

**12. ONOSMA** Linnaeus, Sp. Pl. ed. 2, 1: 196. 1762.

滇紫草属 dian zi cao shu

Herbs biennial or perennial, rarely subshrubs, scabrous. Leaves petiolate or sessile, margin entire. Cymes scorpioid, solitary at stem apex or terminating stems and branches and forming a panicle, usually elongated in fruit, bracteate. Flowers actinomorphic, pedicellate or sessile. Calyx parted to or nearly to base; lobes 5, linear or linear-lanceolate, equal, usually enlarged after anthesis. Corolla blue, yellow, rarely white or red, tubular-campanulate or retrorse-conical, usually gradually expanded from base upward, rarely abruptly expanded from middle; throat unappendaged; nectary ringlike or irregularly lobed, pubescent or glabrous; lobes vertical or recurved, margin dentate. Anthers laterally coherent into a tube or sagittate at base, usually pellucid, emarginate, apex sterile. Style included or slightly exerted; stigma capitate. Gynobase flat. Nutlets 4, erect, ovate-triangular, length and width subequal, adaxially usually ribbed, abaxially slightly convex; attachment scar basal.

About 145 species: centered in Asia, 29 species in China.

- 1a. Anthers coherent only at base.
  - 2a. Corolla 2–2.5 cm; filaments inserted at or above middle of corolla tube.
    - 3a. Corolla blue, purple, or light purple-red ..... 1. *O. hookeri*
    - 3b. Corolla yellow or light yellow.
      - 4a. Herbs, mostly biennial; stems branched; leaves not convolute; anther appendages exerted; nutlets 4–5 mm ..... 6. *O. setosa*
      - 4b. Subshrubs or perennial herbs; stems mostly not branched; leaves convolute; anthers included; nutlets 2.5–3 mm ..... 7. *O. simplicissimum*
  - 2b. Corolla 0.7–1.6 cm; filaments inserted below middle of corolla tube.
    - 5a. Corolla red, 7–9 mm, ca. as long as calyx lobes; filaments inserted ca. 2.5 mm above base of corolla tube ..... 2. *O. cingulatum*
    - 5b. Corolla blue or red, 10–16 mm, longer than calyx lobes; filaments inserted 4–5.5 mm above base of corolla tube.
      - 6a. Stems several, branched at base; inflorescences terminal and axillary, capitate; corolla 1–1.2 cm ..... 4. *O. glomeratum*
      - 6b. Stem single, unbranched, or branched at middle; inflorescences terminal, elongated; corolla 1.4–1.6 cm.
        - 7a. Plants gray; basal leaves oblanceolate, apex acuminate; inflorescences sometimes dichotomously branched; nutlets gray ..... 3. *O. mertensioides*
        - 7b. Plants green; basal leaves linear-lanceolate, apex obtuse; inflorescences unbranched; nutlets yellow-white ..... 5. *O. zayuense*
- 1b. Anthers coherent into a tube.
  - 8a. Anthers included, or only sterile apex exerted from corolla.
    - 9a. Filaments and style pubescent.
      - 10a. Stems single, not branched; upper stem leaves hastate and usually clasping at base ..... 11. *O. paniculatum*
      - 10b. Stems several, cespitose, branched from base; upper stem leaves cuneate or rounded at base ..... 12. *O. lijiangense*
    - 9b. Filaments and style glabrous.
      - 11a. Corolla 2–2.7 cm.
        - 12a. Corolla club-shaped, lobes apiculate; bracts longer than calyx ..... 9. *O. apiculatum*
        - 12b. Corolla not club-shaped, lobes not apiculate; bracts not longer than calyx.
          - 13a. Leaves green, only 4–5 mm wide ..... 8. *O. irritans*
          - 13b. Leaves gray-white, wider than 5 mm ..... 10. *O. gmelinii*
      - 11b. Corolla 1–1.3 cm.
        - 14a. Filaments not decurrent, base expanded, triangular ..... 16. *O. maaikangense*
        - 14b. Filaments decurrent.
          - 15a. Filaments inserted near middle of corolla tube, decurrent part linear, mealy, minutely pubescent ..... 15. *O. waltonii*
          - 15b. Filaments inserted at lower part of corolla tube, decurrent part oblong, not pubescent.
            - 16a. Leaf blade gray-white abaxially, densely strigose, with only midvein evident; corolla lobe short strigose inside on midveins ..... 14. *O. confertum*
            - 16b. Leaf blade gray abaxially, densely pubescent and strigose, 3-veined; corolla lobes glabrous or nearly so ..... 13. *O. wardii*
  - 8b. Anthers half to completely exerted from corolla.
    - 17a. Filament bases and adjacent corolla tube pilose.
      - 18a. Filament insertion with sparse hairs, not forming a ring ..... 17. *O. liui*

- 18b. Filament insertion with dense hairs, forming a ring.
- 19a. Stems herbaceous, pallid; stem leaves lanceolate, 3–8 × 1–1.5 cm, base rounded, apex acuminate, 3-veined, lateral veins conspicuous; corolla 10-ranked, minutely hispid inside ..... 19. *O. decastichum*
- 19b. Stems suffruticose, gray-green; stem leaves oblanceolate, 1–1.5 × 0.2–0.5 cm, base attenuate or sessile, apex obtuse, only midvein evident.
- 20a. Base of filaments and corolla interior glabrous; calyx ca. 6 mm; corolla 11–11.5 mm ..... 21. *O. farreri*
- 20b. Base of filaments and adjacent parts of corolla villous; calyx 7–9 mm; corolla 8–9.5 mm ..... 20. *O. sinicum*
- 17b. Filament base and adjacent corolla tube glabrous.
- 21a. Stems single, stout, base 0.8–1.4 cm wide; plants biennial.
- 22a. Anthers half exerted; corolla 11–14 mm, throat 5–8.5 mm wide, tube glabrous inside ..... 18. *O. fistulosum*
- 22b. Anthers completely exerted; corolla 7–8 mm, throat 3–3.5 mm wide, tube sparsely pubescent inside ..... 29. *O. exsertum*
- 21b. Stems usually several, more slender; plants perennial or, if biennial, caespitose.
- 23a. Anthers and buds curved at apex ..... 27. *O. multiramosum*
- 23b. Anthers and buds straight.
- 24a. Filament bases and adjacent corolla tube papillate, glandular.
- 25a. Leaf blade lanceolate to oblong, only midvein evident; inflorescences terminal and axillary, branches slender; calyx lobes linear, 5–7 × 1 mm; nutlets yellow-white, 2–3 mm, tuberculate, wrinkled ..... 25. *O. adenopus*
- 25b. Leaf blade ovate-lanceolate or linear-lanceolate, 3-veined; inflorescences terminal, branches stout; calyx lobes lanceolate, 7–9 × 1–2 mm; nutlets gray-brown, ca. 3 mm, papillate, tuberculate ..... 26. *O. nangqenense*
- 24b. Filament base and adjacent corolla tube not papillate or glandular, rarely papillate on decurrent part of filament.
- 26a. Leaf blade gray-white abaxially, hispid, densely appressed pubescent.
- 27a. Leaves noticeably 3-veined; style glabrous ..... 24. *O. yajiangense*
- 27b. Leaves with only midvein evident; style pubescent below middle ..... 23. *O. album*
- 26b. Leaf blade green or light green abaxially, sparsely short appressed pubescent or pilose, sparsely hispid.
- 28a. Corolla obscurely pubescent outside, throat 4–9 mm wide; filaments decurrent, 6.5–7 mm ..... 28. *O. waddellii*
- 28b. Corolla short strigose outside, throat 4–5 mm wide; filaments not decurrent ..... 22. *O. luquanense*

**1. *Onosma hookeri*** C. B. Clarke in J. D. Hooker, Fl. Brit. India 4: 178. 1883.

细花滇紫草 xi hua dian zi cao

Herbs perennial, 20–30 cm tall, hispid, strigose, hairs discoid at base. Stems single to several, caespitose, not branched. Basal leaves oblanceolate, 5–15 × 0.5–1.5 cm, abaxially densely short strigose, adaxially hispid; stem leaves sessile, lanceolate to narrowly lanceolate, 3–8 cm × 4–10 mm, base obtuse to rounded, apex acute. Inflorescences usually solitary, terminal, 3–5 cm wide at anthesis, many flowered; bracts narrowly lanceolate. Pedicel 2–4 mm, densely hispid. Flowers crowded. Calyx lobes subulate, 1–1.5 cm, hispid, strigose. Corolla blue, purple, or light purple-red, tubular-campanulate, 1.7–3.3 cm; throat 7–8 mm wide, base 2–3 mm wide, strigose above middle and pubescent outside, glabrous inside; lobes broadly triangular, ca. 1.5 × 3 mm, margin revolute. Filaments linear, 5–6 mm, inserted at middle to ca. 2/3 from base of corolla tube; anthers united at base, 7–8 mm, sterile apex ca. 1 mm. Style exerted, 2.2–2.8 cm, glabrous. Nutlets unknown. Fl. Jun-Jul.

Hillsides, meadows, thickets; 3000–4700 m. Xizang [Bhutan,

India, Nepal].

- 1a. Corolla 1.7–2.2 cm ..... 1a. var. *hookeri*
- 1b. Corolla 3–3.3 cm.
- 2a. Filaments inserted ca. 2/3 from base of corolla ..... 1b. var. *longiflorum*
- 2b. Filaments inserted at middle of corolla tube or somewhat above ..... 1c. var. *hirsutum*

**1a. *Onosma hookeri* var. *hookeri***

细花滇紫草 (原变种) xi hua dian zi cao (yuan bian zhong)

*Onosma hookeri* subsp. *wardii* Stapf; *O. hookeri* var. *intermedium* I. M. Johnston.

Corolla 1.7–2.2 cm. Style glabrous. Fl. Jun-Jul.

Hillsides, valley meadows; 3100–4100 m. Xizang [Bhutan, NE India].

**1b. *Onosma hookeri* var. *longiflorum*** (Duthie) Duthie ex Stapf, Bot. Mag. 155: t. 9254. 1931.

长花细花滇紫草 *chang hua xi hua dian zi cao*

*Onosma longiflorum* Duthie, Bull. Misc. Inform. Kew 1912: 40. 1912.

Corolla usually 3–3.3 cm. Filaments inserted ca. 2/3 from base of corolla tube. Style glabrous. Fl. and fr. Aug.

Gravelly slopes, meadows, thickets; 3000–4700 m. Xizang [Nepal].

**1c. *Onosma hookeri* var. *hirsutum*** Y. L. Liu, Acta Phytotax. Sin. 18: 66. 1980.

毛柱细花滇紫草 *mao zhu xi hua dian zi cao*

Corolla 3.2–3.3 cm. Filaments inserted at middle of corolla tube or somewhat above. Style minutely hispid. Fl. Jul.

- Rocky and sandy hillsides; ca. 3800 m. Xizang (Lhasa Shi).

**2. *Onosma cingulatum*** W. W. Smith & Jeffrey, Notes Roy. Bot. Gard. Edinburgh 9: 112. 1916.

昭通滇紫草 *zhao tong dian zi cao*

*Onosma tsiangii* I. M. Johnston.

Herbs annual, yellow-green, 50–70(–150) cm tall, densely yellow hispid, reflexed white pubescent. Stems single, not branched. Basal leaves oblanceolate, 5–10 × 0.5–1.2 cm, abaxially densely strigose and sparsely hispid, adaxially densely hispid, hairs discoid at base, base attenuate into petiole, apex obtuse; stem leaves lanceolate or ovate-lanceolate, 4–7 × 1–2 cm, base rounded, apex acute. Inflorescences terminal and axillary, forming a large panicle; bracts linear-lanceolate to lanceolate, 0.5–2 cm × 2–7 mm, densely yellow hirsute and sparsely white strigose. Pedicel pendulous or recurved, slender, 1–1.5 cm, densely hispid. Flowers widely spaced. Calyx 6–8 mm, to 1.2–1.4 cm in fruit, parted nearly to base; lobes linear-lanceolate. Corolla red, tubular-campanulate, 7–9 mm, ca. 1.5 mm wide at base, gradually expanded upward, densely short strigose above middle outside, glabrous inside except for nectaries; throat 4–5.5 mm wide; nectary ringlike, ca. 0.5 mm, villous; lobes broadly triangular, ca. 1 × 2–2.5 mm, margin revolute. Filaments subulate, 2.5–3.5 mm, inserted ca. 2.5 mm above base in corolla tube; anthers united at base, ca. 4 mm, included. Nutlets black, ca. 2.5 mm, shiny. Fl. Jul.

- Rocky slopes, thickets, meadows; 2000–2800 m. Yunnan.

*Onosma tsiangii* differs from typical *O. cingulatum* by having fewer patent bristles on the leaf blade, calyx not yellow when dry, basal tubercles on stem bristles, and shorter hairs on leaf blade abaxially. These characteristics indicate that the taxon should be treated either as a variety or only as a later state of development. Sparse bristles and basal tubercles are characteristic of a later stage of development throughout the Boraginoideae.

**3. *Onosma mertensioides*** I. M. Johnston, J. Arnold Arbor. 32: 353. 1951.

川西滇紫草 *chuan xi dian zi cao*

Herbs perennial, gray, 15–30 cm tall, hispid, reflexed-

pilose. Stems single, erect, not branched. Basal leaves oblanceolate, 5–11 × 0.5–1.5 cm, abaxially densely appressed pubescent, adaxially appressed hispid, hairs discoid at base, base cuneate, apex acuminate; stem leaves oblong-lanceolate, 3–6 cm × 5–7 mm, base rounded or broadly cuneate, apex obtuse. Inflorescences terminal, solitary or dichotomously branched, racemose, 10–12 cm; bracts ovate-lanceolate, 3–7 mm, hispid, appressed pubescent. Pedicel 5–6 mm, elongated in fruit, stout, densely yellow hispid, white appressed pubescent. Calyx 7–8 mm, elongated in fruit, yellow hispid, parted nearly to base; lobes linear-lanceolate. Corolla blue-purple, changing to red late in season, tubular-campanulate, 1.2–1.6 cm, base ca. 2 mm wide, gradually expanded upward; throat 5–6 mm wide, densely short appressed pubescent outside, obscurely pubescent inside along veins; nectary ringlike, ca. 0.5 mm, lobed, pubescent; lobes triangular, ca. 1.5 mm, margin revolute. Filaments subulate, 4–5 mm, inserted ca. 5 mm above base of corolla tube; anthers united at base, 6–7 mm, included; apex sterile, ca. 1 mm. Nutlets gray, ca. 3 mm, shiny, sparsely papillate. Fl. and fr. Jul.

- Meadows; 3900–4000 m. SW and W Sichuan.

**4. *Onosma glomeratum*** Y. L. Liu, Acta Phytotax. Sin. 18: 66. 1980.

团花滇紫草 *tuan hua dian zi cao*

Herbs, gray-white, 20–30 cm tall, densely hispid. Stems several, caespitose, erect or ascending, branched from base. Leaf blade lanceolate or oblanceolate, 2–5 cm × 3–5 mm, base attenuate or rounded, apex obtuse or acute. Inflorescences terminal and axillary, subcapitate, 2–4 cm wide at anthesis, many flowered. Pedicel slender, very short. Flowers crowded. Calyx 7–8 mm; lobes linear-lanceolate, densely hispid outside, glabrous inside. Corolla red, tubular, 1–1.2 cm; throat 2–2.5 mm wide, widest at middle, 3–4 mm wide, glabrescent; nectary ca. 0.5 mm, glabrescent; lobes erect, triangular, ca. 1 × 1 mm, margin revolute. Filaments 2–2.5 mm, inserted 5–5.5 mm above base in corolla tube, decurrent base linear, ca. 3 mm; anthers united at base, ca. 5 mm, included; apex sterile, 0.5–1 mm. Style 1–1.2 cm, glabrous. Nutlets unknown. Fl. Aug.

- Sandy slopes; ca. 3700 m. Xizang (Leiwuqi Xian).

*Onosma glomeratum* resembles *O. limitaneum* I. M. Johnston from Afghanistan, NW India, Iran, and Pakistan, except the calyx lobes are glabrous inside, and the filament bases are decurrent and inserted at the same level. In *O. limitaneum* the calyx lobes are densely villous, and the filament bases are not decurrent and at different levels.

**5. *Onosma zayuense*** Y. L. Liu, Acta Phytotax. Sin. 18: 65. 1980.

察隅滇紫草 *cha yu dian zi cao*

Herbs perennial, green, ca. 35 cm tall, spreading hispid, pubescent. Stems slender, branched from middle. Basal leaves linear-lanceolate, 10–15 × 1–2 cm, abaxially densely pilose and sparsely appressed pubescent, adaxially hispid and short appressed pubescent, hairs discoid at base, base attenuate, apex obtuse; stem leaves sessile, oblong or lanceolate, 2.5–3 cm × 5–9 mm. Inflorescences terminal, not branched,

racemose after anthesis, 5–7 cm; bracts linear-lanceolate, ca. 12 × 2 mm. Pedicel slender, 1–1.5 cm, slightly elongated in fruit, spreading yellow hispid. Calyx parted to base; lobes linear-lanceolate, 1–1.2 cm × ca. 1 mm, hirsute. Corolla tubular-campanulate, 1.4–1.5 cm, base 1.5–2 mm wide; throat ca. 5 mm wide, pubescent outside above middle, glabrous inside except for nectaries; nectary pubescent; lobes triangular, ca. 1.5 × 1 mm, margin revolute. Filaments ca. 4 mm, inserted 4–5 mm above base in corolla tube, decurrent part thickened, linear, ca. 3 mm; anthers united at base, ca. 7.5 mm, slightly exerted; apex sterile, ca. 2.5 mm. Style 1.5–1.7 cm, glabrous. Nutlets light yellow-white, ca. 3.5 mm, shiny. Fl. and fr. Aug.

- River banks; ca. 3300 m. SE Xizang.

**6. *Onosma setosa*** Ledebour, Beitr. Naturk. 70. 1820.

刚毛滇紫草 gang mao dian zi cao

Herbs perennial, 20–40 cm tall. Stems single or several and cespitose, erect or ascending. Basal leaves oblanceolate, 10–25 cm × 5–10 mm, base attenuate, apex obtuse; stem leaves sessile, linear or lanceolate, 2.5–6.5 cm × 5–7 mm. Inflorescences terminal, 3–4 cm wide at anthesis, to 15 cm in fruit, racemose, many flowered; bracts lanceolate, 1–2 cm × 3–6 mm. Pedicel short, ca. 5 mm, elongated in fruit, spreading yellow hispid, short strigose. Flowers crowded. Calyx 1–1.5 cm, to 3 cm in fruit, densely hirsute, parted nearly to base; lobes linear-lanceolate. Corolla yellow; tubular-campanulate, base 2–2.5 mm wide, gradually expanded upward; throat 5–7 mm wide, glabrous on both sides; nectary ringlike, ca. 0.5 mm, glabrous; lobes broadly triangular, 1–2 mm, recurved at apex. Filaments 3–5 mm; anthers united at base, 8–10 mm, included, sterile apex 1–1.5 mm. Style 2.5–2.8 cm, exerted from corolla. Nutlets yellow-brown, ca. 5 mm, wrinkled. Fl. and fr. Jun. 2n = 12.

Steppes, stony slopes. Xinjiang [Kazakhstan, Mongolia, Russia].

- 1a. Plants whitish gray hirsute; corolla 2–2.2(–2.5) cm ..... 6a. subsp. *setosa*
- 1b. Plants yellow-green hirsute; corolla 1.5–1.8(–2) cm ..... 6b. subsp. *transrhymense*

**6a. *Onosma setosa*** subsp. *setosa*

刚毛滇紫草 (原变种) gang mao dian zi cao (yuan bian zhong)

Plants whitish gray hirsute above. Corolla 2–2.2(–2.5) cm.

Xinjiang [Kazakhstan, Russia].

**6b. *Onosma setosa*** subsp. *transrhymense* (Klokov ex Popov) Kamelin, Novon 3: 263. 1993.

黄刚毛滇紫草 huang gang mao dian zi cao

*Onosma transrhymense* Klokov ex Popov, Spisok Rast. Gerb. Fl. SSSR 12: 219. 1953.

Plants yellow-green hirsute above. Corolla 1.5–1.8(–2) cm.

Steppes, stony slopes. Xinjiang [Kazakhstan, Mongolia, Russia].

**7. *Onosma simplicissimum*** Linnaeus, Sp. Pl. ed. 2, 1: 196. 1762.

单茎滇紫草 dan jing dian zi cao

Subshrubs or perennial herbs, with short branched caudex, densely silky appressed pilose. Stems single or several, simple, erect to ascending, 10–20 cm. Leaves linear, 3–5 cm × 2–4 mm, margin usually slightly rolled, apex acute. Inflorescences small, furcate, compressed at anthesis, elongated in fruit. Pedicel short. Calyx 6–8 mm, to 1.3 cm in fruit. Corolla light yellow, 1.8–2 cm. Nectary glabrous or sparsely short pubescent. Anthers included. Nutlets dark gray, 2.5–3 mm, smooth, with well developed shoulders. Fl. May–Jun, fr. Jul. 2n = 14.

Stony slopes, on rocks, in mountain-steppe belt. NW Xinjiang (Altay Shan) [Kazakhstan, Russia; Europe].

**8. *Onosma irritans*** Popov ex Pavlov, Trudy Sredne-Aziatsk. Gosud. Univ., ser. 8b, Bot. 19: 29. 1935.

过敏滇紫草 guo min dian zi cao

Herbs perennial, 20–40 cm tall. Stems simple, stout, spreading thin long white bristly. Basal leaves petiolate, green; stem leaves sessile, spreading long thin bristly, glabrous between bristles; middle stem leaves broadly linear to linear-lanceolate, 4–7 cm × 4–5 mm, apex acute. Cymes terminal, scorpioid, not elongated in fruit; bracts lanceolate, ca. as long as calyx. Pedicel very short. Calyx ca. 2 cm at anthesis, ca. 2.5 cm in fruit; lobes slightly diverging, linear, very long spreading, white bristly, apex acute. Corolla yellow, 2.5–2.7 cm, only slightly expanded upward, with short triangular teeth. Anthers coherent for their full length, slightly longer than filaments; apex sterile, exerted. Nutlets dark gray, ca. 5 mm, rugose-pitted, tuberculate, beaked.

Rocks, gravel. Xinjiang (Yining Xian) [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**9. *Onosma apiculatum*** Riedl, Novon 5: 19. 1995.

细尖滇紫草 xi jian dian zi cao

Herbs perennial, with a rosette of leaves arising from either a stout vertical rhizome or from ± horizontal branches. Stems solitary, ascending, 20–35 cm tall, unbranched, straw colored when dry; bristles dense, white, patent, ca. 2 mm, intermixed with very short patent hairs. Leaves of sterile rosette green, linear-spatulate to linear-oblanceolate, 4–13 cm × 4–8 mm, abaxially bristly mainly along midvein, sparsely bristly elsewhere, densely short pubescent as on stem, adaxially patent to ± appressed white bristly, nearly flat tuberculate, base tapering, petiolelike, margin revolute, apex acute to ± obtuse; uppermost leaves 2.5–4 cm, widest near base, apex acute. Cymes single or paired, involute, 4–6 cm at anthesis; lower bracts to 2 cm. Pedicel 2–5 mm. Calyx ca. 1.5 cm, elongated after anthesis; lobes linear, densely ± appressed soft bristly and short pubescent, apex ± obtuse. Corolla pale yellow, club-shaped, 2–2.2 cm, ca. 3 mm wide at base, ca. 8 mm wide slightly below lobes, very minutely papillate outside, glabrous inside and on nectary; lobes recurved,

apiculate, ca.  $1.5 \times 4.5$  mm. Filaments ca.  $7 \times 0.8$  mm, tapering; anthers coherent, ca. 9.5 mm, fertile part ca. 3.5 mm; sterile tips truncate, exerted by less than 1 mm. Style exerted by 2.5–3 mm; stigma 2-lobed. Nutlets unknown. Fl. Jun.

- Woodlands; ca. 2100 m. Xinjiang.

*Onosma apiculatum* differs from *O. gmelinii* Ledebour by its green leaves, club-shaped corolla, and slightly longer anthers. From *O. irritans*, it differs by the markedly wider, indistinctly petiolate leaves, short hairs between bristles, shorter calyx, and club-shaped corolla. It differs from *O. baldshuanicum* Lipsky by its narrower, indistinctly petiolate leaves, denser bristles and short hairs, and shorter anthers. *Onosma apiculatum* differs from all three of these species by its shorter corolla, apiculate corolla lobes, and bracts longer than the calyx.

**10. *Onosma gmelinii*** Ledebour, Fl. Altaic. 1: 184. 1829.

黄花滇紫草 huang hua dian zi cao

Herbs perennial, gray-white, 25–40 cm tall, hispid, strigose. Stems single or several, cespitose, erect, not branched. Basal leaves long petiolate, oblanceolate, 10–12 cm  $\times$  5–10 mm, abaxially densely pubescent and hispid along veins and margin, adaxially densely appressed hispid and short strigose, base attenuate, apex obtuse; stem leaves sessile, lanceolate, 2–5 cm  $\times$  ca. 5 mm. Inflorescences terminal, not branched, 4–6 cm wide at anthesis, with numerous crowded flowers; bracts lanceolate, 1–1.5 cm, densely hispid, short strigose. Pedicel short, ca. 5 mm. Calyx (1.2–)1.5 cm, to 2 cm in fruit, densely hispid, short strigose, parted nearly to base; lobes linear-lanceolate. Corolla yellow, tubular-campanulate, 2–2.5 cm, base ca. 2 mm wide, gradually expanded upward; throat 5.5–7.5 mm wide, obscurely pubescent outside, glabrous inside; lobes broadly triangular, ca. 2  $\times$  3 mm. Filaments subulate, 9–10 mm, decurrent, exerted; anthers united laterally, ca. 1 cm, included, apex sterile, ca. 2 mm. Style 1.6–2.2 cm, included, glabrous. Nectary ca. 1 mm, glabrous. Nutlets gray-brown, ca. 5 mm, lustrous, smooth, gradually tapering to beak, not gibbous. Fl. May-Jun.

Arid rocky slopes; ca. 1200 m. N Xinjiang (Fuyun Xian) [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**11. *Onosma paniculatum*** Bureau & Franchet, J. Bot. (Morot) 5: 104. 1891.

滇紫草 dian zi cao

*Onosma oblongifolium* W. W. Smith & Jeffrey; *O. paniculatum* var. *hirsutistylum* Lingelshiem & Borza.

Herbs biennial, rarely perennial, 40–80 cm tall, blackened after drying. Stems single, not branched, 5–10 mm in diam. at base, spreading hispid and densely strigose, hairs discoid at base. Basal leaves linear-lanceolate or oblanceolate, 10–12  $\times$  1–2.5(–3) cm, base attenuate, apex acuminate. Upper and middle stem leaves lanceolate or ovate-triangular, 3–7  $\times$  1–2 cm, base hastate,  $\pm$  clasping, apex acuminate. Inflorescences terminal, elongated racemose after anthesis; bracts triangular. Pedicel slender, 0.7–1.7 cm. Calyx 7–8 mm,

enlarged in fruit. Corolla blue-purple, becoming dark red, tubular-campanulate, 1.2–1.4 cm, densely strigose outside, strigose only along lobe midvein inside; throat 5–6 mm wide; nectary ca. 0.5 mm, densely villous; lobes broadly triangular, margin revolute. Filaments decurrent, 4–5 mm, pubescent, inserted 3–4 mm above base of corolla tube; anthers laterally united, ca. 7 mm, included or slightly exerted, apex sterile, ca. 2 mm. Nutlets dark brown, 2–3 mm, not shiny, tuberculate. Fl. and fr. Jun-Sep.

Arid slopes, forest margins; 2000–2300 m. W Guizhou, SW and W Sichuan, C and NW Yunnan [Bhutan, NE India].

The roots, which contain a purple dye, are used as a substitute for *Lithospermum erythrorhizon* in Chinese medicine.

**12. *Onosma lijiangense*** Y. L. Liu, Acta Phytotax. Sin. 22: 320. 1984.

丽江滇紫草 li jiang dian zi cao

Herbs perennial, ca. 30 cm tall, spreading hispid, strigose. Stems several, cespitose, woody, erect or ascending, branched from base. Leaves petiolate, lanceolate, 2.5–4 cm  $\times$  5–8 mm, base cuneate or nearly rounded, apex obtuse. Inflorescences terminal, paniculate. Pedicel pendulous or geniculately recurved, 1–1.5 cm, densely spreading hispid, short strigose, scabrous. Calyx 6–7 mm, slightly enlarged after anthesis, parted nearly to base; lobes lanceolate to linear-lanceolate. Corolla red, tubular-campanulate, 1.2–1.4 cm, base 1.5–2 mm wide, gradually expanded upward; throat ca. 5 mm wide, above middle densely pubescent outside, glabrescent inside; nectary ca. 0.5 mm, densely white pubescent; lobes broadly triangular, ca. 1.5  $\times$  2 mm, margin revolute. Filaments subulate, 4–4.5 mm, sparsely pubescent, base decurrent, inserted ca. 4 mm above base of corolla tube; anthers laterally united, ca. 7 mm, included; apex sterile, ca. 1 mm. Style ca. 1.5 cm, densely pubescent below middle. Nutlets unknown. Fl. Aug.

- In tussocks on hillsides; ca. 2700 m. NW Yunnan (Lijiang Xian).

**13. *Onosma wardii*** (W. W. Smith) I. M. Johnston, J. Arnold Arbor. 32: 215. 1951.

德钦滇紫草 de qin dian zi cao

*Onosma hookeri* C. B. Clarke var. *wardii* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 113. 1916.

Herbs perennial, dark gray, ca. 60 cm tall, sparsely spreading hispid and pubescent. Stems single, erect. Lower and middle stem leaves petiolate, linear-lanceolate, ca. 10  $\times$  0.5–1.2 cm; upper stem leaves lanceolate, 3–6 cm  $\times$  5–10 mm, abaxially gray, densely pubescent and strigose, adaxially hispid and pubescent, base rounded, apex acuminate; 3-veined. Inflorescences terminal, paniculate; bracts lanceolate, 3–10 mm. Pedicel 6–7 mm, spreading hispid. Calyx 0.8–1.2 cm; lobes linear-lanceolate, hispid, short strigose. Corolla 1–1.3 cm, tubular-campanulate, 1.5–2 mm wide at base, gradually expanded upward; throat 5–8 mm wide, strigose above middle except for nectaries, glabrous inside; nectary ca. 0.5 mm, 10-lobed, villous. Filaments ca. 5 mm, inserted ca. 3.5 mm above base of corolla tube; anthers laterally united, 5–6 mm, included; base decurrent, 1–1.5 mm, apex sterile. Style

1.3–1.5 cm, glabrous. Nutlets brown, ovoid, ca. 3 mm, tuberculate, papillate. Fl. and fr. Nov.

- Meadows; 2200–2800 m. NW and W Yunnan.

**14. *Onosma confertum*** W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 106. 1913.

密花滇紫草 mi hua dian zi cao

*Onosma forrestii* W. W. Smith.

Herbs perennial, 30–70 cm tall, with thick taproots. Stems single or several, caespitose, erect, not branched, densely hispid and short strigose, hairs discoid at base. Basal leaves oblanceolate or linear-lanceolate, 8–12 cm × 5–10 mm, apex acute. Middle and upper stem leaves lanceolate, 5–10 × 0.5–1.5 cm, abaxially gray-white, densely strigose, adaxially green and white spotted. Inflorescences terminal and axillary, solitary or branched into a spreading or crowded panicle. Pedicel slender, 6–10 mm, to 1.5 cm in fruit. Calyx lobes linear-lanceolate, 1–1.3 cm. Corolla red or purple, 1.2–1.7 cm, densely strigose outside, strigose only along lobe midvein inside; nectary 5-lobed, densely villous; lobes broadly triangular, ca. 1.5 × 2–2.5 mm. Filaments ca. 5 mm, decurrent part expanded, inserted 2–3.5 mm above base in corolla tube; anthers laterally united 6.5–8 mm, included or slightly exerted. Style 1.4–1.7 cm, glabrous. Nutlets gray-brown, ca. 3 mm, tuberculate, shiny. Fl. and fr. Jul–Oct.

- Thickets; 2300–3300 m. Sichuan (Muli Xian), NW Yunnan.

**15. *Onosma waltonii*** Duthie, Bull. Misc. Inform. Kew 1912: 41. 1912.

西藏滇紫草 xi zang dian zi cao

Herbs perennial, ca. 15 cm tall. Stems woody, branched, usually spreading, sparsely hispid, short strigose. Leaf blade oblong-lanceolate, 1–2.5 cm × 4–6 mm, abaxially light green, densely pubescent and sparsely hispid, adaxially green, densely hispid and short strigose, hairs discoid at base, base rounded, slightly clasping. Inflorescences solitary, terminal, not branched, 1–2 cm wide at anthesis. Pedicel slender, ca. 3 mm. Calyx 6–7 mm; lobes lanceolate, hispid outside, densely white villous inside. Corolla blue, 1–1.3 cm, base ca. 2 mm wide, gradually expanded upward; throat 5–7 mm wide, obscurely pubescent outside; nectary ca. 0.2 mm, glabrescent; lobes erect, triangular, ca. 1.5 × 2 mm, margin revolute. Filaments slender, 3–3.5 mm, inserted 4–4.5 mm above base of corolla tube, decurrent part linear, 2.3–3 mm, minutely pubescent, appearing mealy; anthers laterally united, included or slightly exerted; apex sterile, ca. 0.5 mm. Style 1.2–1.4 cm, glabrous. Nutlets light yellow, ca. 2.5 mm, shiny, obscurely tuberculate, wrinkled. Fl. and fr. Aug.

- Arid hillsides; ca. 3700 m. Xizang (Jiangzi Xian).

**16. *Onosma maaikangense*** W. T. Wang ex Y. L. Liu, Acta Phytotax. Sin. 18: 64. 1980.

马尔康滇紫草 ma er kang dian zi cao

Herbs perennial, 30–40 cm tall. Stems erect, much branched, spreading hispid, short strigose. Leaf blade oblong, 2–3 cm × 5–10 mm, strigose and hispid, abaxially light green,

pubescent along veins, adaxially green, base cuneate or rounded, apex obtuse. Inflorescences terminal and axillary, widely spaced, spreading panicles; bracts lanceolate, 4–5 mm. Pedicel 6–12 mm. Calyx 6–7 mm; lobes lanceolate, ca. 1 mm wide. Corolla blue-purple or purple, 1–1.2 cm, base 1.5–2 mm wide; throat 6–7 mm wide, densely strigose outside; nectary ca. 0.5 mm, pubescent; lobes triangular, ca. 2 × 3 mm, margin revolute. Filaments subulate, 3–4 mm, not decurrent, base expanded, triangular, inserted 2–2.5 mm above base in corolla tube; anthers laterally united, 7.5–8 mm, included or apex slightly exerted, apex sterile, 1–1.5 mm. Style ca. 1.2 cm, glabrous. Nutlets brown, ca. 2.5 mm, densely papillate, sparsely tuberculate. Fl. and fr. Jun–Aug.

- Hillsides, roadsides; 2300–3800 m. Sichuan, E Xizang (Tiantaweng Shan).

**17. *Onosma liui*** Kamelin & T. N. Popova, Novon 3: 263. 1993.

壤塘滇紫草 rang tang dian zi cao

*Onosma strigosum* Y. L. Liu (1980), not Steven (1851).

Herbs ca. 60 cm tall. Stems several, caespitose, slender, branched from base, sparsely hispid, strigose. Leaf blade oblong-lanceolate or oblanceolate, 1–3 cm × 3–5 mm, abaxially hispid and densely short strigose, adaxially appressed hispid, base cuneate or rounded, apex obtuse. Inflorescences terminal, branched, 1–3 cm at anthesis. Pedicel slender, 2–3 mm, slightly elongated in fruit, hispid, short strigose. Calyx 2.5–3.5 mm; lobes narrowly lanceolate. Corolla tubular-campanulate, 6–8 mm, base 1–1.5 mm wide, gradually expanded upward; throat 4.5–5.5 mm wide, densely short strigose outside, scabrous inside, strigose; nectary ca. 0.5 mm, densely pubescent; lobes broadly triangular, ca. 1.5 × 2 mm, apex recurved. Filaments subulate, base extremely expanded, inserted in villous area 1.5–2 mm above base of corolla tube; anthers laterally united, 6–7 mm, almost completely exerted. Style 0.9–1.1 cm, glabrous. Nutlets dirty gray-brown, ca. 2.5 mm, densely fine papillate, tuberculate. Fl. and fr. Jul.

- Slopes, roadsides; 2300–3400 m. Sichuan.

**18. *Onosma fistulosum*** I. M. Johnston, J. Arnold Arbor. 32: 222. 1951.

管状滇紫草 guan zhuang dian zi cao

Herbs biennial, ca. 1 m tall. Stems stout, 0.8–1.4 cm in diam. at base, hollow, hispid. Basal leaves lanceolate, to 35 cm, widest at middle, 4–6 cm, base attenuate, apex acuminate; lateral veins conspicuous; middle stem leaves ca. 15 × 2.5–3 cm, gradually reduced upward, hispid and strigose, hairs discoid at base. Inflorescences terminal and axillary, in more crowded panicles. Pedicel 5–10 mm, slender. Calyx lobes narrowly lanceolate, 0.9–1.2 cm × 1–1.5 mm, yellow hispid, short strigose. Corolla pink or purple-red, 1.1–1.4 cm, 1.5–2 mm wide at base, abruptly expanded at middle; throat 5–8.5 mm wide, strigose above middle outside, glabrous except for

nectaries inside; nectary ca. 0.5 mm, pubescent; lobes broadly triangular, 1–1.5 × 2.5–4 mm, margin revolute. Filaments subulate, 7–9 mm, not decurrent, glabrous, inserted 3–4 mm above base in corolla tube; anthers laterally united, 7–8 mm, almost completely exerted, apex sterile, 1.5–2 mm. Style 1.4–1.6 cm, glabrous. Nutlets gray-brown, ca. 3 × 2 mm, shiny, black striate, obscurely tuberculate. Fl. and fr. Jul–Sep.

- Thickets, *Quercus* forests; 1600–3000 m. SW Sichuan.

**19. *Onosma decastichum*** Y. L. Liu, Acta Phytotax. Sin. 18: 67. 1980.

易门滇紫草 yi men dian zi cao

Herbs perennial, ca. 45 cm tall, pallid, hispid, densely retrorse pubescent. Stems single, not branched. Basal leaves narrowly lanceolate, 3–6 cm × 3.5–6 mm, abaxially densely tomentose, adaxially hispid and pubescent, base attenuate, apex acute; stem leaves crowded, lanceolate, 3–8 × 1–1.5 cm, abaxially gray-white, densely tomentose, adaxially green, hispid and pubescent, base rounded, apex acuminate; main veins 3, lateral veins conspicuous. Inflorescences terminal and axillary, in densely flowered panicles ca. 10 cm; bracts lanceolate, 5–10 mm. Pedicel ca. 3 mm, slender. Calyx 5–6 mm, densely white pubescent, parted nearly to base; lobes linear-lanceolate. Corolla blue-purple, tubular-campanulate, ca. 1 cm, base 1.5–2 mm wide, gradually expanded upward; throat 3–4 mm wide, densely short strigose outside, 10-ranked, sparsely short hispid inside and between lobes; nectary ca. 0.3 mm, 10-lobed, white villous; lobes triangular-lanceolate, 2–2.5 × 1–1.5 mm, apex recurved. Filaments subulate, inserted 2–2.5 mm above base of corolla tube; anthers laterally united, 7–7.5 mm, almost completely exerted. Style 1.3–1.5 cm. Nutlets gray-brown, 2–2.5 mm, shiny. Fl. Oct.

- Meadows, thickets; ca. 1300 m. C Yunnan.

*Onosma decastichum* resembles *O. burmanicum* Collett & Hemsley (Myanmar), but the latter has glabrous corollas inside and dark, shiny nutlets 3–3.5 mm.

**20. *Onosma sinicum*** Diels, Bot. Jahrb. Syst. 29: 547. 1900.

小叶滇紫草 xiao ye dian zi cao

*Onosma potaninii* Popov.

Herbs perennial, suffrutescent, 15–30 cm tall. Stems branched from base, hispid, strigose; branches erect, ascending to prostrate, 5–15 cm; old branches woody, laciniate. Leaf blade oblanceolate, 1–1.5 cm × 2–5 mm, hispid along margin and veins, abaxially gray-green, strigose, with many short hairs, adaxially green, hispid and strigose, base attenuate into a petiole, apex acute to obtuse. Inflorescences solitary, rarely branching, terminating branches, ca. 5 cm at anthesis; bracts lanceolate to ovate-lanceolate, ca. 3 mm. Pedicel ca. 3 mm at anthesis, to 9 mm in fruit. Calyx lobes linear to linear-lanceolate, 7–9 × ca. 1 mm, hirsute, strigose. Corolla blue, 8–9.5 mm; throat 4–5 mm wide, strigose outside above, villous inside near filament insertion; nectary ca. 0.5

mm, villous. Filaments 5–7 mm, not decurrent, base slightly expanded, densely villous, inserted 2.5–3 mm above base of corolla tube; anthers laterally united, 6–7 mm, apex sterile, 0.5–1 mm, nearly completely exerted. Nutlets brown, 2–2.5 mm, densely tuberculate. Fl. May–Jul., fr. Aug.

- Dry banks, ravines, rocky hillsides, *Quercus* forests; 1700–3200 m. S Gansu, N Sichuan.

**21. *Onosma farreri*** I. M. Johnston, J. Arnold Arbor. 32: 345. 1951.

小花滇紫草 xiao hua dian zi cao

*Onosma sinicum* Diels var. *farreri* (I. M. Johnston) W. T. Wang & Y. L. Liu.

Subshrubs grayish. Stems simple or with few branches at apex, 20–30 cm tall, slender, spreading bristly and short strigose, hairs discoid at base. Leaf blade oblanceolate, 1.5–3 cm × 2–4 mm, abaxially densely strigose, adaxially spreading hispid and densely strigose, tubercles discoid at base. Cymes ca. 4 × 1–2 cm in fruit. Pedicel to 6 mm. Calyx ca. 6 mm at anthesis; lobes 0.5–1 mm. Corolla blue, 1.1–1.2 cm, 2–2.5 mm wide at base, to 3–5 mm wide toward lobes, folded below sinuses above middle, antrorsely strigose, minutely puberulent outside, glabrous inside except for a few hairs on nectary. Filaments not decurrent, inserted ca. 3 mm from base, gradually tapering toward anthers; anthers ca. 8 mm, united into a tube, sterile apex ca. 1 mm, located 1–2 mm below sinuses of corolla. Nutlets unknown. Fl. Apr.

- Dry hillsides, open sandy areas. Gansu, Shaanxi (Taibai Shan).

**22. *Onosma luquanense*** Y. L. Liu, Acta Phytotax. Sin. 18: 67. 1980.

禄劝滇紫草 lu quan dian zi cao

Herbs biennial, gray-green, 40–70 cm tall, hispid, short strigose. Stems several, cespitose, woody, erect or ascending, branched above middle; branches crowded, 7–12 cm. Leaf blade lanceolate, 2–6 cm × 3–10 mm, abaxially pubescent and sparsely hispid, adaxially densely hispid, base cuneate or rounded, apex obtuse. Inflorescences terminal, 1–1.5 cm in diam. at anthesis, to 5–7 cm in fruit, racemose, many flowered; bracts ovate-lanceolate, 5–10 mm, hispid and pubescent. Flowers crowded. Calyx 5–7 mm, parted nearly to base; lobes linear-lanceolate, hispid outside, densely pilose. Corolla tubular-campanulate, 8–10 mm; throat 4–5 mm wide, short strigose outside, 1-ranked pubescent along lobe midvein inside; nectary ca. 0.5 mm, pubescent; lobes triangular, margin revolute, apex caudate, acute, recurved. Filaments subulate, 4.5–5.5 mm, not decurrent, inserted ca. 2.5 mm above base in corolla tube; anthers laterally united, 5–7 mm, almost completely exerted, sterile apex ca. 2.5 mm. Style ca. 1.4 cm, glabrous. Nutlets dark gray, ca. 2.5 mm, not shiny, densely fine papillate, sparsely tuberculate. Fl. and fr. Oct.

- Hillsides; ca. 1900 m. N Yunnan.

**23. *Onosma album*** W. W. Smith & Jeffrey, Notes Roy. Bot.

Gard. Edinburgh 9: 112. 1916.

白花滇紫草 bai hua dian zi cao

Herbs perennial, gray-white, 40–60 cm tall, densely hispid, short strigose, extremely scabrous. Stems single, erect, not branched. Basal leaves linear-lanceolate, 3–8 cm × ca. 5 mm, densely hispid, abaxially densely white pubescent and sparsely hispid, adaxially strigose, base attenuate, apex acute; stem leaves lanceolate or linear-lanceolate, 4–6 cm × 4–7 mm, abaxially pubescent, adaxially densely hispid and strigose, base rounded, apex acuminate. Inflorescences terminal and axillary, in widely spaced panicles; bracts ovate-lanceolate, 5–10 mm. Pedicel slender, 5–8 mm, densely hispid, slightly elongated after anthesis. Calyx 7–9 mm, densely hispid outside, densely pilose inside, parted nearly to base; lobes linear-lanceolate. Corolla white, tubular-campanulate, 8–10 mm; throat 3.5–5 mm wide, upper 1/3 pubescent outside, only lobe midvein pubescent inside; nectary ca. 0.5 mm, white villous; lobes erect, triangular, ca. 1.5 mm, margin revolute. Filaments 6–7.5 mm, decurrent part pubescent, inserted ca. 3 mm above base of corolla tube; anthers laterally united, ca. 9 mm, mostly exerted, sterile apex ca. 2 mm. Style 1.6–1.7 cm, sparsely pubescent below middle. Fl. Jul.

• Hillsides, open forests, gravelly and sandy areas; ca. 3000 m. NW Yunnan.

**24. *Onosma yajiangense*** W. T. Wang ex Y. L. Liu, Acta Phytotax. Sin. 18: 64. 1980.

雅江滇紫草 ya jiang dian zi cao

Herbs perennial, gray-white, ca. 30 cm tall, appressed hispid, pubescent. Stems frequently cespitose, not branched. Basal leaves long petiolate, narrowly oblanceolate, 1.4–1.8 cm × 4–10 mm, abaxially densely strigose and hispid along veins, adaxially hispid and strigose, base attenuate, apex obtuse; upper and middle stem leaves sessile, lanceolate, 3–6 cm × 5–10 mm, 3-veined. Inflorescences terminal and axillary, in panicles 4–8 × 8–12 cm; bracts lanceolate, 3.5–6 mm. Pedicel slender, 5–7 mm, densely hispid, strigose. Calyx 7–9 mm, densely hispid, strigose, parted nearly to base; lobes lanceolate. Corolla tubular-campanulate, ca. 1 cm, 1–1.5 mm wide at base; throat 4–5.5 mm wide, densely yellow strigose outside, only lobe midvein white pubescent inside; nectary ca. 0.5 mm, white villous; lobes broadly triangular, ca. 1.5 × 2 mm, margin revolute, apex caudate. Filaments ca. 5.5 mm, decurrent part pubescent, inserted 3.5–4 mm above base in corolla tube; anthers laterally united, ca. 7.5 mm, almost completely exerted. Style ca. 1.2 cm, exerted, glabrous. Nutlets unknown. Fl. Jul.

• W Sichuan.

**25. *Onosma adenopus*** I. M. Johnston, J. Arnold Arbor. 32: 224. 1951.

腺花滇紫草 xian hua dian zi cao

Herbs perennial, 20–30 cm tall. Stems several, cespitose, erect or ascending, densely hispid, short strigose. Basal leaves forming a rosette; leaf blade oblanceolate or lanceolate, 2–4

cm × 7–10 mm, densely hispid, base broadly cuneate or rounded, apex obtuse or acute; stem leaves lanceolate or oblong, 2–4.5 cm × 3–10 mm, abaxially densely hispid, adaxially densely hispid and short strigose, densely white pilose along veins and margin, only midvein evident. Inflorescences terminal and axillary, to 3–5 cm after anthesis, becoming racemose. Pedicel slender, 2–3 mm, elongated in fruit, densely hispid. Flowers crowded. Calyx 5–7 mm, parted to base; lobes linear, less than 1 mm wide, hispid outside, pubescent inside. Corolla blue-purple or light purple, tubular-campanulate, 8–10 mm; throat 3.5–5 mm wide; nectary ringlike, membranous, glabrous; lobes broadly triangular, 1–1.5 × ca. 2.5 mm, lobe midvein densely pubescent outside, glabrescent inside. Filaments subulate, 5–6 mm, not decurrent, base and nearby part of corolla tube papillate and glandular, inserted 3–3.5 mm above base of corolla tube; anthers laterally united, mostly exerted, apex sterile, 2–3 mm. Style 1–1.5 cm, glabrous. Nutlets yellow-white, 2–3 mm, wrinkled, tuberculate. Fl. and fr. Aug–Sep.

• Hillsides, benches in arid valleys; 2800–3500 m. C, NW and SW Sichuan, E Xizang.

**26. *Onosma nangqenense*** Y. L. Liu, Acta Phytotax. Sin. 18: 68. 1980.

囊谦滇紫草 nang qian dian zi cao

Herbs erect, spreading hispid, appressed pubescent. Stems single, branched above. Leaves sessile, ovate-lanceolate or linear-lanceolate, 3–7 × 1–1.5 cm, 3-veined, abaxially densely strigose, sparsely hispid along veins and margin, adaxially scabrous, hispid, or minutely hispid, hairs discoid at base, base rounded or cuneate, apex obtuse. Inflorescences terminal, becoming racemose, stout, 12–15 cm; bracts ovate-lanceolate, 2–3 × 0.5–1.5 cm. Pedicel stout, 5–10 mm. Calyx lobes lanceolate, 7–9 × 1–2 mm, densely hispid and short strigose outside, villous inside. Corolla pink, tubular-campanulate, 1.1–1.2 cm; throat 3–6 mm wide, glabrous inside except midvein of lobe 1-ranked pubescent; nectary ringlike, membranous, glabrous; lobes broadly triangular, ca. 1.5 × 2.5–3 mm, margin revolute. Filaments subulate, 5–5.5 mm, decurrent at base, inserted ca. 3.5 mm above base in corolla tube; anthers laterally united, 7–7.5 mm, mostly exerted, apex sterile, 1.5–2 mm. Style 1.5–1.7 cm, glabrous. Nutlets gray-brown, ca. 3 mm, tuberculate, finely papillate. Fl. and fr. Aug.

• Shaded hillsides. S Qinghai.

**27. *Onosma multiramsum*** Handel-Mazzetti, Anz. Akad. Wiss. Wien. Math.-Nat. Kl. 61: 166. 1924.

多枝滇紫草 duo zhi dian zi cao

*Onosma multiramsum* var. *mekongense* I. M. Johnston.

Herbs perennial, gray-green, ca. 30 cm tall. Stems erect, much branched, sparsely hispid and densely pubescent, hairs discoid at base. Lower stem leaves oblanceolate, 5–7 mm; middle stem leaves oblong-lanceolate, 3–4 cm × 6–10 mm, abaxially densely pilose, along midvein and margin sparsely



hispid, adaxially hispid, pubescent, base attenuate, apex acuminate. Inflorescences solitary, terminal, 1–2 cm wide at anthesis. Pedicel 2–3 mm. Calyx lobes linear-lanceolate, 7–8 mm, densely villous inside, slightly shorter than corolla tube. Flower buds curved at apex. Corolla yellow, tubular-campanulate, 8–9 mm, ca. 1.5 mm wide at base; throat 4–4.5 mm wide, upper 1/3 densely short hispid outside; nectary ca. 0.5 mm, 5-lobed, pubescent; lobes broadly triangular, appressed pubescent inside, margin revolute. Filaments subulate, 5–6 mm, inserted ca. 3.5 mm above base in corolla tube, decurrent part linear, 1.5–2 mm; anthers laterally united, blue-purple, ca. 9 mm, curved at apex, mostly exerted, apex sterile, ca. 3 mm. Style 1.3–1.5 cm, glabrous. Nutlets 2.5–3 mm, wrinkled, tuberculate. Fl. and fr. Aug.

• Valleys, arid slopes; 1600–3100 m. SW Sichuan, E Xizang, NW Yunnan.

**28. *Onosma waddellii*** Duthie, Bull. Misc. Inform. Kew 1912: 41. 1912.

从茎滇紫草 *cong jing dian zi cao*

*Onosma waddellii* var. *brachylinum* I. M. Johnston.

Herbs annual or biennial, rarely perennial, green, 15–25 cm tall, densely appressed pubescent, sparsely hispid. Stems single or several, caespitose, erect to ascending, branched from base; branches extremely crowded. Leaves sessile, lanceolate or oblanceolate, 1–3 cm × 3–6 mm, abaxially densely strigose, margin and midvein hispid, adaxially hispid and strigose, base cuneate, apex obtuse. Inflorescences numerous, terminal, to 4–6 cm after anthesis, becoming racemose; bracts ovate-lanceolate, 3–7 mm. Pedicel 1–3 mm, densely spreading hispid. Flowers crowded. Calyx 5–8 mm, parted nearly to base; lobes lanceolate. Corolla blue, tubular-campanulate, 0.8–1.2 cm; throat 4–9 mm wide; nectary obscurely pubescent; lobes broadly triangular, short appressed pubescent, otherwise obscurely pubescent outside, glabrous inside except for nectary, margin revolute. Filaments 6.5–7 mm, decurrent part linear, inserted 3.4–4 mm above base in corolla tube, mealy pubescent; anthers laterally united, 5–6 mm, mostly or completely exerted. Nutlets light yellow-brown, 2–2.5 mm, shiny, sparsely tuberculate, obscurely wrinkled. Fl. and fr. Aug-Sep.

• Meadows, gravelly slopes; 3000–4000 m. Xizang.

**29. *Onosma exsertum*** Hemsley, Hooker's Icon. Pl. 27: t. 2637. 1900.

露蕊滇紫草 *lu rui dian zi cao*

Herbs biennial, 60–100 cm tall. Stems single, much branched above, stout, 5–12 mm in diam. at base, densely hispid and strigose, hairs discoid at base. Basal leaves oblanceolate, ca. 30 × 7 cm, apex obtuse; middle stem leaves lanceolate or oblong-lanceolate, 5–10 × 1.5–4 cm, base rounded, apex acute or obtuse; upper stem leaves 3–5 × ca. 1 cm. Inflorescences numerous, terminal, in spreading panicles, ca. 20 cm; bracts long ovate. Pedicel slender, 5–10 mm. Calyx 6–8 mm; lobes lanceolate, densely appressed

hispid. Corolla red, later becoming blue-purple, 7–8 mm, ca. 1 mm wide, densely short strigose outside above, sparsely pubescent along lobe midvein inside, base ca. 1 mm wide; throat 3–3.5 mm wide; nectary ringlike, ca. 0.2 mm, glabrous; lobes broadly triangular, margin revolute. Filaments subulate, 7–9 mm, decurrent, inserted 2.5–3 mm above base of corolla tube; anthers laterally united, 5–6 mm, completely exerted, sterile apex ca. 1 mm. Style 1.5–1.7 cm, glabrous. Nutlets ca. 3 mm, glossy, wrinkled. Fl. Jun.

• Open hillsides, meadows, *Pinus* and *Quercus* forests; 1800–2100 m. Guizhou, SW Sichuan, Yunnan.

