

**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 thyrs, 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. chanetii*
    - 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.
          - 7a. Stamens slightly shorter than or equaling petals; bracts shorter than flowers, ovate-oblong ..... 7. *O. thyrsiflora*
          - 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 chanelii*** (H. Léveillé) A. Berger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 18a: 464. 1930.

塔花瓦松 ta hua wa song

*Sedum chanelii* H. Léveillé, Repert. Spec. Nov. Regni Veg. 5: 99. 1908; *S. fimbriatum* (Turczaninow) Franchet var. *chanelii* 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. chanelii*. 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 chanelii* (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, cylindric, 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 [Kazakstan, 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 lanceolate, 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].

