

2. CIRCAEA Linnaeus, Sp. Pl. 1: 9. 1753.

露珠草属 lu zhu cao shu

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Herbs, perennial, rhizomatous, often forming large colonies. Leaves petiolate, opposite, becoming alternate and bractlike in inflorescence. Inflorescences simple or branched racemes, terminal on main stem and at apices of short axillary branches. Flowers 2-merous, with a floral tube. Sepals and petals alternate. Petals obcordate or obovate, notched at apex, white or pink. Stamens opposite sepals; nectary wholly within floral tube or elongated and projecting above opening of floral tube as a fleshy cylindrical or ringlike disk. Ovary locules 1 or 2; ovules 1 per locule; style equaling or longer than stamens, stigma 2-lobed. Fruit an indehiscent capsule, with stiff uncinuate hairs, with or without conspicuous rows of corky tissue. Seeds smooth, fusiform or broadly clavoid to narrowly ovoid, adhering ± firmly to inner ovary. $2n = 22$.

Eight species: temperate and boreal forests of the N hemisphere, from near sea level to 5000 m and from 10°–70° N; seven species (one endemic) and five natural hybrids (two endemic) in China.

Hybrids are common and often abundant in naturally disturbed habitats in Europe, Japan, and North America, but few gatherings of hybrids are known from China.

Ascherson and Magnus (Bot. Zeitung (Berlin) 28: 47–49, 745–787. 1870) divided *Circaea* into two groups, which they called “divisions,” based on the number of locules in the ovary. Included in their “*Uniloculares*” are *C. alpina* and *C. repens*, with all of the other species placed in “*Biloculares*.” These groups were later given sectional status by Steinberg (in Schischkin & Bobrov, Fl. URSS 15: 634. 1949). The single line of specialization, leading from the 2-loculed, outcrossing species to the 1-loculed, self-pollinating *C. alpina*, through the intermediate *C. repens*, represents a continuum that makes formal recognition of two infrageneric groups unwarranted.

Flowers, mature fruits, and carefully collected rhizomes are highly desirable to facilitate identification. The nature of the nectary is most easily determined in living plants.

- 1a. Locule of ovary and fruit 1; rhizomes terminated by a tuber.
 - 2a. Petals notched to more than 1/2 their length, V-shaped; pedicels glandular pubescent; leaves with 9–15 secondary veins; combined length of mature fruit and pedicel 7.5–15 mm 6. *C. repens*
 - 2b. Petals notched to 1/2 or less their length, obovate to obtriangular, ± cordate; pedicels glabrous; leaves with 4–10 secondary veins; combined length of mature fruit and pedicel 3.5–7.8 mm 7. *C. alpina*
- 1b. Locules of ovary and fruit 2; rhizomes without tubers.
 - 3a. Nectary wholly included within floral tube, not projecting as a cylindrical or ringlike disk beyond opening of floral tube.
 - 4a. Axis of inflorescence with glandular and nonglandular hairs; fruit obliquely thickly lenticular to flattened-pyriform, obliquely rounded to pedicel 1. *C. cordata*
 - 4b. Axis of inflorescence glabrous or with only glandular hairs; fruit obovoid to pyriform, not at all or only slightly flattened, tapering smoothly to pedicel 2. *C. glabrescens*
 - 3b. Nectary exerted beyond opening of floral tube, projecting as a ringlike or cylindrical fleshy disk above opening of floral tube.
 - 5a. Petals obovate, notched to 1/5 or less their length; axis of inflorescence and pedicels glabrous 5. *C. erubescens*
 - 5b. Petals obovate to depressed broadly obovate, notched to 1/4 or more their length; axis of inflorescence and pedicels commonly pubescent; fruit with prominently thickened ribs, ribs separated by deep grooves (sulci).
 - 6a. Stem pubescent, often densely so; leaves basally cuneate, rarely rounded; inflorescence with both glandular and falcate hairs 3. *C. mollis*
 - 6b. Stem glabrous or with sparse falcate hairs; leaves basally rounded to subcordate; inflorescence densely glandular pubescent, without falcate hairs 4. *C. canadensis*

1. *Circaea cordata* Royle, Ill. Bot. Himal. Mts. 211. 1835.

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Circaea cardiophylla Makino; *C. ×hybrida* Handel-Mazzetti; *C. kitagawae* H. Hara.

Plants 20–150 cm tall, pubescent, usually densely so, with long, soft, spreading hairs, soft, falcately recurved hairs, and capitate and clavately tipped glandular hairs. Rhizomes not tuberous. Leaves narrowly to broadly ovate, 4–13 × 2.3–11 cm, base broadly cuneate to broadly rounded or truncate or more

commonly cordate, margin denticulate to subentire, apex shortly acuminate. Racemes simple or branched near base, 2–20 cm; flowering pedicels ± clustered and perpendicular to axis of raceme, pubescent, with a minute setaceous bracteole at base. Buds with few to many, long, straight or slightly curved, rarely hooked, hairs. Floral tube 0.6–1 mm. Sepals reflexed in flower, white or pale green, ovate to broadly so, 2–3.7 × 1.4–2 mm, apex broadly to narrowly rounded to obtuse. Petals reflexed, white, ovate to broadly so, or depressed-obovate to broadly obovate, 1–2.4 × 1.2–3.1 mm, apex obcordate, apical notch 1/2–2/3 length of petal, petal lobes broadly rounded. Stamens spread-

ing, shorter than to ca. as long as style; nectary wholly within floral tube and inconspicuous. Fruiting pedicel and mature fruit 4.4–7 mm. Fruit 3–3.9 × 1.8–3.3 mm, locules 2, obliquely obovoid to lenticular, abaxially flattened, base obliquely rounded or truncate to pedicel, with low, corky thickenings along margins and between locules, without prominent sulci. Seed 1 per locule. Fl. Jun–Aug, fr. Jul–Sep. $2n = 22$.

Well-drained soils in mixed deciduous, rarely boreal, forests; near sea level to 3500 m. Anhui, Gansu, Guizhou, Hebei, Henan, Heilongjiang, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [N India, Japan, Kashmir, Korea, Nepal, Pakistan, Russia (Far East)].

“*Circaea bodinieri*” (H. Léveillé, Bull. Acad. Int. Geogr. Bot. 22: 224. 1912) belongs here but was a provisional name and was therefore not validly published (*Vienna Code*, Art. 34.1(b)).

2. *Circaea glabrescens* (Pampanini) Handel-Mazzetti, Symb. Sin. 7: 604. 1933.

秃梗露珠草 tu geng lu zhu cao

Circaea cordata Royle var. *glabrescens* Pampanini, Nuovo Giorn. Bot. Ital. 17: 677. 1910.

Plants 12–80 cm tall, pubescent with short, soft, falcately recurved hairs, rarely glabrous. Rhizomes not tuberous. Leaves narrowly to broadly ovate, 3.7–11 × 1.8–5 cm, base rounded or rarely subcordate, margin denticulate, apex acuminate to shortly acuminate. Racemes simple or branched at base, 2–18 cm; flowering pedicel perpendicular to axis of raceme, glabrous, subtended by a setaceous bracteole. Buds commonly pubescent with a few, long, straight to slightly bent hairs, occasionally also with short uncinat hairs. Floral tube 0.9–1.3 mm. Sepals reflexed in flower, pink or greenish white, oblong to nearly ovate, 1.8–3.3 × 1.2–1.7 mm, apex acute or obtuse. Petals pink, obovate to broadly obovate in outline, 1–1.9 × 1.3–2.6 mm, apex obcordate, apical notch ca. 1/2 length of petal; petal lobes broadly rounded. Stamens spreading, shorter than style; nectary wholly within floral tube and inconspicuous. Fruiting pedicel and mature fruit 4.5–8.5 mm. Fruit 2.5–3.3 × 1.6–1.8 mm thick, locules 2, 2-seeded, obovoid to pyriform, tapering smoothly to pedicel, without ribs or sulci but with a shallow groove extending from pedicel. Seed 1 per locule. Fl. Jul–Aug, fr. Aug–Sep. $2n = 22^*$.

• Deciduous forests; 700–2500 m. SE Gansu, W Hubei, C and S Shaanxi, SW Shanxi, N Sichuan, Taiwan.

3. *Circaea mollis* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 134. 1845.

南方露珠草 nan fang lu zhu cao

Circaea coreana H. Léveillé; *C. coreana* var. *sinensis* H. Léveillé; *C. lutetiana* Linnaeus var. *taquetii* H. Léveillé.

Plants 25–150 cm tall, pubescent with falcately recurved hairs. Rhizomes not tuberous. Leaves narrowly to broadly lanceolate to narrowly ovate, 3–16 × 2–5.5 cm, base cuneate or occasionally rounded, margin subentire to denticulate, apex attenuate to slightly acuminate. Terminal raceme branched at base, rarely simple, 1.5–4 cm to ca. 20 cm; racemes at apex of

axillary branches usually simple; flowering pedicel perpendicular to axis of raceme, without or rarely with a minute setaceous bracteole at base, commonly pubescent. Buds glabrous or pubescent with crisped, straight, capitate and clavately tipped glandular hairs. Floral tube 0.5–1 mm. Sepals spreading or somewhat reflexed in flower, pale green or whitish, 1.6–2.9 × 1–1.5 mm, apex abruptly shortly acuminate to obtuse or minutely mammiform. Petals white, broadly to broadly depressed-obovate, 0.7–1.8 × 1–2.6 mm, apical notch 1/4–1/2 length of petal. Stamens normally spreading at anthesis, shorter than or occasionally equal to, rarely longer than, style; nectary conspicuous, exerted beyond floral tube. Pedicel and mature fruit 5–7 mm. Fruit narrowly to broadly pyriform or globose, 2.6–3.5 × 2–3.2 mm, with prominent ribs and deep sulci, tapering concavely and obliquely to pedicel; fruiting pedicel reflexed, often sharply so. Ovary locules 2. Seeds 2. Fl. Jul–Sep, fr. Aug–Oct. $2n = 22^*$.

Deciduous forests; near sea level to ca. 2000 m. Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shandong, Sichuan, Yunnan, Zhejiang [Cambodia, India (Assam), Japan, Korea, N Laos, N Myanmar, SE Russia, N Vietnam].

4. *Circaea canadensis* (Linnaeus) Hill subsp. ***quadrisulcata*** (Maximowicz) Boufford, Harvard Pap. Bot. 9: 256. 2005.

水珠草 shui zhu cao

Circaea lutetiana Linnaeus f. *quadrisulcata* Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9 [Prim. Fl. Amur.]: 106. 1859; *C. lutetiana* subsp. *quadrisulcata* (Maximowicz) Ascherson & Magnus; *C. maximowiczii* (H. Léveillé) H. Hara; *C. maximowiczii* f. *viridicalyx* (H. Hara) Kitagawa; *C. maximowiczii* var. *viridicalyx* H. Hara; *C. mollis* Siebold & Zuccarini var. *maximowiczii* H. Léveillé; *C. quadrisulcata* (Maximowicz) Franchet & Savatier.

Plants 15–80 cm tall. Rhizomes not tuberous. Stem glabrous or rarely with sparse falcate hairs. Leaves narrowly to broadly ovate to oblong ovate, 4.5–12 × 2–5 cm, base rounded to subcordate, rarely broadly cuneate, margin denticulate, apex shortly to long acuminate. Racemes 2.5–30 cm, simple or branched at base. Flowering pedicels perpendicular to axis of raceme, with stipitate glandular hairs, without a bracteole at base. Floral tube 0.6–1 mm. Sepals reflexed, most commonly purple, 1.3–3.2 × 1–1.7 mm. Petals commonly pink, 1–2 × 1.4–2.5 mm, apical notch 1/3 to slightly more than 1/2 length of petal; nectary conspicuous, exerted beyond floral tube. Fruiting pedicel and mature fruit 5.3–8.5 mm. Fruit pyriform to subglobose, 2.2–3.8 × 1.8–3 mm, rounded, usually obliquely, to pedicel, with prominent ribs and deep sulci. Ovary locules 2. Seeds 2. Fl. Jun–Aug(–Sep), fr. Jul–Sep. $2n = 22$.

Cool-temperate deciduous forests and mixed deciduous-boreal forests; near sea level to ca. 1500 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Nongol, Shandong [N Japan, Korea, Russia; E Europe from vicinity of Moscow across Siberia between 50°–60° N].

Molecular and morphological analyses indicate that *Circaea lutetiana* Linnaeus is a distinct species from *C. canadensis*. *Circaea canadensis* subsp. *canadensis* occurs in E North America.

5. *Circaea erubescens* Franchet & Savatier, Enum. Pl. Jap. 2: 370. 1879.

谷蓼 gu liao

Circaea delavayi H. Léveillé; *C. kawakamii* Hayata; *C. lutetiana* Linnaeus race *erubescens* (Franchet & Savatier) H. Léveillé.

Plants 10–120 cm tall, glabrous. Rhizomes not tuberous. Leaves lanceolate to ovate or occasionally broadly ovate, 2.5–10 × 1–6 cm, base broadly cuneate to rounded or truncate, rarely subcordate, margin denticulate, apex shortly acuminate. Terminal raceme simple or more commonly branched at base, 2–20 cm, flowering pedicel perpendicular to axis of raceme, without, less commonly with, a minute, setaceous bracteole at base, bracteole usually deciduous before maturation of fruit. Buds glabrous; floral tube 0.5–0.8 mm. Sepals reflexed in flower, reddish purple, oblong to lanceolate, 0.6–2.5 × 0.8–1.2 mm, abruptly acuminate. Petals pink, narrowly to broadly obtrullate or obovate, 0.8–1.7 × 0.7–1 mm, apical notch 1/10–1/5 length of petal; petal lobes minutely crenulate or with minute secondary lobes. Stamens shorter than style; nectary exerted beyond opening of floral tube. Fruiting pedicel and mature fruit 6–12 mm. Fruit obovoid to broadly so, 1.7–3.2 × 1.2–2.1 mm, slightly flattened abaxially, tapering smoothly to pedicel, without prominent ribs or sulci, but with a narrow groove representing extension of pedicel. Ovary locules 2. Seeds 2. Fl. Jun–Sep, fr. Jul–Sep. $2n = 22$.

Rocky stream beds and seepages, along trails and road banks and in rich alluvial woods in temperate broad-leaved forests; near sea level to 2500 m. Anhui, Fujian, Guangdong, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan (except Ryukyu Islands), S Korea].

6. *Circaea repens* Wallich ex Ascherson & Magnus, Bot. Zeitung (Berlin) 28: 761. 1870.

匍匐露珠草 pu fu lu zhu cao

Circaea alpina Linnaeus var. *himalaica* C. B. Clarke.

Plants 15–100 cm tall, pubescent with falcate hairs, inflorescence with capitate and clavately tipped glandular hairs. Rhizomes with tuberous thickening at apex. Leaves narrowly to broadly ovate, rarely nearly orbicular, 1.8–9 × 1.5–5 cm, base rounded, broadly cuneate, or cordate, margin denticulate, apex acute to shortly acuminate. Inflorescence simple or branched, sometimes also with terminal racemes on upper axillary branches. Flowering pedicels perpendicular to axis of raceme or slightly ascending, with stipitate glandular hairs, with or without a minute bracteole at base. Buds sparsely pubescent, rarely glabrous; floral tube 0.4–0.8 mm. Sepals spreading to reflexed, white, green or reddish tinged, oblong to ovate, 1.8–2.5 × 1.1–1.5 mm, apex gradually rounded to obtuse or acute. Petals white or pink, broadly to narrowly obtriangular in outline, V-shaped, 1.4–2.3 × 1.3–2(–2.9) mm, apical notch 3/4 length of petal. Stamens ca. equal to or shorter than style; nectary inconspicuous, within floral tube. Fruiting pedicel and mature fruit 7.5–15 mm. Fruit narrowly to broadly clavate, 3.5–4.2 × 0.9–1.6 mm, tapering smoothly to pedicel, without prominent ribs and deep sulci,

but with a shallow groove representing an extension of pedicel; locule 1, but with trace of a second locule in cross-section. Seed 1. Fl. Jul–Oct, fr. Jul–Nov. $2n = 22$.

Moist to wet forests, thickets, and open places; 1500–3300 m. W Hubei, Sichuan, Xizang, Yunnan [Bhutan, N India, Myanmar (one gathering), Nepal, Pakistan (one gathering)].

The fruit of *Circaea repens* often shows a trace of a second locule in cross-section, but bears only a single seed. In many ways this species is intermediate between species with one and two locules.

7. *Circaea alpina* Linnaeus, Sp. Pl. 1: 9. 1753.

高山露珠草 gao shan lu zhu cao

Plants 3–50 cm tall, glabrous or pubescent with short falcate hairs on stem and short glandular hairs in inflorescence. Rhizomes with tuberous thickening at apex. Leaves highly variably shaped from narrowly trullate or elliptic to nearly circular, 1–11 × 0.7–5.5(–8) cm, base narrowly cuneate to cordate, margin subentire to sharply serrate, apex acute to shortly acuminate. Terminal raceme 0.7–2 to 12(–17) cm. Flowering pedicels perpendicular to axis of raceme (in *C. alpina* subsp. *caulescens* and some plants of subsp. *angustifolia*) to ascending or erect, with or without a minute setaceous bracteole at base. Buds glabrous, rarely glabrescent; floral tube ranging from nearly absent to 0.6 mm. Sepals, spreading or slightly reflexed, white or pink, occasionally purple tinged at apex, rarely purple throughout, oblong, ovate to broadly so, or triangular-ovate, 0.8–2 × 0.6–1.3 mm, glabrous, apex rounded to obtuse or minutely mammiform. Petals white, narrowly obtriangular, obdeltoid, obovate to broadly so to depressed-obovate, 0.5–2 × 0.6–1.9 mm, apical notch essentially lacking or to 1/2 length of petal; petal lobes rounded to truncate, rarely somewhat crenulate (in *C. alpina* subsp. *angustifolia*). Stamens erect or ascending, less commonly spreading, equaling or slightly longer than style; nectary wholly within floral tube and inconspicuous. Fruiting pedicel and mature fruit 3.5–7.8 mm. Fruit clavate or obovoid, 1.6–2.7 × 0.5–1.2 mm, tapering smoothly to pedicel, locule 1, seed 1, without ribs or sulci, but pedicel extending as a shallow groove along upper surface. $2n = 22$ (unknown in *C. alpina* subsp. *micrantha*).

Forests, thickets, grassy alpine areas, cool, moist, and wet places, on moss-covered rocks and logs; near sea level to 5000 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [NE Afghanistan, Bhutan, India, Japan, Kazakhstan, Korea, Mongolia, N Myanmar, Nepal, Russia, Thailand, NW Vietnam; circumboreal in forests between 30°–65° N, but restricted to high elevations at lower latitudes].

Circaea alpina is a facultatively inbreeding complex of six subspecies, each exhibiting different geographic or ecological preferences but with areas of overlap between two or more subspecies in parts of their range. The subspecies form a reticulate pattern of morphologically intergrading populations, some of which are separated only by seemingly minute differences. Other subspecies, were it not for the numerous intermediate plants, appear so dissimilar that some might recognize them as separate species, as has often been done in the past. Five subspecies are in China.

1a. Inflorescences elongating as or before flowers open; flowers ± loosely spaced; lower flower-

bearing pedicels perpendicular to raceme axis at anthesis.

- 2a. Pedicels without a minute bracteole at base, or bracteole represented by a darkened gland; leaves ovate to broadly so, base rounded, truncate, or subcordate; hairs on fruit translucent 7a. subsp. *caulescens*
- 2b. Pedicels with a minute bracteole at base; leaves elliptic to trullate or ovate, base narrowly to broadly cuneate; hairs on fruit containing purple pigment 7b. subsp. *angustifolia*
- 1b. Inflorescences elongating after flowers open; flowers clustered and corymbose at summit of raceme; pedicels erect or ascending at anthesis.
- 3a. Stem glabrous.
- 4a. Ovary minutely pubescent at anthesis; petals conspicuously notched, notch 1/4–1/2 length of petal 7d. subsp. *alpina*
- 4b. Ovary glabrous at anthesis; petals emarginate or barely notched, notch less than 1/5 length of petal 7e. subsp. *micrantha*
- 3b. Stem pubescent, with at least a few, soft, falcate hairs.
- 5a. Leaves thin, pale green, translucent; ovary glabrous at anthesis; petals emarginate or barely notched 7e. subsp. *micrantha*
- 5b. Leaves thick, deep green or reddish, opaque; ovary pubescent with hooked hairs at anthesis; petals clearly notched to ca. 1/2 their length.
- 6a. Leaves elliptic to trullate, base narrowly to broadly cuneate 7b. subsp. *angustifolia*
- 6b. Leaves ovate, base rounded to subcordate, rarely broadly cuneate 7c. subsp. *imaicola*

7a. *Circaea alpina* subsp. *caulescens* (Komarov) Tatewaki, Veg. Shikotan Is. 44. 1940.

深山露珠草 shen shan lu zhu cao

Circaea alpina var. *caulescens* Komarov, Fl. Manshur. 3: 99. 1905; *C. alpina* var. *pilosula* (H. Hara) H. Hara; *C. caucasica* A. K. Skvortsov; *C. caulescens* (Komarov) Nakai ex H. Hara; *C. caulescens* var. *pilosula* H. Hara; *C. caulescens* var. *robusta* Nakai ex H. Hara; *C. ×dubia* H. Hara var. *makinoi* H. Hara.

Plants 5–35 cm tall. Stem pubescent. Leaves opaque, ovate to broadly ovate to nearly deltoid, 1.2–4.5 × 0.6–3.5 cm, base rounded to truncate or cordate, margin shallowly to prominently dentate, apex acute to shortly acuminate. Inflorescence glabrous or rarely with sparse glandular hairs; pedicels ascending or diverging perpendicular to axis of raceme at anthesis, glabrous, with a minute bracteole at base or more commonly bracteole

absent and represented by a short glandular process; flowers opening during or after elongation of raceme and ± widely spaced. Buds glabrous; ovary with uncinete hairs at anthesis; floral tube 0.2–0.4 mm. Sepals narrowly to broadly ovate or oblong-ovate, apex rounded to obtuse or rarely minutely mammiform. Petals white or pink, obovate to depressed-obovate or obdeltoid, apical notch 1/3–1/2 length of petal; petal lobes rounded. Uncinate hairs of fruit unpigmented. Fl. Jun–Sep, fr. Jul–Sep. 2n = 22.

Moist places, on moss-covered rocks and logs and in drier soils in cool-temperate deciduous and mixed forests and lower part of boreal forests; near sea level to 1500 m. Anhui, Hebei, Heilongjiang, Jilin, Liaoning, Shandong, Shanxi [Japan, Korea, Mongolia, Russia (Far East, also disjunct on S shore of Lake Baikal and in Altai mountains); SW Asia (Caucasus)].

7b. *Circaea alpina* subsp. *angustifolia* (Handel-Mazzetti) Boufford, Ann. Missouri Bot. Gard. 69: 910. 1983 [“1982”].

狭叶露珠草 xia ye lu zhu cao

Circaea imaicola (Ascherson & Magnus) Handel-Mazzetti var. *angustifolia* Handel-Mazzetti, Symb. Sin. 7: 603. 1933; *C. imaicola* var. *mairei* (H. Léveillé) Handel-Mazzetti; *C. lutetiana* Linnaeus var. *mairei* H. Léveillé; *C. pricei* Hayata var. *mairei* (H. Léveillé) Handel-Mazzetti.

Plants 7–35 cm tall. Stem pubescent. Leaves opaque, elliptic, trullate, broadly trullate, or ovate, rarely broadly ovate, 1.4–4.5 × 0.6–3 cm, base narrowly to broadly cuneate, margin shallowly denticulate, apex acute. Inflorescence simple or with lateral racemes at base, glabrous or pubescent, with short glandular hairs; pedicels ascending or diverging perpendicular to axis of raceme at anthesis, glabrous or, rarely, sparsely pubescent with short glandular hairs; flowers opening during or after elongation of raceme and ± widely spaced, with a setaceous bracteole at base. Buds glabrous; ovary with uncinete hairs at anthesis; floral tube 0.2–0.3 mm. Sepals broadly to broadly ovate or oblong-ovate, apex rounded to obtuse. Petals white or pink, narrowly to broadly obovate, apical notch 1/5–1/3 length of petal; petal lobes rounded, truncate, or minutely crenulate. Uncinate hairs of fruit containing purple pigment. Fl. Jul–Sep(–Oct), fr. Aug–Nov. 2n = 22*.

• Moist open areas, thickets and forests in mountains; 2000–3600 m. Sichuan, Xizang, Yunnan.

7c. *Circaea alpina* subsp. *imaicola* (Ascherson & Magnus) Kitamura, Fl. Afghanistan 279. 1960.

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Circaea alpina var. *imaicola* Ascherson & Magnus, Bot. Zeitung (Berlin) 28: 749. 1870; *C. hohuanensis* S. S. Ying; *C. imaicola* (Ascherson & Magnus) Handel-Mazzetti; *C. minutula* Ohwi; *C. pricei* Hayata; *C. taiwaniana* S. S. Ying.

Plants 3.5–45 cm tall. Stem densely to sparsely pubescent. Leaves ovate to broadly ovate, less commonly orbicular-ovate, 2–7 × 1.4–4.5 cm, base truncate or rounded, less often broadly cuneate to subcordate, margin subentire to occasionally prominently dentate, apex acute to shortly acuminate. Inflorescence simple or branched, pubescent with short glandular hairs, less

commonly glabrous; flowering pedicel erect or ascending, glabrous; flowers clustered at apex of raceme and opening before elongation of raceme axis, with a minute setaceous bracteole at base. Buds glabrous, rarely glabrescent; ovary with uncinata hairs at anthesis; floral tube nearly absent to 0.3 mm. Sepals oblong to ovate, apex rounded to obtuse. Petals white or pink, narrowly to broadly obovate in outline, apical notch 1/4–1/2 length of petal; petal lobes rounded. Uncinate hairs of fruit unpigmented. Fl. Jul–Sep(–Oct), fr. Aug–Nov. $2n = 22^*$.

Cool moist places along streams, thickets, deciduous and coniferous forests in mountains; (1500–)2000–4000 m. Anhui, Gansu, Guizhou, Henan, Hubei, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [NE Afghanistan, Bhutan, India, N Myanmar, Nepal, Thailand, NW Vietnam].

7d. *Circaea alpina* subsp. *alpina*

露珠草(原亚种) lu zhu cao (yuan ya zhong)

Circaea caulescens (Komarov) Nakai ex H. Hara var. *glabra* H. Hara; *C. caulescens* f. *ramosissima* H. Hara; *C. caulescens* var. *rosulata* H. Hara; *C. lutetiana* race *alpina* (Linnaeus) H. Léveillé; *C. lutetiana* subsp. *alpina* (Linnaeus) H. Léveillé.

Plants 3–30 cm tall. Stem glabrous, sometimes with glan-

dular hairs in inflorescence. Leaves translucent, ovate to broadly so, rarely nearly circular in outline, base cordate to subcordate, less commonly truncate or rounded, margin conspicuously dentate, apex shortly acuminate to acute. Inflorescence simple or with lateral racemes from base, glabrous to densely pubescent with short glandular hairs; flowering pedicel ascending or erect, glabrous, with a setaceous bracteole at base; flowers opening before elongation of raceme and clustered at its apex. Buds glabrous; floral tube nearly absent to 0.5 mm. Sepals oblong to ovate, sometimes broadly so, apex rounded to obtuse or minutely mammiform. Petals white, obtriangular to obovate, apical notch, 1/4–1/2 length of petal; petal lobes rounded. Uncinate hairs of fruit unpigmented. Fl. Jun–Aug(–Sep), fr. Jul–Sep. $2n = 22$.

Moist to wet places, on moss-covered rocks and logs; near sea level to 2500 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shanxi [Japan, Kazakhstan, Korea, Mongolia, Russia; circumboreal in forests between 30°–65° N, but restricted to high elevations at lower latitudes].

7e. *Circaea alpina* subsp. *micrantha* (A. K. Skvortsov) Boufford, Ann. Missouri Bot. Gard. 69: 959. 1983 [“1982”].

高寒露珠草 gao han lu zhu cao

Circaea micrantha A. K. Skvortsov, Byull. Glavn. Bot. Sada (Moscow) 103: 36. 1977.

Plants 4–25 cm tall. Stem glabrous or minutely pubescent, rarely densely pubescent. Leaves translucent, narrowly ovate to broadly triangular, (1–)2–6.5 × 0.8–4 cm, base cordate, less often truncate, margin sharply dentate to serrate, apex acute or shortly acuminate. Inflorescence a simple raceme or with 1 or 2, rarely more, lateral racemes arising from base, densely to sparsely pubescent with glandular hairs; flowering pedicel ascending or erect, glabrous or glandular pubescent, basally with a setaceous bracteole; flowers opening before elongation of raceme and clustered at its tip. Buds glabrous; ovary glabrous or rarely with minute uncinata hairs at anthesis; floral tube nearly absent to 0.4 mm. Sepals ovate to broadly ovate to oblong ovate, apex rounded or minutely mammiform. Petals white or pink, obtriangular to obovate, apical notch absent or to 1/5 length of petal; petal lobes, when present, truncate to rounded. Uncinate hairs of fruit unpigmented or occasionally with purple pigment. Fl. Jun–Sep(–Oct), fr. Jul–Nov. Chromosome number unknown.

Moist thickets and coniferous forests, grassy alpine areas; 3100–5000 m. Gansu, Sichuan, Xizang, Yunnan [Bhutan, N India, N Myanmar, Nepal].

Hybrids

Hybrids in *Circaea* are common and abundant in Europe, North America, and Japan, but remarkably uncommon on the Asian mainland, even though the greatest number of taxa in the genus occurs in China, and many of them have sympatric ranges. The hybrids are usually intermediate between their parents. They occur most frequently in naturally disturbed places, such as the floodplains of rivers and streams. The ease with which they form colonies from rhizomes no doubt explains their abundance outside of China, despite their almost total sexual sterility. Hybrids that do occur in China are the following.

Circaea × *dubia* H. Hara, Bot. Mag. (Tokyo) 50: 306. 1936.

可疑露珠草 ke yi lu zhu cao

This is the hybrid *Circaea cordata* × *C. erubescens* and is

intermediate between the parents. The flowers have the exerted nectary of *C. erubescens* and usually at least a few of the long, spreading hairs of *C. cordata*. They also resemble *C. cordata* in being more robust, in leaf shape and in having more closely

spaced flowers at anthesis. Although the petals are more like those of *C. cordata* in shape, they are often pink as in *C. erubescens*.

Disturbed areas, commonly along streams, in broad-leaved deciduous forests. Near sea level to 1500 m. NE China (“Manchuria, 1941” without further data) [Japan].

Circaea* × *skvortsovii Boufford, Ann. Missouri Bot. Gard. 69: 965. 1983 [“1982”].

北方露珠草 bei fang lu zhu cao

This is the hybrid *Circaea canadensis* subsp. *quadrisulcata* × *C. cordata* and is most obviously intermediate between the parents in degree and the nature of pubescence and in the morphology of the flower parts. It is similar to *C. cordata* in having sporadic, long, sharply pointed, straight or slightly curved spreading hairs on various parts of the plant and in having a pubescent stem. It is similar to *C. canadensis* subsp. *quadrisulcata* in the color of the buds, sepals, and petals and in the presence of a low, exerted nectary projecting beyond the opening of the floral tube. It also has the densely glandular inflorescence of *C. canadensis* subsp. *quadrisulcata*, but the closely spaced flowers and petal shape of *C. cordata*.

Disturbed habitats; near sea level (upper elevation unknown). Hebei, also “Manchuria, Korii-mon” [Japan].

Circaea* × *ovata (Honda) Boufford, Ann. Missouri Bot. Gard. 69: 968. 1983 [“1982”].

卵叶露珠草 luan ye lu zhu cao

Circaea quadrisulcata (Maximowicz) Franchet & Savatier var. *ovata* Honda, Bot. Mag. (Tokyo) 46: 3. 1932.

This is the hybrid *Circaea cordata* × *C. mollis* and is morphologically intermediate between the parents. It resembles *C.*

cordata in the long, recurved and straight, sharply pointed hairs on some parts of the plant, but is similar to *C. mollis* in having an exerted, ringlike nectary and darkened stem nodes.

Disturbed areas in broad-leaved deciduous forests; below 100–1500 m. Sichuan, Yunnan [Japan, S Korea].

Circaea* × *taronensis H. Li, Fl. Yunnan. 4: 157. 1986.

贡山露珠草 gong shan lu zhu cao

Known only from the type, this is the hybrid *Circaea alpina* subsp. *imaicola* × *C. cordata* and is intermediate between the two parents in overall appearance. Some leaves with the base rounded to cordate are like those in *C. alpina* subsp. *imaicola*, but some leaves on the upper portion of the stem have the base cordate as in *C. cordata*. The pubescence is more dense than in *C. alpina* subsp. *imaicola* but with fewer of the long, straight trichomes of *C. cordata*.

- Moist forests; ca. 1800 m. NW Yunnan (Gongshan).

Circaea alpina Linnaeus subsp. ***imaicola*** (Ascherson & Magnus) Kitamura × ***C. repens*** Wallich ex Ascherson & Magnus

西南露珠草 xi nan lu zhu cao

Plants that appear to be hybrids between *Circaea alpina* subsp. *imaicola* and *C. repens* are like *C. repens* in stature. The flowers are smaller and more closely spaced than in *C. repens* and are borne on ascending, minutely glandular pubescent pedicels. In *C. repens*, the petioles are glandular pubescent and most commonly spread at right angles to the raceme axis at anthesis. The hybrids have deeply notched petals, as in *C. repens*, but which are often broader, as in some plants of *C. alpina* subsp. *imaicola*.

- Habitat unknown, but presumably in disturbed shaded places; 1800–3200 m. Sichuan, Yunnan.

