

CRASSULACEAE

景天科 jing tian ke

Fu Kunjun (傅坤俊 Fu Kun-tsun)¹; Hideaki Ohba²

Herbs, subshrubs, or shrubs. Stems mostly fleshy. Leaves alternate, opposite, or verticillate, usually simple; stipules absent; leaf blade entire or slightly incised, rarely lobed or imparipinnate. Inflorescences terminal or axillary, cymose, corymbiform, spiculate, racemose, paniculate, or sometimes reduced to a solitary flower. Flowers usually bisexual, sometimes unisexual in *Rhodiola* (when plants dioecious or rarely gynodioecious), actinomorphic, (3 or)4–6(–30)-merous. Sepals almost free or basally connate, persistent. Petals free or connate. Stamens as many as petals in 1 series or 2 × as many in 2 series. Nectar scales at or near base of carpels. Follicles sometimes fewer than sepals, free or basally connate, erect or spreading, membranous or leathery, 1- to many seeded. Seeds small; endosperm scanty or not developed.

About 35 genera and over 1500 species: Africa, America, Asia, Europe; 13 genera (two endemic, one introduced) and 233 species (129 endemic, one introduced) in China.

Some species of Crassulaceae are cultivated as ornamentals and/or used medicinally.

Fu Shu-hsia & Fu Kun-tsun. 1984. Crassulaceae. In: Fu Shu-hsia & Fu Kun-tsun, eds., Fl. Reipubl. Popularis Sin. 34(1): 31–220.

- 1a. Stamens in 1 series, usually as many as petals; flowers always bisexual.
 - 2a. Leaves always opposite, joined to form a basal sheath; inflorescences axillary, often shorter than subtending leaf; plants not developing enlarged rootstock 1. *Tillaea*
 - 2b. Leaves alternate, occasionally opposite proximally; inflorescence terminal, often very large; plants sometimes developing enlarged, perennial rootstock.
 - 3a. Inflorescence with a distinct, elongated main axis forming a raceme or thyrses much longer than broad; carpels narrowed at base, free; basal leaves often densely hairy 4. *Kungia*
 - 3b. Inflorescence cymose with no distinct main axis, often broader than long; carpels broad at base, often ± connate; basal leaves often glabrous.
 - 4a. Plants with conspicuous basal leaf rosettes; corolla campanulate, petals initially erect then spreading above middle, ± S-shaped in longitudinal section 8. *Sinocrassula*
 - 4b. Plants without basal leaf rosettes, often ephemeral; petals rotate 12. *Sedum*
- 1b. Stamens usually in 2 series, 2 × as many as petals; flowers sometimes unisexual and male flowers without stamens.
 - 5a. Flowers 4-merous and with prominent, persistent corolla tube completely enclosing follicles; leaves opposite.
 - 6a. Filaments inserted basally on corolla tube; flowers usually pendulous 2. *Bryophyllum*
 - 6b. Filaments inserted near or above middle of corolla tube; flowers erect 3. *Kalanchoe*
 - 5b. Flowers 5- or 6(–12)-merous, rarely 3- or 4-merous (*Rhodiola*) and then petals free or joined at base only and not enclosing follicles; leaves alternate, opposite, or in a rosette.
 - 7a. Carpels stipitate to substipitate or basally constricted or conspicuously attenuate, free.
 - 8a. Plants perennial, usually with several to many flowering stems; basal leaves not in a conspicuous rosette; inflorescence formed from a terminal group of cymes, usually broader than long, sometimes with additional cymes in axils of distal leaves 6. *Hylotelephium*
 - 8b. Plants monocarpic, with a single flowering stem; basal leaves in a somewhat conspicuous rosette, dying when plant flowers; inflorescence with an elongated main axis and numerous lateral cymules, sometimes a true raceme with cymules reduced to single flowers 5. *Orostachys*
 - 7b. Carpels sessile, base not constricted (slightly attenuate in some *Rhodiola* species) and usually connate (free in *Sedum chuhsingense*, *S. semilunatum*, and sometimes in *S. przewalskii*).
 - 9a. Stems dimorphic with usually very stout caudex or rhizome, usually with brown or blackish, membranous, scalelike leaves, sharply differentiated from much more slender, erect or ascending, leafy flowering stems.
 - 10a. Flowers bisexual; petals basally connate 7. *Pseudosedum*
 - 10b. Flowers unisexual or bisexual; petals free or nearly so 13. *Rhodiola*
 - 9b. Stems not sharply dimorphic, proximally with well developed leaves, rarely plants stoloniferous.

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- 11a. Leaf rosette absent at anthesis; inflorescence terminal.
 - 12a. Leaves flattened, margin serrate or crenate; seed testa longitudinally costate or subsmooth 11. *Phedimus*
 - 12b. Leaves terete or semiterete in cross section, margin entire (4–8-dentate in *Sedum rosthornianum* and remotely dentate in *S. engleri* var. *dentatum*); seed testa reticulate or papillate-reticulate 12. *Sedum*
- 11b. Leaf rosette conspicuous at anthesis; inflorescence axillary.
 - 13a. Petals yellow; basal leaf rosette almost as wide as inflorescences are long; plants glabrous throughout 10. *Ohbaea*
 - 13b. Petals white, pink, and/or red, (rarely pale yellow outside China); plants hairy or glabrous.
 - 14a. Plants glandular hairy or, if glabrous, flowers 6–8-merous; petals connate at base 9. *Rosularia*
 - 14b. Plants glabrous; flowers (3–)5-merous; petals free or almost so 13. *Rhodiola*

1. TILLAEA Linnaeus, Sp. Pl. 1: 128. 1753.

东爪草属 *dong zhao cao shu*

Fu Kunjun (傅坤俊 Fu Kun-tsun); Michael G. Gilbert³

Herbs often annual, small, usually glabrous. Roots fibrous. Stems erect or ascending, sometimes ± stoloniferous at base. Leaves opposite, fused at base to form short sheath, flat or terete, margin entire. Inflorescences axillary, cymose, often shorter than subtending leaf, 1- to few flowered. Flowers bisexual, (3 or)4- or 5-merous, inconspicuous. Sepals free, spurless. Petals inconspicuous, free, dull white, greenish, pinkish, or yellowish, often translucent, sometimes shorter than sepals. Stamens as many as petals; filaments filiform. Carpels free. Stigma terminal. Follicles 1- to many seeded, dehiscent along adaxial suture. Seeds smooth, papillate, or striate.

About 16 species: almost worldwide; five species (two endemic) in China.

- 1a. Flowers sessile; sepals ovate, shorter than petals 1. *T. aquatica*
- 1b. Flowers pedicellate; sepals linear-lanceolate to lanceolate, shorter or longer than petals.
 - 2a. Carpels 5 5. *T. schimperi*
 - 2b. Carpels 4.
 - 3a. Stems ascending; nectar scales broadly obconical; seeds papillate 2. *T. mongolica*
 - 3b. Stems erect; nectar scales linear to spatulate; seeds longitudinally striate.
 - 4a. Flowers in cymules; pedicels variable in length, always some much longer than sepals; petals shorter than sepals, apex acute 3. *T. alata*
 - 4b. Flowers solitary; pedicels ca. 1/2 as long as sepals; petals longer than sepals, apex obtuse 4. *T. likiangensis*

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1. *Tillaea aquatica* Linnaeus, Sp. Pl. 1: 128. 1753.

东爪草 *dong zhao cao*

Herbs 2–6 cm tall. Roots fibrous. Stems branched from base, erect or ascending. Leaf blade linear-lanceolate, 4–8 × ca. 1 mm, base connate, apex acute. Flowers axillary or rarely terminal, sessile, 4- or rarely 5-merous. Sepals ovate, ca. 0.5 mm, apex obtuse. Petals white, ovate-oblong, ca. 1 mm, apex obtuse. Stamens shorter than petals. Nectar scales spatulate-linear, ca. 1.5 × as long as carpels. Carpels ovoid-oblong. Styles short. Follicles more than 10-seeded. Seeds brown, cylindrical, ca. 0.5 mm, longitudinally striate. Fl. May–Jul.

Sandy areas along rivers or river banks. Heilongjiang, Nei Mongol [Japan, Korea, Mongolia, Russia; Europe, North America].

2. *Tillaea mongolica* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 112. 1965.

承德东爪草 *cheng de dong zhao cao*

Crassula mongolica Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 16. 1883.

Herbs 2.5–5 cm tall, glabrous. Stems branched from middle, ascending. Leaf blade lanceolate, 2–3 mm, apex often reflexed. Flowers axillary, 4-merous; pedicel longer than sepals in fruiting material. Sepals erect, violet striate adaxially, lanceolate, apex obtuse. Petals brown striate, shorter than sepals, base connate, apex hooded. Stamens with anthers ovoid. Nectar scales broadly obconical, ca. 1/4 as long as carpels. Styles shortly acuminate. Follicles gibbous, 7- or 8-seeded. Seeds yellow, cylindrical-ovoid, densely rounded tuberculate.

• Edges of ponds. NE Hebei (Chengde).

This species needs comparison with *Tillaea decumbens* (Thunberg) Willdenow, which was originally described from S Africa but is now known to be adventive elsewhere.

3. *Tillaea alata* Viviani, Pl. Aegypt. Dec. 4: 16. 1830.

云南东爪草 *yun nan dong zhao cao*

Crassula alata (Viviani) Berger; *Tillaea yunnanensis* S. H. Fu.

Herbs 3.5–5.5 cm tall, glabrous. Stems branched from base and middle, erect. Leaf blade lanceolate, 3–4(–7) × 0.5–1(–2) mm, apex extended into a pale bristle. Flowers in very condensed axillary cymes shorter than subtending leaf, 3- or 4(or 5)-merous on densely leafy axillary shoots usually shorter than subtending leaves; pedicel filiform, to 4 mm. Sepals linear-lanceolate, ca. 1.5 × 0.2 mm. Petals yellow, lanceolate, ca. 1 mm. Stamens to 1 mm. Nectar scales linear to spatulate, ca. 0.3 mm. Styles short. Follicle 2-seeded. Seeds brown, oblong, 0.4–0.5 mm. Fl. Sep.

Slopes; ca. 2700 m. NW Yunnan (Dêqên Xian) [India, Pakistan; NE Africa, SW Asia].

The Chinese material of *Tillaea alata* is described as having yellow petals but is otherwise not distinguishable from the Indian and African material which has white to pale red petals. Material from tropical Africa has consistently 5-merous flowers and is included in subsp. *pharnaceoides* (C. A. Meyer) Wickens & Bywater.

4. *Tillaea likiangensis* H. Chuang, Acta Bot. Yunnan. 19: 225. 1997.

丽江东爪草 *li jiang dong zhao cao*

Herbs green occasionally flushed purplish, 2–5 cm tall. Roots fibrous. Stems often simple, erect or ascending from a prostrate rhizome. Leaf blade linear, 3–6 × ca. 0.5 mm, base connate for 0.5–0.8 mm, apex acute. Flowers solitary in leaf axils, 4- or 5-merous; pedicel ca. 0.5 mm. Sepals triangular, 0.8–1 mm, apex obtuse. Petals pink, narrowly ovate, 1.4–1.6 × 0.5–0.8 mm, apex obtuse. Stamens 0.7–0.8 mm. Nectar scales very small. Carpels narrowly ovoid, ca. 1.5 mm. Style very short. Seeds narrowly cylindrical, ca. 0.5 × 0.2 mm, longitudinally striate.

• Marshes; ca. 2700 m. NW Yunnan (Lijiang Naxi Zu Zizhixian).

This species is known to the present authors only from the protologue.

5. *Tillaea schimperii* (C. A. Meyer) M. G. Gilbert et al., Novon 10: 366. 2000.

五蕊东爪草 *wu rui dong zhao cao*

Crassula schimperii C. A. Meyer in Fischer et al., Index Sem. Hort. Petrop. 8: 56. 1842; *C. pentandra* (Royle ex Edgeworth) Schönland; *Tillaea pentandra* Royle ex Edgeworth.

Herbs 2–7 cm tall. Roots fibrous. Stems branched mostly from base, erect or ascending. Leaf blade linear-lanceolate to oblong, 3–5 × 1–2 mm, margin often hyaline, apex acute to shortly acuminate. Flowers in very condensed axillary cymes shorter than subtending leaf, (4 or 5)-merous; pedicel shorter than sepals, sometimes almost absent. Sepals narrowly triangular, 1.5–1.8 × ca. 0.6 mm, apex long acuminate and aristate. Petals dull white to purplish, ovate-lanceolate, 0.7–1.6 × 0.2–0.6 mm, apex long acuminate and aristate. Stamens ca. 0.6 mm. Nectar scales spatulate-linear, ca. 0.6 mm. Carpels oblong-ovoid. Styles short. Follicles brown, 2-seeded. Seeds brown, cylindrical-ovoid, ca. 0.5 × 0.3 mm, smooth or obscurely longitudinally ribbed. Fl. Jul–Aug, fr. Sep.

Among rocks on grassy slopes; 3000–4800 m. Xizang [Bhutan, India, Kashmir, Nepal, Pakistan; tropical Africa, SW Asia].

The Chinese material belongs to subsp. *schimperii*. Two further subspecies are recognized in Africa.

2. BRYOPHYLLUM Salisbury, Parad. Lond. t. 3. 1805.

落地生根属 *lao di sheng gen shu*

Fu Kunjun (傅坤俊 Fu Kun-tsun); Michael G. Gilbert

Herbs, rarely subshrubs or shrubs. Roots fibrous. Stems usually erect. Leaves opposite, rarely 3-verticillate, petiolate, pinnately compound, rarely simple or pinnately lobed (or simple and bearing bulbils along margin). Inflorescences

terminal, cymose, many flowered. Flowers bisexual, usually pendulous, 4-merous, brightly colored, large. Calyx tubular or rarely campanulate; tube sometimes basally dilated. Corolla purple-red (in China), tubular to salverform, equaling or longer than calyx; lobes shorter than or scarcely longer than tube. Stamens $2 \times$ as many as petals, inserted below middle of corolla tube, usually near base; filaments equaling corolla tube. Nectar scales entire or emarginate. Carpels erect, free. Styles long. Follicles many seeded.

About 20 species: Africa (including Madagascar); one species (introduced) in China.

1. Bryophyllum pinnatum (Linnaeus f.) Oken, Allg. Naturgesch. 3(3): 1966. 1841.

落地生根 lao di sheng gen

Crassula pinnata Linnaeus f., Suppl. Pl. 191. 1782;

Bryophyllum calycinum Salisbury; *Kalanchoe pinnata* (Linnaeus f.) Persoon.

Herbs 40–150 cm tall, glabrous. Stems usually branched. Leaf blade pinnately compound with 3–5 leaflets, 10–30 cm; petiolules 2–4 cm; leaflet blades oblong to elliptic, $6-8 \times 3-5$ cm, margin crenate, apex

obtusely. Inflorescences terminal, paniculate, 10–40 cm, many flowered. Flowers pendulous. Calyx tubular, 2–4 cm. Corolla reddish to purple, to 5 cm, base sparsely ciliate; lobes ovate-lanceolate. Stamens inserted basally on corolla. Nectar scales oblong. Follicles included in calyx and corolla tube. Seeds striate. Fl. Jan–Mar.

Cultivated and naturalized. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [native to Africa; naturalized elsewhere].

This species is cultivated as an ornamental and is used medicinally.

3. KALANCHOE Adanson, Fam. Pl. 2: 248. 1763.

伽蓝菜属 jia lan cai shu

Fu Kunjun (傅坤俊 Fu Kun-tsun); Michael G. Gilbert; Hideaki Ohba

Herbs sometimes biennial, subshrubs, or shrubs. Roots usually fibrous. Leaves opposite, petiolate or sessile, usually amplexicaul; leaf blade margin entire, dentate, crenate, or leaves pinnate. Inflorescences terminal, cymose, sometimes also with subterminal cymes and thus paniculate, many flowered; bracts small. Flowers bisexual, erect, 4-merous. Sepals free or basally subconnate, triangular to lanceolate, usually shorter than corolla tube. Corolla yellow (or white, red, pink, or orange), salverform; tube subquadrangular or basally inflated and urn-shaped, base slightly narrowed; lobes longer than tube. Stamens $2 \times$ as many as petals, inserted near middle of corolla tube; filaments unequal in length, usually very short. Nectar scales linear to suborbicular. Carpels erect. Styles short or long. Follicles many seeded. Seeds ellipsoid.

About 125 species: Africa, Asia; four species (two endemic) in China.

1a. Leaves pinnately lobed 4. *K. ceratophylla*

1b. Leaves simple.

2a. Plants 5–8 cm tall; leaf blade 1–1.8 cm 3. *K. garambiensis*

2b. Plants over 40 cm tall; leaf blade 5–11.3 cm.

3a. Leaf blade spatulate-oblong, base attenuate 1. *K. integra*

3b. Leaf blade triangular to broadly ovate, base truncate to broadly cuneate 2. *K. tashiroi*

1. Kalanchoe integra (Medikus) Kuntze, Revis. Gen. Pl. 1: 229. 1891.

匙叶伽蓝菜 chi ye jia lan cai

Cotyledon integra Medikus, Hist. & Commentat. Acad. Elect. Sci. Theod.-Palat. 3: 200. 1775; *C. spathulata* (de Candolle) Poiret; *Kalanchoe spathulata* de Candolle; *K. yunnanensis* Gagnepain.

Herbs perennial, 40–120 cm tall, glabrous. Leaves subsessile, amplexicaul; leaf blade spatulate-oblong, $5-7 \times 1.5-3.5$ cm, base attenuate, margin irregularly lobed to rarely subentire, apex obtuse. Inflorescences cymose, ca. 10 cm, elongated in fruit; bracts linear. Sepals linear-ovate to narrowly triangular, apex acuminate. Corolla yellow, 1.5–2 cm; lobes acuminate at apex. Stamens inserted at corolla throat; filaments short. Nectar scales linear, ca. 3 mm. Fl. May–Aug.

Fujian, Guangdong, Taiwan, Xizang, Yunnan [Bhutan, Cambodia, India, Indonesia, Kashmir, Laos, Malaysia, Nepal, Philippines, Sikkim, Thailand, Vietnam; SW Asia].

2. Kalanchoe tashiroi Yamamoto, Icon. Pl. Formos. Suppl. 2: 25. 1926.

台东伽蓝菜 tai dong jia lan cai

Plants suffrutescent, glabrous. Petiole ca. 2 mm; leaf blade triangular to broadly ovate, $5.3-11.3 \times 2.5-6.5$ cm, base truncate to broadly cuneate, margin irregularly crenate, apex triangularly obtuse. Inflorescences paniculiform cymose; pedicels ca. 1 mm. Sepals linear-lanceolate, ca. 8×3 mm. Corolla yellow; tube urn-shaped, ca. $1 \times 0.2-0.6$ cm; lobes broadly elliptic, ca. 7×5 mm, apex abruptly acute. Stamens inserted at corolla throat; filaments ca. 1.2 cm. Nectar scales linear, ca. 4×0.5 mm. Carpels lanceolate, ca. 1.2 cm. Styles short. Follicles many seeded. Seeds oblong, finely rugose. Fl. Dec.

• SE Taiwan (Taidong Xian).

The division between this species and *Kalanchoe integra* is ill defined.

3. Kalanchoe garambiensis Kudo, J. Soc. Trop. Agric. 2: 235. 1930.

台南伽蓝菜 tai nan jia lan cai

Herbs 5–8 cm tall, glabrous. Root stout, sometimes branched. Leaves petiolate; leaf blade spatulate, 1–1.8 × 0.3–0.7 cm, base tapered, margin entire, apex obtuse to shortly acute. Inflorescences laxly corymbiform, cymose, 3–10-flowered. Sepals ovate-oblong, ca. 5 mm, glandular, apex acute. Corolla yellow; tube slender, ca. 2 cm, base urceolate; lobes broadly ovate, apex obtuse, subconcave, or acute. Fl. Apr, fr. Aug.

• Among rocks. S Taiwan.

This species could be regarded as a very depauperate form of *Kalanchoe integra*.

4. *Kalanchoe ceratophylla* Haworth, Rev. Pl. Succ. 23. 1821.

伽蓝菜 jia lan cai

Kalanchoe gracilis Hance; *K. macrosepala* Hance; *K. takeoi* Hayata.

Herbs perennial, 20–100 cm tall. Leaves at middle of stem pinnately lobed; petiole 2.5–4 cm; leaf blade 8–15 cm; leaflets linear to linear-lanceolate, margin shallowly serrate. Inflorescences paniculiform cymose, 10–30 cm; bracts linear. Sepals lanceolate, 4–10 mm, apex acute. Corolla yellow; tube ca. 1.5 cm, basally dilated; lobes 5–6 mm. Nectar scales linear, ca. 3 mm. Carpels lanceolate, 5–6 mm. Styles 2–4 mm. Fl. Mar. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [India, SE Asia]. The record of *Kalanchoe laciniata* (Linnaeus) de Candolle in FRPS is based on misidentified plants of *K. ceratophylla*. True *K. laciniata* differs in having leaves irregularly and more shallowly lobed (vs. regularly and deeply lobed, almost to pinnately compound).

This species is cultivated as an ornamental and the whole plant is used medicinally.

4. KUNGIA K. T. Fu, J. NorthW. Teachers Coll. (Nat. Sci.) 1: 3. 1988.

孔岩草属 kong yan cao shu

Fu Kunjun (傅坤俊 Fu Kun-tsun); Michael G. Gilbert

Herbs perennial, glabrous or hairy. Roots short, fibrous. Stolons present; sterile stems usually present. Basal leaves in sessile rosettes, spiral or decussate, mostly alternate; stem leaves alternate. Flowering stems erect, very slender but strong. Inflorescence terminal, racemiform or paniculiform, formed by many cymelets, many flowered; bracts acuminate at apex. Flowers bisexual, 5-merous. Sepals lanceolate-triangular, spurless. Petals connate at base, red or purple, lanceolate, apex acute. Stamens 1 or 2 × as many as petals, inserted opposite sepals; anthers oblong-reniform. Nectar scales short. Carpels nearly free, oblong, base attenuate or stalked. Styles long. Follicles erect, many seeded. Seeds ovoid, minutely papillate.

• Two species.

1a. Basal leaves obovate, oblong, broadly elliptic, or orbicular, 5–16 mm wide 1. *K. aliciae*

1b. Basal leaves obovate-lanceolate, 1–2 mm wide 2. *K. schoenlandii*

1. *Kungia aliciae* (Raymond-Hamet) K. T. Fu, J. NorthW. Teachers Coll. (Nat. Sci.) 1: 4. 1988.

孔岩草 kong yan cao

Basal leaves decussate or spiral, forming a rosette; middle stem leaves opposite or alternate; distal stem leaves alternate; basal leaf blade obovate, oblong, broadly elliptic, or orbicular, 9–12 × 5–16 mm, margin entire, narrowly brown lunulate, apex obtuse to rounded. Flowering stems 10–35 cm, usually minutely papillate-hairy at base. Inflorescence racemiform, simple or few branched, or paniculiform with cymose branches; pedicels long. Sepals narrowly triangular, 1–2 × 0.5–0.8 mm. Petals red to reddish violet, lanceolate to oblong, 3.5–4.5 × 0.8–1 mm, apex acuminate. Stamens 5. Nectar scales nearly transversely oblong. Carpels suboblong. Styles ca. 1 mm. Follicles ca. 3 mm including style. Fl. Jun–Aug.

• Moist rocks on valley slopes; 1300–2500 m. S Gansu, N Sichuan.

1a. Basal leaves spiral, middle and distal stem leaves alternate; inflorescence racemiform, simple or few branched 1a. var. *aliciae*

1b. Basal leaves decussate, middle stem leaves opposite, distal stem leaves alternate; inflorescence paniculiform with cymose branches 1b. var. *komarovii*

1a. *Kungia aliciae* var. *aliciae*

孔岩草(原变种) kong yancao (yuan bian zhong)

Crassula aliciae Raymond-Hamet, Bull. Soc. Bot. France 55: 710. 1908; *Orostachys aliciae* (Raymond-Hamet) H. Ohba; *Sedum aliciae* (Raymond-Hamet) Raymond-Hamet; *Sinocrassula aliciae* (Raymond-Hamet) A. Berger.

Basal leaves spiral; middle and distal stem leaves alternate. Inflorescence racemiform, simple or few branched.

• 2000–2500 m. S Gansu, N Sichuan.

1b. *Kungia aliciae* var. *komarovii* (Raymond-Hamet) K. T. Fu, J. NorthW. Teachers Coll. (Nat. Sci.) 1: 4. 1988.

对叶孔岩草 dui ye kong yan cao

Sedum aliciae var. *komarovii* Raymond-Hamet, Russk. Bot. Zhurn. 1913: 175. 1913.

Basal leaves decussate; middle stem leaves opposite; distal stem leaves alternate; inflorescence paniculiform with cymose branches.

• Moist rocks on valley slopes; 1300–1700 m. NC Sichuan (Maowen Qiang Zu Zizhixian, Wenchuan Xian).

2. **Kungia schoenlandii** (Raymond-Hamet) K. T. Fu, J. NorthW. Teachers Coll. (Nat. Sci.) 1: 5. 1988.

弯毛孔岩草 wan mao kong yan cao

Basal leaves forming a dense rosette; leaf blade obovate-lanceolate, abaxially curved, ca. 5 × 1–2 mm, margin entire or coarsely dentate, apex obtuse. Flowering stem ascending, curved, 6–30 cm, sparsely glandular hairy. Inflorescence racemose or paniculate-racemiform and composed of cymelets; cymelet peduncles slender, short; pedicels to 4 mm. Sepals narrowly triangular, ca. 2 × 0.6 mm, Petals red, oblong-lanceolate, 5.5–6 × ca. 1 mm, apex long acute. Stamens 5, shorter than petals. Nectar scales spatulate-quadrate, apex subemarginate. Carpels lanceolate. Styles ca. 1.5 mm. Follicles ca. 3.5 mm including style. Seeds broadly fusiform, striate. Fl. Jun–Jul, fr. Aug–Sep.

• Sunny rocks, valleys and rocks on slopes, rocks near river banks, stone walls; 700–3100 m. S Gansu, Shaanxi, N Sichuan.

- 1a. Leaf blade adaxially densely glandular hairy, abaxially sparsely glandular hairy, hairs long and reflexed, margin entire; inflorescence conical, most flowers in cymelets; petals 5–6 mm 2a. var. *schoenlandii*
1b. Leaf blade shortly white lepidote, minutely papilliferous, or glabrous, margin entire or coarsely dentate; inflorescence uniformly slender, many flowers solitary; petals ca. 4 mm 2b. var. *stenostachya*

2a. **Kungia schoenlandii** var. *schoenlandii*

5. OROSTACHYS Fischer, Mém. Soc. Imp. Naturalistes Moscou 2: 270. 1809.

瓦松属 wa song shu

Herbs biennial. Roots fibrous. Rhizome absent. Leaves of 1st year arranged in a solitary, basal, dense rosette, alternate, linear to ovate, often with dull purple dots, apex usually cuspidate with a white, cartilaginous appendage to rarely softly obtuse or acuminate. Flowering stem solitary, arising from center of rosette in 2nd year; stem leaves alternate. Inflorescence terminal, a dense raceme or thyrse, narrowly pyramidal to cylindrical in outline, with a distinct main axis and sometimes cymose lateral branches, many flowered, bracteate. Flowers bisexual, sessile or pedicellate, 5-merous. Sepals usually shorter than petals. Petals subconnate at base, white, pink, or red, lanceolate. Stamens 2 × as many as petals, in 2 series. Nectar scales small. Carpels erect, free, stipitate, many ovuled. Styles slender. Follicles beaked at apex, many seeded.

Thirteen species: China, Japan, Kazakstan, Korea, Mongolia, Russia; eight species (one endemic) in China.

- 1a. Apical spine of rosette leaves absent; bracts spatulate-ovate 1. *O. malacophylla*
1b. Apical spine of rosette leaves cuspidate; bracts oblong to linear.
2a. Apical spine or appendage of rosette leaves not cartilaginous 2. *O. japonica*
2b. Apical spine or appendage of rosette leaves cartilaginous.
3a. Rosette leaves apically fimbriate or spine 1-toothed on each side.
4a. Margin of rosette leaf appendage fimbriate; petals red or white 3. *O. fimbriata*
4b. Margin of rosette leaf appendage entire, sometimes spine 1-toothed on each side; petals white 4. *O. chanelii*
3b. Rosette leaves apically fimbriate, sometimes ± undulate.
5a. Petals yellowish green; pedicel ca. 1 mm or absent; anthers yellow 5. *O. spinosa*
5b. Petals white, red, reddish, or petal apex reddening; pedicel conspicuous, rarely almost absent; anthers purple.
6a. Flowering stem 2–6 cm 6. *O. minuta*
6b. Flowering stem 5–40 cm.

弯毛孔岩草(原变种) wan mao kong yan cao (yuan bian zhong)

Sedum schoenlandii Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 265. 1910; *Orostachys schoenlandii* (Raymond-Hamet) H. Ohba; *Sinocrassula schoenlandii* (Raymond-Hamet) S. H. Fu.

Leaf blade adaxially densely glandular hairy, abaxially sparsely glandular hairy, margin entire. Fl. Jun–Jul, fr. Aug–Sep.

• Sunny rocks, stone walls; 3000–3100 m. N Sichuan (Songpan Xian).

2b. **Kungia schoenlandii** var. *stenostachya* (Fröderström) K. T. Fu, J. NorthW. Teachers Coll. (Nat. Sci.) 1: 5. 1988.

狭穗孔岩草 xia sui kong yan cao

Sedum stenostachyum Fröderström, Acta Horti Gothob. 7: 113. 1932; *Kungia schoenlandii* var. *lepidotricha* K. T. Fu; *Orostachys stenostachya* (Fröderström) H. Ohba; *Sinocrassula stenostachya* (Fröderström) S. H. Fu; *S. stenostachya* var. *integrifolia* S. H. Fu; *S. stenostachya* var. *lepidotricha* S. H. Fu.

Leaf blade shortly white lepidote, minutely papilliferous, or glabrous, margin entire or coarsely dentate. Fl. Jul, fr. Aug.

• Valleys and rocks on slopes, rocks near river banks, stone walls; 700–2700 m. S Gansu, Shaanxi.

The toothed, slightly broader rosette leaves, very short, papillalike hairs, racemelike inflorescence, and shorter petals suggest that this variety might be better placed under *Kungia aliciae*.

- 7a. Stamens slightly shorter than or equaling petals; bracts shorter than flowers, ovate-oblong 7. *O. thyrsoiflora*
- 7b. Stamens slightly shorter than petals; bracts equaling or longer than flowers, linear to lanceolate 8. *O. cartilaginea*

1. *Orostachys malacophylla* (Pallas) Fischer, Mém. Soc. Imp. Naturalistes Moscou 2: 274. 1809.

钝叶瓦松 *dun ye wa song*

Rosette 4–15 cm in diam.; rosette leaves oblong, oblong-lanceolate, obovate, or elliptic, 1.5–7 × 1–3 cm, margin entire, apex obtuse to shortly acuminate, apical spine absent. Stem leaves to 7 cm, usually longer than rosette leaves, apex obtuse. Inflorescence racemose or sometimes spicate and branched, dense, 10–30 cm; bracts spatulate-ovate, margin often erose, apex shortly acuminate (apically on inflorescence). Flowers often sessile. Sepals oblong, 3–4 mm, apex acute. Petals white or greenish, oblong to ovate-oblong, 4–6 mm, base connate for 1–1.4 mm, margin often erose. Stamens longer than petals; anthers yellow. Nectar scales linear-lanceolate, apex emarginate. Carpels ovoid, ca. 4.5 mm, tapered toward both ends. Styles ca. 1 mm. Seeds ovoid-oblong, longitudinally striate. Fl. Jul, fr. Aug–Sep.

Rock crevices; 1200–1800 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Russia].

- 1a. Flowering stem bearing flowers for less than 1/2 its length; rosette leaves persistent at anthesis 1a. subsp. *malacophylla*
- 1b. Flowering stem bearing flowers for more than 1/2 its length; rosette leaves not persistent at anthesis 1b. subsp. *lioutchenngoi*

1a. *Orostachys malacophylla* subsp. *malacophylla*

钝叶瓦松(原亚种) *dun ye wa song (yuan ya zhong)*

Cotyledon malacophylla Pallas, Reise Russ. Reich. 3: 729. 1776; *Sedum malacophyllum* (Pallas) Steudel; *Umbilicus malacophyllus* (Pallas) de Candolle.

Rosette leaves persistent at anthesis. Flowering stem 10–20 cm, bearing flowers for less than 1/2 its length. Fl. Jul, fr. Aug–Sep.

Rock crevices; 1200–1800 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Russia].

1b. *Orostachys malacophylla* subsp. *lioutchenngoi* H. Ohba, J. Jap. Bot. 65: 198. 1990.

慎谔瓦松 *shen e wa song*

Rosette leaves not persistent at anthesis. Flowering stem to 30 cm, bearing flowers for more than 1/2 its length.

•?Rock crevices. Nei Mongol.

2. *Orostachys japonica* A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 464. 1930.

晚红瓦松 *wan hong wa song*

Rosette leaves narrowly spatulate, 15–30 × 4–7 mm, apex narrowly acuminate, apical spine not cartilaginous. Stem leaves red dotted, linear to linear-lanceolate, 2–6 × 0.3–0.7 cm, apex narrowly acuminate and prickles absent. Inflorescence racemose, dense, 8–20 × 2–5 cm in diam.; bracts resembling stem leaves but smaller. Flowers pedicellate. Sepals ovate, ca. 2 × 1 mm, apex obtuse. Petals white, minutely punctate, lanceolate, ca. 6 × 1.8 mm, apex reddish and rounded. Stamens shorter than petals. Nectar scales subquadrangular, ca. 0.3 mm, apex emarginate. Carpels erect, lanceolate, ca. 6 mm, abruptly tapered toward base. Styles slender, ca. 2 mm. Seeds brown, ca. 1 mm. Fl. Sep–Oct.

Rocks on low mountains, along streams. Anhui, E Heilongjiang, Jiangsu, Shandong, Zhejiang [Japan, Korea, Russia].

The present authors have followed V. V. Byalt (pers. comm.) who believes that the species identified in FRPS as *Orostachys erubescens* is in fact *O. japonica*, whereas true *O. erubescens* is a synonym of *O. spinosa*.

3. *Orostachys fimbriata* (Turczaninow) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 464. 1930.

瓦松 *wa song*

Cotyledon fimbriata Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 17: 241. 1844; *C. fimbriata* var. *ramosissima* (Maximowicz) Maximowicz; *Orostachys fimbriata* var. *grandiflora* F. Z. Li & X. D. Chen; *O. fimbriata* var. *shandongensis* F. Z. Li & X. D. Chen; *O. jiuhuaensis* X. H. Guo & X. L. Liu; *O. ramosissima* (Maximowicz) V. V. Byalt; *Sedum fimbriatum* (Turczaninow) Franchet; *S. fimbriatum* var. *ramosissimum* (Maximowicz) Fröderström; *S. limuloides* Praeger; *S. ramosissimum* (Maximowicz) Franchet; *Umbilicus fimbriatus* (Turczaninow) Turczaninow; *U. ramosissimus* Maximowicz. Rosette leaves linear, short; appendage white, suborbicular, cartilaginous, centrally spinose, margin fimbriate. Stem leaves linear to lanceolate, 1.9–3 × 0.2–0.5 cm, apex spinose. Flowering stem 10–20(–40) cm. Inflorescence racemose or basally branched and conical, dense, 12–25 × 10–20 cm; bracts linear, apex acuminate; pedicels to 1 cm. Sepals oblong, 1–3 mm. Petals red or white, lanceolate elliptic, 5–6 × 1.2–1.5 mm, base connate for ca. 1 mm, apex acuminate. Stamens shorter than or equaling petals; anthers purple. Nectar scales subquadrangular, apex subemarginate. Follicles oblong, apical beak slender, ca. 1 mm. Seeds numerous, ovoid, minute. Fl. Aug–Sep, fr. Sep–Oct. Rocks on slopes, house roofs, mossy tree trunks; below 1600 m (to 3500 m in Gansu and Qinghai). Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Zhejiang [Korea, Mongolia, Russia]. This species is used medicinally.

4. *Orostachys chanetii* (H. Léveillé) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 464. 1930.

塔花瓦松 ta hua wa song

Sedum chanetii H. Léveillé, Repert. Spec. Nov. Regni Veg. 5: 99. 1908; *S. fimbriatum* (Turczaninow) Franchet var. *chanetii* H. Léveillé; *S. pyramidale* Praeger.

Rosette leaves linear, ca. 2.5 × 0.4 cm; appendage white, suborbicular, cartilaginous, apical spine sometimes 1-toothed on each side. Stem leaves linear, to 2.5 × 0.4 cm, apex spinose. Flowering stem branched, erect, 10–30 cm. Inflorescence paniculate, narrowly pyramidal in outline, to 7 cm in diam., small inflorescences corymbiform; bracts attached to middle part of pedicel. Flowers long pedicellate. Sepals ovate, ca. 1 mm, apex acute. Petals white, adaxially red spotted, lanceolate, 3–4 × ca. 1 mm, apex obtuse. Stamens slightly shorter than petals; anthers dark purple. Nectar scales subquadrangular, apex rounded to emarginate. Carpels erect, lanceolate-oblong, base shortly stipitate. Styles ca. 1 mm. Follicles erect, apical beak ca. 1 mm. Seeds brown. Fl. Sep, fr. Oct.

• Rocks on slopes, house roofs; 400–1700 m. Gansu, Hebei, Shanxi, Sichuan.

V. V. Byalt (pers. comm.) believes that *Orostachys ramosissima*, here treated as a synonym of *O. fimbriata*, is synonymous with *O. chanetii*. If this were to prove true, then *O. ramosissima* (Maximowicz) V. V. Byalt (Probl. Bot. XX–XXI Cent.: 167. 1998) would be the correct name for the species because *Umbilicus ramosissimus* (1859) antedates *Sedum chanetii* (1908).

5. *Orostachys spinosa* (Linnaeus) Sweet, Hort. Brit., ed. 2, 225. 1830.

黄花瓦松 huang hua wa song

Cotyledon spinosa Linnaeus, Sp. Pl. 1: 429. 1753; *C. erubescens* (Maximowicz) Franchet & Savatier; *Orostachys erubescens* (Maximowicz) Ohwi; *Sedum erubescens* (Maximowicz) Ohwi; *S. spinosum* (Linnaeus) Thunberg; *Umbilicus erubescens* Maximowicz.

Rosette leaves crowded, oblong; appendage white, suborbicular, cartilaginous, apical spine 2–4 mm. Stem leaves broadly linear to oblanceolate, 1–3 × 0.2–0.5 cm, apex acuminate, apical prickle cartilaginous. Flowering stem 10–30 cm. Inflorescence terminal, spicate or racemose, 5–20 cm; bracts lanceolate to oblong, to 4 mm, apex spinose; pedicels ca. 1 mm or absent. Sepals red spotted, ovate-oblong, 2–3 mm, apex spinose. Petals yellowish green, ovate-lanceolate, 5–7 × ca. 1.5 mm, base connate for ca. 1 mm, apex acuminate. Stamens slightly longer than petals; anthers yellow. Nectar scales subquadrangular, apex emarginate. Follicles erect, ellipsoid-lanceolate, base narrowed, apical beak ca. 1.5 mm. Seeds oblong-ovoid. Fl. Jul–Aug, fr. Sep.

Rock crevices on dry slopes; 600–2900 m. Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang, Xizang [Korea, Mongolia, Russia].

6. *Orostachys minuta* (Komarov) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 464. 1930.

小瓦松 xiao wa song

Cotyledon minuta Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 436. 1901.

Rosette leaves crowded, oblong-lanceolate to spatulate, 1–1.5 × 0.2–0.3 cm; appendage white, suborbicular, cartilaginous, apical spine short. Stem leaves ovate-lanceolate, 10–15 × 1.2–3 mm, apical prickle white, cartilaginous, spinose. Flowering stem 2–6 cm. Inflorescence a spike or raceme, dense, cylindrical, 1.5–4 cm; bracts purple spotted, oblong-lanceolate, 2–2.5 mm. Flowers subsessile. Sepals purple spotted, lanceolate to ovate, ca. 2 × 1–1.5 mm, apical prickle spinose. Petals red or reddish, purple spotted, lanceolate to oblong-lanceolate, 4–4.5 mm, apex subacute. Stamens subequaling petals; anthers purple. Nectar scales subquadrangular, ca. 0.3 mm, ± thickened, apex emarginate. Carpels ovoid-lanceolate, tapered toward both ends, base shortly stipitate. Styles ca. 1 mm. Seeds minute. Fl. Aug–Oct.

House roofs. Heilongjiang, Liaoning [Korea].

7. *Orostachys thyrsoflora* Fischer, Mém. Soc. Imp. Naturalistes Moscou 2: 274. 1809.

小苞瓦松 xiao bao wa song

Cotyledon leucantha Ledebour; *C. thyrsoflora* (Fischer) Maximowicz; *Sedum spinosum* (Linnaeus) Thunberg var. *thyrsoflorum* (Fischer) Fröderström; *Umbilicus leucanthus* (Ledebour) Ledebour; *U. thyrsoflorus* (Fischer) de Candolle.

Rosette leaves greenish, imbricate, incurved, linear-oblong, 1.5–2 cm, margin minutely dentate or entire; appendage cartilaginous, apex acute and shortly mucronate. Stem leaves linear-oblong, 4–7 × 1–1.5 mm, apical appendage cuspidate and cartilaginous, apex acute. Inflorescence racemose, 4–14 cm; bracts ovate-oblong, shorter than flowers, apex acuminate; pedicels ca. 2 mm. Sepals triangular-ovate, ca. 1.5 × 2 mm, apex acute. Petals white or reddish, basally subconnate. Stamens slightly shorter than or equaling petals; anthers purple. Nectar scales subquadrangular or suboblong, apex emarginate. Carpels narrowly lanceolate-oblong. Styles 1.5–2 mm. Follicles erect. Seeds ovoid, minute. Fl. Jul–Aug.

Steppe slopes, sunny slopes on mountains; 1000–2100 m. Gansu, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia].

8. *Orostachys cartilaginea* Borissova in Komarov, Fl. URSS 9: 482. 1930.

狼爪瓦松 lang zhao wa song

Rosette leaves oblong-lanceolate, abaxially convex, margin entire; appendage cartilaginous, apically spinose.

Stem leaves linear to linear-lanceolate, 1.5–3.5 × 0.2–0.4 cm, apex acuminate and with a white, cartilaginous spine. Flowering stem solitary, 10–35 cm. Inflorescence racemose, dense, cylindric, 10–30 cm, many flowered; bracts linear to linear-lanceolate, equaling or longer than flowers, apex spinose; pedicels equaling or slightly longer than flowers. Sepals spotted, oblong to lanceo-

late, ca. 2 mm, apex cartilaginous. Petals white, oblong-lanceolate, 5–6 × ca. 2 mm, base subconnate, apex acute. Stamens slightly shorter than petals. Nectar scales subquadrangular. Carpels shortly stipitate, apical beak filiform. Seeds brown, linear-oblong. Fl. Sep–Oct. Slopes on low mountains. Heilongjiang, Jilin, Liaoning, Nei Mongol, Shandong [Russia].

6. HYLOTELEPHIUM H. Ohba, Bot. Mag. (Tokyo) 90: 46. 1977.

八宝属 ba bao shu

Herbs perennial, glabrous or hairy. Roots fibrous or tuberous, often carrot-shaped. Rhizome short, fleshy or woody; young branches not covered with scales. Flowering stem arising from lateral bud of previous year, annual and abscising from base or persisting and basally woody. Stem leaves alternate, opposite, or 3–5-verticillate; leaf blade flat, glabrous, spurless. Inflorescence terminal, sometimes also subterminal and thus paniculate, cymose, often corymbiform, sometimes umbel-like, many flowered, bracteate. Flowers bisexual or unisexual, unequally (4 or) 5-merous, sometimes reduced. Sepals usually shorter than petals, base subconnate and spurless. Petals usually free, purple, red, pink, or white, occasionally yellowish or greenish. Stamens 2 × as many as petals, inserted basally on corolla. Nectar scales oblong-cuneate to linear-oblong, apex rounded or subemarginate. Carpels free, base narrow, substipitate. Follicles erect, many seeded. Seeds narrowly winged.

About 33 species: Asia, Europe, North America; 16 species (six endemic) in China.

- 1a. Basal leaves 2 1. *H. bonnafousii*
 1b. Basal leaves not 2.
 2a. Stems mostly ascending, less than 20 cm.
 3a. Leaves orbicular to orbicular-flabellate, 3-verticillate 5. *H. sieboldii*
 3b. Leaves neither orbicular nor orbicular-flabellate, alternate, opposite, or 3-verticillate.
 4a. Leaves alternate 2. *H. tatarinowii*
 4b. Leaves opposite or 3-verticillate.
 5a. Leaves opposite, margin usually entire 3. *H. ewersii*
 5b. Leaves opposite or 3-verticillate, margin slightly crenulate 4. *H. mongolicum*
 2b. Stems erect, more than 30 cm.
 6a. Inflorescences both terminal and axillary, interrupted elongate in outline 6. *H. angustum*
 6b. Inflorescences all terminal or nearly so, corymbiform or capitate-umbellate in outline.
 7a. Inflorescences capitate-umbellate 16. *H. subcapitatum*
 7b. Inflorescences corymbiform.
 8a. Leaves usually 3–5-verticillate, sometimes basal ones opposite; leaf axil bulbils often present.
 9a. Leaves usually longer than internodes, 4–8 × 2.5–3.5 cm 7. *H. verticillatum*
 9b. Leaves usually shorter than internodes, 2–4 × 0.7–1.2 cm 8. *H. viviparum*
 8b. Leaves usually opposite or alternate, rarely 3-verticillate; leaf axil bulbils absent.
 10a. Leaves usually opposite, rarely 3-verticillate; anthers violet or purple.
 11a. Stamens not exerted from corolla 9. *H. erythrostickum*
 11b. Stamens exerted from corolla.
 12a. Leaf base cuneate; petals purplish 10. *H. spectabile*
 12b. Leaf base subcordate and amplexicaul; petals reddish 11. *H. pseudospectabile*
 10b. Leaves usually alternate; anthers yellow (brown-red in *H. tangchiense*).
 13a. Stems ± flexuous; leaves elliptic-obovate or suborbicular.
 14a. Basal stem leaves elliptic-obovate, to 8.5 × 3 cm, base attenuate; anthers yellow 12. *H. mingjinianum*
 14b. Basal stem leaves suborbicular, 5–10 × 4–9 cm, base abruptly narrowed; anthers brown-red 13. *H. tangchiense*
 13b. Stems erect; leaves elliptic-lanceolate, oblong-ovate, or oblong.
 15a. Roots carrot-shaped; petals purplish red 15. *H. triphyllum*
 15b. Roots not carrot-shaped; petals white or reddish 14. *H. pallescens*

1. *Hylotelephium bonnafousii* (Raymond-Hamet) H. Ohba, 川鄂八宝 chuan e ba bao Bot. Mag. (Tokyo) 90: 48. 1977.

Sedum bonnafousii Raymond-Hamet, J. Bot. 54(Suppl. 1): 30. 1916.

Rhizome stout. Stem erect, slender, 10–30 cm. Basal leaves 2, opposite; leaf blade semiorbicular to broadly ovate, 4–10 cm, margin subentire to crenulate. Stem leaves alternate, sessile, obovate-oblong, 0.8–1 × 0.25–0.5 cm, margin entire, apex acute. Cymes terminal and subterminal, lax, forming a panicle, 8–15 × 4–8 cm. Sepals triangular-lanceolate, 1.2–2 × 1–1.5 mm, apex acute and mucronate. Stamens shorter than petals, glabrous. Nectar scales obovate to almost square, apex emarginate. Follicles erect, ovoid-lanceolate, base narrow, apex acuminate. Seeds obovoid-oblong.

• W Hubei (Badong Xian), E Sichuan (Wushan Xian).

2. *Hylotelephium tatarinowii* (Maximowicz) H. Ohba, Bot. Mag. (Tokyo) 90: 52. 1977.

华北八宝 hua bei ba bao

Roots tuberous, usually with carrot-shaped rootlets. Stems numerous, simple, erect or ascending, leafy, 8–15 cm. Leaves alternate, pseudopetiolate; leaf blade linear-lanceolate, lanceolate, narrowly oblanceolate, or oblong, margin entire or sparsely serrate to lobed, apex obtuse to acuminate. Cyme flat topped, 3–5 cm; pedicels 2–3.5 mm. Sepals ovate-lanceolate, 1–2 mm, apex subacute. Petals reddish. Stamens subequaling petals; filaments white; anthers purple. Nectar scales subsquare, apex emarginate. Carpels erect, ovoid-lanceolate. Styles ± recurved, ca. 1 mm. Fl. Jul–Aug, fr. Sep.

Rock crevices in mountainous areas; 1000–3000 m. Hebei, Nei Mongol, Shaanxi [Mongolia].

1a. Stem leaves oblanceolate to lanceolate, margin remotely serrate to lobed 2a. var. *tatarinowii*

1b. Stem leaves linear-lanceolate to oblong, margin entire 2b. var. *integrifolium*

2a. *Hylotelephium tatarinowii* var. *tatarinowii*

华北八宝(原变种) hua bei ba bao (yuan bian zhong) *Sedum tatarinowii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 29: 134. 1883; *Sedum definitum* H. Léveillé.

Stems 10–15 cm. Stem leaf blades oblanceolate to lanceolate, margin remotely serrate to lobed. Fl. Jul–Aug, fr. Sep.

Rock crevices in mountainous areas; 1000–3000 m. Hebei, Nei Mongol, Shaanxi [Mongolia].

2b. *Hylotelephium tatarinowii* var. *integrifolium* (Palibin) S. H. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 52. 1984.

全缘华北八宝 quan yuan hua bei ba bao

Sedum tatarinowii Maximowicz var. *integrifolium* Palibin, Trudy Imp. S.-Peterburgsk. Bot. Sada 14: 120. 1895; *Hylotelephium almae* (Fröderström) K. T. Fu & G. Y. Rao; *Sedum almae* Fröderström; *S. pekinense* H. Léveillé & Vaniot.

Stems 8–12 cm. Stem leaf blades linear-lanceolate to oblong, margin entire. Fl. Jul, fr. Sep.

• N Hebei, S Nei Mongol (Urad Qianqi).

3. *Hylotelephium ewersii* (Ledebour) H. Ohba, Bot. Mag. (Tokyo) 90: 50. 1977.

圆叶八宝 yuan ye ba bao

Sedum ewersii Ledebour, Icon. Pl. 1: 14. 1829.

Roots slender, cordlike. Rhizome branched, woody. Stems many, branched near base, ascending, purplish brown, 5–25 cm, woody near base, glabrous. Leaves opposite, sessile, usually with brown spots, broadly ovate to suborbicular, 1.5–2 × 1.5–2 cm, margin entire or inconspicuously dentate, apex obtuse, tip acuminate. Cyme umbel-like, crowded, 2–3 cm wide. Sepals free, lanceolate, ca. 2 mm. Petals purplish red, ovate-lanceolate, ca. 5 mm, apex acute. Stamens shorter than petals; filaments reddish; anthers purple. Nectar scales ovate-oblong, apex emarginate. Follicles erect, 3–4 mm, base narrow, apex shortly beaked. Seeds brown, lanceolate. Fl. Jul–Aug.

Forests, rock crevices on sides of ravines; 1800–2500 m. Nei Mongol, Xinjiang, Xizang [Afghanistan, India, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan].

4. *Hylotelephium mongolicum* (Franchet) S. H. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 60. 1984.

承德八宝 cheng de ba bao

Sedum fabaria Koch var. *mongolica* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 10. 1883.

Root cap woody. Stems many, ascending, leafy, 4–16 cm, glabrous. Leaves opposite or 3-verticillate, sessile, ovate-oblong to obovate, 2.2–3.5 × 0.7–1.5 cm, base subattenuate, distal margin sparsely crenulate, apex obtuse to acute. Cyme flat topped, 0.5–4 × 2–6.5 cm, many flowered. Flowers 5–6 mm in diam.; pedicel 1.5–4 mm. Sepals reddish, ca. 1 mm, apex acute. Petals reflexed from middle, pinkish or white, lanceolate, ca. 6 × 1.2 mm, apex acuminate. Epipetalous stamens slightly longer than petals; anthers purple. Nectar scales square. Carpels ovoid, apex with a slender beak.

Follicles ovoid-lanceolate, 6–7 mm. Seeds numerous, brownish, oblong. Fl. Jul–Aug, fr. Sep.

• Rock crevices on mountain slopes or summits; ca. 900 m. NE Hebei (Chengde, Xinglong Xian).

5. *Hylotelephium sieboldii* (Sweet ex Hooker) H. Ohba var. *chinense* H. Ohba, J. Jap. Bot. 67: 199. 1992.

圆扇八宝 yuan shan ba bao

Roots tuberous, carrot-shaped, slender, fleshy. Stems creeping-ascending, 10–15 cm. Leaves 3-verticillate, subsessile; leaf blade orbicular to orbicular-flabellate, 1–1.5 × 1.2–2 cm, base cuneate to broadly so, margin ± undulate to subentire, apex subacute to obtuse-rounded. Cyme umbel-like, flat topped, 2–4 cm in diam.; bracts ovate; pedicels 3–5 mm. Sepals triangular, ca. 1.5 mm, base connate. Petals reddish, oblong-lanceolate, 4–5 × ca. 2 mm, apex acute. Antesealous stamens longer than petals; epipetalous ones subequaling petals; anthers yellow. Nectar scales oblong-spatulate, ca. 0.8

mm, apex truncate to subemarginate. Carpels erect, narrowly ovoid, 2.5–3 mm. Styles ca. 1.5 mm. Fl. Sep.

•Rocks on slopes. SW Hubei (Lichuan Xian).

Hylotelephium sieboldii var. *sieboldii* is endemic to Japan.

6. *Hylotelephium angustum* (Maximowicz) H. Ohba, Bot. Mag. (Tokyo) 90: 48. 1977.

狭穗八宝 xia sui ba bao

Sedum angustum Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 138. 1883; *S. telephium* Linnaeus subsp. *angustum* (Maximowicz) Fröderström.

Roots slender, fibrous. Stem erect, 50–100 cm. Leaves 3–5-verticillate; leaf blade oblong, 4–7.5 × 1.5–2 cm, base attenuate, margin with a few obtuse crenulations, apex obtuse to acuminate. Cymes terminal and axillary, in 2 or more widely spaced whorls, pedunculate, flat topped, to more than 30 cm × ca. 5 cm overall, densely many flowered; pedicels nearly equaling flowers. Sepals free, lanceolate, ca. 1 mm. Petals free, reddish, oblong, ca. 3 mm, base attenuate, apex obtuse, tip acuminate. Stamens equaling or longer than petals. Nectar scales oblong, ca. 0.8 × 0.4 mm. Carpels free. Follicles erect, oblong, ca. 4 mm, base attenuate, apex shortly beaked. Seeds few. Fl. Aug.

•Woodlands, sides of ravines near thickets, rocky slopes; 1400–3500 m. Gansu, Hubei, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan.

- 1a. Axillary inflorescences short cymes, forming 2 or more dense whorls, contiguous and concealing peduncles 6a. var. *angustum*
1b. Axillary inflorescences long pedunculate panicles subtended by well-developed leaves 6b. var. *longipedunculum*

6a. *Hylotelephium angustum* var. *angustum*

狭穗八宝(原变种) xia sui ba bao (yuan bian zhong)

Axillary inflorescences short cymes, forming 2 or more dense whorls, contiguous and concealing peduncles.

•Woodlands, sides of ravines near thickets, rocky slopes; 1800–3500 m. Gansu, Hubei, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan.

6b. *Hylotelephium angustum* var. *longipedunculum* J. M. Zhang & K. T. Fu, Guihaia 19: 207. 1999.

长穗八宝 chang sui ba bao

Axillary inflorescences long pedunculate panicles subtended by well-developed leaves.

•Slopes; 1400–2000 m. Gansu, Shaanxi.

7. *Hylotelephium verticillatum* (Linnaeus) H. Ohba, Bot. Mag. (Tokyo) 90: 54. 1977.

轮叶八宝 lun ye ba bao

Sedum verticillatum Linnaeus, Sp. Pl. 1: 430. 1753, not (J. D. Hooker & Thomson) Raymond-Hamet (1912); *S. telephium* Linnaeus f. *verticillatum* (Linnaeus) Fröderström; *S. telephium* subsp. *verticillatum* (Linnaeus) Fröderström.

Roots slender, fibrous. Stem simple, erect, 0.4–2 m. Leaves mostly (4 or)5-verticillate, basal ones usually 3-verticillate or opposite, petiolate, longer than internodes; leaf blade abaxially usually glaucous, oblong-lanceolate to ovate-lanceolate, 4–8 × 2.5–3.5 cm, base cuneate, margin few dentate, apex acute, tip obtuse. Cyme subglobose, 2–6 cm wide, densely flowered; bracts ovate. Flowers pedicellate. Sepals triangular-ovate, 0.5–1 mm, base subconnate. Petals free, greenish to yellowish white, oblong-elliptic, 3.5–5 mm, base attenuate, apex acute. Antesepalous stamens slightly longer than petals; epipetalous ones slightly shorter than petals. Nectar scales linear-cuneate, apex emarginate. Carpels shortly stipitate, obovoid to oblong, 2.5–5 mm. Styles short. Seeds brownish, narrowly ovoid. Fl. Jul–Aug, fr. Sep.

Grassland slopes, shady moist places on sides of ravines; 900–2900 m. Anhui, Gansu, Henan, Hubei, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea, Russia].

This species is used medicinally.

8. *Hylotelephium viviparum* (Maximowicz) H. Ohba, Bot. Mag. (Tokyo) 90: 55. 1977.

珠芽八宝 zhu ya ba bao

Sedum viviparum Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 137. 1883; *S. telephium* Linnaeus subsp. *viviparum* (Maximowicz) Fröderström.

Roots short, fibrous. Stems 1 to several, simple, erect, 15–60 cm; leaf axils with whitish, fleshy, viviparous buds. Leaves 3- or 4-verticillate, subsessile, usually shorter than internodes; leaf blade ovate-lanceolate to ovate-oblong, 2–4 × 0.7–1.2 cm, base attenuate, margin sparsely and shallowly dentate, apex acuminate, tip obtuse. Cyme dense, flat topped, apex hemispheric; bracts resembling stem leaves but smaller. Sepals ovate, ca. 1 m. Petals yellowish white to yellowish green, ovate to oblong, ca. 3 × 1.5 mm, apex acute.

Antesepalous stamens subequaling or slightly longer than petals; epipetalous ones slightly shorter than petals; anthers yellow, globose. Nectar scales linear-cuneate. Carpels broadly ovoid, ca. 2 mm, base tapering into a short stipe. Styles linear. Seeds ovoid, small. Fl. Aug–Sep.

Rocks on slopes in forests; ca. 900 m. Jilin, Liaoning [Korea, Russia].
9. *Hylotelephium erythrostickum* (Miquel) H. Ohba, Bot. Mag. (Tokyo) 90: 50. 1977.

八宝 ba bao

Sedum erythrostickum Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 155. 1865; *S. alboroseum* Baker; *S.*

labordei H. Léveillé & Vaniot; *S. telephium* Linnaeus subsp. *alboroseum* (Baker) Fröderström.

Roots tuberous, carrot-shaped. Stem simple, erect, 30–70 cm. Leaves opposite, rarely 3-verticillate, sessile, oblong to ovate-oblong, 4.5–7 × 2–5.5 cm, base attenuate, margin sparsely serrate, apex obtuse to acute. Cymes flat topped, densely flowered. Flowers ca. 1 cm in diam.; pedicel shorter than or equaling flowers. Sepals ovate, ca. 1.5 mm. Petals dense, white or pink, broadly lanceolate, 5–6 mm, apex acuminate. Stamens slightly shorter than or equaling petals; anthers purple. Nectar scales oblong-cuneate, ca. 1 mm, apex emarginate. Carpels nearly free, erect, ellipsoid. Fl. Aug–Oct.

Grasslands, sides of ravines; 400–1800 m. Anhui, Guizhou, Hebei, Henan, Jiangsu, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea, Russia].

This species is used medicinally.

10. *Hylotelephium spectabile* (Boreau) H. Ohba, Bot. Mag. (Tokyo) 90: 52. 1977.

长药八宝 *chang yao ba bao*

Stem erect, 30–70 cm. Leaves opposite or 3-verticillate; leaf blade narrowly elliptic-oblong, oblong-ovate, ovate, or broadly so, 2.5–10 × 0.8–5 cm, base attenuate, margin entire, ± undulately dentate, or dentate, apex obtuse to acute. Cyme flat topped, dense, 7–11 cm wide. Flowers ca. 1 cm in diam. Sepals linear-lanceolate to broadly lanceolate, ca. 1 mm, apex acuminate. Petals purplish red to purple, lanceolate to broadly so, 4–5 mm. Stamens longer than corolla, 6–8 mm; anthers violet. Nectar scales rectangular, 1–1.2 mm, apex emarginate. Carpels narrowly ellipsoid, ca. 3 mm. Styles ca. 1.2 mm. Follicles erect. Fl. Aug–Sep, fr. Sep–Oct.

Forest margins, rocky slopes on low mountains. Anhui, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Shaanxi, Shandong [Korea].

1a. Leaves ovate, broadly ovate, or oblong-

ovate,

4–10 × 2–5 cm, margin entire or ±

undulately dentate 10a. var. *spectabile*

1b. Leaves narrowly elliptic-oblong, 2.5–5 ×

0.8–1.5 cm, margin dentate 10b. var. *angustifolium*

10a. *Hylotelephium spectabile* var. *spectabile*

长药八宝(原变种) *chang yao ba bao* (yuan bian zhong)

Sedum spectabile Boreau, Mém. Soc. Acad. Maine

Loire 20: 116. 1866; *S. telephium* Linnaeus var.

kirinense Komarov.

Leaf blade oblong-ovate, ovate, or broadly so, 4–10 × 2–5 cm, margin entire or ± undulately dentate.

Rocky slopes on low mountains. Anhui, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Shaanxi, Shandong [Korea].

This variety is used as an ornamental.

10b. *Hylotelephium spectabile* var. *angustifolium* (Kitagawa) S. H. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 73. 1980.

狭叶长药八宝 *xia ye chang yao ba bao*

Sedum spectabile Boreau var. *angustifolium* Kitagawa in Nakai et al., Rep. Exped. Manchoukuo, Sect. 4, 4: 86. 1936.

Leaf blade narrowly elliptic-oblong, 2.5–5 × 0.8–1.5 cm, margin dentate.

• Forest margins, rocky slopes. N Hebei, Jilin, Liaoning.

11. *Hylotelephium pseudospectabile* (Praeger) S. H. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 73. 1980.

心叶八宝 *xin ye ba bao*

Sedum pseudospectabile Praeger, J. Bot. 55: 40. 1917.

Roots tuberous, carrot-shaped, fleshy. Stems few, simple, erect, 30–60 cm; internodes subequaling or longer than leaves. Leaves 3-verticillate, rarely opposite or 4-verticillate, sessile, obovate proximally on stem, ovate-oblong distally on stem, 3.5–7 × 1.5–4 cm, base subcordate and amplexicaul, margin entire or sparsely and shallowly dentate, apex obtuse to acute. Cyme flat topped, 4–5 × 5–7 cm; bracts few; pedicels shorter than flower. Sepals ovate-lanceolate, 1–1.5 mm. Petals reddish, ovate-lanceolate, 3.5–4.5 mm, apex acute. Stamens erect, to 6 mm, longer than corolla; filaments pink; anthers purple. Nectar scales rectangular-cuneate, ca. 0.6 mm. Carpels narrowly lanceolate, 3.5–4 mm. Styles ± recurved. Seeds brown, narrowly oblong, ca. 0.8 mm. Fl. Aug–Sep, fr. Oct.

Rocks on slopes; ca. 1000 m. Hebei, Jilin, Liaoning [Korea].

12. *Hylotelephium mingjinianum* (S. H. Fu) H. Ohba, Bot. Mag. (Tokyo) 90: 51. 1977.

紫花八宝 *zi hua ba bao*

Sedum mingjinianum S. H. Fu, Acta Phytotax. Sin., Addit. 1: 113. 1965.

Stem simple, erect, 20–40 cm. Basal leaves alternate; leaf blade elliptic-obovate, ca. 8.5 × 3 cm, base attenuate, margin entire, apex acute. Stem leaves alternate; leaf blade linear, ca. 2 × 0.2 cm, base attenuate, margin irregularly undulate and obtusely dentate, apex acute. Cyme flat topped, very dense, ca. 7 × 10 cm. Sepals oblong-lanceolate, 2–2.5 × ca. 0.7 mm. Petals erect and spreading, purple, obovate-oblong, ca. 5 × 1.5 mm. Stamens ca. 5 mm; anthers yellow. Nectar scales spatulate-rectangular, longer than wide, base subcuneate, apex rounded. Carpels erect, free, ovoid, ca. 5 mm; stipe ca. 1 mm. Styles ca. 1 mm. Seeds brown, linear, ca. 1 mm. Fr. Oct.

• Moist places on mountains, beside streams; ca. 700 m. Anhui, Guangxi, Hubei, Hunan, Zhejiang.

13. *Hylotelephium tangchiense* R. X. Meng, Bull. Bot. Res., Harbin 12: 243. 1992.

汤池八宝 *tang chi ba bao*

Stems 1–3, brownish, cespitose, stout, ± flexuous at nodes. Basal leaves broadly petiolate; leaf blade 5–10 × 4–9 cm, base abruptly narrowing, margin irregularly undulate and with obtuse teeth, apex rounded, obtuse, or acute. Stem leaves alternate, middle ones petiolate; leaf blade ovate, 5–9 × 2–5 cm, base tapering, apex obtuse to acute. Apical leaves sessile; leaf blade oblanceolate to linear-elliptic, 1.7–5.5 × 0.6–1.8 cm. Cymes terminal and subterminal, dense, forming a flat-topped panicle, 2–8 × 2–9 cm; pedicels red, 6–10 mm. Sepals oblong-lanceolate, base connate, apex obtuse to acute. Petals purplish red, skiff-shaped, obovate-lanceolate, apex acute. Epipetalous stamens equaling petals; anthers brown-red. Nectar scales oblong-cuneate, ca. 0.5 mm, apex retuse. Carpels erect, ovoid, base abruptly contracted and stipitate. Styles ca. 1 mm. Seeds ovoid-oblong, ca. 1 mm. Fl. Oct, fr. Nov–Dec.

• Rocks on hillsides. C Anhui (Lujiang Xian).

14. *Hylotelephium pallescens* (Freyn) H. Ohba, Bot. Mag. (Tokyo) 90: 51. 1977.

白八宝 bai ba bao

Sedum pallescens Freyn, Oesterr. Bot. Z. 45: 317. 1895; *Hylotelephium eupatorioides* (Komarov) H. Ohba; *Sedum eupatorioides* (Komarov) Komarov; *S. telephium* Linnaeus var. *albiflorum* Maximowicz; *S. telephium* var. *eupatorioides* Komarov; *S. telephium* var. *pallescens* (Freyn) Komarov.

Roots fasciculate. Rhizomes erect. Stem erect, 20–60(–100) cm. Leaves alternate, sometimes opposite, sessile, adaxially with numerous reddish brown spots, oblong-ovate to elliptic-lanceolate, 3–7(–10) × 0.7–2.5(–4) cm, base cuneate, margin entire or irregularly undulate and sparsely serrate distally, apex rounded. Cymes terminal and subterminal, densely branched, forming a flat-topped panicle, to 10 × 13 cm; pedicels 2–4 mm. Sepals lanceolate-triangular, 1–2 mm, apex acute. Petals erect, white or reddish, lanceolate-elliptic, 4–8 × ca. 1.8 mm, apex acute. Antesepalous stamens equaling or longer than petals; anthers yellow. Nectar scales rectangular-cuneate, ca. 1 mm, apex emarginate. Carpels free. Follicles erect, lanceolate-ellipsoid, base attenuate, apex shortly beaked. Seeds brown, narrowly oblong. Fl. Jun–Sep, fr. Aug–Sep.

Forests, grasslands, stony river beaches. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi [Japan, Korea, Mongolia, Russia].

7. PSEUDOSEDUM (Boissier) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 465. 1930.

合景天属 he jing tian shu

Umbilicus de Candolle sect. *Pseudosedum* Boissier, Fl. Orient. 2: 775. 1872–1873.

Herbs perennial, glabrous. Roots cordlike to tuberous. Root crown with a few triangular, small, membranous leaves. Leaves alternate, oblong to linear, terete, fleshy. Flowering stems annual, simple, erect or ascending, densely leafy, old stems sometimes persisting. Stem leaves alternate. Inflorescence terminal, a group of predominantly scorpioid cymes, usually corymbiform, many flowered. Flowers bisexual, 5- or 6-merous. Sepals subconnate at base. Corolla

15. *Hylotelephium triphyllum* (Haworth) Holub, Folia Geobot. Phytotax. 18, 2: 204. 1983.

紫八宝 zi ba bao

Anacampseros triphylla Haworth, Syn. Pl. Succ. 111. 1813; *Hylotelephium purpureum* (Linnaeus) Holub; *Sedum purpureum* (Linnaeus) Schultes; *S. telephium* Linnaeus subsp. *purpureum* (Linnaeus) Schinz & Keller; *S. telephium* var. *purpureum* Linnaeus.

Roots numerous, tuberous, carrot-shaped. Stems 1 to few, erect, 20–70 cm. Leaves alternate, sessile distally on stem; leaf blade oblong to oblong-ovate proximally on stem, 2–7 × (0.4–) 1–3 cm, base rounded to cuneate, margin irregularly dentate, apex obtuse to acute. Cyme flat topped, dense; pedicels ca. 4 mm. Sepals ovate-lanceolate, ca. 2 mm, base connate, apex acute. Petals extrorsely reflexed from middle, purplish red, oblong-lanceolate, 5–6 mm, apex acute. Stamens subequaling petals; anthers yellow. Nectar scales linear-spatulate, ca. 1 mm, apex ± incised. Carpels erect, ellipsoid-lanceolate. Styles short. Seeds brown, ovoid-ellipsoid, minute. Fl. Jul–Aug, fr. Sep.

Shady moist places in forests, grasslands on slopes; 400–1600 m. Heilongjiang, Jilin, Liaoning, Xinjiang [Japan, Kazakstan, Russia; Europe, North America].

16. *Hylotelephium subcapitatum* (Hayata) H. Ohba, Bot. Mag. (Tokyo) 90: 52. 1977.

头状八宝 tou zhuang ba bao

Sedum subcapitatum Hayata, Icon. Pl. Formos. 3: 112. 1913.

Stem erect, ca. 14 cm, quadrangular-cylindric. Leaves alternate; pseudopetiole 1–2 mm; leaf blade straw-colored when dry, obovate-orbicular to oblong, 2.4–2.8 × 1.2–2 cm, veins 3, base abruptly narrowed, margin irregularly dentate to subentire, apex rounded. Cyme umbel-like, forming a dense head; pedicels ca. 2 mm. Sepals linear, ca. 1.3 mm, apex obtuse. Petals oblong, 3.5–4 × ca. 1.5 mm, base slightly narrowed, apex acute. Stamens equaling petals. Nectar scales oblong, 0.6–0.7 mm, apex emarginate. Carpels free, lanceolate-fusiform, ca. 3 mm, apex acute. Styles ± curved, ca. 1 mm. Seeds obovoid-fusiform, ca. 1.3 mm, minutely reticulate veined, narrowly winged at apex. Fl. Jul, fr. Sep–Oct.

• Alpine summits; 3000–3900 m. Taiwan.

reddish and drying golden yellow, or white, funnellform to campanulate; lobes connate nearly to middle. Stamens 2 × as many as petals. Carpels erect. Styles slender. Follicles erect, lanceolate, many seeded. Seeds mostly oblong.

Ten species: C Asia; two species in China.

- 1a. Petals white, 5–6 mm 1. *P. affine*
1b. Petals reddish, golden yellow when dry, to 3 mm 2. *P. lievenii*

1. **Pseudosedum affine** (Schrenk) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 465. 1930.

Xian, Tacheng Xian) [Kazakstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan].

白花合景天 *bai hua he jing tian*

V. V. Byalt (pers. comm.) believes that this species is not a true *Pseudosedum*, but belongs within *Sedum* proper.

Umbilicus affinis Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 72. 1841; *Cotyledon affinis* (Schrenk) Maximowicz; *Sedum affine* (Schrenk) Raymond-Hamet; *S. albertii* Regel; *S. schrenkii* Fröderström.

2. **Pseudosedum lievenii** (Ledebour) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 465. 1930.

合景天 *he jing tian*

Roots numerous, branched, tufted. Sterile shoots numerous, small, 1–2 mm. Leaves crowded apically on stem, alternate, linear to suboblong, subterete, 4–6 × 1–1.5 mm, densely and minutely papillate apically, base broadly spurred, apex obtuse. Flowering stems few, prostrate at base and usually rooting, erect toward apex, 8–15 cm, sparsely leafy. Inflorescence corymbiform with nearly scorpioid branching, 1.5–2.5 × 2.5–4 cm. Flowers subsessile. Sepals subovate, 1.5–2.5 mm, base subconnate, apex subacute. Corolla white; tube 1–1.5 mm; lobes oblong, 5–6 mm. Stamens 10–12; epipetalous ones ca. 3 mm, inserted ca. 1 mm from petal base. Nectar scales 5 or 6, semilunate, ca. 0.3 × 1 mm, apex dentate. Carpels 5 or 6, erect, lanceolate. Follicles many seeded. Seeds ovoid. Fl. May–Jun, fr. Jul–Aug.

Cotyledon lievenii Ledebour, Fl. Altaic. 2: 197. 1830; *Sedum lievenii* (Ledebour) Raymond-Hamet. Roots numerous, tufted, slender. Root crown stout. Leaves linear, 0.5–2 cm. Flowering stems 1–4, 20–25 cm. Inflorescence corymbiform, many flowered; bracts oblong to lanceolate, smaller than leaves, apex obtuse; pedicels 1–2 mm. Sepals lanceolate-oblong, to 3 mm, apex obtuse. Corolla reddish, drying golden-yellow, funnellform; tube ca. 6 mm; lobes lanceolate, ca. 6 mm. Stamens 10–12; antesealous ones 3–4 mm; epipetalous ones ca. 3 mm, inserted at corolla base; anthers ca. 0.9 mm. Nectar scales 5 or 6, transversely broad, small. Styles slender, ca. 2 mm. Follicles lanceolate, ca. 1 cm. Seeds ellipsoid-oblong, ± winged at both ends. Fl. Apr–May.

Grasslands, shady slopes in valleys, sandy beaches along rivers, gravelly areas, sandy-silty soil; 700–1600 m. W Xinjiang (Huocheng)

N Xinjiang (Shawan Xian) [Kazakstan, Mongolia, Russia].

8. SINOCRASSULA A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 462. 1930.

石莲属 *shi lian shu*

Plants annual, biennial, or perennial, with reddish brown, thin striations or spots throughout, glabrous or minutely hairy. Roots fibrous. Sterile stems usually present. Leaves mostly in basal rosettes, often with several rosettes per plant, often caducous and lost by anthesis, alternate, apex obtuse or acuminate. Flowering stems erect, ± elongated; stem leaves alternate. Inflorescence terminal or lateral, paniculate-corymbiform with long, basally subopposite branches, rarely simple and racemelike; bracts leaflike, laxly arranged. Flowers erect, pedicellate, bisexual, 5-merous. Calyx subglobose; sepals erect, triangular or triangular-lanceolate, base connate. Petals free or almost so, yellow to red or purplish red, subglobose-urceolate, S-shaped in longitudinal section, apically extrorsely vaulted curved, base concave, apex sometimes thickened. Stamens as many as petals, inserted on sepals, slightly shorter than petals. Nectar scales entire, apex emarginate or dentate. Carpels somewhat wide, base abruptly narrowed. Styles short; stigmas capitate. Follicles many seeded.

Seven species: Bhutan, China, India, Nepal, Pakistan, Sikkim; seven species (six endemic) in China.

1a. Plants usually more than 10 cm.

2a. Lateral branches of inflorescence to 10 cm 5. *S. longistyla*

2b. Lateral branches of inflorescence generally 5–6 cm or shorter.

3a. Stem leaves uniformly broadly oblanceolate, subobovate, or ovate-orbicular, 0.4–1 cm wide .. 6. *S. indica*

3b. Stem leaves dimorphic: proximal ones broadly obovate or elliptic, 2–2.7 cm wide, distal ones narrowly lanceolate to linear-lanceolate, 0.3–0.8 cm wide 7. *S. diversifolia*

1b. Plants 5–10 cm.

4a. Plants densely shortly white pubescent 1. *S. yunnanensis*

4b. Plants glabrous, or sparsely hairy on leaves adaxially or on flowering stems.

5a. Leaves hairy but flowering stems glabrous 6. *S. indica*

- 5b. Leaves glabrous but flowering stems sometimes sparsely pilose.
 6a. Sepals equaling or longer than petals; caudex branched, 3–6 cm 2. *S. ambigua*
 6b. Sepals shorter than petals; caudex not elongated.
 7a. Basal leaves in a compact rosette; petals triangular-lanceolate 3. *S. densirosulata*
 7b. Basal leaves caducous; petals oblong 4. *S. techinensis*

1. *Sinocrassula yunnanensis* (Franchet) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 463. 1930.

云南石莲 *yun nan shi lian*

Crassula yunnanensis Franchet, J. Bot. (Morot) 10: 284. 1896; *Sedum indicum* (Decaisne) Raymond-Hamet var. *yunnanense* (Franchet) Raymond-Hamet.

Plants 5–10 cm tall. Rosette lax, 2.5–3.5 cm in diam. Basal leaves oblanceolate to spatulate, 1.2–2.5 × 0.4–0.5 cm, with dense, white, short pubescence, apex acute to acuminate. Flowering stems 5–10 cm, densely leafy, hairy; stem leaves oblanceolate, hairy. Inflorescences corymbiform, ± dense, ca. 2.5 cm in diam.; bracts few, obovate-lanceolate, pubescent. Flowers mostly large. Sepals linear-lanceolate, ca. 1.8 mm, minutely papillate, apex obtuse. Petals yellowish green, oblong-lanceolate, 3.5–4 × ca. 1 mm, minutely papillate abaxially. Stamens shorter than petals. Nectar scales quadrate. Carpels lanceolate. Styles short. Fl. Sep–Oct.

• W Yunnan (Dali Xian).

2. *Sinocrassula ambigua* (Praeger) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 462. 1930.

长萼石莲 *chang e shi lian*

Sedum ambiguum Praeger, Notes Roy. Bot. Gard. Edinburgh 13: 69. 1921; *S. indicum* (Decaisne) Raymond-Hamet var. *ambiguum* (Praeger) Raymond-Hamet.

Plants perennial, glabrous. Roots fibrous. Caudex branched, ascending, slender, 3–6 cm, with sterile lateral branches. Basal leaves opposite, oblanceolate to oblong, 7–9 × 1.5–3 mm, apex obtuse. Flowering stems terminal, erect, 7–10 cm; stem leaves few, alternate or opposite, orbicular, orbicular-obovate, or orbicular-rhomboid, 0.9–1.2 × 0.9–1.2 cm, apex acute and mucronate. Inflorescences corymbiform, lax, 1.2–2.5 × 2.5–3.5 cm; bracts few, linear-oblong, apex obtuse; pedicels purple, longer than flowers. Sepals linear-lanceolate, 2.5–4 × 0.8–1 mm, apex obtuse. Petals reddish purple, ovate-triangular, apex acute. Filaments narrowly triangular, 1.1–1.3 mm. Nectar scales nearly quadrate. Carpels erect. Styles short. Seeds oblong-ovoid. Fl. May–Sep.

• Rocks on slopes; 2000–3000 m. SW Sichuan, NW Yunnan.

3. *Sinocrassula densirosulata* (Praeger) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 468. 1930.

密叶石莲 *mi ye shi lian*

Sedum indicum (Decaisne) Raymond-Hamet var.

densirosulatum Praeger, J. Bot. 57: 55. 1919.

Rosette compact, 2–2.5 × 4–4.5 cm. Basal leaves ca. 30, pale green, spatulate, 1–2.5 × 0.6–0.8 cm, apex purple, acuminate. Flowering stem branched near base, 5–7.5 cm; stem leaves alternate, spatulate to elliptic, 1–2 ×

0.3–0.5 cm, base rounded to cuneate. Inflorescences globose, 1.5–3 × 2.5–5 cm, many flowered; pedicels short. Sepals narrowly triangular, ca. 2.5 × 0.8 mm. Petals purplish red, with purple spots toward apex, triangular-lanceolate, to 4 × 1–1.2 mm. Stamens ca. 3 mm. Nectar scales spatulate-quadrate, minute. Carpels erect, almost free, ovate-lanceolate. Styles slender. Fl. Jul, fr. Nov.

• Walls and moist places along rivers. W Sichuan (Huili Xian, Kangding Xian), E Yunnan (Dongchuan Shi).

4. *Sinocrassula techinensis* (S. H. Fu) S. H. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 65. 1980.

德钦石莲 *de qin shi lian*

Sedum techinense S. H. Fu, Acta Phytotax. Sin. 1: 124. 1951.

Plants glabrous, rarely very shortly hairy. Basal leaves caducous. Flowering stem solitary, erect, 7–10 cm; stem leaves alternate, linear to lanceolate, 1.5–2.5 × 0.2–0.5 mm. Inflorescences corymbiform. Sepals lanceolate, 2–4 mm. Petals red, oblong, 4–5 mm, apex obtuse to acute. Stamens ca. 4 mm. Nectar scales subsquare to broadly quadrate, ca. 0.4 × 0.6 mm. Carpels erect, ovate-lanceolate, ca. 4 mm. Follicles many seeded. Seeds ovoid, ca. 0.5 mm, striate, narrowly winged. Fl. Sep.

• Rocks on slopes; ca. 2700 m. NW Yunnan (Dêqên Xian).

5. *Sinocrassula longistyla* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 112. 1965.

长柱石莲 *chang zhu shi lian*

Sedum longistylum Praeger, Notes Roy. Bot. Gard.

Edinburgh 13: 87. 1921; *S. indicum* (Decaisne)

Raymond-Hamet var. *longistylum* (Praeger)

Fröderström.

Herbs annual or biennial, 20–25 cm tall, glabrous. Basal stem leaves opposite and others alternate, elliptic, ca. 1.5 × 0.5 cm. Flowering stem many branched, erect; branches divergent, to 20 cm. Inflorescence a ± corymbiform panicle, ca. 10 × 15 cm; branches to 10 cm, each with a dense, small, 10–20-flowered cyme to 10 mm in diam.; bracts sessile, ovate, 2–3 mm, apex acute; pedicels short. Sepals narrowly triangular, 1.5–2.5 × 1–1.2 mm. Petals deep red to purple, oblong-triangular or oblong-ovate, 3.5–4 × ca. 1.2 mm, apex acute or acuminate. Stamens ca. 3 mm; filaments basally gradually broadened; anthers golden yellow. Nectar scales broadly quadrate, apex subemarginate. Carpels erect, lanceolate, ca. 3 mm, base broad. Styles recurved, slender, ca. 1.5 mm. Fl. Jul–Oct.

• Valleys; 1300–1600 m. C and W Sichuan (Danba Xian, Hanyuan Xian).

6. *Sinocrassula indica* (Decaisne) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 463. 1930.

石莲 shi lian

Herbs biennial, glabrous. Roots fibrous. Basal leaves spatulate-oblong, 3.5–6 × 1–1.5 cm. Flowering stem erect, 5–60 cm; stem leaves alternate, broadly oblanceolate, subobovate, or ovate-orbicular, 2.5–3 × 0.4–1 cm, margin entire or distally acuminately serrate, apex obtusely rounded or acuminate. Inflorescences paniculate, often corymbiform; lateral branches generally 5–6 cm or shorter; bracts resembling distal stem leaves but smaller. Sepals broadly triangular, ca. 2 × 1 mm, apex subacute. Petals red, reddish, yellow, or greenish yellow, lanceolate to ovate, 2.5–5.5 × ca. 2 mm, apex usually reflexed. Stamens 3–4 mm. Nectar scales quadrate, apex emarginate. Carpels ovoid, 2.5–3 mm, base connate for 0.5–1 mm, apex acute. Styles less than 1 mm. Follicles apically with a recurved beak. Seeds smooth. Fl. Jul–Oct.

Rocks in valleys or on slopes, dry stony and gravelly slopes, river banks. 500–4000 m. S Gansu, Guangxi, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Pakistan, Sikkim].

- 1a. Plants 5–10 cm tall; leaves hairy, margin acuminately serrate distally 6b. var. *serrata*
1b. Plants more than 10 cm tall (8–9 cm tall in var. *obtusifolia*); leaves glabrous, margin entire.
2a. Petals red or reddish.
3a. Leaf apex acuminate 6a. var. *indica*
3b. Leaf apex obtuse-rounded 6c. var. *obtusifolia*
2b. Petals yellow or greenish yellow, sometimes with reddish apex.
4a. Plants 30–60 cm tall; leaves ovate-orbicular 6d. var. *forrestii*
4b. Plants 10–20 cm tall; leaves narrow.
5a. Petals yellow with reddish apex, 5–5.5 mm ... 6e. var. *luteorubra*
5b. Petals greenish yellow, ca. 2.5 mm 6f. var. *viridiflora*

6a. *Sinocrassula indica* var. *indica*

石莲(原变种) shi lian (yuan bian zhong)

Crassula indica Decaisne in Jacquemont, Voy. Inde 4 (Bot.): 61. 1844; *Sedum cavaleriei* H. Léveillé; *S. cavaleriense* H. Léveillé; *S. indicum* (Decaisne) Raymond-Hamet; *S. indicum* var. *silvaticum* Fröderström; *S. martini* H. Léveillé; *S. scallanii* Diels var. *majus* Pampanini.

Plants 15–60 cm tall. Leaves glabrous, margin entire, apex acuminate. Petals red.

1200–3300 m. S Gansu, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Pakistan Sikkim]. The plants are used medicinally.

6b. *Sinocrassula indica* var. *serrata* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 113. 1965.

锯叶石莲 ju ye shi lian

Sedum indicum (Decaisne) Raymond-Hamet var. *serratum* Raymond-Hamet, Bull. Soc. Bot. France 74: 271. 1927.

Plants 5–10 cm tall. Leaves hairy, margin acuminately serrate distally.

•Rocks in valleys or on slopes; 3700–4000 m. W Sichuan.

6c. *Sinocrassula indica* var. *obtusifolia* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 113. 1965.

钝叶石莲 dun ye shi lian

Sedum indicum (Decaisne) Raymond-Hamet var. *obtusifolium* Fröderström, Acta Horti Gothob. 6(Add.): 21. 1931.

Plants 8–9 cm tall. Leaves glabrous, margin entire, apex obtuse-rounded. Petals reddish.

•Rocks in valleys; 2300–2500 m. W Sichuan, NW Yunnan.

6d. *Sinocrassula indica* var. *forrestii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 113. 1965.

圆叶石莲 yuan ye shi lian

Sedum indicum (Decaisne) Raymond-Hamet var. *forrestii* Raymond-Hamet, Notes Roy. Bot. Gard. Edinburgh 5: 115. 1912.

Plants 30–60 cm tall. Leaves ovate-orbicular, glabrous, margin entire. Petals yellow.

•Rocks; 1000–3000 m. NW Yunnan.

This variety was treated as *Sinocrassula luteorubra* var. *forrestii* (Raymond-Hamet) H. Chuang (in C. Y. Wu, Fl. Yunnan. 8: 142 1997), but that name is invalid because the basionym was not fully cited and the species name to which it was assigned was itself invalid (see note under var. *luteorubra*).

6e. *Sinocrassula indica* var. *luteorubra* (Praeger) S. H. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 68. 1984.

黄花石莲 huang hua shi lian

Sedum indicum (Decaisne) Raymond-Hamet var. *luteorubrum* Praeger, Notes Roy. Bot. Gard. Edinburgh 13: 84. 1921; *S. paoshingense* S. H. Fu; *Sinocrassula paoshingensis* (S. H. Fu) H. Ohba et al.

Plants 10–20 cm tall. Leaves narrow, glabrous, margin entire. Petals yellow with reddish apex, 5–5.5 mm.

•Dry stony and gravelly slopes; 700–3700 m. Sichuan, NW Yunnan.

This variety was treated at specific rank, as *Sinocrassula paoshingensis* (S. H. Fu) H. Ohba et al. (J. Jap. Bot. 75: 296. 2000) and as *S. luteorubra* H. Chuang (in C. Y. Wu, Fl. Yunnan. 8: 142. Nov 1997). The basionym of *S. luteorubra* was not fully cited so the name is invalid under Art. 33.3 of the St. Louis Code. Earlier in the same year, Chuang described *S. luteorubra* var. *maculosa* H. Chuang (Acta Bot. Yunnan. 19: 224. Aug 1997), which is invalid under Art. 43.1 of the Code. This name was later validated as *S. indica* var. *maculosa* H. Chuang ex Thiede (Cactus Succ. J. (Los Angeles) 71: 160. 1999). The taxon is known to the present authors only from the protologue. It was distinguished by its smaller flowers, petals 3–3.5 mm, with sepals and petals bearing many “glandular spots.”

6f. *Sinocrassula indica* var. *viridiflora* K. T. Fu, Fl. Tsinling. 1(2): 606. 1974.

绿花石莲 lu hua shi lian

Plants 10–20 cm tall. Leaves narrow, glabrous, margin entire. Petals greenish yellow, ca. 2.5 mm.

• River banks, rocks on slopes; 500–1200 m. Henan, S Shaanxi, N Sichuan.

7. *Sinocrassula diversifolia* H. Chuang, Acta Bot. Yunnan. 19: 224. 1997.

异形叶石莲 yi xing ye shi lian

Plants 40–50 cm tall, glabrous, many parts purple-spotted. Roots fibrous. Rosette not well defined. Basal leaves densely brown-spotted, broadly obovate, 3–4 × 2–2.5 cm, base broadly cuneate, apex rounded. Stem leaves alternate, dimorphic: broadly obovate or elliptic and 3–5 × 2–2.7 cm proximally on stem, narrowly lanceolate to linear-lanceolate and 0.3–0.8 cm wide distally on stem, base cuneate to angustate, apex obtuse to acute or acuminate. Inflorescences corymbiform, 6–15 × 8–12 cm; branches winged; bracts resembling

distal stem leaves but smaller; pedicels longer than flowers, winged. Sepals triangular-lanceolate, 2–2.5 × 1–1.5 mm, apex acute or acuminate. Petals yellow, spotted with purple, lanceolate, 3.5–4 × 1–1.5 mm, apex acuminate. Stamens 2.5–3 mm; filaments white, spotted with purple; anthers oblong-cordate, ca. 0.8 mm. Nectar scales broadly quadrate, 0.3–0.5 × 0.5–0.7 mm. Carpels erect, narrowly ovoid, 2.5–3 mm. Styles slender, 0.5–1 mm. Follicles many seeded. Seeds brown, ovoid-cylindric, longitudinally 10–12-striate. Fl. Aug, fr. Nov.

• 2500–2700 m. NW Yunnan (Gongshan Drung-Nu Zu Zizhixian).

This species is included here on the basis of the protologue; no material has been seen by the present authors. It is clearly closely related to the widespread and variable *Sinocrassula indica*.

9. ROSULARIA (de Candolle) Stapf, Bot. Mag. 149: t. 8985. 1923.

瓦莲属 wa lian shu

Umbilicus de Candolle sect. *Rosularia* de Candolle, Prodr. 3: 399. 1828; *Sempervivella* Stapf.

Herbs perennial, usually hairy. Rootstock usually fleshy. Leaves mostly in dense, basal rosettes, usually with several rosettes per plant, alternate, sessile, flat. Flowering stems often several, arising from axils of rosette leaves (or solitary and arising from center of rosette); stem leaves alternate. Inflorescence lateral, cymose-corymbiform, paniculate-corymbiform, or spicate-paniculate, lax to dense. Flowers bisexual, 5–9-merous. Sepals connate at base. Corolla pink or white, sometimes with red or purple markings, campanulate or cupular; lobes partly connate at base, limb erect to spreading, membranous. Stamens 2 × as many as petals, inserted above corolla base, ca. 2 × as long as petals. Nectar scales cuneate to cuneate-spatulate-quadrate. Carpels erect, free, often hairy. Follicles erect, free, many seeded. Seeds striate.

Thirty-six species: C and SW Asia; three species in China.

1a. Rosette leaves glabrous or very sparsely glandular hairy; flowers 6–8-merous 1. *R. alpestris*

1b. Rosette leaves densely glandular hairy; flowers 5-merous.

2a. Leaf rosettes 5–10 cm in diam.; rosette leaves 1.2–2 cm wide 2. *R. platyphylla*

2b. Leaf rosettes 1.5–2 cm in diam.; rosette leaves ca. 0.5 cm wide 3. *R. turkestanica*

1. *Rosularia alpestris* (Karelin & Kirilov) Borissova in Komarov, Fl. URSS 9: 129. 1939.

长叶瓦莲 chang ye wa lian

Umbilicus alpestris Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 354. 1842; *Rhodiola durisii* (Raymond-Hamet) S. H. Fu; *Sedum durisii* Raymond-Hamet; *S. olgae* Regel & Schmalhausen ex Regel; *S. schlagintweitii* Fröderström; *S. umbilicoides* Regel; *Sempervivella acuminata* (Decaisne) A. Berger; *Sempervivum acuminatum* Decaisne.

Rootstock to 1.5 cm thick. Rosette 1.5–3 cm in diam.; rosette leaves oblong-lanceolate to oblong, (9–)15–25(–30) × (2–)3–6 mm, glabrous or very sparsely glandular, apex acuminate. Flowering stem axillary from rosette leaves, erect or ascending, 5–12(–15) cm, leafy, glabrous; stem sessile, oblong to oblong-lanceolate, leaves flat, 5–10 × 2–2.5 mm, adaxially glabrous, margin hispidulous-ciliate distally, apex acuminate. Inflorescences cymose-corymbiform, 2–12(–20)-flowered, glabrous; bracts small, ovate-lanceolate. Flowers 6–8-

merous; pedicel shorter than corolla on proximal flowers but elongating on distal ones. Sepals lanceolate, ca. 1/2 as long as corolla, glabrous, veins 3, apex acute to acuminate. Corolla white, or reddish with purple or red abaxial keel, 6–9 mm; lobes basally connate, oblong-lanceolate, veins 3, apex reflexed and acute. Stamens 12–16, shorter than corolla. Nectar scales suborbicular. Follicles 2.5–3.5 mm, apex beaked; beak filiform. Seeds numerous, ovoid. Fl. Jun–Jul.

Scrub-covered slopes, rock crevices; 1500–5000 m. Xinjiang, Xizang [Russia].

2. *Rosularia platyphylla* (Schrenk) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 466. 1930.

卵叶瓦莲 luan ye wa lian

Umbilicus platyphyllus Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 71. 1841.

Rootstock to 2.5 cm thick. Rosette 5–10 cm in diam.; rosette leaves rhomboid-obovate to spatulate, flat, 15–40 × 12–20 mm, densely glandular hairy, base sometimes attenuate, margin ciliate, apex obtuse and emarginate or subacute. Flowering stems 1–4, axillary

from outer rosette leaves, simple, ascending, 5–10 cm, puberulent; stem leaves remote, sessile, oblong to linear, 10–15 × 4–5 mm, puberulent, margin ciliate. Inflorescences cymose-corymbiform, 3–5 × 3–4 cm, glandular-pubescent, many flowered; bracts linear-oblong, small. Flowers 5-merous; pedicel shorter than corolla. Sepals ovate, ca. 3 mm. Corolla white, 5–7 mm; tube ca. 2.5 mm; lobes reflexed, ovate. Stamens 10, shorter than corolla. Follicles ovoid-oblong, apex beaked; beak linear. Seeds brown, oblong-ovoid. Fl. Jun–Jul, fr. Aug. Terraces in valleys, slopes in ravines; 2200–2800 m. C Xinjiang [Kazakstan, Kyrgyzstan].

3. *Rosularia turkestanica* (Regel & Winkler) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 466. 1930.

小花瓦莲 xiao hua wa lian

Umbilicus turkestanicus Regel & Winkler, Trudy Imp. S.-Peterburgsk. Bot. Sada 6(2): 301. 1879; *Cotyledon turkestanica* (Regel & Winkler) O. Fedtschenko & B. Fedtschenko.

Rootstock thick, with numerous fibrous roots. Rosette 1.5–2 cm in diam.; rosette leaves lanceolate to oblong-lanceolate, 10–20 × ca. 5 mm, densely glandular hairy, apex acuminate. Flowering stem axillary from outer rosette leaves, ascending, 13–20 cm, glabrous; stem leaves remote, oblong to linear, 4–7 × 1–2 mm.

Inflorescences cymose-paniculate, with subscorpioid, secund branches. Flowers 5-merous; pedicel shorter than flowers. Sepals lanceolate to elliptic-lanceolate, ca. 2.5 mm, apex acute. Corolla yellow or white with purple striations, campanulate, ca. 5 mm; lobes erect, elliptic-lanceolate. Stamens 10, equaling corolla. Follicles narrowly lanceolate, ca. 5.5 mm, apex acuminate and beaked; beak ca. 1.5 mm. Fl. Jun–Jul.

Slopes, deserts. N Xinjiang (Manas Xian) [Kazakstan, Kyrgyzstan].

Eggl (Bradleya 6 (Suppl.): 75. 1988) did not consider this species to be separable from *Rosularia platyphylla*.

10. OHBAEA V. V. Byalt & I. V. Sokolova, Kew Bull. 54: 476. 1999.

岷江景天属 min jiang jing tian shu

Sedum subgen. *Balfouria* H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 12: 177. 1978; *Balfouria* (H. Ohba) H. Ohba (1995), not R. Brown (1810).

Herbs perennial, glabrous. Rosettes conspicuous, lax; rosette leaves alternate, flat, larger than stem leaves. Inflorescence lateral, cymose, with 3 scorpioid branches, bracteate. Flowers bisexual, 5(or 6)-merous. Sepals subequal, base subconnate. Petals ± free, brassy yellow. Stamens 2 × as many as petals, in 2 series. Carpels suberect, base subconnate. Follicles erect, many seeded.

• One species.

1. *Ohbaea balfourii* (Raymond-Hamet) V. V. Byalt & I. V. Sokolova, Kew Bull. 54: 476. 1999.

岷江景天 min jiang jing tian

Sedum balfourii Raymond-Hamet, Notes Roy. Bot. Gard. Edinburgh 5: 116. 1912; *Rhodiola balfourii* (Raymond-Hamet) S. H. Fu; *Sedum banlanense* Limpricht; *S. mossii* Raymond-Hamet; *S. orichalcum* W. W. Smith.

Rootstock short, thick. Rosette to 7 cm in diam.; rosette leaves suboblong to oblong, 1.5–3 × 0.2–0.5 cm, margin sometimes apically ciliate. Flowering stems 1 to several, erect, slender, 10–30 cm; stem leaves oblong to lanceolate, 0.8–2 cm, base spurred, margin ciliate or

glabrous, apex acute. Inflorescences cymose-scorpioid; peduncle arcuate; pedicels short. Sepals triangular to suboblong, 2–3 mm, apically often minutely papillate, apex acute. Petals ± free, brassy yellow, oblong, 5–7 mm, midvein often minutely papillate, apex mucronate. Stamens 10(or 12), ca. 3/4 as long as petals. Nectar scales narrowly linear, ca. 0.7 mm, apex subobtusate. Carpels suberect, 4–5 mm, base connate for 0.5–0.7 mm. Styles slender, ca. 2 mm. Follicles many seeded. Seeds ovoid, ca. 0.6 mm, smooth. Fl. Sep, fr. Oct.

• Thickets in ravines, scrub, sunny grasslands, rocky slopes, rocks along trails, rock crevices in valleys; 2700–4000 m. W Sichuan, NW Yunnan.

11. PHEDIMUS Rafinesque, Amer. Monthly Mag. & Crit. Rev. 1: 438. 1817.

费菜属 fei cai shu

Herbs perennial. Rootstock thick. Stems arising from rootstock or persistent basal part of flowering stems, simple, glabrous, rarely pubescent. Leaves alternate or opposite, petiolate or sessile; leaf blade flat, margin serrate or crenate. Inflorescences terminal, cymose with 3 main branches, bractless, many flowered. Flowers sessile or nearly so, bisexual, mostly 5-merous. Sepals basally connate, fleshy, spurless. Petals spreading at anthesis, nearly free, bright yellow. Stamens 2 × as many as petals, in 2 series. Nectar scales entire or apex emarginate. Ovaries and follicles with adaxial outgrowth. Styles short, oblique or spreading at flowering. Follicles many seeded. Seeds striate.

About 20 species: Asia, Europe; eight species (two endemic) in China.

A record of *Phedimus stevenianus* (Rouy & E. G. Camus) 't Hart (*Sedum stevenianum* Rouy & E. G. Camus, based on *S. roseum* Steven (1812), not (Linnaeus) Scopoli (1771)) from China by H. Lévillé (Cat. Pl. Yun-Nan, 62. 1916, as *S. hametianum* H. Lévillé, also based on *S. roseum* Steven) is based on a misidentification. True *P. stevenianus* occurs in the Caucasus region and has never been collected in China.

- 1a. Plants densely grayish pubescent 1. *P. selskianus*
 1b. Plants glabrous.
 2a. Rootstock tuberous, roots carrot-shaped, robust; stems few, erect.
 3a. Carpels 5 2. *P. aizoon*
 3b. Carpels 8(or 12 or 20) 3. *P. hsinganicus*
 2b. Rootstock not tuberous, roots not carrot-shaped or absent; stems numerous, ascending or decumbent (sometimes erect in *P. middendorffianus*).
 4a. Leaves linear-spatulate, 0.3–0.5 cm wide 4. *P. middendorffianus*
 4b. Leaves not linear-spatulate, 0.5–3 cm wide.
 5a. Stems many branched; sepals linear to oblanceolate 5. *P. floriferus*
 5b. Stem simple or few branched; sepals lanceolate, triangular-linear, or suboblong (sometimes linear in *P. hybridus*).
 6a. Stems branched, decumbent; sepals linear to suboblong; follicles initially suberect, stellately divergent at maturity 8. *P. hybridus*
 6b. Stems simple, ascending; sepals lanceolate to triangular-linear; follicles stellately horizontally spreading.
 7a. Leaves sessile, oblanceolate, spatulate, or obovate 6. *P. kamtschaticus*
 7b. Leaves pseudopetiolate, oblong, elliptic, or ovate 7. *P. odontophyllus*

1. *Phedimus selskianus* (Regel & Maack) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 169. 1995.

灰毛费菜 *hui mao fei cai*

Sedum selskianum Regel & Maack, *Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 4(4): 66. 1861*; *Aizopsis selskiana* (Regel & Maack) Grulich; *S. aizoon* Linnaeus subsp. *selskianum* (Regel & Maack) Fröderström.

Herbs perennial, densely grayish pubescent. Stems numerous, simple or branched, erect or ascending, 25–40 cm, woody. Leaves alternate; leaf blade linear-lanceolate, 3–6 × 0.5–1 cm, base connate, margin serrate in apical 1/2. Inflorescence corymbiform, 4–8 cm in diam., many flowered. Flowers unequally 5-merous. Sepals linear-lanceolate, 2–4 × ca. 1 mm, base subconnate, apex obtuse and acuminate. Petals golden-yellow, lanceolate, 4–7 mm, apex acuminate. Stamens 10, slightly shorter than petals; antepetalous ones inserted near petal base; anthers orange. Nectar scales transversely wide to subquadrangular, ca. 0.3 mm. Carpels horizontally spreading, narrowly oblong, 5–6 mm; apical beak ca. 1 mm. Seeds brown, oblong, ca. 0.8 mm. Fl. Jul–Aug, fr. Sep.

Rocks on slopes. E Heilongjiang, E Jilin, Liaoning [Korea, Russia].

2. *Phedimus aizoon* (Linnaeus) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 168. 1995.

费菜 *fei cai*

Herbs perennial. Roots tuberous, carrot-shaped to narrowly conical. Rootstock short, robust. Stems 1–3, simple, erect, 20–50 cm. Leaves alternate; leaf blade narrowly lanceolate, elliptic-lanceolate, elliptic, ovate-oblanceolate, ovate, broadly ovate, or orbicular, 3.5–8 × 0.5–3 cm, base cuneate, margin irregularly serrate, apex obtuse-rounded or acuminate. Inflorescence

horizontally branched, many flowered; bracts leaflike. Flowers unequally 5-merous. Sepals linear, unequal, 3–5 mm, apex obtuse. Petals yellow, oblong to elliptic-lanceolate, 6–10 mm, apex mucronate. Stamens 10, shorter than petals. Nectar scales subquadrangular, ca. 0.3 mm. Carpels ovoid-oblong, adaxially convex, base connate. Styles narrowly subulate. Follicles stellate, ca. 7 mm. Seeds ellipsoid, ca. 1 mm. Fl. Jun–Jul, fr. Aug–Sep.

Scrub, ravine edges in valleys, grasslands on rocky slopes, sandy, sunny, and grassy places on mountains, shady places on slopes, field banks, rock crevices; 1000–3100 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Korea, Japan, Mongolia, Russia].

1a. Plants minutely roughly papillate .. 2c. var. *scabrus*
 1b. Plants smooth.

2a. Leaf blade less than 0.5 cm wide 2d. var. *yamatutae*

2b. Leaf blade 1.2–3 cm wide.

3a. Leaf blade narrowly lanceolate, elliptic-lanceolate, or ovate-oblanceolate, 1.2–2 cm wide, apex acute 2a. var. *aizoon*

3b. Leaf blade elliptic, ovate, broadly obovate, or sometimes orbicular, to 3 cm wide, apex obtuse-rounded 2b. var. *latifolius*

2a. *Phedimus aizoon* var. *aizoon*

费菜(原变种) *fei cai* (*yuan bian zhong*)

Sedum aizoon Linnaeus, *Sp. Pl.* 1: 430. 1753; *Aizopsis aizoon* (Linnaeus) Grulich; *Sedum aizoon* var.

floribundum Nakai; *S. aizoon* var. *glabrifolium* (Kitagawa) Kitagawa; *S. pseudoaizoon* Debeaux; *S. selskianum* Regel & Maack var. *glaberrimum* Kitagawa; *S. selskianum* var. *glabrifolium* Kitagawa; *S. yantaiense* Debeaux.

Plants smooth. Leaves leaf blade narrowly lanceolate, elliptic-lanceolate, or ovate-oblong, 1.2–2 cm wide, apex acute. Fl. Jun–Jul, fr. Aug–Sep.

Scrub, ravine edges in valleys, field banks, rock crevices; 2500–3100 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Korea, Japan, Mongolia, Russia].

The plants are used medicinally.

2b. *Pseudisotria medeoloides* var. *latifolius* (Maximowicz) H. Ohba et al., *Novon* 10: 401. 2000.

宽叶费菜 *kuan ye fei cai*

Sedum aizoon var. *latifolium* Maximowicz, *Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans* 9: 115. 1859; *S. aizoon* var. *austromanshuricum* (Nakai & Kitagawa) Kitagawa; *S. austromanshuricum* Nakai & Kitagawa.

Plants smooth. Leaves leaf blade elliptic, ovate, broadly obovate, or sometimes orbicular, to 3 cm wide, apex obtuse-rounded. Fl. Jul.

Sandy, sunny, and grassy places on mountains; 1000–1800 m. Hebei, Heilongjiang, Jilin, Liaoning, Shandong [Korea, Russia].

2c. *Pseudisotria medeoloides* var. *scabrum* (Maximowicz) H. Ohba et al., *Novon* 10: 401. 2000.

乳毛费菜 *ru mao fei cai*

Sedum aizoon var. *scabrum* Maximowicz, *Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér.* 3, 29: 144. 1834.

Plants minutely roughly papillate. Fl. Jun–Jul, fr. Aug.

• Grasslands on rocky slopes; 1500–3100 m. Gansu, Hebei, Nei Mongol, S Ningxia, E Qinghai, Shanxi.

2d. *Pseudisotria medeoloides* var. *yamatutae* (Kitagawa) H. Ohba et al., *Novon* 10: 401. 2000.

狭叶费菜 *xia ye fei cai*

Sedum aizoon var. *yamatutae* Kitagawa, *Lin. Fl. Manshur.* 247. 1939; *S. aizoon* Linnaeus var.

angustifolium (Franchet) Chu; *S. aizoon* Linnaeus f. *angustifolium* Franchet.

Plants smooth. Leaf less than 0.5 cm wide.

Shady places on slopes; 1300–1400 m. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Shaanxi, Shandong [Russia].

3. *Pseudisotria medeoloides* var. *hsinganicum* (Y. C. Chu ex S. H. Fu & Y. H. Huang) H. Ohba et al., *Novon* 10: 402. 2000.

兴安费菜 *xing an fei cai*

Sedum hsinganicum Y. C. Chu ex S. H. Fu & Y. H. Huang in *Liou, Fl. Pl. Herb. Chin. Bor.-Orient.* 4: 230. 1980.

Herbs perennial. Roots tuberous, carrot-shaped to narrowly conical. Rootstock short. Stems 3–5, 20–30 cm; remains of stems from previous year few, basally branched, terete, more than 25 cm. Leaves subopposite

or alternate; leaf blade obovate-oblong, 4–7 × 1.5–3 cm, veinlets anastomosing near margin, base attenuate, margin sparsely serrate to subentire, apex obtuse-rounded. Inflorescences terminal and axillary, densely flowered, bracteate; peduncle long. Flowers numerous, unequally 8 (or 12 or 20)-merous. Sepals triangular-lanceolate, subequal, 0.5–1.8 mm, apex acuminate. Petals yellow, oblong-lanceolate, ca. 5.2 × 1.5 mm, apex acuminate and mucronate. Stamens 16; antesealous ones ca. 4.8 mm; antepetalous ones ca. 3 mm, inserted ca. 1 mm from petal base. Nectar scales subquadrangular, ca. 0.9 mm, apex subtruncate. Carpels lanceolate, ca. 5.5 mm, base connate for ca. 1 mm, apex divergent. Styles ca. 1.5 mm. Seeds few, brown, oblong, ca. 0.8 mm. Fl. Aug.

• Stony slopes; 700–800 m. N Nei Mongol (Hulun Buir Meng).

4. *Pseudisotria medeoloides* var. *middendorffianus* (Maximowicz) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 169. 1995.

吉林费菜 *ji lin fei cai*

Sedum middendorffianum Maximowicz, *Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans* 9: 116. 1859;

Aizopsis middendorffiana (Maximowicz) Grulich;

Sedum aizoon Linnaeus subsp. *middendorffianum* (Maximowicz) Fröderström; *S. middendorffianum* var. *diffusum* Praeger.

Herbs perennial. Rootstock branched, creeping, woody. Stems numerous, tufted, basally branched, erect or

ascending, 10–30 cm, usually persistent. Leaves alternate; leaf blade linear-spatulate, 1.2–2.5 × 0.3–0.5 cm, base cuneate, margin apically serrate, apex obtuse.

Inflorescence often with divergent branches, many flowered. Flowers unequally 5-merous. Sepals linear, 2–3 × 0.6–0.8 mm, apex obtuse. Petals yellow, lanceolate to linear-lanceolate, 5–11 × 1.8–3 mm, apex acuminate and mucronate. Stamens 10, shorter than petals; filaments yellow; anthers purple. Nectar scales minute, margin subentire. Carpels lanceolate, ca. 6 mm, base connate for ca. 2 mm. Styles ca. 1 mm. Follicles stellately subhorizontal, apex shortly beaked. Seeds ovoid, minute. Fl. Jun–Aug, fr. Aug–Sep.

Among rocks in forests in mountainous areas; 300–1000 m. Jilin, Liaoning [Japan, Korea, Russia].

5. *Pseudisotria medeoloides* var. *floriferus* (Praeger) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 168. 1995.

多花费菜 *duo hua fei cai*

Sedum floriferum Praeger, *J. Bot.* 56: 149. 1918.

Herbs perennial. Rootstock branched, short, woody. Stems ascending, 15–30 cm, apically sparsely papillate.

Leaves alternate; leaf blade spatulate, 2.5–4.5 × 8–13 mm, base cuneate, margin apically sparsely serrate, apex obtuse-rounded. Flowering stems apically with numerous short axillary branches. Inflorescences terminal and axillary, densely many flowered. Flowers unequally 5-merous. Sepals linear to oblanceolate, unequal, 2–4 mm, apex obtuse. Petals yellow, lanceolate, 4–5 × 1.5–2 mm. Stamens 10, slightly shorter than

petals. Nectar scales minute, subquadrangular, margin entire. Carpels initially erect, later ± curved, equaling or slightly shorter than petals. Styles slender. Fl. Jun–Jul.

• Low mountainous areas; below 1000 m. E Shandong (Weihai Shi, Yantai Shi).

6. *Phedimus kamschaticus* (Fischer) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 168. 1995.

堪察加费菜 kan cha jia fei cai

Sedum kamschaticum Fischer & C. A. Meyer, *Index Sem. Hort. Petrop.* 7: 54. 1840; *Aizopsis kamschatica* (Fischer) Grulich; *Sedum aizoon* Linnaeus subsp. *kamschaticum* (Fischer) Fröderström.

Herbs perennial. Rootstock branched, thickened, woody. Stems mostly simple, ascending, 15–40 cm, sometimes papillate. Leaves alternate or opposite, rarely 3-verticillate; leaf blade oblanceolate, spatulate, or obovate, 2.5–7 × 0.5–3 cm, base narrowly cuneate, margin apically sparsely serrate to crenate, apex obtuse-rounded. Inflorescence terminal. Flowers unequally 5-merous. Sepals lanceolate, 3–4 mm, base broad, apex obtuse. Petals yellow, lanceolate, 6–8 mm, abaxially keeled, apex acuminate and mucronate. Stamens 10, slightly shorter than petals; anthers orange. Nectar scales subquadrangular, minute. Carpels erect, equaling or slightly shorter than petals, adaxially gibbous, base connate for ca. 2 mm. Follicles stellately horizontal. Seeds brown, obovoid, minute. Fl. Jun–Jul, fr. Aug–Sep.

Rocky slopes; 600–1800 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Russia].

7. *Phedimus odontophyllus* (Fröderström) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 169. 1995.

齿叶费菜 chi ye fei cai

Sedum odontophyllum Fröderström, *Acta Horti Gothob.* 7: 117. 1932; *Aizopsis odontophylla* (Fröderström) Grulich.

Herbs perennial, creeping when young, glabrous. Roots long, fibrous. Sterile shoots ascending, 5–10 cm, apically often leafy. Flowering stems rooting at base, ascending, 10–30 cm. Leaves alternate, opposite, or 3-

verticillate; pseudopetiole 1.1–1.8 cm; leaf blade ovate, elliptic, or oblong, 2–5 × 1.2–2.8 cm, base abruptly tapered, margin sparsely and irregularly dentate, apex obtuse to subacute. Inflorescence branches scorpioid. Flowers sessile, 5- or 6-merous. Sepals triangular-linear, 2–2.5 mm, base dilated and spurless, apex obtuse. Petals yellow, lanceolate-oblong to subovate, 5–7 × 1.7–2 mm, base slightly narrowed, apex long mucronate. Stamens 10–12; antepetalous ones 3–4.5 mm, inserted near petal base. Nectar scales subquadrangular, ca. 0.5 × 0.4–0.6 mm, apex slightly dilated and emarginate. Carpels suberect, ovoid-oblong, 3–4 mm, adaxially slightly gibbous, base connate for 0.5–0.7 mm. Follicles stellately horizontal, ca. 5 mm, base connate for ca. 1 mm. Seeds numerous. Fl. Apr–Jun, fr. Jun.

Moist shady rocks on mountain slopes; 300–1300 m. W Hubei, SE Sichuan [Nepal].

This species is used medicinally.

8. *Phedimus hybridus* (Linnaeus) 't Hart in 't Hart & Egli, *Evol. & Syst. Crassulac.* 168. 1995.

杂交费菜 za jiao fei cai

Sedum hybridum Linnaeus, *Sp. Pl.* 1: 431. 1753; *Aizopsis hybrida* (Linnaeus) Grulich.

Herbs perennial. Rootstock branched, prostrate, cordlike, long, woody. Stems branched, creeping, decumbent; sterile shoots short, densely leafy. Flowering stems to 30 cm. Leaves alternate; leaf blade spatulate-elliptic to obovate, 1.5–3 × 1–2 cm, base cuneate, margin obtusely serrate, apex obtuse. Inflorescence terminal, 3–5 cm in diam. Flowers unequally 5-merous. Sepals often subequal, linear to suboblong, 4–8 mm. Petals yellow, lanceolate, 8–10 × ca. 4 mm. Stamens 10; anthers orange. Nectar scales small, transversely wide. Carpels divergent, yellowish green. Styles slender. Follicles initially suberect, stellately divergent at maturity, ellipsoid, 8–10 mm, base connate for ca. 2 mm. Seeds ellipsoid, less than 1 mm. Fl. Jun–Jul, fr. Aug–Oct.

Rock crevices on forested slopes; 1400–2500 m. NW Xinjiang [Mongolia, Russia].

12. *SEDUM* Linnaeus, *Sp. Pl.* 1: 430. 1753.

景天属 jing tian shu

Herbs annual or perennial, mostly glabrous, less often hairy. Roots normally fibrous. Rootstock usually not developed, occasionally plants rhizomatous. Stems erect or decumbent, sometimes fasciculate or mosslike, fleshy, glabrous or hairy, base rarely woody. Leaves alternate, opposite, or verticillate, base often spurred, margin normally entire (4–8-dentate in *Sedum rosthornianum* and remotely dentate in *S. engleri* var. *dentatum*). Inflorescence terminal or axillary, cymose, often corymbiform, 1- to many flowered. Flowers usually bisexual, rarely unisexual, mostly unequally (3–)5(–9)-merous. Sepals and petals free or basally connate. Petals free or almost so, mostly yellow, less often white or reddish. Stamens usually 2 × as many as petals, in 2 series, rarely equal in number to petals and in 1 series; antepetalous ones adnate to petal base or slightly above. Nectar scales entire or apex emarginate. Carpels usually as many as petals, occasionally fewer, free or basally widened and connate. Styles short or long. Follicles many or few seeded. Seeds smooth or papillate, less often striate.

About 470 species: mainly in the N hemisphere, but extending to the S hemisphere in Africa and South America; 121 species (91 endemic) in China.

Key to sections

- 1a. Carpels and follicles adaxially gibbous 3. *S.* sect. *Sedum*
 1b. Carpels and follicles adaxially not gibbous.
 2a. Leaf base spurred; petals yellow, rarely red or purple-red 2. *S.* sect. *Oreades*
 2b. Leaf base spurless; petals white or reddish purple, rarely yellow 1. *S.* sect. *Filipes*

1. *Sedum* sect. **Filipes** (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 115. 1965.

小山飘风组 xiao shan piao feng zu

Sedum Linnaeus "group" *Filipes* Fröderström, Acta Horti Gothob. 6(App.): 34. 1931.

Leaf base often narrowed into a petiole, spurless. Inflorescence cymose or paniculate-corymbose, lax. Flowers long pedicellate. Sepals spurless. Petals white or reddish purple, rarely yellow. Carpels and follicles adaxially not gibbous. Carpels erect to suberect, base connate to subconnate. Follicles usually many seeded.

Eight species: Bhutan, China, Japan, Myanmar, Nepal, Sikkim; eight species (three endemic) in China.

- 1a. Plants perennial, fasciculate; stamens in 1 series 1. *S. correptum*
 1b. Plants annual or biennial, rarely perennial, solitary or tufted; stamens in 2 series.
 2a. Plants glandular hairy.
 3a. Plants annual; stems soft; leaves 2–4 × 1.4–2.5 cm 7. *S. drymarioides*
 3b. Plants biennial; stems ± woody at base; leaves 0.7–1.5 × 0.7–0.9 cm 8. *S. stellariifolium*
 2b. Plants glabrous.
 4a. Carpels minutely papillate.
 5a. Stems simple, erect; leaf margin dentate 2. *S. rosthornianum*
 5b. Stems many branched, decumbent; leaf margin entire 3. *S. elatinoides*
 4b. Carpels smooth.
 6a. Carpels 3 4. *S. bonnierei*
 6b. Carpels 5.
 7a. Petals reddish purple; flowering stems branched, ca. 20 cm 5. *S. filipes*
 7b. Petals white; flowering stem simple, ca. 10 cm 6. *S. majus*

1. *Sedum correptum* Fröderström in Handel-Mazzetti, Symb. Sin. 7: 409. 1931.

单花景天 dan hua jing tian

Herbs perennial. Stems tufted, 2–4 cm, basally prostrate then ascending to suberect, terete, densely and minutely papillate. Leaves alternate, crowded, sessile, spatulate to narrowly obovate, 5–6.5 × 1.3–1.6 mm, densely and minutely papillate-hairy, apex rounded. Cyme terminal or axillary, simple, 3–6-flowered; bracts leaflike, small. Flowers 5-merous; pedicel 1.5–2 mm. Sepals narrowly oblong-lanceolate, 1.6–2 × 0.3–0.5 mm, apex obtuse. Petals white, narrowly elliptic, 3.2–3.5 × 0.9–1.2 mm, apex acute. Stamens 5, antesealous, 2.2–2.4 mm; anthers ovoid, apex emarginate. Nectar scales narrowly linear-spatulate. Carpels erect, 2.5–3 mm, base broad, subconnate; ovules 8–10. Styles ca. 0.5 mm. Follicles 3.2–3.5 mm. Seeds narrowly oblong, narrowly winged. Fl. May.

Rocks on slopes; 4100–4300 m. SW Sichuan (Yanyuan Xian), NW Yunnan [Bhutan].

2. *Sedum rosthornianum* Diels, Bot. Jahrb. Syst. 29: 361. 1900.

南川景天 nan chuan jing tian

Herbs ?perennial, glabrous. Flowering stems solitary, simple, erect, 15–25 cm. Leaves opposite or 3- or 4-verticillate; pseudopetiole 4–6 mm wide; leaf blade rhombic-oblong, 20–33 × 8–12 mm, base abruptly narrowed, margin 4–8-dentate. Cyme paniculiform, 5–

10 cm. Flowers unequally 5-merous; pedicel 3–8 mm. Sepals narrowly triangular, 1–1.5 mm, midvein conspicuous, base connate. Petals white, suboblong, 3–4 mm, base broad, apex acuminate, tip subobtuse. Stamens 10; antesealous ones ca. 2 mm; antepetalous ones ca. 1.5 mm, inserted slightly above petal base. Nectar scales broadly spatulate, ca. 0.5 mm. Carpels erect, broadly ovoid, ca. 3 mm, adaxially minutely papillate, base broad. Styles slender. Follicles many seeded. Seeds ovoid. Fl. Jun.

• Grassland slopes; ca. 1500 m. E Sichuan.

3. *Sedum elatinoides* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 11. 1883.

细叶景天 xi ye jing tian

Sedum silvestrii Pampanini.

Herbs annual, glabrous. Stems solitary or tufted, 5–30 cm; branches many, decumbent. Leaves 3–6-verticillate, sessile or subsessile; leaf blade narrowly oblanceolate, 8–20 × 2–4 mm, base attenuate, apex acute. Cymes terminal and axillary, long pedunculate basally on rachis, paniculiform or corymbiform, few flowered. Flowers unequally 5-merous; pedicel slender, 5–8 mm. Sepals narrowly triangular to ovate-lanceolate, 1–1.5 cm, apex subacute. Petals white, lanceolate-ovate, 2–3 mm, apex acute. Stamens 10, shorter than petals. Nectar scales broadly spatulate, ca. 0.5 mm, apex emarginate. Carpels suberect, ellipsoid, minutely mammillate, base

connate. Follicles divergent when mature. Seeds ovoid. Fl. May–Jun, fr. Aug–Sep.

Rocks on slopes; 400–3400 m. Gansu, Hubei, Shaanxi, Shanxi, Sichuan, NW Yunnan [Myanmar].

This species is used medicinally.

4. *Sedum bonnierei* Raymond-Hamet, Rev. Gén. Bot. 25: 92. 1913.

城口景天 cheng kou jing tian

Herbs perennial, glabrous. Stems tufted, 5–20 cm; branches many, creeping, slender. Leaves 3–5-verticillate; pseudopetiole 1–7 mm; leaf blade ovate to orbicular, 5–9 × 2–7 mm, base abruptly narrowed, apex rounded-obtuse. Cyme subpaniculiform, 4- or 5-flowered. Flowers unequally 4- or 5-merous; pedicel slender, 5–9 mm. Sepals broadly triangular to suboblong, 0.6–1.5 mm, apex obtuse. Petals obovate, 2–2.3 mm, apex obtuse. Stamens 8–10, shorter than or subequaling petals. Nectar scales 3, linear-spatulate, ca. 0.6 mm. Carpels 3, oblong, 2.5–5 mm, base connate. Styles short. Follicles 3–8-seeded. Seeds oblong, ca. 0.6 mm. Fl. Aug–Sep, fr. Oct.

• Rocks in forests; 500–1400 m. S Shaanxi, E Sichuan.

5. *Sedum filipes* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 284. 1887.

小山飘风 xiao shan piao feng

Herbs annual or perennial, glabrous. Stems 10–30 cm, usually branched, erect or ascending. Leaves opposite or 3- or 4-verticillate; pseudopetiole ca. 1.5 cm; leaf blade broadly ovate to suborbicular, 15–30 × 12–20 mm, apex rounded. Cymes terminal and subterminal, corymbiform, 5–10 cm in diam. Flowers unequally 5-merous; pedicel 3–5 mm. Sepals lanceolate-triangular, 1–1.2 mm, apex obtuse. Petals reddish purple, ovate-oblong, 3–4 mm, apex obtuse. Stamens 10, 3–5 mm. Nectar scales spatulate, minute, apex emarginate. Carpels suberect, oblong to lanceolate, 2–3 mm, glabrous. Styles ca. 1 mm. Follicles 3- or 4-seeded. Seeds brown, obovoid. Fl. Aug–Oct, fr. Oct.

Forested slopes; 800–2000 m. Henan, Hubei, Jiangsu, Shaanxi, Sichuan, Yunnan, Zhejiang [Bhutan, Myanmar, Nepal, Sikkim].

6. *Sedum majus* (Hemsley) Migo, Bull. Shanghai Sci. Inst. 14: 293. 1944.

山飘风 shan piao feng

Sedum filipes Hemsley var. *majus* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 284. 1887. Herbs. Stem simple, ca. 10 cm. Leaves in 2 pairs, decussate but appearing 4-verticillate; pseudopetiole or sessile; leaf blade orbicular to ovate-orbicular, ca. 40 × 40 mm in larger pair, base abruptly narrowed, apex rounded to obtuse. Cyme corymbiform; peduncle 1.5–3 cm. Flowers unequally 5-merous; pedicel 3–5 mm. Sepals subquadrangular, ca. 0.5 mm, apex obtuse. Petals white, oblong-lanceolate, 3–4 × 1–1.2 mm.

Stamens 10, ca. 3 mm. Nectar scales oblong, ca. 0.8 mm. Carpels erect, oblong-ellipsoid, 3–4 mm, glabrous, base connate for ca. 1 mm. Follicles few seeded. Fl. Jul–Oct.

Rocks on forested slopes; 1000–4300 m. Hubei, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

This species is used medicinally.

7. *Sedum drymarioides* Hance, J. Bot. 3: 379. 1865.

大叶火焰草 da ye huo yan cao

Sedum uraiense Hayata.

Herbs annual, glandular pubescent. Stems solitary, 7–25 cm; branches many, ascending, slender, soft. Proximal stem leaves opposite or 4-verticillate, others alternate; petiole 1–2 cm; leaf blade ovate to broadly so, 26–40 × 14–25 mm, base broadly cuneate and decurrent. Cyme paniculiform, few flowered. Flowers unequally 5-merous; pedicel 4–8 mm. Sepals oblong to lanceolate, ca. 2 mm, apex subacute. Petals white, oblong, 3–4 mm, apex acuminate. Stamens 10, 2–3 mm. Nectar scales broadly spatulate, apex emarginate to shallowly cleft. Carpels divergent, 2.5–5 mm. Seeds oblong-ovoid, longitudinally striate. Fl. Apr–Jun, fr. Aug.

Shady places among rocks on mountains; ca. 900 m. Anhui, Fujian, Guangdong, Guangxi, Henan, Hubei, Hunan, Jiangxi, Taiwan, Zhejiang [Japan].

8. *Sedum stellariifolium* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 10. 1883.

火焰草 huo yan cao

Sedum bodinieri H. Léveillé & Vaniot; *S. drymarioides* Hance var. *stellariifolium* (Franchet) Raymond-Hamet; *S. esquirolii* H. Léveillé; *S. viscosum* Praeger.

Herbs annual or biennial, glandular pubescent. Stems solitary or tufted, erect, brown, 10–15 cm; branches many, declinate, base ± woody. Leaves alternate; petiole 4–8 mm; leaf blade triangular to broadly triangular-ovate, 7–15 × 7–9 mm, base broadly cuneate to truncate, apex acute. Cyme lax, sometimes 1-branched. Flowers unequally 5-merous; pedicel 5–10 mm. Sepals lanceolate to oblong, 1–2 mm, apex acuminate. Petals yellow, lanceolate to oblong, 3–5 mm. Stamens 10, shorter than petals. Nectar scales broadly spatulate to cuneate, ca. 0.3 mm, apex emarginate. Carpels suberect, oblong, ca. 4 mm. Styles short. Follicles basally connate, apically divergent. Seeds brown, oblong-ovoid, longitudinally striate. Fl. Jun–Aug, fr. Aug–Sep.

• Soil or rock crevices in valleys or on slopes; 400–3400 m. Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan.

2. *Sedum* sect. *Oreades* (Fröderström) K. T. Fu, Acta Phytotax. Sin. 12: 52. 1974.

山景天组 shan jing tian zu

Sedum “group” *Oreades* Fröderström, Acta Horti Gothob. 6(App.): 41. 1931.

Leaf base sessile, rarely subsessile, spurred. Inflorescence usually corymbiform, 1- to many flowered. Flowers pedicellate, very rarely subsessile. Sepals spurred or spurless. Petals yellow, rarely red or purple-red. Carpels erect to suberect, rarely divergent, not or only very slightly adaxially gibbous, base mostly broad and connate, less often free. Follicles erect or apically slightly divergent, not or only very slightly adaxially gibbous. Seeds mostly papillate.

About 67 species: Bhutan, China, India, Myanmar, Nepal, Pakistan, Sikkim; 64 species (54 endemic) in China.

- 1a. Leaves verticillate or both opposite and alternate (all leaves alternate in *S. chauveaudii* var. *margaritae*).
- 2a. Inflorescences cymose-scorpoid; flowers sessile or subsessile; sepals broadly ovate to suboblong, equal,
ca. 1.5 mm 72. *S. chuhsingense*
- 2b. Inflorescences corymbiform; flowers shortly pedicellate; sepals sublinear, unequal, 3–6.5 mm.
- 3a. Plants annual or biennial.
- 4a. Styles ca. 1.8 mm; nectar scales broadly linear-spatulate 70. *S. leblancae*
- 4b. Styles ca. 0.5 mm; nectar scales quadrangular 71. *S. tsiangii*
- 3b. Plants perennial.
- 5a. Leaves both verticillate and alternate; placenta subfalcate 66. *S. bergeri*
- 5b. Leaves all verticillate (alternate in *S. chauveaudii* var. *margaritae*); placenta not subfalcate.
- 6a. Petals ± free, apex papillate 69. *S. dielsii*
- 6b. Petals basally connate for more than 1.5 mm, apex not papillate.
- 7a. Sepals linear-spatulate; petals basally connate for ca. 1.5 mm 67. *S. chauveaudii*
- 7b. Sepals linear-lanceolate; petals basally connate for 2–3 mm 68. *S. tsonanum*
- 1b. Leaves alternate (sometimes opposite in *S. blepharophyllum*).
- 8a. Seed funicle inflated at base, appendage stomach-shaped.
- 9a. Sepals spurless.
- 10a. Seeds covered with thick, chaffy scales 58. *S. ramentaceum*
- 10b. Seeds minutely papillate or hairy.
- 11a. Follicles 2- or 3-seeded; seeds minutely hairy 59. *S. trichospermum*
- 11b. Follicles 12–14-seeded; seeds minutely papillate 60. *S. prasinopetalum*
- 9b. Sepals spurred.
- 12a. Leaves and sepals acuminate to cuspidate apically; petals 2–2.3 mm 65. *S. erici-magnusii*
- 12b. Leaves and sepals obtuse to sometimes subacute apically; petals 4–7.2 mm.
- 13a. Sepals of terminal flower in 2 series 64. *S. didymocalyx*
- 13b. Sepals in 1 series.
- 14a. Leaves oblong to subovate; nectar scales 1.6–1.8 mm 61. *S. forrestii*
- 14b. Leaves linear-oblong, linear-lanceolate, or linear-obovate; nectar scales 0.4–0.7 mm.
- 15a. Leaves linear-lanceolate to linear-obovate; petals 4–6 mm; follicles 4- or 5-seeded 62. *S. perrottii*
- 15b. Leaves linear-oblong; petals 7–7.2 mm; follicles usually ca. 7-seeded 63. *S. longifuniculatum*
- 8b. Seed funicle not inflated at base.
- 16a. Placenta inflated, falcate to lunate.
- 17a. Plants perennial; sterile stems present.
- 18a. Flowers 5-merous; petals ca. 3.5 mm, apex obtuse 43. *S. muyaicum*
- 18b. Flowers unequally 5-merous; petals 5.8–9 mm, apex acuminate.
- 19a. Underground stems absent; basal spur of leaves truncate-obtuse 46. *S. longyanense*
- 19b. Underground stems present; basal spur of leaves obtuse or 3-lobed.
- 20a. Sepals 6.5–7.2 mm, spurless 44. *S. celiae*
- 20b. Sepals 3.5–5 mm, spurred 45. *S. dugueyi*
- 17b. Plants annual or biennial; sterile stems absent.
- 21a. Sepals spurless at base.
- 22a. Nectar scales broadly spatulate, ca. 0.4 mm, apically appendaged; leaf apex acuminate . 47. *S. celatum*
- 22b. Nectar scales narrowly linear to linear-spatulate, 0.7–1.3 mm, apically not appendaged; leaf apex obtuse.
- 23a. Nectar scales 0.8–1.3 mm; follicles 3–6-seeded; stamens 5 48. *S. przewalskii*
- 23b. Nectar scales ca. 0.7 mm; follicles 1–3-seeded; stamens 10.
- 24a. Petals narrowed toward base, apex obscurely mucronate; placenta lunulate 49. *S. pagetodes*
- 24b. Petals broadened toward base, apex not mucronate; placenta basal 50. *S. pratoalpinum*
- 21b. Sepals spurred at base.
- 25a. Leaves broadened in distal 1/2 (sometimes not so in *S. sinoglaciale*); nectar scales 1–1.5 mm.

- 26a. Follicles 2-seeded; antepetalous stamens inserted 1–1.2 mm from petal base; seeds smooth 57. *S. semilunatum*
- 26b. Follicles 5- to many seeded; antepetalous stamens inserted ca. 2 mm from petal base; seeds papillate.
- 27a. Carpels basally connate for 1.2–1.8 mm; basal leaves spatulate, others subpanduriform; sepals obtuse at apex 55. *S. chingtungense*
- 27b. Carpels ± free; leaves linear to linear-oblong; sepals acute at apex 56. *S. sinoglaciale*
- 25b. Leaves broadened in proximal 1/2; nectar scales 0.5–0.8 mm.
- 28a. Nectar scales apically parted to lobate; leaf apex obtuse; follicles 2–4-seeded 54. *S. purdomii*
- 28b. Nectar scales apically obtuse or retuse; leaf apex acute to acuminate; follicles (3–)7–12-seeded.
- 29a. Petals ca. 4 mm, ± free 53. *S. fedtschenkoi*
- 29b. Petals 6–10.5 mm, basally subconnate.
- 30a. Petals yellow; placenta falcate; follicles 10–12-seeded 51. *S. paracelatum*
- 30b. Petals purplish red; placenta sublunulate; follicles 7–9-seeded 52. *S. luchuanicum*
- 16b. Placenta not inflated, rarely falcate to lunate.
- 31a. Petals abruptly narrowed basally or attenuate into a claw.
- 32a. Plants annual or biennial; sterile stems absent.
- 33a. Sepals lanceolate to lanceolate-oblong; petals red, obtrullate; stamens often 5 41. *S. obrullatum*
- 33b. Sepals ovate to ovate-oblong; petals yellow, narrowly oblong; stamens 10 42. *S. raymondii*
- 32b. Plants perennial; sterile stems present.
- 34a. Petal claw broad, less than 3 mm; sepals spurred, margin papillate 38. *S. gagei*
- 34b. Petal claw narrow, to 4 mm; sepals spurless, margin laevigate.
- 35a. Petals sagittate, limb subovate, attenuate in distal 1/2, apex narrowly apiculate . 39. *S. sagittipetalum*
- 35b. Petals trullate, limb ovate-lanceolate to broadly ovate, basally narrowed, apex mucronate 40. *S. trullipetalum*
- 31b. Petals neither narrowed basally nor attenuate into a claw.
- 36a. Petals basally connate for more than 1 mm (for ca. 0.8 mm in *S. constantinii*); stamens in 2 series.
- 37a. Petal margin erose or suberose.
- 38a. Petals lanceolate to oblong, margin conspicuously erose; leaves linear, apex spinose-apiculate; sepals spurless, apex spinose-apiculate 9. *S. daigremontianum*
- 38b. Petals obovate-lanceolate to obovate, margin ± erose; leaves lanceolate to broadly oblong, apex acute; sepals spurred, apex acute 10. *S. oreades*
- 37b. Petal margin entire.
- 39a. Petals ca. 11 mm 12. *S. feddei*
- 39b. Petals 5–6.2 mm
- 40a. Sepals yellowish green; leaf base spur 3-lobed 11. *S. constantinii*
- 40b. Sepals green; leaf base spur entire.
- 41a. Petal base clawless, apex long mucronate; sepals linear or subspatulate 13. *S. fui*
- 41b. Petal base ± clawed, apex subacuminate; sepals suboblong 14. *S. wangii*
- 36b. Petals free or basally subconnate usually for less than 1 mm; stamens in 1 or 2 series.
- 42a. Leaf apex obtuse; stamens 5–10(–12).
- 43a. Sepals spurless.
- 44a. Flowers 5-merous; plants less than 2.5 cm tall.
- 45a. Plants 1–2.5 cm tall; leaves narrowly oblong; follicles 6–8(–14)-seeded; seeds minutely papillate 28. *S. fischeri*
- 45b. Plants ca. 10 mm tall; leaves ovate to suborbicular; follicles 1- or 2-seeded; seeds winged at both ends 29. *S. oligocarpum*
- 44b. Flowers unequally 5-merous; plants 3.5–6 cm tall.
- 46a. Leaves broadly linear to oblong; follicles few seeded 30. *S. lutzii*
- 46b. Leaves ovate; follicles 6- or 7-seeded 31. *S. tsinghaicum*
- 43b. Sepals spurred.
- 47a. Seeds smooth, winged; leaf and sepal margin smooth; follicles 10–12-seeded .. 37. *S. magniflorum*
- 47b. Seeds papillate, wingless; leaf and sepal margin papillate; follicles more than 12-seeded.
- 48a. Petals basally free or almost so.
- 49a. Petal apex smooth; nectar scales apically emarginate; follicles 12–15-seeded 32. *S. roborowskii*

- 49b. Petal apex papillate; nectar scales apically rounded; follicles 20–22-seeded 33. *S. blepharophyllum*
- 48b. Petal basally subconnate.
- 50a. Leaves broadly lanceolate to lanceolate-oblong; petal apex papillate 34. *S. obtusipetalum*
- 50b. Leaves obovate, obovate-oblong, or suboblong; petal apex smooth.
- 51a. Petals broadly triangular; sepal apex rounded; stamens 5 or 10 35. *S. somenii*
- 51b. Petals narrowly oblong; sepal apex obtuse; stamens 10 36. *S. morotii*
- 42b. Leaf apex acuminate to acute; stamens 10 (sometimes 5 in *S. ulricae*).
- 52a. Plants perennial; sterile stems numerous.
- 53a. Leaf base spur obtuse or truncate.
- 54a. Sepals spurless; petals basally almost free; basal leaves of flowering stems ovate-lanceolate, persistent; seeds winged 19. *S. barbeyi*
- 54b. Sepals spurred; petals basally connate for ca. 1.2 mm; basal leaves of flowering stems linear, soon withered; seeds wingless 20. *S. pampaninii*
- 53b. Leaf base spur lobed to sublobed.
- 55a. Spur 2-lobed, occasionally ± 3-lobed; leaf and sepal margin glandular ciliate 18. *S. glaebosum*
- 55b. Spur 3-lobed or ± so (sometimes truncate in *S. heckelii*); leaf and sepal margin glabrous.
- 56a. Sepals spurless, adaxially papillate 15. *S. beauverdii*
- 56b. Sepals spurred, adaxially smooth.
- 57a. Inflorescences dense; sepals narrowly oblong to ovate, apex shortly acuminate 16. *S. heckelii*
- 57b. Inflorescences lax; sepals lanceolate to narrowly triangular, apex acuminate 17. *S. nothodugueyi*
- 52b. Plants annual or biennial; sterile stems absent (present in *S. susanneae*).
- 58a. Sepals spurless.
- 59a. Leaf and sepal margin glabrous; carpels glabrous 21. *S. susanneae*
- 59b. Leaf and sepal margin spinescent ciliate; carpels adaxially spinescent hairy 22. *S. stimulosum*
- 58b. Sepals spurred.
- 60a. Petals 6.5–8.9 mm.
- 61a. Pedicel 1–2 mm; sepals linear-lanceolate or subovate; petals apex long mucronate . 23. *S. rosei*
- 61b. Pedicel 6–10 mm; sepals oblong; petal apex acuminate 24. *S. platysepalum*
- 60b. Petals less than 4.5 mm.
- 62a. Petals ca. 3 mm, basally connate, apex mucronulate 27. *S. henrici-robertii*
- 62b. Petals to 4.5 mm, free, apex not mucronulate.
- 63a. Plants 10–13 cm tall; carpels suberect 25. *S. franchetii*
- 63b. Plants 3–6 cm tall; carpels divergent 26. *S. ulricae*

9. *Sedum daigremontianum* Raymond-Hamet, Bull. Soc. Bot. France 56: 235. 1909.

啮瓣景天 *nie ban jing tian*

Flowering stems erect, ascending, or arched-ascending, slender, 3–10(–20) cm. Leaves alternate, linear, 4–9 × 0.9–1.3 mm, base slightly broadened and with a 3-lobed spur, apex spinose-apiculate. Cyme corymbiform, with several or many crowded flowers; bracts leaflike.

Flowers unequally 5-merous; pedicel 0.4–0.8 mm. Sepals linear, unequal or rarely equal, 4–8 × 0.9–1.1 mm, base connate and spurless, apex spinose-apiculate. Petals yellow, lanceolate to oblong, 5–8 × ca. 1.5 mm, base connate for 1–1.5 mm, margin markedly erose, apex mucronate. Stamens 10; antesealous ones 1.5–2 mm; antepetalous ones 1.4–1.5 mm, inserted 1.5–2 mm from petal base. Nectar scales linear-spatulate, apex subrounded. Carpels erect, narrowly ovoid, apex acuminate; ovules ca. 10. Seeds obovoid-oblong, mammillate. Fl. Aug, fr. Sep–Oct.

•Rocks, mountain slopes, rocks on grassland slopes; 2300–4000 m. S Gansu, C and W Sichuan.

- 1a. Flowering stems erect or ascending; cyme dense; sepals unequal, 4–7 mm; petals 7–8 mm 9a. var. *daigremontianum*
- 1b. Flowering stems arched-ascending; cyme lax; sepals rarely equal, 5–8 mm; petals 5–6 mm 9b. var. *macrosepalum*

9a. *Sedum daigremontianum* var. *daigremontianum*

啮瓣景天(原变种) *nie ban jing tian (yuan bian zhong)*

Flowering stems erect or ascending. Cyme dense. Sepals unequal, 4–7 mm. Petals 7–8 mm. Fl. Aug, fr. Sep.

•Rocks, mountain slopes. W Sichuan.

9b. *Sedum daigremontianum* var. *macrosepalum* Fröderström, Acta Horti Gothob. 7: 114. 1932.

大萼啮瓣景天 *da e nie ban jing tian*

Flowering stems arched-ascending. Cyme lax. Sepals rarely equal, 5–8 mm. Petals 5–6 mm. Fl. Aug, fr. Sep–Oct.

•Rocks on grassland slopes. S Gansu, C Sichuan.

10. *Sedum oreades* (Decaisne) Raymond-Hamet, Bull. Soc. Bot. France 56: 571. 1909.

山景天 *shan jing tian*

Umbilicus oreades Decaisne in Jacquemont, Voy. Inde 4(Bot.): 62. 1844; *Cotyledon oreades* (Decaisne) C. B. Clarke; *Sedum piloschanense* Fröderström. Stems simple or branched from base, tufted, 2.5–12 cm. Leaves alternate, gradually larger toward stem apex; leaf blade lanceolate to broadly oblong, 3–9 mm, veins several, base obtuse or 3-lobed spurred, apex acute. Cyme corymbiform, 1- to several flowered. Flowers subsessile, unequally 5-merous. Sepals oblong to obovate-lanceolate, 7–7.5 × 2–2.2 mm, base spurred, margin entire or minutely erose, apex acute. Petals yellow, obovate to obovate-lanceolate, 6–9.8(–12) × 2.5–3.5 mm, base connate for 1.2–1.3(–3) mm, shortly clawed, margin ± minutely erose, apex mucronate. Stamens 10; antepetalous ones 2.5–3.5 mm; antepetalous ones 2.5–3.5 mm, inserted 1–1.5(–3) mm from petal base. Nectar scales nearly linear-spatulate. Carpels erect, lanceolate, base connate for 0.3–0.5(–0.7) mm; ovules many. Seeds obovoid-oblong, minutely mammillate. Fl. Jul–Aug, fr. Sep–Oct.

Grasslands, rocks on slopes; 3000–4500 m. SE Xizang, NW Yunnan [Bhutan, India, Myanmar, N Pakistan, Sikkim].

11. *Sedum costantinii* Raymond-Hamet, Bull. Mus. Hist. Nat. (Paris) 15: 490. 1909.

山裂距景天 *san lie ju jing tian*

Roots fibrous. Flowering stems branched from base, divergent, slender, 2.5–5 cm. Leaf blade linear-triangular, 3.5–5.2 × 1.1–1.8 mm, basal spur 3-lobed. Cyme corymbiform, 2–5-flowered; bracts leaflike. Flowers unequally 5-merous; pedicel 1.2–1.5 mm. Sepals yellowish green, suboblong to obovate-linear, 7–7.5 × ca. 2 mm, base 3-lobate and obtuse, apex obtuse to subacute. Petals yellow, obovate-oblong, base slightly narrowed and connate for ca. 0.8 mm, apex obtuse and shortly mucronate. Stamens 10, all shorter than petals; antepetalous ones inserted 2.5–3.5 mm from petal base. Nectar scales linear-spatulate, apex obtuse. Carpels 4–6.5 mm, base connate for 0.5–0.8 mm; ovules 4–6. Seeds obovoid, mammillate. Fl. Sep, fr. Oct.

•Rocks in forests; 3000–3500 m. W Sichuan.

12. *Sedum feddei* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 25. 1910.

折多景天 *zhe duo jing tian*

Roots fibrous. Sterile stems absent. Flowering stems branched from base, erect, 8–10 cm, glabrous. Leaf blade narrowly triangular to lanceolate, 7–8.5 × 2.4–3.2 mm, base spurred (spur entire, 1.3–1.6 mm), apex acute, entire. Cyme corymbiform, densely many flowered, 0.8–1.5 × 0.9–2.5 cm; bracts leaflike. Flowers unequally 5-merous; pedicel 1.2–3 mm. Sepals broadly lanceolate, 6–6.8 × 1.7–2 mm, base spurless, apex entire, papillate-apiculate. Petals oblong-obovate, ca. 11 × 2.5 mm, base connate for 1.2–1.4 mm, apex apiculate. Stamens 10, all shorter than petals; antepetalous ones inserted 3–4 mm from petal base. Nectar scales linear,

ca. 0.8 × 0.3 mm, apex truncate. Carpels 4.3–5.3 mm, base connate for 0.8–1 mm; ovules many. Styles ca. 1.5 mm. Fl. Sep–Oct.

•W Sichuan (Kangding Xian).

13. *Sedum fui* Rowley, Natl. Cact. Succ. J. 28: 6. 1973.

宽叶景天 *kuan ye jing tian*

Sedum platyphyllum S. H. Fu, Acta Phytotax. Sin. 1: 123. 1951, not Alexander (1942).

Roots fibrous. Sterile stems absent. Flowering stems branched from base, erect, 6.5–14 cm; branches alternate or opposite. Leaves remote; leaf blade obovate-lanceolate to lanceolate, 1.2–1.8 × 1.5–5 mm, base subobtusate and spurred, apex obtuse to acute. Cyme corymbiform, many flowered; bracts leaflike, small. Flowers unequally 5-merous; pedicel to 2 mm. Sepals green, linear to subspatulate, 2.2–7 × 0.7–2 mm, base spurless, apex subacute. Petals greenish yellow, lanceolate, 5–6.2 × ca. 1.1 mm, base connate for 1.5–2 mm, apex long mucronate. Stamens 10; antepetalous ones ca. 1 mm; antepetalous ones 0.7–0.8 mm, inserted 1.5–2.5 mm from petal base. Nectar scales linear, 0.6–0.9 mm, apex truncate to obtuse. Carpels erect, 3.5–5 mm, mammillate, base connate for 1.2–1.5 mm, apex abruptly tapered. Seeds ovoid, winged. Fl. Aug–Sep, fr. Sep–Oct.

•Rocks in forests, grasslands, or at mixed *Picea* forest margins; 3500–3800 m. S Sichuan, W Yunnan.

- 1a. Sepals 2.2–4.5 × ca. 0.7 mm; antepetalous stamens ca. 0.8 mm, inserted 1.5–1.8 mm from petal base; nectar scales 0.6–0.8 mm 13a. var. *fui*
- 1b. Sepals 6.5–7 × 1.2–2 mm; antepetalous stamens ca. 0.7 mm, inserted ca. 2.5 mm from petal base; nectar scales 0.8–0.9 mm 13b. var. *longisepalum*

13a. *Sedum fui* var. *fui*

宽叶景天(原变种) *kuan ye jing tian* (yuan bian zhong) Sepals 2.2–4.5 × ca. 0.7 mm. Antepetalous stamens ca. 0.8 mm, inserted 1.5–1.8 mm from petal base. Nectar scales 0.6–0.8 mm. Fl. Aug–Sep, fr. Oct.

•Rocks in forests or grasslands; 3700–3800 m. S Sichuan, W Yunnan.

13b. *Sedum fui* var. *longisepalum* (K. T. Fu) S. H. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 86. 1984.

长萼宽叶景天 *chang e kuan ye jing tian*

Sedum platyphyllum S. H. Fu var. *longisepalum* K. T. Fu, Acta Phytotax. Sin. 12: 54. 1974.

Sepals 6.5–7 × 1.2–2 mm. Antepetalous stamens ca. 0.7 mm, inserted ca. 2.5 mm from petal base. Nectar scales 0.8–0.9 mm. Fl. Aug, fr. Sep–Oct.

•Rocks at mixed *Picea* forest margins; ca. 3500 m. NW Yunnan.

14. *Sedum wangii* S. H. Fu, Acta Phytotax. Sin. 1: 125. 1951.

德钦景天 *de qin jing tian*

Roots fibrous. Sterile stems absent. Flowering stems branched from base, erect, 1.5–3 cm. Leaf blade linear to lanceolate-ovate, 2–5 × 0.7–1.5 mm, base spurred, apex obtuse to subacute. Cyme corymbiform, few flowered, rarely 1-flowered. Flowers unequally 5-

merous; pedicel slender, 0.5–1 mm. Sepals green, suboblong, ca. 3 × 1 mm, base spurless, apex acuminate. Petals yellow, narrowly ovate-oblong, ca. 5.4–1.3 mm, base connate for ca. 1.5 mm and shortly clawed, apex subacuminate. Stamens 10, equal; antesealous ones ca. 1.2 mm, inserted at basal suture of petals; antepetalous ones inserted ca. 1.5 mm from petal base; anthers oblong-reniform. Nectar scales ca. 1 mm, apex obtuse. Carpels erect, lanceolate, base connate for ca. 1 mm; ovules many. Seeds oblong-ovoid, densely mammillate. Fl. Aug–Sep, fr. Sep–Oct.

• Slopes; ca. 3000 m. NW Yunnan.

15. *Sedum beauverdii* Raymond-Hamet, Bull. Soc. Bot. France 56: 48. 1909.

短尖景天 *duan jian jing tian*

Herbs perennial. Roots fibrous. Rhizome creeping underground. Sterile stems numerous. Flowering stems erect, slender, 1.5–8. Leaves numerous, alternate, sessile, linear to triangular-lanceolate, 4–7 mm, adaxially papillate-hairy, base dilated and 3- or 4-lobed, apex acuminate. Cyme corymbiform, dense; bracts leaflike. Flowers unequally 5-merous; pedicel 1–3.5 mm. Sepals linear to linear-lanceolate, 4.2–6.5 × 0.9–1.2 mm, adaxially mammillate, base spurless, apex acuminate and spinose. Petals yellow, lanceolate, 7.5–8 × 1.5–1.6 mm, base connate for ca. 0.5 mm, apical mucro 0.2–0.3 mm, occasionally twinned. Stamens 10; antesealous ones ca. 5.5 mm, inserted on suture of petals; antepetalous ones 3.5–4 mm, inserted ca. 2 mm from petal base. Nectar scales linear-spatulate, apically expanded, ca. 0.5 mm. Carpels erect, ovoid-lanceolate, base connate for 0.9–1.1 mm; ovules 12–15. Seeds obovoid, minutely mammillate. Fl. Sep–Oct, fr. Nov–Dec.

• Rock crevices or rocks in forests, rocks on slopes; 3000–4000 m. W Sichuan, NW Yunnan.

16. *Sedum heckelii* Raymond-Hamet, Notul. Syst. (Paris) 1: 139. 1910.

巴塘景天 *ba tang jing tian*

Herbs perennial, glabrous. Sterile stems 1–5, 1–2.5 cm. Flowering stems simple or branched, erect or basally vaulted, 7–13 cm, densely leafy. Leaf blade ovate-lanceolate to narrowly triangular, 3–7 × 1.2–2 mm, basal spur short and truncate or 3-lobed. Cyme corymbiform, ± dense; bracts leaflike. Flowers shortly pedicellate, unequally 5-merous. Sepals narrowly oblong to ovate, 3.5–4.8 × ca. 0.4 mm, base truncate and shortly spurred, apex shortly acuminate. Petals yellowish green, narrowly ovate-lanceolate, 6.5–8.2 × 1.4–1.5 mm, base subconnate and slightly narrowed, apex acute and mucronate. Stamens 10; antepetalous ones ca. 4 mm, inserted 1.5–2 mm from petal base. Nectar scales linear-spatulate, apex depressed. Carpels oblong, base connate for ca. 1.1 mm; ovules 10–17. Styles ca. 2 mm. Seeds brown, obovoid, mammillate. Fl. Sep, fr. Oct.

• Forests, forest margins, rocks, gravel beaches in valleys; 3500–4200 m. W Sichuan, E Xizang.

17. *Sedum nothodugueyi* K. T. Fu, Acta Phytotax. Sin. 12: 55. 1974.

距萼景天 *ju e jing tian*

Herbs perennial. Rhizome erect, robust, 4–6 mm. Sterile stems present. Flowering stems 4–10, tufted, broomlike, 3–6 cm, densely leafy. Leaf blade narrowly triangular-lanceolate to triangular-linear, 2–6 × 0.7–1 mm, basal spur broadly obtuse and 3-lobed, apex acuminate. Cyme corymbiform, 2–5-flowered; bracts leaflike. Flowers unequally 5-merous; pedicel 1–3 mm. Sepals lanceolate to narrowly triangular, 5–5.6 × 0.9–1 mm, base spurred, apex acuminate. Petals yellow, lanceolate to ovate, 6–6.5 × 1.3–1.4 mm, base connate, apex long mucronate. Stamens 10; antesealous ones ca. 4.5–5.5 mm; antepetalous ones inserted 0.8–1 mm from petal base. Nectar scales broadly spatulate, apex rounded. Carpels erect, lanceolate, base subconnate; ovules 4 or 5. Fl. Sep–Oct.

• Rocks; ca. 2300 m. W Sichuan.

18. *Sedum glaebosum* Fröderström, Acta Horti Gothob. 15: 16. 1942.

道孚景天 *dao fu jing tian*

Herbs perennial. Sterile stems densely tufted, 1–2 cm. Flowering stems usually solitary, suberect, 4–6 cm. Leaf blade linear-lanceolate to ovate, 3–6 mm, basal spur obtuse or 2-lobed to ± 3-lobed, margin sparsely glandular ciliate, apex acuminate. Cyme corymbiform, dense; bracts lanceolate, sparsely glandular ciliate. Flowers subsessile, unequally 5-merous. Sepals suboblong, 4–6 × 1–1.2 mm, base spurred, margin glandular ciliate, apex spinose-acuminate. Petals yellow, suboblong, 6–7.5 × ca. 2 mm, base connate for ca. 0.5 mm and broadly clawed, apex mucronate. Stamens 10; antesealous ones 4.5–5.5 mm; antepetalous ones inserted 1–2 mm from petal base. Nectar scales clawed-spatulate. Carpels erect, ovoid-lanceolate, base connate for ca. 2 mm; ovules many. Styles ca. 2 mm. Seeds smooth, narrowly winged. Fl. Aug–Sep, fr. Oct.

• Rocks on slopes, ravines; 3500–5000 m. SE Qinghai, W Sichuan, Xizang.

19. *Sedum barbeyi* Raymond-Hamet, Bull. Soc. Bot. France 56: 45. 1909.

离瓣景天 *li ban jing tian*

Herbs perennial, tufted. Stolon roots fibrous. Sterile stems erect, 1–3.5 cm. Flowering stems erect, 3–6 cm. Proximal stem leaves glaucescent, persistent, others yellowish green; leaf blade ovate-lanceolate, 4–7 × 1.2–2 mm, basal spur obtuse, apex acuminate. Cyme corymbiform, 3–5-flowered; bracts leaflike. Flowers shortly pedicellate, unequally 5-merous. Sepals yellowish green, broadly lanceolate, 4–5 × 1.2–1.8 mm, base spurless, apex acuminate. Petals yellow, lanceolate, 6–7.5 × 1.2–1.5 mm, base almost free, apex mucronate. Stamens 10; antesealous ones 4.5–5 mm; antepetalous

ones 3–3.5 mm, inserted 1.5–2 mm from petal base. Nectar scales subspatulate, ca. 0.4 mm, apex retuse. Carpels lanceolate to linear-lanceolate, 4–6 mm, base connate for 1.3–1.5 mm; ovules 6–8. Styles ca. 2 mm. Seeds narrowly oblong, minutely mammillate, winged. Fl. Aug, fr. Sep–Oct.

• Humus-rich soil in forests, rocks on shady slopes, usually with mosses; 800–2400 m. W Henan, NW Hubei, S Shaanxi.

20. *Sedum pampaninii* Raymond-Hamet, Malpighia 26: 59. 1913.

秦岭景天 qin ling jing tian

Herbs perennial, glabrous. Roots fibrous. Sterile stems 0.2–0.3 cm. Flowering stems branched, ascending, 5–10 cm. Proximal stem leaves soon withered; leaf blade linear, 4–7 × 0.5–0.8 mm, base truncately and obtusely spurred, apex acute. Cyme corymbiform, several flowered; bracts linear. Flowers unequally 5-merous; pedicel slender, 4–6 mm. Sepals lanceolate, 4–6 × 1.2 mm, base shortly spurred, apex acute. Petals yellow, lanceolate, 6–10 × ca. 1.8 mm, base connate for ca. 1.2 mm, apex subacuminate and mucronate. Stamens 10; antesealous ones 5.5–7.5 mm; antepetalous ones 3–4.5 mm, inserted 2.5–3 mm from petal base. Nectar scales oblong-spatulate, apex obtuse to retuse. Carpels oblong, base connate for 2–3 mm; ovules 4–6. Seeds ovoid, ca. 1 mm, mammillate, wingless. Fl. Jul–Sep, fr. Sep–Oct.

• Forested slopes, rocks in ravines; 1000–2500 m. W Henan, S Shaanxi, Sichuan, Yunnan.

21. *Sedum susanneae* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 24. 1910.

方腺景天 fang xian jing tian

Herbs biennial. Roots fibrous. Sterile stems present. Flowering stems many branched from base, erect or ascending, ± slender, 4–12 cm. Leaf blade linear-lanceolate to oblong, 4–9 × 1–2.2 mm, basal spur obtuse or 3-lobed, apex spinose-acuminate. Cyme dense; bracts linear-lanceolate to oblong. Flowers unequally 5-merous; pedicel 0.8–1.5 mm. Sepals linear-lanceolate, 3.8–5.6 × 1.1–1.5 mm, base spurless, apex spinose-acuminate. Petals oblong-lanceolate, 5.5–7 × 1.6–1.8 mm, base connate for 0.3–0.5 mm or ± free, apex long acuminate. Stamens 10; antesealous ones ca. 5 mm; antepetalous ones ca. 4 mm, inserted 1–1.5 mm from petal base. Nectar scales oblong-spatulate, 0.4–0.8 mm, apex retuse to obtuse. Carpels erect, oblong, ca. 6 mm, base connate for 1–1.5 mm, apex attenuate; ovules many. Styles 0.8–1 mm. Seeds oblong, ca. 1 mm. Fl. Aug–Sep, fr. Sep–Oct.

Exposed rocks, rock walls in valleys, stone walls; 2100–3800 m. W Sichuan, E Xizang [Myanmar].

1a. Sepals subequal 21a. var. *susanneae*

1b. Sepals unequal 21b. var. *macrosepalum*

21a. *Sedum susanneae* var. *susanneae*

方腺景天(原变种) fang xian jing tian (yuan bian zhong)

Sedum subgaleatum K. T. Fu.

Sepals subequal. Fl. Aug–Sep, fr. Sep–Oct.

Exposed rocks, stone walls; 2100–3800 m. W Sichuan [Myanmar].

21b. *Sedum susanneae* var. *macrosepalum* K. T. Fu, Acta Phytotax. Sin. 12: 57. 1974.

大萼方腺景天 da e fang xian jing tian

Sepals unequal.

• Rock walls in valleys; 3200–3500 m. E Xizang.

22. *Sedum stimulosum* K. T. Fu, Acta Phytotax. Sin. 12: 57. 1974.

刺毛景天 ci mao jing tian

Herbs biennial. Flowering stems branched from base, erect or ascending, 6–10 cm. Leaf blade oblong to obovate-oblong, 4–9.5 × 1–2.5 mm, abaxially spinescent and hirsute in distal 1/2, adaxially glabrous, base truncate or 3-lobed spurred, margin spinescent ciliate, apex long mucronate. Cyme corymbiform, dense, many flowered; bracts oblong to obovate-oblong. Flowers subsessile, unequally 5- or 6-merous. Sepals linear-oblong, 5.3–6 × 1.3–2 mm, abaxially spinescent hirtellous in distal 1/2, base spurless, margin spinescent ciliate, apex long mucronate. Petals free, yellow, lanceolate, ca. 7.5 × 1.8 mm, abaxially spinescent hairy and apically keeled, apex long mucronate. Stamens 10; antesealous ones ca. 5 mm; antepetalous ones inserted ca. 2 mm from petal base. Nectar scales oblong-spatulate, 0.4–0.8 mm, apex retuse to obtuse. Carpels erect, adaxially spinescent hairy, base connate for ca. 0.8 mm; ovules 4–6. Seeds oblong, ca. 1 mm, appendaged. Fl. Sep–Oct, fr. Oct–Nov.

• Rocks in valleys; 1500–2600 m. W Sichuan (Kangding Xian).

23. *Sedum rosei* Raymond-Hamet, Bot. Jahrb. Syst. 44(Beibl. 101): 32. 1910.

川西景天 chuan xi jing tian

Herbs annual. Roots fibrous. Flowering stems branched from base, erect or ascending, 3–8 cm. Leaves ± crowded or remote; leaf blade sublinear to narrowly triangular-linear, 5–6.8 × 1.2–1.4 mm, basal spur truncate to shallowly 3-lobed, apex acuminate. Cyme corymbiform, dense; bracts sublinear to narrowly triangular-linear. Flowers unequally 5- or 6-merous; pedicel 1–2 mm. Sepals sublinear-lanceolate or subovate, subequal or unequal, 5.5–9 × 1.3–1.8 mm, base obtusely spurred, apex acuminate. Petals yellow, oblong-lanceolate, 7–8.9 × ca. 1.3 mm, base connate for 0.5–0.8 mm, apex long mucronate. Stamens 10; antesealous ones 4.5–5.2 mm; antepetalous ones ca. 3 mm, inserted ca. 2.5 mm from petal base. Nectar scales linear-spatulate, apex ± dilated. Carpels erect, oblong to narrowly ovoid; ovules 5–10. Seeds obovoid-oblong. Fl. Sep–Oct, fr. Oct–Nov.

• Alpine thickets, grasslands, rocky or stony slopes, rocks in valleys or on slopes, stone walls; 2700–4800 m. W Sichuan, E Xizang.

- 1a. Stem leaves crowded; sepals sublinear-lanceolate, subequal, 5.5–6 mm, shorter than petals; carpels basally connate for ca. 0.5 mm 23a. var. *rosei*
- 1b. Stem leaves remote; sepals subovate, unequal, 7–9 mm, longer than petals; carpels basally connate for ca. 2 mm 23b. var. *magniflorum*

23a. *Sedum rosei* var. *rosei*

川西景天(原变种) *chuan xi jing tian (yuan bian zhong)*

Sedum rosei var. *brevistamineum* Fröderström.

Stem leaves crowded. Sepals sublinear-lanceolate, subequal, 5.5–6 mm, shorter than petals. Carpels basally connate for ca. 0.5 mm.

• Alpine thickets, grasslands, rocky or stony slopes, rocks in valleys; 2700–4800 m. W Sichuan, E Xizang.

23b. *Sedum rosei* var. *magniflorum* Fröderström, Acta Horti Gothob. 15: 18. 1942.

大花川西景天 *da hua chuan xi jing tian*

Stem leaves remote. Sepals subovate, unequal, 7–9 mm, larger than petals. Carpels basally connate for ca. 2 mm.

• Rocks on slopes, stone walls; 4000–4300 m. W Sichuan.

24. *Sedum platysepalum* Franchet, J. Bot. (Morot) 10: 289. 1896.

宽萼景天 *kuan e jing tian*

Herbs annual or biennial, glabrous. Flowering stems many branched from base, 6–10 cm, leafy. Leaf blade linear-lanceolate to linear, 6–10 mm, base broadly spurred, apex acute. Cyme corymbiform, dense. Flowers unequally 5-merous; pedicel 6–10 mm. Sepals oblong, 5–8.5 × 1.5–2.5 mm, veins with rust-colored dots, base spurred, apex acuminate. Petals yellow, linear-lanceolate, 6.5–7.5 × 2.4–2.8 mm, base connate for 0.8–1.3 mm and slightly narrowed, apex shortly mucronate. Stamens 10; antesealous ones 5–6.5 mm; antepetalous ones 2.5–3.5 mm, inserted 2–3.5 mm from petal base. Nectar scales linear, 0.7–1 mm, apex slightly dilated. Carpels oblong, ca. 0.8 mm, mammillate. Fl. Aug–Sep, fr. Oct.

• Forest margins, rocks in forests and on alpine summits, stony places; 3200–4000 m. SW Sichuan, NW Yunnan.

25. *Sedum franchetii* Grande, Bull. Orto Bot. Regia Univ. Napoli 4: 364. 1914.

细叶山景天 *xi ye shan jing tian*

Sedum tenuifolium Franchet, J. Bot. (Morot) 10: 290. 1896, not Strobl (1884).

Herbs annual. Roots fibrous. Flowering stems erect, subrobust, 10–13 cm, leafy. Leaf blade linear-lanceolate, 5–10 × ca. 1 mm, base shortly spurred, apex subacute. Cyme corymbiform, many flowered; bracts linear-lanceolate. Flowers unequally 5-merous; pedicel 1–3 mm. Sepals lanceolate to linear-oblong, subequal, 4.5–5 × 1–1.2 mm, base obtusely spurred, apex subacute. Petals free, yellow, lanceolate-spatulate, narrowed at middle, 4–4.5 × ca. 1.1 mm, apex obtuse. Stamens 10; antesealous ones ca. 4 mm; antepetalous ones ca. 1.6 mm, inserted ca. 2 mm from petal base. Nectar scales narrowly linear, ca. 1.5 mm, apex obtuse. Carpels suberect, ca. 3.5 mm, base connate for ca. 1 mm; ovules many. Seeds obovoid, 0.3–0.4 mm, mammillate. Fl. Jul–Aug, fr. Sep–Oct.

• Thickets, rocks in *Abies* forests and by water, cliffs, rock crevices, pebble beaches; 2800–4100 m. NW Yunnan.

26. *Sedum ulricae* Fröderström, Bull. Mus. Hist. Nat. (Paris), sér. 2, 1: 442. 1929.

甘南景天 *gan nan jing tian*

Herbs annual, glabrous. Roots fibrous. Flowering stems erect but sometimes basally arched, 3–6 cm. Leaf blade linear to suboblong, 5–7.5 mm, base shortly spurred, apex subacute. Cyme corymbiform, few flowered. Flowers equally or unequally 5-merous; pedicel 2–2.4 mm. Sepals linear to oblanceolate, 4.5–5 mm, base obtusely spurred, apex subacute. Petals free, lanceolate, ca. 4 × 1–1.2 mm, apex subobtusely. Stamens 5 and shorter than petals, or 10 and antesealous ones 2.1–2.6 mm. Nectar scales narrowly linear, 1.1–1.2 mm, apex emarginate. Carpels stellately divergent, 2.7–3.2 mm, base connate for 1.2–1.3 mm, apex abruptly tapered; ovules 5 or 6. Seeds narrowly ovoid-oblong, ca. 1 mm, shallowly furrowed, minutely mammillate. Fl. Jul–Aug, fr. Aug.

• *Abies* forests, mountain summits, gravelly slopes; 3000–4500 m. S Gansu, SE Qinghai, E Xizang.

27. *Sedum henrici-robertii* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 12: 407. 1913.

山岭景天 *shan ling jing tian*

Herbs annual, glabrous. Roots fibrous. Flowering stems branched from base, erect, slender, 1.8–2.5 cm. Leaves alternate; leaf blade broadly linear to narrowly obovate, 2.5–5 × 0.6–0.7 mm, base obtusely spurred, apex acute. Cyme subcorymbiform, few flowered; bracts narrowly obovate to broadly linear. Flowers unequally 5-merous; pedicel 1.7–2 mm. Sepals narrowly ovate-lanceolate, ca. 3 mm, base obtusely spurred, apex acute. Petals suboblong, ca. 3 mm, base connate for 0.3–0.4 mm, apex subacute and mucronulate. Stamens 10; antesealous ones 1.7–1.9 mm; antepetalous ones 1.4–1.5 mm, inserted 0.6–0.9 mm from petal base. Nectar scales linear, 1–1.1 mm, apex obtuse. Carpels 2–2.8 mm, base connate for 1.4–1.8 mm, apex tapered; ovules few.

Seeds obovoid, ca. 1 mm, minutely mammillate. Fl. Jul, fr. Aug.

Rocks, stony places; 3800–5000 m. E Qinghai, S Xizang [?Bhutan, Nepal, ?Sikkim].

The record of this species in FRPS from Bhutan and Sikkim has not been confirmed.

28. *Sedum fischeri* Raymond-Hamet, Russk. Bot. Zhurn. 1914: 1. 1914.

小景天 *xiao jing tian*

Herbs annual, glabrous. Stems branched from base, ascending, 1–2.5(–4) cm. Leaf blade narrowly oblong, 3–6 × 1–2 mm, base obtusely spurred, apex obtuse.

Cyme corymbiform, few flowered; bracts narrowly oblong. Flowers shortly pedicellate, 5-merous. Sepals subovate, 3–4 mm, base spurless, apex obtuse. Petals free, yellow, suboblong, 3–4 mm, apex obtuse. Stamens 5, ca. 3 mm. Nectar scales narrowly linear-spatulate, 0.8–1.1 mm, apex obtuse. Carpels ovoid-oblong, ca. 4.2 mm, base subconnate, apex abruptly tapered; ovules 12–14. Styles ca. 1 mm. Follicles 6–8(–14)-seeded.

Seeds oblong-ovoid, ca. 0.7 mm, minutely mammillate. Fl. Jul–Aug, fr. Aug–Sep.

Meadows and rock crevices on slopes; 3600–5600 m. E Qinghai (Xinghai Xian), S Xizang [Bhutan, NW India, Sikkim].

The follicles of specimens from Xizang sometimes have up to 14 seeds.

29. *Sedum oligocarpum* Fröderström, Acta Horti Gothob. 15: 26. 1942.

少果景天 *shao guo jing tian*

Herbs annual, glabrous. Stems many branched from base, ca. 1 cm; branches divergent. Leaf blade ovate to suborbicular on middle and distal stem leaves, 1–1.5 mm, basal spur broad or emarginate, apex obtuse.

Cyme few flowered; bracts usually 2, subopposite, lanceolate, ca. 1.5 mm, apex apiculate. Flowers shortly pedicellate, mostly 5-merous. Sepals subovate, 1.5–2 mm, base spurless, apex subacute. Petals yellow when dry, oblong, ca. 2 mm, base broad, apex mucronate. Stamens 5, ca. 1.5 mm, base dilated; anthers nearly ovate-reniform, ca. 0.5 mm. Nectar scales narrowly linear, ca. 1 mm, apex slightly expanded. Carpels 3, slightly divergent, ca. 1.5 mm. Styles long. Follicles 1- or 2-seeded. Seeds lanceolate, ca. 1.5 mm, smooth, winged at both ends. Fl. Aug, fr. Aug.

• Rocks; 4400–4600 m. W Sichuan.

30. *Sedum lutzii* Raymond-Hamet, Bull. Soc. Bot. France 59: 762. 1913.

康定景天 *kang ding jing tian*

Herbs annual, glabrous. Roots fibrous. Stems branched from base, erect, ± slender, 3.5–5 cm. Leaves greenish; leaf blade broadly linear to oblong, 5–6 × 0.8–1.4 mm, base obtusely spurred, apex obtuse. Cyme corymbiform, few flowered; bracts broadly linear to oblong. Flowers unequally 5-merous; pedicel 2.5–3 mm. Sepals greenish or yellowish green, suboblong-linear to

ovate-linear, 2.7–3.5 × 1–1.5 mm, base spurless, apex obtuse. Petals yellow, broadly ovate, 3.3–4.8 or more × 1.4–1.8 mm, base connate for 0.2–0.3 mm, apex subobtusely and mucronate. Stamens 10; antepetalous ones 2.6–2.8 mm; antepetalous ones shorter than petals, inserted 0.8–3 mm from petal base. Nectar scales suboblong-obovate, 0.5–0.6 × 4–5 mm, apex emarginate. Carpels 2.4–2.8 mm, base connate for ca. 0.4 mm, apex tapered; ovules few to many. Follicles few seeded. Seeds mammillate. Fl. Sep, fr. Oct.

• Grasslands, mountain ridges, shady places on summits, rocks, trailsides; 4200–4400 m. W Sichuan.

- 1a. Sepals greenish; petals 3.3–4.8 mm; antepetalous stamens inserted 0.8–1.2 mm from petal base; carpels few ovuled 30a. var. *lutzii*
- 1b. Sepals yellowish green; petals longer than 4.8 mm; antepetalous stamens inserted 2.2–3 mm from petal base; carpels many ovuled 30b. var. *viridiflavum*

30a. *Sedum lutzii* var. *lutzii*

康定景天(原变种) *kang ding jing tian* (yuan bian zhong)

Sepals greenish. Petals 3.3–4.8 mm. Antepetalous stamens inserted 0.8–1.2 mm from petal base. Carpels few ovuled. Fl. Sep, fr. Oct.

• Grasslands, shady places on summits, rocks on shady slopes; ca. 4400 m. W Sichuan (Dawu Xian, Kangding Xian).

30b. *Sedum lutzii* var. *viridiflavum* K. T. Fu, Acta Phytotax. Sin. 12: 60. 1974.

黄绿景天 *huang lu jing tian*

Sepals yellowish green. Petals longer than 4.8 mm. Antepetalous stamens inserted 2.2–3 mm from petal base. Carpels many ovuled. Fl. Sep.

• Mountain ridges, rocks, trailsides; 4200–4300 m. W Sichuan (Dawu Xian, Jinchuan Xian).

31. *Sedum tsinghaicum* K. T. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 40. 1980.

青海景天 *qing hai jing tian*

Herbs annual, dark purplish red. Stems branched from base, 5–6 cm. Leaf blade ovate, 3–6 mm, base spurred, apex obtuse. Cyme many flowered. Flowers unequally 5-merous. Sepals narrowly ovate, 2.5–3 mm, base spurless, apex obtuse. Petals yellow, oblong, ca. 3.2 mm, base subconnate, apex mucronate. Stamens 10, all shorter than petals; antepetalous ones inserted ca. 0.8 mm from petal base. Nectar scales broadly spatulate, ca. 0.2 × 0.3 mm, apex dilated. Carpels suberect, narrowly oblong, ca. 3.5 × 1.2 mm, base subconnate. Follicles 6- or 7-seeded. Seeds narrowly ovoid, ca. 0.8 mm, mammillate. Fl. Jul–Sep, fr. Sep.

• Stony cliffs or slopes, river beaches; 3800–4100 m. SE Qinghai.

32. *Sedum roborowskii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 29: 154. 1883.

阔叶景天 *kuo ye jing tian*

Herbs biennial, glabrous. Roots fibrous. Stems branched from base, suberect, 3.5–15 cm. Leaf blade oblong, 5–13 × 2–6 mm, base obtusely spurred, apex obtuse. Cyme corymbiform with ± scorpioid cymes, lax, many flowered; bracts oblong. Flowers unequally 5-merous; pedicel to 3.5 mm. Sepals oblong to obovate-obovate, unequal, 3–5 × 1.1–2 mm, sometimes papillate apically, base obtusely spurred, apex obtuse. Petals free, yellowish, ovate-lanceolate, 3.5–3.8 × ca. 1 mm, apex obtuse. Stamens 10; antesealous ones ca. 2.7 mm; antepetalous ones ca. 2 mm, inserted ca. 0.7 mm from petal base. Nectar scales oblong, 0.6–0.9 mm, apex emarginate, sometimes dilated. Carpels oblong, ca. 6 mm, base connate for ca. 0.7 mm, apex abruptly tapered. Styles 0.5–0.7 mm. Follicles 12–15-seeded. Seeds ovoid-oblong, ca. 0.7 mm, minutely mammillate. Fl. Aug–Sep, fr. Sep.

Forested slopes, shady rocks in forests, alluvial beaches; 2200–4500 m. C Gansu, C Ningxia, Qinghai, SE Xizang [Nepal].

33. *Sedum blepharophyllum* Fröderström, Acta Horti Gothob. 15: 26. 1942.

叶景天 *sui ye jing tian*

Herbs biennial. Roots short, fibrous. Stems erect, subrobust, long branched, 6–14 cm, papillate. Leaves alternate or opposite; leaf blade ovate to suboblong, 5–6 mm, densely shortly and acutely papillate-hairy, base broad and obtusely spurred, apex obtuse. Cyme corymbiform, to 6 cm; bracts broadly lanceolate, mammillate. Flowers shortly pedicellate, 5-merous. Sepals brownish red or striate, oblong, equaling or longer than petals, base obtusely spurred, margin mammillate, apex subobtuse. Petals almost free, pale yellow, oblong-ovate, 4–4.2 mm, apex subacute and mammillate. Stamens 5, 3–3.2 mm. Nectar scales linear-spatulate, ca. 0.8 mm, apex rounded. Carpels suberect, oblong, 4–5 mm, adaxially mammillate, base connate for 1–1.5 mm. Styles long. Follicles 20–22-seeded. Seeds ovoid, ca. 0.5 mm, minutely mammillate. Fl. Aug–Sep, fr. Oct.

• Sunny rocks in valleys, stone walls; 3200–3800 m. W Sichuan (Dawu Xian, Kangding Xian).

34. *Sedum obtusipetalum* Franchet, J. Bot. (Morot) 10: 289. 1896.

钝瓣景天 *dun ban jing tian*

Sedum mosoynense Franchet; *S. obtusipetalum* subsp. *danyanum* H. Ohba.

Herbs biennial, glabrous. Roots carrot-shaped. Stems branched, erect, 5–15 cm. Basal leaves crowded, soon withering but persistent; leaf blade broadly lanceolate to lanceolate-oblong, 6–10 × 1.7–2.5 mm, base truncately spurred, apex obtuse. Cyme corymbiform, dense; bracts broadly lanceolate to lanceolate-oblong. Flowers unequally 5-merous; pedicel to 5 mm. Sepals suboblong, 3.5–5 × 1.1–1.8 mm, base obtusely spurred,

apex obtuse and mammillate. Petals yellow, oblong, 5–6.5 × 1.3–1.7 mm, base connate for 0.4–1 mm and narrowed, apex subemarginate and mammillate. Stamens 10; antesealous ones 4.5–5 mm; antepetalous ones inserted 1–2 mm from petal base. Nectar scales subquadrangular to linear-spatulate, 0.4–0.6 mm, apex abruptly expanded, obtuse to retuse. Carpels oblong, 5–6 mm, base connate for ca. 1 mm. Follicles many seeded. Seeds obovoid, ca. 0.5 mm, minutely mammillate. Fl. Aug–Oct, fr. Sep–Nov.

Rocks on slopes in *Abies* forests and in valleys, moist soil and sandy places on slopes; 2000–3700 m. SW Sichuan, NW Yunnan [Nepal].

35. *Sedum somenii* Raymond-Hamet, J. Bot. 54(Suppl. 1): 18. 1916.

邓川景天 *deng chuan jing tian*

Sedum mairei Praeger.

Herbs annual, glabrous. Roots fibrous. Stems apically branched, suberect to ascending, 12–23 cm. Leaf blade obovate-oblong to suboblong, 3.5–7 × 2.6–8.5 mm, adaxially papillate-hairy, base shortly and obtusely spurred, apex obtuse. Cyme corymbiform, lax; bracts ovate-deltoid, longer than wide, spurred, apex acute. Flowers shortly pedicellate, equally or unequally 5-merous. Sepals obovate, 2.5–7 × 0.6–3 mm, base obtusely spurred, apex rounded. Petals broadly triangular, 3.5–5 × 1.2–2 mm, base subconnate, apex subacute. Stamens 5 or 10; antepetalous ones (when present) inserted ca. 1 mm from petal base. Nectar scales linear-spatulate; claw linear. Carpels erect, 4–4.5 mm, base connate for ca. 1 mm and wide, apically tapered; ovules many. Styles short. Seeds obovoid-oblong, 0.5–0.6 mm, mammillate. Fl. Aug–Sep, fr. Sep–Oct.

• Below 2500 m. NW Yunnan (Eryuan Xian).

36. *Sedum morotii* Raymond-Hamet, Bull. Mus. Hist. Nat. (Paris) 15: 491. 1909.

倒卵叶景天 *dao luan ye jing tian*

Herbs biennial, glabrous. Roots fibrous. Stems branched from base, erect or ascending, 5–15 cm. Leaf blade obovate to obovate-oblong, 6–22 × 1.8–8 mm, adaxially papillate-hairy, base obtusely spurred, apex obtuse. Cyme corymbiform, dense; bracts obovate to obovate-oblong. Flowers unequally 5-merous; pedicel 0.4–0.8 mm. Sepals oblong to subobovate, subequal or equal, 3.5–4.5 or less × ca. 1.1 mm, base obtusely spurred, apex obtuse. Petals yellow, narrowly oblong, 5–6 × 1.2–1.3 mm, base connate for ca. 0.3 mm and narrowed, apex submucronate to mucronate. Stamens 10; antesealous ones ca. 4.3 mm; antepetalous ones ca. 3 mm, inserted ca. 1.6 mm from petal base; anthers retuse at apex. Carpels oblong, 5.5–6 mm, base connate for 1–1.5 mm, apex attenuate; ovules many. Styles ca.

1.5 mm. Seeds ca. 1 mm, mammillate. Fl. Aug–Sep, fr. Sep–Oct.

•Rocks on woodland slopes or in valleys, trails on slopes, rock crevices, stone walls; 1300–3000 m. W Sichuan, E Xizang.

- 1a. Leaf blade 6–22 mm; sepals subequal, 3.5–4.5 mm; petals ca. 6 mm, apex scarcely mucronate 36a. var. *morotii*
1b. Leaf blade 3.6–8 mm; sepals equal, to 3.5 mm; petals ca. 5 mm, apex prominently mucronate 36b. var. *pinoyi*

36a. *Sedum morotii* var. *morotii*

倒卵叶景天(原变种) *dao luan ye jing tian* (*yuan bian zhong*)

Leaf blade 6–22 mm, adaxially papillate-hairy. Sepals subequal, 3.5–4.5 mm. Petals ca. 6 mm, apex scarcely mucronate. Fl. Aug–Sep, fr. Oct.

•Rocks in valleys, trails on slopes, stone walls; 1300–2800 m. W Sichuan, E Xizang.

36b. *Sedum morotii* var. *pinoyi* (Raymond-Hamet) Fröderström, *Acta Horti Gothob.* 6(App.): 69. 1931.

小倒卵叶景天 *xiao dao luan ye jing tian*

Sedum pinoyi Raymond-Hamet, *Bull. Soc. Bot. Genève* 11: 149. 1919.

Leaf blade 3.6–8 mm, margin entire. Sepals equal, to 3.5 mm. Petals ca. 5 mm, apex prominently mucronate. Fl. Aug–Sep, fr. Sep–Oct.

•Rocks on woodland slopes, rock crevices; 2800–3000 m. W Sichuan.

37. *Sedum magniflorum* K. T. Fu, *Acta Phytotax. Sin.* 12: 61. 1974.

大花景天 *da hua jing tian*

Herbs annual, tufted, glabrous. Stem solitary, erect, 7–8 cm. Leaf blade narrowly oblong, 6–8 × 1.6–1.8 mm, veins 3–5, lateral ones anastomosing before reaching margin, base broadly and truncately spurred, apex obtuse. Cyme corymbiform, lax, 3–5-flowered; bracts narrowly oblong. Flowers unequally 5-merous; pedicel 2–7(–15) mm. Sepals narrowly oblong, 6.8–7.5 × 2–2.2 mm, veins 3–5, anastomosing near margin, base obtusely long spurred, apex obtuse. Petals yellowish, oblong, 7–8 × 2–2.3 mm, base connate for ca. 0.8 mm, apex obtuse. Stamens 10; antepetalous ones inserted 1–1.5 mm from petal base. Nectar scales linear-subspatulate, dilated at both ends, apex subrounded to truncate. Carpels suberect, oblong, 7–7.6 mm, base subconnate; ovules 10–12. Seeds obovoid-lanceolate, winged. Fl. Aug, fr. Sep.

•Rocks in *Abies* forests, among weeds, pebble beaches; ca. 3800 m. NW Yunnan (Zhongdian Xian).

38. *Sedum gagei* Raymond-Hamet, *Repert. Spec. Nov. Regni Veg.* 8: 263. 1910.

锡金景天 *xi jin jing tian*

Sedum trullipetalum J. D. Hooker & Thomson var. *gagei* (Raymond-Hamet) H. Ohba.

Herbs perennial, glabrous. Sterile stems 0.6–2 cm. Flowering stems erect, slender, 1.4–6 cm. Leaves alternate, sessile, triangular-linear, 3.6–4.8 × 1.3–1.8 mm, minutely papillate on margin, basal spur 3-lobed, apex acuminate. Cyme corymbiform, dense, 0.8–2.3 cm; bracts triangular-linear. Flowers unequally 5-merous, small; pedicel 0.8–1.3 mm. Sepals ovate-linear, 3.5–5.6 mm, base obtusely spurred, margin entire and minutely mammillate, apex acuminate. Petals ovate-lanceolate, 5.6–7.3 mm, basally connate for 0.4–0.5 mm, basal claw less than 3 mm, apex acute and mucronate. Stamens 10; antesealous ones 4–5.7 mm; antepetalous ones 2.1–2.6 mm, inserted 1.3–2 mm from petal base. Nectar scales clawed, subquadrangular, 0.4–0.6 mm, apex deeply emarginate. Carpels 4.2–4.6 mm, base connate for 2.3–2.5 mm. Follicles obliquely divergent, many seeded. Fl. Aug, fr. Aug.

Below 5000 m. S Xizang [Bhutan, Nepal, Sikkim].

39. *Sedum sagittipetalum* Fröderström, *Acta Horti Gothob.* 15: 15. 1942.

箭瓣景天 *jian ban jing tian*

Herbs perennial, tufted, glabrous. Primary root present. Rootstock capitate, ± thickened, small. Sterile stems tufted, 0.5–1 cm. Flowering stems erect, 1–2 cm. Leaves crowded; leaf blade bright green to greenish white when dry, 4–6 mm, basal spur obtuse or lobed, apex long acuminate. Cyme 1- or 2-flowered; bracts 2, resembling stem leaves. Flowers unequally 5–7-merous. Sepals oblanceolate to oblong, 4–4.5 mm, base spurless, apex long acuminate. Petals free, yellow when dry, sagittate, 6–6.5 mm, base narrowly clawed, limb subovate, apex narrowly apiculate. Stamens 10–14; antesealous ones ca. 4 mm; antepetalous ones inserted 2–2.5 mm from petal base. Nectar scales dilated and emarginate at apex. Carpels erect, lanceolate to broadly so; ovules many. Styles very short. Follicles many seeded. Seeds ovoid, ca. 1 mm, smooth, winged at both ends. Fl. Aug, fr. Sep.

•Cliffs in glacial valleys; 4300–4500 m. W Sichuan (Dawu Xian).

40. *Sedum trullipetalum* J. D. Hooker & Thomson, *J. Proc. Linn. Soc., Bot.* 2: 102. 1858.

馒头瓣景天 *man ban jing tian*

Herbs perennial, glabrous. Sterile stems densely tufted, 1–4 mm. Flowering stems simple or branched from base, 2.8–8 cm. Leaf blade suboblong to narrowly triangular, 3–10 mm, base broad, 3-lobed spurred or spurless, apex acuminate. Cyme corymbiform, dense. Flowers subsessile, unequally 5-merous. Sepals suboblong to narrowly ovate, 4–6.5 mm, base spurless, apex acuminate. Petals free, yellow, trullate, 6–10 mm, base narrowly clawed, limb broadly ovate to ovate-lanceolate, apex mucronate. Stamens 10; antesealous ones 4.5–5.5 mm; antepetalous ones inserted on petal claw, shorter than petal limb. Nectar scales oblong,

apex emarginate. Carpels erect, linear, 5–9 mm, base connate for ca. 2.5 mm; ovules many. Styles long. Seeds oblong, ca. 0.6 mm, minutely mammillate. Fl. Aug–Oct, fr. Oct–Nov.

Grassy meadows on alpine summits, grasslands, rocks, rock crevices, dry places; 2700–4400 m. W Sichuan, NE and S Xizang, NW Yunnan [Nepal, Sikkim].

- 1a. Basal spur of leaf blade broadly 3-lobed; sepal margin entire; anther apex obtuse 40a. var. *trullipetalum*
1b. Basal spur of leaf blade usually absent; sepal margin long ciliate; anther apex acute 40b. var. *ciliatum*

40a. *Sedum trullipetalum* var. *trullipetalum*

馒头景天(原变种) man ban jing tian (yuan bian zhong)

Basal spur of leaf blade broadly 3-lobed. Sepal margin entire. Anther apex obtuse. Fl. Aug–Oct, fr. Oct–Nov.

Grassy meadows on alpine summits, grasslands, rocks, rock crevices, dry places; 2700–4400 m. W Sichuan, S Xizang, NW Yunnan [Nepal, Sikkim].

40b. *Sedum trullipetalum* var. *ciliatum* Fröderström, Acta Horti Gothob. 15: 14. 1942.

缘毛景天 yuan mao jing tian

Basal spur of leaf blade usually absent. Sepal margin long ciliate. Anther apex acute. Fl. Aug–Oct.

• Granitic rocks in glacial valleys; ca. 4300 m. W Sichuan (Dawu Xian, Kangding Xian), NE Xizang.

41. *Sedum obtrullatum* K. T. Fu, Acta Phytotax. Sin. 12: 63. 1974.

铲瓣景天 chan ban jing tian

Herbs biennial, glabrous. Flowering stems branched or rarely simple, erect, 3–8 cm. Proximal stem leaves crowded, sparse toward stem apex; leaf blade ovate-lanceolate, 4–5 mm, base shortly spurred, apex acuminate. Cyme corymbiform. Flowers 5-merous, rarely unequally so; pedicel 2–3 mm. Sepals free, lanceolate to lanceolate-oblong, subequal, 3.5–4.2 mm, base obtusely long spurred, apex acute. Petals red, obtrullate to narrowly so, 2.5–2.6 mm, base clawed, apex obtuse to acute. Stamens 5, rarely 10 when antepetalous ones inserted between petal claw and limb. Nectar scales linear, 1.3–1.7 mm, apex obtuse to truncate. Carpels oblong, 3–3.5 mm, base connate; ovules many. Seeds obovoid, 0.6–0.7 mm, mammillate. Fl. Jul, fr. Sep.

• Slopes, along rivers; 2400–3300 m. SE Xizang (Zayü Xian), NW Yunnan (Dêqên Xian).

42. *Sedum raymondii* Fröderström in Handel-Mazzetti, Symb. Sin. 7: 411. 1931.

膨果景天 peng guo jing tian

Herbs annual, glabrous. Roots fibrous. Flowering stems simple or branched from base, erect, stout, 1–2.5 cm.

Leaves crowded; leaf blade broadly oblanceolate to subobovate, 4–9 mm, basal spur broad and obtuse, apex subacute. Cyme corymbiform, 1–2.7 cm in diam., densely 5–20-flowered; bracts broadly oblanceolate to subobovate. Flowers unequally 5-merous; pedicel 3–5 mm. Sepals ovate to ovate-oblong, unequal, 2.8–4 mm, base obtuse and shortly spurred, apex subacute. Petals free, yellow, narrowly oblong, 2.5–3.5 mm, base broadly clawed, apex subacute. Stamens 10; antesealous ones ca. 2.8 mm; antepetalous ones inserted ca. 0.8 mm from petal base. Nectar scales linear, 1–1.7 mm, apex obtuse. Carpels divergent, ca. 3 mm, base connate for 0.5–0.7 mm; ovules many. Seeds ovoid-oblong, 0.8–1 mm, mammillate. Fl. Jul, fr. Aug.

• Grasslands, rocks on slopes or along trails, pebble beaches; 3200–4300 m. NW Yunnan.

43. *Sedum muyaicum* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 6: 107. 1986.

木雅景天 mu ya jing tian

Herbs perennial, glabrous. Roots curved; fibrous roots present. Sterile shoots present. Flowering stems solitary or tufted, erect, 1.2–2.3 cm. Leaves alternate, usually clustered at base; leaf blade oblong to obovate-oblong, 4–5.5 × 2–2.3 mm, base shortly spurred, apex subacute. Cyme 5–8-flowered. Flowers 5-merous; pedicel 3–5 mm. Sepals linear-lanceolate, equal, ca. 4 mm, longer than petals, base spurless, apex obtuse to acute. Petals yellowish green to greenish, linear-lanceolate, ca. 3.5 mm, base subconnate, apex obtuse. Stamens 5, ca. 2.8 mm; anthers pink, ovoid, ca. 1.2 mm. Nectar scales transversely oblong, ca. 0.2 × 0.5 mm. Carpels triangular-ovoid, 1.3–1.5 mm; ovules 20–30. Styles 1.5–2 mm. Follicles erect, more than 20-seeded; placenta lunulate. Seeds narrowly ovoid, 0.5–0.6 mm, smooth. Fl. Aug, fr. Aug.

• W Sichuan (Kangding Xian).

44. *Sedum celiae* Raymond-Hamet, Bull. Acad. Int. Géogr. Bot. 23: 67. 1913.

镰座景天 lian zuo jing tian

Herbs perennial, glabrous. Roots fibrous. Underground stems creeping. Sterile stems tufted, 1–2 cm. Flowering stems erect, slender, 3–8 mm. Leaf blade linear to linear-lanceolate, 3.2–8.5 mm, basal spur obtuse or ± 3-lobed, apex acuminate. Cyme corymbiform, dense, few flowered; bracts linear to linear-lanceolate. Flowers unequally 5-merous; pedicel 0.6–1.6 mm. Sepals ± free, lanceolate, 6.5–7.2 mm, base spurless, apex acute. Petals broadly lanceolate, 6–9 mm, apex acuminate and mucronate. Stamens 10; antesealous ones 5–6 mm; antepetalous ones inserted 0.8–1.5 mm from petal base. Nectar scales obovate-spatulate, 0.4–0.6 mm, apex obtuse to emarginate. Carpels oblong, 7–8 mm, base connate for 0.5–1 mm.

Follicles 13–15-seeded; placenta falcate, conspicuously stalked below middle. Seeds obovoid-oblong, ca. 0.8 mm, smooth. Fl. Oct, fr. Oct–Nov.

• Rocks in valleys; 2600–3000 m. SW Sichuan (Yanyuan Xian), NW Yunnan (Eryuan Xian).

45. *Sedum dugueyi* Raymond-Hamet, J. Bot. 54(Suppl. 1): 24. 1916.

藓茎景天 xian jing jing tian

Herbs perennial. Sterile stems erect, mosslike, 1–3 cm. Flowering stem usually solitary, erect, 1.5–5.5 cm. Leaf blade triangular-lanceolate, 3–7.5 mm, midvein often reddish brown, basal spur obtuse or 3-lobed, apex acuminate. Cyme corymbiform, few flowered; bracts triangular-lanceolate. Flowers subsessile, unequally 5-merous. Sepals triangular-lanceolate, 5–5.5 mm, base obtuse and shortly spurred, apex acuminate. Petals yellow, lanceolate-ovate, 6–8 mm, base subconnate and slightly narrowed. Stamens 10; antepetalous ones inserted 0.8–1 mm from petal base. Nectar scales linear-spatulate, 0.4–0.6 mm, apex emarginate. Carpels suboblong, 5–7 mm, base connate for ca. 0.8 mm. Follicles 10–12-seeded. Seeds narrowly ovoid, ca. 0.8 mm, smooth. Fl. Sep–Oct, fr. Oct–Nov.

• Slopes in *Abies* forests, rocks in valleys; 2000–3600 m. NW Sichuan, NW Yunnan (Dêqên Xian).

46. *Sedum longyanense* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 6: 108. 1986.

浪岩景天 lang yan jing tian

Herbs perennial. Roots fibrous. Sterile stems 0.5–1.2 cm. Flowering stems simple, arched, 5–10 cm. Proximal stem leaves alternate, scalelike; leaf blade narrowly suboblong, 3–7 × 1–1.6 mm, gradually larger toward stem apex, veins brown spotted when dry, basal spur truncate-obtuse, apex spinose-cuspidate. Cyme 5–12-flowered. Flowers unequally 5-merous; pedicel 1–3 mm. Sepals oblong-lanceolate to lanceolate, 3.5–4 × 0.7–0.9 mm, veins 3, brown spotted, base spurred, apex spinose-acuminate. Petals yellow with brown midvein, linear to sublinear-oblong, 5.8–6 × 0.8–1 mm, base subconnate to ± free, apex shortly mucronate. Stamens 10; antesealous ones 3.5–4 mm; antepetalous ones 2–2.2 mm, inserted 0.8–1.2 mm from petal base. Nectar scales linear or quadrangular, 0.3–0.4 mm, apex rounded to obtuse. Carpels erect, narrowly ovoid, ca. 5 mm, base connate for 1–2 mm; ovules 6–10. Styles 1.7–1.8 mm. Follicles suberect, 6–8-seeded; placenta sublunulate. Seeds ovoid, 0.5–0.6 mm, smooth.

• Among moss on rocks. E Xizang.

47. *Sedum celatum* Fröderström, Acta Horti Gothob. 7: 114. 1932.

隱匿景天 yin ni jing tian

Sedum celatum f. *calcaratum* K. T. Fu; *S. wuanum* K. S. Hao.

Herbs biennial, glabrous. Main root conical. Flowering stems branched from base, erect, 3–9 cm. Leaf blade lanceolate to narrowly ovate, 5–7 mm, basal spur

obtuse or ± lobed, apex acuminate. Cyme corymbiform, 3–9-flowered; bracts lanceolate to narrowly ovate.

Flowers unequally 5-merous; pedicel 2–6.5 mm. Sepal base spurless, apex long acuminate. Petals yellow, lanceolate, 3.5–4.5 mm, base connate for 0.2–0.3 mm, apex acuminate and long mucronate. Stamens 10; antesealous ones ca. 3 mm; antepetalous ones inserted 0.5–0.7 mm from petal base. Nectar scales broadly spatulate, ca. 0.4 mm, apical appendage transversely oblong. Carpels suboblong, 3.5–3.8 mm, base connate for 0.6–0.7 mm; ovules 6–8. Follicles 6–8-seeded; placenta falcate, apically 3–5-lobed. Seeds obovoid-oblong, 0.7–1 mm, mammillate, narrowly winged. Fl. Jul, fr. Aug–Sep.

• Slopes; 2900–4200 m. S Gansu, E Qinghai.

48. *Sedum przewalskii* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 156. 1883.

高原景天 gao yuan jing tian

Herbs annual, glabrous. Roots fibrous. Flowering stems usually branched from base, erect, 1–4 cm. Leaf blade broadly lanceolate to ovate, 2–4.8 mm, base truncately spurred, apex obtuse. Cyme corymbiform, 3–7-flowered; bracts broadly lanceolate to ovate. Flowers 5-merous; pedicel 3–6 mm. Sepals suboblong, base spurless, apex obtuse. Petals yellow, triangular-ovate, 3–3.5 mm, base subconnate, apex obtuse. Stamens 5, ca. 3 mm. Nectar scales narrowly linear to linear-spatulate, 0.8–1.3 mm, apex subobtuse. Carpels subrhomboid, 3.2–3.4 mm, base free or connate for 0.2–0.5 mm. Follicles 3–6-seeded; placenta falcate. Seeds ovoid-oblong, ca. 0.8 mm, minutely mammillate. Fl. Aug, fr. Sep.

Dry grasslands on high mountain slopes, rocks; 2400–5400 m. C Gansu (Datong He), SE Qinghai, W Sichuan, E Xizang, NW Yunnan (Dêqên Xian) [Nepal].

49. *Sedum pagetodes* Fröderström, Acta Horti Gothob. 15: 25. 1942.

寒地景天 han di jing tian

Herbs annual, glabrous. Flowering stems branched from base, erect or ascending, 2–4 cm. Leaf blade broadly linear to oblong, 2.5–4.8 mm, basal spur broad and truncate, apex obtuse. Cyme corymbiform, 4–12-flowered; bracts broadly linear to oblong. Flowers unequally 5-merous; pedicel 1–3 mm. Sepals blackish brown spotted, subovate to broadly lanceolate, 2.8–3 mm, base spurless, apex obtuse. Petals yellow, sub-oblong, 3.7–4 mm, base subconnate and slightly narrowed, apex obtuse and obscurely mucronate.

Stamens 10; antesealous ones 2.9–3.2 mm; antepetalous ones inserted ca. 1.2 mm from petal base. Nectar scales linear-spatulate, ca. 0.7 mm, apex obtuse. Carpels obovoid, 2.8–3 mm, base subconnate. Follicles 2.8–3 mm, 2- or 3-seeded; placenta lunulate. Seeds obovoid-oblong, 0.9–1.2 mm, mammillate. Fl. Aug–Sep, fr. Sep.

• Grassland slopes; 3700–4600 m. S Qinghai (Zadoi Xian), W Sichuan (Kangding Xian).

50. *Sedum pratoalpinum* Fröderström, Acta Horti Gothob. 15: 24. 1942.

牧山景天 *mu shan jing tian*

Herbs annual, glabrous. Roots fibrous. Flowering stems branched near base, erect, 2–4 cm. Leaf blade oblong, 3–5 mm, base broadly spurred, apex obtuse. Cyme corymbiform, many flowered; bracts broadly lanceolate. Flowers unequally 5-merous, long pedicellate. Sepals broadly lanceolate, ca. 3 mm, base spurless, apex subacute. Petals ± free, whitish when dry, lanceolate, ca. 4 mm, base broadened, apex obtuse.

Stamens 10; antesepalous ones longer; antepetalous ones inserted 1–1.2 mm from petal base. Nectar scales linear-spatulate, ca. 0.7 mm, apex obtuse. Carpels obovoid, ca. 3 mm, base connate, apex divergent. Styles long. Follicles 1–3-seeded; placenta basal. Seeds subovoid, ca. 1 mm, mammillate. Fl. Aug–Sep, fr. Sep.

• Alpine pastures, bare places on mountain summits; 4300–4600 m. S Qinghai (Zhidoi Xian), W Sichuan (Danba Xian).

51. *Sedum paracelatium* Fröderström, *Acta Horti Gothob.* 15: 17. 1942.

敏感景天 *min gan jing tian*

Herbs annual, glabrous. Roots fibrous. Flowering stems many branched above base, erect, 6–10 mm. Leaves larger toward stem apex; leaf blade lanceolate to oblong, 4–7 mm, basal spur obtuse and entire or rarely ± lobed, apex abruptly and shortly apiculate. Cyme corymbiform, few flowered; bracts oblong. Flowers unequally 5-merous. Sepals abaxially dark red mottled, oblong, unequal, 4.2–6 mm, base obtusely spurred, apex acute. Petals yellow, oblong, 6–7 mm, base connate for ca. 0.5 mm, apex long mucronate. Stamens 10; antesepalous ones 4–4.5 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales oblong spatulate, ca. 0.5 mm, apex obtuse. Follicles suberect, 5–5.5 mm, 10–12-seeded, base connate for 1.5–1.8 mm; placenta falcate. Seeds subovoid, ca. 0.8 mm, mammillate. Fl. Aug–Sep, fr. Sep–Oct.

• Grasslands, meadows, shady places on alpine slopes, sunny places, rocks in valleys, beaches; 3200–4400 m. W Sichuan (Dawu Xian, Kangding Xian).

52. *Sedum luchuanicum* K. T. Fu, *Acta Phytotax. Sin.* 12: 65. 1974.

禄劝景天 *lu quan jing tian*

Herbs annual, glabrous. Roots fibrous. Stems branched from base, erect, 5–9 cm. Proximal stem leaves very small; leaf blade subulate, linear-lanceolate to triangular-lanceolate, 1–7 mm, veins 3–5, brown spotted, basal spur broadly 3-lobed or truncate, apex acuminate. Cyme corymbiform, 3–9-flowered; bracts linear-lanceolate to triangular-lanceolate. Flowers unequally 5(or 6)-merous; pedicel 3–4 mm. Sepals linear-lanceolate to sub lanceolate, 5.8–7.5 mm, veins 3–5, brown spotted, base obtusely long spurred, apex acuminate. Petals purplish red, linear-lanceolate, 9–10.5 mm, base connate for 0.3–0.7 mm, apex long mucronate. Stamens 10(–12); antesepalous ones 6–6.8 mm; antepetalous ones inserted 2.5–3 mm from petal base. Nectar scales broadly spatulate, 0.7–0.8 mm, apex obtuse. Follicles erect, free, lanceolate, 8–10 mm, 7–9-

seeded; placenta sublunulate. Seeds obovoid, 1.2–1.4 mm, few mammillate. Fl. Sep–Oct, fr. Nov.

• Rock crevices; ca. 4400 m. NC Yunnan (Luquan Xian).

53. *Sedum fedtschenkoi* Raymond-Hamet, *Russk. Bot. Zhurn.* 1914: 2. 1914.

尖叶景天 *jian ye jing tian*

Herbs annual. Stems branched from base, ascending, 2.5–4.5 cm. Leaf blade linear-lanceolate, 4.7–8 mm, base obtusely spurred, apex acute. Cyme corymbiform, very lax, few flowered. Flowers unequally 5-merous. Sepals lanceolate to subobovate, 3–5 mm, base spurred, apex acuminate. Petals ± free, yellow, suboblong, ca. 4 mm, apex shortly acuminate. Stamens 10; antesepalous ones ca. 2.8 mm; antepetalous ones ca. 1.5 mm, inserted 0.8–1 mm from petal base. Nectar scales suborbicular-spatulate, ca. 0.5 mm, apex rounded to retuse. Carpels erect, base connate for 0.8–0.9 mm, apex abruptly tapered. Follicles broadly ovoid, 3–3.5 mm, 3–8-seeded; placenta falcate. Seeds ovoid, 0.8–1 mm, minutely mammillate. Fl. Aug, fr. Sep.

• Meadows near river beaches, swampy places by beaches in valleys, lake banks, rocks on alpine slopes, steppes, granite crevices; 3300–4800 m. S Qinghai, W Sichuan, E Xizang.

54. *Sedum purdomii* W. W. Smith, *Notes Roy. Bot. Gard. Edinburgh* 9: 126. 1916.

裂鳞景天 *lie lin jing tian*

Herbs annual, glabrous. Stems simple or branched from base, erect, 4.5–5.5 cm. Leaf blade linear-oblong to oblong, 4–5 mm, base truncate and shortly spurred, apex obtuse. Cyme more than 10-flowered. Flowers unequally 5-merous; pedicel 1–4 mm. Sepals oblong, 2–3 mm, base shortly spurred, apex obtuse. Petals yellow, narrowly oblanceolate, 4.5–5 mm, apex subobtusely and mucronate. Stamens 10; antepetalous ones equaling petals, inserted ca. 1 mm from petal base. Nectar scales broadly linear-spatulate, ca. 0.7 × 0.8 mm, apex parted to lobate. Carpels basally connate for ca. 1 mm. Follicles divergent, broad, 3–4 mm, 2–4-seeded; placenta falcate. Seeds densely mammillate, basally narrowly winged. Fl. Aug.

• Gravelly places in alpine zone; 3700–4000 m. S Gansu.

55. *Sedum chingtungense* K. T. Fu, *Acta Phytotax. Sin.* 12: 67. 1974.

景东景天 *jing dong jing tian*

Herbs annual, glabrous. Stems prostrate, 4–15 cm. Leaf blade spatulate and ca. 1 cm on proximal leaves, subpanduriform and 4–8 mm on distal ones, basal spur broad and obtuse, apex obtuse. Flower solitary, terminal, unequally 5-merous. Sepals narrowly oblong to ± oblanceolate-oblong, 4.5–6 mm, base obtusely spurred, apex obtuse. Petals yellow, subobovate, ca. 5.8 mm, base connate and slightly narrowed, apex obtuse. Stamens 10; antepetalous ones inserted ca. 2 mm from petal base. Nectar scales linear, 1–1.2 mm, apex slightly dilated, retuse. Carpels basally connate for 1.2–1.8 mm, apically divergent. Follicles oblong, 4–5 mm, many

seeded; placenta lunulate. Seeds obovoid, ca. 0.7 mm, mammillate; funicle curved. Fl. Apr, fr. May.

• Sides of wells; ca. 2100 m. WC Yunnan (Jingdong Xian).

56. *Sedum sinoglaciale* K. T. Fu, Acta Phytotax. Sin. 12: 67. 1978.

冰川景天 *bing chuan jing tian*

Sedum glaciale Franchet, J. Bot. (Morot) 1896: 290. 1896, not de Candolle (1828).

Herbs annual, glabrous. Stems branched from base, erect or ascending, 1.5–3 cm. Leaf blade linear to linear-oblong, 4–7 mm, base spurred, apex subobtuse. Cyme corymbiform, 1–3-flowered; bracts linear to linear-oblong. Flowers unequally 5-merous; pedicel 3–7 mm. Sepals oblong to linear-oblong, 5–7 mm, veins 6–8, basal spur truncate or obtuse, apex acute. Petals yellow, subobovate, 7–7.5 mm, base connate for 0.5–0.8 mm, apex obtuse and very shortly mucronate. Stamens 10; antesepalous ones 5.5–6 mm; antepetalous ones inserted ca. 2 mm from petal base. Nectar scales spatulate, widened near base, 1–1.5 mm, apex retuse. Carpels erect, ± free. Styles ca. 1.8 mm. Follicles almost free, oblong, ca. 7 mm, 5-seeded; placenta falcate, not stalked. Seeds oblong, ca. 1 mm, mammillate. Fl. Aug, fr. Sep.

• Thickets in meadows, slopes; 3000–4700 m. NW Yunnan (Lijiang Naxi Zu Zizhixian, Zhongdian Xian).

57. *Sedum semilunatum* K. T. Fu, Acta Phytotax. Sin. 12: 67. 1974.

月座景天 *yue zuo jing tian*

Herbs annual, glabrous. Roots fibrous. Stems simple or 2- or 3-branched at base, erect, 1–1.8 cm. Leaf blade brown spotted, broadly oblanceolate to subobovate, 3.2–3.5 mm, base broadly spurred, apex obtuse. Cyme 1–3-flowered. Flowers unequally 5-merous; pedicel 2–3 mm. Sepals brown spotted, obovate to subobovate, 3.5–3.8 mm, base obtusely spurred, apex obtuse. Petals yellow, suboblong, 3.8–3.9 mm, base connate for ca. 0.3 mm, apex ± helmet-shaped. Stamens 10; antesepalous ones 3.5–4 mm; antepetalous ones inserted 1–1.2 mm from petal base. Nectar scales linear, 1–1.3 mm, apex obtuse to subrounded. Carpels free. Styles ca. 1 mm. Follicles oblong, 2.5–3.5 mm, 2-seeded; placenta falcate, 2-branched. Seeds narrowly obovoid, ca. 1 mm, smooth. Fl. Aug, fr. Sep.

• W Yunnan (Dali Xian).

58. *Sedum ramentaceum* K. T. Fu, Acta Phytotax. Sin. 12: 71. 1974.

糠秕景天 *kang bi jing tian*

Herbs biennial, glabrous. Stems simple or few branched at base, erect, 0.8–1.2 cm. Proximal stem leaves yellowish green and deciduous, others persistent; leaf blade linear- to oblanceolate-oblong, 3.5–5.5 mm, base broadly spurred, apex obtuse to subacute. Cyme corymbiform, 1–3-flowered; bracts linear-oblong to oblanceolate-oblong. Flowers equally or unequally 5-merous; pedicel 1.5–3 mm. Sepals suboblong to

narrowly ovate, 3–4.6 mm, base spurless, apex subacute. Petals yellow, suboblong, 3.8–5 mm, base slightly narrowed, apex obtuse. Stamens 5 or 10; antesepalous ones (when present) 2.5–3.8 mm; antepetalous ones ca. 2 mm, inserted 1–1.1 mm from petal base. Nectar scales linear to ± club-shaped, 0.8–1 mm, apex obtuse. Carpels divergent. Styles ca. 0.8 mm. Follicles free, broadly ovoid, 2.5–4 mm, 4- or 5-seeded. Seeds oblong, 1–1.1 mm, ramentaceous, basal appendage stomach-shaped; funicle long. Fl. Jul, fr. Aug.

• Rocks along trails on alpine ridges; ca. 4500 m. W Sichuan.

59. *Sedum trichospermum* K. T. Fu, Acta Phytotax. Sin. 12: 68. 1974.

毛籽景天 *mao zi jing tian*

Herbs annual, glabrous. Roots fibrous. Stems simple or branched, erect or ascending, 2.5–5 cm. Leaf blade linear to linear-lanceolate, 2.5–7.1 mm, base spurred, apex subacute. Cyme corymbiform, few to many flowered. Flowers unequally 5-merous; pedicel 1–2.5 mm. Sepals suboblong, ca. 3 mm, base spurless, apex obtuse. Petals suboblong, 4–4.5 mm, base free to subconnate, apex obtuse and ± helmet-shaped. Stamens 10; antesepalous ones ca. 3.5 mm; antepetalous ones inserted 0.8–1 mm from petal base. Nectar scales linear to sublinear-spatulate, apex obtuse. Carpels divergent, base connate. Follicles oblong, 2- or 3-seeded; placenta lunulate. Seeds hairlike, basal appendage stomach-shaped; funicle long. Fl. Aug–Sep, fr. Sep–Oct.

• Alpine grasslands by trails; 4000–4600 m. W Sichuan.

60. *Sedum prasinopetalum* Fröderström, Acta Horti Gothob. 15: 20. 1942.

绿瓣景天 *lu ban jing tian*

Herbs annual, yellowish green when dry, glabrous. Stems simple or branched, erect or ascending, 3–7 cm. Leaf blade narrowly oblong to broadly lanceolate, 3–5 mm, basal spur obtuse or ± lobed, apex obtuse to subacute. Cyme corymbiform, few flowered; bracts broadly oblanceolate. Flowers unequally 5-merous, long pedicellate. Sepals yellowish green, oblong, 3–4.6 mm, veins 3–5, blackish, base spurless, apex obtuse. Petals ± free, yellow, greenish yellow when dry, subovate, 5–6 mm, apex obtuse and incurved. Stamens 10; antepetalous ones inserted 1.5–2 mm from petal base. Nectar scales linear-spatulate, 0.4–0.8 mm, apex obtuse. Carpels erect, base broad. Follicles green when dry, 4–5 mm, 12–14-seeded. Seeds obovoid, 0.5–0.7 mm, minutely mammillate, basal appendage stomach-shaped; funicle long. Fl. Aug–Sep, fr. Sep–Oct.

• Rocks in thickets, alpine grasslands; 4100–4500 m. S Qinghai (Jigzhi Xian, Zhidoi Xian), W Sichuan (Dawu Xian, Kangding Xian).

61. *Sedum forrestii* Raymond-Hamet, Notes Roy. Bot. Gard. Edinburgh 5: 118. 1912.

川滇景天 *chuan dian jing tian*

Herbs biennial, glabrous. Stems branched from base, erect or ascending, 2–4 cm. Leaf blade oblong to subovate, 4.5–10 mm, base truncately spurred, apex obtuse. Cyme corymbiform, dense, many flowered; bracts oblong to subovate. Flowers unequally 5-merous; pedicel ca. 3.5 mm. Sepals oblong to obovate, 3.2–6.5 mm, base obtusely to truncately spurred, apex obtuse. Petals free, yellow, oblong to suboblong, 5.5–6 mm, apex obtuse. Stamens 10; antepetalous ones inserted 0.5–1.5 mm from petal base. Nectar scales linear to sublinear-spatulate, 1.6–1.8 mm, apex obtuse. Carpels basally connate for 0.5–1 mm. Follicles oblong, 5–6.5 mm, 3–5-seeded. Seeds oblong, minutely mammillate, basal appendage tobacco pipe-shaped; funicle long. Fl. Jul–Aug, fr. Aug–Sep.

• Grasslands, broad pastures, summits, exposed rocks, rock crevices on slopes, talus on alpine slopes; 3300–4300 m. NW Yunnan (Lijiang Naxi Zu Zizhixian, Zhongdian Xian).

62. *Sedum perrottii* Raymond-Hamet, Bull. Soc. Bot. France 71: 157. 1924.

甘肃景天 gan su jing tian

Sedum anthoxanthum Fröderström.

Herbs annual, glabrous. Roots shortly fibrous. Stems branched from base, erect, 2–6 cm. Leaf blade linear-lanceolate to linear-obovate, 4–8 mm, base obtuse and shortly spurred, apex subacute to subobtuse. Cyme corymbiform, ± dense, 5–15-flowered; bracts linear-obovate to linear-lanceolate. Flowers unequally 5-merous; pedicel 3–4 mm. Sepals oblong to linear-lanceolate, 2.5–4.5 mm, base obtuse and shortly spurred, apex subacute. Petals free, yellow, ± narrowly oblong to subobovate-oblong, 4–6 mm, apex obtuse. Stamens 10; antepetalous ones inserted 1–1.5 mm from petal base. Nectar scales linear-spatulate, 0.5–0.7 mm, apex subobtuse. Carpels erect, base connate for 0.6–1.6 mm. Styles long. Follicles lanceolate, 4.5–5 mm, 4- or 5-seeded; placenta subfalcate. Seeds ovoid, ca. 1.2 mm, mammillate; funicle long. Fl. Jul, fr. Aug.

• Thickets in meadows, grasslands, alpine meadows; 4000–4300 m. SW Gansu, SE Qinghai (Baima Xian), N Sichuan.

63. *Sedum longifuniculatum* K. T. Fu, Acta Phytotax. Sin. 12: 70. 1974.

长珠柄景天 chang zhu bing jing tian

Herbs annual, glabrous. Stems simple or branched at base, erect to ± arched, 5–12 cm. Proximal stem leaf blade linear-oblong, 3–12 mm, base shortly spurred, apex obtuse. Cyme corymbiform, many flowered; bracts linear-oblong. Flowers unequally 5-merous; pedicel 1.5–5 mm. Sepals linear-oblong, unequal, 5.5–6.5 mm, base obtuse and shortly spurred, apex obtuse. Petals yellow, suboblong, 7–7.2 mm, base connate for 0.4–0.5 mm, apex shortly mucronate. Stamens 10; antesealous ones 5–5.2 mm; antepetalous ones 4–4.1 mm, inserted 1.8–2 mm from petal base. Nectar scales broadly linear-spatulate, apically expanding into a

transversely oblong to suborbicular appendage 0.4–0.5 mm. Carpels erect, base connate for ca. 2 mm. Styles ca. 1.5 mm. Follicles oblong, 7.3–7.5 mm, usually ca. 7-seeded. Seeds obovoid, 1.1–1.4 mm, minutely mammillate; funicle long. Fl. Aug, fr. Aug–Sep.

• Grassy places on mountain summits; ca. 4200 m. NC Sichuan (Li Xian).

64. *Sedum didymocalyx* Fröderström, Acta Horti Gothob. 15: 21. 1942.

双萼景天 shuang e jing tian

Herbs annual, glabrous. Roots fibrous. Stems branched at base, erect, 1–3 cm. Proximal stem leaf blade subovate and 3–3.5 mm, others oblanceolate and 5–5.5 mm, base obtuse and shortly spurred, apex obtuse.

Cyme 1–3-flowered; bracts oblanceolate. Flowers unequally 5-merous or equally 4- or 5-merous. Sepals of lateral flowers in 1 series, those of terminal flower in 2 series; outer sepals subovate, 6–6.5 mm, base obtusely spurred, apex obtuse; inner sepals broadly lanceolate, apex subacute. Petals ± free, yellow, oblong, 5.5–6 mm, apex obtuse. Stamens 10; antesealous ones ca. 4 mm; antepetalous ones inserted ca. 2 mm from petal base. Nectar scales linear, slightly contracted at middle, ca. 8 mm, apex obtuse. Carpels divergent, base subconnate. Styles ca. 1 mm. Follicles suboblong, 4.8–5 mm, many seeded. Seeds obovoid, ca. 1 mm, mammillate; funicle curved, very long. Fl. Aug, fr. Sep.

• Alpine grasslands, rock crevices; 4400–4700 m. W Sichuan.

65. *Sedum erici-magnusii* Fröderström, Acta Horti Gothob. 15: 22. 1942.

大炮山景天 da pao shan jing tian

Herbs annual, glabrous. Stems branched from base, erect, 1–3 cm. Leaf blade oblong, 1.5–3.5 mm, basal spur entire and subtruncate or ± 2-cleft, apex acuminate to spinose-cuspidate. Cymes terminal or axillary, 1- or 2-flowered; bracts broadly lanceolate, apex subacute. Flowers unequally 4- or 5-merous or irregular, shortly pedicellate. Sepals oblong, unequal, 2.8–3.2 mm, base obtusely spurred, apex cuspidate. Petals free, yellowish, subovate, 2–2.3 mm, apex obtuse. Stamens 8–10; antesealous ones 1.8–2 mm; antepetalous ones inserted ca. 0.5 mm from petal base. Nectar scales linear-spatulate, ca. 1 mm, apex obtuse. Carpels 3 or 4 (or 5), ovoid, 2–2.8 mm, base subconnate, apex abruptly narrowed. Styles short. Follicles 4–8-seeded. Seeds subovoid, ca. 0.8 mm, smooth or minutely papillate. Fl. Aug, fr. Aug–Sep.

• Pastures on slopes, granite in glacial valleys, gravelly places, sandy beaches, rock crevices on slopes; 3800–4900 m. W Gansu, W Sichuan, E Xizang.

- 1a. Basal spur of leaf blade ± 2-cleft; seeds minutely papillate 65a. subsp. *erici-magnusii*
- 1b. Basal spur of leaf blade entire, subtruncate; seeds smooth 65b. subsp. *chilianense*

65a. *Sedum erici-magnusii* subsp. *erici-magnusii*

大炮山景天(原亚种) da pao shan jing tian (yuan ya zhong)

Sedum erici-magnusii var. *subalpinum* Fröderström.

Basal spur of leaf blade \pm 2-cleft. Seeds minutely papillate. Fl. Aug, fr. Aug–Sep.

• Pastures on slopes, granite in glacial valleys, gravelly places, sandy beaches, rock crevices on slopes; 3800–4900 m. W Sichuan, E Xizang.

65b. *Sedum erici-magnusii* subsp. *chilianense* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 11: 170. 1991.

祈连山景天 qi lian shan jing tian

Basal spur of leaf blade entire, subtruncate. Seeds smooth.

• Slopes. W Gansu (Qilian Shan).

66. *Sedum bergeri* Raymond-Hamet, Bull. Mus. Hist. Nat. (Paris) 15: 488. 1909.

长丝景天 chang si jing tian

Herbs perennial, glabrous. Sterile stems 2.5–3.5 cm. Flowering stems branched, erect, 10–28 cm. Proximal stem leaves verticillate, others alternate or subverticillate; leaf blade linear-spatulate, 0.8–3.5 cm, base obtusely spurred, apex subacute. Cyme corymbiform, dense; bracts leaflike. Flowers shortly pedicellate, unequally 5-merous. Sepals adaxially brown spotted, linear to suboblong, 3.2–6 mm, base spurless, apex subacute and mammillate. Petals \pm free, yellow, oblong, 6–8 mm, base slightly narrowed, apex shortly mucronate. Stamens 10; antesealous ones 4.8–6.5 mm; antepetalous ones inserted 1.7–2.5 mm from petal base. Nectar scales subquadrangular, apically slightly widened, 0.3–0.5 mm. Carpels erect, base connate for 1.3–1.6 mm. Styles 1.7–1.8 mm. Follicles oblong, 5–7 mm, many seeded; placenta subfalcate. Seeds obovoid, 0.6–0.7 mm, shallowly mammillate. Fl. Sep–Oct, fr. Nov.

• Rocks on slopes; 3000–3500 m. E Yunnan.

67. *Sedum chauveaudii* Raymond-Hamet, Notul. Syst. (Paris) 1: 137. 1910.

轮叶景天 lun ye jing tian

Herbs perennial, glabrous. Sterile stems 3–6 cm. Flowering stems ascending, \pm stout or slender, 8–18 cm; basal nodes with adventitious roots. Leaves 3-verticillate or alternate, subsessile; leaf blade adaxially brown spotted, spatulate, 0.8–2.2 \times 3–5 mm, adaxially papillate, basal spur obtuse or slightly 2-cleft, apex obtuse. Cyme corymbiform, lax, many flowered; bracts leaflike. Flowers shortly pedicellate, unequally 5-merous. Sepals adaxially rust-colored spotted, linear-spatulate, unequal, 4.5–6.5 mm, adaxially mammilliform, basal spur broad and obtuse, apex rounded to obtuse. Petals yellow, lanceolate to oblong, 8–10 mm, base connate for ca. 1.5 mm, apex shortly mucronate. Stamens 10; antepetalous ones ca. 4.5 mm, inserted 2–3 mm from petal base. Nectar scales quadrangular to oblong, apically slightly widened, 0.5–

0.6 mm. Carpels basally connate for ca. 1.5 mm, adaxially slightly gibbous or not. Styles long. Follicles oblong, ca. 7.5 mm, many seeded. Seeds ovoid, ca. 0.8 mm, basally papillate. Fl. Aug–Nov, fr. Oct–Dec.

Rocks in mixed and *Picea* forests, shady moist ravine banks, valleys near water, and on sunny slopes, rock crevices in alpine zone, edges of rocky slopes; 1700–3800 m. NW Guizhou, SW Sichuan, E Yunnan [Nepal].

- 1a. Flowering stems slender; leaves alternate; carpels adaxially slightly gibbous 67b. var. *margaritae*
1b. Flowering stems \pm stout; leaves 3-verticillate; carpels adaxially not gibbous 67a. var. *chauveaudii*

67a. *Sedum chauveaudii* var. *chauveaudii*

轮叶景天(原变种) lun ye jing tian (yuan bian zhong)

Sedum triphyllum Praeger.

Flowering stems \pm stout. Leaves 3-verticillate. Carpels adaxially not gibbous. Fl. Sep–Nov, fr. Oct–Dec.

Rocks in *Picea* forests, shady moist ravine banks, and on sunny slopes, edges of rocky slopes; 2500–3800 m. SW Sichuan, E Yunnan [Nepal].

67b. *Sedum chauveaudii* var. *margaritae* (Raymond-Hamet) Fröderström, Acta Horti Gothob. 6(App.): 55. 1931.

互生叶景天 hu sheng ye jing tian

Sedum margaritae Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 142. 1910.

Flowering stems slender. Leaves alternate. Carpels adaxially slightly gibbous. Fl. Aug.

• Rocks in mixed forests and valleys near water, rock crevices in alpine zone; ca. 1700 m. NW Guizhou, SW Sichuan, NE Yunnan.

68. *Sedum tsonanum* K. T. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 41. 1980.

错那景天 cuo na jing tian

Herbs perennial, glabrous. Sterile stems 1–3 cm. Flowering stems ascending, 8–10 cm; basal nodes with adventitious roots. Leaves 3-verticillate; leaf blade adaxially green and sometimes reddish brown spotted, sublinear-spatulate, 5–20 \times 1–4 mm, base obtusely spurred, apex obtuse. Cyme corymbiform, lax, many flowered; bracts leaflike. Flowers shortly pedicellate, unequally 5-merous. Sepals adaxially reddish brown spotted, linear-lanceolate, subequal, 3.5–5 mm, base spurless, apex rounded to obtuse. Petals yellow, linear-lanceolate, 9–11 \times ca. 2 mm, base connate for 2–3 mm, apex subacute. Stamens 10; antesealous ones inserted in cleft between petals; antepetalous ones inserted ca. 4 mm from petal base. Nectar scales suboblong, apically slightly widened, 0.3–0.4 mm. Carpels basally connate for 1.2–1.3 mm. Styles ca. 2 mm. Follicles oblong, ca. 7 mm, 8–10-seeded. Seeds narrowly ovoid, ca. 0.8 mm, minutely mammillate. Fl. Sep, fr. Oct.

• Rocks on slopes in valleys; 2900–3500 m. S Xizang (Cona Xian).

69. *Sedum dielsii* Raymond-Hamet, Malpighia 26: 57. 1913.

乳瓣景天 ru ban jing tian

Sedum angustipetalum Fröderström; *S. leblancae* Raymond-Hamet var. *dielsii* (Raymond-Hamet) Fröderström.

Herbs perennial, glabrous. Rootstock sometimes very stout; nodes with adventitious roots. Flowering stems simple or many branched, erect or ascending, 6–18 cm. Leaves 3- or 4-verticillate; leaf blade obovate to suboblong, 1–2 cm, base obtuse and shortly spurred. Cyme corymbiform; bracts subobovate. Flowers unequally 5-merous. Sepals broadly linear to obovate-linear, unequal, 3–5 mm, base spurless, apex obtuse and long papillate. Petals ± free, yellow, narrowly lanceolate, 7–10 mm, apex subobtuse, helmet-shaped, mucronate, and papillate. Stamens 10; antepetalous ones 3.5–4.5 mm, inserted 2–3 mm from petal base. Nectar scales broadly spatulate, ca. 1 mm, apex retuse. Carpels erect, base connate for 1–1.5 mm. Styles 1.5–1.7 mm. Follicles ovoid to subovoid-globose, many seeded; placenta linear. Seeds broadly obovoid, ca. 0.8 mm, densely and minutely papilliferous. Fl. Sep–Oct, fr. Nov.

•Rocks; 700–1900 m. S Gansu, W Hubei (Shennongjia Linqu), N Sichuan.

70. *Sedum leblancae* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 311. 1910.

钝萼景天 *dun e jing tian*

Herbs biennial, glabrous. Rootstock ± woody, rooting at nodes. Stems branched from base, erect, 5–16 cm, sometimes apically mammillate. Proximal stem leaves 4-verticillate, others alternate; leaf blade obovate-linear, 4–18 mm, basal spur obtuse, margin mammillate, apex obtuse. Cyme corymbiform, many flowered; bracts leaflike. Flowers unequally 5-merous; pedicel 2–6 mm. Sepals adaxially sometimes reddish brown striped toward apex, linear to linear-oblong, unequal, 3.1–3.8 mm, base spurless, apex obtuse and long papillate. Petals yellow, oblong, 3.6–7 mm, base connate for 0.2–0.7 mm, apex subacute and mucronate. Stamens 5 or 10; antepetalous ones 1.8–4.2 mm, inserted 1–1.7 mm from petal base. Nectar scales broadly linear-spatulate to subquadrangular, 0.4–0.6 mm, apex retuse. Carpels basally connate for 1.1–1.3 mm. Styles ca. 1.8 mm. Follicles ovoid-oblong, 3.2–6 mm, many seeded. Seeds ovoid, 0.6–0.7 mm, minutely papilliferous. Fl. Sep–Nov, fr. Oct–Dec.

•Rocks in *Picea* forests, among mosses on limestone rocks in alpine zone, rocks in valleys, rock walls; 1500–3500 m. SW Sichuan, NW Yunnan.

71. *Sedum tsiangii* Fröderström, Sinensia 3: 199. 1933.

安龙景天 *an long jing tian*

Herbs annual, glabrous. Stems branched, suberect, 10–15 cm. Leaves alternate or 3- or 4-verticillate; leaf blade oblanceolate, 1–1.5 cm, sparsely papillate-hairy, base obtuse and shortly spurred, apex subobtuse. Cyme corymbiform, lax, few flowered; bracts subobovate. Flowers shortly pedicellate, unequally 5-merous. Sepals lanceolate to linear, unequal, 3.5–4.2 mm, base spurless, apex subobtuse and papillate. Petals yellow, oblong to broadly ovate, 4.5–5 mm, base subconnate to free, apex

mucronate. Stamens 10; antepetalous ones 1.8–2.2 mm, inserted 0.5–1.2 mm from petal base. Nectar scales quadrangular or linear-spatulate, slightly constricted at middle, ca. 0.5 mm, apex truncate. Carpels erect, base connate for 0.8–1.2 mm. Styles ca. 0.5 mm. Follicles subovoid, 3.5–4.5 mm, many seeded; placenta linear. Seeds ovoid, ca. 0.5 mm, mammillate. Fl. Sep–Oct, fr. Oct–Nov.

•Rocks on slopes or cliffs; 400–2700 m. W Guizhou, E Yunnan.

1a. Leaves alternate, sometimes basally verticillate; petals oblong; nectar scales quadrangular 71a. var. *tsiangii*

1b. Leaves 3- or 4-verticillate; petals broadly ovate; nectar scales linear-spatulate 71b. var. *torquatum*

71a. *Sedum tsiangii* var. *tsiangii*

安龙景天(原变种) *an long jing tian* (yuan bian zhong)

Leaves alternate, sometimes basally verticillate. Petals oblong. Nectar scales quadrangular. Fl. Sep–Oct, fr. Oct–Nov.

•Moist rocks on slopes or cliffs; 400–2700 m. W Guizhou (Hezhang Xian, Shuicheng Tequ), NE Yunnan (Zhenxiang Xian).

71b. *Sedum tsiangii* var. *torquatum* (Fröderström) K. T. Fu in S. H. Fu & K. T. Fu, Fl. Reipubl. Popularis Sin. 34(1): 126. 1984.

珠节景天 *zhu jie jing tian*

Sedum leblancae Raymond-Hamet var. *torquatum* Fröderström, Acta Horti Gothob. 6(App.): 76. 1931.

Leaves 3- or 4-verticillate. Petals broadly ovate. Nectar scales linear-spatulate.

•Rocks on slopes; ca. 2600 m. SE Yunnan (Funing Xian).

72. *Sedum chuhsingense* K. T. Fu, Bull. Bot. Res., Harbin 7 (1): 68. 1987.

楚雄景天 *chu xiong jing tian*

Herbs perennial. Roots fibrous. Stems erect, gray, stout, subquadrangular, 8–10 mm, to 4 mm thick when dry; apical nodes branched. Leaves 4-verticillate; leaf blade linear-lanceolate, 4–16 × 1.5–2 mm, basal spur rounded or ± lobed, apex acute. Cyme scorpioid, often 4-branched, many flowered. Flowers sessile or subsessile, unequally 5-merous. Sepals broadly ovate to suboblong, equal, ca. 1.5 × 1.2 mm, base subconnate and spurless, apex obtuse or acute. Petals yellow, lanceolate-ovate, 5–5.5 × 1.8–2 mm, base subconnate, apex ± helmet-shaped. Stamens 10; antepetalous ones 3.5–4 mm; antepetalous ones 2.5–3 mm, inserted ca. 1 mm from petal base. Nectar scales oblong-spatulate, ca. 0.2 mm, apex retuse. Carpels free, narrow. Styles ca. 1.8 mm. Follicles broadly ovoid, ca. 4 mm, 12–14-seeded. Seeds ovoid, ca. 0.3 mm. Fl. Oct, fr. Oct–Nov.

•C Yunnan (Chuxiong Xian).

- 22b. Leaves 4-verticillate, similarly shaped basally and apically on stem.
- 23a. Leaf apex acute; nectar scales spatulate-oblong; anthers blackish 114. *S. phyllanthum*
- 23b. Leaf apex obtuse; nectar scales oblong-cuneate; anthers not blackish 115. *S. yvesii*
- 15b. Leaves usually alternate or opposite (verticillate or verticillate and alternate in *S. cryptomerioides*, *S. dimorphophyllum*, and *S. subtile*).
- 24a. Leaves verticillate and alternate apically on stems, verticillate basally on old stems 87. *S. dimorphophyllum*
- 24b. Leaves alternate or opposite (verticillate apically on stems in *S. cryptomerioides* and occasionally in *S. subtile*).
- 25a. Leaves usually conspicuously pseudopetiolate.
- 26a. Leaf base spurred; sepals equal; bracts very large, resembling stem leaves 120. *S. concarpum*
- 26b. Leaf base spurless; sepals unequal; bracts very small, mostly obscure 121. *S. engleri*
- 25b. Leaves inconspicuously pseudopetiolate.
- 27a. Leaves opposite (sometimes alternate or less often verticillate in *S. actinocarpum*).
- 28a. Stems 3–7 cm 110. *S. baileyi*
- 28b. Stems 10–25 cm.
- 29a. Leaf apex emarginate 108. *S. emarginatum*
- 29b. Leaf apex truncate.
- 30a. Stems erect; carpels suboblong to ovoid, ca. 2.5 mm; follicles horizontally spreading 107. *S. actinocarpum*
- 30b. Stems basally prostrate; carpels lanceolate, ca. 5 mm; follicles obliquely spreading 109. *S. makinoi*
- 27b. Leaves alternate (opposite basally on stems in *S. bulbiferum* and occasionally in *S. formosanum*).
- 31a. Plants pubescent throughout.
- 32a. Leaves obovate; sepals ovate 88. *S. giajajae*
- 32b. Leaves spatulate; sepals spatulate 89. *S. lungtsuanense*
- 31b. Plants glabrous throughout.
- 33a. Bulbils usually present in leaf axils 90. *S. bulbiferum*
- 33b. Bulbils absent in leaf axils.
- 34a. Sterile stems absent.
- 35a. Sepals wider at base than at middle.
- 36a. Sepals triangular 100. *S. microsepalum*
- 36b. Sepals linear-ovate 101. *S. hangzhouense*
- 35b. Sepals narrower at base than at middle.
- 37a. Leaves 0.6–1 cm; seeds minutely papillate or reticulate.
- 38a. Leaves ca. 6 × 1.5 mm; seeds reticulate 102. *S. morrisonense*
- 38b. Leaves 6–10 × 3–5 mm; seeds papillate 103. *S. nokoense*
- 37b. Leaves 1.2–3 cm; seeds smooth.
- 39a. Flowering stems branched from base 104. *S. formosanum*
- 39b. Flowering stems simple, rarely apically branched.
- 40a. Leaves oblanceolate to narrowly elliptic-lanceolate; sepals 1.5–3 × ca. 0.5 mm; seeds yellow 105. *S. parvisepalum*
- 40b. Leaves linear-cuneate, spatulate, or obovate; sepals 3–5 × 1–1.5 mm; seeds brown 106. *S. alfredii*
- 34b. Sterile stems present.
- 41a. Leaves of flowering stems terete or ± flat.
- 42a. Leaves of flowering stems very crowded, 0.3–0.5 cm; sepals to 3 mm 91. *S. uniflorum*
- 42b. Leaves of flowering stems ± remote, 7–10 cm; sepals to 4 mm 92. *S. japonicum*
- 41b. Leaves of flowering stems flat.
- 43a. Leaves of flowering stems minutely papillate on distal margin; sepals minutely papillate; follicles stellately subhorizontally spreading 93. *S. planifolium*
- 43b. Leaves of flowering stems not minutely papillate on margin; sepals not minutely papillate; follicles stellately divaricate but not horizontally spreading.
- 44a. Sepals spurless; leaves of sterile stems rosulate 95. *S. sekiteiense*
- 44b. Sepals spurred; leaves of sterile stems not rosulate.

- 45a. Leaves opposite or 3–6-verticillate basally on stem or verticillate and crowded apically on stem.
 46a. Leaves opposite or 3–6-verticillate basally on stem 96. *S. subtile*
 46b. Leaves verticillate and crowded apically on stem 99. *S. cryptomerioides*
 45b. Leaves all alternate.
 47a. Sepals subequal; seeds smooth 94. *S. hengduanense*
 47b. Sepals unequal; seeds papillate.
 48a. Petals narrowly elliptic-lanceolate 97. *S. tosaense*
 48b. Petals oblong-lanceolate 98. *S. nanchuanense*

73. *Sedum oligospermum* Maire in Maire & Weiller, Bull. Soc. Hist. Nat. Afrique N. 30: 278. 1939.

大苞景天 da bao jing tian

Sedum bracteatum Diels, Bot. Jahrb. Syst. 29: 362. 1900, not Viviani (1824); *S. amplibracteatum* K. T. Fu; *S. amplibracteatum* var. *emarginatum* (S. H. Fu) S. H. Fu; *S. bracteatum* var. *emarginatum* S. H. Fu.

Herbs annual. Stems 15–50 cm. Proximal stem leaves alternate and deciduous, others 3-verticillate and usually aggregate below inflorescences; pseudopetiole to 1 cm; leaf blade rhombic-elliptic, 3–6 × 1–2 cm, tapered toward both ends, apex attenuate or emarginate to retuse. Cyme corymbiform, often 3-branched, each branch 1–4-flowered; bracts ± orbicular, slightly longer or subequaling flower. Flowers sessile, unequally 5-merous, less often equally 5-merous. Sepals broadly triangular, 0.5–0.7 mm, apex obtuse. Petals yellow, oblong, 5–6 × 1–1.5 mm, midvein inconspicuous, apex subacute. Stamens 10 or 5, slightly shorter than petals. Nectar scales suboblong to oblong-spatulate, 0.7–0.8 mm. Carpels divergent, ca. 5 mm, base connate for ca. 2 mm. Styles long. Follicles 1- or 2-seeded. Seeds fusiform, 2–3 mm, minutely mammillate. Fl. Jun–Sep, fr. Aug–Nov.

Shady moist slopes in forests, rocks on forested mountain slopes; 1100–2800 m. Gansu, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan [Myanmar].

The typical form of this species has the leaf apex attenuate. Collections from Sichuan with the leaf apex emarginate to retuse were treated in FRPS as *Sedum amplibracteatum* var. *emarginatum*.

74. *Sedum wilsonii* Fröderström, Acta Horti Gothob. 10(App.): 166. 1935.

兴山景天 xing shan jing tian

Herbs annual. Roots fibrous. Flowering stems branched near base, erect or ascending, to 20 cm. Pseudopetiole ca. 6 mm; leaf blade ovate to orbicular, 1.5–3 × ca. 1.5 cm, base broadly cuneate, apex rounded, minutely papillate. Cyme large, many flowered; involucre absent; bracts linear-subspatulate, 3–3.5 × ca. 0.6 mm, apex acute and apiculate. Flowers unequally 5-merous. Sepals ovate, ca. 1 mm, base spurless, apex subacute. Petals yellow, ovate-oblong, 3.5–4.5 × 1.5–1.8 mm, base subconnate, apex subacute. Stamens 10, ca. 3.5 mm; antepetalous ones inserted near petal base. Nectar scales quadrangular-subspatulate, ca. 0.6 × 0.4 mm, apex subemarginate. Carpels erect, ovoid-lanceolate,

1.2–2 mm, base connate for ca. 4 mm. Styles 1–1.2 mm. Follicles 2- or 3-seeded. Seeds subovoid-oblong, 1–1.3 mm, smooth, winged at both ends.

• Hubei (Xingshan Xian).

75. *Sedum tetractinum* Fröderström, Acta Horti Gothob. 6 (App.): 103. 1931.

四芒景天 si mang jing tian

Flowering stems simple or branched, erect or prostrate, 9–15 cm. Leaves alternate or 3-verticillate, pseudopetiolate, usually deciduous; leaf blade ovate to orbicular, 1.5–3.2 × 1–1.3 cm, base abruptly and narrowly cuneate, apex rounded, minutely papillate. Cyme scorpioid, pedunculate; bracts shortly petiolate, orbicular, 4–5 mm, apex minutely papilliferous. Flowers unequally 4-merous. Sepals narrowly triangular, ca. 0.8 mm, apex obtuse. Petals lanceolate-oblong, 3.5–5 × ca. 1 mm, apex obtuse. Stamens 8, slightly shorter than petals; antepetalous ones inserted ca. 0.8 mm from petal base. Nectar scales broadly spatulate, ca. 0.7 × 0.4 mm, apex obtuse. Carpels 4, divergent, 4–5 mm, base connate. Styles ca. 0.8 mm. Follicles many seeded. Seeds ovoid, 1–1.2 mm, mammillate. Fl. Aug–Sep.

• Among rocks near streams; 500–1000 m. Anhui, Guangdong, Guizhou, Jiangxi.

76. *Sedum triactina* A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 460. 1930.

三芒景天 san mang jing tian

Triactina verticillata J. D. Hooker & Thomson, J. Linn. Soc. 2: 103. 1858; *Sedum verticillatum* (J. D. Hooker & Thomson) Raymond-Hamet (1912), not Linnaeus (1753).

Herbs slender, weak. Flowering stems 7–35 cm. Leaves often 3-verticillate or opposite, inconspicuously pseudopetiolate, usually persistent around middle of stem; leaf blade spatulate-oblong, 0.7–3.5 × ca. 0.7 cm, base narrowly cuneate, apex emarginate to obtuse. Cyme corymbiform, lax; bracts obovate-orbicular to suborbicular, 5–10 × ca. 6 mm. Flowers 5-merous. Sepals narrowly triangular-oblong, ca. 1 × 0.3–0.4 mm, apex obtuse. Petals yellow, narrowly oblong, 4–6.5 × 2–3 mm, apex obtuse. Stamens 10, slightly shorter than petals; antepetalous ones inserted 0.5–0.8 mm from petal base. Nectar scales 3, linear or linear-spatulate,

0.6–1 mm, apex emarginate or obtuse. Carpels 3, divergent, ca. 5 mm, base connate for 1.5–2.5 mm. Styles ca. 1 mm. Follicles divergent, 1- or 2-seeded. Seeds oblong-ovoid, ca. 0.6 mm, minutely mammillate. Fl. Jun–Jul, fr. Aug.

Rocks in mixed forests and valleys near water, mossy rocks in alpine *Rhododendron* thickets, shady moist rocks in valleys, rock crevices in alpine zone; 2200–3700 m. W Sichuan, E Xizang, Yunnan [Bhutan, Nepal, Sikkim].

- 1a. Leaf blade 0.7–3.5 cm; nectar scales linear, 0.6–0.7 mm, apex obtuse 76a. subsp. *triactina*
1b. Leaf blade less than 1 cm; nectar scales linear-spatulate, ca. 1 mm, apex emarginate 76b. subsp. *leptum*

76a. *Sedum triactina* subsp. *triactina*

三芒景天(原亚种) san mang jing tian (yuan ya zhong)

Flowering stems 7–35 cm. Leaf blade 0.7–3.5 cm. Nectar scales linear, 0.6–0.7 mm, apex obtuse. Fl. Jun–Jul, fr. Aug.

Rocks in mixed forests and valleys near water, rock crevices in alpine zone; 2200–3600 m. SW Sichuan, E Xizang, Yunnan [Bhutan, Nepal, Sikkim].

76b. *Sedum triactina* subsp. *leptum* Fröderström, Acta Horti Gothob. 15: 28. 1942.

小三芒景天 xiao san mang jing tian

Flowering stems 9–14 cm. Leaf blade less than 1 cm. Nectar scales linear-spatulate, ca. 1 mm, apex emarginate.

• Mossy rocks in alpine *Rhododendron* thickets, shady moist rocks in valleys; 3200–3700 m. W Sichuan (Kangding Xian, Xiaojin Xian).

77. *Sedum leptophyllum* Fröderström in Handel-Mazzetti, Symb. Sin. 7: 412. 1931.

薄叶景天 bo ye jing tian

Herbs perennial. Roots short, fibrous. Sterile shoots slender, weak, ca. 8.5 cm; leaves 6 or 7, crowded apically. Flowering stems arising from base of plant, 10–20 cm, basally leafless. Leaves alternate, less often verticillate; leaf blade narrowly linear-lanceolate to oblanceolate, 2–2.3 × 1–2 mm, base shortly spurred, apex obtuse. Cyme corymbiform, ca. 8 cm in diam.; branches scorpioid; bracts resembling stem leaves, 0.5–2 cm. Flowers subsessile, 5-merous. Sepals slightly spreading, narrowly triangular, ca. 1 × 0.4 mm, apex obtuse. Petals narrowly lanceolate, 4–4.5 × ca. 1.2 mm, apex mucronate. Stamens 10; antesealous ones 3.3–3.5 mm; antepetalous ones 2.5–2.7 mm, inserted ca. 0.7 mm from petal base. Nectar scales 3, broadly spatulate-oblong, 0.8–1 mm. Carpels 3, lanceolate to oblong, ca. 4 mm, base connate for ca. 1 mm, apex slightly divergent. Styles ca. 1 mm. Follicles 2–5-seeded. Fl. Jul–Aug, fr. Sep–Oct.

• About 1300 m. S Anhui (Huang Shan), SE Hubei, Hunan, NW Zhejiang (Tianmu Shan).

78. *Sedum hakonense* Makino, Bot. Mag. (Tokyo) 15: 35. 1901.

本州景天 ben zhou jing tian

Sterile stems suberect, rather stout, 6–8 cm. Flowering stems basally ascending or prostrate but apically erect, ± tufted, 5–10 cm. Leaves alternate; leaf blade narrowly oblanceolate, flat, 1–2.5 × (0.1–)0.2–0.3 cm, apex ± obtuse. Cyme usually 3-branched, corymbiform, lax, many flowered; bracts 4–10 mm. Flowers sessile, unequally 4-merous. Sepals triangular to narrowly elliptic, unequal, 0.5–1 mm, apex very obtuse. Petals yellow, suboblong to broadly lanceolate, 4–4.5 mm, apex shortly mucronate. Stamens 8, slightly shorter than or equaling petals. Nectar scales broadly spatulate, shortly clawed, apex obtuse. Carpels subdivergent, 4.5–5.5 mm, base connate for 2–2.5 mm. Styles short. Follicles many seeded. Seeds lanceolate, 1–1.3 mm. Fl. Aug, fr. Sep.

Forests on mountain summits; 1600–1700 m. N Guangdong (Renhua Xian) [Japan].

79. *Sedum dongzhiense* D. Q. Wang & Y. L. Shi, Bull. Bot. Res., Harbin 10(3): 48. 1990.

东至景天 dong zhi jing tian

Herbs perennial. Roots red, fibrous. Rootstock prostrate. Stems erect or arched, 14–25 cm. Leaves alternate, pseudopetiolate; leaf blade oblanceolate, 2.5–4.5 × 0.6–0.8 cm, base cuneate to tapered, apex obtuse. Cyme 3-branched, 2–12 cm in diam., many flowered; branches 2-forked; bracts oblanceolate to subrhomboid, 0.2–4.5 cm, apex obtuse to suboblique. Flowers unequally 4-merous; pedicel of central flower 2–6 mm or absent. Sepals narrowly triangular, 1–1.2 mm, apex obtuse. Petals yellow, linear-lanceolate, ca. 7 × 1.5 mm, apex acute. Stamens 8; antesealous ones ca. 5 mm; antepetalous ones ca. 4 mm, inserted ca. 1 mm from petal base; anthers purplish red. Nectar scales subtriangular, ca. 0.5 × 0.4 mm, apex retuse. Carpels divergent, narrowly ellipsoid, ca. 5 mm, base connate for 1.3–1.5 mm. Styles 1.5–2 mm. Follicles stellately divergent, many seeded. Seeds narrowly ovoid, brown papilliferous. Fl. Jun–Jul, fr. Jul.

• S Anhui (Dongzhi Xian).

80. *Sedum leucocarpum* Franchet, J. Bot. (Morot) 10: 288. 1896.

白果景天 bai guo jing tian

Sedum variicolor Praeger.

Herbs perennial. Roots numerous, fibrous. Sterile shoots present. Stems 5–20 cm. Leaves alternate, less often 3-verticillate, ± crowded, sessile, spatulate to broadly obovate, 1.2–2 × 0.4–0.7 cm, base cuneate and shortly spurred, apex obtuse and apiculate. Cyme 3-

branched, corymbiform, 5–7.5 cm in diam., minutely papillate; branches usually 2-forked. Flowers sessile, 4- or 5-merous. Sepals oblong-linear, oblong-lanceolate, or oblong-spatulate, unequal, 3–10 mm, base slightly widened and spurless, apex obtuse. Petals deep yellow, ovate- to lanceolate-oblong, 5–7 × 1.3–1.5 mm, apex acuminate and mucronate. Stamens 8–10, ca. 4 mm; antepetalous ones inserted near petal base. Nectar scales 4 or 5, subquadrangular, 0.6–0.8 × 0.5–0.6 mm, apex emarginate. Carpels 4 or 5, ca. 4 mm. Styles 1.5–1.8 mm. Follicles initially erect but later divergent. Seeds brown, oblong, ca. 0.3 mm, minutely mammillate.

• Rocks in valleys; 1600–2800 m. SW Sichuan, NW Yunnan.

81. *Sedum wenchuanense* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 116. 1965.

汶川景天 wen chuan jing tian

Sedum japonicum Siebold ex Miquel f. *rugosum* Fröderström; *S. uniflorum* Hooker & Arnott subsp. *rugosum* (Fröderström) K. T. Fu.

Herbs perennial. Rhizome short, basally with fibrous roots, apically with numerous shoots. Sterile shoots present. Stems erect, ca. 7 cm, basally leafless. Leaves alternate, imbricate, sessile, ovate, 3–4 × 1.5–2 mm, base rounded and spurred, apex obtuse to acute. Cyme corymbiform, ca. 1.5 cm in diam.; bracts linear. Flowers sessile, unequally 5-merous. Sepals ovate to lanceolate, 2.5–3 × ca. 1.2 mm, base spurred, apex obtuse to acute. Petals lanceolate, 3–3.5 × ca. 1 mm, apex mucronate. Stamens 10, shorter than petals; antepetalous ones inserted ca. 1 mm from petal base; filaments ca. 2 mm; anthers yellow. Nectar scales quadrangular, ca. 0.4 × 0.6 mm, apex obtuse. Carpels divergent, ovoid-lanceolate, subequalling stamens. Styles slender, ca. 0.8 mm. Follicles stellately horizontally spreading, 10–12-seeded, base connate for ca. 0.5 mm. Fl. Jun.

• Exposed poor soils; 1300–2400 m. NC Sichuan (Maowen Qiang Zu Zizhixian, Wenchuan Xian).

82. *Sedum tianmushanense* Y. C. Ho & F. Chai, Bull. Bot. Res., Harbin 9(4): 32. 1989.

天目山景天 tian mu shan jing tian

Herbs perennial. Rhizome short; underground nodes with globose dormant bulbils. Flowering stems branched from base, erect, 5–12 cm. Leaves alternate; leaf blade linear to linear-lanceolate, 3–15 × ca. 2 mm, base spurred, apex obtuse. Cyme 2–7-branched, corymbiform, lax, 1.5–3.5 cm, few flowered; bracts resembling stem leaves. Flowers sessile, unequally 5-merous. Sepals obovate-lanceolate, unequal, 1.5–7 mm, base shortly spurred, apex obtuse. Petals yellowish, narrowly ovate, ca. 4 mm, base connate for ca. 0.5 mm, apex subacute. Stamens 10, shorter than petals;

antepetalous ones ca. 2 mm, inserted ca. 1.5 mm from petal base. Nectar scales subquadrangular, ca. 0.5 mm. Carpels ovoid-lanceolate, ca. 3.5 mm, base connate for ca. 1 mm. Follicles stellately divergent, 5–7-seeded. Seeds brown, oblong-ovoid, ca. 1 mm, minutely mammillate. Fl. May, fr. Jun.

• Shady moist areas on forested slopes; ca. 1000 m. NW Zhejiang (Tianmu Shan).

83. *Sedum latentibulosum* K. T. Fu & G. Y. Rao, Acta Bot. Boreal.-Occid. Sin. 8: 122. 1988.

潜茎景天 qian jing jing tian

Herbs perennial. Roots fibrous. Rhizome slender; nodes with dormant bulbils; bulbils white, oblong to globose, 5–8 × 4–5 mm, bulb leaves scalelike, 12–18 cm, delicate. Flowering stems erect, slender, 1–1.6 cm. Leaves opposite proximally on stem, 4-verticillate at middle, alternate at apex; leaf blade narrowly linear, 1.2–3 × 0.1–0.2 cm, base shortly spurred, apex obtuse. Cyme 3-branched, few flowered; bracts linear, longer than flowers. Flowers sessile, unequally 5-merous. Sepals brown spotted, narrowly triangular-lanceolate, 2–2.5 × 0.8–1 mm, base very shortly spurred, apex obtuse to acute. Petals linear-lanceolate, 6–7 × ca. 1 mm, base somewhat broad, apical mucro ca. 0.3 mm. Stamens 10; antepetalous ones 4.5–5 mm; antepetalous ones ca. 3.5 mm, inserted ca. 1 mm from petal base; anthers oblong-ovoid, ca. 1 mm, apex obtuse. Nectar scales sub-spatulate, ca. 0.4 mm, apex rounded. Carpels divergent, oblong, base connate for ca. 1.5 mm. Follicles many seeded. Seeds oblong, basal appendage saccate. Fl. Apr–Jun, fr. Jul–Aug.

• Rocky cliffs, rocks with mosses; 800–900 m. N Jiangxi (Lu Shan).

84. *Sedum woronowii* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 315. 1910.

长萼景天 chang e jing tian

Herbs annual. Roots fibrous. Flowering stems simple, erect, ± slender and weak, ca. 12 cm. Leaves alternate. Cyme lax, ca. 6 × 9 cm, many flowered. Flowers unequally 5-merous. Sepals linear-obovate, unequal, 4–8.8 × 2–2.3 mm, base connate and spurless, apex obtuse. Petals linear-triangular, 4–4.4 × 1.4–1.6 mm, margin entire, apex acute. Stamens 10; antepetalous ones 3–3.3 mm; antepetalous ones inserted below middle of petals, adnate for ca. 1 mm; anthers ca. 0.4 mm. Nectar scales linear, 0.8–1.1 × ca. 0.2 mm, apex obtuse. Carpels divergent, 4–4.7 mm, base connate for 1.2–1.5 mm. Styles 0.8–1 mm. Follicles divaricate, many seeded. Seeds obovoid, ca. 0.6 mm, minutely mammillate. Fr. Nov.

• W Yunnan (Dali Xian).

85. *Sedum multicaule* Wallich ex Lindley, Bot. Reg. 26 (misc.): 58. 1840.

多茎景天 duo jing jing tian

Herbs perennial. Stems basally branched, 5–15 cm, smooth or rugose when dry. Leaves alternate, imbricate;

leaf blade linear, 1–1.5 × 0.1–0.2 cm, base shortly spurred, apex acuminate and apiculate. Cymes with several scorpioid branches. Flowers sessile or very shortly pedicellate, unequally 5-merous. Sepals linear, linear-lanceolate, sublanceolate, or narrowly suboblong, unequal or equal, 5–6.5 mm, base spurless, apex acuminate and apiculate or spinose. Petals yellow, oblong-ovate, 5–6 mm, apex long mucronate. Stamens 10, slightly shorter than petals. Nectar scales spatulate-quadrangular or transversely oblong, minute, ca. 0.5 × 0.5 mm, apex emarginate. Carpels initially erect, horizontally spreading in fruit. Follicles 4–6 mm. Seeds ovoid, 0.5–0.7 mm. Fl. Jul–Aug, fr. Aug–Sep.

Rocks on forested slopes, rock crevices, rock walls; 1300–3500 m. Gansu, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Pakistan, Sikkim].

- 1a. Stems smooth when dry; sepals linear to linear-lanceolate, unequal, apex acuminate and apiculate; nectar scales spatulate-quadrangular 85a. subsp. *multicaule*
1b. Stems rugose when dry; sepals sublanceolate to narrowly suboblong, equal, apex spinose-acuminate; nectar scales transversely oblong 85b. subsp. *rugosum*

85a. *Sedum multicaule* subsp. *multicaule*

多茎景天(原亚种) duo jing jing tian (yuan ya zhong)

Sedum dolosum K. T. Fu; *S. mekongense* Praeger.

Stems smooth when dry. Sepals linear to linear-lanceolate, unequal, apex acuminate and apiculate. Nectar scales spatulate-quadrangular. Fl. Jul–Aug, fr. Aug–Sep.

Rocks on forested slopes, rock crevices, rock walls; 1300–3500 m. Gansu, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Pakistan, Sikkim].

85b. *Sedum multicaule* subsp. *rugosum* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 6: 105. 1986.

皱茎景天 zhou jing jing tian

Stems rugose when dry. Sepals sublanceolate to narrowly suboblong, equal, apex spinose-acuminate. Nectar scales transversely oblong. Fr. Sep.

• Rock crevices on slopes; 2200–2300 m. SE Xizang (Zayü Xian), NW Yunnan (Weixi Xian).

86. *Sedum polytrichoides* Hemsley in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 23: 286. 1887.

藓状景天 xiang zhuang jing tian

Herbs perennial. Sterile shoots numerous. Stems ascending, tufted, slender, 5–10 cm, woody. Leaves alternate; leaf blade linear to linear-lanceolate, 5–11 × 1–2 mm, base spurred, apex acute. Cyme 2–4-branched, many flowered. Flowers shortly pedicellate, unequally 5-merous. Sepals lanceolate-ovate, equal, 1.5–2.5 mm, base spurless, apex acute. Petals yellow, narrowly lanceolate, 5–7 mm, apex acuminate. Stamens 10, slightly shorter than petals. Nectar scales minute, base cuneate, apex broadly rounded. Carpels ± erect.

Follicles stellately divergent, ovoid-oblong, 4.5–5 mm, many seeded, base connate for ca. 1.5 mm, apical beak erect, ca. 1.5 mm. Seeds oblong, less than 1 mm. Fl. Jul–Aug, fr. Aug–Sep.

Rocky slopes; ca. 1000 m. Anhui, Heilongjiang, Henan, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Zhejiang [Japan, Korea].

87. *Sedum dimorphophyllum* K. T. Fu & G. Y. Rao, Acta Bot. Boreal.-Occid. Sin. 8: 117. 1988.

二型叶景天 er xing ye jing tian

Herbs perennial. Sterile branches 2–4 cm. Flowering stems ascending, 5–12 cm, base usually prostrate. Basal leaves verticillate, deciduous on old stems; leaf blade acicular-spinose to linear, 0.8–2 cm, base spurred. Distal leaves alternate and persistent; leaf blade lanceolate, 8–10 × 2–3 mm, apex obtuse. Cyme simple or 2-branched, few flowered; bracts leaflike, 6–6.5 × 1–1.5 mm, spurred. Flowers sessile, unequally 5-merous. Sepals narrowly triangular to lanceolate, unequal, 2.5–4.3 × 0.8–1 mm, base connate and spurless, apex obtuse. Petals free, yellow, oblong-lanceolate, 4.5–5.3 × 1.2–1.5 mm, apex mucronate. Stamens 10; antesealous ones 3.2–3.5 mm; antepetalous ones 2.4–2.6 mm, inserted ca. 0.6 mm from petal base; anthers yellowish. Nectar scales transversely oblong, ca. 0.4 × 0.7–0.9 mm, apex truncate to retuse. Carpels free, oblong-lanceolate, 3–3.5 mm; ovules many. Styles 0.8–1 mm. Follicles stellately divergent. Seeds subovoid, ca. 0.8 mm, longitudinally minutely papillate. Fl. Jul–Aug.

• Shady moist rocks, along trails near ravines; 2800–2900 m. W Sichuan (Daocheng Xian).

88. *Sedum gijajae* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 313. 1910.

柔毛景天 rou mao jing tian

Herbs perennial, pubescent on stems and leaves. Roots fibrous. Sterile stems 8–20 cm; leaves alternate, obovate, 4.5–5.5 × ca. 2.6 mm, base enlarged and spurred, apex obtuse. Flowering stems simple, erect, 5–16 cm, villous. Leaves alternate; leaf blade obovate-oblong, 8–15 × 3–5 mm, hairy, base slightly narrowed and spurred, margin ciliate, apex obtuse. Cyme corymbiform, lax, 3.5–6 × 4–8 cm; bracts ovate-linear, 3–4 × 1.5–1.8 mm, spurred. Flowers unequally 5-merous; pedicel 1–1.5 mm. Sepals ovate, 2.3–2.5 × 1.3–1.5 mm, base spurless. Petals yellow, ovate, 4.8–5 × 1.7–2 mm, apex obtuse. Stamens 10, 3–4 mm. Nectar scales quadrangular-spatulate, 0.3–0.5 mm. Carpels 1.8–2 mm, base connate. Styles 1.5–2 mm. Follicles divergent, many seeded. Fl. Aug.

• Rocks in valleys, trailsides; 2600–3000 m. W Sichuan (Kangding Xian).

89. *Sedum lungtsuanense* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 115. 1965.

龙泉景天 long quan jing tian

Herbs annual. Roots fibrous. Flowering stems branched, erect, 5–6 cm; branches divaricate, sparsely pubescent. Leaves sparsely pubescent, base obscurely spurred, apex acute. Flowers shortly pedicellate, unequally 5-merous. Sepals lanceolate to spatulate, ca. 2 × 0.8–1 mm, sparsely puberulent, basal spur inconspicuous, apex acute. Petals lanceolate, 4.5–5 × ca. 1 mm, base slightly narrowed, apex mucronate. Stamens 10, shorter than petals; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales quadrangular-spatulate, ca. 0.3 mm. Carpels erect, 3–3.5 mm, glabrous, base connate for ca. 1 mm. Fl. Jun.

• Fujian, SW Zhejiang (Longquan Xian).

90. *Sedum bulbiferum* Makino, Ill. Fl. Jap. 1(10): 2. 1891.

珠芽景天 *zhu ya jing tian*

Sedum alfredii Hance var. *bulbiferum* (Makino) Fröderström; *S. jinianum* X. H. Guo.

Herbs perennial. Roots fibrous. Stems 7–22 cm; bulbils in leaf axils white, globose, viviparous. Proximal stem leaves opposite; leaf blade ovate-spatulate. Distal stem leaves alternate; leaf blade spatulate-oblancheolate, 10–15 × 2–4 mm, base tapered, apex obtuse. Cyme 3-branched, many flowered; branches 2-forked. Flowers unequally 5-merous. Sepals free, lanceolate to oblanceolate, 3–4 × ca. 1 mm, base shortly spurred, apex obtuse. Petals free, yellow, lanceolate, 4.5–5 × ca. 1.2 mm, apex mucronate. Stamens 10, ca. 3 mm. Nectar scales obovate, ca. 0.6 mm. Carpels basally connate for ca. 1 mm, apically divergent. Styles ca. 1 mm. Fl. Apr–Jul.

Shade of trees on mountains or plains; near sea level to 1000 m. Anhui, Fujian, Guangdong, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan].

No original material of *Sedum jinianum* has been seen by the present authors, but the differences from *S. bulbiferum*, as indicated in the protologue (Acta Bot. Yunnan. 18: 297. 1996), do not seem adequate to justify the recognition of a distinct species.

91. *Sedum uniflorum* Hooker & Arnott, Bot. Beechey Voy. 263. 1841.

梳花佛甲草 *shu hua fu jia cao*

Sedum sasakii Hayata.

Herbs perennial. Roots fibrous, borne in basal nodes of stem. Flowering stems many branched, tufted, prostrate, 5–7 cm. Leaves alternate, very crowded; leaf blade narrowly cylindrical-oblong, 3–5 × ca. 2 mm, margin laevigate. Cyme 1-branched, racemelike, 1(–6)-flowered. Flowers sessile, unequally 5-merous. Sepals oblong-linear, ca. 3 × 1 mm, base slightly narrowed, apex rounded to obtuse. Petals ovate-spatulate, ca. 3.5 × 1.5 mm, base slightly narrowed, apex acute. Stamens 10; antepetalous ones shorter than petals; anthers ellipsoid, ca. 0.5 mm, apex obtuse to subobtuse. Carpels narrowly ovoid, 2–4 mm, base connate, apex

acuminate. Follicles divaricate, stellately divergent at maturity. Seeds yellow, ca. 0.5 mm. Fl. May.

Sandy places near seashores. N Taiwan [Japan].

92. *Sedum japonicum* Siebold ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 156. 1965.

日本景天 *ri ben jing tian*

Sedum chrysastrum Hance; *S. uniflorum* Hooker & Arnott subsp. *japonicum* (Siebold ex Miquel) H. Ohba. Herbs perennial, creeping. Sterile shoots 2–4 cm. Flowering stems many branched, ascending, slender, 10–20 cm. Leaves alternate, remote, sessile, linear-spatulate, terete to ± flat, 7–10 × 0.2–0.3 cm, base shortly spurred, apex obtuse. Cyme 3-branched, corymbiform, 4–8 cm in diam. Flowers unequally 5-merous; pedicel thick, short. Sepals linear-oblong to subtriangular, 2–4 mm, base shortly spurred, apex obtuse. Petals yellow, oblong-lanceolate, 6–7 × ca. 1.5 mm, apex acuminate. Stamens 10; antepetalous ones subequaling or longer than petals; antepetalous ones slightly shorter than petals, inserted ca. 1.2 mm from petal base. Nectar scales minute, base broadly cuneate, apex rounded-truncate. Carpels lanceolate, ca. 5 mm, base connate for ca. 2 mm. Styles ca. 1 mm. Follicles horizontally stellately divergent. Fl. May–Jun, fr. Jul–Aug.

Shady moist places on slopes; below 1000 m. Anhui, Guangdong, Hunan, Jiangxi, Taiwan, Zhejiang [Japan].

Sedum jiaodongense Y. M. Zhang & X. D. Chen (Bull. Bot. Res., Harbin 10(1): 43. 1990), described from E Shandong (Rongcheng Xian: Longxu Island), may possibly be synonymous with this species.

93. *Sedum planifolium* K. T. Fu, Fl. Tsinling. 1(2): 606. 1974.

平叶景天 *ping ye jing tian*

Herbs perennial. Roots fibrous. Sterile shoots ascending, to 10 cm. Flowering stems branched at base, arched ascending, 6–15 cm, usually fleshy, densely leafy. Leaves alternate, imbricate; leaf blade linear-oblancheolate, flat, 8–22 × 2–3.5 mm, basal spur truncate to rounded, margin apically minutely mammillate, apex obtuse. Cyme 3-branched, often scorpioid, many flowered. Flowers shortly pedicellate, unequally 5-merous. Sepals linear-lanceolate, unequal, 2.8–3.8 × 0.8–0.9 mm, base spurless, margin apically minutely mammillate, apex obtuse. Petals free, yellow, oblong-lanceolate, 7.5–7.8 × 1.5–1.8 mm, apex acuminate and mucronate. Stamens 10, shorter than petals; antepetalous ones inserted ca. 0.5 mm from petal base. Nectar scales suborbicular to suboblong, 0.3–0.5 mm, apex rounded and emarginate. Carpels divergent, ovoid-lanceolate, ca. 5 mm, base connate for ca. 1 mm; ovules 10–12. Follicles subhorizontally stellately divergent. Seeds dark brown, obovoid-oblong, ca. 0.7 mm, densely and minutely mammillate. Fl. Jun–Jul, fr. Aug.

• Beaches in valleys, rocks on slopes; 1000–1600 m. Gansu, Shaanxi.

94. *Sedum hengduanense* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 6: 105. 1986.

横断山景天 *heng duan shan jing tian*

Herbs perennial. Roots fibrous. Sterile stems 1.3–1.5 cm. Flowering stems simple or many branched, erect, slender, 3–6 cm. Leaves alternate; leaf blade linear-lanceolate, oblanceolate, subspatulate, narrowly obovate, or obovate, flat, 5–9 × 1–2 mm, base obtusely spurred, apex subacute. Cyme 2- or 3-branched, corymbiform, often scorpioid, 2–3 cm, 10- or more flowered. Flowers 5-merous; pedicel 1–1.5 mm or obscure. Sepals usually 3-marked, suboblong to oblanceolate, subequal, 4–5 × ca. 1 mm, base spurred, apex subacute. Petals yellow, oblong-lanceolate, 3.5–4 × ca. 1 mm, base subconnate, apex acuminate. Stamens 10; antesepalous ones 2.8–3 mm; antepetalous ones 1.8–2 mm, inserted ca. 0.3 mm from petal base; anthers yellowish. Nectar scales 5, broadly cuneate, ca. 0.3 mm, apex subrounded. Carpels 5, subovoid, ca. 3.5 mm. Styles ca. 0.8 mm. Follicles stellately divaricate. Seeds subovoid, 0.5–0.6 mm, smooth. Fl. Jul, fr. Aug.

• Thickets on slopes near river banks, rocks on dry grassy slopes, rock crevices; 2100–2900 m. SW Sichuan, SE Xizang, NW Yunnan.

95. *Sedum sekiteiense* Yamamoto, Icon. Pl. Formos. Suppl. 2: 24. 1926.

石啞佛甲草 *shi ding fu jia cao*

Herbs smooth. Sterile shoots rosulate; rosette leaves alternate, pseudopetiolate. Flowering stems basally creeping or decumbent and rooting at nodes, apically suberect, 6–18 cm, apex sometimes 2-cleft. Stem leaves subopposite, crowded near stem apex; leaf blade narrowly spatulate, 1–2.5 × 0.4–0.6 cm, base tapered, apex obtuse to subobtusely. Cyme cymose. Flowers sessile, (4 or)5-merous. Sepals spatulate to linear-oblanceolate, unequal, 2.8–4 × 1–2 mm, base attenuate to truncate, apex obtuse. Petals linear-lanceolate, equal, 1-veined. Stamens 8–10; antepetalous ones inserted slightly above petal base; filaments ca. 3 mm; anthers oblong. Nectar scales 4 or 5, long, apex emarginate. Carpels 4 or 5, base connate. Styles ca. 1 mm. Follicles stellately divergent, ca. 7 mm in diam., many seeded. Seeds brown, oblong, ca. 0.6 mm, minutely mammillate. Fl. Jun, fr. Nov.

• Mountainous areas. N Taiwan (Taibei, Yilan Xian).

96. *Sedum subtile* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 156. 1865.

细小景天 *xi xiao jing tian*

Herbs perennial. Sterile shoots arising from base. Flowering stems 5–10 cm. Proximal stem leaves opposite or 3–6-verticillate; leaf blade obovate, 5–15 × 3–5 mm. Distal stem leaves alternate; leaf blade oblanceolate-linear, 5–20 × 1–2 mm, apex obtuse. Cyme 2- or 3-branched, lax; branches 3- to several flowered; bracts linear. Flowers unequally 5-merous. Sepals broadly linear to narrowly lanceolate, unequal, 3–7 mm, base

shortly spurred, apex obtuse. Petals yellow, broadly lanceolate, ca. 5 mm, apex acute. Stamens 10; antesepalous ones ca. 4 mm; antepetalous ones inserted slightly above petal base. Nectar scales broadly cuneate, ca. 0.4 × 0.5 mm, apex truncate. Carpels erect, lanceolate, ca. 5 mm, base connate for ca. 2 mm. Styles slender, ca. 2 mm. Follicles stellately divergent at maturity. Fl. Apr–Jun, fr. Jul–Aug.

Shady moist rocks on low mountains; 1000–1500 m. Jiangsu, Jiangxi, Shanxi [Vietnam].

The plants from China have also been treated as *Sedum subtile* subsp. *chinense* H. Ohba (J. Jap. Bot. 61: 227. 1986). *Sedum wannanense* X. H. Guo et al. (Acta Bot. Yunnan. 21: 25. 1999) and *S. wannanense* var. *incarnatum* X. H. Guo et al. (loc. cit.: 26), both described from SE Anhui (Ningguo Xian), may possibly be synonymous with *S. subtile*.

97. *Sedum tosaense* Makino, Bot. Mag. (Tokyo) 6: 52. 1892.

土佐景天 *tu zuo jing tian*

Sedum tosaense subsp. *sinense* K. T. Fu & G. Y. Rao.

Herbs perennial. Sterile shoots present; leaves with blade obovate-spatulate, base cuneate. Flowering stems prostrate when young, later erect, weak, to 15 cm. Leaf blade linear-spatulate, 1.2–2 × 0.5–1 cm, tapered toward base, apex rounded and retuse. Cyme sometimes several branched, many flowered; bracts resembling stem leaves. Flowers unequally 5-merous. Sepals unequal, base spurred. Petals yellow, narrowly elliptic-lanceolate, apex mucronate. Carpels compressed, divergent at maturity, base connate. Styles short. Follicles many seeded. Seeds mammillate. Fl. May–Jul.

N Zhejiang (Lin'an Xian) [Japan].

98. *Sedum nanchuanense* K. T. Fu & G. Y. Rao, Acta Bot. Boreal.-Occid. Sin. 8: 116. 1988.

金佛山景天 *jin fu shan jing tian*

Herbs perennial. Sterile stems suberect, 3–5 cm.

Flowering stems erect or basally prostrate, 5–10 cm, densely leafy; basal nodes with fibrous roots. Leaves alternate; leaf blade oblong to obovate, 5–8 × 2.5–1 mm, base shortly spurred, apex rounded-obtusely. Cyme usually 3-branched, corymbiform, often scorpioid, many flowered. Sepals free, unequal, broadly linear to triangular, 1–2.5 × 0.7–1 mm, base spurred, apex obtuse. Petals yellow, oblong-lanceolate, 4.5–6.5 × 1–1.5 mm, base connate, apex mucronate. Stamens 10; antesepalous ones 3.2–4.6 mm; antepetalous ones inserted ca. 1 mm from petal base; anthers yellowish brown. Nectar scales ± flabellate, ca. 0.5 mm. Carpels ovoid-lanceolate, 3.5–5 mm, base connate; ovules many. Styles 1–1.5 mm. Follicles stellately divergent. Seeds subovoid, ca. 0.6 mm, minutely mammillate. Fl. Jun–Jul.

• Rocks on slopes; ca. 1200 m. SE Sichuan (Nanchuan Xian).

99. *Sedum cryptomerioides* Bartlet & Yamamoto, J. Soc. Trop. Agric. 4: 485. 1932.

杉叶佛甲草 *shan ye fu jia cao*

Herbs perennial. Roots many. Stems tufted, 6–10 cm. Leaves many, verticillate and crowded apically on stem;

leaf blade oblanceolate to linear-spatulate, 10–15 × 2.5–3 mm, ca. 1 mm thick, base attenuate-cuneate and spurless, apex subobtuse. Cyme 2- or 3-branched, lax. Flowers pedicellate, unequally 5-merous. Sepals green, narrowly elliptic, 3–4 × ca. 0.9 mm, apex obtuse. Petals lanceolate-boat-shaped, 4–6 × ca. 1.2 mm, margin membranous, apex mucronate. Stamens 10; antepetalous ones ca. 4 mm. Nectar scales obovate. Carpels lanceolate, ca. 3 × 0.6 mm. Seeds narrowly oblong, ca. 0.6 mm × ca. 0.2 mm. Fl. Jun–Jul.

• Talus on steep slopes; 2000–3500 m. C Taiwan.

100. *Sedum microsepalum* Hayata, Icon. Pl. Formos. 3: 111. 1913.

小萼佛甲草 xiao e fu jia cao

Sedum triangulisepalum T. S. Liu & N. J. Chung; *S.*

truncatistigmum T. S. Liu & N. J. Chung.

Herbs ?perennial. Stems erect or ascending, 10–20 cm, base prostrate and rooting at nodes, apex few branched. Leaves alternate, sessile, narrowly elliptic to oblanceolate, 1–4 × 0.4–1 cm, base attenuate, apex obtuse to rounded. Cyme divaricately branched; bracts lanceolate-linear, ca. 1.5 mm, apex obtuse. Flowers sessile, unequally 5-merous. Sepals triangular, subequal, 1.5–2 × 0.5–1.8 mm, connate to at least middle, apex obtuse. Petals yellow, equal, linear-lanceolate, ca. 6 × 2 mm, apex acuminate. Stamens 10, 3–5 mm; anthers yellow, locules extrorse. Nectar scales opposite carpels, ca. 1.2 × 1.2 mm, apex retuse. Carpels ca. 5 mm, base connate for ca. 2 mm. Styles 1.5–2 mm. Follicles ca. 7 mm, leathery, many seeded. Fl. Jul–Aug.

• Alpine zone; 1700–3000 m. NC Taiwan.

101. *Sedum hangzhouense* K. T. Fu & G. Y. Rao, Acta Bot. Boreal.-Occid. Sin. 8: 119. 1988.

杭州景天 hang zhou jing tian

Herbs annual. Roots fibrous. Flowering stems branched from near base, erect or ascending, 8–20 cm. Leaves alternate; leaf blade narrowly obovate to spatulate-oblong, 20–30 × 0.3–0.7 mm, base narrowly cuneate and spurred, apex obtusely rounded. Cyme large, many flowered; bracts leaflike, 6–20 × 2–5 mm. Flowers sessile, unequally 5-merous. Sepals broadly linear-ovate, subequal, 1.5–2.4 × 0.3–0.6 mm, base spurred, apex obtuse. Petals yellow, linear-lanceolate, 4–4.5 × 0.8–1.2 mm, base connate for ca. 0.5 mm. Stamens 10; antepetalous ones 3.5–4.5 mm; antepetalous ones 2–3 mm, inserted ca. 1.2 mm from petal base; anthers orange. Nectar scales subspatulate, ca. 0.4 mm. Carpels ovoid-lanceolate, 4–4.5 mm, base connate for 1.2–1.5 mm; ovules 10–20. Follicles stellately divaricate. Seeds oblong, ca. 0.5 mm, minutely mammillate, conspicuously ridged. Fl. May–Jun.

• Forested slopes, shady moist rock crevices, rocks along trails. N Zhejiang (Hangzhou Shi).

102. *Sedum morrisonense* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 94. 1908.

玉山佛甲草 yu shan fu jia cao

Herbs perennial, erect, 8–10 cm. Flowering stems branched from base. Leaves ± imbricate; leaf blade oblong-oblanceolate, ca. 6 × 1.5 mm, base shortly spurred, apex obtuse. Cyme often 3-branched, corymbiform, many flowered; bracts resembling stem leaves, shorter than flowers. Flowers sessile, unequally 5-merous, campanulate, ca. 7 mm. Sepals oblong-linear, unequal, ca. 1/2 as long as petals, fleshy, apex obtuse. Petals oblong, 4–6.5 × ca. 1.2 mm, abaxially slightly keeled, apex obtuse. Stamens 10, shorter than or subequaling petals. Nectar scales suboblong, small. Follicles erect or divergent, oblong, ca. 6 mm. Seeds oblong, small, veins minutely and obscurely netted. Fl. Jul–Aug, fr. Oct–Nov.

• Mountainous areas; 2500–3900 m. Taiwan.

103. *Sedum nokoense* Yamamoto, Icon. Pl. Formos. Suppl. 2: 21. 1926.

能高佛甲草 neng gao fu jia cao

Sedum taiwanianum S. S. Ying.

Herbs perennial. Stems 9–20 cm, base prostrate and rooting at nodes, apex branched. Leaves alternate; leaf blade spatulate, 6–10 × 3–5 mm, base rounded and spurred, apex obtuse. Cyme branched, corymbiform. Flowers sessile, unequally 5-merous. Sepals oblanceolate, subspatulate, or linear-lanceolate, unequal, ca. 3 × 1 mm, base slightly narrowed, apex obtuse. Petals linear-lanceolate, equal, ca. 5 × 1.5 mm, abaxially keeled, apex subacuminate. Stamens 10; filaments ca. 4 mm; anthers yellow, ca. 0.8 × 0.5 mm, base cordate, apex obtuse. Nectar scales transversely broadened, apex emarginate. Carpels oblong, ca. 2 × 1.5 mm, base connate, apically attenuate and divergent. Follicles stellately divergent, many seeded. Seeds brownish yellow, oblong, ca. 0.8 × 0.3 mm, minutely mammillate. Fl. Jul, fr. Aug–Oct.

• Rocks in mountainous areas; 2500–3900 m. Taiwan.

104. *Sedum formosanum* N. E. Brown, Gard. Chron. 26: 134. 1885.

台湾佛甲草 tai wan fu jia cao

Herbs perennial. Stems 2- or 3-branched from base, erect, tufted, ± stout, 10–15 cm, densely leafy. Leaves alternate or opposite; leaf blade spatulate, obovate, or suborbicular, ca. 1.5 × 0.8–1.2 cm, apex obtusely rounded. Cyme corymbiform, 5–8 cm in diam., many flowered; bracts leaflike. Flowers sessile, unequally 5-merous, ca. 1 mm in diam. Sepals linear-lanceolate, unequal, 2–3 mm, apex obtuse. Petals yellow, narrowly lanceolate, 6–7 mm, apex sharply pointed. Stamens 10; anthers yellow, shorter than petals. Nectar scales opposite carpels. Carpels broadly lanceolate, 5–6 mm, apex shortly acuminate. Styles ca. 1 mm. Follicles erect, many seeded. Seeds narrowly ellipsoid, ca. 0.4 mm. Fl. Mar–May, fr. Jun–Jul.

Seashores. Taiwan [Japan, Philippines].

105. *Sedum parvisepalum* Yamamoto, Icon. Pl. Formos. Suppl. 2: 22. 1926.

尖萼佛甲草 jian e fu jia cao

Herbs perennial. Stems simple, prostrate at base and rooting at nodes, apically suberect, 17–25 cm. Leaves alternate; leaf blade oblanceolate to narrowly elliptic-lanceolate, 2–2.5 cm × ca. 0.5 mm, base narrowed, apex obtuse. Flowers sessile, unequally 5-merous. Sepals green, linear-oblanceolate to linear, unequal, 1.5–3 × ca. 0.5 mm, apex obtuse. Petals linear-lanceolate, ca. 6 × 2 mm, apex acuminate. Stamens 10; anthers yellow, base subcordate, apex obtuse. Nectar scales opposite carpels. Carpels connate, apical beak ca. 2 mm. Follicles 4–5 × ca. 0.1 mm, leathery. Seeds yellow. Fl. Aug, fr. Oct.

• Mountainous areas; 1800–3000 m. C Taiwan.

106. *Sedum alfredii* Hance, J. Bot. 8: 7. 1870.

东南景天 dong nan jing tian

Herbs perennial. Stems simple or apically branched, ascending, 10–20 cm. Leaves alternate proximally on stem, usually deciduous, crowded distally on stem; leaf blade linear-cuneate, spatulate, or obovate, 1.2–3 × 0.2–0.6 cm, base narrowly cuneate and spurred, apex obtuse and sometimes emarginate. Cyme corymbiform, 5–8 mm in diam., many flowered; bracts leaflike, small. Flowers sessile, unequally 5-merous, ca. 1 mm in diam. Sepals linear-spatulate, 3–5 × 1–1.5 mm, base spurred. Petals yellow, lanceolate to lanceolate-oblong, 4–6 × 1.6–1.8 mm, base connate, apex mucronate. Stamens 10; antesealous ones ca. 4 mm; antepetalous ones ca. 2.5 mm, inserted 1–1.5 mm from petal base. Nectar scales spatulate-quadrangular, ca. 1.2 mm, apex obtusely truncate. Carpels erect, ovoid-lanceolate, ca. 4 mm, base connate. Styles ca. 1 mm. Follicles obliquely divergent. Seeds numerous, brown, ca. 0.6 mm. Fl. Apr–May, fr. Jun–Aug.

Shady moist rocks on forested slopes; 2000–3000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan, Korea].

Sedum shिताense Y. Zheng & D. C. Zhang (in Y. Zheng et al., Bull. Bot. Res., Harbin 20: 246. 2000), described from Anhui, is known to the present authors only from the protologue. It was compared to *S. emarginatum* and *S. kiangnanense*, from which it was separated by its mostly alternate leaves, although these and other features suggest a closer relationship to *S. alfredii*, from which it may be separable by its larger (ca. 1 × 0.5 mm), tuberculate seeds.

107. *Sedum actinocarpum* Yamamoto, Icon. Pl. Formos. Suppl. 2: 17. 1926.

星果佛甲草 xing guo fu jia cao

Herbs ?perennial. Stems simple or apically 2- or 3-branched, erect, slender, 10–18 cm. Leaves alternate, sometimes opposite, less often verticillate; leaf blade spatulate, 0.8–2.7 × 0.4–1.1 cm, basal spur obtuse, apex rounded to obtuse. Cyme sessile, often 3-branched, less often 2-branched, corymbiform. Flowers sessile, unequally 5-merous. Sepals spatulate, oblanceolate, or linear-oblanceolate, unequal, 2.5–4.5 × 2–3

mm, base attenuate, apex obtuse. Petals yellow, narrowly elliptic to lanceolate, ca. 4 × 1.5 mm, midvein conspicuous, base somewhat narrowed, apex acuminate. Stamens 10; anthers oblong, ovoid, or subglobose, ca. 0.4 mm. Nectar scales suboblong, ca. 0.5 × 0.3 mm. Carpels suboblong to ovoid, ca. 2.5 × 8 mm, base connate, apex acuminate and with a beak ca. 0.2 mm. Follicles horizontally spreading. Seeds brown, narrowly oblong, ca. 0.8 mm, tuberculate. Fl. Feb–Mar, fr. Apr–May.

• Mountainous areas; 300–2500 m. Taiwan.

108. *Sedum emarginatum* Migo, J. Shanghai Sci. Inst., Sect. 3, 3: 224. 1937.

凹叶景天 ao ye jing tian

Sedum makinoi Maximowicz var. *emarginatum* (Migo) S. H. Fu.

Herbs perennial. Stems slender, 10–15 cm. Leaves opposite; leaf blade spatulate-obovate to broadly obovate, 1–2 × 0.5–1 cm, base attenuate and shortly spurred, apex rounded and emarginate. Cyme usually 3-branched, 3–6 mm in diam., many flowered. Flowers sessile, unequally 5-merous. Sepals lanceolate to narrowly oblong, 2–5 × 0.7–2 mm, base shortly spurred, apex obtuse. Petals yellow, linear-lanceolate to lanceolate, 6–8 × 1.5–2 mm. Nectar scales oblong, ca. 0.6 mm, apex obtuse. Carpels oblong, 4–5 mm, base connate. Follicles divergent. Seeds brown, minute. Fl. May–Jun, fr. Jul.

• Shady and moist slopes; 600–1800 m. Anhui, Gansu, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

This species is used medicinally.

109. *Sedum makinoi* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 32: 487. 1888.

圆叶景天 yuan ye jing tian

Sedum alfredii Hance var. *makinoi* (Maximowicz) Fröderström.

Herbs perennial. Stems basally prostrate and rooting at nodes, apically erect, 15–25 cm. Leaves opposite, pseudopetiolate; leaf blade obovate to obovate-spatulate, 1.7–2 × 0.6–0.8 cm, base tapered and shortly spurred, apex obtuse. Cyme 2-branched, 8–18 cm in diam.; bracts resembling stem leaves but smaller. Flowers sessile, unequally 5-merous. Sepals linear-spatulate, 2–3 × 0.7–0.8 mm, base shortly spurred, apex obtuse. Petals yellow, lanceolate, ca. 4.5 × 1.2 mm, apex obtusely acuminate. Stamens 10; antesealous ones subequaling petals; antepetalous ones shorter than petals. Nectar scales oblong-spatulate, ca. 0.6 mm. Carpels lanceolate, ca. 5 mm, base connate for ca. 1 mm. Styles ca. 1 mm. Follicles obliquely divergent. Seeds ovoid, small, minutely mammillate. Fl. Jun–Jul.

Shady moist forests in low mountain valleys. Anhui, Zhejiang [Japan]. **110. *Sedum baileyi*** Praeger, Proc. Roy. Irish Acad., B, 35: 4. 1919.

对叶景天 dui ye jing tian

Herbs perennial. Roots fibrous. Rhizome prostrate, long. Stems 3–7 cm. Leaves opposite; leaf blade obovate-spatulate, ca. 1.5 × 0.6 cm, base cuneate and shortly spurred, apex subacute. Cyme corymbiform, few flowered; bracts resembling stem leaves but obovate and smaller. Flowers unequally 5-merous. Sepals oblong-linear, 1.5–2 × ca. 1 mm, basal spur broad and obtuse. Petals lanceolate, 4–5 × ca. 1.5 mm, apex mucronate. Stamens 10, shorter than petals. Nectar scales oblong-spatulate, ca. 0.6 mm, apex obtuse. Follicles divergent, many seeded, base connate for ca. 2 mm. Fl. Apr, fr. Jul.

• Rock crevices on slopes; ca. 900 m. Guangdong, Guangxi, Hunan, Jiangxi.

111. *Sedum jiu lungshanense* Y. C. Ho, Bull. Bot. Res., Harbin 9(4): 31. 1989.

九龙山景天 *jiu long shan jing tian*

Herbs perennial. Sterile stems creeping, slender, rooting at nodes. Flowering stems erect, slender, 8–10 cm. Leaves 3-verticillate or apical ones opposite; leaf blade linear, 5–10 mm, base shortly spurred, apex obtuse and retuse. Cyme usually 3-branched, corymbiform, 3–5 cm, few flowered; bracts leaflike, linear. Flowers sessile, unequally 5-merous. Sepals linear-ovate, 2–3 mm, base shortly spurred, apex obtuse and retuse. Petals yellow, ovate-lanceolate, 5–6 × 1–1.5 mm. Stamens 10, shorter than petals; antepetalous ones inserted ca. 1 mm from petal base; anthers brown. Nectar scales subquadrangular, ca. 0.6 mm. Carpels ovoid-lanceolate, ca. 6 mm, base connate for ca. 2 mm, apex divergent; ovules ca. 10. Styles ca. 2 mm. Follicles divaricate. Seeds dusky, oblong, ca. 0.8 mm, minutely mammillate. Fl. Apr–May.

• Moist forested slopes; 800–900 m. W Zhejiang (Jiulong Shan).

112. *Sedum onychopetalum* Fröderström, Sinensia 3: 199. 1933.

爪瓣景天 *zhao ban jing tian*

Herbs perennial, ± purplish. Roots fibrous. Sterile shoots suberect, slender, 2–4 cm, leafy. Flowering stems several, suberect, tufted, 5–12(–22) cm. Leaves 3- or 4-verticillate; leaf blade broadly linear to lanceolate, 6–11 × 1–1.5 mm, base shortly spurred, apex obtuse. Cyme scorpioid, many flowered; bracts suboblong, ca. 5 mm, apex obtuse. Flowers sessile, unequally 5-merous. Sepals broadly linear to suboblong, ca. 2.5 × 0.8 mm, base spurless, apex obtuse. Petals yellow, lanceolate, ca. 5 × 1.2 mm, apex mucronate. Stamens 10; antesepalous ones ca. 4 mm; antepetalous ones ca. 3 mm, inserted 0.5–0.8 mm from petal base. Nectar scales subquadrangular, ca. 0.5 × 0.4 mm, apex emarginate. Carpels ca. 5 mm, base connate for ca. 1 mm, apex divergent. Styles ca. 1 mm. Follicles many seeded. Seeds subovoid, ca. 0.5 mm, minutely mammillate. Fl. Apr–May, fr. May–Jun.

• Shady moist rocks in open places; ca. 200 m. Anhui, Jiangsu, Zhejiang.

113. *Sedum erythrosperrum* Hayata, Icon. Pl. Formos. 3: 110. 1913.

红籽佛甲草 *hong zi fu jia cao*

Sedum arisanense Yamamoto; *S. brachyrhinchum* Yamamoto.

Herbs annual. Stems branched at base, ca. 8 cm; branches diffuse. Leaves opposite or 3-verticillate, less often alternate; leaf blade obovate-spatulate, 7–12 × 3–6 mm, base attenuate and spurred, apex obtuse to rounded. Cyme 2-branched, divaricate, lax. Flowers sessile, unequally 5-merous. Sepals oblanceolate, ca. 3.5 × 2 mm, apex acuminate. Stamens 10; anthers yellow, globose, ca. 0.3 × 0.2 mm, base subcordate, apex truncate. Nectar scales opposite carpels. Carpels divergent at a definite angle at maturity, oblong, ca. 3 × 2 mm, base connate. Seeds yellow, narrowly oblong, ca. 0.6 mm. Fl. May–Aug, fr. Sep–Dec.

• Mountainous areas; 2000–3500 m. Taiwan.

114. *Sedum phyllanthum* H. Léveillé & Vaniot, Bull. Soc. Agric. Sarthe 39: 318. 1904.

叶花景天 *ye hua jing tian*

Sedum quaternatum Praeger.

Herbs perennial. Stems ascending, robust, to 6 cm, rooting at base. Leaves (3 or) 4-verticillate; leaf blade narrowly lanceolate, 8–14 × 2–2.5 mm, base spurred, apex acute. Cyme 3-branched, scorpioid, ca. 4 cm in diam.; branches 2-forked. Flowers sessile, unequally 5-merous. Sepals narrowly lanceolate-oblong, unequal, 3–5 × ca. 1 mm, base spurless, apex obtuse. Petals yellow, apex mucronate. Stamens 10; antepetalous ones ca. 3 mm, inserted ca. 1.5 mm from petal base; anthers blackish, ca. 1 mm. Nectar scales spatulate-oblong, ca. 0.4 × 0.3 mm, base slightly narrowed, apex obtuse. Carpels stellately divergent at maturity, narrowly lanceolate, 3–3.5 mm. Fl. May, fr. Jun–Jul.

• Rocks, moist slopes; 400–800 m. Guizhou, Henan, Shaanxi.

115. *Sedum yvesii* Raymond-Hamet, Repert. Spec. Nov. Regni Veg. 8: 27. 1910.

短蕊景天 *duan rui jing tian*

Sedum obtusolineare Hayata.

Herbs perennial. Roots fibrous. Sterile shoots 4–8 cm. Flowering stems branched at base, erect, 7–13 cm. Leaves 4-verticillate, sessile, broadly linear to oblanceolate-linear, 5–10 × 1–2 mm, base spurred, apex obtuse. Cyme 0.8–1.5 × 1.5–2.5 cm, few flowered; bracts resembling stem leaves. Flowers unequally 5-merous; pedicel 1–1.5 mm. Sepals broadly linear to oblanceolate, unequal, 3–6 × 1–1.4 mm, apex obtuse. Petals yellow, oblong-ovate, ca. 5 × 2 mm. Stamens 10; antesepalous ones ca. 3 mm; antepetalous ones ca. 2 mm, inserted slightly above petal base. Nectar scales oblong-cuneate, ca. 0.4 mm, apex subtruncate to emarginate. Carpels oblong, ca. 3 mm, base connate for

0.5–1 mm. Styles ca. 1 mm. Follicles divergent, many seeded. Seeds brown, lanceolate-oblong, ca. 1 mm, minutely mammillate. Fl. Apr–May, fr. May.

• Shady moist rocks in ravines; 1000–1300 m. Guizhou, Hubei, Sichuan, Taiwan.

116. *Sedum kiangnanense* D. Q. Wang & Z. F. Wu, Bull. Bot. Res., Harbin 10(3): 46. 1990.

江南景天 *jiang nan jing tian*

Herbs perennial, 10–20 cm tall. Sterile stems erect; leaves 4- or 5-verticillate; leaf blade basally on stem linear-spatulate to oblanceolate, base shortly spurred, apex obtuse to acute; leaf blade distally on stem spatulate to broadly so, base cuneate, apex retuse. Flowering stems suberect. Leaves 4- or 5-verticillate proximally on stem, usually alternate apically; leaf blade broadly linear to oblanceolate, 1–1.8 × 1.5–2.5 cm, base shortly spurred, apex acute. Cyme 3- or 4-branched, scorpioid, 4–6 cm in diam., many flowered; bracts leaflike. Flowers unequally 5-merous; pedicel absent, rarely 0.5–2 mm. Sepals linear-oblong, unequal, 2–10 × 0.5–2 mm, base spurless, apex acute. Petals yellow, broadly lanceolate to narrowly ovate, 6–9 × 2–3 mm, apex acuminate. Stamens 10; antesealous ones ca. 6 mm; antepetalous ones ca. 4.5 mm, inserted ca. 1.5 mm from petal base; anthers red, pollen yellow. Nectar scales ± flabellate, ca. 0.4 × 0.5 mm, base slightly narrowed. Carpels lanceolate, ca. 1 mm, base connate for 0.6–0.7 mm. Follicles divergent, many seeded. Seeds ovoid, 0.8–1 mm, tuberculate. Fl. Apr, fr. Apr–May.

• 200–800 m. S Anhui (Huang Shan, Jiuhua Shan).

117. *Sedum sarmentosum* Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 2: 104. 1838.

垂盆草 *chui pen cao*

Sedum angustifolium Z. B. Hu & X. L. Huang; *S. koutangense* H. Léveillé & Vaniot; *S. sarmentosum* f. *majus* Diels; *S. shearerii* S. Moore.

Herbs perennial. Sterile and flowering stems creeping and rooting at nodes toward inflorescences, slender, 10–25 cm. Leaves 3-verticillate; leaf blade oblanceolate to oblong, 1.5–2.8 × 0.3–0.7 cm, base abruptly narrowed and spurred, apex subacute. Cyme 3–5-branched, corymbiform, 5–6 cm diam., few flowered. Flowers sessile, unequally 5-merous. Sepals lanceolate to oblong, 3.5–5 mm, base spurless, apex obtuse. Petals yellow, lanceolate to oblong, 5–8 mm, apex ± long mucronate. Stamens 10, shorter than petals. Nectar scales cuneate-quadrangular, ca. 0.5 mm, apex submarginate. Carpels divergent, oblong, 5–6 mm. Styles long. Seeds ovoid, ca. 0.5 mm. Fl. May–Jul, fr. Aug.

Shady places, rocks on slopes; below 1600 m. Anhui, Fujian, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Zhejiang [Japan, Korea, N Thailand].

Sedum angustifolium, in its protologue (in Z. B. Hu et al., Acta Phytotax Sin. 19: 311. 1981), was separated from *S. sarmentosum* primarily by having narrower leaves and a different chemical profile, but the described morphology falls within the range of the latter species as recognized here.

Sedum sarmentosum is used medicinally, as an ornamental, and sometimes as a vegetable.

118. *Sedum lineare* Thunberg in Murray, Syst. Veg., ed. 14, 430. 1784.

佛甲草 *fu jia cao*

Sedum anhuiense S. H. Fu & X. W. Wang.

Herbs perennial. Sterile stems present. Flowering stems erect, 10–20 cm. Leaves 3(or 4)-verticillate, sessile, linear, 2–2.5 × ca. 0.2 cm, base shortly spurred, apex subacute. Cyme 2- or 3-branched, lax, 4–8 cm in diam.; branches 2-forked. Flowers sessile (but dichasial central flower shortly pedicellate), unequally 5-merous. Sepals linear-lanceolate, unequal, 1.5–7 mm, base spurless or sometimes spurred, apex obtuse. Petals yellow, lanceolate, 4–6 mm, base slightly narrowed, apex acute. Stamens 10, shorter than petals. Nectar scales broadly cuneate to subquadrangular, ca. 0.5 × 0.5–0.6 mm. Follicles divergent, 4–5 mm, apex shortly beaked. Seeds small. Fl. Apr–May, fr. Jun–Jul.

Low mountains, rocks on grassy slopes, plains. Anhui, Fujian, Gansu, Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan].

This species is used medicinally.

119. *Sedum grammophyllum* Fröderström, Acta Horti Gothob. 10(App.): 164. 1935.

禾叶景天 *he ye jing tian*

Sterile stems small. Flowering stems ascending, weak, 14–20 cm; basal nodes rooting. Leaves 3-verticillate on proximal and middle parts of stem; leaf blade linear to oblanceolate, 2–3 × 3–4 mm, base broadly spurred, apex subacute and minutely papillate. Cyme scorpioid, lax, few flowered; bracts 1–1.5 cm. Flowers unequally 5-merous. Sepals broadly lanceolate, unequal, 4–5 × ca. 1 mm, base shortly spurred, apex subacute. Petals free, yellow, lanceolate, ca. 6 × 1.2 mm, apex acuminate and long mucronate. Stamens 10, 4–5 mm; antepetalous ones inserted 1.5–2 mm from petal base; anthers broad, apex obtuse. Nectar scales subspatulate-quadrangular, ca. 0.5 × 0.5 mm, apex subretuse. Carpels substellate, 4.5–5.5 mm. Styles ca. 1 mm. Seeds subovoid, small, ca. 0.4 mm. Fl. May.

• C and W Guangdong, E Guangxi.

This species is very close to *Sedum lineare*, and the two may in fact be conspecific.

120. *Sedum concarpum* Fröderström, J. Wash. Acad. Sci. 25: 122. 1935.

合果景天 *he guo jing tian*

Sedum concarpum var. *hupehense* S. H. Fu.

Herbs perennial. Sterile shoots erect, 3–5 cm; leaves pseudopetiolate; leaf blade oblong-orbicular, 0.5–2.5 × 0.5–0.8 cm, apex rounded to emarginate. Flowering stems 8–20 cm, rarely more. Pseudopetiole to 1.5 cm; leaf blade obovate, 0.5–1.5 × ca. 1.2 cm, base shortly spurred, apex obtuse. Cyme corymbiform, dense; bracts resembling stem leaves, very large. Flowers unequally 5-merous. Sepals oblanceolate, equal, 5–6 × ca. 1 mm, base spurless, apex subobtuse and papillate. Petals free, yellow, lanceolate, 7–8 × ca. 2 mm, apex obtuse and mucronulate. Stamens 10; antepetalous ones ca. 4 mm, inserted ca. 2 mm from petal base. Nectar scales linear-spatulate, ca. 1.1 mm, apex rounded. Carpels erect, 5–6 mm, base connate for ca. 3 mm. Styles ca. 1 mm. Follicles erect. Seeds brown, oblong, 1–1.7 mm, smooth. Fl. Aug. fr. Sep.

• Grassland slopes; 2800–3400 m. SW Hubei (Hefeng Tujia Zu Zizhixian), SW Yunnan.

121. *Sedum engleri* Raymond-Hamet, Bot. Jahrb. Syst. 44 (Beibl. 101): 31. 1910.

粗壮景天 *cu zhuang jing tian*

Herbs perennial. Sterile stems present. Flowering stems simple, erect, thick, 25–35 cm, apically minutely mammillate. Leaves alternate; pseudopetiole 3–13 mm;

leaf blade oblong, 2–5 × 1–3 cm, base attenuate and spurless, margin entire or remotely dentate, apex obtuse. Cyme branched, corymbiform, scorpioid, ca. 4 cm in diam., many flowered; bracts mostly obscure, sessile, obovate-oblong, 3.5–5.3 × 1–2 mm, margin minutely mammillate. Flowers unequally 5-merous. Sepals unequal, 3 linear and 1.7–2 mm, 2 oblong-linear and 2.5–3 mm, base connate. Petals yellow, oblong-lanceolate, 3.6–4 mm, apex mucronate. Stamens 10, 2.5–3 mm. Nectar scales suboblong-quadrangular, 0.3–0.4 mm. Carpels ovoid-lanceolate, 2.3–2.6 mm, base connate. Styles ca. 1 mm. Follicles divergent, many seeded. Seeds oblong, ca. 0.6 mm, minutely mammillate. Fl. Sep, fr. Oct.

• Rocks on slopes in *Pinus* forests, rocky caves near houses; 1900–3600 m. SW Hubei, SW Sichuan, NW Yunnan.

1a. Leaf margin entire 121a. var. *engleri*
1b. Leaf margin remotely dentate 121b. var. *dentatum*

121a. *Sedum engleri* var. *engleri*

粗壮景天(原变种) *cu zhuang jing tian (yuan bian zhong)*

Sedum engleri Raymond-Hamet var. *forrestii* Raymond-Hamet.

Leaf margin entire. Fl. Sep, fr. Oct.

• Rocks on slopes in *Pinus* forests, rocky caves near houses; 1900–3600 m. SW Sichuan, NW Yunnan.

121b. *Sedum engleri* var. *dentatum* S. H. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 74. 1980.

远齿粗壮景天 *yuan chi cu zhuang jing tian*

Leaf margin remotely dentate.

• SW Hubei (Xianfeng Xian).

13. RHODIOLA Linnaeus, Sp. Pl. 2: 1035. 1753.

红景天属 *hong jing tian shu*

Chamaerhodiola Nakai; *Clementsia* Rose.

Herbs perennial, with some dimorphism. Rhizome a fleshy caudex, thick or slender, apex usually at or slightly above ground level. Caudex leaves present, usually reduced and scalelike, but sometimes with well-developed leaf blade. Flowering stems 1 to many, arising from axils of caudex leaves, annual, simple, leafy; dried remains of old stems sometimes persisting. Stem leaves usually alternate, occasionally verticillate or opposite, simple, fleshy. Inflorescences terminal, a simply or compoundly corymbiform or dichotomous cyme, less often 1-flowered, rarely a helicoid cyme or with additional axillary inflorescences arising from distal leaf axils, usually bracteate and pedunculate. Flowers usually bisexual, sometimes unisexual (when plants dioecious, or gynodioecious in *Rhodiola alsia* subsp. *alsia* and rarely in *R. purpureoviridis* subsp. *phariensis*). Calyx (3 or)4- or 5(or 6)-parted. Petals ± free, as many as sepals. Stamens in 2 series, usually 2 × as many as petals; antepetalous stamens adnate to basal part of petals; anthers mostly purple before anthesis, later turning yellow, basifixed or less often dorsifixed, 2-loculed. Nectar scales linear, oblong, suborbicular, or quadrangular. Ovary superior; carpels as many as petals. Follicles few to many seeded.

About 90 species: high altitudes and frigid zone of N hemisphere; 55 species (16 endemic) in China.

Sedum carnegiei Raymond-Hamet (Ann. Carnegie Mus. 8: 418–420. 1913), known only from Xizang (near Lhasa Shi), seems to be a possible member of *Rhodiola*, based on the turnip-shaped caudex, stem leaves with a basal spur, specialized flowering stem/lateral inflorescence, and deeply divided calyx and corolla. It differs from other members of that genus in its caudex leaves, which are fleshy and lack the persistent, scalelike base characteristic of other members of *Rhodiola*. The habit is like that of *Rosularia*. The exact generic placement needs further investigation.

Rhodiola multibracteata H. Chuang (Acta Bot. Yunnan. 19: 225. 1997) has been described from Yunnan. No material has been seen by the present authors, and it has not been possible to place it within the following key. In the protologue, it was compared with *R. kirilowii*, from which it was said to differ in having narrower leaves, many bracts, hardly unguiculate male flower petals, and erect follicle beaks. Its relationship to that species needs investigation.

- 1a. Caudex leaves (at least inner ones) with a distinct leaf blade, green.
 - 2a. Caudex leaves conspicuously dimorphic: outer ones scalelike and membranous, inner ones with a distinct leaf blade.
 - 3a. Caudex leaves prominently basally spurred; stem leaves 3.5–4 × 1–1.3 mm 4. *R. handelii*
 - 3b. Caudex leaves basally spurless; stem leaves 7–14 × 1.3–2.2 mm 5. *R. smithii*
 - 2b. Caudex leaves monomorphic, all with a green leaf blade (sometimes deciduous but leaving a dark brown, persistent petiole).
 - 4a. Caudex leaves sessile, without persistent, scalelike base; stem leaves with distinct basal spur *Sedum carnegiei* (see above)
 - 4b. Caudex leaves distinctly petiolate, petiole to 10 mm, turning dark brown and persisting after leaf blade falls; stem leaves (when present) basally spurless.
 - 5a. Anthers dorsifixed; inflorescences helicoid-cymose 1. *R. hobsonii*
 - 5b. Anthers basifixed; inflorescences corymbiform, sometimes reduced to a single flower or monochasium.
 - 6a. Caudex leaf blade linear-oblongate to linear-rhomboid, ca. 1.5 mm wide; petals 2.5–3 mm 2. *R. humilis*
 - 6b. Caudex leaf blade broadly spatulate to obovate, ca. 5 mm wide; petals 5–10 mm 3. *R. primuloides*
- 1b. Caudex leaves without a distinct leaf blade, reduced, usually scalelike and not green.
 - 7a. Inflorescences dense racemes, much longer than wide, with uniformly distributed flowers 8. *R. semenovii*
 - 7b. Inflorescences cymose, sometimes reduced to a single flower, sometimes elongated but then clearly made up of cymes, usually in several discontinuous whorls.
 - 8a. Stem leaves 4–6, in a single whorl; plants less than 5 cm tall.
 - 9a. Flowers bisexual; inflorescences 13–18-flowered, bracteate, pedicels 1.5–2.5 mm; stem leaf blade 2–6 × 2.5–4 cm 6. *R. prainii*
 - 9b. Flowers unisexual; inflorescences 1–6-flowered, ebracteate, pedicels 10–13 mm; stem leaf blade 0.8–1.5 × 0.4–0.7 cm 7. *R. stapfii*
 - 8b. Stem leaves many, alternate, aggregated or subverticillate, if verticillate then plants more than 10 cm tall, less often 6-verticillate.
 - 10a. Old flowering stems persistent; follicles connate in basal 1/2.
 - 11a. Petals ca. 10 mm, margin entire or sparsely fimbriate 9. *R. dumulosa*
 - 11b. Petals less than 6 mm, margin entire.
 - 12a. Remnants of old shoots and stems few; flowers somewhat large.
 - 13a. Part of caudex producing new stems not enlarged each year.
 - 14a. Caudex 0.5–0.7 cm in diam.; flowering stems 1–5, straight; flowers usually 4-merous.
 - 15a. Flowering stem leaves linear 24. *R. angusta*
 - 15b. Flowering stem leaves lanceolate, oblong, obovate-rhombic, or broadly obovate 17. *R. atuntsuensis*
 - 14b. Caudex 1–1.5 cm in diam.; flowering stems numerous, flabellate; flowers usually 5-merous, rarely 4-merous.
 - 16a. Petals often red 21. *R. fastigiata*
 - 16b. Petals often yellow, especially when sepals yellow or yellowish green.
 - 17a. Stem leaves linear, linear-lanceolate, or lanceolate; stamens usually shorter than petals 22. *R. pamiroalaica*
 - 17b. Stem leaves elliptic; stamens equaling or longer than petals 23. *R. litwinowii*
 - 13b. Part of caudex producing new stems somewhat enlarged each year.
 - 18a. Flowering stems often straw-colored when dry; leaves smooth.
 - 19a. Plants pubescent 25. *R. himalensis*
 - 19b. Plants glabrous 28. *R. tangutica*
 - 18b. Flowering stems often purplish red or pink when dry; leaves finely and minutely hairy.
 - 20a. Stem leaf margin entire; petals greenish yellow; pedicels densely papillate 27. *R. sherriffii*
 - 20b. Stem leaf margin entire or apically dentate; petals deep purple; pedicels smooth.
 - 21a. Stem leaves 1.7–2.7 × 0.4–1 cm 25. *R. himalensis*
 - 21b. Stem leaves 0.8–1.5 × ca. 0.2 cm 26. *R. alsia*
 - 12b. Remnants of old shoots and stems numerous; flowers small.
 - 22a. Nectar scales linear to broadly so 10. *R. gelida*

- 22b. Nectar scales suboblong, quadrangular, or suborbicular.
- 23a. Stem leaves elliptic to ovate or ovate-lanceolate.
- 24a. Stem leaves shortly petiolate, margin irregularly crenulate 16. *R. subopposita*
- 24b. Stem leaves sessile, margin entire (coarsely dentate in *R. recticaulis*).
- 25a. Flowering stems less than 4 cm 17. *R. atuntsuensis*
- 25b. Flowering stems more than 12 cm.
- 26a. Petals yellow; stem leaf margin coarsely dentate; inflorescences corymbiform-capitate 18. *R. recticaulis*
- 26b. Petals purplish red or red; stem leaf margin entire, sometimes mammillate; inflorescences cymose.
- 27a. Plants (6–)15–18 cm tall; stem leaves ovate or ovate-lanceolate; flowers often 4-merous 19. *R. gannanica*
- 27b. Plants to 30 cm tall; stem leaves linear to narrowly ovate; flowers usually 5-merous 20. *R. tibetica*
- 23b. Stem leaves lanceolate to ovate or oblong-oblancheolate, rarely linear to oblong-linear.
- 28a. Caudex base not or only slightly enlarged.
- 29a. Stems 1–2 mm in diam. 15. *R. nobilis*
- 29b. Stems 0.5–1 mm in diam.
- 30a. Flowering stems blackening when old; caudex leaves 6–8 mm wide; sepal apex subobtuse 12. *R. coccinea*
- 30b. Flowering stems grayish when old; caudex leaves 3–5 mm wide; sepal apex acute 14. *R. kashgarica*
- 28b. Caudex base enlarged.
- 31a. Caudex densely clustered; leaves linear-lanceolate 12. *R. coccinea*
- 31b. Caudex slightly or not clustered; leaves linear.
- 32a. Caudex less than 1 cm in diam., persistent old flowering stems and branches usually few; flowers often white, 5-merous; inflorescences ca. 1 cm in diam. 13. *R. kansuensis*
- 32b. Caudex 1–3 cm in diam., persistent old flowering stems and branches usually more than 100; flowers often purplish red, 4-merous; inflorescences 1.2–1.5 cm in diam.
- 33a. Winter bud at apex of rhizome conspicuous; flowering stems 6–9 cm 11. *R. quadrifida*
- 33b. Winter bud at apex of rhizome absent; flowering stems 1–5 cm 12. *R. coccinea*
- 10b. Old flowering stems not persistent; follicles almost free.
- 34a. Flowers usually bisexual.
- 35a. Petals apex awnlike, with a mucro to 1 mm 55. *R. liciae*
- 35b. Petals apex subobtuse.
- 36a. Flowering stems leafy at middle or near apex.
- 37a. Flowering stems with leaves in a whorl at middle of stem 54. *R. sexifolia*
- 37b. Flowering stems with leaves grouped near apex of stem.
- 38a. Stem leaves 1–1.5 cm 52. *R. chrysanthemifolia*
- 38b. Stem leaves 2–3 cm 53. *R. ovatisepala*
- 36b. Flowering stems leafy throughout.
- 39a. Stem leaves 2–4 cm, margin divided.
- 40a. Flowering stems ca. 15 cm; stem leaves elliptic to obovate, 5–7 cm; sepals ca. 3 mm 48. *R. sinuata*
- 40b. Flowering stems 8–11 cm; stem leaves oblong, 1–3 cm; sepals ca. 6 mm 49. *R. tieghemii*
- 39b. Stem leaves 1–2.3(–3) cm, margin serrate or dentate.
- 41a. Stem leaf margin with 4 or 5 dentate lobes on each side 50. *R. sacra*
- 41b. Stem leaf margin with 2 to several shallowly incised serrations on each side.
- 42a. Stem leaves 0.2–0.3 cm wide 42. *R. wallichiana*
- 42b. Stem leaves 0.4–1.1 cm wide.
- 43a. Stem leaves elliptic, narrowly ovate, or ovate, margin irregularly and remotely serrate, base shallowly cordate; petal margin entire 38. *R. purpureoviridis*
- 43b. Stem leaves oblong to obovate-oblong, margin with 2 shallowly incised serrations on each side, base attenuate; petal margin apically erose 51. *R. alterna*
- 34b. Flowers usually unisexual (plants hermaphroditic or rarely gynodioecious in *R. purpureoviridis* subsp. *phariensis*).
- 44a. Carpel beak reflexed.
- 45a. Sepals 0.5–1 mm; petals spatulate to oblong-lanceolate 46. *R. yunnanensis*
- 45b. Sepals ca. 3 mm; petals oblong or triangular-ovate 47. *R. forrestii*

- 44b. Carpel beak not reflexed.
- 46a. Carpels ovoid or narrowly so, basally narrowed.
- 47a. Flowers usually bisexual 42. *R. wallichiana*
- 47b. Flowers unisexual.
- 48a. Carpels ovoid, 9–11 mm; stem leaves obtrullate to linear-lanceolate 45. *R. macrocarpa*
- 48b. Carpels narrowly ovoid, 7–9 mm; stem leaves narrowly elliptic to lanceolate or oblanceolate, or widely oblanceolate.
- 49a. Caudex 0.5–1 cm in diam.; stem leaves 0.6–0.8 cm wide; stamens equaling or slightly longer than petals 43. *R. stephanii*
- 49b. Caudex 1–2 cm in diam.; stem leaves 0.3–0.5 cm wide; stamens ca. 1.5 × as long as petals 44. *R. pinnatifida*
- 46b. Carpels oblong or narrowly so, basally thickened.
- 50a. Carpels oblong, ca. 2 × as long as wide.
- 51a. Plants glandular hairy; flowering stems more than 2 per caudex apex 38. *R. purpureoviridis*
- 51b. Plants not glandular hairy; flowering stems 1 or 2 per caudex apex.
- 52a. Flowering stems transversely wrinkled, mostly leafless; caudex elongate and rhizomelike, covered by scree so that only inflorescences are visible above ground 41. *R. atsaensis*
- 52b. Flowering stems smooth or longitudinally ridged, leafy; caudex often erect or almost so, not deeply buried.
- 53a. Caudex subprostrate, ascending, or suberect; stem leaves abaxially ± glaucescent; petals of male flowers 5–6 × 1.2–2 mm, those of female flowers 3–4 × 0.9–1.2 mm . 39. *R. discolor*
- 53b. Caudex erect; stem leaves abaxially not glaucescent; petals of male flowers 2.8–4 × 1.2–1.6 mm, those of female flowers 1.5–3 × 0.5–0.7 mm 40. *R. bupleuroides*
- 50b. Carpels narrowly oblong, over 3 × as long as wide.
- 54a. Stem leaves linear to oblanceolate, margin entire or remotely dentate.
- 55a. Caudex prostrate, 0.2–0.4 cm in diam.; flowering stems 2–12 cm; sepals 3–4.5 mm, apex obtuse 36. *R. cretinii*
- 55b. Caudex erect, 1.5–2.5 cm in diam.; flowering stems 15–60 cm; sepals 1.5–3 mm, apex acute to acuminate 37. *R. kirilowii*
- 54b. Stem leaves oblong, elliptic, lanceolate, rhombic-ovate, ovate-triangular, or orbicular-cordate, margin crenulate throughout, apically dentate, or sometimes subentire.
- 56a. Stem leaves rhombic-ovate to elliptic 29. *R. calliantha*
- 56b. Stem leaves not as above.
- 57a. Flowering stems not leafy apically; stem leaves short, broadest near base.
- 58a. Leaf base cordate, amplexicaul, apex acute; sepals linear, ca. 7 × 1.3 mm; stamens reddish 34. *R. heterodonta*
- 58b. Leaf base truncate to subcordate, apex shortly acuminate; sepals triangular-linear, ca. 1.1 × 1.3 mm; stamens yellow 35. *R. junggarica*
- 57b. Flowering stems leafy apically; stem leaves long, usually broadest in distal 1/2.
- 59a. Flowering stems apically papillate; stem leaf margin serrate 33. *R. serrata*
- 59b. Flowering stems smooth; stem leaf margin subentire, apically sometimes dentate.
- 60a. Persistent old flowering stems and branches black when dry 32. *R. crenulata*
- 60b. Persistent old flowering stems and branches not black when dry.
- 61a. Plants 20–30 cm tall; stem leaves elliptic-lanceolate, oblong, or broadly oblong-ovate; sepals ca. 1/3 as long as petals 30. *R. rosea*
- 61b. Plants 10–15 cm tall; stem leaves oblong-spatulate, oblong-lanceolate, or oblong-rhombic; sepals ca. 1/2 as long as petals 31. *R. sachalinensis*

1. *Rhodiola hobsonii* (Prain ex Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 118. 1965.
背药红景天 bei yao hong jing tian
Sedum hobsonii Prain ex Raymond-Hamet, Bull. Misc. Inform. Kew 1913: 154. 1913; *S. praegerianum* W. W. Smith.

Caudex erect, robust. Caudex leaves leaflike, long petiole; leaf blade oblanceolate to oblong, to 1.8 × 0.3 cm, deciduous, apex subacute. Flowering stems 5.5–13.5 cm. Stem leaves alternate, sessile, narrowly oblanceolate to oblong, ca. 10 × 2–4.5 mm, margin entire or sparsely denticulate, apex obtuse. Inflorescences helicoid cymose, 3–10-flowered. Flowers

unequally 5-merous. Sepals triangular- to ovate-lanceolate, ca. 5×2 mm, apex acute. Petals red, ovate, to 8×3 mm, base connate, margin slightly fimbriate toward apex. Stamens 10; antesepalous ones ca. 7.5 mm; antepetalous ones ca. 4 mm; anthers dorsifixed. Nectar scales subspatulate-oblong, ca. 1×0.6 mm. Carpels ca. 5.5 mm. Styles ca. 1 mm. Follicles erect, 9–10 mm, base connate. Seeds obovoid, ca. 0.8 mm. Fl. Jul.

Forests, thickets, rock crevices; 2600–4100 m. Xizang [Bhutan, Sikkim].

2. *Rhodiola humilis* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 119. 1965.

矮生红景天 ai sheng hong jing tian

Sedum humile J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 99. 1858; *Chamaerhodiola humilis* (J. D. Hooker & Thomson) Nakai; *Rhodiola karpelesae* (Raymond-Hamet) S. H. Fu; *Sedum barnesianum* Praeger; *S. karpelesae* Raymond-Hamet; *S. levii* Raymond-Hamet.

Main root thick. Caudex simple, erect, short. Caudex leaves leaflike; petiole ca. 9 mm, persistent; leaf blade linear-oblong to -rhomboid, ca. 6×1.5 mm, deciduous, apex subacute. Flowering stems few, to 2.5 cm. Stem leaves alternate, sessile, linear-elliptic, 4–5 \times ca. 1 mm, narrowed at both ends, margin entire.

Inflorescences 1- or 2-flowered. Flowers unequally 5-merous. Sepals ovate-oblong, ca. 3×1.5 mm, apex obtuse to acute. Petals ovate, 2.5–3 mm, apex attenuate. Stamens 10; antesepalous ones equaling or slightly shorter than petals; antepetalous ones inserted ca. 1/3 from petal base. Nectar scales suboblong, apex obtuse. Carpels erect. Styles short. Fl. and fr. Sep.

Alpine meadows; 3900–4500 m. Qinghai, Xizang [Nepal, Sikkim].

Plants collected in S Qinghai, apparently belonging to this species, formed dense mats to 10 cm wide.

3. *Rhodiola primuloides* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 118. 1965.

报春红景天 bao chun hong jing tian

Plants 3–5 cm tall. Caudex branched, thick, ca. 5 mm in diam., densely leafy. Caudex leaves leaflike; leaf blade oblanceolate, obovate, or broadly ovate, slightly contracted near middle, to 10×2 –5 mm, finely mammillate, base usually widened, margin entire, apex obtuse. Flowering stems much reduced. Inflorescences 1- or 2-flowered; bracts linear, ca. 3×1 mm. Flowers unequally 5-merous. Sepals narrowly lanceolate, ovate-lanceolate, or broadly oblong, 2.5 – 5×0.7 –1.5 mm, margin ciliolate, apex obtuse. Petals white, ovate, 5 – 10×2.5 –5 mm, base narrowed, margin entire or apically erose, apex mucronate. Stamens 10, shorter than petals; antepetalous ones inserted 1.5–2 mm from petal base. Nectar scales broadly spatulate-quadrangular, 0.5–1 mm, apex emarginate. Styles short. Seeds few, oblong-lanceolate, 0.5–1 mm, 1-winged. Fl. Oct.

•Rocks on slopes or in valleys; 2500–4400 m. SE Qinghai, SW Sichuan, S Xizang, W Yunnan.

- 1a. Petal margin apically erose; sepals narrowly lanceolate to ovate-lanceolate 3a. subsp. *primuloides*
1b. Petal margin entire; sepals broadly oblong 3b. subsp. *kongboensis*

3a. *Rhodiola primuloides* subsp. *primuloides*

报春红景天(原亚种) bao chun hong jing tian (yuan ya zhong)

Sedum primuloides Franchet, J. Bot. (Morot) 10: 287. 1896; *Rhodiola pleurogynantha* (Handel-Mazzetti) S. H. Fu; *S. pleurogynanthum* Handel-Mazzetti; *Sedum primuloides* var. *pleurogynanthum* (Handel-Mazzetti) Fröderström.

Sepals narrowly lanceolate to ovate-lanceolate. Petals 5 – 10×2.5 –5 mm, margin apically erose.

•Rocks on slopes; 2500–4400 m. SE Qinghai, SW Sichuan, W Yunnan.

3b. *Rhodiola primuloides* subsp. *kongboensis* H. Ohba, J. Jap. Bot. 53: 329. 1978.

工布红景天 gong bu hong jing tian

Sepals broadly oblong. Petals 7.5–8.5 mm, margin entire. Fl. Oct.

•Rocks in valleys; ca. 2500 m. S Xizang.

4. *Rhodiola handelii* H. Ohba, J. Jap. Bot. 52: 307. 1977.

小株红景天 xiao zhu hong jing tian

Plants to 1.5 cm tall. Caudex branched, 5 – 10×5 –10 mm. Caudex leaves leaflike and scalelike; petiole brown, 4 – 5.5×1.5 –1.7 mm at base, persistent, base spurred; leaf blade oblong, 1.5 – 3.5 (–4) $\times 0.8$ –1.7 mm, apex obtuse. Flowering stem solitary, ascending, 0.9–1.5 cm, glabrous. Stem leaves few, alternate, sessile, spatulate-oblong, 3.5 – 4×1 –1.3 mm, base attenuate, margin entire, apex obtuse. Inflorescences 1(–3)-flowered; bracts few, ca. 1.5×0.5 mm. Flowers bisexual, 4- or 5-merous, 3–3.5 mm in diam. Sepals ovate-oblong, 3.2–3.7 mm, base conspicuously spurred, spur ca. 0.8 mm, apex rounded. Petals ?white, triangular-ovate to oblong-ovate, 2.5 – 2.7×1.4 –1.7 mm, margin entire, apex mucronate. Stamens 8 or 10, slightly shorter than petals; antepetalous ones inserted ca. 0.2 mm from petal base; filaments 2.2–2.5 mm; anthers ?reddish, globose. Nectar scales oblong, 1–1.2 $\times 0.5$ –0.7 mm, apex irregularly erose. Carpels erect, 2.2–2.5 mm, 8–10-ovuled. Styles less than 0.5 mm. Follicles not seen. Fl. May.

•Sichuan.

This species is known to the present authors only from the type collection.

5. *Rhodiola smithii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

异鳞红景天 yi lin hong jing tian

Sedum smithii Raymond-Hamet, Bot. Jahrb. Syst. 50 (Beibl. 112): 8. 1913; *Rhodiola sangpotibetana* (Fröderström) S. H. Fu; *S. sangpotibetanum* Fröderström.

Caudex simple, erect, thick. Outer caudex leaves scalelike, triangular-suborbicular. Inner caudex leaves leaflike; petiole 0.6–3.5 cm; leaf blade linear to oblong, 1.5–3 × 0.3–0.8 mm, apex long caudate. Flowering stems simple, erect, slender, delicate. Stem leaves alternate, narrowly ovate to ovate-linear, 7–14 × 1.3–2.2 mm, margin entire, apex obtuse. Inflorescences corymbiform, lax. Flowers bisexual, unequally 5-merous. Sepals lanceolate, 2.5–4 × 1–1.8 mm. Petals suboblong, 3.7–6.2 × 1.4–2 mm, abaxially apically keeled, margin entire, apex acute. Stamens 10; antesealous ones 3–6 mm; antepetalous ones 1.5–3.2 mm, inserted at middle of petals. Nectar scales subquadrangular, 0.5–0.6 × 0.6–0.9 mm, apex emarginate. Carpels basally connate for ca. 1 mm. Styles 1.4–2 mm. Follicles erect, few seeded. Seeds subobovoid-oblong, ca. 1.3 mm. Fl. Jul–Sep, fr. Aug–Dec.

Sandy grasslands, gravelly places on sandy beaches, rock crevices; 4000–5000 m. S Xizang [Sikkim].

6. *Rhodiola prainii* (Raymond-Hamet) H. Ohba, J. Jap. Bot. 51: 386. 1976.

四轮红景天 si lun hong jing tian

Sedum prainii Raymond-Hamet, Bull. Soc. Bot. France 56: 566. 1909; *Rhodiola petiolata* (Fröderström) S. H. Fu; *Sedum petiolatum* Fröderström.

Plants to 8 cm tall. Caudex erect, thick, to 2 cm in diam.; old shoots and stems deciduous. Caudex leaves brown to black-brown and scalelike, subulate, narrowly triangular, or broadly linear. Flowering stem simple, erect, to 8 cm. Stem leaves 4, verticillate; pseudopetiole 1–3 cm; leaf blade oblong-elliptic, ovate, broadly ovate, or reniform-orbicular, (1.5–)2–6 × 2.5–4 cm, glabrous or minutely few mammillate, base abruptly narrowed to long attenuate, margin entire, apex rounded or obtuse. Inflorescences simple or few branched, corymbiform, 1–4 cm in diam., 13–18-flowered; peduncle 15–25 mm; bracts sessile or shortly petiolate, linear-lanceolate, broadly elliptic, ovate, or suborbicular, (4–)5–15 × 3–8 mm. Flowers bisexual, unequally 5-merous; pedicel 1.5–2.5 mm. Sepals narrowly triangular-ovate to suboblong-triangular, 2.5–3.5(–4) mm, base ca. 1.5 mm, apex acute to acuminate, tip obtuse. Petals white, pink, or red, oblong-ovate, ovate, or orbicular, 4–6(–7) × 2–3 mm, margin erose or apically minutely dentate. Stamens 10, shorter than petals. Nectar scales obspatulate-oblong, 0.6–1 mm. Carpels lanceolate to ovoid. Styles slender. Fl. Jul, fr. Sep.

Rocks in broad-leaved forests in valleys, rock crevices at bases of mountains; 2200–4300 m. Xizang [NE India, Nepal, Sikkim].

7. *Rhodiola stapfii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

托花红景天 tuo hua hong jing tian

Sedum stapfii Raymond-Hamet, Bull. Misc. Inform. Kew 1913: 156. 1913.

Caudex leaves scalelike, triangular, 7–10 × 2.4–4 mm, base broadened, apex acute. Flowering stems simple, erect, 1.4–3.5 cm. Middle stem leaves 5- or 6-verticillate; pseudopetiole 2–3 mm; leaf blade ovate to ovate-oblong, 8–15 × 4–7 mm, base abruptly narrowed, margin entire, apex subobtusely. Inflorescences umbelliform cymes, 1–6-flowered; peduncle ca. 5 mm, shorter than pedicels; bracts absent. Flowers unisexual, unequally 5-merous; pedicel 1–1.3 cm. Sepals linear-triangular to narrowly triangular, 2.5–3.5 mm, base connate, apex obtuse. Petals red, obovate to oblong, 2.5–3.5 × 1.4–1.7 mm, margin ± erose. Nectar scales subquadrangular, 0.6–0.8 × 0.4–0.6 mm, apex obtuse. Carpels ovoid-lanceolate, base connate for ca. 1 mm. Styles ca. 0.5 mm. Seeds brown, oblong, 0.5–0.8 mm. Fl. Aug–Sep.

Grassland slopes; 2900–5000 m. S Xizang [Bhutan, NE India].

8. *Rhodiola semenovii* (Regel & Herder) Borissova in Komarov, Fl. URSS 9: 28. 1939.

柱花红景天 zhu hua hong jing tian

Umbilicus semenovii Regel & Herder, Bull. Soc. Imp. Naturalistes Moscou 39: 65. 1866; *Clementsia semenovii* (Regel & Herder) Borissova; *Sedum semenovii* (Regel & Herder) Masters; *Umbilicus linearifolius* Franchet; *U. linifolius* Osten-Sacken & Ruprecht.

Caudex branched, short. Caudex leaves scalelike, triangular. Flowering stems numerous, simple, erect, 35–60 cm × 5–6 mm, densely leafy. Stem leaves 3.5–7 × 0.2–0.3 cm, margin entire or sparsely serrate, apex acuminate. Inflorescences cylindric racemes. Flowers shortly pedicellate or sessile, bisexual, unequally 4- or 5-merous. Sepals linear, ca. 3 mm, apex acuminate. Petals white or red, lanceolate, ca. 7 × 2 mm. Stamens 8 or 10, equaling petals; filaments white; anthers red. Nectar scales subquadrangular, ca. 1 × 1.3 mm. Carpels erect, 0.8–1.2 cm. Follicles red. Seeds ovoid, ca. 1 mm, winged. Fl. Jun–Jul.

Beside water; 1800–2900 m. W Xinjiang [Kazakhstan].

9. *Rhodiola dumulosa* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 119. 1965.

小丛红景天 xiao cong hong jing tian

Sedum dumulosum Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 9. 1883; *Chamaerhodiola dumulosa* (Franchet) Nakai; *C. wulingensis* Nakai; *Sedum dumulosum* var. *rendleri* (Raymond-Hamet)

Fröderström; *S. farreri* Raymond-Hamet; *S. rariflorum* N. E. Brown; *S. rendleri* Raymond-Hamet; *S. talilhsiense* Fröderström; *S. wulingense* (Nakai) Kitagawa. Caudex branched, robust; persistent old flowering stems present as remnants. Flowering stems aggregated apically on caudex, simple, erect or curved, 5–28 cm. Stem leaves alternate, sessile, linear to broadly so, 7–10 × 1–2 mm, margin entire, apex subacute. Inflorescences cymose, 4–7-flowered. Flowers unequally 5-merous. Sepals linear-lanceolate, ca. 4 × 0.7–0.9 mm, base broad, apex acuminate. Petals erect, white or red, lanceolate-oblong, 8–11 × 2.3–2.8 mm, margin entire or sparsely fimbriate, apex acuminate and long mucronate. Stamens 10, shorter than petals; antesealous ones ca. 7 mm; antepetalous ones ca. 3 mm, inserted ca. 3 mm from petal base. Nectar scales transversely oblong, apex emarginate. Carpels erect, ovoid-oblong, 6–9 mm, base connate for 1–1.5 mm. Seeds oblong, finely mammillate, narrowly winged. Fl. Jun–Jul, fr. Aug. Rocks on slopes; 1600–4100 m. Gansu, Hebei, Hubei, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan [Bhutan, Myanmar].

10. *Rhodiola gelida* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 67. 1841.

长鳞红景天 *chang lin hong jing tian*

Chamaerhodiola gelida (Schrenk) Nakai; *Rhodiola fastigiata* (J. D. Hooker & Thomson) S. H. Fu var.

gelida (Schrenk) H. Jacobsen; *Sedum dubium* Paulsen; *S. gelidum* (Schrenk) Karelin & Kirilov.

Main root robust. Caudex many branched, 2–7 cm × 5–8 mm; persistent old flowering stems present, blackening. Caudex leaves scalelike. Flowering stems curved, straw-colored when young, 3–5(–10) cm × ca. 1 mm. Stem leaves alternate, ovate-oblong, 8–10 × 2–5 mm, margin serrulate or subentire. Inflorescences compact, 1–1.5 × 1–2 cm, many flowered. Flowers unisexual, unequally 4- or 5-merous. Sepals linear-lanceolate to oblong, ca. 3 mm, apex subobtusate. Petals yellow, oblong to oblanceolate-oblong, ca. 4 × 1.7 mm, apex obtuse and mucronate. Stamens 8(or 10), 4–5 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales linear to narrowly oblong, 1.2–1.8 × 0.4–0.6 mm, apically irregularly few toothed. Carpels oblong, 5–6 mm, base connate for 1.5–2 mm. Styles ± incurved, short. Follicles red. Seeds brown, ovoid, winged at both ends. Fl. Jun–Jul, fr. Aug.

Grassland slopes, rocks; 2800–4200 m. Xinjiang [Mongolia, Russia, Tajikistan].

11. *Rhodiola quadrifida* (Pallas) Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 69. 1841.

四裂红景天 *si lie hong jing tian*

Sedum quadrifidum Pallas, Reise Russ. Reich. 3: 730. 1776; *Chamaerhodiola quadrifida* (Pallas) Nakai.

Caudex 1–3 cm; persistent old flowering stems present. Winter bud at apex of rhizome conspicuous. Caudex

leaves brown, scalelike, triangular, ca. 4 × 4 mm. Flowering stems ± erect, 6–9 cm × 0.5–1 mm. Stem leaves alternate, erect, sessile, linear, subterete, 5–8(–12) × ca. 1 mm, margin entire, apex acute. Inflorescences corymbiform, ca. 1 cm in diam., few flowered. Flowers unisexual, usually 4-merous, equaling or longer than pedicel. Sepals green, linear-lanceolate, ca. 3 mm, apex obtuse. Petals yellow, sometimes reddish at apex, oblong-obovate, ca. 4 mm, apex obtuse. Stamens 8, equaling or slightly longer than petals. Follicles erect, red when mature, lanceolate, ca. 5 mm, apical beak slightly reflexed or erect. Seeds brown, oblong, ca. 2 mm, winged. Fl. May–Jun.

Alpine regions, stony slopes, rocks; 2300–3700 m. Xinjiang [Kazakhstan, Mongolia, Russia].

12. *Rhodiola coccinea* (Royle) Borissova in Komarov, Fl. URSS 9: 41. 1939.

圆丛红景天 *yuan cong hong jing tian*

Main root 10–30 cm or longer. Caudex thick; persistent old flowering stems present. Winter bud at apex of rhizome inconspicuous. Caudex leaves brown, scalelike, orbicular-triangular, ca. 5 × 6–8 mm. Flowering stems erect or curved, 1–5 cm × less than 1 mm or 1.5–2 mm. Stem leaves alternate, sessile, linear-lanceolate to lanceolate, (3–)5–7 × (0.6–)1–1.5 mm, margin entire, apex subobtusate to acute or acuminate to long acuminate. Inflorescences corymbiform, compact, 0.8–1 cm in diam., few flowered. Flowers unisexual, (4 or)5-merous, longer than pedicel. Sepals red, oblong or lanceolate to triangular-oblong, 1.5–4 mm, apex obtuse or acute to acuminate. Petals red or yellow, oblong-ovate to subobovate or lanceolate to broadly oblong, apically constricted, 1.5–4 mm, apex subobtusate to obtuse. Stamens (8–)10, 3–4 cm. Follicles red when mature, ovoid to oblong-ovoid, apical beak reflexed, very short. Seeds brown, oblong, 1–1.5 mm, winged. Fl. Jun–Jul, fr. Jul–Sep.

Alpine regions, stony soils, rocks, rock crevices on slopes; 2200–5300 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, NW Yunnan [Afghanistan, Bhutan, NW India, Kashmir, Nepal, Sikkim].

1a. Flowering stems 1.5–2 mm in diam.; stem leaf apex subobtusate to acute; sepals oblong, apex obtuse; petals oblong-ovate to subobovate, ca. 4 mm 12a. subsp. *coccinea*

1b. Flowering stems less than 1 mm in diam.; stem leaf apex acuminate to long acuminate; sepals lanceolate to triangular-oblong, apex acute to acuminate; petals lanceolate to broadly oblong, 1.5–2(–4) mm 12b. subsp. *scabrida*

12a. *Rhodiola coccinea* subsp. *coccinea*

圆丛红景天(原亚种) *yuan cong hong jing tian* (*yuan ya zhong*)

Sedum coccineum Royle, Ill. Bot. Himal. Mts. 1: 223. 1835; *Rhodiola juparensis* (Fröderström) S. H. Fu; S.

juparensis Fröderström; *Sedum quadrifidum* Pallas var. *coccineum* (Royle) J. D. Hooker & Thomson.

Flowering stems 1.5–2 mm in diam. Stem leaf apex subobtusate to acute. Sepals oblong, apex obtuse. Petals oblong-ovate to subobovate, ca. 4 mm. Fl. Jun–Jul, fr. Aug.

Alpine regions, stony soils, rocks; 2600–4900 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Afghanistan, Bhutan, NW India, Kashmir, Nepal].

12b. *Rhodiola coccinea* subsp. *scabrida* (Franchet) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 153. 1982.

粗糙红景天 *cu cao hong jing tian*

Sedum scabridum Franchet, J. Bot. (Morot) 10: 284. 1896; *Chamaerhodiola scabrida* (Franchet) Nakai; *Rhodiola likiangensis* (Fröderström) S. H. Fu; *R. scabrida* (Franchet) S. H. Fu; *Sedum brachystylum* Fröderström; *S. likiangense* Fröderström.

Flowering stems less than 1 mm in diam. Stem leaf apex acuminate to long acuminate. Sepals lanceolate to triangular-oblong, apex acute to acuminate. Petals lanceolate to broadly oblong, 1.5–2(–4) mm. Fr. Jul–Sep.

Rock crevices on slopes; 2200–5300 m. W Sichuan, Xizang, NW Yunnan [Sikkim].

13. *Rhodiola kansuensis* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

甘肃红景天 *gan su hong jing tian*

Sedum semenovii (Regel & Herder) Masters var. *kansuense* Fröderström, Oesterr. Bot. Z. 87: 120. 1938.

Main roots brown, straight. Caudex erect, clustered, slightly enlarged; persistent old flowering stems few. Caudex leaves scalelike, suboblong, apex obtuse. Sterile stems 2–3 cm, densely leafy. Flowering stems few, tufted, 7–8 cm. Stem leaves narrowly linear, less than 10 mm. Inflorescences corymbiform, dense. Flowers bisexual, pedicellate or sessile, unequally 5-merous. Sepals linear, ca. 3.8 mm, apex acuminate. Petals oblong, 6–6.5 mm, apex galeate and mucronate. Stamens 10; antepetalous ones ca. 4.5 mm; antepetalous ones ca. 2.2 mm, inserted ca. 2 mm from petal base; anthers ca. 0.8–0.9 mm. Carpels erect. Seeds oblong. Fl. Jun–Jul.

• Rocks on mountain slopes; 2300–3200 m. Gansu (Lanzhou Shi).

14. *Rhodiola kashgarica* Borissova in Komarov, Fl. URSS 9: 476. 1939.

喀什红景天 *ka shi hong jing tian*

Roots gray, slender. Caudex many branched, 5–10 mm in diam.; persistent old flowering stems present. Caudex leaves scalelike, triangular, 3–5 mm wide. Flowering stems numerous, ascending, grayish when old, 3–5(–10) cm × 0.5–1 mm. Stem leaves alternate, subhorizontally spreading, oblong to linear-lanceolate, 3–10 × 1–2 mm, margin entire, apex obtuse. Inflorescences corymbiform or subcapitate, 4–6 × 5–10 mm, few flowered. Flowers unisexual, unequally 4- or

5-merous; pedicel short, slightly elongated in fruit. Sepals linear, 2–3 mm, apex acute. Petals golden yellow, oblong-lanceolate, apically slightly narrowed, 3–4 mm, apex obtuse. Stamens 8 or 10; anthers yellow. Nectar scales subquadrangular to suboblong. Follicles ovoid, 3–4 mm, apical beak recurved, short. Seeds brown, lanceolate, to 1.5 mm. Fl. Jun–Jul.

Rocks; 2600–3200 m. SW Xinjiang (Kashi Shi) [Kazakhstan].

15. *Rhodiola nobilis* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 120. 1965.

优秀红景天 *you xiu hong jing tian*

Sedum nobile Franchet, J. Bot. (Morot) 10: 285. 1896; *Chamaerhodiola horrida* (Praeger) Nakai; *C. nobilis* (Franchet) Nakai; *S. horridum* Praeger.

Main root long. Caudex erect, more than 20 cm; persistent old flowering stems present, brown with age. Caudex leaves scalelike. Flowering stems numerous, erect, red-brown when young, 3–4 cm × 1–2 mm, subscabrous, densely leafy. Stem leaves sessile, oblong-lanceolate to -oblanceolate, 7–11 × 1.7–2 mm, adaxially subscabrous, finely mammillate when dry, apex obtuse. Inflorescences 1–4-flowered; bracts leaflike, small. Flowers terminal, shortly pedicellate, unisexual, unequally 4- or 5-merous. Sepals lanceolate-triangular, 2.3–2.5 × 1.3–1.5 mm, apex obtuse. Petals red, suboblong, 4–6 × 1.5–1.7 mm, base slightly narrowed, apex obtuse. Stamens 8–10, ca. 4 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales suborbicular, apex rounded to emarginate. Styles slightly recurved, short. Follicles erect, 1–1.4 cm, base connate for ca. 2 mm. Fl. Jul, fr. Aug–Oct.

Thickets, grassy slopes; 3700–4500 m. NW Yunnan [Myanmar].

16. *Rhodiola subopposita* (Maximowicz) Jacobsen, Natl. Cact. Succ. J. 28: 6. 1973.

对叶红景天 *dui ye hong jing tian*

Sedum suboppositum Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 132. 1883.

Plants greenish. Flowering stems numerous, slender, flexuose, more than 30 cm. Stem leaves subopposite or alternate, divergent, shortly petiolate to subsessile; leaf blade broadly elliptic to ovate, ca. 2 × 1 cm, margin irregularly crenulate, apex obtuse. Inflorescences cymes, ca. 10 mm in diam., to 4 cm in fruit, many flowered, bracteate. Flowers unisexual, unequally 5-merous, ca. 7 mm in diam., equaling pedicel. Sepals oblong. Petals yellow, oblong. Stamens 10, slightly longer than petals. Nectar scales subquadrangular, apex emarginate. Carpels of male flowers rudimentary, ovoid, small. Styles short, apiculate. Follicles ca. 6 mm, apical beak horizontally spreading, short. Seeds winged.

• Rocks in alpine areas; 3800–4100 m. C Gansu (Tianzhu Zhang Zu Zixhixian), NE Qinghai.

17. *Rhodiola atuntsuensis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 120. 1965.

德钦红景天 de qin hong jing tian

Sedum atuntsuense Praeger, Notes Roy. Bot. Gard. Edinburgh 13: 71. 1921; *Chamaerhodiola atuntsuensis* (Praeger) Nakai; *Rhodiola aporontica* (Fröderström) S. H. Fu; *R. brevipetiolata* (Fröderström) S. H. Fu; *R. concinna* (Praeger) S. H. Fu; *R. nobilis* (Franchet) S. H. Fu subsp. *atuntsuensis* (Praeger) H. Ohba; *R. venusta* (Praeger) S. H. Fu; *Sedum aporonticum* Fröderström; *S. brevipetiolatum* Fröderström; *S. concinnum* Praeger; *S. venustum* Praeger.

Caudex few branched, erect, 3–5 × 0.5–1.2 cm; persistent old flowering stems present or absent. Caudex leaves scalelike, triangular to triangular-suborbicular, apex acute to acuminate. Flowering stems few to numerous, simple, erect, 2–9 cm. Stem leaves alternate, sessile or shortly petiolate; leaf blade broadly oblong-lanceolate, obovate-lanceolate, oblong-ovate, or subovate, (5–)6–12 × 2.5–4 mm, base connate, margin entire but sometimes undulate, apex rounded, obtuse, or acuminate. Inflorescences subumbellate or corymbiform. Flowers bisexual or unisexual, 5-merous, or 4-merous in male plants. Sepals linear, lanceolate, or broadly oblong, 1.5–6.5 mm, base ca. 1 mm wide and connate for ca. 1 mm, apex obtuse. Petals suberect, yellow or purple at base and yellow toward apex, oblong-linear, oblong, oblong-lanceolate, or obovate, 2.5–4.5 × 1–0.6–2.5 mm, apex obtuse and mucronate. Stamens 8 or 10, subequaling petals; antepetalous ones inserted ca. 0.5 mm from petal base. Nectar scales subelliptic to obliquely quadrangular, apex ± emarginate. Carpels suberect or erect, 2.5–4 mm. Seeds subovoid-oblong, smooth, winged at both ends. Fl. and fr. Aug.

Forests, glacial valleys, granitic rocks, gravelly or limestone areas; 3100–5000 m. W Sichuan (Dawu Xian, Kangding Xian), Xizang, NW Yunnan [Myanmar].

Rhodiola atuntsuensis shows a wide range of variation, especially in leaf shape and flower number. Several allied species are better regarded as extreme variants of this species. The species is functionally dioecious, but the male flowers have large pistils and appear bisexual.

18. *Rhodiola recticaulis* Borissova in Komarov, Fl. URSS 9: 478. 1939.

直茎红景天 zhi jing hong jing tian

Sedum recticaule (Borissova) Wendelbo.

Main root thick, woody. Caudex branched, 3–6 cm in diam., woody, apically leafy; branches ca. 1.5 cm in diam. Caudex leaves brown, scalelike, triangular, ca. 1 × 1 mm, apex obtuse. Flowering stems numerous, erect, 8–15 cm × 1.5–2 mm, slightly sulcate; persistent old flowering stems present. Stem leaves alternate, erect or divergent, sessile, yellowish green, elliptic to elliptic-oblong, 8–10 × 2–3 mm, margin coarsely dentate, apex

subacute. Inflorescences corymbiform-capitate, compact, 1.5–2 cm in diam., many flowered, bracteate. Flowers shortly pedicellate, unisexual, unequally 4-merous, small. Sepals red, elliptic, ca. 2 mm, apex obtuse. Petals yellow, oblong-elliptic, ca. 4 mm, apex obtuse. Stamens 8, longer than petals; filaments yellow; anthers globose. Nectar scales subquadrangular, apex entire. Carpels erect. Stigma capitate. Follicles apically shortly beaked. Seeds brown, oblong, ca. 2 mm. Fl. Jun–Aug, fr. Jul–Sep.

Rock crevices on mountain slopes; 3800–4600 m. Xinjiang (Tian Shan) [Kazakhstan; SW Asia (Iran)].

Typical *Rhodiola recticaulis* has flowering stems to 5 mm thick and globose inflorescences. One of the present authors (Ohba) believes that the Chinese plants described here need further investigation, as they may prove to be a different species.

19. *Rhodiola gannanica* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 11: 170. 1991.

甘南红景天 gan nan hong jing tian

Plants (6–)15–18 cm tall, glabrous. Caudex thick.

Caudex leaves scalelike. Flowering stems erect, 14–16 cm × 1–2 mm, smooth, leafy. Stem leaves alternate, sessile, ovate-lanceolate to ovate, 7–9 × 2.5–3.5 mm, base narrowed, margin mammillate, apex very acute. Inflorescences terminal, cymose, 0.8–1.2 × 1–1.5 cm, 10–15-flowered; bracts ca. 4 mm. Flowers shortly pedicellate, unisexual, female ones 4(or 5)-merous. Sepals triangular-linear, ca. 2 × 1–1.2 mm, apex obtuse.

Petals free, purple, oblong, ca. 2.5 × 1–1.2 mm, apex obtuse. Nectar scales subquadrangular, ca. 0.7 × 0.7 mm, apex emarginate to truncate. Carpels usually 4, erect, ovoid-oblong, 3–3.5 mm, apex beaked at maturity. Seeds 10 or 11, narrowly oblong, smooth. Fl. Jun, fr. Jul.

• Rocky slopes, alpine mountain summits; 3500–3900 m. S Gansu (Lintan Xian, Xiahe Xian).

20. *Rhodiola tibetica* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

西藏红景天 xi zang hong jing tian

Sedum tibeticum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 96. 1858; *Chamaerhodiola stracheyi* (J. D. Hooker & Thomson) Nakai; *C. tibetica* (J. D. Hooker & Thomson) Nakai; *Sedum quadrifidum* Pallas var. *tibeticum* (J. D. Hooker & Thomson) Fröderström; *S. stracheyi* J. D. Hooker & Thomson; *S. tibeticum* var. *stracheyi* (J. D. Hooker & Thomson) C. B. Clarke.

Caudex short to long; persistent old flowering stems few, present as remnants. Flowering stems to 30 cm, basally usually finely papillate. Stem leaves linear to narrowly ovate, 5–9 × 1.5–4 mm, base broadly triangular, margin entire or dentate, apex long acuminate and awn-shaped. Inflorescences corymbiform, compact, 2–2.5 cm in diam., many flowered.

Flowers unisexual, unequally 5-merous. Sepals suboblong, ca. 1 mm. Petals purple to red, elliptic-lanceolate, 2–4 mm. Stamens 10, subequaling or somewhat longer than petals. Nectar scales sub-

oblong, ca. 1 mm. Petals purple to red, elliptic-lanceolate, 2–4 mm. Stamens 10, subequaling or somewhat longer than petals. Nectar scales sub-

oblong, ca. 1 mm. Petals purple to red, elliptic-lanceolate, 2–4 mm. Stamens 10, subequaling or somewhat longer than petals. Nectar scales sub-

oblong, ca. 1 mm. Petals purple to red, elliptic-lanceolate, 2–4 mm. Stamens 10, subequaling or somewhat longer than petals. Nectar scales sub-

quadrangular, ca. 0.6 mm, apex emarginate. Carpels erect, lanceolate, 4–5 mm, apex ± recurved. Fl. Jul–Aug, fr. Sep.

Stony slopes on sides of ravines; 4100–5400 m. SW Xizang [Afghanistan, India, Pakistan].

21. *Rhodiola fastigiata* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

长鞭红景天 *chang bian hong jing tian*

Sedum fastigiatum J. D. Hooker & Thomson, J. Proc.

Linn. Soc., Bot. 2: 98. 1858; *Chamaerhodiola fastigiata*

(J. D. Hooker & Thomson) Nakai; *S. quadrifidum*

Pallas var. *fastigiatum* (J. D. Hooker & Thomson)

Fröderström; *Triplostegia pinifolia* H. Léveillé.

Caudex simple or few branched, more than 50 × 1–1.5 cm; persistent old flowering stems few or absent.

Caudex leaves scalelike, triangular. Flowering stems 4–10, arising from caudex apex, 8–20 cm × 1.2–2 mm, densely leafy. Stem leaves alternate, linear-oblong, linear-lanceolate, elliptic, or oblanceolate, 8–12 × 1–4 mm, margin entire but finely mammillate, apex obtuse.

Inflorescences corymbiform, dense, ca. 1 × 2 cm. Flowers unisexual, male ones unequally 5-merous. Sepals linear to narrowly triangular, ca. 3 mm, apex obtuse.

Petals red, oblong-lanceolate, ca. 5 × 1.3 mm, apex obtuse. Stamens 10, to 5 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales transversely oblong, apex emarginate. Carpels erect, lanceolate. Styles long. Follicles 7–8 mm, apex ± recurved. Fl. Jun–Aug, fr. Sep.

Rocky slopes; 3500–5400 m. Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

22. *Rhodiola pamiroalaica* Borissova in Komarov, Fl. URSS 9: 477. 1939.

帕米红景天 *pa mi hong jing tian*

Sedum pamiroalaicum (Borissova) C.-A. Jansson.

Roots robust, thick. Caudex robust, woody, apically leafy; persistent old flowering stems present. Caudex leaves scalelike, triangular, 4–8 × 1.5–6 mm. Flowering stems numerous, ascending, 10–30 cm × ca. 2 mm, basally sulcate. Stem leaves alternate, remote, sessile, linear, linear-lanceolate, or lanceolate, 7–15 × 1.5–2 mm, base broad, margin entire, apex subacute.

Inflorescences corymbiform-paniculate, compact, 0.5–1 × 1–2 cm in diam., few to many flowered. Flowers unisexual, unequally 5 (or 6)-merous in male plants, equaling pedicels. Sepals greenish yellow, lanceolate to linear, 2–3 mm, apex subobtuse. Petals yellowish green, lanceolate to linear, 4–4.5 mm, apex subobtuse. Stamens 10 or 12, yellow, shorter than petals. Nectar scales cuneate-quadrangular, apex truncate to ± recurved, apical beak filiform. Seeds brown, lanceolate. Fl. Jun–Jul, fr. Jun–Aug.

Valley slopes, rock crevices in ravines; 2400–2800 m. W Xinjiang (Wensu Xian) [Tajikistan].

23. *Rhodiola litwinowii* Borissova in Komarov, Fl. URSS 9: 478. 1939.

黄萼红景天 *huang e hong jing tian*

Main root thick, ca. 30 cm, apically to 2 cm in diam.

Caudex many branched, robust, 3–4 cm.; persistent old flowering stems few. Caudex leaves scalelike, ovate-triangular, 1–1.5 × 1–1.5 cm. Flowering stems numerous, erect, 10–17 cm, densely leafy. Stem leaves alternate, greenish, usually yellowish green when dry, 10–15 × 3–5 mm, base cuneate, apical margin obtusely dentate, apex obtuse. Inflorescences compact, 1–1.5 × 2–2.5 cm, many flowered, bracteate. Flowers unisexual, unequally 4- or 5-merous; equaling or slightly longer than pedicel. Sepals yellow, lanceolate, ca. 3 mm, apex obtuse. Petals yellow, lanceolate, ca. 4 mm, apex obtuse. Stamens 8 or 10, ca. 4 mm, equaling or longer than petals; filaments and anthers yellow. Nectar scales quadrangular, apex truncate. Follicles to 8 mm, tapered and apically filiform, apical beak 1–1.5 mm. Seeds brown, oblong-lanceolate, 1.5–2 mm. Fl. Jun–Aug, fr. Jul–Sep.

Below 3200 m. Xinjiang [Mongolia, Uzbekistan].

24. *Rhodiola angusta* Nakai, Bot. Mag. (Tokyo) 28: 304. 1914.

长白红景天 *chang bai hong jing tian*

Rhodiola komarovii Borissova; *R. ramosa* Nakai;

Sedum fenzelii Fröderström; *S. komarovii* (Borissova)

Chu; *S. ohbae* J. P. Kozhevnikov.

Main root often simple. Caudex erect, slender, 5–7 mm in diam.; persistent old flowering branches few, present as remnants. Caudex leaves scalelike, triangular.

Flowering stems erect, straw-colored, 3.5–10 cm, densely leafy. Stem leaves alternate, linear, 10–20 × 1–2 mm, base slightly narrowed, margin entire or apically 1- or 2-dentate, apex obtuse. Inflorescences corymbiform, few to many flowered. Flowers unisexual, male ones unequally 4-merous. Sepals linear, 2–4 mm, apex obtuse. Petals yellow, oblong-lanceolate, 4–5 × ca. 1 mm, apex obtuse. Stamens 8, slightly shorter than or equaling petals; antepetalous ones inserted ca. 1.8 mm from petal base. Nectar scales subquadrangular, 0.4–0.5 × 0.5–0.6 mm, apex truncate to emarginate. Carpels erect, lanceolate, ca. 6 mm, apex acuminate. Styles ca. 1.5 mm. Stigma capitate. Follicles erect, purplish red, 7–8 mm, apical beak ± recurved. Seeds lanceolate, winged at both ends. Fl. Jul–Aug, fr. Aug–Sep.

Alpine grasslands, rocks on slopes; 1700–2600 m. Heilongjiang [Korea, Russia].

25. *Rhodiola himalensis* (D. Don) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

喜马拉雅红景天 *xi ma hong jing tian*

Caudex long; persistent old flowering stems present. Caudex leaves scalelike, triangular. Flowering stems usually reddish, 10–50 cm, with many small, hyaline glands. Stem leaves alternate, loosely imbricate, sessile, narrowly lanceolate, lanceolate, oblanceolate, oblong-

oblanceolate, or obovate, 0.7–2.7 × 0.2–1 cm, finely mammillate especially on margin, midvein conspicuous, base rounded, margin entire or apically dentate, apex acute to apiculate. Inflorescences corymbiform. Flowers unisexual, male ones unequally 4- or 5-merous; pedicel slender. Sepals narrowly triangular, 1.5–2 mm, base connate. Petals deep purple, oblong-lanceolate, 3–4 mm. Stamens 8 or 10, 2–3 mm. Nectar scales oblong, apex emarginate. Carpels suberect or erect, lanceolate, 2–9 mm. Styles recurved, short. Fl. May–Jun, fr. Aug.

Forests, scrub, slopes; 2600–4200 m. S Gansu, Qinghai, NW Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

- 1a. Flowering stems 25–50 cm; stem leaves 1.7–2.7 × 0.4–1 cm; carpels ca. 9 mm 25a. var. *himalensis*
1b. Flowering stems 10–13 cm; stem leaves 0.7–1 × ca. 0.2 cm; carpels ca. 2 mm 25b. var. *taohoensis*

25a. *Rhodiola himalensis* subsp. *himalensis*

喜马拉雅景天(原亚种) xi ma hong jing tian (yuan ya zhong)

Sedum himalense D. Don, Prodr. Fl. Nepal. 212. 1825; *Chamaerhodiola himalensis* (D. Don) Nakai; *S. quadrifidum* Pallas var. *himalense* (D. Don) Fröderström.

Flowering stems 25–50 cm. Stem leaves lanceolate, oblanceolate, oblong-oblanceolate, or obovate, 1.7–2.7 × 0.4–1 cm. Carpels erect, ca. 9 mm.

Forests, scrub, slopes; 3700–4200 m. NW Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

25b. *Rhodiola himalensis* subsp. *taohoensis* (S. H. Fu) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 140. 1982.

洮河红景天 tao he hong jing tian

Rhodiola taohoensis S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965; *Sedum himalense* subsp. *taohoense* (S. H. Fu) J. P. Kozhevnikov.

Flowering stems 10–13 cm. Stem leaves narrowly lanceolate, 0.7–1 × ca. 0.2 cm. Carpels suberect, ca. 2 mm.

• Shaded slopes; 2600–3800 m. S Gansu (Jonê Xian, Lintan Xian), Qinghai.

26. *Rhodiola alsia* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

西川红景天 xi chuan hong jing tian

Caudex erect, long; persistent old flowering stems present. Flowering stems erect, pale red when dry, 15–20 cm, or 10–15 cm in female plants. Stem leaves alternate; leaf blade lanceolate to oblanceolate or oblong, 8–15 × ca. 2 mm, sparsely papillate, margin entire or usually apically few dentate, apex acute, finely

papillate in female plants. Inflorescences cymose, 1.5–2 × 1.5–2 cm, slightly smaller in female plants. Flowers shortly pedicellate, bisexual or female (plants hermaphroditic or gynodioecious), unequally 5-merous, female ones 4-merous. Sepals reddish when dry, triangular-lanceolate, 2.4–3.5 mm, apex obtuse. Petals reddish when dry, oblong, 5–6 mm, apex obtuse, or slightly narrowed and shortly apiculate in female flowers. Stamens 10, to 7 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales subtransversely rectangular, or square in female flowers, apex ± emarginate. Carpels erect, suboblong, 5.6–6 mm. Follicles many seeded. Seeds subovoid, winged at both ends. Fl. Jul, fr. Aug.

• *Rhododendron* forests, rocky slopes; 3400–4800 m. NW Sichuan, Xizang, Yunnan.

- 1a. Flowers bisexual or female (plants gynodioecious), 7–10 mm wide; flowering stems 2–6, to 20 cm 26a. subsp. *alsia*
1b. Flowers always bisexual (plants hermaphroditic), 5–7 mm wide; flowering stems many, fastigiate, 20–25 cm 26b. subsp. *kawaguchii*

26a. *Rhodiola alsia* subsp. *alsia*

西川红景天(原变种) xi chuan hong jing tian (yuan bian zhong)

Sedum alsium Fröderström, Acta Horti Gothob. 15: 8. 1942; *Rhodiola staminea* (Paulsen) S. H. Fu; *Sedum doratocarpum* Fröderström; *S. stamineum* Paulsen.

Flowering stems 2–6, to 20 cm. Flowers bisexual or female (plants gynodioecious), 7–10 mm wide. Sepals 2.2–2.6 mm, or 2.6–3.5 mm in female flowers.

• *Rhododendron* forests, rocky slopes; 3400–4800 m. NW Sichuan, Xizang, Yunnan.

26b. *Rhodiola alsia* subsp. *kawaguchii* H. Ohba, Acta Phytotax. Geobot. 32: 192. 1981.

河口红景天 he kuo hong jing tian

Flowering stems many, fastigiate, 20–25 cm. Flowers always bisexual (plants hermaphroditic), 5–7 mm wide. Sepals 2.4–2.6 mm.

• Rocky slopes; 4400–4600 m. Xizang.

27. *Rhodiola sherriffii* H. Ohba, J. Jap. Bot. 53: 258. 1978.

小杯红景天 xiao bei hong jing tian

Sedum sherriffii (H. Ohba) J. P. Kozhevnikov.

Caudex prostrate, apically ascending, terete, 1–2.5 cm in diam. Caudex leaves somewhat dusky when dry, scalelike, triangular-ovate. Flowering stems simple, flabellately fascicled, usually reddish, 10–30 cm × (1.5–)2–4(–6) mm, smooth, deciduous each year. Stem leaves alternate, ascending, oblanceolate to narrowly oblong, 1–3 × 0.2–0.7 cm, adaxially densely mammillate, abaxially mammillate along midvein, base attenuate, margin entire, apex acute. Inflorescences

compound cymes; male inflorescences 40–100-flowered; female inflorescences 10–20-flowered. Flowers unisexual, male ones unequally 5-merous; pedicel 2–8 mm, densely mammillate. Petals free, greenish yellow, usually reddish apically, narrowly oblong-ob lanceolate, 4–6 × 1–1.5 mm, apex rounded. Stamens 10, longer than petals; antepetalous ones inserted 0.2–0.8 mm from petal base. Nectar scales oblong, apex emarginate. Carpels almost free, 6–12 mm. Styles short. Follicles ca. 8-seeded. Seeds ellipsoid, winged.

Thickets, grassy slopes, moist places, rocks; 4000–5000 m. Xizang [Bhutan, Sikkim].

28. *Rhodiola tangutica* (Maximowicz) S. H. Fu, Bull. Bot. Res., Harbin 6(4): 158. 1986.

唐古红景天 tang gu hong jing tian

Sedum algidum (Ledebour) Fischer & C. A. Meyer var. *tanguticum* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 3, 29: 126. 1883; *Rhodiola algida* Ledebour var. *tangutica* (Maximowicz) S. H. Fu.

Plants glabrous. Caudex robust, long; persistent old flowering stems sometimes present, few. Caudex leaves sessile, scalelike, triangular. Flowering stems straw-colored (or at least dusky) when dry and 10–17(–30) cm in male plants, brown and 15–30 cm in female plants. Leaf blade linear, 8–15 × 0.5–2 mm, apex obtusely acuminate. Inflorescences corymbiform to obconical, compact, to 5 × 5 cm in female plants, bracteate. Flowers unequally 5-merous. Sepals linear-oblong, 2.5–3 × 0.5–0.6 mm in male flowers, 3–3.5 × 0.5–0.7 mm in female flowers, apex obtuse. Petals pinkish when dry, oblong-lanceolate, ca. 4.5 × 1.2 mm, apex obtusely acuminate. Stamens 10; antepetalous ones ca. 2.5 mm, inserted ca. 1.5 mm from petal base. Nectar scales quadrate, apex emarginate. Follicles erect, narrowly lanceolate, to 10 mm, apical beak erect or ± recurved, short. Fl. May–Aug, fr. Aug.

• Rock crevices in alpine areas, beside water; 2100–4700 m. Gansu, Qinghai, Sichuan.

This species is used medicinally.

29. *Rhodiola calliantha* (H. Ohba) H. Ohba, J. Jap. Bot. 51: 386. 1976.

美花红景天 mei hua hong jing tian

Sedum callianthum H. Ohba, J. Jap. Bot. 49: 325. 1974.

Caudex terete, ca. 1.5 cm in diam. Caudex leaves brownish, scalelike, triangular to ovate-triangular. Flowering stems straw-colored when dry, 12–18 × 1.5 cm. Stem leaves subopposite or alternate; petiole ca. 2 mm; leaf blade rhombic-ovate or narrowly so or elliptic or narrowly so, 4–5.5 × 1–2.2 cm, base attenuate, margin apically roughly serrate-crenate, apex acute. Inflorescences terminal, compound corymbs; peduncle 0.5–1.5 cm; bracts few, resembling stem leaves but smaller. Flowers unisexual, male ones unequally 5-merous; pedicel 1.5–2.5 mm. Sepals triangular to ovate-

triangular, 1.2–0.6 mm, apex obtuse. Petals pinkish to purple, narrowly obovate, 3–4.5 × 0.8–1.5 mm, margin entire or erose toward apex, apex obtuse. Stamens 10; antepetalous ones 1–1.5 mm, inserted ca. 0.5 mm from petal base. Nectar scales suboblong, apex rounded-truncate. Carpels erect, lanceolate, ca. 1.5 mm. Fl. Jun.

Rocks on shady slopes; ca. 3600 m. S Xizang (Gyirong Xian) [Nepal].

30. *Rhodiola rosea* Linnaeus, Sp. Pl. 2: 1035. 1753.

红景天 hong jing tian

Roots erect, robust. Caudex short. Caudex leaves scalelike. Flowering stems 10–30 cm. Stem leaves remote, sessile, oblong, elliptic-ob lanceolate, or obovate, 0.7–3.5 × 0.5–1.8 cm, base subamplexicaul, margin entire, apically few dentate, or serrate, apex acute to acuminate. Inflorescences corymbiform or capitate, compact, ca. 2 × 3–6 cm, many flowered. Flowers unisexual, male ones unequally 4-merous. Sepals lanceolate-linear, ca. 1 mm, apex obtuse. Petals greenish yellow or yellow, linear-ob lanceolate to oblong, ca. 3 mm, apex obtuse. Stamens 8, longer than petals. Nectar scales oblong, apically slightly narrowed, 1–1.5 × ca. 0.6 mm, apex emarginate. Carpels of female flowers erect. Styles recurved. Follicles lanceolate to linear-lanceolate, 6–8 mm, apical beak ca. 1 mm. Seeds lanceolate, ca. 2 mm, winged at one end. Fl. Apr–Aug, fr. Jul–Sep.

Forested, grassy, or rocky slopes; 1800–2700 m. C Gansu, Hebei, Jilin, Shanxi, Xinjiang [Japan, Kazakstan, Korea, Mongolia, Russia; Europe, North America].

- 1a. Leaves to 3.5 cm, margin entire or apically few dentate; flowering stems 20–30 cm; inflorescences corymbiform; petals greenish yellow 30a. var. *rosea*
- 1b. Leaves 0.7–1.2 cm, margin serrate; flowering stems 10–16 cm; inflorescences capitate; petals yellow 30b. var. *microphylla*

30a. *Rhodiola rosea* var. *rosea*

红景天(原变种) hong jing tian (yuan bian zhong)
Sedum roseum (Linnaeus) Scopoli, Fl. Carniol. ed. 2, 1: 326. 1771; *Rhodiola elongata* (Ledebour) Fischer & C. A. Meyer; *R. rosea* var. *elongata* (Ledebour) H. Jacobsen; *R. telephioides* (Maximowicz) S. H. Fu; *Sedum caerulans* H. Léveillé & Vaniot; *S. elongatum* Ledebour; *S. rhodiola* de Candolle; *Sedum suboppositum* Maximowicz var. *telephioides* Maximowicz.

Flowering stems 20–30 cm. Leaves oblong to elliptic-ob lanceolate, to 3.5 cm, margin entire or apically few dentate. Inflorescences corymbiform. Petals greenish yellow. Fl. Apr–Jun, fr. Jul–Sep.

Forested, grassy, or rocky slopes; 1800–2700 m. Hebei, Jilin, Shanxi, Xinjiang [Japan, Kazakstan, Korea, Mongolia, Russia; Europe, North America].

Plants misidentified in FRPS as *Rhodiola atropurpurea* (Turczaninov) Trautvetter & C. A. Meyer belong to this variety.

30b. *Rhodiola rosea* var. *microphylla* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

小叶红景天 xiao ye hong jing tian

Sedum roseum (Linnaeus) Scopoli var. *microphyllum* Fröderström, Oesterr. Bot. Z. 87: 120. 1938.

Flowering stems 10–16 cm. Leaves obovate to oblong, 0.7–1.2 cm, margin serrate. Inflorescences capitate. Petals yellow. Fl. Jul–Aug.

• C Gansu (Wuwei Xian).

31. *Rhodiola sachalinensis* Borissova in Komarov, Fl. URSS 9: 473. 1939.

库页红景天 ku ye hong jing tian

Sedum sachalinense (Borissova) Voroschilov.

Roots usually erect, rarely prostrate, robust. Caudex short, thick. Caudex leaves dusky, scalelike, membranous. Flowering stems 6–30 cm. Stem leaves basally remote but apically denser, spatulate, oblong-rhombic, or lanceolate, 0.7–4 × 0.4–0.9 cm, base cuneate, margin basally subentire but apically roughly dentate, apex acute to acuminate. Inflorescences cymes, compact, 1.5–2.5 cm in diam., many flowered, basally leafy. Flowers unisexual, 4(or 5)-merous. Sepals lanceolate-linear, 1–3 mm. Petals yellowish, linear-oblong to oblong, 2–6 mm, apex obtuse. Stamens of male flowers 8, longer than petals; anthers yellow. Nectar scales 4, oblong, 1–1.5 × ca. 0.6 mm, apex emarginate. Carpels of female flowers 4. Styles recurved. Follicles erect, lanceolate to linear-lanceolate, 6–8 mm, apical beak ca. 1 mm. Seeds oblong to lanceolate, ca. 2 × 0.6 mm. Fl. Apr–Jun, fr. Jul–Sep. Forested slopes, gravel slopes, alpine tundra; 1600–2500 m. Heilongjiang, Jilin [Japan, Korea, Russia].

32. *Rhodiola crenulata* (J. D. Hooker & Thomson) H. Ohba, J. Jap. Bot. 51: 386. 1976.

大花红景天 da hua hong jing tian

Sedum crenulatum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 96. 1858; *Rhodiola euryphylla* (Fröderström) S. H. Fu; *R. megalophylla* (Fröderström) S. H. Fu; *R. rotundata* (Hemsley) S. H. Fu; *Sedum bupleuroides* Wallich ex J. D. Hooker & Thomson var. *rotundatum* (Hemsley) Fröderström; *S. euryphyllum* Fröderström; *S. megalanthum* Fröderström; *S. megalophyllum* Fröderström; *S. rotundatum* Hemsley; *S. rotundatum* Hemsley var. *oblongatum* C. Marquand & Airy Shaw.

Caudex few branched, short, 5–20 cm; persistent old flowering stems and branches few, black when dry. Caudex leaves scalelike, oblanceolate, 1–2 cm, apex subacute. Sterile branches erect, 4–17 cm, apically densely leafy; leaves broadly obovate, 1–3 cm. Flowering stems numerous, erect or flabellate, straw-colored to red, 5–20 cm; leaves shortly pseudopetiolate;

leaf blade elliptic-oblong to suborbicular, 1.2–3 × 1–2.2 cm, margin entire and undulate to crenate, apex obtuse to mucronate. Inflorescences corymbiform, ca. 2 × 2–3 cm, many flowered, bracteate. Flowers shortly to long pedicellate, unisexual, large, male ones unequally 5-merous. Sepals narrowly triangular, lanceolate, or oblong, 2–3.5 mm, apex obtuse to subobtusate. Petals red to purplish red, oblanceolate, (5–)6–7.5 × 1–1.5 mm, base long unguulate, apex obtuse. Stamens 10, equaling petals; antepetalous ones inserted ca. 2.5 mm from petal base. Nectar scales subquadrangular, quadrangular, or oblong, apex emarginate. Carpels lanceolate to oblong, 3–3.5(–6) mm, sterile. Styles short. Female flowers similar but stamens absent and carpels equaling petals. Follicles erect, red when dry, 8–10 mm. Seeds obovoid to ovoid, 1.5–2 mm, winged at both ends. Fl. Jun–Sep.

Thickets, grassland slopes, schist on mountain slopes, rocky places, rock crevices; 2800–5600 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

33. *Rhodiola serrata* H. Ohba, J. Jap. Bot. 52: 263. 1977.

齿叶红景天 chi ye hong jing tian

Sedum serratum (H. Ohba) J. P. Kozhevnikov.

Caudex thick. Caudex leaves scalelike. Flowering stems solitary or few, straw-colored, 28–60 cm, apically mammillate. Stem leaves alternate, sessile, narrowly oblong, oblong, or linear-oblong, 6–13 × 1.6–3.5 cm, base somewhat auriculate, margin serrulate, apex acute. Inflorescences terminal, compoundly cymose, large, more than 300-flowered; peduncle mammillate; bracts few, sessile, oblanceolate to narrowly lanceolate, 2.5–4 × ca. 1 cm, margin serrate. Flowers unisexual, male ones unequally 5- or 6-merous, female ones 4- or 5-merous; pedicel 1.5–2 mm. Sepals narrowly oblong in male flowers, subulate in female ones, ca. 1 mm. Petals oblanceolate to linear-oblong and 2–3 mm in male flowers, linear and 2–2.5 mm in female ones. Stamens 10 or 12, 2.7–3 mm. Ovary ca. 2 mm. Nectar scales oblong, apex emarginate. Carpels erect, 4.2–7 mm, base subconnate, apex tapered. Styles recurved. Fl. Aug.

Forested slopes, field borders, beside trails near field borders; 3300–3800 m. S Xizang (Gyaca Xian) [India].

34. *Rhodiola heterodonta* (J. D. Hooker & Thomson) Borissova in Komarov, Fl. URSS 9: 32. 1939.

异齿红景天 yi chi hong jing tian

Sedum heterodontum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 95. 1858; *S. roseum* (Linnaeus) Scopoli var. *heterodontum* (J. D. Hooker & Thomson) Fedtschenko ex Fröderström.

Roots vertical, stout. Caudex branched. Caudex leaves scalelike. Flowering stems erect, 30–40 cm × 4–5 mm. Stem leaves alternate, sessile, triangular-ovate, 1.5–2 × ca. 1.4 cm, base cordate and amplexicaul, margin coarsely serrate, apex acute. Inflorescences

corymbiform, compact, 1–1.5 × 1.5–2 cm, ebracteate. Flowers shortly pedicellate, unisexual, male ones unequally 4-merous. Sepals linear, ca. 3 mm, apex obtuse. Petals greenish yellow, linear, to 7 × 1.3 mm, apex subobtusate. Stamens 8, reddish, much longer than petals. Nectar scales linear, apex shallowly concave. Carpels lanceolate, ca. 6 mm. Styles short. Follicles erect, linear-oblong, apical beak curved, short. Seeds brown, ellipsoid. Fl. May–Jun, fr. Jul.

Slopes, sides of ravines, glacial rocks; 2800–4700 m. Xinjiang, Xizang [Afghanistan, India, Mongolia, Pakistan, Tajikistan; SW Asia (Iran)].

35. *Rhodiola junggarica* C. Y. Yang & N. R. Cui, Acta Phytotax. Sin. 20: 321. 1982.

准噶尔红景天 zhun ga er hong jing tian

Main root robust. Caudex thick, 4–5(–10) cm. Caudex leaves brown, scalelike, ovate-triangular, membranous. Flowering stems 1–4, 5–11 cm. Stem leaves alternate, yellowish green, ovate-triangular, 5–10 × 4–5 mm, base truncate to subcordate, margin coarsely obtuse-serrate, apex shortly acuminate. Inflorescences capitately corymbiform, dense, ca. 1 × 1–2 cm, basally leafy. Flowers unisexual, male ones unequally 4-merous; pedicel 2–3 mm. Sepals reddish, triangular-linear, shorter than petals. Petals red, sometimes yellow at base, elliptic, ca. 2 mm, apex obtuse. Stamens 8, ca. 4 mm; filaments and anthers yellow. Nectar scales oblong, apex retuse. Fl. Jun.

• Subalpine and alpine meadows; 2500–2700 m. W Xinjiang (Wenquan Xian).

36. *Rhodiola cretinii* (Raymond-Hamet) H. Ohba, J. Jap. Bot. 51: 386. 1976.

根出红景天 gen chu hong jing tian

Caudex prostrate, 2–4 mm in diam. Caudex leaves scalelike, small, apex obtuse. Flowering stems few, ascending to suberect, 2–12 cm. Stem leaves somewhat crowded, linear, narrowly elliptic, linear-obovate, elliptic-oblong, or spatulate, 7–10 × 1.5–2.5 mm, base decurrent or long attenuate and shortly spurred, margin entire or shallowly 3–5-crenate, apex rounded, obtuse, or acute. Inflorescences corymbiform, dense, ca. 1 cm in diam., bracteate. Flowers unisexual, unequally 5-merous in male plants, rarely 4- or 6-merous. Sepals linear to subulate, 3–4.5 mm, apex obtuse. Petals green to yellowish white, linear-oblancheolate, linear-spatulate, narrowly elliptic, or linear-obovate, 3.5–6 × 1–1.5 mm, apex obtuse. Stamens 10; antesealous ones 5–7 mm; antepetalous ones 4–6 mm, inserted ca. 1.5 mm from petal base. Nectar scales oblong, apex emarginate. Carpels erect, narrowly ellipsoid, 5–7 mm. Seeds numerous. Fl. Jun–Aug.

3700–4400 m. Xizang, NW Yunnan [Bhutan, NE India, Nepal, Sikkim].

1a. Flowers 5-merous; petals narrowly elliptic to linear-obovate; leaves linear, narrowly

elliptic, or linear-obovate, apex obtuse or acute; flowering stems to 12 cm 36a. subsp. *cretinii*

1b. Flowers often 4-merous; petals linear-oblancheolate to linear-spatulate; leaves elliptic-oblong to spatulate, apex rounded; flowering stems 2–5 cm

..... 36b. subsp. *sinoalpina*

36a. *Rhodiola cretinii* subsp. *cretinii*

根出红景天(原亚种) gen chu hong jing tian (yuan ya zhong)

Sedum cretinii Raymond-Hamet, J. Bot. 54(Suppl. 1): 16. 1916; *Chamaerhodiola cretinii* (Raymond-Hamet) Nakai; *Rhodiola crassipes* var. *cretinii* (Raymond-Hamet) H. Jacobsen; *Sedum crassipes* Wallich ex J. D. Hooker & Thomson var. *cretinii* (Raymond-Hamet) Fröderström; *S. wallichianum* Hooker var. *cretinii* (Raymond-Hamet) Hara.

Flowering stems to 12 cm. Leaves linear, narrowly elliptic, or linear-obovate, base long attenuate and shortly spurred, margin entire or shallowly 3–5-crenate, apex obtuse to acute. Flowers 5-merous. Petals narrowly elliptic to linear-obovate.

3700–4100 m. Xizang [Bhutan, NE India, Nepal, Sikkim].

36b. *Rhodiola cretinii* subsp. *sinoalpina* (Fröderström) H. Ohba, J. Jap. Bot. 52: 265. 1977.

高山红景天 gao shan hong jing tian

Sedum roseum (Linnaeus) Scopoli var. *sinoalpinum* Fröderström in Handel-Mazzetti, Symb. Sin. 7: 406. 1931; *Rhodiola sinoalpina* (Fröderström) S. H. Fu.

Flowering stems 2–5 cm. Leaves elliptic-oblong to spatulate, base decurrent, margin entire, apex rounded. Flowers often 4-merous. Petals linear-oblancheolate to linear-spatulate.

• 4300–4400 m. NW Yunnan.

37. *Rhodiola kirilowii* (Regel) Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9: 422. 1859.

狭叶红景天 xia ye hong jing tian

Sedum kirilowii Regel in Regel & Tiling, Fl. Ajan. 92. in adnot, no. 114. 1858; *Rhodiola kirilowii* var. *latifolia* S. H. Fu; *R. linearifolia* Borissova; *R. longicaulis* (Praeger) S. H. Fu; *R. macrolepis* (Franchet) S. H. Fu; *R. robusta* (Praeger) S. H. Fu; *Sedum kirilowii* var. *altum* Fröderström; *S. kirilowii* var. *linifolium* Regel & Schmalhausen; *S. kirilowii* var. *rubrum* Praeger; *S. longicaule* Praeger; *S. macrolepis* Franchet; *S. robustum* Praeger.

Roots erect, thick. Caudex 1.5–2.5 cm in diam. Caudex leaves scalelike, lanceolate, ovate, or triangular.

Flowering stems few, (10–)15–60(–90) cm × 4–6 mm, densely leafy. Stem leaves alternate or subverticillate, sessile, linear to linear-lanceolate, (1.5–)4–6 × 0.2–1.5 cm, margin sparsely serrulate, sometimes entire, rarely shallowly serrate. Flowers unisexual, sometimes bisexual, male ones unequally 4- or 5-merous. Sepals linear, oblong, or triangular, 1.5–3 mm, apex acute to

acuminate. Petals green, greenish yellow, or red, linear-lanceolate, oblanceolate, oblong-lanceolate, broadly oblong, or obovate, 3–4 × ca. 0.8 mm. Stamens 8 or 10, 2–2.5(–5) mm, equaling or slightly longer than petals; filaments and anthers yellow. Nectar scales oblong, spatulate-subquadrangular, subquadrangular, or ovate, apex obtuse to emarginate. Carpels erect. Follicles lanceolate, 7–8 mm, apical beak recurved, short. Seeds oblong-lanceolate, ca. 1.5 mm. Fl. May–Sep.

Forest margins, grassy slopes, often in partial shade; 2000–5600 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Myanmar].

38. *Rhodiola purpureoviridis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

紫绿红景天 *zi lu hong jing tian*

Caudex branched, erect, to 2 cm in diam. Caudex leaves scalelike, triangular to subtriangular. Flowering stems few, erect, (10–)12–40 cm, densely glandular hairy. Stem leaves numerous, alternate, sessile, narrowly oblong-lanceolate-elliptic, narrowly ovate, or ovate, 1–6 × 0.3–1 cm, glabrous or abaxially glandular hairy, midvein conspicuous, base rounded or subcordate, margin remotely dentate and often revolute, apex rounded, obtuse, or subacute. Inflorescences corymbiform-umbellate, many flowered, bracteate. Flowers bisexual or unisexual (plants hermaphroditic, dioecious, or rarely gynodioecious), male ones unequally 5-merous; pedicel long, glandular. Sepals linear-lanceolate, 1–2.5 mm. Petals greenish or reddish, linear-oblanceolate to narrowly obovate, 3–4 mm. Stamens 10, 2.5–3.5 mm; filaments purple; anthers globose. Nectar scales oblong-cuneate, apex emarginate. Carpels erect, lanceolate, 2–3 mm. Follicles ca. 6 mm, apical beak recurved. Fl. Jul–Aug.

• Forests or forest margins, grassland near streams, stony places on grassy slopes; 2500–4100 m. W Sichuan, S Xizang, NW Yunnan.

- 1a. Stem leaves narrowly oblong-lanceolate, 2.5–6 × 0.3–1 cm, abaxially glandular hairy, base rounded; flowering stems 15–40 cm; flowers unisexual (plants dioecious); petals greenish, linear-oblanceolate 38a. subsp. *purpureoviridis*
- 1b. Stem leaves elliptic, narrowly ovate, or ovate, 1–2 × 0.4–0.7 cm, glabrous, base subcordate; flowering stems (10–)12–20(–22) cm; flowers bisexual or rarely female (plants hermaphroditic or rarely gynodioecious); petals reddish, narrowly obovate 38b. subsp. *phariensis*

38a. *Rhodiola purpureoviridis* subsp. *purpureoviridis*

紫绿红景天(原亚种) *zi lu hong jing tian* (yuan ya zhong)

Sedum purpureoviride Praeger, J. Bot. 55: 39. 1917; *S. bupleuroides* Wallich ex J. D. Hooker & Thomson var. *purpureoviride* (Praeger) Fröderström.

Flowering stems 15–40 cm. Stem leaves narrowly oblong-lanceolate, 2.5–6 × 0.3–1 cm, abaxially glandular hairy, base rounded, apex subacute. Flowers unisexual (plants dioecious). Petals greenish.

• Forests or forest margins, grassland near streams, stony places on grassy slopes; 2500–4100 m. W Sichuan, NW Yunnan.

38b. *Rhodiola purpureoviridis* subsp. *phariensis* (H. Ohba) H. Ohba, J. Jap. Bot. 61: 206. 1986.

帕里红景天 *pa li hong jing tian*

Sedum phariense H. Ohba, J. Jap. Bot. 48: 328. 1973; *Rhodiola phariensis* (H. Ohba) S. H. Fu.

Flowering stems (10–)12–20(–22) cm. Stem leaves elliptic, narrowly ovate, or ovate, 1–2 × 0.4–0.7 cm, glabrous, base subcordate, apex rounded, obtuse, or subacute. Flowers bisexual or rarely female (plants hermaphroditic or rarely gynodioecious). Petals reddish, narrowly obovate.

• S Xizang (Yadong Xian).

39. *Rhodiola discolor* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

异色红景天 *yi se hong jing tian*

Sedum discolor Franchet, J. Bot. (Morot) 10: 285. 1896; *S. bupleuroides* Wallich ex J. D. Hooker & Thomson var. *discolor* (Franchet) Fröderström.

Caudex subprostrate, ascending, or suberect, 3–5 mm in diam. Caudex leaves scalelike, narrowly triangular. Flowering stems 1 to few, simple, erect, 12–40 cm. Stem leaves alternate; petiole ca. 1 mm; leaf blade adaxially green, abaxially ± glaucescent, linear-lanceolate, oblong-lanceolate, ovate-lanceolate, or ovate, 9–25 × 3–5(–7) mm, base auriculate to rounded, margin obscurely dentate to subentire and usually revolute, apex acute to acuminate. Inflorescences corymbiform, 3–5 × 5–10 cm; bracts leaflike, small. Flowers shortly pedicellate, unisexual, unequally 4- or 5-merous. Sepals narrowly triangular, 1–2.5 × 0.5–1 mm. Petals purplish red, oblong to oblong-obovate, 5–6 mm in male flowers, 3–4 × 1–1.3 mm in female ones. Stamens of male flowers 8–10; antesealous ones ca. 2 mm; antepetalous ones ca. 1.5 mm. Nectar scales oblong-quadrangular, apex emarginate. Carpels erect, ca. 2 mm. Follicles 3–4 mm. Fl. Jun–Jul, fr. Jul–Aug.

Forests, grassy slopes, rocky cliffs; 2800–4300 m. W Sichuan, SE Xizang, NW Yunnan [Nepal, Sikkim].

40. *Rhodiola bupleuroides* (Wallich ex J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

紫胡红景天 *cai hu hong jing tian*

Sedum bupleuroides Wallich ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 98. 1858; *Rhodiola bhutanica* (Praeger) S. H. Fu; *R. hookeri* S. H. Fu; *Sedum bhutanense* Praeger; *S. bhutanicum* Praeger;

S. cooperi Praeger (1919), not Clemenceau (1868); *S. gorisii* Raymond-Hamet.

Caudex erect, dusky, obconical, to 10 × 3 cm. Caudex leaves brown-black, scalelike. Flowering stems 1 or 2, (1–)5–60(–100) cm. Stem leaves alternate, abaxially greenish, narrowly to broadly elliptic, narrowly to broadly ovate, oblong-ovate, obovate, or suborbicular, 0.3–6(–9) × 0.4–2.2(–4.5) cm, base cordate to shortly or long attenuate, margin entire or sparsely serrate, apex rounded, obtuse, acute, or mucronate. Inflorescences terminal, corymbiform, 7–100-flowered; bracts leaflike. Flowers unisexual, male ones unequally 5-merous. Sepals purplish red, narrowly oblong, oblong-ovate, or narrowly triangular, 1–5 × 0.3–1.2 mm, apex rounded to obtuse. Petals dark purplish red, obovate or narrowly so, 2.8–4 × 1.2–1.6 mm in male flowers, 1.5–3 × 0.5–0.7 mm in female ones. Stamens 10, equaling or slightly shorter than petals. Nectar scales oblong or narrowly or transversely so, apex emarginate. Carpels of female flowers erect, broadest at base, 3–5 × as long as petals, apex recurved. Follicles 4–5(–10) mm. Seeds 10–16. Fl. Jun–Aug, fr. Aug–Sep.

Thickets, grassy places, rock crevices on slopes; 2400–5700 m. W Sichuan, Xizang, NW Yunnan [Bhutan, Myanmar, Nepal, Sikkim].

41. *Rhodiola atsaensis* (Fröderström) H. Ohba, J. Jap. Bot. 51: 386. 1976.

柴胡红景天 *chai hu hong jing tian*
Sedum atsaense Fröderström, Ark. Bot. 30A(9): 4. 1943. Caudex mostly simple, prostrate; persistent old flowering stems absent. Winter bud 8–10 mm, apex acute. Caudex leaves scalelike, triangular-ovate, 6–9 mm, apex subacute. Sterile stems apically densely leafy. Flowering stems 1 or 2, pale, to 6 cm, transversely wrinkled when dried, mostly leafless. Stem leaves alternate, sessile, oblanceolate, much reduced except immediately below inflorescences, 6–8 mm, base slightly narrowed, apex subobtuse. Inflorescences corymbiform-umbellate, to 4 × 4 cm; bracts leaflike, 4–10 mm. Flowers unisexual, 4-merous; pedicel 2–4 mm. Sepals broadly lanceolate, ca. 4 mm, apex obtuse. Petals reddish, drying pale, broadly oblanceolate, ca. 4.5 mm, apex obtuse. Stamens 8, slightly shorter than or equaling petals. Nectar scales rectangular, apex emarginate. Carpels ovoid; ca. 4 mm. Styles short. Follicles not seen. Fl. Jul–Aug.

Scree slopes; 4500–4900 m. Xizang [India].

The available herbarium material suggests that this is a typical plant of loose scree slopes, on which loose stones cover the caudex and flowering stems (except the inflorescences) and pull them downhill.

42. *Rhodiola wallichiana* (Hooker) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

粗茎红景天 *cu jing hong jing tian*

Caudex prostrate, slender, ca. 1 cm in diam.; persistent old flowering stems absent. Flowering stems 3–5, 17–40 cm. Stem leaves numerous, sessile, lanceolate to

linear-oblongate, 1.2–3 × 0.2–0.3 cm, attenuate on both ends, margin apically 1–3-serrate. Inflorescences terminal, corymbiform, 1.5–2.5 cm in diam., bracteate. Flowers bisexual, rarely unisexual, unequally 5-merous. Sepals linear, 3–8 mm, apex obtuse. Petals reddish, greenish, green, or yellowish white, linear-oblongate or obovate-elliptic, 5–10 × ca. 2 mm, apex obtuse. Stamens 10, 0.8–1.2 cm. Nectar scales subspatulate-quadrangular or subquadrangular, apex slightly dilated, emarginate. Carpels erect, ovoid. Follicles lanceolate, 1–1.5 cm, base narrow. Seeds winged. Fl. Aug–Sep, fr. Oct.

Forests, rocks on slopes; 2500–3800 m. W Sichuan, SE Xizang, W Yunnan [Bhutan, N India, Myanmar, Nepal, Sikkim].

1a. Flowering stems 17–25 cm; stem leaves 1.2–1.6 cm; petals reddish, greenish, or yellowish white, obovate-elliptic; nectar scales subspatulate-quadrangular 42a. var. *wallichiana*

1b. Flowering stems ca. 40 cm; stem leaves ca. 3 cm; petals green, linear-oblongate; nectar scales subquadrangular 42b. var. *cholaensis*

42a. *Rhodiola wallichiana* var. *wallichiana*

粗茎红景天(原变种) *cu jing hong jing tian* (yuan bian zhong)

Sedum wallichianum Hooker, Icon. Pl. 7: t. 604. 1844; *Chamaerhodiola crassipes* (J. D. Hooker & Thomson) Nakai; *Rhodiola crassipes* (J. D. Hooker & Thomson) Borissova; *S. crassipes* Wallich ex J. D. Hooker & Thomson.

Flowering stems 17–25 cm. Stem leaves 1.2–1.6 cm. Petals reddish, greenish, or yellowish white, obovate-elliptic. Nectar scales subspatulate-quadrangular.

Forests, rocks on slopes; 2500–3800 m. SE Xizang, NW Yunnan [Bhutan, N India, Myanmar, Nepal, Sikkim].

42b. *Rhodiola wallichiana* var. *cholaensis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

大株粗茎红景天 *da zhu cu jing hong jing tian*

Sedum crassipes J. D. Hooker & Thomson var. *cholaense* Praeger, J. Bot. 57: 50. 1919.

Flowering stems ca. 40 cm. Stem leaves ca. 3 cm. Petals green, linear-lanceolate. Nectar scales subquadrangular.

About 3500 m. W Sichuan, SW Yunnan [Sikkim].

43. *Rhodiola stephanii* (Chamisso) Trautvetter & C. A. Meyer in Middendorff, Reise Sibir. 1(2): 39. 1856.

兴安红景天 *xing an hong jing tian*

Sedum stephanii Chamisso, Linnaea 6: 549. 1831; *Chamaerhodiola stephanii* (Chamisso) Nakai; *S. crassipes* Wallich ex J. D. Hooker & Thomson var. *stephanii* (Chamisso) Fröderström.

Roots branched, thick. Caudex few branched, short, 5–10 mm in diam. Flowering stems few, 10–20 cm × 2.5–5 mm. Stem leaves pale green, linear-lanceolate to lanceolate, 3–5 × 0.6–0.8 cm, base cuneate, margin apically roughly and deeply serrate, apex acuminate. Inflorescences compact, 2–3 cm in diam., bracteate. Flowers shortly pedicellate, unisexual, male ones unequally 4- or 5-merous. Sepals linear, 3–4 mm. Petals yellowish to yellowish white, linear-lanceolate, 5–6 mm, apex obtuse. Stamens 8 or 10, equaling or slightly longer than petals; filaments pale; anthers yellowish, sometimes reddish. Nectar scales subquadrangular. Carpels narrowly ovoid. Styles erect, long. Stigma wide. Follicles erect, oblong-lanceolate, 7–10 mm, apical beak ca. 1 mm. Seeds brown, obovoid. Fl. Jun–Aug, fr. Jul–Aug.

N Nei Mongol (Hulun Buir Meng) [Russia].

44. *Rhodiola pinnatifida* Borissova in Komarov, Fl. URSS 9: 475. 1939.

羽裂红景天 *yu lie hong jing tian*

Sedum pinnatifidum (Borissova) J. P. Kozhevnikov.

Main root few branched, thick, fusiform. Caudex 1–1.5 × 1–2 cm. Caudex leaves scalelike, oblong-triangular, 4–5 × ca. 3 mm, apex acute. Flowering stems few, erect, 10–20 cm × 3–4 mm, densely leafy. Stem leaves alternate, subopposite, or nearly 3-verticillate, linear-lanceolate to lanceolate, 2–3.5 × 0.3–0.5 cm, base attenuate, apex acute. Inflorescences corymbiform-umbellate, compact, 1.5–2 × 2.5–3 cm, many flowered. Flowers unisexual, unequally 4-merous in male plants, shorter than pedicel. Sepals yellowish green, lanceolate, ca. 4 mm, apex subacute. Petals yellow, lanceolate to oblong-lanceolate, ca. 6 mm, apex subobtuse. Stamens 8, ca. 9 mm, ca. 1.5 × as long as petals; filaments yellow; anthers greenish yellow, globose. Nectar scales ca. 1 × 0.5 mm. Follicles oblong-lanceolate, to 8 mm, apical beak 1–2 mm. Seeds brown, oblong, to 2 mm. Fl. Jun–Aug, fr. Jul–Aug.

About 2200 m. N Xinjiang (Altay Shan) [Mongolia, Russia].

Rhodiola pinnatifida falls within the range of variation of *R. stephania* and is therefore difficult to separate from the latter species. Further study is needed to determine whether or not the two are conspecific.

45. *Rhodiola macrocarpa* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

大果红景天 *da guo hong jing tian*

Sedum macrocarpum Praeger, Notes Roy. Bot. Gard.

Edinburgh 13: 88. 1921; *Chamaerhodiola eurycarpa* (Fröderström) Nakai; *Rhodiola eurycarpa* (Fröderström) S. H. Fu; *Sedum eurycarpum* Fröderström; *S. progressum* Diels.

Caudex 0.5–2.5 cm in diam. Caudex leaves scalelike, long triangular. Flowering stems few to numerous, erect, 10–30 cm, apically finely mammillate. Stem leaves subverticillate, basal ones shorter, margin entire, apical ones sessile, linear-oblancheolate to oblanceolate, 2–5 × 1–1.5 cm, base attenuate, margin irregularly serrate or lobed. Inflorescences corymbiform, 2–4 × 3–7 cm, bracteate. Flowers unisexual, male ones unequally 5-merous; pedicel mammillate. Sepals linear to narrowly so, 4–5 mm. Petals greenish yellow to purplish red,

linear to linear-oblancheolate, 5–6 mm. Stamens 10, yellow, 6–8 mm. Nectar scales subquadrangular to quadrangular, apex emarginate. Carpels of female flowers purple, oblong-ovoid to obliquely ovoid, 6–10 mm, adaxially gibbous, base attenuate. Styles erect, short. Seeds lanceolate-ovoid to ovoid, winged at both ends. Fl. Jun–Jul, fr. Aug–Sep.

Rocks on slopes; 2900–4300 m. Gansu, Qinghai, Shaanxi, Sichuan, SE Xizang, NW Yunnan [Myanmar].

46. *Rhodiola yunnanensis* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

云南红景天 *yun nan hong jing tian*

Sedum yunnanense Franchet, J. Bot. (Morot) 10: 286. 1896; *Rhodiola henryi* (Diels) S. H. Fu; *R.*

papillocarpa (Fröderström) S. H. Fu; *R. rotundifolia* (Fröderström) S. H. Fu; *R. sinica* (Diels) Jacobsen; *Sedum henryi* Diels; *S. sinicum* Diels; *S. valerianoides* Diels; *S. yunnanense* var. *henryi* (Diels) Raymond-Hamet; *S. yunnanense* var. *oxyphyllum* Fröderström; *S. yunnanense* var. *papillocarpum* Fröderström; *S. yunnanense* var. *rotundifolium* Fröderström; *S. yunnanense* var. *valerianoides* (Diels) Raymond-Hamet.

Caudex simple or few branched, long, 0.7–2 cm in diam. Caudex leaves scalelike, lanceolate, ovate-triangular, or triangular. Flowering stems solitary or few, erect, 20–100 cm, glabrous. Stem leaves 3-verticillate, rarely opposite, sessile, abaxially pale green, ovate-lanceolate, elliptic, oblong, ovate-oblong, broadly ovate, or orbicular, (1–)4–7(–10) × (0.6–)2–4(–8) cm, base rounded-cuneate, margin remotely serrate, sublobate, or rarely entire, apex obtuse to acute. Inflorescences cymose-paniculate, (3–)5–15 × 2–8 cm; branches verticillate. Flowers numerous, unisexual, unequally 4- or 5-merous in male plants, small. Sepals linear-lanceolate to lanceolate, 0.5–1 mm. Petals of male flowers greenish yellow to yellow, spatulate to oblong-lanceolate, ca. 1.5 mm; those of female flowers purple, linear, ca. 1.2 mm. Stamens 8, shorter than petals. Nectar scales spatulate-quadrate or cuneate-quadrate in male flowers, suborbicular in female ones. Carpels divergent, ovoid, 1.5–3 mm. Follicles stellate, 3–3.2 mm, base connate for ca. 1 mm. Seeds lanceolate, ca. 2 × 0.4 mm, winged. Fl. May–Jul, fr. Jun–Aug.

• Forests on slopes; 1000–4000 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Xizang, Yunnan.

This species is used medicinally.

47. *Rhodiola forrestii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

长圆红景天 *chang yuan hong jing tian*

Sedum yunnanense Franchet var. *forrestii* Raymond-Hamet, Notes Roy. Bot. Gard. Edinburgh 5: 117. 1912; *S. yunnanense* var. *muliense* Fröderström; *S.*

yunnanense var. *oblanceolatum* Fröderström; *S. yunnanense* var. *strictum* Fröderström.

Caudex erect or inclining, ca. 1.5 cm in diam. Caudex leaves scalelike, narrowly triangular-lanceolate. Flowering stems erect, 20–40 cm. Proximal stem leaves 3- or 4-verticillate or opposite, sessile, ± lanceolate- to ovate-oblong, linear-oblong distally on stem, 2–5 × 0.6–1 cm, margin remotely and coarsely dentate, pinnately lobate, or subentire. Inflorescences terminal cymose panicles or axillary cymes. Flowers unisexual, male ones unequally 5-merous. Sepals ca. 3 mm, base connate for ca. 1 mm. Petals oblong and 3–3.5 mm in male flowers, triangular-ovate and ca. 1.1 mm in female ones. Stamens 10; antesepalous ones as long or slightly longer than petals; antepetalous ones slightly shorter than petals. Nectar scales broadly cuneate, apex rounded to emarginate. Carpels oblong-ovoid, ca. 3 mm. Styles recurved, short. Fl. Jun–Jul, fr. Aug.

• Slopes; 2900–4000 m. W Sichuan, NW Yunnan.

48. *Rhodiola sinuata* (Royle ex Edgeworth) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

裂叶红景天 *lie ye hong jing tian*

Sedum sinuatum Royle ex Edgeworth, Trans. Linn. Soc. London 20: 47. 1846; *S. linearifolium* Royle var. *sinuatum* (Edgeworth) Raymond-Hamet.

Roots long. Caudex leaves scalelike. Flowering stems erect or creeping, ca. 15 cm, glabrous or finely mammillate, leafy. Stem leaves alternate, elliptic to obovate, 5–7 × 2–4 cm, base attenuate, margin pinnately parted or divided; segments 2 or 3, linear, 1.5–3 mm wide. Inflorescences corymbiform, compact, ca. 1.5 × 2.5 cm. Flowers bisexual, unequally 5-merous; pedicel finely mammillate or absent. Sepals narrowly triangular-linear, ca. 3 mm. Petals greenish white, elliptic, ca. 6 × 2 mm, margin entire, apex subobtuse. Stamens 10; antesepalous ones ca. 5 mm; antepetalous ones ca. 4 mm, inserted ca. 1 mm from petal base. Nectar scales subquadrangular, apex somewhat broadly truncate to subretuse. Carpels narrowly lanceolate, ca. 3.5 mm. Styles short. Follicles erect, ca. 6 mm. Seeds brown, ovoid-oblong, winged at both ends. Fl. Aug, fr. Oct.

Rock crevices on slopes, scree slopes; 3200–4300 m. Xizang, NW Yunnan (Zhongdian Xian) [India, Nepal, Pakistan].

49. *Rhodiola tieghemii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

巴塘红景天 *ba tang hong jing tian*

Sedum tieghemii Raymond-Hamet, Bull. Soc. Bot. France 55: 711. 1908; *S. linearifolium* Royle var. *tieghemii* (Raymond-Hamet) Raymond-Hamet.

Caudex short, fleshy. Flowering stems simple, erect, 8–11 cm, glabrous, apically finely mammillate. Stem leaves alternate, evenly distributed; petiole 1.5–2 cm;

leaf blade oblong, 1–3 × 0.5–2.5 cm, base abruptly narrowed, margin deeply crenate to pinnatifid and finely mammillate, apex obtuse. Inflorescences corymbiform, compact; bracts linear, 8–11 mm. Flowers bisexual, unequally 5-merous; pedicel short, finely mammillate. Sepals triangular-linear, ca. 6 mm, base ca. 1.5 mm wide, margin sometimes finely mammillate. Petals narrowly oblong to elliptic, 5.5–8.5 × 2.5–4.3 mm, margin apically erose, apex obtuse. Stamens 10; antesepalous ones ca. 6 mm; antepetalous ones 2.5–3 mm, inserted ca. 2 mm from petal base. Nectar scales quadrangular, ca. 0.4 × 0.5 mm, apex emarginate. Carpels erect, narrowly lanceolate, ca. 6.5 mm. Styles ca. 1.5 mm. Fl. Sep.

• W Sichuan (Batang Xian), E Xizang.

50. *Rhodiola sacra* (Prain ex Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

圣地红景天 *sheng di hong jing tian*

Main root branched, thick. Caudex short. Caudex leaves scalelike, lanceolate-triangular. Flowering stems few or numerous, simple, erect, straw-colored, 8–16 cm, finely mammillate with age. Stem leaves alternate, evenly distributed, shortly petiolate; leaf blade obovate-oblong to obovate, 8–11 × 4–6 mm, glabrous or sparsely villous, base cuneate, margin with 4 or 5 dentate lobes on each side, apex obtuse to acute. Inflorescences corymbiform, few flowered. Flowers bisexual, unequally 5-merous. Sepals narrowly lanceolate-triangular, 3.5–5 × ca. 1.2 mm. Petals white, narrowly oblong, 10–11 × 1.2–2 mm, margin entire or somewhat erose. Stamens 10, ca. 10 mm; filaments yellowish; anthers purple. Nectar scales subquadrangular, base somewhat narrowed, apex slightly dilated, rounded to subretuse. Carpels narrowly lanceolate, ca. 5.5 mm. Follicles erect, ca. 6 mm. Seeds brown, oblong-lanceolate. Fl. Aug–Sep, fr. Sep.

Grassland slopes, rock crevices on slopes; 2700–5000 m. SE Qinghai, Xizang [Nepal].

1a. Flowering stems few; leaves glabrous 50a. var. *sacra*

1b. Flowering stems numerous; leaves sparsely villous 50b. var. *tsuiana*

50a. *Rhodiola sacra* var. *sacra*

圣地红景天(原变种) *sheng di hong jing tian* (yuan bian zhong)

Sedum sacrum Prain ex Raymond-Hamet, Acta Horti Gothob. 2: 395. 1926; *Rhodiola chrysanthemifolia* (H. Léveillé) S. H. Fu subsp. *sacra* (Prain ex Raymond-Hamet) H. Ohba; *S. linearifolium* Royle var. *sacrum* (Prain ex Raymond-Hamet) Raymond-Hamet. Flowering stems few. Leaves glabrous. Fl. Aug, fr. Sep. Rock crevices on slopes; 2700–4600 m. Xizang [Nepal].

50b. *Rhodiola sacra* var. *tsuiana* (S. H. Fu) S. H. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 75. 1980.

长毛圣地红景天 *chang mao sheng di hong jing tian*

Rhodiola tsuiana S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

Flowering stems numerous. Leaves sparsely villous. Fl. Aug–Sep.

• Grassland slopes; 3600–5000 m. SE Qinghai, E and S Xizang (Lhasa Shi, Qamdo Xian).

51. *Rhodiola alterna* S. H. Fu, Acta Phytotax. Sin. 17(3): 128. 1979.

互生红景天 hu sheng hong jing tian

Caudex terete, 0.7–1.5 cm in diam. Caudex leaves brown, scalelike, triangular. Flowering stems simple, erect to ascending, 9.5–14(–21) cm. Stem leaves alternate, sessile, oblong, obovate-oblong, or obovate, gradually smaller toward base on stem, 1.5–2.2 × 0.8–1.1 cm, base attenuate and spurless, margin with 2 shallowly incised serrations on each side, mammillate when dry, apex obtuse. Inflorescences corymbiform, somewhat compact, 10–15-flowered; bracts spatulate to oblanceolate, 6–8 × ca. 1 mm. Flowers bisexual, unequally 5-merous. Sepals linear-lanceolate, 4–5 × ca. 1 mm. Petals reddish or white, oblong-ovate, 6–7 × ca. 4 mm, margin basally entire and apically erose, apex acuminate. Stamens 10, shorter than petals; antesealous ones to 6 mm; antepetalous ones to 3 mm, inserted ca. 2 mm from petal base. Nectar scales suboblong, ca. 0.4 × 0.6 mm, apex emarginate. Carpels erect, lanceolate, ca. 6 mm, base subconnate. Styles ca. 1 mm. Fl. Aug–Sep.

• Forests, forest margins, rock crevices in scrub or on sunny slopes, moss-covered rocks, riversides; 3800–4600 m. NE Xizang.

52. *Rhodiola chrysanthemifolia* (H. Léveillé) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

菊叶红景天 ju ye hong jing tian

Sedum chrysanthemifolium H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 283. 1913; *Rhodiola dielsiana* (W. Limpricht) S. H. Fu; *Sedum dielsianum* W. Limpricht; *S. linearifolium* Royle var. *balfourii* (Raymond-Hamet) Raymond-Hamet; *S. linearifolium* var. *dielsianum* (W. Limpricht) Raymond-Hamet; *S. linearifolium* var. *forrestii* (Raymond-Hamet) Raymond-Hamet; *S. trifidum* J. D. Hooker & Thomson var. *balfourii* Raymond-Hamet; *S. trifidum* var. *forrestii* Raymond-Hamet.

Main root branched, thick. Caudex long, 6–7 mm in diam. Caudex leaves scalelike, triangular, ca. 4 × 4 mm. Flowering stems 4–10 cm, finely mammillate. Stem leaves aggregated toward stem apex; petiole 5–8 mm; leaf blade oblong, ovate-oblong, or ovate, 1–1.5 × 0.8–1.3 cm, base cuneate, margin pinnately lobed, apex obtuse. Inflorescences corymbiform, compact; bracts orbicular-spatulate, ca. 1 cm. Flowers bisexual, unequally 5-merous. Sepals linear, triangular-linear, or narrowly triangular-ovate, ca. 4 × 0.6–1 mm. Petals oblong-ovate, 7–9 × 1.5–3 mm, margin entire or apically erose. Stamens 10; antesealous ones ca. 6 mm; antepetalous ones ca. 4 mm, inserted ca. 2 mm from

petal base. Nectar scales suboblong, ca. 1 × 0.5 mm, apex emarginate. Styles ca. 2 mm. Follicles erect, lanceolate, 7–8 mm. Fl. Aug, fr. Sep–Oct.

• Grasslands, rocks, rock crevices; 3200–4200 m. SW Sichuan, NW Yunnan.

53. *Rhodiola ovatisepala* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

卵萼红景天 luan e hong jing tian

Caudex prostrate and underground basally, ascending or erect in middle part, slender. Caudex leaves scalelike, triangular. Flowering stems simple, ascending to suberect, 5–25 cm. Stem leaves aggregated toward stem apex; petiole ca. 1.5 cm; leaf blade oblong to elliptic, 3–5 × 1.1–2.5 cm, base attenuate and decurrent, margin 3- or 4-lobed or -cleft; segments sometimes with 1 obtuse serration at margin. Inflorescences dichasia, compact, ca. 2 × 2 cm. Flowers bisexual, unequally 5-merous. Sepals linear or ovate-triangular, ca. 1 mm or (4–)6–8 mm, apex rounded. Petals greenish white, narrowly oblong-ovate, ca. 5 × 1.5 mm, margin entire. Stamens 10, slightly shorter than or equaling petals. Nectar scales oblong, apex truncate to emarginate. Carpels erect, 4–5 mm. Styles ca. 1 mm. Fl. Jun–Sep, fr. Sep–Oct.

Forested slopes, moss-covered tree trunks, rocks, rocky cliffs; 2700–4200 m. S Xizang, NW Yunnan [Bhutan, Myanmar, Nepal, Sikkim].

1a. Sepals ovate-triangular, ca. 1 mm 53a. var. *ovatisepala*
1b. Sepals linear, (4–)6–8 mm 53b. var. *chingii*

53a. *Rhodiola ovatisepala* var. *ovatisepala*

卵萼红景天(原变种) luan e hong jing tian (yuan bian zhong)

Sedum linearifolium Royle var. *ovatisepalum* Raymond-Hamet, Acta Horti Gothob. 2: 394. 1926; *S. ovatisepalum* (Raymond-Hamet) H. Ohba.

Sepals ovate-triangular, ca. 1 mm. Fl. Jul–Sep.

Moss-covered tree trunks, rocks; 2700–4200 m. S Xizang (Cona Xian) [Bhutan, Myanmar, Nepal, Sikkim].

53b. *Rhodiola ovatisepala* var. *chingii* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

线萼红景天 xian e hong jing tian

Sepals linear, (4–)6–8 mm. Fl. Jun–Aug, fr. Sep–Oct.

• Forested slopes, rocky cliffs; 3000–3900 m. SE Xizang, NW Yunnan.

54. *Rhodiola sexifolia* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 123. 1965.

六叶红景天 liu ye hong jing tian

Flowering stems ascending, ca. 18 cm, minutely mammillate. Stem leaves 6-verticillate, sessile, elliptic-oblong, ca. 4 × 2.5 cm, finely to minutely mammillate, base cuneate, margin pinnately lobed; lobes entire or remotely dentate at margin, apex obtuse. Inflorescences corymbiform, dense, ca. 3 × 3–5 cm; bracts narrowly oblanceolate-linear, ca. 6 × 1.2 mm, minutely mammillate. Flowers bisexual, unequally 5-merous. Sepals linear, ca. 3.5 × 1–1.3 mm. Petals lanceolate, 6.3–7 × ca. 2 mm, apex subacute. Stamens 10, slightly shorter than petals; antepetalous ones inserted ca. 2 mm from

petal base; anthers globose. Nectar scales obovate, ca. 0.5 mm. Styles long. Follicles erect, free almost to base, narrowly lanceolate, ca. 5.2 mm. Seeds ellipsoid, ca. 1 mm, striate.

•Rocks in *Picea* forests, slopes; 3500–4100 m. E Xizang (Qamdo Xian).

55. *Rhodiola liciae* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 128. 1965.

昆明红景天 kun ming hong jing tian

Sedum liciae Raymond-Hamet, Bull. Soc. Bot. France 56: 569. 1909.

Main root somewhat thick. Caudex prostrate, short, fleshy. Caudex leaves scalelike, triangular-ovate, ca. 2 mm. Flowering stems simple, erect, 6.5–13 cm. Stem leaves alternate; petiole 4–14 mm; leaf blade rhombic to rhombic-spatulate, 0.7–2 × 0.5–2 cm, base tapered. Inflorescences corymbiform, compact, 1–2 × 1–2 cm; bracts sessile, 3–10 mm, basal ones ovate, margin crenate, apical ones obovate-linear, margin entire. Flowers bisexual, shortly pedicellate, unequally 5-merous. Sepals ovate-triangular, 4–6 × 1.2–2 mm. Petals white, ovate-lanceolate, 8–11 × 2.5–3 mm, apex mucronate, mucro awnlike, to 1 mm. Stamens 10; antesealous ones 6–7 mm; antepetalous ones 4–5 mm, inserted slightly below middle of petal. Nectar scales oblong-quadrangular, apex emarginate. Carpels ovoid-oblong, ca. 6 mm. Styles ca. 2 mm. Follicles erect. Seeds numerous, obovoid-oblong, winged at both ends. Fl. Sep, fr. Oct–Nov.

•Rocks on slopes; ca. 2400 m. Yunnan (Kunming Shi).

