, Hunan, Jiangxi.

22c. *Trigonotis laxa* var. *xichougensis* (H. Chuang) C. J. Wang, Kung & W. T. Wang, Fl. Reipubl. Popularis Sin. 64(2): 97. 1989.

西畴南川附地菜 *xi chou nan chuan fu di cai*

Trigonotis xichougensis H. Chuang, Acta Bot. Yunnan. 5: 61. 1983.

Stems sparsely short strigose. Petiole to 7 cm; basal leaves to 8 × 3.5 cm. Nutlets glabrous.

• Moist alpine ravines and valleys; ca. 1600 m. SE Yunnan (Xichou Xian).

23. *Trigonotis bracteata* C. J. Wang, Acta Phytotax. Sin. 18: 254. 1980.

全苞附地菜 *quan bao fu di cai*

Herbs perennial. Stems erect to obliquely spreading, 35–45 cm tall, short strigose. Leaf blade oblong to ovate, 1.5–4 × 0.5–1.5 cm, strigose, abaxially more densely and longer strigose along veins, base rounded to broadly cuneate, apex acute. Inflorescences at apex of branches, extra-axillary, with solitary flowers, bracteate throughout; peduncle thin, weak, with thick hairs 1–1.5 cm; bracts leaflike. Pedicel 1–1.5 mm, densely short strigose, usually pendulous after anthesis. Calyx 5-parted; lobes narrowly ovate, ca. 2 mm, slightly enlarged in fruit, ca. 3 mm. Corolla light blue-purple; throat appendages ca. 0.5 mm, pubescent, apex retuse; limb 4–5 mm wide; lobes suborbicular, ca. 3 mm wide. Anthers oblong, ca. 0.5 mm, apex obtuse. Style slightly longer than corolla tube; stigma capitate. Nutlets brown, oblique subulate, trigonous-tetrahedral, ca. 1 mm, glabrous, adaxial bottom surface smaller than 2 subequal lateral surfaces; abaxial surfaces broadly ovate, 1–1.3 mm, narrowly marginate; stipe ca. 3 mm, curved. Fl. May.

• Forest margins, hillside meadows; ca. 2100 m. Xizang (Tongmai Xian).

24. *Trigonotis radicans* (Turczaninow) Steven subsp. *sericea* (Maximowicz) Riedl, Linzer Biol. Beitr. 25: 94. 1993.

北附地菜 *bei fu di cai*

Omphalodes sericea Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 17: 453. 1872; *O. aquaticica* Brand; *O. aquaticica* var. *sinica* Brand; *O. sericea* var. *koreana* Brand; *Trigonotis coreana* Nakai; *T. nakaii* H. Hara; *T. radicans* var. *sericea* (Maximowicz) H. Hara; *T. sericea* (Maximowicz) I. M. Johnston; *T. sericea* Ohwi.

Herbs perennial, sparsely short strigose, glabrescent,

or more densely sericeous-strigose. Stems several, cespitose, erect becoming creeping, to 50 cm tall, rooting from apex or producing rooting branches from axils of upper leaves. Petiole of basal leaves to 18 cm; leaf blade oblong-ovate to ovate, 1–4 cm, rarely longer, abaxially finely short strigose, base cordate to rounded, apex acute; midvein prominent, lateral veins obscure; stem leaves short petiolate. Pedicel to 2 cm in fruit, densely short strigose. Flowers solitary, above stem leaf axils. Calyx 5-parted; lobes lanceolate to broadly ovate, ca. 3 mm, to 5 mm in fruit, apex acute. Corolla light blue or white; tube ca. 1.2–2 mm; throat appendages ca. 0.5 mm, pubescent; limb 6–8(–12) mm wide; lobes divaricate, oblong. Anthers elliptic, ca. 0.5 mm, apex obtuse. Mature nutlets brown, oblique subulate, trigonous-tetrahedral, pubescent, adaxial bottom surface slightly smaller than 2 lateral surfaces; abaxial surfaces flat, rhomboid to rhomboid-ovate, ca. 2 mm, margin narrowly ribbed, apex acute; stipe ca. 0.8 mm, curved. Fl. Jun-Aug, fr. Jul-Sep.

Forest margins, thickets, brookside meadows. NE Hebei, Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia].

25. *Trigonotis myosotidea* (Maximowicz) Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 27: 506. 1881.

水甸附地菜 shui dian fu di cai

Eritrichium myosotideum Maximowicz, Prim. Fl. Amur. 203. 1859.

Plants perennial. Rhizomes creeping, black. Stem usually single or few, erect, 20–45 cm tall, sparsely short strigose, branched at apex; stem leaves oblong-lanceolate to lanceolate, 2.5–6 cm × 7–10 mm, sparsely short strigose or glabrescent, base narrowly cuneate, decurrent on a short narrowly winged petiole, apex acute. Inflorescences terminal on stems and branches, to 15 cm in fruit, reclinate, bracteate only at base. Pedicel ca. 5 mm, to 1 cm in fruit, recurved, rarely horizontal. Calyx lobes narrowly elliptic, ca. 1.5 mm, to 4–5 mm in fruit, sparsely short strigose, apex acute. Corolla light blue; tube ca. 1.8 mm; throat appendages short hairy, apex retuse; limb ca. 6 mm wide; lobes divaricate, broadly ovate, ca. 2.5 mm. Anthers elliptic, ca. 0.6 mm, base subcordate, apex obtuse. Nutlets dark brown, oblique subulate, trigonous-tetrahedral, shiny, glabrous, sessile, adaxial bottom surface smaller than 2 subequal lateral surfaces, margin narrowly ribbed, apex acute; abaxial surfaces flat or slightly concave, triangular, ca. 2 mm. Fl. and fr. Jul-Aug.

In tussocks in swamps, moist ditch banks. Hebei, Heilongjiang, Jilin, Liaoning [E Russia].

26. *Trigonotis tenera* I. M. Johnston, J. Arnold Arbor. 21: 56. 1940.

蒙山附地菜 meng shan fu di cai

Herbs perennial, densely cespitose, with short thick caudex and withered petioles. Stems numerous, cespitose, prostrate to ascending, 10–16 cm tall, sparsely strigose. Basal leaves numerous; petiole 0.3–1.8 cm, base expanded becoming sheathy, ciliate; leaf blade cordate to orbicular-ovate, 0.5–3 × 0.5–1.5 cm, finely strigose, base cordate, rarely

rounded, apex acute; upper and middle stem leaves few, with smaller blade and petiole 4–5 mm. Inflorescences terminal, 5–9 cm; bracts basal, 2 or 3, leaflike. Pedicel filiform, 0.8–2 cm. Calyx lobes lanceolate, 0.5–2 mm at anthesis, slightly enlarged in fruit, apex acute. Corolla blue; tube ca. 1.5 mm; throat appendages ca. 0.5 mm; limb ca. 3 mm wide; lobes divaricate, suborbicular, ca. 1.5 mm. Stamens inserted on middle of corolla tube; anthers oblong, ca. 0.5 mm. Nutlets dark brown, oblique subulate, trigonous-tetrahedral, vertical, 1–3 mm, sparsely pubescent, adaxial 3 surfaces slightly convex, bottom surface smaller than 2 subequal lateral surfaces, longitudinally ribbed at juncture of lateral surfaces; abaxial surfaces convex or somewhat flat, ovate, acutely 3-ribbed, apex acute; stipe ca. 0.3 mm, straight to ± curved. Fl. Aug.

• Moist forests, forest margins, crevices; ca. 900 m. Shandong.

27. *Trigonotis petiolaris* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 506. 1881.

祁连山附地菜 qi lian shan fu di cai

Herbs perennial, densely cespitose, with short thick caudex. Stems numerous, cespitose, erect to ascending, 15–20 cm tall, sparsely fine strigose. Petiole of basal leaves 2–4 cm, sparsely strigose; leaf blade oblong to rotund, unequal in size, 0.7–4 × 0.7–1.5 cm, sparsely strigose, base rounded to subcordate, rarely broadly cuneate, apex rounded, mucronate. Upper stem leaves short petiolate, elliptic. Inflorescences terminal; bracts 2 or 3, basal, leaflike. Pedicel spreading or subhorizontal, filiform, 1–2.5 cm. Calyx lobes ovate, 1.5–2 mm, apex acute. Corolla light blue; tube ca. 1 × 1.5 mm; throat appendages ca. 0.5 mm; limb ca. 3 mm wide; lobes suborbicular. Nutlets dark brown, oblique subulate, trigonous-tetrahedral, pubescent, adaxial bottom surface slightly convex, 2 lateral surfaces flat, at their juncture 1 longitudinally ribbed; abaxial surfaces convex, triangular-ovate, ca. 1.5 mm, acutely 3-ribbed, apex acute; stipe short, curved.

• Hillside meadows, roadsides; 2700–2900 m. Gansu (E Qilian Shan), Qinghai.

28. *Trigonotis harrismithii* R. R. Mill in & G. L. Chu, Kamelin, R. R. Mill, & M. G. Gilbert, Novon 5: 17. 1995.

松潘附地菜 song pan fu di cai

Trigonotis smithii W. T. Wang, Bull. Bot. Res., Harbin 13(1): 3. 1993, not Banerjee, Bull. Bot. Surv. India 8: 325. 1967.

Stems 4 to many, cespitose, simple or with a single lateral branch, slender, 5–19 cm tall, sparsely minute strigose. Petiole 0.9–1.2 cm, shorter in upper leaves; leaf blade ovate to narrowly elliptic, 6–13 × 3–8 mm, papery, densely appressed puberulent, base broadly cuneate, apex acute; lateral veins prominent abaxially, flat adaxially. Inflorescences 3.2–12 cm, 5–15-flowered; bracts basal or throughout, sessile or short stalked, narrowly ovate to narrowly elliptic; axis and pedicel densely puberulent. Pedicel 0.6–3 mm, lowermost often

longer. Calyx lobes ca. 1 mm at anthesis, ca. 2 mm in fruit, densely appressed puberulent on both sides, apex acute. Corolla blue, glabrous; tube 0.8–1 mm; appendages lunate; limb 1.7–2.2 mm wide; lobes obovate-quadrate, rounded to truncate at apex. Anthers ovate, 0.3–0.4 mm. Nutlets subulate, trigonous-tetrahedral; adaxial surfaces triangular, ca. 1.2×0.6 mm, with prominent adaxial angle; abaxial surfaces convex, ovate-triangular, ca. 1.2×1 mm, finely puberulent; stipe short. Fl. and fr. Jul.

- Mountain meadows, along rivulets; ca. 3200 m. Sichuan.

29. *Trigonotis longipes* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 85. 1986.

长梗附地菜 *chang geng fu di cai*

Plants ?biennial. Stems ascending, branched from the base upward, 8–20 cm tall, sparsely strigose. Petiole of basal and lower stem leaves 2–3.6 cm, sparsely minute strigose; leaf blade narrowly elliptic to elliptic-ovate, 1–2.2 cm \times 6–9 mm, strigose, base cuneate, apex \pm acute or subobtusate, often apiculate; lateral veins 3 pairs, inconspicuous; upper stem leaves and bracts gradually decreasing in size, short petiolate to sessile, narrowly ovate to spatulate. Inflorescences 1–17 cm, occupying whole length of branches, axis sparsely minute strigose. Pedicel 4–9 mm, 0.9–1.6 cm in fruit, densely minute strigose at apex. Calyx lobes narrowly triangular, ca. 1.8 mm, united at base, minutely strigose. Corolla purple, glabrous, 4–5 mm wide; tube ca. 1.1 mm; appendages low trapeziform, ca. 0.3 mm; lobes suborbicular. Anthers oblong, ca. 0.5 mm. Nutlets subulate, trigonous-tetrahedral, smooth, sparsely pubescent; abaxial surfaces plane, deltate-ovate, ca. 1.2×1.2 mm, with sharp angles, sessile. Fl. and fr. Jun.

- Along paths and rivulets; 3200–3500 m. Sichuan.

30. *Trigonotis gracilipes* I. M. Johnston, J. Arnold Arbor. 18: 9. 1937.

细梗附地菜 *xi geng fu di cai*

Herbs perennial. Stems usually numerous, cespitose, erect to ascending, branched below or not, 10–40 cm tall,

strigose. Leaves numerous; petiole 1–4 cm; leaf blade elliptic to oblong-lanceolate, 0.7–3 cm × 3–15 mm, abaxially strigose, base narrowly cuneate to rounded, apex rounded, mucronate; upper stem leaves short petiolate or sessile. Inflorescences of middle and lower stems and branches extra-axillary, 1-flowered, bracteate and several flowered on stem apices. Pedicel 1–10 mm, to 2 cm in fruit, straight and obliquely spreading, or tortuous. Calyx lobes ovate, ca. 1.5 mm, slightly enlarged to 2–3 mm, strigose, apex acute. Corolla light blue; tube ca. 2 × 2 mm; limb 4–5 mm wide; lobes suborbicular. Anthers oblong, apex obtuse. Mature nutlets dark brown, oblique subulate, trigonous-tetrahedral, sparsely pubescent, adaxial bottom surface slightly convex, smaller, 2 lateral surfaces equal in size, slightly concave; abaxial surfaces flat, triangular-ovate, ca. 1.3 mm, narrowly 3-ribbed; carpophore ca. 0.2 mm, sharply recurved. Fl. Jun-Jul, fr. Jul-Aug.

• Hillside meadows, forests, forest margins, valleys, ravines; 2500–4200 m. SW Sichuan, S Xizang, NW Yunnan.

Trigonotis gracilipes resembles *T. ovalifolia* of the Himalaya and India except for the ebracteate inflorescences. It resembles *T. delicatula* and *T. corispermoides* in having the inflorescences of lower and middle stems with solitary extra-axillary flowers, but the nutlets in these two species are semiglobose-tetrahedral.

31. *Trigonotis muliensis* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 84. 1986.

木里附地菜 mu li fu di cai

Plants ?perennial. Stems branched from the base upward or only at apex, 23–28 cm tall, spreading white pubescent. Petiole of upper stem leaves 3–14 mm, longer in basal leaves; leaf blade broadly ovate to broadly elliptic, 1–1.8 × 0.9–1.2 cm, appressed pubescent, apex obtuse or rounded, apiculate; lateral veins indistinct. Inflorescences 1.5–11 cm, few to many flowered, axis with spreading hairs at base, minutely strigose at apex. Pedicel 1.5–4.5 mm, to 7 mm in fruit, minutely strigose. Calyx lobes oblong-ovate, ca. 3 mm, strigose, with long white hairs at margin, slightly connected at base. Corolla blue, ca. 4.5 mm wide; tube ca. 1.1 mm; appendages low trapeziform, ca. 0.4 mm; lobes 5, suborbicular. Anthers oblong, ca. 0.5 mm. Nutlets subulate, trigonous-tetrahedral, smooth, with very short hairs; abaxial surfaces deltate-ovate, ca. 1.2 × 1.2 mm, inner surfaces subequal in size, joined at sharp angles; stipe indistinct. Fl. and fr. Jul.

• Mountain slopes; above 3000 m. Sichuan.

32. *Trigonotis microcarpa* (de Candolle) Bentham ex C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 172. 1883.

毛脉附地菜 mao mai fu di cai

Eritrichium microcarpum de Candolle in A. de Candolle, Prodr. 10: 123. 1846; *Myosotis microcarpa* Wallich; *Trigonotis peduncularis* (Treviranus) Bentham ex Baker & Moore var. *microcarpa* (de Candolle) Brand.

Herbs perennial, with short rhizomes and caudex and persistent petioles. Stems erect to ascending, 20–60 cm tall, short strigose; branches numerous, short. Petiole of basal and

lower stem leaves to 3 cm; leaf blade ovate to oblong, 1.5–5 × 0.5–2 cm, abaxially strigose, with more numerous longer hairs along prominent veins, base rounded, apex mucronate; lateral veins 3 pairs, basal pair arcuate. Inflorescences 2–4 cm, to 18 cm in fruit, short strigose; bracts at base only. Pedicel 3–5 mm in fruit. Calyx lobes lanceolate, 2–2.5 mm, apex acute. Corolla blue-purple; tube ca. 2 mm; throat appendages retuse at apex; limb 4–5 mm wide; lobes divaricate, broadly ovate. Anthers elliptic, ca. 0.6 mm, apex mucronulate. Nutlets dark brown, oblique subulate, trigonous-tetrahedral, 0.8–1 mm, smooth, glabrous, adaxial bottom surface slightly convex, somewhat smaller than 2 equal lateral surfaces; abaxial surfaces convex, ovate, acutely 3-ribbed; carpophore obscure, short.

Hillside meadows, thickets, forest margins, stream banks, valleys; 1000–2800 m. Guangxi, SW Guizhou, S and SE Xizang, NW, SE and W Yunnan [Bhutan, India, Japan, Kazakhstan, Nepal, Russia].

33. *Trigonotis longiramosa* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 83. 1986.

长枝附地菜 chang zhi fu di cai

Plants ?perennial. Stems diffuse, with long branches from base upward, ca. 60 cm tall, minutely crisped strigose. Basal leaves unknown. Lower stem leaves long petiolate; leaf blade ca. 5.8 × 2 cm, pubescent, base broadly truncate, apex obtuse, short apiculate; lateral veins 2 pairs, indistinct; upper leaves reduced in size upward, narrowly ovate, 1.5–4 cm, apex acute. Inflorescences 12–50 cm in fruit, minutely strigose; bracts in lower part, leaflike. Pedicel 1.5–6 mm, minutely strigose. Calyx lobes linear-lanceolate, ca. 1.2 mm, sparsely pubescent, margin long ciliate. Corolla glabrous; tube ca. 1.5 mm; faucal appendages low trapeziform, ca. 0.4 mm; limb ca. 5 mm wide; lobes orbicular-obovate. Anthers oblong, ca. 0.5 mm. Pistil ca. 1 mm. Nutlets subulate, trigonous-tetrahedral, smooth, glabrous, adaxially with sharp angles; abaxial surfaces deltate-ovate, ca. 1 × 1 mm; stipe ca. 0.2 mm. Fl. and fr. Oct.

• Sichuan.

34. *Trigonotis cinereifolia* C. J. Wang, Acta Phytotax. Sin. 18(2): 254. 1980.

灰叶附地菜 hui ye fu di cai

Herbs perennial. Stems erect, much branched, rarely not branched, 30–45 cm tall, short strigose. Petiole of lower leaves to 3 cm; stem leaves gray, ovate to oblong, 0.7–2 cm × 3–10 mm, subleathery, abaxially densely strigose, with more numerous longer hairs along prominent veins, base broadly cuneate to rounded, apex obtuse, mucronate; middle and upper stem leaves short petiolate to sessile. Inflorescences terminal, densely strigose; lowermost 2–5 flowers with leaflike bracts. Pedicel spreading, 3–10 mm, densely strigose. Calyx lobes narrowly elliptic, ca. 3 mm in fruit, densely strigose, apex acuminate. Corolla light blue; tube ca. 1 mm; throat appendages ca. 0.5 mm, pubescent; limb 4–5 mm wide; lobes broadly obovate, ca. 2 mm. Anthers oblong, apex mucronate. Style ca. as long as corolla tube. Nutlets dark brown, oblique subulate, trigonous-tetrahedral,

ca. 1 mm, glabrous, shiny, adaxial bottom surface slightly smaller than 2 lateral surfaces; abaxial surfaces broadly ovate, acutely 3-ribbed; carpophore short, curved. Fl. Jun-Jul, fr. Jul-Aug.

- Thickets, meadows; ca. 2000 m. Xizang (Tongmai Xian).

35. *Trigonotis rockii* I. M. Johnston, Contr. Gray Herb. 75: 47. 1925.

高山附地菜 *gao shan fu di cai*

Herbs perennial, densely cespitose. Stems erect, base frequently ascending, 7–15 cm tall, sparsely strigose. Petiole of basal leaves 1–3 cm; leaf blade green, elliptic to ovate, ca. 2.5 × 1 cm, sparsely strigose, base rounded, apex obtuse, mucronate; stem leaves smaller, short petiolate to subsessile. Inflorescences racemose; bracts basal, leaflike. Pedicel 2–7 mm, usually spreading, strigose. Calyx lobes narrowly oblong to oblanceolate-oblong, ca. 2 mm, densely long strigose, apex obtuse. Corolla light blue-purple; tube ca. 2 mm; throat appendages trapeziform, ca. 0.8 mm, pubescent; limb 7–8 mm wide; lobes rotate spreading, suborbicular. Stamens inserted above middle of corolla tube; anthers elliptic. Style slightly longer than corolla tube. Nutlets subulate, irregularly trigonous-tetrahedral, ca. 2 × 2 mm, glabrous, obscurely tuberculate.

- Alpine valleys, hillside meadows, thickets; 3300–4900 m. S Xizang, NW Yunnan.

36. *Trigonotis peduncularis* (Trevisan) Benth. ex Baker & S. Moore, J. Linn. Soc., Bot. 17: 384. 1879.

附地菜 *fu di cai*

Herbs annual or biennial. Stems usually numerous, rarely single, crowded, diffuse, much branched at base, 5–30 cm tall, short strigose. Basal leaves rosulate, petiolate, spatulate, 2–5 cm, strigose, base cuneate to attenuate, apex rounded to obtuse; upper stem leaves sessile or short petiolate, oblong to elliptic. Inflorescences terminal, circinate when young, gradually elongated, 5–20 cm; basal 2 or 3 flowers with leaflike bracts. Pedicel to 3–5 mm after anthesis, apex thickened, clavate in fruit. Calyx lobes ovate, 1–3 mm, apex acute. Corolla light blue or pink; throat appendages white or yellowish; limb 1.5–2.5 mm; lobes divaricate, obovate, apex rounded to obtuse. Anthers ovate, ca. 0.3 mm, apex mucronate. Nutlets oblique subulate, trigonous-tetrahedral, 0.8–1 mm, short pubescent or glabrous, adaxial 2 lateral surfaces subequal, bottom surface smaller and convex; abaxial surfaces triangular-ovate, acutely 3-ribbed; carpophore ca. 1 mm, curved. Fl. early.

Hillsides, meadows, forest margins, thickets, fields, waste areas. Fujian, Gansu, N Guangxi, Hebei, Heilongjiang, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Xinjiang, Xizang, Yunnan [temperate Asia, E Europe].

- 1a. Corolla 1.5–2(–3) mm wide, tube scarcely 1 mm 36a. var. *peduncularis*
- 1b. Corolla 3.5–5(–6) mm wide, tube

1.5–2 mm.

- 2a. Calyx lobes linear-lanceolate in fruit, apex acute 36b. var. *macrantha*
- 2b. Calyx lobes oblanceolate-linear in fruit, apex obtuse to rounded, rarely acute 36c. var. *amblyosepala*

36a. *Trigonotis peduncularis* var. *peduncularis*

附地菜(原变种) *fu di cai (yuan bian zhong)*

Myosotis peduncularis Trevisan, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamten Naturk. 7: 147. 1813; *Eritrichium pedunculare* (Trevisan) A. de Candolle; *E. japonicum* Miquel; *Myosotis chinensis* A. de Candolle; *Trigonotis clavata* Steven.

Corolla 1.5–2.5 mm wide; tube scarcely 1 mm wide. Calyx lobes narrowly triangular to linear-triangular in fruit.

Hillsides, meadows, forest margins, fields, waste areas. Fujian, Gansu, N Guangxi, Heilongjiang, Jiangxi, Jilin, Liaoning, Nei Mongol, Xinjiang, Xizang, Yunnan [temperate Asia, E Europe].

36b. *Trigonotis peduncularis* var. *macrantha* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 89. 1986.

大花附地菜 *da hua fu di cai*

Corolla 3.5–4.5 mm wide; tube ca. 2 mm. Calyx lobes linear-lanceolate in fruit, apex acute.

- Gansu, Hebei, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi.

36c. *Trigonotis peduncularis* var. *amblyosepala* (Nakai & Kitagawa) W. T. Wang, Bull. Bot. Res., Harbin 6(3): 90. 1986.

钝萼附地菜 *dun e fu di cai*

Trigonotis amblyosepala Nakai & Kitagawa, Rep. Exped. Manchoukuo, Sect. IV, 4(1): 44. 1934.

Corolla 3.5–5(–6) mm wide; tube ca. 1.5 mm. Calyx lobes oblanceolate-linear in fruit, apex obtuse or rounded, rarely ± acute.

- Hillside meadows, forest margins, thickets, fields. Hebei, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi.

37. *Trigonotis tibetica* (C. B. Clarke) I. M. Johnston, Contr. Gray Herb. 75: 48. 1925.

西藏附地菜 *xi zang fu di cai*

Eritrichium tibeticum C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 165. 1883; *Pedinogyne tibetica* (C. B. Clarke) Brand.

Herbs annual or biennial, diffuse, 10–25 cm tall. Stems much branched, short strigose. Basal leaves and lower stem leaves petiolate, elliptic-ovate to linear, 0.8–2 cm × 2–6 mm, short gray strigose, base cuneate, apex acute. Inflorescences terminal, lax; bracts basal only, leaflike. Pedicel usually obliquely spreading, to 5 mm. Calyx 5-parted; lobes erect,

narrowly ovate to lanceolate, to 1.5 mm. Corolla light blue or white, campanulate; tube ca. 1.5 mm; throat yellow; appendages lunate; limb ca. 3 mm wide; lobes obovate, ca. 1.5 mm. Stamens included, inserted at middle of corolla tube. Nutlets dark brown, oblique subulate, trigonous-tetrahedral, 1–1.5 mm, shiny, usually glabrous, adaxial bottom surface prominent, 2 lateral surfaces equal, a longitudinal rib at their juncture; abaxial surface convex, ovate, acutely 3-ribbed; carpophore sharply curved. Fl. May-Sep, fr. Jun-Sep.

Alpine and subalpine hillside meadows, thickets. Qinghai, W Sichuan, Xizang [Bhutan, N India, Nepal].

38. *Trigonotis leucantha* W. T. Wang, Bull. Bot. Res., Harbin 6(3): 87. 1986.

白花附地菜 bai hua fu di cai

Herbs annual. Stems much branched from base upward, ca. 15 cm tall, white pubescent. Petiole of basal leaves 1.8–3.4 cm; leaf blade ovate, 0.9–1.6 cm × 6–12 mm, papery, minutely strigose, base rounded-truncate, apex rounded; stem leaves similar, with shorter petiole, sometimes ± cordate at base. Inflorescences 2–7 cm, axis minutely strigose; bracts basal, 2 or 3. Pedicel 1.5–3 mm, minutely strigose. Calyx lobes broadly lanceolate, ca. 1.2 mm, outside sparsely minute strigose, apex acute. Corolla white, glabrous, ca. 4 mm wide; tube ca. 1 mm; throat appendages trapeziform, ca. 0.2 mm; lobes suborbicular. Anthers ca. 0.3 mm. Nutlets subulate, trigonous-tetrahedral, smooth, glabrous, adaxial surfaces forming sharp angles; abaxial surfaces deltate, ca. 1.1 × 1 mm, sessile. Fl. and fr. Jul.

• In mountain forests; ca. 3700 m. Sichuan.

39. *Trigonotis funingensis* H. Chuang, Acta Bot. Yunnan. 5: 62. 1983.

富宁附地菜 fu ning fu di cai

Herbs perennial. Rhizomes dark brown, ca. 6 mm in diam., usually ascending, frequently with withered petioles; roots numerous, fine, fibrous. Stems erect, usually not branched, 20–25 cm, strigose. Basal leaves 2 or 3; petiole 4–8 cm, leaf blade long elliptic to narrowly ovate, 7–20 × 3–4 cm, abaxially sparsely strigose, base rounded or slightly so, apex rounded, mucronate; stem leaves smaller, short petiolate. Inflorescences 2 or 3, fascicled on stem and branch apices, ebracteate. Pedicel ca. 3 mm, densely strigose. Calyx lobes oblanceolate, 2–3 mm, apex acute. Corolla white or light blue; limb ca. 5 mm wide; lobes obovate to orbicular, ca. 2.5 × 2 mm. Mature nutlets unknown.

• Forests; ca. 1000 m. Yunnan (Funing Xian).

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