Fl. China 23: 39–43. 2010.

20. PINELLIA Tenore, Atti Reale Accad. Sci. Sez. Soc. Reale Borbon. 4: 69. 1839, nom. cons.

半夏属 ban xia shu

Li Heng (李恒 Li Hen); Josef Bogner

Atherurus Blume; *Hemicarpurus* Nees.

Herbs, perennial, seasonally dormant; tuber cormlike, subglobose, or rhizome cylindric; tubercles usually formed around main tuber, on tuber around base area of petioles, or at rhizome ends; bulbils usually at proximal, middle, or distal part of petioles, sometimes on both petiole and base of leaf blade. Leaves 1–5; petiole green, usually unspotted, sometimes spotted; sheath fairly long, very short, or nearly absent; bulbils present or absent; leaf blade simply cordate, ovate, oblong, deeply trifid, or trisect, or pedatisect; leaflets oblong-elliptic to ovate-oblong; primary lateral veins of leaf blade or of each leaflet pinnate, forming a submarginal collective vein, with 1 or 2 distinct marginal veins also present, higher order venation reticulate. Inflorescence solitary, appearing with leaves; peduncle green, shorter or slightly longer than petioles. Spathe persistent, slightly to strongly constricted between tube and blade (except in *Pinellia pedatisecta*); tube convolute, narrowly ellipsoid to ovate, almost closed within by a transverse septum (except in *P. pedatisecta*), gaping at base; limb arching, gaping, green to purple, oblong-elliptic, boat-shaped, ca. 2 × or more as long as tube. Spadix much longer than spathe; female zone adnate to spathe, separated from male zone by spathe septum (except in *P. pedatisecta*) and by short, free, naked part of spadix axis; male zone free, cylindric, short; terminal sterile appendix long exserted from spathe, often sigmoid, narrowly subulate. Flowers unisexual, perigone absent. Male flowers 1- or 2–4-androus; stamens sometimes united congenitally in pairs or groups of 4, short, laterally compressed; anthers sessile, connective slender, thecae ellipsoid, 2-celled, dehiscing by apical slit, rarely each pollen sac opening by a pore. Pollen extruded in amorphous mass, inaperturate, spherical or subspheroidal, small to medium sized, exine spinulose. Female flower (gynoecium, pistil) with ovary ovoid to ovoid-oblong, 1-loculed; ovule 1, orthotropous, funicle very short; placentation basal; stylar region attenuate; stigma small, hemispheric to disciform. Berries green, yellowish green, or whitish, oblong-ovoid. Seeds obnapiform to ellipsoid; testa irregularly verrucose-rugulose or smooth; embryo axile, elongate, or very small and subglobose; endosperm copious. $2n = 26, 28, 52, 54, 72, 78, 104, 115, 116, 128$.

Nine species: E Asia (China, Japan, Korea), with the center of diversity in E China (Anhui, Fujian, Zhejiang); two species regionally naturalized in Australia, Europe, and North America; nine species (seven endemic) in China.

See the recent synopsis of *Pinellia* by G. Zhu, H. Li and R. Li (Willdenowia 37: 503–522. 2007).

1a. Leaf blade compound, 3-foliolate or pedate.
- 2a. Leaf blade always pedate, leaflets 6–11; bulbils absent ..... 9. *P. pedatisecta*
- 2b. Leaf blade 3-foliolate or pedate with 5 leaflets.
  - 3a. Leaf blade only deeply 3-partite, anterior lobe broadly ovate or ovate-oblong, sessile; bulbils absent ..... 6. *P. tripartita*
  - 3b. Leaf blade trisect, sometimes pedate with only 5 leaflets, leaflets oblong or lanceolate.
    - 4a. Petiole lacking bulbils, bulbils emerging only from tuber; lateral leaflets usually bifid ..... 7. *P. yaoluopingensis*
    - 4b. Bulbils present at petiole below middle, or both at proximal part of petiole and at base of leaf blade ..... 8. *P. ternata*

1b. Leaf blade entire.
- 5a. Leaf blade peltate, ovate or oblong ..... 4. *P. peltata*
- 5b. Leaf blade not peltate.
  - 6a. Petiole lacking bulbils.
    - 7a. Leaf blade deltoid-ovate or broadly ovate, base deeply cordate, 6–33 × 4–22 cm ..... 1. *P. polyphylla*
    - 7b. Leaf blade ovate or oblong, base obtuse or shallowly cordate, 5–19 × 1.5–6 cm ..... 2. *P. integrifolia*
  - 6b. Petiole or base of leaf blade bearing bulbils.
    - 8a. Tuber globose; leaf blade sagittate-oblong, cordate-ovate, base deeply cordate; bulbils present at base of petiole and at base of leaf blade ..... 3. *P. cordata*
    - 8b. Rhizome cylindric; leaf blade broadly sagittate; bulbils at base of petiole ..... 5. *P. fujianensis*

1. Pinellia polyphylla S. L. Hu, Acta Pharmacol. Sin. 19: 713. 1984.

大半夏 da ban xia

Tuber depressed globose, irregularly depressed, to 6 cm in diam., with 1–4 stolons 4–7 cm; stolons often bearing globose tubercles 5–10 mm in diam. at end. Leaves 1–4; petiole greenish or flesh-red, 10–60(–70) cm; leaf blade deltoid-ovate to broadly ovate, 6–33 × 4–22 cm, papery, base deeply cordate, apex acuminate; primary lateral veins 5–15 per side. Inflorescence with peduncle shorter than petioles. Spathe erect, greenish or yellowish green, constricted, 5–8 cm; tube funnelform, 1–2.5 × ca. 0.5 cm; limb broadly lanceolate, 3.5–5 × 0.8–1.2 cm. Spadix longer than spathe; female zone 1.5–2 cm, adnate to spathe; female flowers densely arranged; pistil ca. 2.4 mm; ovary ovoid, ca. 2 × 1.3 mm; style very short; stigma sub-

sessile, small, ca. 0.4 mm in diam.; sterile zone between female and male flowers 1–1.5 cm; male zone 1–1.5 cm; thecae ellipsoid, opening by a slit; appendix greenish to yellowish, tortuous, 6–11.5 cm. Berries green to whitish, ovoid. Seed 1, globose, ca. 1.5 mm in diam. Fl. May–Jun, fr. Jul–Sep.

● Secondary forests, rock slopes, fields; below 800 m. Sichuan.

Pinellia polyphylla differs from *P. cordata* in having a larger tuber to 6 cm in diam., with 1–4 stolons, and petioles without bulbils.

2. Pinellia integrifolia N. E. Brown, Hooker's Icon. Pl. 19: t. 1875. 1889.

石蜘蛛 shi zhi zhu

Tuber depressed globose, 1–1.3 cm in diam. Leaves 1–3; petiole 5–15 cm, slender, base sheathing; leaf blade entire, ovate, oblong, or oblong-lanceolate, 5–19 × 1.5–6 cm, base obtuse, rarely shallowly cordate, apex shortly acuminate to acute; primary lateral veins 6 or 7 per side. Inflorescence including peduncle shorter than petioles; peduncle 6–10 cm. Spathe constricted, (6–)7–9 cm; tube 0.8–1.2 cm; limb curved, lanceolate, 7–8 cm, apex long acuminate. Spadix 8–12 cm; female zone 5–10 mm, adnate to spathe; female flowers densely arranged; pistil 0.8–0.9 mm; ovary ovoid, ca. 0.6 × 0.4 mm; style distinct, ca. 0.3 mm; stigma subhemispheric, ca. 0.18 mm in diam., broader than style; sterile zone between female and male flowers 5–10 mm; male zone 5–10 mm; thecae elongate, ca. 0.7 mm, opening by a long slit; appendix pendulous, incurved, filiform, 4–9 cm. Berries pale green to whitish, ovoid. Fl. Sep.

● Slopes, moist areas by streams; below 1000 m. Chongqing, Hubei (Yichang), SE Sichuan (Xuyong).

Pinellia integrifolia is characterized by its ovate or oblong leaf blades, obtuse or shallowly cordate leaf bases, and petioles lacking bulbils.

The poisonous tubers are used for treating traumatic injuries and gonorrhea.

3. Pinellia cordata N. E. Brown, J. Linn. Soc., Bot. 36: 173. 1903.

滴水珠 di shui zhu

Pinellia browniana Dunn.

Tuber depressed globose, 1–1.5 cm in diam. Leaves 1–3; petiole green or purple, 12–25 cm; leaf blade greenish or purple abaxially, green adaxially, cordate-oblong, cordate-ovate, or cordate to sagittate, 4–25 × 2–7.5 cm, base deeply cordate, apex long acuminate; primary lateral veins 9 or 10 per side; bulbils present at basal part of petiole and at base of leaf blade (apex of petiole), ovoid. Inflorescence including peduncle shorter than petioles, 3.7–18 cm. Spathe green, purplish yellow, or violet, constricted, 4–7 cm; tube 1–1.3 × 1–1.3 cm; limb erect or slightly incurved, elliptic, 3–4.5 × 1.2–3 cm, apex obtuse or acute. Spadix 9–23 cm; female zone (0.8–)1–1.2 cm, adnate to spathe; female flowers densely arranged; pistil ca. 2.5 mm; ovary ellipsoid-oblong, ca. 2 × 1 mm; style short, ca. 0.3 × 0.5 mm; stigma disciform, 0.6–0.7 mm in diam.; sterile zone between female and male flowers 7–8 mm; male zone 5–7 mm; thecae elongate, ca. 1.8 mm, opening by a slit; appendix violet-green, tortuous, 6.5–20 cm. Berries ovoid. Fl. Mar–Jun, fr. May–Sep. 2*n* = 26*, 72*.

● Forests, along streams, moist meadows, cliffs, rock debris; below 800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Zhejiang.

Pinellia cordata is characterized by its small size and by having bulbils at both the petiole and leaf blade bases.

The poisonous tubers are used for detoxifying viper bites, for treating lumbago and allergic reactions, and externally for treating traumatic injuries, abscesses, neck lymphosarcoma, mastitis, and also for draining pus.

4. Pinellia peltata C. Pei, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. 10: 1. 1935.

盾叶半夏 dun ye ban xia

Tuber subglobose, 1–2.5 cm in diam. Leaves 2 or 3; petiole 27–33 cm; leaf blade deep green, peltate, ovate or oblong, 10–17 × 5.5–12 cm, base deeply cordate, apex shortly acuminate; primary lateral veins (5 or)6–8 per side. Inflorescence including peduncle 7–15 cm, shorter than petioles; peduncle 5–8 cm. Spathe yellowish green, constricted, 4–5 cm; tube obovoid, ca. 8 mm; limb opening, 3–4 × 0.5–0.8 cm, apex obtuse to acute. Spadix 11–13 cm; female zone ca. 0.8 cm, adnate to spathe; female flowers densely arranged; pistil obovoid, 2.5–3 × 1.2–1.5 mm; stigma sessile, very small; sterile zone between female and male zones ca. 3.5 mm; male zone ca. 6 mm; thecae elongate; appendix ca. 10 cm. Berries pale green to whitish, ovoid, acute at apex. Seeds globose. Fl. May–Jun, fr. Aug–Sep. 2*n* = 78*.

● Forests, grassy slopes, on rocks or between rocks. Fujian, Zhejiang.

Pinellia peltata differs from all of the other species of the genus by its subglobose tuber and its peltate leaves, which are ovate to oblong-ovate and shortly acuminate at apex.

5. Pinellia fujianensis H. Li & G. H. Zhu, Willdenowia 37: 512. 2007.

闽半夏 min ban xia

Stem an obovoid rhizome, to 3.5 × 1.4 cm; nodes more than 5, swollen; internodes very short, 2–3 mm; annual part rooting; cataphylls 2 or 3, ca. 1.5 cm, long acuminate. Leaves 2 or 3; petiole 10–45 cm, bearing bulbils at base; leaf blade broadly sagittate; anterior lobe deltoid-ovate, 7–13.5 × 4.5–10 cm, apex long acuminate; basal lobes divaricate, subtriangular, 4–7 × 2.5–3.5 cm; primary lateral veins 6 or 7(or 8) per side. Inflorescence including peduncle 8–20(–25) cm; peduncle shorter than petioles, to 14(–15) cm. Spathe reddish to yellowish violet, constricted, ca. 5.5 cm; tube ca. 1.5 × 0.1 cm; limb erect, navicular, lanceolate, 3.5–4 × ca. 1.4 cm. Spadix ca. 11 cm; female zone ca. 1.3 cm with 9 or 10 pistils, adnate to spathe; female flowers densely arranged; pistil ca. 1.2 mm; ovary ellipsoid, 0.7–0.8 mm in diam.; style slender, ca. 0.25 × 0.15 mm; stigma disciform, ca. 0.3 mm in diam.; sterile zone between female and male flowers 5–7 mm; male zone ca. 7 × 3 mm; appendix outcurved, ca. 8 cm, slender. Berries ovoid. Seed 1, ovoid, ca. 0.4 mm in diam. Fl. Apr, fr. Sep.

● Forest margins, on rocks or between rocks, moist places. Fujian.

Pinellia fujianensis is similar to *P. cordata* but differs in having an acute rhizome to 3.5 cm and leaf blade broadly sagittate.

6. Pinellia tripartita (Blume) Schott, Syn. Aroid. 5. 1856.

三裂叶半夏 san lie ye ban xia

Atherurus tripartitus Blume, Rumphia 1: 137. 1835; *Arisaema tripartitum* (Blume) Engler; *Pinellia tripartita* var. *atropurpurea* Makino.

Tuber subglobose, ca. 2.5 cm in diam.; cataphylls lanceolate, to 10 cm. Leaves 2–5; petiole green, 30–35 cm; leaf blade green, 3-partite; leaflets broadly ovate to ovate-oblong; anterior leaflet ca. 15 × 4–7 cm, apex ca. 1.5 cm; lateral leaflets smaller; primary lateral veins 8–12 per side on each leaflet, forming a distinct marginal collective vein, also with 2 thinner collective veins along margin. Inflorescence solitary; peduncle to 25 cm, shorter than petioles, slender. Spathe whitish to light green, slightly constricted, 7–9(–10) cm; tube almost closed within by a transverse septum, gaping at base, oblong to subcylindric, ca. 3.5 × 1–1.25 cm; limb gaping, boat-shaped, oblong, ca. 4 × 2.5 cm. Spadix 20–25 cm; female zone ca. 3 cm, adnate to spathe; female flowers densely arranged; pistil 1–1.2 mm; ovary ovoid, 0.9–1 mm; style distinct, 0.2–0.3 mm, attenuate; stigma subhemispheric; sterile zone between female and male zone 0.6–0.7 cm; male zone 1.8–2 cm; thecae elongate, opening by a slit; appendix long exserted from spathe, sigmoid, 15–20 cm, base ca. 3 mm in diam., smooth. Berries pale green to whitish, ovoid, 1-seeded. Fl. May–Jul, fr. Jun–Sep. 2*n* = 26, 52.

Dense broad-leaved forests, forest margins, roadsides. Hong Kong [Japan].

Pinellia tripartita was considered endemic to Japan for a long time; it is first reported here from Hong Kong (*C. Wright 508*, P).

This species differs from *Pinellia yaoluopingensis* in having broadly ovate or ovate-oblong, sessile leaflets and a tuber lacking tubercles. It is also easily distinguishable from *P. ternata* by its petioles lacking bulbils.

This species is used ornamentally.

7. Pinellia yaoluopingensis X. H. Guo & X. L. Liu, Acta Bot. Yunnan. 8: 223. 1986.

鹞落坪半夏 yao luo ping ban xia

Tuber subglobose, 1.3–3 cm in diam., bearing bulbils at apex. Leaves 1–4; petiole deep green, with purple spots, 12–25 cm; leaf blade 3-foliolate, sometimes also pedate; leaflets 3–5; central leaflet oblong-elliptic or obovate-elliptic, 5–10 × 3–4.5 cm, base cuneate, apex acuminate or acute; lateral leaflets sessile, smaller, 5.5–7.3 × ca. 4 cm, with 4 or 5 primary lateral veins per side, forming a collective vein along margin. Inflorescences 1 or 2; peduncle usually longer than petioles, 22–36 cm. Spathe green, constricted, 7–8 cm; tube 2–3.5 cm × 6–8 mm; limb oblong, 3–4 × 2–3 cm, apex obtuse. Spadix 16–20 cm; female zone 2–2.5 cm × 3–5 mm, adnate to spathe; female flowers densely arranged; pistil 1–1.1 mm; ovary broadly ovoid, ca. 0.9 mm; style distinct; stigma disciform, ca. 0.25 mm in diam.; sterile zone between female and male flowers 5–6 mm; male zone 5–7 × 3–4 mm; thecae elongate, ca. 1.4 mm, each pollen sac opening by a pore; appendix recurved, sigmoid, green, 13–18 cm. Berries conic, obtuse, 1-seeded. Fl. May, fr. Jul–Sep. 2*n* = 26*.

● Broad-leaved forests; ca. 1000 m. Anhui (Jingde, Yuxi), Jiangsu (Nanjing).

This species differs from *Pinellia ternata* in having a tuber with tubercles around the petiole bases and by lacking bulbils elsewhere.

8. Pinellia ternata (Thunberg) Tenore ex Breitenbach, Bot. Zeitung. 37: 687. 1879.

半夏 ban xia

Arum ternatum Thunberg in Murray, Syst. Veg., ed. 14, 827. 1784; *Arisaema loureiroi* Blume; *A. macrourum* (Bunge) Kunth; *A. ternatum* (Thunberg) Schott; *Arum atrorubens* Sprengel (1826), not Linnaeus (1753); *A. bulbiferum* Salisbury; *A. bulbosum* Persoon ex Kunth; *A. fornicatum* Roth; *A. macrourum* Bunge; *A. subulatum* Desfontaines; *A. triphyllum* Houttuyn (1774), not Linnaeus (1753); *Hemicarpurus fornicatus* (Roth) Nees; *Pinellia angustata* Schott; *P. koreana* K. H. Tae & J. H. Kim; *P. ternata* var. *angustata* (Schott) Engler; *P. ternata* var. *giraldiana* Engler; *P. ternata* var. *subpandurata* Engler; *P. ternata* var. *vulgaris* Engler; *P. tuberifera* Tenore, nom. illeg. superfl.; *Typhonium tuberculigerum* Schott.

Tuber globose, 1–2 cm in diam. Leaves 2–5; petiole 15–20 cm, base sheathing; bulbils present in sheath, at proximal or middle part of petiole, and at base of leaf blade; leaf blade 3-foliolate, sometimes pedate with 5 leaflets; leaflets greenish abaxially, green adaxially, oblong-elliptic or lanceolate, base cuneate, apex acuminate; anterior leaflet 3–10 × 1–3 cm; lateral leaflets (3–)4–7.5 × 1.8–2.3 cm, with 7–9(or 10) primary lateral veins per side, forming a collective vein along margin. Inflorescence including peduncle longer than petioles, 25–35 cm; peduncle 15–25 cm. Spathe greenish or whitish green, rarely purplish, slightly constricted, 6–7 cm; tube narrowly cylindric, 1.5–2 cm; limb green and usually violet at margin, oblong, 4–5 × ca. 1.5 cm, apex obtuse or acute. Spadix 9–10 cm; female zone ca. 2 cm, adnate to spathe; female flowers densely arranged; pistil 2.1–2.2 mm; ovary ovoid, ca. 1.8 × 1–1.1 mm; style distinct, attenuate; stigma very small, ca. 0.2 mm in diam., not broader than style; sterile zone between female and male flowers ca. 3 mm; male zone 5–7 mm; thecae elongate, ca. 1.2 mm, opening by a slit; appendix erect or sigmoid, green to violet, 6–7(–8) cm. Berries yellowish green to whitish, ovoid, with persistent stigma and style, 1-seeded. Fl. May–Jul, fr. Jul–Sep. 2*n* = 28, 54, 72, 104, 115, 116, 128.

Grasslands, secondary forests, wastelands, cultivated lands; below 2500 m. Widely distributed in China, excluding Nei Mongol, Qinghai,

Xinjiang, and Xizang [Japan (including Ryukyu Islands), Korea; naturalized in Europe and North America].

Pinellia ternata is a highly variable species in morphology and cytology. It differs from other *Pinellia* species by having bulbils at different parts of the petiole; bulbils on each petiole may be 1, 2, or 3. Fourteen sheets of specimens in the Herbarium of the Royal Botanic Garden Edinburgh (E), have been studied and counted: six specimens have bulbils at the proximal part of the petiole; five specimens show bulbils at the median part; one specimen has three bulbils located at the proximal and median parts and at the distal part; another specimen has two bulbils at the distal and proximal parts (6 May 1975, *N. Togash s.n.* from Tokyo); and one has two bulbils found at the distal and the median parts. After examining the variability in position and number of bulbils, we suggest that *"Pinellia zinguiensis"* H. Li (nom. nud.), with bulbils at both the distal and proximal parts of the petiole, must be a synonym of *P. ternata*. For the same reason, Engler's four variants (*P. ternata* var. *angustata*, *P. ternata* var. *giraldiana*, *P. ternata* var. *subpandurata*, and *P. ternata* var. *vulgaris*) may not represent any independent systematic taxa. *Pinellia koreana* was described from Korea as differing by its pedate leaf blades with five leaflets; but strong growing plants sometimes produce pedate leaf blades, and, therefore, this is only a further synonym of *P. ternata*. It was collected from Korea, Mt. Chiri, 480 m, 10 Jun 1999 (fl.), *K.-H. Tae 99-001* (holotype, TUT).

The poisonous tubers are used in traditional Chinese medicine for treating coughs, reducing phlegm, stopping vomiting, and externally for treating mastitis and otitis media. The plant is also used ornamentally.

9. Pinellia pedatisecta Schott, Oesterr. Bot. Wochenbl. 7: 341. 1857.

虎掌 hu zhang

Arisaema cochinchinense Blume; *Pinellia cochinchinensis* (Blume) W. Wight; *P. tuberifera* Tenore var. *pedatisecta* (Schott) Engler; *P. wawrae* Engler.

Tuber subglobose, to 4 cm in diam., with some surrounding tubercles. Leaves 1–3 or more; petiole greenish, 20–70 cm, proximally sheathing; leaf blade pedate; leaflets 6–11, sessile, lanceolate, base cuneate, apex acuminate; central leaflet 15–18.3 cm, following ones smaller; outermost ones 4–5 cm; primary lateral veins 7–12 per side, forming an inner collective vein and an outer second collective vein near margin. Inflorescence including peduncle 20–50 cm, green; peduncle to 35 cm. Spathe slightly convolute at base, green outside, greenish to whitish inside, lanceolate in total, not constricted between tube and limb, inside transverse septum absent, 10–19 × 1.5–2 cm, apex long acuminate. Spadix 14–20 cm; female zone 1.5–3 cm, adnate to spathe; female flowers very densely arranged; pistil 2.1–2.2 mm; ovary green, obovoid, ca. 1.9 × 1.2–1.3 mm; stigma subsessile, white, spherical, papillose; sterile zone between female and male flowers short, 4–5 mm; male zone cylindric, 5–8 mm; thecae yellow, elongate, ca. 1.3 mm, opening by a slit; appendix suberect, greenish to whitish, ± cylindric, 10–15 cm, 2–3 mm in diam. at base, distally becoming filiform. Berries pale to whitish green, ovoid, 4–5 × 3–5 mm, 1-seeded. Seed brown, obovoid, ca. 3.5 × 2.5 mm; funicle robust. Fl. May–Jun, fr. Jul–Sep. 2*n* = 26*.

● Forests, valleys, shaded areas; below 1000 m. Anhui, Fujian, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Shandong, Shanxi, Sichuan, NE Yunnan, Zhejiang.

Pinellia pedatisecta is the only species of *Pinellia* with always pedate leaf blades and lacking the transverse septum inside its spathe. It is easily distinguished from other species by having a spathe lacking a constriction between the tube and blade.

The poisonous tubers are used in medicine for treating enlarged lymph nodes and urinary tract infections.

Fl. China 23: 39–43. 2010.