ERICACEAE

杜鹃花科 du juan hua ke

Fang Mingyuan (方明渊), Fang Ruizheng (方瑞征), He Mingyou (何明友), Hu Linzhen (胡琳贞), Hu Ling-cheng (胡凌程), Yang Hanbi (杨汉碧), Yu Han-pi (于汉庇), Qin Haining (秦海宁), Min Tianlu (闵天禄), Ming Tien-lu (明天禄), David F. Chamberlain, Peter F. Stevens, Gary D. Wallace, Arne Anderberg

Plants usually woody, or herbs, sometimes lacking chlorophyll. Leaves spiral, sometimes decussate, margin often toothed. Inflorescence racemose; bracteoles paired, basal. Flowers (4 or)5-merous. Calyx imbricate. Corolla connate, imbricate. Stamens 10, sometimes with spurs or awns, dehiscing by pores, pollen in tetrads, rarely single. Ovary superior or inferior, placenta axile, rarely parietal, often many ovules per locule. Style ± as long as corolla, slender. Fruit a capsule or berry, rarely a drupe; calyx persistent.

About 125 genera and 4000 species: widely distributed in temperate and subarctic regions, also at high elevations in tropical regions; 22 genera and 826 species (524 endemic) in China.

The Monotropoideae are here included in the Ericaceae; previously in FRPS (56: 157–216. 1990), they were treated as the Pyrolaceae. Chionogon, recorded from China in FRPS (57(3): 69–71. 1991), is here included in Gaultheria. Over the last half century, the Empetraceae have usually been separated from, but closely associated with, the Ericaceae. In their ecology, leaf morphology and insertion, rusts, embryology, stamen anatomy, etc., they largely agree with that family. Molecular data place Empetrum and its relatives firmly within the Ericaceae, and in particular within the subfamily Ericoideae, in agreement with phytochemical and palynological data, and there they are best recognized as a separate tribe. There are distinctive features of the Empetreae that were responsible for their past familial status, e.g., reduced perianth with separate members, low ovule number, enlarged stigmas, etc. However, these are likely to be derived features associated with wind pollination. See Kron et al. (Bot. Rev. 68: 335–423. 2002) and the recent treatment of the Ericaceae by Stevens et al. (in Kubitzki, Fam. Gen. Vasc. Pl. 6: 145–194. 2004).

Several genera and many species are ornamentals. Some fruits of Vaccinium in N China are sweet and edible, but of no particular value to humans. Some species of Chamaedaphne, Cratiodendron, Leucothoe, Lyonia, Pieris, and Rhododendron contain more or less toxic diterpenes, which are harmful to humans or domestic animals.

1a. Herbs to subshrubs; petals free.

2a. Achlorophyllous plant without green leaves; anthers without pores.

3a. Fruit a capsule; ovary 5-located, with axile placentation ................................................................. 6. Monotropa

3b. Fruit a berry; ovary 1-located, with parietal placentation ................................................................. 7. Monotropastrum

2b. Plant usually with green leaves, usually autotrophic; anthers opening by pores.

4a. Subshrub; leaves along stem; flowers in corymbs or umbels, or solitary; filaments ciliate on lower half; style thick, short ..................................................................................................................... 2. Chimaphila

4b. Herb; leaves generally basal; flowers in racemes, or solitary; filaments not ciliate; style slender.

5a. Flower solitary; capsule opening from tip to base, valves without fibers at margins .......................... 3. Moneses

5b. Flowers in racemes; capsule opening from base to tip, valves with fibers at margins.

6a. Leaves cuneate; racemes with flowers on one side; upper portion of scape papillate; disk present ...... 4. Orthilia

6b. Leaves appearing basal; racemes with flowers on all sides; scape not papillate; disk absent ............. 5. Pyrola

1b. Plants woody; petals nearly always fused (absent and replaced by petaloid sepals in Empetrum).

7a. Fruit fleshy.

8a. Ovary superior, free from calyx; seeds 4–9, enclosed in stones.

9a. Leaf blade linear, margin entire, slightly reflexed; corolla absent, sepals petaloid, free ..................... 13. Empetrum

9b. Leaf blade broad, margin serrate or crenate, flat; corolla urceolate, shortly lobed .............................. 8. Arctous

8b. Ovary inferior, completely or rarely mostly adnate to hypanthium; seeds separate, numerous.

10a. Corolla usually short, to 1 cm, urceolate or campanulate, rarely tubular; anthers free; pedicels usually not expanded toward apex; plants usually terrestrial, rarely epiphytic ......................... 21. Vaccinium
10b. Corolla usually long, (0.5–)2–6 cm, tubular or cylindric, rarely urceolate; anthers weakly connate or free; pedicels usually expanded toward apex, sometimes forming a cup below calyx; plants often epiphytic ................................................................. 22. Agapetes
7b. Fruit a capsule.

11a. Persistent calyx ± accrescent and succulent; capsule loculicidal, enclosed in fleshy calyx; anthers with 2–4 awns or minute projections .......................................................... 20. *Gaultheria*

11b. Persistent calyx withered.

12a. Capsule septicidal; anthers without appendages.

13a. Corolla lobes free ................................................................. 11. *Ledum*

13b. Corolla sympetalous.

14a. Corolla actinomorphic or somewhat zygomorphic, funnel-shaped, campanulate, rarely rotate or cylindrical, more than 10 mm; stamens exerted, rarely included; leaf blade not linear .......................................................... 12. *Rhododendron*

14b. Corolla actinomorphic, cylindrical or urceolate, 4–7(–11) mm; stamens included; leaf blade linear to linear-oblong.

15a. Inflorescence shortly racemose to subcapitate; pedicels very short; corolla cylindric; anthers opening by slits .............................. 9. *Diplarche*

15b. Inflorescence umbellate; pedicels elongate, 2–2.5(–4) cm; corolla urceolate; anthers opening by terminal pores .................................. 10. *Phyllodoce*

12b. Capsule loculicidal; anthers with or without appendages.

16a. Inflorescence a solitary flower; leaves decussate, imbricate, sessile, scalelike, 5–8 mm ........... 14. *Cassiope*

16b. Inflorescences racemose, paniculate, or umbellate, many flowered, or flowers rarely solitary in *Enkianthus*; leaves spirally arranged, petiolate, leaf blade never scalelike, more than 3 cm.

17a. Anther awns tipped with 2 awns or with dorsal spurs; filaments straight; leaf margin usually serrate.

18a. Anther awns reflexed; inflorescences paniculate ................................................. 17. *Pieris*

18b. Anther awns erect or spreading; inflorescences racemose, umbellate, or corynbose.

19a. Inflorescences umbellate or corynbose, rachis abbreviated or nearly absent; corolla broadly campanulate to urceolate; seeds winged ........................................ 1. *Enkianthus*

19b. Inflorescences racemose, rachis elongate; corolla suburceolate to tubular; seeds angled or rounded .................................................. 15. *Leucothoë*

17b. Anthers usually without appendages; filaments geniculate, rarely straight; leaf margin entire.

20a. Young shoots and both surfaces of leaves lepidote ................................. 19. *Chamaedaphne*

20a. Young shoots and both surfaces of leaves not lepidote.

21a. Corolla tubular or urceolate; capsule subglobose, less than 5 mm in diam., sutures thickened; seeds wingless ........................................ 18. *Lyonia*

21b. Corolla shortly campanulate; capsule depressed globose, more than 10 mm in diam., sutures not thickened; seeds winged on 1 side ........ 16. *Craibiodendron*

---

**1. ENKIANTHUS** Loureiro, Fl. Cochinch. 1: 276. 1790.

吊钟花属  diao zhong hua shu

Fang Ruizheng (方瑞征 Fang Rhui-cheng); Peter F. Stevens

Shrubs or small trees, deciduous, rarely evergreen. Leaves clustered at ends of twigs, petiolate; leaf blade serrate or subentire. Inflorescence terminal, in umbels or corynbose racemes, flowers rarely solitary or in pairs, 5-merous. Corolla broadly campanulate to urceolate; lobes short. Stamens much shorter than corolla; filaments flattened, distinctly dilated towards base; anthers oblong, thecae each dehiscing by an elongate slit, awned at apex; pollen grains single. Ovary superior, with few ovules per locule; stigma truncate. Capsule loculicidal, ovoid. Seeds several or one; testa lamellate-winged.

Twelve species: from the E Himalayas through China to Japan, extending south to Indochina; seven species (four endemic) in China.

1a. Flowers solitary, rarely in pairs; leaves abaxially puberulous, adaxially glabrous ................................................. 3. *E. pauciflorus*

1b. Flowers in corynbose racemes or umbels; leaves glabrous, or with other than unicellular hairs.

2a. Pedicels in fruit pendulous; flowers in corynbose racemes.

3a. Leaves glabrous on both surfaces; pedicels glabrous or pubescent .................................................. 1. *E. chinensis*

3b. Leaves abaxially densely or sparsely hispidulous on veins, adaxially sparsely short puberulous and puberulous on veins or glabrous; pedicels densely pubescent, sometimes also with glandular hairs ........ 2. *E. deflexus*

2b. Pedicels in fruit erect; flowers in umbels.

4a. Corolla urceolate; leaf margin ciliate, both surfaces glabrous .......................................................... 7. *E. perulatus*

4b. Corolla campanulate; leaf margin denticulate or entire, both surfaces glabrous or with hairs.

5a. Leaf margin denticulate from base to apex, leaf blade sometimes hispidulous ........................................ 4. *E. serrulatus*

5b. Leaf margin entire or only simuleate-serrulate towards apex; leaf blade never hispidulous.
6a. Corolla broadly campanulate; leaf with fine veins distinctly raised on both surfaces; both surfaces glabrous ........................................................... 5. E. quinqueflorus
6b. Corolla tubular-campanulate; leaf with fine veins inconspicuous on both surfaces; abaxially densely floccose towards base on midvein ........................................ 6. E. serotinus

灯笼吊钟花  deng long diao zhong hua

Bodinierella cavaleriei H. Léveillé; Enkianthus brachyphyllus Franchet; E. cerasiflorus (H. Léveillé) H. Léveillé; E. leveilleanus Craib; E. rosthornii Diels; E. sinohimalaicus Craib; Zenobia cerasiflora H. Léveillé.

Shrubs or small trees, deciduous, 2.5–8 m tall. Twigs glabrous. Leaf petiole 0.5–1.5 cm, glabrous; leaf blade elliptic or oblong-elliptic, ca. 1.5 × 1.5–2.5 cm, papery to thinly papery, glabrous, midvein raised abaxially, impressed adaxially; secondary and fine veins inconspicuous, base cuneate or broadly cuneate, margin serrulate, apex acute. Inflorescences corymbose-racemose or umbellate; rachis 3–7 cm, slender, 10–20-flowered, glabrous or pubescent. Pedicel 1.5–3 cm, slender, glabrous or pubescent. Calyx glabrous or slightly ciliolate; lobes triangular, 2–3 mm. Corolla yellowish orange-striped and red, broadly campanulate, 7–10 mm; lobes slightly recurved, usually dark red. Filaments puberulous. Ovary glabrous; style glabrous or pubescent. Capsule pendulous, 4–7 mm; stalk distinctly recurved, 1–3.5 cm. Fl. May–Jul, fr. Jun–Sep.

- Mixed forests, disturbed forests, thickets; 900–1200(–3000) m. Anhui, Fujian, Guangdong, Guizhou, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang.

2. Enkianthus deflexus (Griffith) C. K. Schneider, Ill. Handb. Laubholzk. 2: 519. 1911.
毛叶吊钟花  mao ye diao zhong hua

Shrubs or trees, deciduous, 1.5–5 m tall. Twigs subglabrous. Leaf petiole 0.5–1.5 cm, pubescent, hispidulous, or glabrous; leaf blade elliptic, obovate-elliptic, or oblong-elliptic, 3–7 × 1.5–3 cm, thinly papery, abaxially hispidulous on veins or glabrescent, adaxially sparsely shortly setulose and puberulous on veins or glabrous, midvein raised abaxially, adaxially slightly impressed, secondary and fine veins slender and inconspicuous, base cuneate to broadly cuneate, margin serrulate, apex acute. Inflorescences corymbose-racemose or umbellate; rachis 3–7 cm, slender, 10–20-flowered, glabrous or pubescent. Pedicel 1.5–3 cm, slender, glabrous or pubescent. Calyx glabrous or slightly ciliolate; lobes triangular, 2–3 mm. Corolla white, brick red, or pale yellow, broadly campanulate, 0.8–1.5 cm; lobes erect, broadly triangular. Filaments puberulous. Ovary shortly setulose, pubescent, or glabrous; style pubescent to glabrous. Capsule pendulous, 5–7 mm; stalk erect or distinctly recurved, 2.5–3.5 cm. Fl. Apr–Jul, fr. Jun–Jul.

Pinus or Quercus forests, mixed forests on mountain slopes, disturbed forests, thickets; 1000–3300(–3900) m. S. Gansu, Guizhou, Guangdong, Hubei, Sichuan, Xizang, Yunnan [Bhutan, NE India (Darjiling), Myanmar, Nepal, Sikkim].

2a. Enkianthus deflexus var. deflexus

2b. Enkianthus deflexus var. glabrescens

毛叶吊钟花(原变种)  mao ye diao zhong hua (yuán biàn zhòng)


Leaf petiole pubescent or hispidulous; leaf blade with conspicuous hairs on both surfaces, abaxially hispidulous on veins. Inflorescence rachis and pedicles pubescent.

Pinus or Quercus forests, disturbed forests, thickets; 1000–3300(–3900) m. Guizhou, Guangdong, Hubei, Sichuan, Yunnan [Bhutan, NE India (Darjiling), Myanmar, Nepal, Sikkim].

少花吊钟花  shào huā diao zhong hua

Shrubs 1–3 m tall. Twigs puberulous. Leaf petiole 2–6 mm, puberulous, winged in upper part; leaf blade elliptic or obovate, 1.5–3 × 1–1.2 cm, thinly papery, abaxially puberulous, adaxially glabrous, midvein raised abaxially, inconspicuous adaxially, secondary and fine veins slightly distinct abaxially, inconspicuous adaxially, base cuneate, margin serrulate, apex acuminate, mucronate. Flowers solitary, rarely in pairs, axillary. Pedicel flattened, ca. 1 cm, puberulous. Calyx glabrous; lobes ovate, 1–1.5 mm, apex acute. Corolla yellow with red stripes, or red, urceolate, 8–10 mm; lobes usually reflexed, short. Filaments puberulous. Ovary glabrous or puberulous; style glabrous. Capsule 3–5 mm; stalk distinctly recurved, ca. 1 cm, slender. Fl. May, fr. Jun–Oct.

- Alpine thickets, humus-clad cliffs on mountains; 3000–3700 m. Sichuan, Yunnan.

齿缘吊钟花  chǐ yuán diao zhong hua

Shrubs or small trees, deciduous, 3–6 m tall. Twigs glabrous. Leaf petiole 6–10 mm, glabrous or sparsely hispidulous; leaf blade elliptic, oblance-elliptic, or obovate-elliptic, 5–8 × 1.6–2.6 cm, papery, both surfaces hispidulous or glabrous, or abaxially densely floccose towards base and adaxially glabrous, midvein strongly raised abaxially, flat to slightly raised adaxially, secondary and fine veins slightly raised abaxially, inconspicuous adaxially, base broadly cuneate to narrowly obtuse, margin denticulate, apex shortly acuminate. Inflorescence umbellate, 2–6–flowered. Pedicel 1–2 cm, glabrous or pubescent. Calyx lobes triangular, ca. 2.2 mm, glabrous or ciliate. Corolla white, campanulate, ca. 1 cm; lobes recurved. Filaments pubescent. Ovary glabrous or pubescent; style glabrous. Capsule 5-angled, 7–10 mm; stalk erect, 2–3 cm. Fl. Apr, fr. May–Oct.

- Forest margins, mountain slopes, roadsides; 800–1800 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang.


吊钟花 diao zhong hua

**Enkianthus cavaleriei** H. Léveillé; *E. dunnii* H. Léveillé; *E. quinquefloros* var. *cilioserrulatus* P. C. Huang & K. M. Li; *E. uniflorus* Bentham; *E. xanthocaulon* H. Léveillé.

Shrubs or small trees, deciduous, 1–3(–10) m tall. Twigs glabrous. Leaf petiole 0.5–1.5 cm, glabrous; leaf blade elliptic, elliptic-lanceolate, or obovate-lanceolate, rarely lanceolate, 5–15 × 1.6–5 cm, leathery, glabrous, midvein abaxially raised, axially ± flat, secondary and fine veins distinctly raised on both surfaces, base cuneate, margin entire, sometimes sparsely sinuolate-serrulate towards apex, apex acuminate or shortly abruptly acuminate. Inflorescence umbellate, 3–8–flowered. Pedicel 1–2 cm, glabrous. Calyx glabrous; lobes ovate-lanceolate or triangular-lanceolate, 2–3 mm. Corolla pink, red, or white, broadly campanulate, 0.8–1.2 cm; lobes recurved, triangular-ovate. Stamens ca. 4 mm; filaments pubescent. Ovary glabrous or densely pubescent. Capsule 5-angled, 7–12 mm; stalk erect, 2–3.5 mm. Fl. Jan–Jun, fr. Mar–Sep.

This is a rare species.


喜冬草属 xi dong cao shu

Qin Haining (覃海宁); Peter F. Stevens

**Chimaza** R. Brown ex de Candolle; *Pipseva* Rafinesque; *Pseva* Rafinesque.

Herbs perennial, decumbent or shrubs dwarf, erect, evergreen. Leaves opposite or subverticillate, shortly petiolate, often crowded; leaf blade leathery, margin serrate. Flowers solitary, terminal, or 1 or 2 on simple or branched, bracteate peduncles, nodding, regular. Sepals 5, persistent. Petals 5, concave. Filaments pilose; anthers opening by pores. Ovary depressed-globose, 5-locular; style obconic, straight, very short. Capsules depressed-globose, long persistent, erect. n = 13.

Five species: Bhutan, China, Japan, Korea, Russia; Europe, North America, Central America (Mexico); three species (one endemic) in China.

1a. Flowers 2–7, rarely solitary; bracts broadly linear; sepals ovate-orniculate, ca. as long as wide ........................................... 3. **C. umbellata**
1b. Flower usually solitary; bracts lanceolate or ovate-elliptic; sepals narrowly lanceolate or obovate, ca. as long as to 2 × as long as wide.

2a. Bracts broadly ovate-lanceolate; sepals 4–6 mm ................................................................. 1. C. japonica

2b. Bracts elliptic; sepals 1.5–2 mm ................................................................. 2. C. monticola


喜冬草 xi dong cao

Chimaphila astyla Maximowicz; C. fukuyamae Masamune.

Herbs perennial, to 15 cm tall. Rhizome descending or creeping, somewhat short, slender, 0.5–1 mm in diam., sparsely branched. Aerial stems erect, 0.5–2 mm in diam. Leaves in 2–5 subverticils of 2–4(–6) each, alternating with 5–7 persistent or caducous scales. Petiole 3–10 mm, glabrous; leaf blade axially pale green, rather shiny, adaxially deep green, not shiny, with paler or white midvein, lanceolate to broadly lanceolate, ovate, or broadly elliptic, 1.5–3.5 cm × 3–15 mm, leathery, glabrous, base rounded to subacute, margin serrate, apex acute or rarely obtuse, mucronate. Flower usually solitary, not opening fully. Peduncle erect, 2.5–5(–7) cm, slender, 0.2–0.6 mm in diam., papillose, rarely glabrous. Bracts 1–3, on upper part of peduncle, broadly ovate-lanceolate, 4.7 × 1–3 mm, membranous, base narrowed, sometimes into short stalk, margin irregularly toothed. Sepals 5(6), white with black veins when dry, rarely lanceolate, 4–6(–7) × 1.5–3 mm, membranous, margin irregularly toothed, apex acute, rarely obtuse. Petals white, obovate-orbicular, 6–8 × 3–6 mm, concave, margin irregularly toothed. Stamens: lower dilated portion of filaments ovoid, pilose at margin and abaxially; anthers 1.2–2 mm, without distinct tubes, apex truncate. Ovary glabrous; stigma rounded with 5 undulate teeth, 1.5–2.5 mm in diam. Capsules 4–7 mm in diam. Seeds fusiform to oblanceol. Fl. Jun–Aug, fr. Sep–Oct.

Common, mainly in dry forests; sea level to 3000 m. Anhui, Gui- zhou, Hubei, Jilin, Liaoning, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan [Bhutan, Japan, Korea, Russia (Sakhalin)].


川西喜冬草 chuan xi xi dong cao

Herbs suffruticose, to 15 cm tall. Rhizomes long creeping. Aerial stems 10–20 cm long. Leaves opposite and verticillate; petiole 4–7 mm; leaf blade deep green, with paler midvein adaxially, narrowly to broadly elliptic, 1.5–4.6 cm × 6–25 mm, subleathery, base cuneate, margin few toothed, apex acute, mucronate. Flower solitary, or inflorescence of 2–3-flowered, white, ca. 1 cm in diam.; peduncle 3–7 cm, papillose; bracts elliptic, ca. 3 mm. Sepals obovate, 1.5–2 × ca. 2 mm. Petals oblong-ovaricular, 7–8 × ca. 5 mm. Stamens ca. 4 mm. Style sessile, obovoidal; stigma peltate. Capsules depressed-globose, ca. 5 mm in diam. Fl. Sep, fr. unknown.

● Moss-rich virgin forests, mossy ground beneath Tsuga canopies; 2600–3000 m. Sichuan, Taiwan.

1a. Plant to 15 cm tall; largest leaf broadly elliptic, 2.3–4.6 × 1.3–2.5 cm; inflorescence (1-or)2- or 3-flowered ................. 2a. subsp. monticola

1b. Plant to 10 cm tall; largest leaf narrowly elliptic, 1.5–2.5 × 0.6–1.1 cm; inflorescence 1- or 2-flowered .................... 2b. subsp. taiwaniana

2a. Chimaphila monticola subsp. monticola

川西喜冬草 (原亚种) chuan xi xi dong cao (yuana zhong)

Plant usually to 15 cm tall. Largest leaf broadly elliptic, 2.3–4.6 × 1.3–2.5 cm. Inflorescence (1-or)2- or 3-flowered. Fl. Sep.

● Moss-rich virgin forests; ca. 3000 m. Sichuan.


台湾喜冬草 tai wan xi dong cao


Plant usually to 10 cm tall. Largest leaf narrowly elliptic, 1.5–2.5 cm × 6–11 mm. Inflorescence 1- or 2-flowered.

● Mossy ground beneath Tsuga canopies; 2600–3000 m. Taiwan.


伞形喜冬草 san xing xi dong cao

Pyrola umbellata Linnaeus, Sp. Pl. 1: 396. 1753; Chimaphila corymbosa Pursh; P. corymbosa (Pursh) Bertoloni.

Shrubs or herbs, to 15 cm tall, clonal, often forming extensive mats. Rhizome long creeping, 1–2 mm in diam., branched. Aerial stems erect or ascending, 1–2 mm in diam., simple or branched, angled, glabrous. Leaves cauleine, in 2–6 subverticils of 4–9 each, alternating with caducous scales; petiole 3–6 mm, glabrous; leaf blade abaxially pale green, adaxially deep green, oblanceolate, 1–5 cm × 6–8 mm, thickly leathery, shiny, adaxially glabrous and with veins impressed, base cuneate, margin serrate above middle, apex obtuse to subacute. Peduncle erect, 3–6 cm, papillose, 2.7–flowered. Bract broadly linear, 3–4 mm. Sepals 5, persistent, ovate-orbicular, 1.2 × 1–2 mm, margin irregularly toothed, ciliate. Petals white, sometimes rosy, suborbicular, 4–6 × 3–5 mm, concave, margin irregularly toothed, opening fully. Stamens: lower dilated portion of filaments broadly ellipsoid, sparsely papillose; anthers 1.5–2.3 mm, papillate at base, tubes short, pores ca. 0.4 mm wide. Ovary longitudinally papillose, 5-loculed; stigma rounded, with 5 shallow lobes, 1.5–2.5 mm in diam. Capsules 4–7 mm in diam., fibers absent or oblong, 0.6–0.7 mm. Fl. Jul, fr. Sep–Oct. 2n = 26.

Dry coniferous or deciduous broad-leaved forests; low elevations. Jilin, Liaoning, Nei Mongol [Japan, Russia; widely distributed elsewhere in N temperate zone].

Chimaphila umbellata is an evergreen subshrub occurring princi-
pally in the coniferous forests of the temperate regions of the N hemisphere. This species has been divided into five geographically delimited infraspecific taxa, and only the typical subsp. umbellata is distributed in China.


**Bryophthalmum** E. Meyer; **Odostima** Rafinesque.

Herbs perennial, small, glabrous, stoloniferous. Leaves radical, petiolate, leathery, serrulate. Flower solitary, terminal on long stalk. Sepals 5, deeply lobed, persistent. Petals spreading, white or pink, orbicular. Stamens (8–)10; filaments subulate, base glabrous; anthers with tubes, opening by 2 apical pores; disk obscure. Ovary globose or subglobose; ovules on thickened placentas on inner angles of loculi; style straight, apex clavate; stigma 5-toothed. Seeds small, testa elongated at both ends. n = 13.

One or two species: Asia, Europe, North America; one species in China.


**Pyrola uniflora** Linnaeus, Sp. Pl. 1: 397. 1753; **Bryophthalmum uniflorum** (Linnaeus) E. Meyer; **Chimaphila rhombifolia** Hayata; **Moneses grandiflora** Salisbury; **M. rhombifolia** (Hayata) Andres.

Subshrubs evergreen, herbaceous, 4–15 cm high. Rhizome creeping, slender, 0.2–0.6 mm in diam.; roots long, slender, branched. Aerial stems erect or ascending, terete to angular, 1–5 cm, 0.6–1 mm in diam., not branched, glabrous. Leaves in 3 or 4 subverticils of 2 or 3 each, alternating with ca. 5 scales; petiole (0.5–)1–1.5 cm; leaf blade abaxially pale green, adaxially deep green and slightly shiny, broadly rhombic, 1–1.6 × 1–1.5 cm; leaf blade dark green abaxially, light green adaxially, broadly ovate, sessile. Pedals (4 or)5 white, orbicular to broadly ovate, sessile. Stamens (8–)10; anthers 3–4 mm, tubes distinct and strongly curved. Ovary subglobose; style 4–5 mm; stigma peltate with 5 distinct marginal papillae. Capsules subglobose, 5–6 mm in diam., fibers absent at margin. Seeds narrowly fusiform; testa generally with 7 or 8 cells along longest axis, inner testa walls with scalariform pits. Fl. Jul, fr. Sep. n = 26.

Moist mossy coniferous forests, more rarely in wet Betula or Pinus woods; middle elevations. Gansu, Heilongjiang, Jilin, Shanxi, N Sichuan, Taiwan, Xinjiang, NW Yunnan [Japan, N Korea, Mongolia, Russia; widely distributed in N temperate and subarctic zones, particularly Europe].


**Actinocyclus** Klotzsch (1857), not Ehrenberg (1837, fossil); **Ramischia** Opiz ex Garcke.


One or two species: circumboreal; two species in China.

1a. Leaves broadly ovate, 1.2–2.3 cm, apex obtuse or broadly rounded; inflorescences 4–8-flowered ........................................ 1. **O. obtusata**
1b. Leaves oblong-ovate, 2.2–3.7 cm, apex acute; inflorescences 8–15-flowered ......................................................... 2. **O. secunda**


**Pyrola secunda** Linnaeus var. obtusata Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 21(4): 507. 1848; **Orthilia nummularia** (Ruprecht) Y. L. Chou; ?**O. obtusata** var. xizangensis Y. L. Chou; **O. secunda** (Linnaeus) House var. nummularia (Ruprecht) H. Hara; **O. secunda** subsp. obtusata (Turczaninow) Böcher; **O. secunda** var. obtusata (Turczaninow) House; **Pyrola nummularia** (Ruprecht) Ruprecht ex Komarov; **P. obtusata** (Turczaninow) Turczaninow ex Komarov; **P. secunda** var. nummularia Ruprecht; **P. secunda** subsp. obtusata (Turczaninow) Hultén; **P. secunda** var. pumila Chamisso; **Ramischia obtusata** (Turczaninow) Freyn; **R. secunda** (Linnaeus) Garcke subsp. obtusata (Turczaninow) Andres.

Shrubs evergreen, herbaceous, 4–15 cm high. Rhizome long branched. Leaves subverticillate at base of stem; petiole 0.5–1.5 cm; leaf blade dark green abaxially, light green adaxially, broadly ovate, 1.2–2.3 × 1–2 cm, thinly leathery, base rounded or obtuse to truncate, margin crenulate-serrulate, apex obtuse or nearly rounded. Scape slender, loosely and minutely papillose, scales 1–3 at base, ovate-lanceolate, 3–5 mm. Raceme 1.5–4 mm, with 4–8 rather densely arranged flowers along one side. Bracts broadly lanceolate, 2–3 mm, mem-
branous, apex abruptly acute. Pedicel ca. 2 mm, slender, prominently papillose. Sepals ovate-orbicular, ca. 1 mm, margin minutely toothed, apex obtuse. Petals broadly elliptic, 4.5 × 2–3 mm, margin toothed. Anthers 1.5–1.8 mm, apex truncate; pores 0.6–0.9 mm wide. Style exserted, straight, (1.5–)2–4 mm; stigma peltate with 5 shallow lobes. Capsules depressed-globose, ca. 4 mm in diam. Fl. Jul, fr. Jul–Aug. 2

Coniferous forests. Gansu, Heilongjiang, Nei Mongol, Qinghai, Shanxi, N Sichuan, Xining, Xizang [Mongolia, ?Russia (Siberia)].

2. Orthilia parvifolia (Linnaeus) Klotzsch; *Orthilia secunda* var. vulgaris Opiz.

2a. Leaves reniform to cordate-ovate, base cordate.

2b. Leaves not as above.

Shrubs evergreen, herbaceous. Rhizome long creeping, slender, 0.5–1 mm in diam., woody, branched. Stems erect or ascending, 2–10 cm, 0.8–1.5 mm in diam., simple, angular, longitudinally minutely papillose. Leaves in 1–3 subverticils of 2–4 each, alternating with 5–7 scales; petiole 1–2 cm, minutely papilllose; leaf blade pale green abaxially, light green adaxially, oblong-ovate to broadly ovate or elliptic, 2.2–3.7 × 1.4–2.6 cm, thinly leathery to herbaceus, abaxially glabrous, adaxially slightly shiny, base obtuse to truncate, margin crenulate-serrulate, apex acute to subobtuse or mucronulate. Scape 7–14 cm tall, slender, 0.4–1 mm in diam., loosely and minutely papilllose, angled; scales 5–8 at middle and base, narrowly ovate or broadly lanceolate, 2–5 mm. Raceme with 8–15 rather densely arranged flowers along one side. Bracts broadly oblanceolate or broadly lanceolate, 3–5 mm, membranous, somewhat hyaline-margined, apex abruptly acute. Pedicel ca. 3 mm, slender, rather prominently papillose. Sepals overlapping at base, depressed-orbicular, 0.8–1 mm, margin minutely toothed, apex obtuse. Petals erect, greenish white, 3–5 mm. Anthers 1–1.5 mm, apex truncate; pores 0.3–0.4 mm wide. Style exserted, straight or slightly curved, ca. 4 mm; stigma peltate with 5 shallow lobes. Capsules 5-angular, ca. 4 mm in diam. Seeds with thin testa prolonged at both ends, fusiform to oblong; testa generally with 6–8 cells along longest axis. Fl. Jul–Aug, fr. Sep–Oct. 2n = 38.

Deciduous broad-leaved or subalpine coniferous forests; sea level to 3200 m. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xining [Japan, Kashmir, N Korea, Mongolia, Russia; widely distributed in N temperate and subarctic zones].


鹿蹄草属 lu ti cao shu

Qin Haining (覃海宁); Peter F. Stevens

Amelia Alefeld; Braxilia Rafinesque; Erxlebenia Opiz ex Rydberg; Thelaia Alefeld.

Herbs suffruticose, evergreen, erect, glabrous. Rootstock long, slender, branched, with sparse fine roots. Aerial stem ascending, not branched, scaly at base. Leaves in a rosette at base of caudex, long petiolate; leaf blade abaxially light green, adaxially green, margin entire or serrate. Scapes long, slender, with scalelike bracts at base. Flowers many, nodding, in racemes. Calyx 5-lobed, tubularly minutely papillose. Leaves in 1–3 subverticils of 2–4

5a. Corolla purplish red or only brownish purple outside.

5a. Corolla white, green, yellowish green, sometime pinkish red.

5b. Leaves not as above.

5b. Leaves broadly elliptic or suborbicular, 2.7–3 × 2.5–2.6 cm; sepals oblong; style 4–5 mm

5b. Leaves more numerous.
8a. Leaves thickly leathery, rough, wrinkled.

9a. Bracts broadest above middle; petals oblong, margin dentate, apex broadly rounded .......................... 26. *P. xinjiangensis*

9b. Bracts broadest at or below middle; petals ovate-lanceolate to ± triangular, margin entire, apex obtuse or acuminate.

10a. Margin of leaf blade sinuate; petals ovate-lanceolate or triangular-lanceolate, apex acuminate .......... 2. *P. rugosa*

10b. Margin of leaf blade crenate; petals triangular or triangular-ovate, apex obtuse, rarely acute .......... 10. *P. forestiana*

8b. Leaves papery to leathery, smooth, not wrinkled.

11a. Sepals broadly triangular, ovate-triangular, or triangular-ovate.

12a. Leaves 1–1.6 × 1–1.2 cm; petals triangular-ovate ........................................................................ 5. *P. chlorantha*

12b. Leaves ca. 2 × 1.5 cm or more; petals broadly triangular or ovate-triangular.

13a. Leaves elliptic or ovate-elliptic; style 6–7 mm .......................................................... 22. *P. shanxienensis*

13b. Leaves broadly elliptic or suborbicular to broadly ovate; style less than 4 mm.

14a. Margin of leaf blade sinuate; styles 3–3.5 mm, slightly curved towards apex ................................ 23. *P. sororia*

14b. Margin of leaf blade crenate; styles 2–2.2 mm, erect .............................................................. 16. *P. minor*

11b. Sepals ovate to oblong or ligulate.

15a. Styles less than 6 mm, not or slightly exserted.

16a. Leaves elliptic or oblong, 5–7.5 × 2.2–3 cm, margin subentire or sparsely dentate ................. 14. *P. mattfeldiana*

16b. Leaves suborbicular, elliptic, or broadly ovate, 2.9–3.5 × 2.3–2.6(–3) cm, margin sparsely dentate .... 15. *P. media*

17a. Raceme 1.5–2.8 cm, 3–5-flowered .................................................................................. 25. *P. tschanbaischanica*

17b. Raceme longer than 2.8 cm, 5- or more flowered.

18a. Sepals ligulate, apex mucronate, margin slightly sinuate ......................................................... 24. *P. szechuanica*

18b. Sepals usually ovate, apex acuminate, margin entire or nearly so.

19a. Leaves often with white stripes over veins adaxially.

20a. Leaves ovate or ovate-elliptic, 3–4 × 1.5–3 cm, base broadly rounded to cuneate, often oblique; petals obovate-elliptic ........................................ 1. *P. alboreticulata*

20b. Leaves oblong or obovate-oblong, (3–)5–7 × 2.5–3.5(–4) cm, base cuneate; petals obovate-oblong ........................................................... 8. *P. decorata*

19b. Leaves without white stripes over veins adaxially, or inconspicuous if present.

21a. Leaf margin crenate; petiole more than 1.5 × as long as leaf blade ...................... 18. *P. morrisonensis*

21b. Leaf margin entire or sinuate; petiole less than 1.5 × as long as leaf blade.

22a. Leaves narrowly oblong, leaf blade 2.5–3.5 × as long as wide, apex acute .......................... 9. *P. elegantula*

22b. Leaves suborbicular, broadly ovate to elliptic, leaf blade less than 2 × as long as wide, apex obtuse to rounded.

23a. Sepals lanceolate-triangular; style 1.1–1.3 cm; bracts linear-lanceolate .............................. 11. *P. japonica*

23b. Sepals narrowly lanceolate to ovate-lanceolate or ligulate; style shorter than 1 cm; bracts lanceolate or long ligulate.

24a. Sepals lanceolate.

25a. Flowers 0.8–1 cm in diam.; sepals ca. as long as or slightly longer than petals ...... 12. *P. macrocalyx*

25b. Flowers 1.5–2 cm in diam.; sepals ca. 1/2–2/3 as long as petals ........................................... 20. *P. rotundifolia*

24b. Sepals ligulate or ovate-lanceolate.

26a. Leaves light green abaxially; flowers ca. 1 cm in diam.; sepals 3–4 mm, margin sparsely slightly denticulate ................................................ 7. *P. dahurica*

26b. Leaves often glaucous abaxially; flowers 1.5–2 cm in diam.; sepals 5–7.5 mm, margin entire ....................................................... 4. *P. calliantha*

---


花叶鹿蹄草 hua ye lu ti cao

Herbs to 20 cm tall. Leaves approximate to remote; petiole 3–4 cm; leaf blade deep green with pale veins adaxially, ovate or ovate-elliptic, 3–4 × 1.5–3 cm, leathery, base rounded, abruptly decurrent, margin with remote, minute teeth, apex acute, mucronulate. Scape 10 cm; scales basal; raceme 1–4–flowered, 2–4 cm. Pedicel ca. 4 mm; bract linear, 8–10 mm. Flowers sessile, 1.5–1.8 cm in diam. Sepals narrowly oblong, 5–6 × ca. 2.5 mm, apex obtuse. Petals white, obovate-elliptic, 7–7.5 × ca. 6 mm, apex rounded. Filaments complanate, yellow, 3–3.5 × 1–1.2 mm, tubules present. Style exserted, 8–10 mm, upper part curved, dilated at apex, without ring of lobes. Capsules 7–8 mm in diam. Fl. and fr. Jan.

- Middle elevations. Taiwan.


红花鹿蹄草 hong hua lu ti cao

*Pyrola rotundifolia* Lindaeus var. *incarnata* de Candolle, Prodr. 7: 773. 1839; *P. asarifolia var. incarnata* (de Candolle) Fernald; *P. incarnata* (de Candolle) Freyn; *P. incarnata* var.
Herbs 1–5 cm tall. Rhizome creeping, long, somewhat thick, 0.7–2 mm in diam., branched, with sparse fine roots. Stems ascending. Leaves appearing radical, 3–8, in 2 or 3 sub-verticils of 3 or 4 each; petiole 3–5 cm; leaf blade pale green abaxially, green and shiny adaxially, elliptic or ovate-elliptic, 2.5–5 × 1.5–5.5 cm, base rounded or scarcely cordate, rarely subacute, margin obscurely serrulate, apex rounded to obtuse. Scape erect, 10–25 cm tall, angled, glabrous, with 4 or 5 broadly lanceolate-elliptic membranous basal scales and 1–4 lanceolate scales near middle; raceme densely 7.5–15-flowered. Bracts broadly lanceolate, membranous, apex acuminate. Flowers drooping, zygomorphic. Sepals narrowly ovate to broadly lanceolate-ca. 2 × as long as wide, 1.7–4.7 × 1–2.3 mm, apex acute to acuminate. Petals rose, 5–9 × 3–6 mm. Filaments lanceolate, ca. 2 × as long as wide, 1.7–4.7 × 1.1–2.3 mm, apex often acute or obtuse. Petals pure white, ovate-elliptic or obovate, 6–10 × 5–8 mm. Filaments glabrous; anthers yellow, obovate-triangular, 2–4 × 1–1.4 mm, tubules present. Style ± exserted, light red, 6–8(–10) mm, nearly erect or upper part slightly curved upward, dilated at apex into a ring. Capsule 7–9 mm in diam. Fl. Jun–Aug, fr. Aug–Sep.

Montane coniferous forests, mixed forests; 700–4100 m. Anhui, Fujian, Guizhou, Hebei, Henan, Hunan, Jiangsu, Jiangxi, Qinghai, Shandong, Shaxi, Sichuan, Xizang, Yunnan, Zhejiang.


Herbs (10–)15–30 cm tall. Rhizome long, slender, branched, producing adventitious roots and aerial stems at nodes; caudex ribbed, 15–30 cm, with a basal rosette of crowded leaves and 1 or 2 bracts; bracts brownish, oblong-ovate, sheathing, scales. Petiole 2–5.5 cm; leaf blade purplish and often glaucous abaxially, green adaxially, elliptic or ovate, (2.5–)3–6 × 2–3.5 cm, leathery, base broadly cuneate or suborbicular, margin entire or crenate, apex obtuse or rounded. Scape with 1 or 2 ovate-lanceolate or lanceolate scalelike bracts sheathing at base; raceme 9–13-flowered, 12–16 cm. Pedicel 5–8(–10) mm; bracts ligulate, 6–7.5 mm. Flowers spreading or rarely nodding, rotate, 1.5–2 cm in diam. Sepals ligulate, (3–)5–7.5 × (1.5–)2–3 mm, margin entire, apex often acute. Petals pure white, obovate-elliptic or obovate, 6–10 × 5–8 mm. Filaments glabrous; anthers yellow, 2.1–2.5 × 4 × 1–1.4 mm, tubules present. Style ± exserted, light red, 6–8(–10) mm, nearly erect or upper part slightly curved upward, dilated at apex into a ring. Capsule 6 mm in diam. Fl. Jun–Aug, fr. Aug–Sep.

Montane coniferous forests, mixed forests; 700–4000 m. Anhui, Fujian, Guizhou, Hebei, Henan, Hunan, Jiangsu, Jiangxi, Qinghai, Shandong, Shaxi, Sichuan, Xizang, Yunnan, Zhejiang.
ear, 1–1.5 cm, base slightly amplexicaul, apex acuminate or acute; raceme 4–9-flowered, short, 1.5–2.5(–4) cm. Flowers nodding, broadly saucer-shaped, relatively large. Pedicel 5–8 mm, bract axillary, narrowly lanceolate, 5–8 mm, longer or ca. as long as pedicel, membranous, apex acuminate. Sepals purplish brown, oblong, ca. 4 × 1.5–2 mm, apex obtuse or acute. Petals white, obovate or orbicular, 5–7 × 4–5 mm. Filaments glabrous; anthers red, ca. 3 mm. Style included or slightly exserted, distinctly curved, dilated at apex into a ring. Capsule 6–8 mm in diam. Fl. Jul–Aug, fr. Sep–Oct.


兴安鹿蹄草 xìng ān lù tí cao


Herbs 15–23 cm tall. Rhizome long, slender, branched. Leaves 2 (or)3–6(or 7), crowded at base of caudex; petioles 2.8–4.5 cm; leaf blade light green abaxially, green adaxially, suborbicular or broadly ovate, (2.5–)3–5 × 2.5–4 cm, leathery, base broadly cuneate or orbicular, margin entire or slightly crenate, apex obtuse or rounded. Raceme 5–10-flowered, 4–8(–10) cm. Pedicel 4–5 mm; bracts ligulate or lanceolate, 4–5 mm. Flowers nodding, spreading, ca. 1 cm in diam. Sepals ligulate, rarely lanceolate, 3–4 × ca. 1.5 mm, margin remotely denticulate, apex often acute. Petals white, obovate, 5–7 × 4–5 mm, apex rounded. Filaments short, ca. 5 mm, glabrous; anthers yellow, 2.5–2.7 × 1–1.5 mm, tubules present. Style slightly exserted, 6–7 mm, upper part curved upward, dilated at apex into a ring, conspicuously so at least at fruiting. Capsule ca. 5 mm in diam. Fl. Jul, fr. Aug.

Coniferous forests, mixed forests, becoming dominant in herbaceous layer; 700–1800 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Mongolia].


普通鹿蹄草 pǔ tōng lù tí cao

Pyrola alba Andres; P. alba var. viridiflora Andres; P. decorata var. alba (Andres) Y. L. Chou & R. C. Zhou; P. handelianana Andres; P. oreadoxa Andres.

Herbs 15–35 cm tall. Rootstock long, slender, branched. Leaves 3–6, crowded at base of caudex; petiole 2–3 cm; leaf blade light green and purplish abaxially, deep green with pale veins adaxially, oblong or obovate-oblong, (3–)5–7 × 2.5–4 cm, thinly leathery, base cuneate, decurrent, margin with remote minute teeth, apex acute or mucronulate. Scape slender, with 1 or 2 scalelike leaves at base; raceme 4–10-flowered, 2.5–4 cm. Pedicel 5–9 mm; bract lanceolate, 5–9 mm, membranous. Flowers ± nodding, saucer-shaped, 1–1.5 cm in diam. Sepals obovate-oblong, 3–6 × 2.2–2.5 mm, apex acute. Petals light green to white, obovate-oblong, 6–8 × 5–7 mm, apex rounded. Filaments glabrous; anthers yellow, 3–4 × 1–1.5 mm, tubules present. Style exserted, 6–10 mm, curved, dilated at apex into a ring. Capsules 7–11 mm in diam. Fl. Jun–Jul, fr. Jul–Aug.

Pinus or broad-leaved forests, scrub; 600–3000 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan].


长叶鹿蹄草 zhǎng yè lù tí cao


Herbs 14–25 cm tall. Rhizome long, slender, branched. Leaves 3–6, crowded at base of caudex; petiole 2–3 cm; leaf blade light green abaxially, deep green adaxially, narrowly oblong, 4–8 × 1.5–3 cm, thinly leathery, base cuneate, decurrent to petiole, margin with remote minute teeth, apex acute. Scape slender, with 1 or 2 scalelike leaves; raceme 4–6-flowered, 2–4 cm. Pedicel 4–9 mm; bracts lanceolate, 4–9 mm, membranous. Flowers spreading, broadly cup-shaped, 1–1.5 cm in diam. Sepals narrowly ligulate, 3–6 × 1–2 mm, apex acuminate. Petals white, obovate-oblong, 7–10 × 4–6 mm, apex rounded. Filaments 5–6 mm, glabrous; anthers yellow, 3–4 mm, tubules present. Style exserted, 9–13 mm, dilated at apex into a ring. Capsules 8–10 mm in diam. Fl. Jun, fr. Jul.

● Montane forests; 1200–1800 m. Fujian, Guangdong.


大理鹿蹄草 dà lǐ lù tí cao

Pyrola forrestiana subsp. alba (Andres) Kfisa; P. forrestiana var. foottiana (Maximowicz) Andres; P. forrestiana var. subaphylla (Maximowicz) Ohwi; P. rotundifolia Linnaeus var. alboflora Maximowicz; P. rotundifolia f. subaphylla (Maximowicz) Makino; P. subaphylla Maximowicz.

Herbs 20–27 cm tall. Rhizome slender, branched. Leaves 3–7; petiole 2–4.5 cm; leaf blade light green abaxially, green adaxially, triangular ovate, obovate, or suborbicular, 2.5–4.5 × 2–3.5 cm, thickly leathery, rough, base rounded or truncate, margin conspicuously crenate, apex obtuse. Scales at base of scape, narrowly oblong, 8–12 × 3–5 mm; raceme 6–9 cm, 9–12-flowered. Pedicel 5–10 mm; bracts oblong-lanceolate, slightly longer than pedicel, membranous, apex acute. Flowers nodding, saucer-shaped, 1–1.5 cm in diam. Sepals triangular or triangular-ovate, 1.5–2.5 × 1.5–2 mm, apex obtuse. Petals greenish yellow, ovate or suborbicular, 7–9 × 5–7 mm. Filaments flattened; anthers yellow, oblong, tubules present. Style exserted, ca. 1 cm, curved at upper part, dilated at apex into a ring. Capsules 5–7 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

● Moist shaded forests; 1500–3800 m. Hubei, Hunan, Sichuan, ?Xizang, Yunnan.


日本鹿蹄草 rì ben lù tí cao

Pyrola asarifolia var. japonica (Klenze ex Alefeld) Miqel; P. incarnata (de Candolle) Freyn var. japonica (Klenze ex Alefeld) Koidzumi; P. japonica var. subaphylla (Maximowicz) Andres; P. japonica f. subaphylla (Maximowicz) Ohwi; P. rotundifolia Linnaeus var. alboflora Maximowicz; P. rotundifolia f. subaphylla (Maximowicz) Makino; P. subaphylla Maximowicz.
Herbs 5–30 cm tall. Rhizome descending and sometimes creeping, somewhat thick, 0.8–2 mm in diam., sparsely branched; roots somewhat thick, to 0.5 mm in diam. Stems ascending, sometimes branched. Leaves appearing radical, 3–6, in 1 or 2 subverticils of 1–3 each; petiole 3–8 cm; leaf blade pale green or reddish abaxially, deep green with pale or white veins adaxially, elliptic, broadly elliptic, or obovate, rarely orbicular, (3–) 4–7 × 2.5–4.5 cm, somewhat thick, base rounded, obtuse, or subacute, margin rather sparsely and obscurely serrulate, apex rounded to obtuse. Scape erect, (6–) 15–30 cm tall, with 3–6 scales near base; scales narrowly to broadly lanceolate or oblanceolate, costate, up to 2 leaflike scales and sometimes 1 smaller, lanceolate scale near middle; raceme rather sparsely 5–12-flowered, 6–10 cm. Pedicel with bracts broadly linear to lanceolate, 5–8 mm, apex long acuminate. Flowers drooping, zygomorphic, 10–12 mm in diam. Sepals broadly lanceolate to narrowly ovate, (1–)2.5–5(–6) × (2–)4–6 mm, apex acute. Petals ovate-elliptic, 3.5–4 × 1.6–2 mm, apex acuminate. Filaments curved upward; anthers creamy white, orange-yellow near apex, 2–3 mm, prolonged into terminal tubules, opening by terminal pores. Style exserted, sometimes scarcely so, curved to somewhat slightly so, 1.1–1.3 cm, dilated at apex but without ring-shaped protuberance; stigma with a collar and 5 erect cylindrical lobes. Capsules 7–8 mm in diam. Fl. Jun–Aug, fr. Sep–Oct.

Common, mainly in dry forests; sea level to 1500 m. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Taiwan [Japan, Korea].


**长萼鹿蹄草** chang e lu ti cao

Herbs 14–21 cm tall. Rhizome long, slender, branched. Leaves 2–6, crowded at base of caudex; petiole 1.5–3.5 cm, often shorter than blade; leaf blade light green with purple abaxially, green adaxially, elliptic, obovate, or ovate, 2.3–4.2 × 1.4–3.8 cm, leathery, base broadly cuneate or orbicular, margin entire or slightly crenate, apex obtuse or rounded. Spike subtended by 1–3 scalelike bracts; raceme 6–10(–15)-flowered, 3–5 cm. Pedicel 3–4 mm; bracts lanceolate, 5–7 × 1.4–1.5 mm, longer than pedicel, membranous. Flowers spreading, saucer-shaped, ca. 1 cm in diam. Sepals lanceolate, 4.5–5 × ca. 1 mm, margin entire, apex acuminate. Petals white, obovate, 5–6 × 3–4 mm, apex acute or obtuse. Filaments glabrous; anthers yellow, 2–2.5 × ca. 1 mm, tubules present. Style not or slightly exserted, 6–6.5 mm, nearly erect or upper part curved upward, without dilated ring at apex. Capsule 4–6 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

*Betula* forests, coniferous forests; 700–2100 m. S Jilin (Changbai Shan) [Korea].


**马尔康鹿蹄草** ma er kang lu ti cao

Herbs 8–10 cm tall. Rhizome long, slender, branched. Leaves 4–7, basal, petiole 1–2 cm; leaf blade light green abaxially, deeply green adaxially, broadly obovate-elliptic or elliptic, 1.8–2.5 × 1.2–1.7 cm, subleathery, base rounded or broadly cuneate, margin minutely glandular sinuate, apex obtuse. Scape subtended by 2 or 3 ovate-oblong, scalelike leaves; raceme 6–8-flowered, 1.5–2 cm. Pedicel 3–4 mm; bracts lanceolate, 6.5–7 mm, longer than pedicel, membranous. Flowers slightly nodding, broadly cup-shaped, 1–1.5 cm in diam. Sepals oblong, 4–4.5 × 2.5–2.5 mm, apex cuspitate. Petals purplish red, obovate-oblong, 8–9 × 5–6 mm, apex rounded. Filaments glabrous; anthers yellow, ca. 3 mm, tubules present, with acuminate base and projecting at apex. Style exserted, curved, ca. 7 mm, apex dilated but without ring-shaped protuberance. Capsules ca. 6 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

● *Abies* and *Picea* forests; ca. 3500 m. Sichuan.


**贵州鹿蹄草** gui zhou lu ti cao

Herbs 20–28 cm tall. Rhizome long, branched, ascending. Leaves 3–7, crowded at base of caudex; petiole usually shorter than blade; leaf blade abaxially brown, adaxially deep green, elliptic or oblong, 5–7.5 × 2–3 cm, thinly leathery, base cuneate, margin entire or with obscure small teeth, apex obtuse. Scapes thickest, with 2 or 3 acute bracts; raceme 5–12-flowered, 3.5–5 cm. Pedicel 5–6 mm; bracts ovate-lanceolate, 5–6 mm. Flowers nodding, 7–8 mm in diam., subglobose. Sepals ovate-oblong or ovate-lanceolate, ca. 4 × 2 mm, margin yellowish, apex obtuse. Petals white, oblong, ca. 7 × 6 mm, apex rounded. Filaments glabrous, flattened, ca. 1.5 mm wide at base; anthers yellow, ca. 3 × 1.5 mm, tubules present. Style not exserted, earlier erect, later declined and curved, dilated at apex into a ring. Capsule 7–9 mm. Fl. Jun, fr. Jul.

● Montane forests; 2600–3000 m. Guizhou, Sichuan.


**小叶鹿蹄草** xiao ye lu ti cao

*Amelia media* (Swartz) Alefeld; *Thelaia media* (Swartz) Alefeld.

Herbs 10–30(–33) cm tall. Rhizome brown, slender, strongly branched. Leaves 4–6, rosetulate; petiole usually longer than blade; leaf blade slightly green abaxially, green adaxially, orbicular or orbicular-ovate, 2.9–3.5 × 2.3–2.6(–3) cm, leathery, base rounded or cuneate-rounded, margin obscurely crenate with shallow and broad or sometimes flat crenations, apex rounded. Scapes 10–33 cm, with a solitary acute bract at or below middle; raceme 3–5(–7) cm, 5–12-flowered. Pedicels (5)–8–9 mm in fruit; bract oblong, longer than pedicel, 4–6 × 1.5–2.5 mm, apex rounded. Flowers slightly nodding, half-opened, saucer-shaped. Sepals reddish, ovate-lanceolate, margins not overlapping, apex acuminate, often recurved at tip. Petals white or at base pinkish, elliptic or suborbicular, 6–8 × 4.5–6 mm, apex rounded. Filaments connivent around pistil, flattened, glabrous; anther yellow, (1.9–)2.1–2.3(–2.5) mm. Style slightly exserted, somewhat declined, 5–5.5 mm, dilated at apex into a ring; stigma 5-lobed. Capsule compressed-globose, 4–5 × 6.5–8 mm. Fl. Jun–Jul.

Coniferous forests; 1900–2600 m. S Jilin (Changbai Shan), N Xinjiang (Altay Shan) [Mongolia, Russia; C Asia, Europe].

*Amelia minor* (Linnaeus) Alefeld; *Braxilia minor* (Linnaeus) House; *B. parvifolia* Rafinesque; *Erolebenia minor* (Linnaeus) Rydberg; *E. rosea* Opiz.

Herbs (7–)12–20 cm tall. Rhizome creeping, long, somewhat slender, 0.5–1 mm in diam., branched, with sparse fine roots. Aerial stems ascending, short or somewhat long, 0.5–2.5 cm, not branched. Leaves appearing radical, 4–8, in 2 or 3 subtverticils of 2–4 each; petiole 1–2.5 cm; leaf blade pale green abaxially, green adaxially, broadly elliptic to orbicular, 1.5–4.5 × 1.5–3 cm, base obtuse to truncate, margin crenulate to obsolete serrulate, apex obtuse or mucronulate. Scape erect, 8–18 cm tall, angled, glabrous, with 3–5 broadly lanceolate-elliptic or broadly obovate scales at base, up to 2 leafy scales or leaves near base, and up to 2 narrowly lanceolate to broadly linear scales near middle; raceme densely 7–16-flowered, 2–3.5 cm. Pedicel 3–6 mm; bracts broadly linear, 3–6 mm, usually longer than pedicel. Flowers drooping, regular, 6–7 mm in diam. Sepals depressed-deltoid or broadly ovate, 1.2–2 × 1–1.5 mm, tubules present. Petals white, ovate-oblong, 6–7 × 3–3.5 mm. Filaments glabrous; anthers yellow, 2–4 mm, prolonged into terminal tubules, opening by small terminal pores, terminal tubules orange-yellow. Style exserted, 5–10 mm, curved, slightly dilated at apex into a ring; stigma with a collar and 5 radially arched lobes. Capsules 4–6 mm in diam. Fl. Jul. fr. Aug. 2n = 46.

Subalpine deciduous broad-leaved forests; 500–2500 m. Heilongjiang, Jilin, Xinjiang, Xizang, Yunnan [Japan, N Korea, Russia; widely distributed in cool N temperate and subarctic zones].

This is a rare species in China.


*Dan ye lu ti cao*

Herbs 11–19 cm tall. Rhizome long, slender, branched. Leaf solitary, basal; petiole ca. 3 cm; leaf blade glaucous abaxially, green adaxially, broadly elliptic or suborbicular, 3 × 2.5 cm, thinly leathery, base subrounded, margin entire or crenulate, apex obtuse or rounded. Scape thick, with 3–5 ovate-lanceolate bracts, sheathed at base; raceme 5- or 6(–9)-flowered, 3.4–8.5 cm. Pedicel 5–6 mm; bracts oblong-lanceolate, 6–7 mm, membranous. Flowers nodding. Sepals ovate-oblong or triangular-oblong, 3.5–4 × 2–2.5 mm, apex often acute. Petals white, ovate-oblong, 6–7 × 3.3–3.5 mm. Filaments glabrous; anthers yellow with purple, ellipsoid, 2.6–2.9 mm, tubules present. Style upper part curved upward, short, ca. 4 mm, dilated at apex into a ring; stigma shallowly 5-lobed. Capsule 5–6 mm in diam. Fl. Aug. fr. Sep.

*Montane mixed forests; ca. 2700 m. Yunnan.*


*Tai wan lu ti cao*


Herbs to 20 cm tall. Rhizome ascending, slender, branched. Leaves 3–8, basal, alternate or subopposite; petiole 5–6 cm, complanate; leaf blade slightly green abaxially, green adaxially, ovate-suborbicular to ovate-rhombic, 2.3 × 2–2.5 cm, base rounded or truncate to subacute, margin crenulate-serulate, apex rounded, obtuse, or emarginate. Scape 4–8.5(–25) cm; scales narrowed; raceme 6–11-flowered, 10–25 cm. Pedicel 7–8 mm; bracts narrowly oblong, ca. 8 × 3 mm, apex acute. Flowers ± nodding, saucer-shaped, ca. 1.5 cm in diam. Sepals ovate, ca. 2.5 × 2 mm, apex obtuse or acute. Petals white, orbicular-oblong, 6.7 × 5–6 mm, margin obscurely denticulate, apex rounded. Filaments 6–7 mm; anthers yellow, occasionally with purple, 2.6–1.5 × 1.5 mm, tubules present. Style upper part curved upward, 7–9 mm, exserted, dilated at apex into ring. Capsules ca. 5 mm in diam. Fl. and fr. unknown.

*High mountains; 1900–3200 m. Taiwan.*


*Shen ye lu ti cao*

*Pyrola soldanelloifolia* Andres.

Herbs 10–21 cm tall. Rhizome creeping, long, slender, 0.2–0.8 mm in diam., branched, with sparse fine roots. Aerial stems ascending, short, usually ca. 0.5 cm, rarely to 2 cm. Leaves appearing radical, 1–3(–6), in 1 or 2 subtverticils, long petiolate; leaf blade pale green abaxially, deep green with paler or white veins adaxially, reniform, 1.3–1.5–4 cm, base cordate, often with overlapping margins, margin crenulate or obsolescently serrulate, apex rounded or shallowly emarginate. Scapes erect, but nodding earlier, 7–21 cm tall, slender, somewhat angled, glabrous, with 2–4 minute lanceolate or broadly linear or obovate scales at base and sometimes one minute scale near middle; raceme rather sparsely 1–3(–6)-flowered, 1.8–3.5(–5) cm. Pedicel 3–8 mm; bracts linear-lanceolate, 1–2 mm. Flowers drooping, zygomorphic, 1.1–1.5–2 mm in diam. Sepals suborbicular to depressed-triangular, 1.1–1.5 × 1.4–2 mm, apex obtuse to rounded. Petals white to greenish, sometimes becoming black when dry, obovate, 5–7 × 3–5.5 mm. Filaments curved upward; anthers creamy white, 2–4 mm, produced into terminal tubules, opening by small terminal pores, terminal tubules orange-yellow. Style exserted, 5–10 mm, curved, slightly dilated at apex into a ring; stigma with a collar and 5 erect cymidric lobes. Capsules 5–7 mm in diam. Fl. Jun–Jul, fr. Aug–Sep.

Shaded coniferous, mixed, and deciduous broad-leaved forests, mossy soil especially near rotting tree trunks; sea level to 200 m. Hebei, Heilongjiang, Jilin, Nei Mongol, Liaoning [Japan, Korea, Russia (Sakhlin)].


*Yuan ye lu ti cao*

Theleia rotundifolia (Linnaeus) Alefeld.

Herbs 15–25(–30) cm tall. Rhizome long, slender, branched, producing adventitious roots and aerial stems at nodes; aerial stems 15–30 cm, ribbed, with a basal rosette of
crowded leaves, and higher up with 1 or 2 oblong-ovate sheathing, scalelike, brownish bracts. Rosulate leaves 4–7, semievergreen; petiole ca. 2 × or ca. as long as blades; leaf blade slightly green abaxially, green adaxially, slightly shiny, orbicular to ovate, (2–)3–6 × (1.5–)2.5–5.5 cm, leathery, base sometimes subcordate, margin obscurely crenate or nearly entire, apex rounded. Rachis-inserted scale-leaved leaves 1 or 2; raceme 8–15-flowered, 6–16 cm. Pedicel 4.5–5 mm; bracts axillary, imbricate, lanceolate, membranous. Flowers spreading or rarely nodding, 1.5–2 cm in diam., widely opened, fragrant (scent of Convallaria majalis Linnaeus). Sepals ovate-lanceolate to lanceolate, 3.5–5.5 mm, reflexed at tip, apex rounded. Petals in-curved, pure white, orbicular-ovate, 6.5–10 × 4–6 mm, rather thick, apex obtuse. Stamens arched toward upper side of flower; filaments glabrous, anthers yellow, tubules present. Style 7.5–10 mm, deflexed at base and facing lower part of corolla, dilated at apex into a ring. Capsule (6–)7–8 mm in diam. Fl. Jun–Jul, fr. unknown.

Pyrola rugosa

21. Pyrola rugosa


皱叶鹿蹄草  zhou ye lu ti cao

Herbs 14–27 cm tall. Rhizome ascending, slender, branch-ed. Leaves 3–7; petiole 4.5–6.5 cm; leaf blade reddish abaxially, green and shiny adaxially, broadly ovate or suborbicular, 3.5–4 × 2.5–3.5 cm, thickly leathery, base rounded or truncate, margin conspicuously crenate, apex obtuse. Scape: scales 1 or 2, oblong, 8–10 × 3–4 mm; raceme 5–13-flowered, 4–9 cm. Pedicel 5–7 mm; bracts lanceolate, ca. as long as petiole or slightly longer, membranous. Flowers nodding, saucer-shaped, ca. 1 cm in diam. Sepals lanceolate or lanceolate-triangular, 3–4 × 1.5–2 mm, margin entire or obscurely crenate, apex acuminate. Petals white, ovate-lanceolate or suborbicular, 6–8 × 4–6 mm, apex acute. Filaments flattened, 7–8 mm; anthers yellow, ellipsoid, ca. 3 × 1 mm, tubules present. Style not exerted, 7–10 mm, slightly curved at upper part, dilated at apex into a ring. Capsules 5–9 mm in diam. Fl. Jun–Jul, fr. Aug–Sep.

22. Pyrola shanxiensis


山西鹿蹄草  shan xi lu ti cao

Herbs 16–21 cm tall. Rhizome long creeping, somewhat slender, 0.5–1 mm in diam., branched. Leaves 2–6, appearing radical; petiole 1.8–2 cm; leaf blade pale green abaxially, green adaxially, elliptic or ova-elliptic, ca. 2.5 × 1.5 cm, thinly leathery, base obtuse to broadly truncate, margin entire or crenulate, apex obtuse. Scape erect, 9–17 cm tall, glabrous, with 1 scalelike leaf at base; raceme 5–8( or 9)-flowered, 5–7 cm. Pedicels shorter than bracts, 3.5–4 mm; bracts broadly linear, 4–5 mm. Flower horizontal. Sepals triangular or ovate-triangular, ca. 2.5 × 2.5 cm, apex acute. Petals white. Style 6–7 mm at fruiting, straight to slightly curved, dilated at apex into a ring. Capsules 7–8 mm in diam. Fl. unknown.

23. Pyrola sororia


珍珠鹿蹄草  zhen zhu lu ti cao

Herbs 15–30 cm tall. Rhizome ascending, branched. Scales at stem base 4–8 mm wide, sheathing. Leaves 6–8, basal; petiole 1–3 cm; leaf blade pale green abaxially, green adaxially, broadly ovate or suborbicular, 2.5–3 × 2–2.5 cm, thinly leathery, base rounded, margin remotely sinuate, apex rounded or subacute. Raceme 7–11-flowered, 3–7 cm. Pedicel 3–4 mm; bracts axillary, strap-shaped, longer than pedicel, membranous. Flowers nodding, saucer-shaped, 7–9 mm in diam. Sepals ovate-triangular, 2.2–5 mm, apex retuse. Petals white or yellowish green, broadly ovate or suborbicular, 7.8 × 5–6 mm, apex rounded. Filaments flattened, glabrous; anthers yellow, ca. 2 mm, base usually with mucro. Style slightly exerted, straight or becoming curved in upper half, 3–3.5 mm. Capsules 7–9 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

24. Pyrola szechuanica


四川鹿蹄草  si chuan lu ti cao

Herbs 15–25 cm tall. Rhizome long, slender, branched. Leaves 3–7, crowded at base of caudex; petiole 6–7.5 cm; leaf blade light green abaxially, green and slightly shiny adaxially, broadly ovate, or broadly oblong, 4–5(–6) × (3.5–)4–5(–6.5) cm, thinly leathery, base suborbicular or suborbicate, margin with remote teeth, apex obtuse. Scape with 2–4 scalelike leaves at base; raceme 6–12-flowered, 4–6 cm. Pedicel to 1 cm at fruiting; bracts lanceolate, 8–10 mm. Flowers ± nodding, widely opened, saucer-shaped, ca. 1 cm in diam. Sepals ligu-late, 4–6 × 1.5–3 mm, apex mucronulate. Petals yellow or yellowish white, broadly ovate, 6–10 × 5–7 mm, apex rounded. Filaments glabrous; anthers yellow, ca. 2 mm. Style exerted, 7–9 mm, curved, dilated inconspicuously at apex into a ring. Capsules 7–8 mm in diam. Fl. Jun–Jul, fr. Aug–Sep.

25. Pyrola tschanbaischanica


长白鹿蹄草  chang bai lu ti cao

Herbs 16–20 cm tall. Rhizome ascending, slender, 0.5–1 mm in diam., branched. Leaves 2–6, appearing radical; petiole 1.8–2.5 cm; leaf blade pale green abaxially, green adaxially, elliptic or ovate-elliptic, ca. 2.5 × 1.5 cm, thinly leathery, base obtuse to broadly truncate, margin entire or crenulate, apex obtuse. Scape erect, 9–17 cm tall, glabrous, with 1 scalelike leaf at base; raceme 5–8( or 9)-flowered, 5–7 cm. Pedicels shorter than bracts, 3.5–4 mm; bracts broadly linear, 4–5 mm. Flower horizontal. Sepals triangular or ovate-triangular, ca. 2.5 × 2.5 cm, apex acute. Petals white. Style 6–7 mm at fruiting, straight to slightly curved, dilated at apex into a ring. Capsules 7–8 mm in diam. Fl. unknown.

26. Pyroloidea huenekii

Herbs 8–13 cm tall. Rhizome long, slender, branched. Leaves 3–5 (or 6); petiole 1.8–4 cm; leaf blade light green abaxially, dark green adaxially, elliptic, 1.8–2.5 × 1.3–1.9 cm, leathery, base cuneate, margin entire, slightly incurred, apex obtuse or rounded. Scape with 1–3 scalelike leaves at base; raceme 3–5–flowered, 1.5–2.8 cm, with 1–3 scalelike bracts subtending scape. Pedicels 3–4 mm; bracts ovate-lanceolate, 4.3–4.5 mm. Flowers nodding, spreading, broadly saucer-shaped, 0.4–1 cm in diam. Sepals oblong or ovate-oblong, 3 × 1.5 mm, apex acute. Petals white, obovate, 5–6 × 3–4 mm, margin entire and incurred, apex obtuse. Filaments glabrous; anthers yellow, ca. 2 × 1 mm. Style exserted, upper part slightly curved, ca. 8 mm, dilated at apex into an inconspicuous ring. Capsule 5–6 mm in diam. Fl. Aug, fr. Sep.


水晶兰属 shui jing lan shu
Qin Haining (覃海宁); Gary D. Wallace

Hypopitys Rafinesque (1808); Hypopitys Hill (1756); Monotropion Saint-Lager.

Herbs perennial, mycoparasitic, lacking chlorophyll. Axis nodding, white to reddish. Leaves absent or reduced to laminar structures. Inflorescence scapose or racemose arising from persistent root system. Flowers solitary or in several-flowered racemes, often nodding at anthesis, usually erect in fruit, bracteate. Sepals 4 or 5, usually appressed to petals. Petals 3–6, oblong, often saccate at base, apex dilated. Stamens 6–12 in two series of alternating unequal lengths; anthers horizontal reformed, with terminal slit. Disk of 8–10 distended paired lobes adnate to base of ovary. Ovary (3–)5–loculed, with axile placenta; style base sharply differentiated from ovary. Capsules globose to narrowly ovoid, loculicidally dehiscent, valves with marginal fibers; perianth segments early deciduous at fruiting. Seeds many, fusiform, minute; testa thin, prolonged at both ends, minutely reticulate. n = 16, 24.

Two species: cool to temperate regions of the N hemisphere, extending to N South America; two species in China.

One of us (Wallace) notes that several taxa included here in synonymy under species of Monotropa and Monotropastrum are ambiguous minor variants in numbers of petals per raceme and degree of pubescence. Numbers of perianth parts often differ among flowers in the same inflorescence or clump. “Features such as color, number of perianth segments, degree of pubescence, numbers of petals per axis in multioflowered taxa, and floral sizes were found to be extremely variable even among inflorescences from a single root cluster” (Wallace, Taxon 36: 128–130. 1987).

1a. Inflorescence pale yellow-brown, racemose, (1 or)2–11-flowered; style slender, about as long as ovary; disk lobes
stout .............................................................................................................................................................................. 1. M. hypopitys

1b. Inflorescence white, scapose, 1-flowered; style thick, shorter than ovary; disk lobes slender, elongate ................. 2. M. uniflora


松下兰 song xia lan

Hypopitys hypopitys (Crantz; H. multiflora Scopoli; H. multiflora var. glabra Ledebour; Monotropa chinensis Koidzumi; M. hypopitys Wallroth; M. hypopitys f. atricha (Domin) Kitagawa; M. hypopitys var. atricha Domin; M. hypopitys var. glaberrima H. Har; M. hypopitys var. glabra Roth; M. hypopitys var. hirsuta Roth; M. hypopitys subsp. lanuginosa (Michaux) H. Har; M. lanuginosa Michaux; M. multiflora (Scopoli) Fritsch; M. taiwaniana S. S. Ying.

Herbs pale yellow-brown, rather fleshy, becoming brown when dry, usually pubescent on upper part of inflorescence. Inflorescence racemose, (1 or)2–11-flowered, 5–30 cm tall, 1–5 mm in diam. below lowermost flower, emerging from soil in nodding position. Inflorescence bracts below soil level shorter and thicker and more densely crowded on axis than upper bracts. Inflorescence bracts above soil level, sessile, ± erect, ovate to oblong, 7–15 × 3–15 mm, rather fleshy, somewhat pubescent to glabrous, margin entire or erose to irregularly toothed, apex acute to acuminate. Flowers nodding, tubular-campanulate. Bracts 1, rarely to 3, similar to inflorescence bracts in size and shape. Sepals 3–5, occasionally absent, oblong to broadly elliptic, 6–10 × 2–5 mm, shorter than petals, base attenuate, margin irregularly toothed, apex acute or acuminate. Petals 4–6, oblong, 1–1.5 cm × 3–6 mm, abaxially finely pubescent, adaxially long pubescent, base saccate, margin entire and irregularly denticulate or erose in upper part, apex acute or rounded. Stamens 8–12; filaments 7–14 mm, pubescent; anthers hippocrepiform, short, 0.8–1.5 mm, opening by a solitary terminal slit over connate sacs. Ovary 4–8 mm, 3–6 mm in diam.
at anthesis, placenta axile; style 2–10 mm, ca. as long as ovary, slender, pubescent, articulation between style and ovary conspicuous. Stigma yellow, funnelform, 1.5–3 mm in diam., often subtended by a ring of short hairs, usually pubescent. Nectary at base of ovary with 8–10 paired lobes directed downward between staminal bases opposite saccate bases of petals. Capsules erect, broadly ellipsoid, 6–10 mm, 4–8 mm in diam. Fl. Jul–Aug, fr. Sep–Oct.

Damp mixed and coniferous forests; 100–2500 m. Anhui, Fujian, Gansu, W Hubei (Shennongjia), Hunan, Jilin, Jiangxi, Liaoning, Qinghai, Shaanxi, Shanxi, Sichuan, Zhejiang [Bangladesh, Bhutan, India, Japan, Mongolia, Gansu, W Hubei (Shennongjia), Hunan, Jilin, Jiangxi, Liaoning, Qinghai, Shannongjia, Sikkim, Thailand; SW Asia, Europe, North America, Central America (Mexico)].


Herbs white when fresh, fleshy, becoming black when dry, usually glabrous. Inflorescence erect, scapose, 1-flowered, 10–30 cm tall, 1.5–2 mm in diam. below flower, emerging from soil in nodding position. Inflorescence bracts scale-form, below soil level shorter and thicker and more densely crowded than upper bracts. Inflorescence bracts above soil level thin, ± erect, slender, pubescent, articulation between style and ovary conspicuous; stigma yellow-brown, ca. 4 mm in diam., funnelform, glabrous. Nectary at base of ovary with 10 paired lobes directed downward between staminal bases. Capsules erect, ellipsoid-globose, 1–1.5 cm. Old spent axes remaining erect throughout season. Fl. (Aug–)Sep–Oct(–Nov), fr. Oct–Nov.

Damp deciduous or mixed forests; 100–1500 m. Anhui, Gansu, Guizhou, Hubei, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bangladesh, Bhutan, India, Japan, Korea, Myanmar, Nepal, Sikkim; North, Central, and N South America].


Herbs perennial, obligate mycorrhizal, from persistent root system. Roots forming a rather dense mass. Stems absent. Leaves absent. Inflorescences scapose or racemose, arising in nodding position from roots; inflorescence bracts laminar, sessile, usually appressed to inflorescence axis. Flowers solitary on scapes or in several flowered racemes, each flower usually nodding at anthesis, erect in fruit. Sepals (1–)3(–5), occasionally absent, appressed to petals. Petals 3–5, oblong, abaxially glabrous, adaxially finely pubescent, base broadly saccate, apex dilated. Stamens ca. as long as petals, usually 6–10 in two series of alternating lengths. Anthers horizontal reniform, with terminal slits. Disk of paired lobes at bases of shorter series of stamens. Ovary 1-loculed, with 4 or 5 or more parietal placentae; style 3–6 mm, slender, merging imperceptibly with ovary, without visible dehiscence lines. Fruit an indehiscent berry. Seeds minute, numerous, cell reticulate, without wings or appendages.

Two species: Bhutan, China, India, Indonesia (Sumatra), Japan (including Ryukyu Islands), Korea, Laos, Myanmar, Nepal, Russia (Sakhalin), Sikkim, Thailand, Vietnam; two species (one endemic) in China.

See the taxonomic comment under Monotropa above.

Monotropastrum arisanarum Andres (Notizbl. Bot. Gart. Berlin-Dahlem 12: 698. 1935) was described from Taiwan. We have seen no specimens and are therefore unable to treat it in this account. Further revision is necessary.

1a. Inflorescence scapose, flower solitary; petals similar to sepals but broadly saccate at base; disk lobes elongate, slender .......................................................................................................................... 1. M. humile

1b. Inflorescence racemose, flowers 2 to several; petals distinct from sepals, narrowly saccate at base; disk lobes short, stout .......................................................................................................................... 2. M. sciaphilum


球果假水晶兰 qiu guo jia sha jing lan

Monotropa humilis D. Don, Prodr. Fl. Nepal. 151. 1825; Chelidothea humilis (D. Don) H. Keng; C. humilis var. glaberrima (H. Haras) H. Keng & C. F. Hsieh; C. humilis var. pubescens (K. F. Wu) C. Ling; C. macrocarpa (Andres) Y. L. Chou; C. pubescens (K. F. Wu) Y. L. Chou; Monotropa uniflora Linnaeus var. pentapetala Makino; M. uniflora var. tripetalum Makino; Monotropastrum ampullaceum Andres; Monotropastrum baranovii Y. L. Chang & Y. L. Chou; M. globosum Andres ex H. Hara; M. globosum var. baranovii (Y. L. Chang & Y. L. Chou) Y. C. Zhu; M. globosum var. pentapetala (Makino) Honda; M. globosum var. tripetalum (Makino) Honda; M. humile var. glaberrimum H. Hara; M. humile var. tripetalum (Makino) H. Hara; M. longianumense K. F. Wu; M. macrocarpum Andres; M. pubescens K. F. Wu; M. tschanbatschan-
shortly lobed, abaxially glabrous, adaxially pubescent. Stamens included; filaments pubescent, much dilated below 1/3 length; anthers with 2 reflexed awns near apex, opening by 2 terminal pores. Ovary superior, glabrous, with one ovule per locule. Fruit a drupe; ding, white, ovoid-globose, 9–20 × 10–24 mm, seeds numerous toward basal saccate portions of petals. Berries erect to nodding at anthesis, tubular-campanulate. Sepals usually oblong, 10–20 × 5–15 mm, slightly longer than sepals, 1–5, oblong, 8–20 × 2–11 mm, usually glabrous. Petals 3–5, serrate or crenate, flat. Flowers pendulous, 5-merous, in short terminal racemose clusters, with scales at base. Corolla urceolate, ovate, apex acute. Corolla white, 4–6 mm; lobes greenish. Stamens 1–2 mm; filaments pubescent. Drupe black-purple, globose, apex acute. Corolla white, 4–6 mm; lobes greenish. Stamens 1–2 mm; filaments pubescent. Drupe black-purple, globose, 6–9 mm in diam. Fl. May–Jun, fr. Jul.–Aug. 2n = 26, 28.

Alpine thickets, among rocks, sandy areas; 1900–3000 m. Gansu, Nei Mongol, Qinghai, Shaanxi, N Sichuan, Xinjiang [Japan, Mongolia, Russia; Europe, North America].

The fruit is edible.


北极果 beijiguoshu

Fang Ruizheng (方瑞征 Fang Rhui-cheng); Peter F. Stevens


Shrubs dwarf, deciduous. Twigs smooth, bark exfoliating in papery sheets; leaf or leaf bases marcescent. Leaf blade broad, margin serrate or crenate, flat. Flowers pendulous, 5-merous, in short terminal racemose clusters, with scales at base. Corolla urceolate, ovate, apex acute. Corolla white, 4–6 mm; lobes greenish. Stamens 1–2 mm; filaments pubescent. Drupe black-purple, globose, 6–9 mm in diam. Fl. May–Jun, fr. Jul.–Aug. 2n = 26, 28.

One of us (Stevens) questions whether this is a good species.


萌生沙晶兰 yin sheng sha jing lan


Inflorescences to 4–11 cm tall, to 5 mm diam. below lowestmost flower, 2- to several flowered racemes. Flowers nodding at anthesis, tubular-campanulate. Sepals 4 or 5, elliptic-oblong, to 9 × 4 mm. Petals 4 or 5, oblong, to 15 × 8 mm, decidedly longer than sepals, base shallowly saccate. Disk of paired, short blunt lobes protruding from base of ovary opposite saccate portions of petal bases. Fl. and fr. unknown.

● Quercus forests; ca. 2200 m. Yunnan (near Kunming).

The berry is not mature on the type specimen of Eremotropa sciaphila, the only specimen seen by one of us (Wallace).


小叶当年枯 xiaoyedangnianku

Shrubs dwarf, tussock-forming or prostrate, 2.5–3.5 cm tall. Twigs terete, glabrous. Leaf blade pale abaxially, dark green adaxially, oblongulate, obovate, or elliptic, 2–6(–17) × 2–7 mm, thickly papery, glabrous, veins impressed adaxially, base attenuate, decurrent into winged petiole, margin crenate-serrate, densely ciliate or white setose along petiole, apex obtuse-acute. Racemes 2- or 3-flowered; scales brown, elliptic, longer than pedicel, margin ciliate, apex acute. Pedicel ca. 5 mm. Calyx lobes triangular, 1–1.5 mm, apex acuminate. Corolla and stamens unknown. Immature drupe white-green, subglobose, 4–5 mm in diam. Fl. May–Jun, fr. Jul.

● Low valley forests; ca. 3500 m. NW Yunnan (Zhongdian).

One of us (Stevens) questions whether this is a good species.


红北极果 hongbeijiguoshu

Shrubs dwarf, 3–15(–20) cm tall. Twigs terete, glabrous. Leaf blade pale abaxially, dark green adaxially, obovate or oblanceolate, 2–4 (including petiole) × 1–1.4 cm, papery, glabrous, veins impressed adaxially, base attenuate-cuneate, decurrent into winged petiole, margin crenate, sparsely ciliate along petiole, apex obtuse-acute. Racemes 2–5-flowered; scales broadly ovate, 5–7 mm, margin densely ciliate. Pedicel ca. 6 mm. Calyx lobes ovate, ca. 1 mm. Corolla white to cream, 3–4 mm; lobes spreading, ovate or orbicular. Stamens 1.5–2 mm; filaments puberulous. Drupe brick-red or scarlet, globose, 6–10 mm in diam. Fl. Jun, fr. Aug–Sep. 2n = 26.

Among mosses and rocks on mountain summits, streamsides, localities rich in calcareous deposits; 2900–3300(–4000) m. Gansu, Jilin, Nei Mongol, Ningxia, N Sichuan [Japan, Korea; NW North America (Alaska)].


杉叶杜鹃属 shan ye du juan shu

Yang Hanbi (杨汉碧 Yang Han-pi); David F. Chamberlain

Shrubs dwarf, evergreen, densely pubescent. Leaves crowded, sessile; leaf blade linear or linear-elliptic, small, leathery, margin serrate or long-ciliate, axil pubescent or ending in a gland. Inflorescence terminal, racemose or subcapitate. Bracts and bracteoles leaflike, margin glandular-ciliate. Calyx lobes 5, leafy, margin glandular-ciliate. Corolla rose, small, deciduous; tube cylindrical; lobes 5, patent. Stamens 10, included: 5 basal or hypogynous, 5 inserted high on corolla and alternating with corolla lobes; anthers elliptic, dehiscing longitudinally. Ovary globose, 5-celled, glabrous; style short; stigma capitate, 5-lobed. Capsule globose, enclosed by calyx, septicidally 5-valved; wall of cells splitting into two layers. Seeds many; testa with reticulate veins.

Two species: China, Myanmar, Sikkim; two species in China.

1a. Inflorescence 8–12(–20)-flowered; leaf blade 6–6.5 mm; branches sparsely glandular-pubescent; lower 5 stamens attached to corolla; calyx lobes linear-oblong............................................................................................................................................. 1. Diplarche multiflora

1b. Inflorescence 2–6-flowered; leaf blade 3–4 mm; branches usually glabrous; lower 5 stamens free from corolla; calyx lobes ovate-oblong ............................................................................................................................................. 2. Diplarche pauciflora


多花杉叶杜鹃 duo hua shan ye du juan

Plants 8–16 cm tall. Branchlets dark brown, sparsely glandular-pubescent. Leaf blade linear, 6–6.5 × 1–1.1(–1.4) mm, base obtuse, margin spinescent-serrate (teeth usually ending in a glabrous, shining gland), apex subacute, spinescent-serrate (teeth usually ending in a gland). Inflorescence subcapitate, 1 cm, 8–12(–20)-flowered. Bracts elliptic-ovate, 2.5–5.5 mm. Calyx lobes linear-oblong, ca. 4 mm. Corolla ca. 7 mm; tube ca. 4 mm; lobes rounded, ca. 3 mm, patent apex usually slightly sinuate. Stamens: lower 5 attached to corolla, ca. 2 mm. Style purple, ca. 1 mm. Capsule peduncle elongating in fruit to 7 cm, pubescent. Fl. and fr. Jun–Sep.

Thickets, alpine meadows, rocky slopes, cliffs; 3500–4100 m. SE Xizang, NW Yunnan [Myanmar, Sikkim].


少花杉叶杜鹃 shao hua shan ye du juan

Plants 4–7 cm tall. Branchlets usually glabrous. Leaf blade linear-elliptic, 3–4 × 1(–1.2) mm, base tapering, margin spinescent-serrate, glabrous, shining, apex obtuse, mucronate. Inflorescence subcapitate, ca. 1 cm, 2–6-flowered. Bracts oblong-ovate to broadly ovate, ca. 4 mm. Calyx lobes ovate-oblong, ca. 3 mm. Corolla ca. 4 mm; tube ca. 2 mm; lobes as long as tube, patent, rounded or ovate apex usually slightly sinuate. Stamens: lower 5 free from corolla and often surrounding capsule after corolla has fallen. Style ca. 1 mm. Capsule peduncle elongating in fruit to 4 cm, glandular-pubescent. Fl. Jun–Jul, fr. Aug–Sep.

Pastures, slopes, alpine rocks, cliffs; 3500–4800 m. NW Sichuan, NW Yunnan [Sikkim].

10. PHYLLODOCE Salisbury in Hooker, Parad. Lond. t. 36. 1806.

松毛翠属 song mao cui shu

Yang Hanbi (杨汉碧 Yang Han-pi); David F. Chamberlain


About seven species: widespread N temperate regions; two species (one endemic) in China.

1a. Calyx lobes strongly deflexed in flower; style longer than corolla tube, nearly as long as whole corolla; leaf blade ca. 10 × 1 mm; pedicels gencilicate above middle ............................................................................................................................................. 1. Phyllocoche deflexa

1b. Calyx lobes not deflexed in flower; style slightly shorter than corolla tube; leaf blade (5–)7(–10) × ca. 1.2 mm; pedicels somewhat recurved ............................................................................................................................................. 2. Phyllocoche caerulea

反折松毛翠fan zhe song mao cui

Shrubs ca. 20 cm tall; usually much branched. Branchlets purplish brown, slender, very leafy, sparsely glandular-hairy. Leaves deciduate, usually subsessile; leaf blade linear, ca. 10 × 1 mm, abaxially densely lanate along midvein, adaxially glabrous, base cuneate, margin serrulate, apex obtuse. Inflorescence subumbellate, 3–7-flowered; bracts 2, broadly ovate, 2–3 mm; pedicels geniculate above middle, purple, filiform, to 2.5 cm in flower, elongating in fruit, densely purple glandular-hairy. Calyx purple-brown, cylindric-oblong; lobes strongly deflexed in flower, lanceolate, ca. 3 mm, glandular-pilose. Corolla white, divided to base; lobes imbricate in bud. Stamens (5–)8–10, protruding beyond corolla; cymes terminal, racemose, many-flowered; bracts present at peduncle base, dry, membranous, soon deciduous; bractlets absent. Carophyllly oblong, leathery, abaxially with white and/or rusty brown-pilose or woolly indumentum, margin entire, recurved. Inflorescence clus-tered, 1–5-flowered; bracts 2, persistent; pedicels somewhat recurved, reddish, ca. 2 cm in flower, elongating to 4 cm in fruit, glandular-hairy. Calyx red-purple, glandular-pilose; lobes not deflexed in flower, lanceolate, 3–4(–5.5) mm. Corolla red or bluish rose, urceolate, 7–8(–11) mm, sparsely glandular-hairy outside. Stamens 10, included; anthers purple. Style slightly shorter than corolla tube; stigma capitate. Capsule globose, 3–4 mm. Fl. Jun–Jul, fr. Aug.

Subalpine scrub, alpine meadows, grasslands, stony tundra, rocks.

Jilin, Nei Mongol, Xinjiang [Japan, Korea, Russia; Europe, North America].


杜香属du xiang shu

Fang Ruizheng (方瑞征 Fang Ruhi-cheng); David F. Chamberlain

Shrubs evergreen, small, multibranched, with fragrant resin. Leaves shortly petiolate; leaf blade linear, linear-lanceolate, or narrowly oblong, leathery, abaxially with white and/or rusty brown-pilose or woolly indumentum, margin entire, recurved. Inflores-cences terminal, racemose, many-flowered; bracts present at peduncle base, dry, membranous, soon deciduous; bractlets absent. Calyx small, 5-lobed, persistent. Corolla white, divided to base; lobes imbricate in bud. Stamens (5–)8–10, protruding beyond corolla; filaments linear; anthers small, abaxially connected, globose, without appendages. Flower disk 8–10-lobe. Ovary globose, 5-locular, lepidote. Style linear; stigma obtuse, 5-lobed. Capsule ellipsoid or cylindric, opening from base. Seeds tiny.

Three or four species: circumboreal in temperate and cold-temperate regions; one species in China.

DNA sequencing has shown that this genus should be included within Rhododendron subg. Rhododen-dron, as R. subsect. Ledum (Linnaeus) Kron & Judd (Syst. Bot. 15: 67. 1990). It has affinities with R. subsect. Micrantha.


杜香du xiang

Shrubs erect or creeping, to 50 cm tall. Branches slender; young branches densely covered with rust-colored wool; terminal buds conspicuous, ovoid, scales densely rufous-woolly. Leaf blade linear, linear-lanceolate, or narrowly oblong, 1–8 × 0.1–1.5 cm, abaxially densely rufous-hairy or woolly, sometimes also white-pubescent, with raised midvein, adaxially dark green and wrinkled, margin strongly or slightly recurved. Inflorescence many-flowered; pedicels thin. Calyx lobes 5, ovate, 5–8 mm, persistent. Corolla milky white, 5–25 mm, densely rufous-woolly. Stamens 10; filaments pilose at base. Style persistent, 2–4 mm. Capsule ovoid, 3.5–4 mm. Fl. Jun–Jul, fr. Jul–Aug.

Coniferous forests, forest margins, marshes, wet meadows; 400–1400 m. Heilongjiang, Jilin, Nei Mongol [N Korea, Mongolia, Russia; NE Asia, C and N Europe, North America].

1a. Leaf blade linear-lanceolate or narrowly oblong, 2–8 × 0.4–1.5 cm ................. 1b. var. dilatatum

1b. Leaf blade linear, 1–3 × 0.1–0.3 cm.

2a. Shrubs creeping; leaf blade abaxially densely rufous-hairy and white-pubescent .......................... 1c. var. decumbens

2b. Shrubs often erect; leaf blade abaxially densely rufous-woolly, not white-pubescent ............................ 1a. var. palustre

1a. Ledum palustre var. palustre

杜香(原变种)du xiang (yuan bian zhong)

Ledum tomentosum Stokes, nom. illeg. superfl.; Rhododen-
Ledum palustre (Linnaeus) Kron & Judd (1990), not Turczaninow ex de Candolle (1839); R. tomentosum Harmaja.

Shrubs often erect. Leaf blade linear, 1–3 × 0.1–0.3 cm, abaxially densely rufous-woolly, not white-pubescent, margin strongly recurved.

Often dominant in coniferous forests, marshes; 400–1400 m. Heilongjiang, Nei Mongol [Mongolia; NE Asia, C and N Europe, North America].

1b. Ledum palustre var. dilatatum Wahlenberg, Pl. Lapp. 103. 1812.

宽叶杜香 kuan ye du xiang

Leaf blade linear-lanceolate or narrowly oblong, 2–8 × 0.4–1.5 cm, abaxially rufous-hairy and white-pubescent, margin slightly recurved.

Coniferous forests, forest margins, marshes, wet meadows. Heilongjiang, Jilin [N Korea, Russia; NE Asia, N Europe].


小叶杜香 xiao ye du xiang

Ledum decumbens (Aiton) Lodiges ex Steudel; Rhododendron subarcticum Harmaja; R. tomentosum Harmaja subsp. subarcticum (Harmaja) G. D. Wallace.

Shrubs creeping. Leaf blade linear, 1–1.5 × 0.1–0.15 cm, abaxially densely rufous-hairy and white-pubescent, margin slightly recurved.

Often dominant in coniferous forests, marshes. Heilongjiang, Nei Mongol [Mongolia; NE Asia, C and N Europe, North America].