

ARACEAE

天南星科 tian nan xing ke

Li Heng (李恒 Li Hen)¹, Zhu Guanghua (朱光华)²; Peter C. Boyce³, Jin Murata⁴, Wilbert L. A. Hetterscheid⁵, Josef Bogner⁶, Niels Jacobsen⁷

Herbs, perennial, of diverse habit including climbers, floating aquatics, helophytes, pachycaul shrubs, and geophytes. Under-ground stems absent, or present and then rhizomatous or tuberous; aerial stems variously produced or not, often evergreen; bulbils for vegetative reproduction sometimes produced, e.g., on leaf or on special shoots. Leaves alternate or apparently basal, usually petiolate with sheathing bases, often subtended by prophylls and/or cataphylls; leaf blade various, e.g., linear, simple (base often cordate to sagittate), sometimes peltate or variously compound (e.g., pinnate, radiate, pedate, or decomound), or still more complex and “dracontoid” (elaborate forms of sagittate, hastate, or trisect leaves in which anterior and posterior divisions are highly dissected and subdivided). Inflorescences (sometimes precocious) subtended by membranous prophylls and/or cataphylls, consisting of a spadix subtended by a spathe. Spathe commonly with tubelike base (margins fused or not) persistent or with deciduous blade. Spadix bearing bisexual or unisexual flowers, in latter case plants paradioecious or monoecious (spadix female proximally and male distally), very rarely with morphologically bisexual but functionally unisexual flowers. Bisexual flowers: tepals 0, 4, or 6; stamens 4–6(–22), filaments free, anthers with 2 thecae; ovary usually 3-loculed or more loculed or 1-loculed (pseudomonomerous). Unisexual flowers almost always naked [rare exceptions (only 3 genera, these all from Africa, including cultivated *Zamioculcas* with tepalate flowers): male represented by 1–6 (usually 2–4) free stamens or 2–12 (rarely up to 32) stamens connate into a synandrium over-topped by a common synconnective, anthers often subsessile, usually dehiscing apically by pores or slits (straight or horseshoe-shaped); female flowers consisting of a single ovary (sometimes associated with a sterile staminode), commonly 1-loculed (sometimes with 3 or 4 locules), ovules 1 to many per locule, placentation parietal, axile, basal, or apical. Pollen grains aperturate or inaperturate, exine of various ornamentation. Most genera (Aroideae s.l.) with inaperturate pollen grains without sporopollenin. Sterile (neuter) flowers derived from male or female flowers sometimes present at apex or base of female and/or male zones of spadix. Spadix sometimes with a sterile, terminal appendix. Fruit usually a head of 1- to several-seeded indehiscent separate berries, or dehiscent via shedding stylar plate (Monstereae excluding *Amydrium*) or syncarpous and apically dehiscent (*Cryptocoryne*) or syncarpous and indehiscent (*Syngonium*, cultivated), commonly red, green, white, or yellow, rarely blue.

About 110 genera and more than 3,500 species: all parts of the world except polar regions and the driest deserts, chiefly in tropical and subtropical regions; 26 genera and 181 species (72 endemic) in China.

There is an abundance of Araceae in the S and SW provinces of China. The NE and NW regions are poorer. About 50% of Araceae species in China are medicinal plants; for example, *Arisaema heterophyllum*, *Pinellia pedatisecta*, and *P. ternata* have been used since ancient times. Tubers of *Amorphophallus* and *Colocasia* are used for food or in industry for starch. *Pistia* is very valuable as feed for pigs and sometimes is cultivated as an ornamental plant in aquatic gardens.

The following genera are not native to China but are cultivated there: *Aglaonema* Schott, *Anthurium* Schott, *Caladium* Ventenat, *Dieffenbachia* Schott, *Monstera* Adanson, *Philodendron* Schott, *Spathiphyllum* Schott, *Syngonium* Schott, *Zamioculcas* Schott, and *Zantedeschia* Sprengel.

Li Hen. 1979. Araceae (excluding *Acorus*). In: Wu Cheng yih & Li Hen, eds., Fl. Reipubl. Popularis Sin. 13(2): 1–242.

- 1a. Flowers bisexual.
- 2a. Flowers with perianth (“perigone”).
 - 3a. Plants climbing.
 - 4a. Ovary 3-loculed (but fruit monomerous); flowers functionally bisexual 2. *Pothos*
 - 4b. Ovary 1-loculed; flowers functionally unisexual (plants dioecious) 3. *Pothoidium*
 - 3b. Plants herbaceous, not climbing.
 - 5a. Plants without prickles (unarmored); leaves deciduous, oblong-cordate; inflorescences carried at ground level with most of peduncle hypogean; plants of boreal habitats 1. *Symplocarpus*
 - 5b. Plants armored with prickles; leaves evergreen, sagittate or hastate to pinnatifid or pinnatipartite; inflorescence carried on an erect, aerial peduncle; plants of tropical habitats 9. *Lasia*
 - 2b. Flowers without perianth (“perigone”) or reduced and not visible from above.

¹ Kunming Institute of Botany, Chinese Academy of Sciences, 132 Lanhei Road, Heilongtan, Kunming, Yunnan 650204, People’s Republic of China.

² Missouri Botanical Garden, P.O. Box 299, Saint Louis, Missouri 63166-0299, U.S.A. (Zhu Guanghua died on 2 November 2005.)

³ Visiting Scientist, Pusat Pengajian Sains Kajihayat, [School of Biological Sciences], Universiti Sains Malaysia, 11800 USM, Pulau Pinang, Malaysia.

⁴ Botanical Gardens, Graduate School of Science, The University of Tokyo, 3-7-1 Hakusan, Bunkyo-ku, Tokyo 112-0001, Japan.

⁵ Von Gimborn Arboretum, Velperengh 13, 3941 BZ Doorn, Netherlands.

⁶ Augsburger Straße 43a, D-86368 Gersthofen, Germany.

⁷ University of Copenhagen, Faculty of Life Sciences, Department of Agriculture and Ecology, Botany Section, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark.

- 6a. Plants aquatic and/or helophytic; spathe persistent; fruit red; plants of boreal habitats 10. *Calla*
 6b. Plants climbing, not aquatic and/or helophytic; spathe deciduous; fruit various, if red then spathe caducous; plants of tropical habitats.
 7a. Fruit each a discrete indehiscent berry.
 8a. Inflorescences solitary or at most 3 held loosely together; flowers without perigone; fruit ovoid, white at maturity 5. *Amydrium*
 8b. Inflorescences several together distichously arranged; flowers with reduced inconspicuous perigone; fruit truncate, red at maturity 4. *Anadendrum*
 7b. Fruit not a discrete berry, dehiscent via shedding of stylar plate.
 9a. Fruit each with numerous small, straight seeds 6. *Rhipidophora*
 9b. Fruit each with 1 to few large, curved seeds.
 10a. Seeds 2–4 per fruit on an intrusive parietal placenta; leaves pinnately divided with pinholes along midrib 7. *Epipremnum*
 10b. Seed 1 per fruit on a basal placenta; leaves always entire 8. *Scindapsus*
- 1b. Flowers unisexual, plants monoecious or sometimes dioecious; perigone absent.
 11a. Plant a free-floating aquatic 26. *Pistia*
 11b. Plant never a free-floating aquatic, if aquatic then rooted in soil.
 12a. Suffruticose herbs; fruit a red berry 15. *Aglaonema*
 12b. Herbaceous plants of various life forms but never suffruticose; fruit various.
 13a. Rooted aquatics; female flowers connate; fruit an apically dehiscent syncarpium 13. *Cryptocoryne*
 13b. Terrestrial herbs and/or geophytes; female flowers free; fruit separate, indehiscent.
 14a. Stamens of each male flower entirely connate into distinct synandrium.
 15a. Spathe not differentiated into a distal limb and proximal tube.
 16a. Spathe brightly colored (inside commonly yellow or purple-red); female flowers with staminodes (staminodes absent in *S. griffithii*); stem a repent or suberect epigeal rhizome 22. *Steudnera*
 16b. Spathe white; female flowers without staminodes; stem a hypogea tuber or stolon 14. *Hapaline*
 15b. Spathe differentiated into a distal limb and proximal tube separated by a pronounced constriction.
 17a. Plant with conspicuous erect aerial stolons bearing numerous barbed bulbils 23. *Remusatia*
 17b. Plant without conspicuous erect aerial stolons, if stolons present then these decumbent and bearing tubercles at tips.
 18a. Mature infructescences declined to pendent; placentation parietal; fruit < 3 mm (to 5 mm in *C. gigantea*), pale yellow to brown and fruit-smelling when ripe; seeds small, very numerous per fruit 24. *Colocasia*
 18b. Mature infructescences erect; placentation basal; fruit > 4 mm, red when ripe, odorless; seeds large, few per fruit 25. *Alocasia*
- 14b. Stamens of each male flower free, or only filaments connate (rarely also anthers fused in *Arisaema*).
 19a. Spadix appendix absent (spadix fertile to apex), or if present then usually consisting of clearly defined subglobose sterile (neuter) flowers.
 20a. Spathe wholly persistent into fruiting, splitting from base to apex at fruit maturity; spathe free from spadix; spadix appendix absent; vegetative tissues aromatic (terpenoids) when crushed 11. *Homalomena*
 20b. Spathe limb deciduous during anthesis, proximal spathe persisting to fruiting and then splitting from apex to base at fruit maturity; much of female zone of spadix adnate to spathe; spadix appendix present; vegetative tissues not aromatic 12. *Schismatoglottis*
- 19b. Spadix appendix present, ± smooth to rugulose, hairy or echinate, without subglobose sterile (neuter) flowers, or if such sterile flowers present then usually confined to proximal part or base.
 21a. Spadix unisexual, or if bisexual then male and female zones contiguous or separated by sterile zone usually covered with staminodes.
 22a. Leaves variously divided (most commonly pedate to pedatisect but not decomound), very rarely entire; berries ripening reddish 21. *Arisaema*
 22b. Leaves commonly solitary, usually decomound, very rarely pedate, never entire; berries ripening red or blue 16. *Amorphophallus*
- 21b. Spadix bisexual, male and female zones separated by naked sterile axis (interstice).

- 23a. Female zone of spadix adnate to spathe 20. *Pinellia*
- 23b. Female zone of spadix free.
 - 24a. Appendix with a whorl of prominent staminodes directly above male zone; placentation parietal 17. *Arum*
 - 24b. Appendix with a stipelike smooth part below base or contiguous with male zone, whorl of staminodes absent above male zone; placentation basal.
 - 25a. Sterile zone between female and male zones with smooth naked distal part, base with various numbers of staminodes or whole zone covered with staminodes but then leaves always entire and proximal staminodes spatulate
(in *T. flagelliforme*) 18. *Typhonium*
 - 25b. Sterile zone between female and male zones fully covered with staminodes, or grooved and with staminodes only at base; leaves usually pedate, rarely entire (in *S. giganteum*); staminodes never spatulate 19. *Sauromatum*

1. SYMPLOCARPUS Salisbury ex W. P. C. Barton, Veg. Mater. Med. U. S. 1: 124. 1817,
nom. cons.

臭菘属 chou song shu

Li Heng (李恒 Li Hen); Peter C. Boyce, Josef Bogner

Ictodes Bigelow; *Spathyema* Rafinesque.

Herbs, large, glabrous, seasonally dormant. Rhizome erect, stout, with thick roots. Leaves few to several, petiolate; petiole long, with sheath; leaf blade subcordate to cordate-ovate, large, apex acute to cuspidate; midvein strong, primary lateral veins pinnate and arching toward apex, running into inconspicuous marginal vein, secondary lateral veins and higher order venation reticulate to transversely reticulate. Inflorescences 1 or 2 in a sympodium, appearing before or with leaves; peduncle long but only shortly exserted above ground; cataphylls surrounding peduncle. Spathe convolute at base, somewhat to widely gaping at apex, thick, boat-shaped or conchiform, apex 2-keeled, rostrate, curving forward. Spadix stipitate, globose to broadly ellipsoid, much shorter than spathe and hidden within. Flowers bisexual, with perigone; tepals 4, arching and imbricate. Stamens 4, free; filaments flattened; connective slender; thecae oblong, dehiscing by longitudinal slit; pollen grains ellipsoid, monosulcate, exine reticulate, apertural exine verrucate. Ovary of gynoecium (pistil) somewhat immersed in spadix axis, 1-loculed; ovule 1, orthotropous; funicle very short; placentation apical-parietal; stylar region long attenuate; stigma punctate-disciform. Infructescence globose to broadly ellipsoid, berries densely arranged. Berry with tepals and style persistent to ripe fruiting stage, base of berry immersed in spongy spadix axis. Seed globose; testa thin, smooth; embryo globose, large; endosperm very sparse, only a single cell layer thick. $2n = 30, 60$.

Four or five species: E Asia, North America; two species in China.

The other species in the genus are *Symplocarpus foetidus* (Linnaeus) Salisbury ex W. P. C. Barton (the type species) in North America; *S. egorovii* N. S. Pavlova & V. A. Nechaev in Russia (Far East), and *S. nabekuraensis* Otsuka & K. Inoue in Japan, but the latter is very close to *S. renifolius* and is better considered as an infraspecific taxon of it.

- 1a. Leaf blade orbicular-cordate, 30–40 cm long and wide or nearly so; flowering before leaves appear in early spring; fruit ripening in summer of same year 1. *S. renifolius*
- 1b. Leaf blade ovate to ovate-oblong, 10–20 × 7–12 cm; flowering with leaf appearance in summer (ca. Jul); fruit ripening in spring of following year 2. *S. nipponicus*

1. Symplocarpus renifolius Schott ex Tzvelev, Novosti Sist. Vyssh. Rast. 28: 28. 1991.

臭菘 chou song

Rhizome hypogeous, to 7 cm in diam. Leaves in a rosette; petiole to 40 × ca. 1 cm; leaf blade orbicular-cordate, 30–40 cm long and wide or nearly so (to 33 cm wide), mid-green, base cordate, apex acute; venation reticulate, midvein very strong, primary veins 5 on each side, ascending toward apex, lower-most ones running into basal lobes. Flowering before leaves

appear; inflorescence usually solitary; peduncle green and purplish tinged, 7–13(–20) × ca. 1 cm. Spathe plain purple to blackish purple, rarely green without any markings or with dark purple spots, boat-shaped, 8–20 × 5–12 cm, strongly leathery, apex acuminate. Spadix ellipsoid, 2–2.5 × ca. 1.2 cm. Flowers densely arranged. Flower 3–3.5 mm in diam., tepals pinkish, thecae yellow. Fl. early spring, fr. summer of same year.

Wet places, forest swamps, moist mixed and coniferous forests, swampy meadows and lands; below 300 m. Heilongjiang [Japan, Russia (Far East)].

The plant is poisonous but sometimes is used medicinally to treat swelling.

2. Symplocarpus nipponicus Makino, J. Jap. Bot. 5: 24. 1928.

日本臭菘 ri ben chou song

Rhizome hypogeous, thinner. Leaves in a rosette; petiole to 20 cm; leaf blade green, rarely variegated, ovate to narrowly

ovate-oblong, 10–20 × 7–12 cm, base obtuse to cordate-subcordate, apex acute; venation reticulate, midvein strong, primary lateral veins 6 or 7 on each side. Flowering with leaf appearance; peduncle purple, long. Spathe plain purple or mottled dark purple, broadly elliptic and boat-shaped, leathery. Spadix ellipsoid, stipitate. Flowers densely arranged. Fl. summer (ca. Jul), fr. spring of following year.

Wet places; below 300 m. Heilongjiang [Japan, Korea].

2. POTTHOS Linnaeus, Sp. Pl. 2: 968. 1753.

石柑属 shi gan shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Tapanava Adanson.

Plants climbing against trees with aid of adhesive roots, or creeping over rocks. Primary shoots branching to produce further adherent shoots and both types (in most species) sterile but giving rise to free, sympodial or physiognomically monopodial flowering shoots, often highly ramified, arising from leaf axil (subg. *Pothos*) or beneath it [subg. *Allopotthos*]. Leaves simple, distichous; petiole conspicuously winged [or wingless]; petiolar sheath minute or well developed, amplexicaul; articulation distinct (pulvinus at junction of petiole and blade); leaf blade with primary lateral veins on each side of midrib traversed by 1 or more intramarginal veins running ± from base and from ca. midway along midrib to apex or first to distal margins and then to apex. Inflorescences in axils of leaves or seemingly extra-axillary, sometimes pseudoterminal, usually several along stem; peduncle partly or entirely enveloped by sheathlike organs (cataphylls). Spathe inconspicuous, cymbiform or elongate, not constricted, at last entirely spreading, and either spreading or recurved. Spadix sessile or stipitate, varying in shape, with reduced flowers at very base, otherwise fertile. Flowers many, bisexual, sometimes reduced; tepals 6, with vaulted-truncate apex. Stamens 6; filaments strap-shaped; anthers ovoid, longitudinally dehiscent. Ovary 3-loculed; ovule 1 per locule, subbasal; stigma sessile, initially umbilicate. Berry 1–3-seeded. Seeds large, without endosperm.

About 75 species: tropical and subtropical regions of Asia, Australia, Madagascar, and Polynesia; five species in China.

- 1a. Petiole 13–15 cm, much longer than leaf blade, leaf blade 3–4 cm; spadix cylindric, 5–6 × 0.15–0.2 cm 5. *P. repens*
- 1b. Petiole shorter than or as long as leaf blade; spadix cylindric to globose.
 - 2a. Petiole nearly as long as to slightly exceeding blade.
 - 3a. Peduncle at anthesis reflexed or recurved; spadix subglobose or ellipsoid, 5–6 mm 1. *P. scandens*
 - 3b. Peduncle erect; spadix cylindric, ellipsoid, ovoid, or subglobose, 4–25 mm 2. *P. chinensis*
 - 2b. Petiole much shorter than leaf blade.
 - 4a. Petiole narrow and long, obovate-oblong or cuneate; veins inconspicuous; branchlets not 4-angled 2. *P. chinensis*
 - 4b. Petiole broad, small, obovate, length and width only 1/8–1/6 of blade; veins conspicuously branched; branchlets 4-angled.
 - 5a. Peduncle and stipe short and broad, together 1.3–2 cm; peduncle stout 3. *P. pilulifer*
 - 5b. Peduncle and stipe long and narrow, together 7.5–8 cm; peduncle very slender 4. *P. kerrii*

1. Pothos scandens Linnaeus, Sp. Pl. 2: 968. 1753.

螳螂跌打 tang lang die da

Batis hermaphrodita Blanco; *Podospadix angustifolia* Rafinesque; *Pothos angustifolius* (Rafinesque) C. Presl; *P. chapelieri* Schott; *P. cognatus* Schott; *P. decipiens* Schott; *P. exiguiflorus* Schott; *P. fallax* Schott; *P. hermaphroditus* (Blanco) Merrill; *P. horsfieldii* Miquel; *P. leptospadix* de Vriese; *P. longifolius* C. Presl; *P. longipedunculatus* Engler, nom. illeg. superfl.; *P. microphyllus* C. Presl; *P. roxburghii* de Vriese; *P. scandens* var. *cognatus* (Schott) Engler; *P. scandens* var. *helpferianus* Engler; *P. scandens* var. *sumatranus* de Vriese; *P. scandens* var. *zeylanicus* de Vriese; *P. scandens* var. *zollingerianus* (Schott) Engler; *P. zollingerianus* Schott; *Tapanava indica* Rafinesque; *T. rheedii* Hasskarl.

Lianas, medium sized to rather large, to 6 m. Stems

weakly 4-angled or subterete, to 10 mm in diam. Leaves paler abaxially, bright to deep green adaxially; petiole obovate-oblong to linear-oblong, 20–140 × 5–20 mm, broadly winged, base decurrent, apex truncate, rounded, or auriculate; each side with 2 or 3 secondary veins and numerous veinlets; leaf blade ovate to elliptic or lanceolate, 2–10 × 3–14 cm, base rounded to acute, apex attenuate-mucronate; each side with 2 intramarginal veins arising from base and either reaching leaf tip or merging into a prominent submarginal collecting vein, all additional veins arising obliquely from midrib. Flowering shoot much abbreviated, arising from most of mid- to distal leaf axils of fertile shoots, bearing a minute prophyll and a few cataphylls 3–10 mm, sequentially longer. Inflorescence solitary; peduncle erect to spreading, green to purple tinged, 3–15 × 0.5–2 mm, slender. Spathe greenish to maroon, ovate, concave, 4–8 × 4–7 mm, base short or somewhat long clawed, margins variously in-

rolled, apex rounded to acute with a tiny, rather stout mucro. Spadix stipitate; stipe erect, greenish to maroon, terete in cross section, $5-10 \times$ ca. 1 mm, distally erect to bent through 270° ; fertile zone yellow-green to off-white, globose or ovoid to sub-clavate, $4-10 \times 3.5-10$ mm. Flowers 1–2 mm in diam. Inflorescence with 1–5 berries. Fruit mid-green, ripening to deep scarlet, obclavate, $10-17.5 \times 10-14$ mm. Fl. and fr. throughout year.

Rain forests, monsoon rain forests, mountain or river terraces, creeping on trees or on rocks; 200–1000 m. SE Xizang (Mêdog), S and SE Yunnan [Bangladesh, Brunei, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, ?Nepal, Philippines, ?Singapore, Sri Lanka, Thailand, Vietnam; Indian Ocean islands (Comoros), Madagascar].

This plant is used medicinally in Yunnan for treating traumatic injuries and rheumatic arthralgia. The leaves are used as tea by the Dai ethnic minority.

2. *Pothos chinensis* (Rafinesque) Merrill, J. Arnold Arbor. 29: 210. 1948.

石柑子 shi gan zi

Tapanava chinensis Rafinesque, Fl. Tellur. 4: 14. 1838; *Pothos balansae* Engler; *P. cathcartii* Schott; *P. chinensis* var. *lotienensis* C. Y. Wu & H. Li; *P. seemannii* Schott; *P. warburgii* Engler; *P. yunnanensis* Engler.

Lianas, small to very large, to 10 m, root-climbing. Stem weakly 4-angled or terete in cross section, to 12 mm in diam. Leaves paler abaxially, bright to mid-green adaxially; petiole obovate-oblong to linear-oblong or narrowly triangular, $50-140 \times 4-20$ mm, broadly winged, base decurrent to clawed, apex truncate, rounded, or auriculate; each side with 2 or 3 secondary veins and numerous veinlets; leaf blade ovate to elliptic or lanceolate, $3-20.5 \times 1.5-20.5$ cm, apex attenuate-mucronate to acute or attenuate, minutely tubulate; each side with 2–4 intramarginal veins arising from base and either immediately diverging or remaining very close and parallel to midrib and then diverging further along leaf blade, submarginal collecting vein prominent. Flowering shoot much abbreviated, arising from most of mid- to distal leaf axils of fertile shoots. Inflorescences solitary or in pairs; peduncle erect to variously curved, green to brown tinged, $3-25 \times 1.5-2.5$ mm, rather stout. Spatha greenish white or green, occasionally faintly purple tinged, ovate, concave, $4-12 \times 4-10$ mm, base cordate, clasping and slightly decurrent on peduncle, margins inrolled, apex arched to recurved, acute to subacute with a rather stout mucro. Spadix stipitate; stipe erect, straight, green, terete, $5-10 \times 1-1.25$ mm; fertile zone pale green or white, globose to ovoid, $3.5-13 \times 3-10$ mm. Flowers 1–2 mm in diam. Fruit mid-green, ripening to scarlet, obclavate to ovoid or ellipsoid, $10-17.5 \times 10-14$ mm. Fl. and fr. throughout year.

Dense forests, moist mountain valleys, climbing on trees or creeping over rocks; below 2400 m. Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Sichuan, Taiwan, SE Xizang (Mêdog), Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand, Vietnam].

Pothos balansae, *P. cathcartii*, *P. chinensis*, and *P. warburgii* are

without doubt synonymous. They might be separable when only a few specimens of each entity are studied, but when a wide range of material is used the four merge together as one species, for which the earliest name is *P. chinensis*. See Boyce (Blumea 45: 147–204. 2000).

The whole plant is used medicinally to treat rheumatic arthralgia, traumatic injuries, fractures, coughs, and infantile malnutrition caused by intestinal parasites.

3. *Pothos pilulifer* Buchet ex P. C. Boyce, Blumea 45: 175. 2000.

地柑 di gan

Lianas, medium sized to large, to 5 m, root-climbing. Stems rectangular in cross section, ± compressed, to 12 mm in diam., angles minutely but prominently winged. Leaves paler abaxially, when fresh mid-green adaxially; petiole obovate-oblong to linear-oblong or narrowly triangular, $10-40 \times 4-17$ mm, somewhat narrowly to rather broadly winged, base decurrent, apex truncate, rounded, or auriculate; each side with 2–4 secondary veins and numerous veinlets, all veins, but particularly secondary veins, prominent; leaf blade ovate to elliptic or lanceolate, $3.5-11 \times 2-5$ cm, base rounded to subacute, apex attenuate, somewhat prominently tubulate; each side with 2–4 intramarginal veins arising from base and either immediately diverging or remaining very close and parallel to midrib and then diverging further along leaf blade, either reaching leaf tip or merging into a prominent submarginal collecting vein, additional veins arising obliquely from midrib, remaining parallel. Flowering shoot much abbreviated, arising mostly from upper-middle to distal leaf axils of fertile shoots. Inflorescence solitary; peduncle erect, green, stout, $0-3(-5) \times$ ca. 1 mm. Spatha green to greenish purple, ovate, concave, $4-5 \times 2.5-4$ mm, base decurrent on peduncle, margins strongly inrolled, apex arched to recurved, acute. Spadix stipitate; stipe erect, straight to slightly curved, green to greenish purple, terete, stout, $10-12 \times 1-1.25$ mm; fertile zone yellow, globose, $4-5 \times 4-5$ mm. Flowers 1–2 mm in diam. Inflorescence not seen. Fl. Dec–Jul.

Dense forests, on rocks; 200–1000 m. SW Guangxi, SE Yunnan [N Vietnam].

The name *Pothos pilulifer* was first published by Gagnepain (in Lecomte et al., Fl. Indo-Chine 6: 1084. 1942) but not validly so because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

All parts of the plant are used medicinally for treating epilepsy.

4. *Pothos kerrii* Buchet ex P. C. Boyce, Blumea 45: 168. 2000.

长梗石柑 chang geng shi gan

Lianas, medium sized, to 4 m, root-climbing. Stems terete in cross section, to 6 mm in diam. Leaves when fresh mid-green; petiole oblong to oblong-triangular, $10-30(-50) \times 5-10$ mm, broadly winged, base decurrent to clawed, apex truncate to auriculate; each side with 2–4 secondary veins, veins prominent, especially in dried material; leaf blade lanceolate to narrowly elliptic, $7.5-13 \times 1.25-2.5$ cm, base rounded, apex long attenuate-mucronate to acute, minutely tubulate; each side with

2 or 3 intramarginal veins arising from base and immediately diverging and reaching leaf tip. Flowering shoot much abbreviated, arising from middle to distal leaf axils of fertile shoots, bearing a minute prophyll and few cataphylls 3–10 mm, sequentially longer. Inflorescence solitary; peduncle erect to spreading, curving to bring inflorescence upright, deep purple, very long and slender, 25–40 × 0.5–1 mm. Spathe greenish purple, ovate, deeply concave to almost flat, 4–6 × 3.5–7 mm, base prominently cordate, clasping and minutely decurrent on peduncle, margins straight, apex obtuse with a small but prominent mucro. Spadix stipitate; stipe erect, straight, deep purple, terete in cross section, 10–18 × 0.23–0.75 mm; fertile zone pale yellow, globose, 3.5–4 × 3.5–4.5 mm. Flowers 1–2 mm in diam. Infructescence with 1–7 berries. Fruit obclavate to ellipsoid, 10–15 × 7.5–10 mm. Fl. Aug.

Dense forests, on rocks. SE Guangxi (Longzhou) [Laos, Vietnam].

The name *Pothos kerrii* was first published by Gagnepain (in Lecomte et al., Fl. Indo-Chine 6: 1085. 1942) but not validly so because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

Pothos kerrii is quite similar to *P. pilulifer*, but it differs by the elongated peduncle and stipe (7.5–8 cm together vs. 1.3–2 cm together in *P. pilulifer*).

The plant is used medicinally to treat traumatic injuries.

5. *Pothos repens* (Loureiro) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 4: 641. 1917.

百足藤 bai zu teng

Flagellaria repens Loureiro, Fl. Cochinch. 1: 212. 1790; *Pothos loureiroi* Hooker & Arnott; *P. terminalis* Hance.

Lianas, medium sized to very large, to 15 m, root-climbing. Stems weakly 4-angled or slightly compressed terete in cross section, to 20 mm in diam. Leaves paler abaxially, bright to deep green adaxially; petiole oblong-obovate-lanceolate to linear-oblong, 50–200 × 5–25 mm, broadly winged, base decurrent, apex truncate, slightly auriculate; each side with 2 or 3 barely differentiated primary veins running parallel to midrib and numerous parallel to subparallel and reticulate veinlets, primary and larger secondary veins reaching petiole tip and there curving inward to merge with leaf blade/petiole junction; leaf blade ovate to elliptic or triangular-lanceolate, 20–80 × 10–20 mm, base rounded to truncate, apex subacute to acute, briefly tubular-mucronate; primary veins 3(–5), ± parallel, arising from base reaching tip of leaf blade. Inflorescences solitary to several together, congested or spaced along a leafy to naked branching system to 2 m; peduncle curving to spreading, slender, 3–8 × 0.5–2 mm; terminal part erect, green. Spathe strongly reflexed at anthesis, greenish with margins stained purple, narrowly elliptic, 20–70 × 3–6 mm, margins recurved to reflexed, base briefly decurrent, apex apiculate to shortly filiform. Spadix stipitate; stipe erect, greenish to purple, terete in cross section, 10–13 × 1–1.2 mm; fertile zone yellow-green to off-white, narrowly cylindric, 40–80 × 2–4 mm, sometimes strongly obliquely inserted on stipe. Flowers 1–2 mm in diam. Infructescence with few berries. Fruit turbinate to ellipsoidal, globose at maturity, 7–15 × 10–14 mm. Fl. Mar–Apr, fr. May–Jul.

Moist forests, climbing on trees or creeping over rocks; below 900 m. S Guangdong, S Guangxi, Hainan, S Yunnan [Laos, N Vietnam].

This plant is used for treating traumatic injuries, fractures, and abscesses.

3. POTHOIDIUM Schott, Aroideae, 26. 1856–1857.

假石柑属 jia shi gan shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Shrubs, climbing. Branches extra-axillary. Leaves simple, distichous, petiolate; petiole elongated, leaflike, flattened, veins parallel; leaf blade triangular-lanceolate, short, with parallel veins. Inflorescences in axil of leaves; bractlike cataphylls 1 or 2. Spathe deciduous, short. Spadix cylindric. Flowers bisexual but plants functionally dioecious; tepals 6, with vaulted-truncate apex; stamens 3–6, anthers oval, longitudinally dehiscent; ovary ovoid, 1-loculed, ovule solitary, subbasal, stigma sessile. Berry ovoid, acute. Seed oblong, without endosperm.

One species: China (Taiwan), Indonesia (Maluku, Sulawesi), Philippines.

Pothoidium is similar to *Pothos repens* but differs in being functionally dioecious, by the branching inflorescences, and by its unilocular ovary and solitary ovule. *Pothoidium* has functionally unisexual spadices arranged seemingly in panicles and maturing sequentially. The structure of the fertile shoots is not yet clearly understood; however, it is possible that they are developed by the reduction of all the leaves of a leafy fertile shoot system to minute prophylls and cataphylls and that the panicle-like synflorescence is hence to be regarded as an aggregate structure. *Pothos repens* and *Pothoidium* are vegetatively almost identical. Depauperate flowering specimens of *Pothoidium* greatly resemble robust plants of *Pothos repens*. Interpretation of *Pothoidium* inflorescences suggests that *P. lobbianum* is functionally dioecious. “Male” spadices have flowers with prominently visible anthers and an apparently sterile ovary. “Female” spadices have flowers with a large unilocular fertile ovary and no stamens. Flowers of *Pothos* species are always bisexual with a 3-locular ovary.

1. *Pothoidium lobbianum* Schott, Oesterr. Bot. Wochensbl. 7: 70. 1857.

假石柑 jia shi gan

Climbers. Branches elongated, striate, internodes 7.5–10 mm. Leaves leathery; petiole 7.5–10 × ca. 1 cm, base angustate, apex truncate; leaf blade triangular-lanceolate, much smaller and shorter than petiole, 2.5–4 × ca. 7.5 mm. Inflorescences

several to many, borne in a terminal branching system, proximal inflorescences axillary to a foliage leaf, distal ones either subtended by a cataphyll or without a subtending leaf, peduncular axis slender, consisting of 1 to several internodes, sometimes subtended by a prophyll, sometimes also bearing a cataphyll ± halfway up. Spathe occurrence irregular, often absent, widely spreading, linear-lanceolate or broadly ovate, 5–7.5 mm, margins usually revolute, apex acute. Spadix apparently often functionally unisexual, cylindric, 1.5–2.5 cm, sessile to long

stipitate when subtended by spathe. Flowers apparently usually unisexual, sometimes bisexual, congested, with a perigone of 6 free tepals; male flowers with well-developed anthers and apparently sterile ovary, stamens 3–6, free, number often varying on a single spadix; female flowers with large fertile ovary and lacking stamens. Berry ca. 1.2 cm × 6 mm. Seed solitary, ovoid. Fl. Feb–May, fr. Jul–Oct.

S Taiwan (Lan Yu) [Indonesia (Maluku, Sulawesi), Philippines].

4. ANADENDRUM Schott, Bonplandia (Hannover) 5: 45. 1857.

上树南星属 shang shu nan xing shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Nothopothos Kuntze.

Plants creeping against trees or over boulders by mean of adhesive roots. Leaves distichous, petiolate, undivided, pinnately veined; distal nodes of stem with usually 2 normal leaves with distinct sheaths, and (mostly) several strongly to entirely reduced leaves with strongly developed sheaths; petioles of other leaves only at base moderately sheathing, pulvinus distinct; trichosclereids and laticiferous vessels absent. Inflorescences emerging from a rhipidium carried at shoot tips (or sometimes laterally displaced), with each inflorescence subtended by a reduced leaf comprised mainly of an expanded petiolar sheath. Spathe white or green, cymbiform, oblong-ovate, initially tubular-inrolled and beaked for ca. 1/4 spathe length, at last entirely spreading, often caducous. Spadix cylindric, with stipe well developed. Flowers many, bisexual; perigone a single cuplike structure, membranous, truncate. Stamens 4; filaments strap-shaped; anthers longitudinally dehiscent. Ovary 1-loculed, 1-ovuled; ovule central-basal; stigma sessile, transversely inserted. Berry subglobose, distinctly truncate apically. Seed large.

Nine species: tropical Asia, from India to Malaysia; two species in China.

One of us (Boyce) notes that the names *Anadendrum latifolium* and *A. montanum* are misapplied here. True *A. latifolium* is endemic to Peninsular Malaysia (type from Perak), and the type of *A. montanum* is from Indonesia (Java). In fact, there are three species of *Anadendrum* in China, but all are as yet undescribed. Further work is needed to resolve this situation.

- 1a. Leaf sheath ca. 10 mm wide; leaf blade oblong-lanceolate, 15–20 × 5–8 cm; inflorescence with linear bracts
ca. 7 cm; spadix stipe 5–8 mm 1. *A. montanum*
- 1b. Leaf sheath 5–7 mm wide; leaf blade ovate-oblong, 25–33 × 10.5–14 cm; inflorescence without linear bracts;
spadix stipe ca. 2 cm 2. *A. latifolium*

1. *Anadendrum montanum* Schott, Bonplandia (Hannover) 5: 45. 1857.

上树南星 shang shu nan xing

Stem 4–5 mm in diam., internodes elongated, ca. 2.5 cm, distal one much shorter, rooting. Petiole 10–15 cm, sheathing from base to pulvinus, developed sheaths 9–14 × ca. 1 cm, mostly early caducous; leaf blade oblong-lanceolate, 15–20 × 5–8 cm, papery, oblique, base obtuse or subcordate, margin entire, apex acuminate; lateral veins 7 or 8 on each side; secondary veins 2 or 3, reticulate. Inflorescences axillary and terminal from bractlike reduced leaves; bractlike leaves linear, ca. 7 cm, apex acuminate with tail 5–7 mm; peduncle 10–15 cm. Spathe initially tubular-inrolled, at last entirely spreading, ovate-lanceolate, apex with a rostrum 10–15 mm. Spadix pale green, ellipsoid, 3–3.5 cm; stipe 5–8 mm. Flowers dense; perigone annular, ca. 1/2 as high as ovary. Filaments 4; anthers ovoid. Ovary obovoid, apex ca. 3 mm in diam.; stigma transversely oblong. Berry ovoid, ca. 8 mm, apex truncate. Fl. and fr. Jun–Oct.

Forests, on trees or rocks; below 500 m. Hainan, SE Yunnan [Indonesia, Laos, Malaysia, Singapore, Thailand, Vietnam].

2. *Anadendrum latifolium* J. D. Hooker, Fl. Brit. India 6: 540. 1893.

宽叶上树南星 kuan ye shang shu nan xing

Stem 0.4–3 m, 4–5 mm in diam., internodes 1.5–3 cm, rooting. Petiole 11–17 cm, narrowly sheathing; sheaths ca. 2/3 as long as petiole, 5–7 mm wide; leaf blade broadly oblong, 25–33 × 10.5–14 cm, base acute, apex cuspidate-acuminate; lateral veins ca. 12 on each side, strong, spreading, and arched. Inflorescences axillary, without bractlike reduced leaves; peduncle ca. 25 cm. Spathe initially fusiform and at last spreading, lanceolate, 5–6 cm, base angustate, apex acuminate. Spadix cylindric, 3–5.8 cm (Yunnan specimens); stipe to 2 cm. Flowers very closed; perigone annular, ca. 1/2 as high as ovary. Stamens 4; anthers base divaricate, apex dehiscent. Ovary obovoid, apex ca. 3 mm in diam.; stigma transversely linear. Berry yellow-green, drying blackened, ovoid, ca. 10 mm, apex truncate. Fl. Apr–May.

Forests; 100–300 m. SE Yunnan [Malaysia, Vietnam].

5. AMYDRIUM Schott, Ann. Mus. Bot. Lugduno-Batavi 1: 127. 1863.

雷公连属 lei gong lian shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Epipremnopsis Engler.

Lianas, creeping against trees and over rocks by aid of adhesive roots. Leaves long petiolate; leaf blade entire and pinnatifid or entire with a series of rather large perforations on either side of midrib; pulvinus distinct; latex absent, trichosclereids sparsely present. Inflorescences mostly solitary at tips of primary or lateral shoots; peduncle initially for greater part enveloped by sheaths, afterward ± becoming naked, far exserted from remnants of fraying sheaths. Spathe initially tubular-inrolled, finally reflexed and entirely spreading, early caducous. Stipe of spadix short; spadix cylindric. Flowers many, bisexual, naked. Stamens 4, free; filaments strap-shaped; anthers longitudinally dehiscent. Ovary 1-loculed; ovules 2, anatropous; placentation subbasal-parietal; style conic; stigma hemispheric, small. Berry white or orange-red, subglobose, apex truncate to domed. Seed subglobose; testa smooth; embryo curved; endosperm present.

Five species: tropical Asia; two species in China.

- 1a. Leaf blade entire, unlobed; spadix obovoid, ca. 4 cm, distal part ca. 17 mm in diam.; stigma rounded 1. *A. sinense*
1b. Leaf blade with oblong perforations; spadix cylindric, ca. 6 × 1.3 cm; stigma oblong 2. *A. hainanense*

1. Amydrium sinense (Engler) H. Li in C. Y. Wu & H. Li, Fl. Reipubl. Popularis Sin. 13(2): 23. 1979.

L. Tseng) H. Li in C. Y. Wu & H. Li, Fl. Reipubl. Popularis Sin. 13(2): 24. 1979.

雷公连 lei gong lian

Scindapsus sinensis Engler, Bot. Jahrb. Syst. 29: 234. 1900; *Epipremnopsis sinensis* (Engler) H. Li; *Raphidophora dunniana* H. Léveillé.

Stem slender, 3–5 mm in diam.; internodes 3–5 cm. Petiole elongated, 8–15 cm, base sheathing; leaf blade light green, after drying black-brown, falcate-lanceolate, 13–23 × 5–8 cm, strongly asymmetric, one side usually 2 × as wide as other, base broadly cuneate or subrounded, margin entire, apex acute; lateral veins many, diverging at 30° from midrib, contracted near margin into a marginal vein. Peduncle pale green, ca. 5.5 cm. Spathe initially green, inrolled fusiform, ca. 7 cm, middle part ca. 2.2 cm in diam., finally spreading, yellow-green to yellow, cymbiform, subovate, 8–9 × ca. 11.5 cm. Stipe of spadix 5–10 mm; spadix obovoid, ca. 4 × 1.8 cm, angustate toward base, apex obtuse. Filaments ca. 4 mm; anthers oblong, ca. 3 mm. Ovary 5- or 6-angular, cylindric, ca. 4 × 5 mm, apex truncate; stigma sessile, nearly circular, 1-loculed, 2-ovuled; ovules subbasal, transversely inserted. Berry green, when mature yellow or red, and bad smelling. Seeds 1 or 2, brown, obovoid-reniform, ca. 2 mm. Fl. Jun–Jul, fr. Jul–Nov.

Evergreen forests, on trees or over rocks; 500–1100 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Yunnan [N Vietnam].

The stems and leaves are used for treating traumatic injuries, fractures, and angina pectoris.

2. Amydrium hainanense (Ting & Wu ex H. Li, Y. Shiao & S.

穿心藤 chuan xin teng

Epipremnopsis hainanensis Ting & Wu ex H. Li, Y. Shiao & S. L. Tseng, Acta Phytotax. Sin. 15(2): 102. 1977.

Stem cylindric, 3–4 mm in diam.; internodes 2–3 cm. Petiole 20–30 cm, on juvenile branch only 4–5 cm; sheath reaching base of leaf blade, base amplexicaul, marcescent; leaf blade green, after drying dark brown, ovate-lanceolate or falcate-lanceolate, 13–15 cm on juvenile branch, on mature branch blade large, 28–35 × 9–12 cm, papery, base rounded or subcordate, margin entire, apex abruptly acuminate; lateral veins 5–7 pairs, ascending and arched, each side along midrib with some large and some small perforations; perforations ovate or oblong, 4–6 × 1.5–4 cm, sometimes reaching margin and midrib of leaf blade. Inflorescence solitary; peduncle dark brown when dry, cylindric, 8–10 cm. Spathe yellow-red, broadly cymbiform, 8–5 × 8–9 cm, apex shortly rostrate. Stipe of spadix 8–10 mm; spadix cylindric, ca. 6 × 1.3 cm. Stamens 6, shorter than ovary during female anthesis but filaments extending at male anthesis to bring thecae above pistils; filaments flat; anthers longitudinally dehiscent. Ovary hexagonal-cylindric, ca. 3 × 2.5 mm, apex truncate; stigma sessile, longitudinally oblong, 1-loculed, 2-ovuled; ovules anatropous with short funicle, inserted on lower part of placenta. Fl. Apr (Hainan), Oct (Guangxi).

Dense forests in valleys or by watersides, creeping against trees or over rocks; below 300 m. Guangdong, Guangxi, Hainan, Hunan, Yunnan [N Vietnam].

6. RHAPHIDOPHORA Hasskarl, Flora 25(Beibl. 2): 11. 1842.

崖角藤属 ya jiao teng shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Lianas, large; raphides numerous on stem and leaf; laticiferous ducts absent. Stems thick, creeping and climbing up trees or over rocks by aid of adhesive roots. Leaves distichous, petiolate; pulvinus short or long; petiole often adaxially grooved or canaliculate, sheath extending to pulvinus; leaf blade entire or divided, or perforate, thinly to rather thickly leathery, pinnately veined. Inflorescences terminal on leafy shoots, solitary or sometimes in a fascicle (synflorescence); as synflorescence develops axis sometimes

reiterating and overtopping synflorescence such that inflorescence cluster is displaced and appears to be produced laterally (here termed “appearing axillary”). Spathe not constricted, initially inrolled and tubular, afterward spreading, firm, mostly early caducous, rarely marcescent. Stalk of spadix short or absent; spadix cylindric. Flowers many, bisexual or sometimes a few male, naked. Stamens 4; anthers much shorter than filaments, dehiscent by a slit. Ovary 1- or incompletely 2-loculed, 2- to many ovuled; ovules basal or parietal, 1- or 2-seriate; style broadly conic; stigma circular to linear, in latter case longitudinally inserted. Fruit with stylar plate sloughing away in groups or singularly to reveal ovary cavity with seeds embedded in pulp, many seeded. Seeds small, oblong to reniform.

About 120 species: tropical Asia, Australia, tropical W Pacific; 12 species (two endemic) in China.

- 1a. Leaf blade entire.
 - 2a. Leaf blade very large, more than 30 cm wide.
 - 3a. Spadix obovoid-cylindric or ellipsoid, narrowing to base, $4.5\text{--}5.5 \times 1.5\text{--}1.75$ cm; inflorescences pendent; innovations puberulent; leaf midrib minutely pubescent abaxially 3. *R. hookeri*
 - 3b. Spadix cylindric, $18\text{--}25 \times 2\text{--}3$ cm; inflorescences erect; innovations glabrous; leaf midrib glabrous 4. *R. megaphylla*
 - 2b. Leaf blade smaller, usually less than 15 cm wide.
 - 4a. Leaf blade oblong or obliquely oblong, obtuse at base, $15\text{--}24 \times 5\text{--}9$ cm 2. *R. liukiuensis*
 - 4b. Leaf blade falcate-lanceolate or falcate-elliptic.
 - 5a. Leaf blade narrowly cuneate at base; spathe green outside; spadix narrowing toward apex 5. *R. hongkongensis*
 - 5b. Leaf blade rounded at base; spathe orange or pale yellow outside; spadix narrower and longer, cylindric.
 - 6a. Spathe orange on both surfaces, light yellow inside at base, light green outside at center immediately after opening (green color soon disappearing); spadix ca. 2/3 of spathe length; leaf blade thickly papery 1. *R. lancifolia*
 - 6b. Spathe dull orange outside, dull yellow to dull orange inside; spadix more than 4/5 of spathe length; leaf blade subleathery 6. *R. peepula*
 - 1b. Leaf blade pinnatifid.
 - 7a. Style conspicuous; leaf blade very large, ovate-oblong, pinnae many, 6 or 7(–15) on each side.
 - 8a. Foliage leaves scattered and interspersed with several (up to 7) cataphyll-bearing nodes; feeding roots corky and smooth; perforations absent, leaf blade $60\text{--}70 \times 40\text{--}50$ cm 12. *R. decursiva*
 - 8b. Leaf arrangement not as above; feeding roots densely scaly; large perforations usually present along midrib, leaf blade $30\text{--}55 \times 22\text{--}36$ cm 11. *R. crassicaulis*
 - 7b. Style obscure.
 - 9a. Leaf blade less than 35×30 cm, with a few pinnae.
 - 10a. Leaf blade broadly ovate, pinnatisect, ca. $35 \times 25\text{--}30$ cm, pinnae 3 or 4 on each side, sinuses almost reaching midrib; spadix long and thin, $15\text{--}18 \times$ ca. 0.5 cm when dry 8. *R. laichauensis*
 - 10b. Leaf blade ovate, pinnatifid, and at least some leaf blades on mature branches entire, $17\text{--}25 \times 5\text{--}12$ cm, pinnae 2 or 3 on each side, or only on 1 side and other side entire, sinuses reaching to 2–3 cm from midrib; spadix shorter, $12\text{--}13 \times 0.8\text{--}1$ cm 7. *R. luchunensis*
 - 9b. Leaf blade longer than 37 cm; pinnae with 3–5 subequal, parallel costae.
 - 11a. Pinnae 2–5 per side; spadix shorter than 9 cm 9. *R. glauca*
 - 11b. Pinnae 6–9 per side; spadix ca. 10 cm 10. *R. dulongensis*

1. Rhaphidophora lancifolia Schott, Bonplandia (Hannover) 5: 45. 1857.

上树蜈蚣 shang shu wu gong

Lianas. Stem climbing, green, to 20 m or more, 1–2 cm in diam.; internodes 1–2 cm, rooting. Petiole green, sheathing from base to pulvinus, 14–30 cm, base ca. 3 mm in diam., at apex pulvinus incrassate, 1–1.5 cm; leaf blade pale green abaxially, green adaxially, falcate-lanceolate to ovate-oblong, rarely ovate, oblique, $25\text{--}40 \times 10\text{--}13.5$ cm, thickly papery, base obliquely rounded, i.e., one side obtuse, other side cuneate, usually one side of blade 7–8 cm wide, other side only 4–5.5 cm wide, margin entire, apex long acuminate; lateral veins 7 or 8 per side, ascending obliquely and arched. Inflorescences terminal on branches; cataphylls membranous, lanceolate, ca. 10 cm, caducous; peduncle green, 7–10 cm, ca. 1 cm in diam., distally recurved. Spathe initially green, inrolled and tubular with a

rostrum 2–3 cm, at anthesis spreading, orange on both surfaces, light green outside at center immediately after opening (green color soon disappearing), light yellow inside at base, cymbiform in outline, ca. 12.5×10 cm, apex abruptly acuminate, with a long rostrum, after anthesis caducous. Spadix sessile, cylindric, ca. 7×1.3 cm, apex obtuse. Flowers bisexual; perigone absent. Anthers purple. Ovary yellow or pale green, tetragonal or pentagonal-cylindric; stigma sessile, longitudinally oblong, many ovuled. Infructescence incrassate, ca. $9 \times 1.5\text{--}2$ cm. Berry gray-green. Seeds many, yellow, cylindric, 1.5–2 mm. Fl. Oct–Nov, fr. following Oct.

Rain forests, monsoon rain forests, creeping on trees; 500–2500 m. W Guangxi, Yunnan [Bangladesh, NE India].

2. Rhaphidophora liukiuensis Hatusima, Acta Phytotax. Geobot. 20: 56. 1962.

针房藤 zhen fang teng

Lianas. Leaves petiolate; leaf blade oblong or obliquely oblong, 15–24 × 5–9 cm, leathery, base obtuse, margin entire, apex acuminate; lateral veins 8 or 9 pairs, ascending, nearly parallel. Peduncles 6–9 cm. Spathe convolute, ca. 8 × 2 cm. Spadix sessile, shorter than spathe, ca. 6 cm, ca. 1 cm in diam. Anthers ovoid, acuminate. Ovary hexagonal-cylindric, ca. 5 mm.

S Taiwan (Lan Yu) [Japan (Ryukyu Islands)].

The records of *Rhaphidophora perkinsiae* Engler from Lan Yu (T. S. Liu & T. C. Huang, Quart. J. Taiwan Mus. 16: 141. 1963; Fl. Taiwan 5: 813. 1978) are based on misidentifications of *R. liukiuensis* (see Fl. Taiwan, ed. 2, 5: 686. 2000). True *R. perkinsiae* is distributed in the Philippines.

3. Rhaphidophora hookeri Schott, Bonplandia (Hannover) 5: 45. 1857.

毛过山龙 mao guo shan long

Lianas, medium to large, to 15 m, moderately robust. Stem mid-green, cylindric, 8–12[–20] mm in diam., internodes short, 5–10 mm. Leaves clustered at shoot tips; petiole 12–30 cm, channeled, margins sharp; pulvini distinct, 1–2 cm; petiolar sheath reaching to or just short of apical pulvinus; leaf blade obliquely oblong, 27.5–45 × 15–30 cm, thinly leathery, midrib and primary veins minutely pubescent, base rounded, truncate, or subcordate, apex with an acumen 15–20 mm; primary lateral veins diverging at 40–70° from midrib (angle smaller toward apex of blade). Inflorescences solitary at tips of free lateral shoots; peduncle pendent, 3–5 cm, subtended by 1 or 2 cataphylls; cataphylls caducous, ovate or ovate-lanceolate, 3–6 cm. Spathe outside green or gray-green, inside yellow, oblong-ovate, 5–6[–10] cm, thick, rostrum ca. 15 mm. Spadix sessile, yellow, obovoid, cylindric, or elliptic, 4.5–5.5 × 1.5–1.75 cm, at fruiting stage ca. 8.5 × 3.5 cm. Filaments ca. 2 mm; anthers oblong; staminodes 4, usually around base of ovary in distal part of spadix. Ovary hexagonal-cylindric; stigma subsessile, yellow, drying brown, longitudinally oblong; ovules many with slender funicle. Infructescences pendent from tips of lateral shoots, broadly cylindric, 10–14 × ca. 3 cm; stigmas prominent. Fl. Mar–Jul.

Dense forests in mountain valleys, on large trees; 300–2200 m. Guangdong, Guangxi, Guizhou, Sichuan, SE Xizang (Médog), Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, Thailand, N Vietnam].

The stems are used medicinally for treating fractures.

4. Rhaphidophora megaphylla H. Li, Acta Phytotax. Sin. 15(2): 102. 1977.

大叶崖角藤 da ye ya jiao teng

Lianas, very large to gigantic, to 40 m, very robust. Stem cylindric, very thick, 3–4 cm in diam., internodes 1–6 cm. Leaves dense, spiro-distichous; petiole green, canaliculate, 50–70 cm; petiolar sheath extending to ca. halfway, soon marcescent; leaf blade light green abaxially, green adaxially, ovate-oblong, very large, 50–70[–90] × 28–50 cm, stiffly leathery, base cordate, margin entire, apex abruptly acuminate; primary lateral veins 10–13 on each side, diverging at 80–90° from mid-

rib. Inflorescences in fascicles of up to 4 inflorescences per synflorescence at tips of primary clinging shoots, appearing axillary. Peduncle green, 15–18 × ca. 2 cm. Spathe initially inrolled, white-green, afterward spreading, light yellow, opening deep yellow, oblong-cymbiform, 20–27 × ca. 16 cm, very thick (ca. 2 mm when dry). Spadix sessile, yellow-green, when dry green-black, cylindric, 18–25 × ca. 2.5 cm, base oblique, apex obtuse. Stamens 4; filaments compressed, 2–3 × 0.5–1 mm; anthers yellow, small. Ovary tetragonal- or hexagonal-cylindric, ca. 7 mm; stigma sessile, punctiform; ovules narrowly ellipsoid or cylindric; funicle long and thin, base hairy. Infructescence broadly cylindric, up to 30 × 5 cm. Fl. Apr–Aug.

Moist rain forests in limestone areas, on large trees or on limestone; 600–1300 m. S Yunnan [N Laos, N Thailand, N Vietnam].

5. Rhaphidophora hongkongensis Schott, Bonplandia (Hannover) 5: 45. 1857.

狮子尾 shi zi wei

Lianas. Stem thick, rectangular in cross section; branches pendulous, 5–10 mm in diam.; internodes 1–4 cm, rooting; internodes of juvenile branches elongated to 6–8 cm, often producing aerial roots opposite to petiole. Petiole 5–10 cm, sheathing to pulvinus; pulvinus conspicuous, 4–10 mm; leaf blade pale green abaxially, green adaxially, usually falcate-elliptic, sometimes oblong-lanceolate, or oblanceolate, 20–35 × 5–6(–14) cm, base narrowly cuneate to minutely truncate, apex long acuminate; lateral veins many (but in fresh material almost invisible), diverging at 45° from midrib; juvenile stems with leaf blade obliquely elliptic, base narrowly cuneate on one side, rounded on other side, apex acute. Inflorescences terminal or appearing axillary; peduncle cylindric, 4–5 cm, apex ca. 10 mm in diam. Spathe early caducous, green to light yellow, ovate, 6–9 cm, involute, apex acuminate. Spadix pale green or light yellow, cylindric, 5–8 × 1.5–3 cm. Ovary hexagonal-cylindric, ca. 4 × 2 mm, apex truncate; stigma black, capitate. Fruit yellow-green. Fl. Apr–Aug.

Valley rain forests, evergreen forests, on trees or stone walls; 100–900(–2000) m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [?Indonesia, Laos, ?Malaysia, Myanmar, N Thailand, N Vietnam].

The plant is used medicinally for treating traumatic injuries, fractures, lumbago, rheumatism, and fevers.

6. Rhaphidophora peepla (Roxburgh) Schott, Bonplandia (Hannover) 5: 45. 1857.

大叶南苏 da ye nan su

Pothos peepla Roxburgh, Fl. Ind. 1: 454. 1820; *Monstera peepla* (Roxburgh) Schott; *Scindapsus peepla* (Roxburgh) Schott.

Lianas, medium to large, to 15 m, moderately robust. Stem pale green, terete, 8–12 mm in diam., rooting, internodes 2–5 cm, terete to weakly sulcate on opposite sides, branching usually short but abundant. Leaves tending to cluster at shoot tips; petiole light green, 10–20 cm, shallowly channeled; pulvinus thickened, 8–12 mm; petiolar sheath reaching pulvinus, marces-

cent; leaf blade oblong, elliptic-oblong, or ovate-oblong to oblong-lanceolate, 8–25 × 4–11 cm, subleathery, base rounded to subtruncate, margin entire, apex abruptly acuminate or acute; primary lateral veins many, parallel, diverging at 45° from midrib. Inflorescences solitary, terminal on lateral free branches; peduncle erect, distally recurved, robust, 8–10 cm; bracts around base early caducous, linear, 6–7 cm, membranous. Spathe gaping and thence spreading at anthesis then caducous, dull orange outside, dull yellow to dull orange inside, elliptic-oblong or oblong in outline, 7–9 cm, apex with rostrum ca. 10 mm. Spadix sessile, ochraceous, pale white, or violet [or yellowish white or yellow], cylindric, 5.5–8 cm, ca. 4/5 of total spathe, 1–1.2 cm in diam. Stamens shorter than ovary during female anthesis; at male anthesis filaments extending to project thecae beyond pistil; anthers elliptic. Ovary tetragonal- or hexagonal-cylindric, ca. 2 × 2 mm; stigma oblong, small. Infructescence initially green, later turning dull orange prior to stylar plates sloughing away, broadly cylindric, 10–13 × ca. 3 cm. Fl. Sep–Oct.

Evergreen forests, valley forests, on trees or on stone walls; 1800–2800 m. Guizhou, Yunnan [Bangladesh, Bhutan, N Cambodia, NE India, Laos, N Myanmar, Nepal, N Thailand, N Vietnam].

The plant is used medicinally for treating fractures, traumatic injuries, rheumatic arthralgia, angina pectoris, bronchitis, and coughs.

7. *Rhaphidophora luchunensis* H. Li, Acta Phytotax. Sin. 15(2): 103. 1977.

绿春崖角藤 lü chun ya jiao teng

Lianas. Juvenile stems dark green, rooting, creeping on humus soil of forest understories or over bark mosses on trees, back rounded, moniliform or torulose, internodes thickened, 10–20 × 5–7 mm. Petiole 20–25 cm; sheath caducous, membranous; pulvinus ca. 10 mm; leaf blade light green abaxially, green adaxially, black-brown when dry, ovate or ovate-lanceolate, 10–27 × 5–12 cm, subleathery, base obliquely rounded, apex acuminate or caudate, unequally pinnately lobed; pinnae 2 or 3 on each side, or only on 1 side and other side entire, sinuses reaching to 2–3 cm from midrib, sometimes on mature branches some leaf blades pinnately lobed and others entire, or all leaf blades entire; lateral veins 9 or 10 on each side of midrib, ascending obliquely. Inflorescence nearly terminal; peduncle erect, green, robust, 12–14 cm. Spathe early caducous, spreading, light yellow-green, ovate, 14–16 cm. Spadix sessile, pale yellow, cylindric, 12–13 × 2–3 cm, base oblique, apex obtuse. Flowers bisexual. Stamens 4; anthers sessile. Ovary green-white, pentagonal-cylindric, ca. 8 × 4 mm, apex truncate; ovules oblong, with slender funicle, parietal; stigma sessile, yellow-brown, oblong. Berry free, juicy, orange, apex yellow-green, obconic, ca. 6 × 4 mm, 4–6-angulate. Fl. Sep–Nov, fr. next Jun–Jul.

- Evergreen forests, mossy forests, on large trees; 1700–2500 m. SE Xizang (Mêdog), Yunnan.

8. *Rhaphidophora laichauensis* Gagnepain, Notul. Syst. (Paris) 9: 137. 1941.

莱州崖角藤 lai zhou ya jiao teng

Lianas. Stem 1–2 cm in diam., internodes 3–4 cm, branched. Petiole ca. 30 cm, sheathing; pulvinus ca. 15 mm; leaf blade broadly ovate, ca. 35 × 25–30 cm, leathery, base truncate in outline, pinnately divided; pinnae 3 or 4 on each side, linear-oblong, ca. 14 × 3–4 cm, apex falcate-truncate with ascending falcate tip, with 1 or 2 equally parallel costae, sinuses almost reaching midrib. Peduncle 15–18 cm × ca. 5 mm. Spathe yellow, 10–11.5 cm. Spadix sessile, cylindric, ca. 11 × 1.5–2 cm. Ovary hexagonal-cylindric, apex truncate; stigma sessile, circular. Berry many seeded. Seeds spotted, oblong, fusiform, ca. 2 × 0.7 mm. Fl. May–Aug, mature fr. next year.

Dense forests, on trees or stone walls; below 1500 m. Hainan, Yunnan [N Vietnam].

9. *Rhaphidophora glauca* (Wallich) Schott, Bonplandia (Hannover) 5: 45. 1857.

粉背崖角藤 fen bei ya jiao teng

Pothos glaucus Wallich, Pl. Asiat. Rar. 2: 45. 1831 [*“glauca”*]; *Monstera glauca* (Wallich) K. Koch ex Ender; *P. wallichii* Steudel, nom. illeg. superfl.; *Rhaphidophora glauca* var. *khasiana* J. D. Hooker; *Scindapsus glaucus* (Wallich) Schott.

Lianas, to 10 m, but frequently smaller, slender to rather robust. Stems 0.7–2.5 cm in diam., terete in cross section; climbing stems with internodes elongated and rooting; free lateral stems forming a complex series of branches eventually pendent under their own weight. Leaves scattered, with 1 foliage leaf at each node except for proximal part of a branch where first few nodes possess a prophyll and 1 or more cataphylls instead of foliage leaves; petiole 9–33 cm, shallowly channeled, apical pulvinus indistinct; petiolar sheath reaching base of leaf blade; leaf blade pale to strikingly glaucous green abaxially, dull mid-green adaxially, ovate in outline, ± symmetric, 11.5–42 × 7.5–24 cm, base truncate, oblique, or shallowly cordate, apex acuminate, variously pinnatifid, pinnatipartite, or pinnatisect, depending upon degree of maturity; pinnae 2–5(–8) per side, each pinna with 3 conspicuous primary lateral veins. Inflorescences erect, solitary, arising from tips of free lateral branches; peduncle spreading, apical part curved, 10–25 cm. Spathe opening wide, pale glaucous green in bud, opening pale to mid-yellow, waxy, oblong-ovate, 4.5–8.5 × 0.8–1.3 cm, apex acuminate. Spadix sessile, dull cream-colored, cylindric, 4.5–8.5 cm, 0.8–1.3 cm in diam. at widest point, base slightly tapering, apex truncate-rounded. Stamens 4 per flower; filaments flat, 2.7–3 × 0.8–1.5 mm, not increasing in length at anthesis; pollen simply expelled from between pistils. Pistils 3–5.5 mm, apex 3–4 mm wide, truncate, smooth; stigma flat, circular to elliptic, 0.6–1 mm; ovules numerous, on 2 intrusive parietal placentae. Infructescence 12–15 × 3–3.5 cm when ripe, subtended by persistent withered spathe remains early in development; stylar tissue on ripening falling as irregular plates to expose ovary cavities with seeds embedded in copious, pale orange pulp. Seeds numerous per ovary, narrowly ellipsoid, 1.5–2 × ca. 1 mm. Fl. Aug–Sep.

Montane broad-leaved forests, trees; below 2000 m. SE Xizang (Mêdog, Zayü) [Bangladesh, Bhutan, NE India, Laos, Myanmar, Nepal, N Thailand].

10. Rhaphidophora dulongensis H. Li, Acta Bot. Yunnan., Suppl. 5: 7. 1992.

独龙崖角藤 du long ya jiao teng

Lianas. Stem green, cylindric, 1–2 m, 2–3 cm in diam., internodes 0.5–2.5 cm. Petiole 41–49 × ca. 1.5 cm, basal 3–4 cm sheathing; pulvinus indistinct; leaf blade pale green abaxially, green adaxially, oblong-ovate in outline, ca. 50 × 35 cm, subleathery, base rounded or subcordate, pinnately divided; pinnae 6–9 per side, broadly linear, oblique, those at middle of leaf 4–5 cm wide, apex truncate with falcate tip; costae 3 or 4, equally strong, parallel; sinuses nearly reaching midrib. Peduncle solitary, cylindric, 15–20 cm × 8–10 mm. Spathe unknown. Spadix sessile, pale green, cylindric, ca. 10 × 1.8 cm. Ovary quadrangular-cylindric or pentagonal-cylindric, apex truncate; stigma capitate. Fr. Nov–Mar.

• Valley forests; below 2500 m. Yunnan (Gongshan).

11. Rhaphidophora crassicaulis Engler & K. Krause in Engler, Pflanzenr. 37(IV. 23B): 52. 1908.

粗茎崖角藤 cu jing ya jiao teng

Lianas. Branches dorsiventrally compressed, to 3 cm in diam., internodes short. Leaf blade ovate in outline, 30–55 × 22–36 cm, leathery, base obtuse, apex acute, pinnately divided; pinnae 6–10 or more per side, reaching midrib or nearly so, linear-falcate, base decurrent, apex truncate; primary lateral veins usually 2–4, equally strong, parallel, along midrib with perforations (8–20 × 2–5 mm), pinnae at middle of leaf 15–21 × 1–5 cm. Inflorescences terminal on lateral branches, solitary, erect; peduncle robust, cylindric, 12–20 × 1–1.6 cm. Spathe unknown. Spadix sessile, white, cylindric, 10–17 cm, 2–2.5 cm in diam. at base. Ovary cylindric, 6–8 × ca. 2 mm; ovules many, oblong, funicle long; style broadly conic; stigma circular. Fr. Nov–Dec.

Dense tropical forests, on trees or over stones; below 1300 m. Guangxi, Hainan, Yunnan [N Laos, N Vietnam].

12. Rhaphidophora decursiva (Roxburgh) Schott, Bonplandia (Hannover) 5: 45. 1857.

爬树龙 pa shu long

Pothos decursivus Roxburgh, Fl. Ind. 1: 456. 1820 [“decurvata”]; *Monstera decursiva* (Roxburgh) Schott; *Rhaphi-*

dophora affinis Schott; *R. eximia* Schott; *R. grandis* Schott; *R. insignis* Schott; *Scindapsus decursivus* (Roxburgh) Schott.

Lianas, very large, to 20 m or more, very robust. Stem green at back, yellow at front, robust, 3–5 cm in diam., rooting, internodes 1–2 cm. Leaves scattered, each foliage leaf separated from next by several (up to 7) cataphyll-bearing nodes; petiole green, cylindric, 20–40 cm, shallowly canaliculate; pulvinus indistinct; petiolar sheath extending to ca. 2/3 along petiole; juvenile leaf blade orbicular, ca. 16 × 13 cm, margin entire, apex abruptly acute; mature leaf blade pale green abaxially, green adaxially, oblong-ovate, ovate in outline, 60–70[–100] × 40–50 cm, base subcordate, margin irregularly and asymmetrically pinnately divided, apex acute; pinnae 9–15 per side, ca. 20 × 3–5 cm at mid-leaf, base narrowed, apex truncate with ascending falcate tip, with a strong costa. Inflorescences axillary, solitary; peduncle green, cylindric, very robust, 11–20 × 1.5–3 cm. Spathe initially involute, afterward spreading, yellow on both sides, cymbiform, oblong-ovate, 17–20 × 10–12 cm. Spadix sessile, gray-green, cylindric, 15–16 × 2–3 cm, base oblique. Filaments flat, ca. 5 mm, nearly as long as ovary, base angustate; anthers yellow, oblong, less than 1 mm. Ovary hexagonal-conic, ca. 5 × 3 mm; style distinct, ca. 1 cm; stigma yellow, longitudinally oblong; ovules many; funicle laterally inserted, slender. Infructescence 15–20 × 5–5.5 cm. Berry green-white, base white or yellow, hexagonal-obconic, ca. 18 × 5 mm, apex with a persistent style, stylar region green-white, sloughing to reveal white or yellow pulp cavity. Fl. May–Aug, fr. mature next Jul–Sep.

Monsoon rain forests, valley evergreen broad-leaved forests, creeping on ground, over rocks, or climbing against trees; below 2200 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, SE Xizang (Mêdog, Zayü), Yunnan [Bangladesh, Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Sri Lanka, N Thailand, Vietnam].

The stems and leaves are used medicinally for treating traumatic injuries, fractures, swellings, colds, lumbago, snake bites, coughs, and bronchitis.

There has been much confusion over *Rhaphidophora decursiva* and *Epipremnum pinnatum* because both species have large, pinnatifid leaves, but *E. pinnatum* has a leaf blade with tiny perforations (ca. 2 mm) along and adjacent to the midrib, an ovary with 2 or 3 ovules, and a sessile, longitudinally linear-oblong stigma. There is also a difference in leaf arrangement: *R. decursiva* has foliage leaves scattered and interspersed with several (up to 7) cataphyll-bearing nodes, whereas *E. pinnatum* has leaves often clustered distally without such cataphyll-bearing nodes.

7. EPIPREMNUM Schott, Bonplandia (Hannover) 5: 45. 1857.

麒麟叶属 qí lin ye shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Lianas, large to very large. Stems robust, woody, branched and rooting. Leaves long petiolate; petiole with pulvinus at junction with leaf blade, somewhat sheathing at base; leaf blade large, entire, pinnatifid, or pinnatisect, with perforations along midrib or not. Inflorescences terminal or sometimes displaced, solitary; peduncle robust. Spathe caducous, cymbiform, ovate, acute or acuminate. Spadix sessile. Flowers bisexual, sometimes with female ones at spadix base and these sterile, lacking perigone. Stamens 4(–6); filaments linear, flat; anthers much shorter than filaments; thecae ellipsoidal, longitudinally dehiscent. Ovary polygonal-cylindric, apex truncate, 1-loculed; ovules 2–4, inserted at base of parietal placenta, sometimes 6–8, distichous on parietal placentae, anatropous, with short funicle; stigma sessile, linear-oblong, longitudinal. Fruit small. Seeds reniform, usually striate.

About 20 species: tropical Asia, Australia, Pacific islands; one species in China.

Epipremnum aureum (Linden & Andre) Bunting is cultivated in gardens.

1. Epipremnum pinnatum (Linnaeus) Engler, Pflanzenr. 37(IV. 23B): 60. 1908.

麒麟叶 qi lin ye

Pothos pinnatus Linnaeus, Sp. Pl., ed. 2, 2: 1324. 1763; *Epipremnum angustilobum* K. Krause; *E. elegans* Engler; *E. formosanum* Hayata; *E. glaucicephalum* Elmer; *E. merrillii* (Engler) Engler & K. Krause; *E. mirabile* Schott; *Monstera caudata* (Roxburgh) Schott; *M. dilacerata* (K. Koch & Sello) C. Koch; *M. pinnata* (Linnaeus) Schott; *M. pinnatifida* (Roxburgh) Schott; *Polypodium laciniatum* N. L. Burman; *Pothos caudatus* Roxburgh; *P. pinnatifidus* Roxburgh; *Rhaphidophora caudata* (Roxburgh) Schott; *R. cunninghamii* Schott; *R. dilacerata* (K. Koch & Sello) C. Koch; *R. formosana* Engler (1879); *R. formosana* (Hayata) M. Hotta (1970); *R. laciniata* (N. L. Burman) Merrill; *R. lovellae* F. M. Bailey; *R. merrillii* Engler; *R. neocaldonica* Guillaumin; *R. pertusa* (Roxburgh) Schott var. *vitiensis* (Schott) Engler; *R. pinnata* (Linnaeus) Schott; *R. pinnatifida* (Roxburgh) Schott; *R. vitiensis* Schott; *R. wallichii* Schott; *Scindapsus caudatus* (Roxburgh) Schott & Endlicher; *S. dilaceratus* K. Koch & Sello; *S. forsteri* Endlicher; *S. pinnatifidus* (Roxburgh) Schott; *S. pinnatus* (Linnaeus) Schott; *Tornelia dilacerata* (K. Koch & Sello) Schott.

Root climbers, to 15 m. Mature stem 5–40 mm in diam., internodes separated by prominent leaf scars, obscured by sheath fibers, active stems lustrous green with prominent irregular longitudinal whitish crests. Foliage leaves often clustered distally; petiole dark green, 19.5–60 cm × 3–13 mm, canalicu-

late, smooth; apical pulvinus 16–70 × 3–5 mm, basal pulvinus 3–7 × 1–1.5 cm; petiolar sheath extending to halfway along apical pulvinus, disintegrating into netted fibers; leaf blade ovate to oblong-elliptic, 10–93 × 5–60 cm, submembranous, base slightly cordate, regularly pinnatifid to pinnatisect, apex acuminate; pinnae paler abaxially, adaxially dark green, 1.2–6.5 cm wide, with tiny perforations along and adjacent to midrib, pinnae each with 1 primary lateral vein and several parallel interprimary veins, higher order venation reticulate, midrib prominently raised abaxially, impressed adaxially. Inflorescence several together, partially obscured by netted fibers; peduncle pale green, 5.5–21.5 cm × 4–10 mm, terete. Spathe dull yellow to mid-green outside, dull yellow or pale green inside, canoe-shaped, 7–23.5 × 3–15 cm, stoutly attenuate to 15 mm, opening almost flat at anthesis. Spadix sessile, white, later glaucous gray-green to yellow, cylindric, 8.5–25 × 1.1–3.5 cm, base slightly obliquely inserted. Flowers 3–7 mm in diam. Ovary cylindric, 4–12 × 2–7 mm, basal part slightly compressed; ovules 2 or 3; stylar region trapezoid, 3–7 × 1.5–4 mm, rather robust, truncate; stigma longitudinally linear-oblong, 2–6 × 0.1–0.5 mm. Fruit mid-green. Seeds reniform, ca. 4.5 × 3.5 mm. Fl. Apr–Jul.

Tropical rain forests, mountain forests, creeping and climbing on trees, rocks, or stone walls; below 2000 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Singapore, Thailand, Vietnam; Australia (Queensland), Pacific islands].

The plants are used medicinally to treat traumatic injuries, abscesses, and rheumatic arthralgia.

8. SCINDAPSUS Schott in Schott & Endlicher, Melet. Bot. 21. 1832.

藤芋属 teng yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Lianas, creeping and climbing against trees with aid of adhesive roots. Stem robust, branched. Leaves spiro-distichous; petiole usually sheathing or winged throughout its length; leaf blade undivided, pinnately veined, with very numerous parallel, thin lateral veins. Inflorescences solitary, near stem apices; peduncle at last laterally protruding from petiolar sheath. Spathe not constricted, initially involute and tubular, afterward somewhat inflated, finally expanding only by a rather narrow longitudinal slit, never entirely or conspicuously flat-spreading, falling off as a whole leaving a thick scar on apex of peduncle. Spadix drying black, cylindric, much thicker than peduncle. Flowers many, bisexual, naked. Stamens 4; filaments strap-shaped. Ovary with flat, often subrhomboid or quadrangular apex, 4–6-angular, 1-loculed; ovule 1, basal; stigma sessile, disciform to linear. Seeds subreniform.

About 36 species: tropical Asia; one species in China.

1. Scindapsus maclarei (Merrill) Merrill & F. P. Metcalf, Lingnan Sci. J. 21: 5. 1945.

海南藤芋 hai nan teng yu

Rhaphidophora maclarei Merrill, Philipp. J. Sci. 21: 337. 1922; *Scindapsus megaphyllus* Merrill.

Lianas. Stem robust, ca. 2.5 cm in diam. Petiole 26–32 cm, base imbricate, sheath reaching pulvinus; leaf blade pale green abaxially, green adaxially, drying pale brown, oblong-elliptic or ovate-elliptic, 23–46 × 12–24 cm, leathery, base subcordate, margin entire, apex acute or shortly acuminate; lateral veins numerous, diverging at 70–80° from midrib. Peduncle robust.

Spatha yellow, involute-tubular, 18–22 cm, apex acuminate. Spadix sessile, cylindric, ca. 15 × 2.5 cm. Filaments ca. 4 mm; anthers ovoid, ca. 3 mm. Fruit ca. 9 × 5 mm, apex truncate, 1-loculed, 1-seeded. Fl. Nov–Dec.

Dense tropical forests, creeping and climbing on trees and stone walls; 400–600 m. Hainan [N Thailand, N Vietnam].

Scindapsus maclarei differs from the vegetatively very similar *Rhaphidophora megaphylla* in leaf venation (primary lateral veins numerous and not differentiated from the interprimary veins, diverging at 70–80° from midrib in *S. maclarei* vs. primary lateral veins 10–13 on each side, diverging at 80–90° from midrib, and strongly differentiated from the interprimary veins in *R. megaphylla*).

9. LASIA Loureiro, Fl. Cochinch. 1: 64, 81. 1790.

刺芋属 ci yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, evergreen, armored, helophytic or of forest swamps. Stem long creeping and stoloniferous with terminal part erect or ascending, with armed internodes. Leaves several, crowded at shoot apex; petiole long, aculeate, inside with longitudinal air vessels; pulvinus well developed, solid; leaf blade sagittate-hastate, simple or divided, prickly abaxially on larger veins, pinnately veined above bifurcate basal veins; secondary venation reticulate. Inflorescences solitary, long pedunculate; peduncle prickly. Spathe constricted above spadix; basal part when mature opening by a slit, long caudate part involute and twisted, at last whole falling off. Spadix sessile, cylindric, within widened part of spathe. Flowers bisexual; tepals 4–6, free, with vaulted-truncate apex. Stamens 4–6; anthers elliptic, dehiscent by a longitudinal slit; filaments much longer. Ovary 1-loculed, 1-ovuled; ovule hanging from apex of locule; style very short; stigma subspherical. Fruit a berry; exocarp thin; mesocarp finely fibrous; endocarp rather thick, leathery, upper part and area around stigma prickly. Seed large, compressed; endosperm absent, embryo large, campylotropous.

Two species: tropical Asia; one species in China.

1. Lasia spinosa (Linnaeus) Thwaites, Enum. Pl. Zeyl. 336. 1864.

刺芋 ci yu

Dracontium spinosum Linnaeus, Sp. Pl. 2: 967. 1753; *Lasia aculeata* Loureiro; *L. crassifolia* Engler; *L. desciscens* Schott; *L. hermannii* Schott; *L. heterophylla* (Roxburgh) Schott; *L. jenkinsii* Schott; *L. loureiroi* Schott; *L. roxburghii* Griffith; *L. zollingeri* Schott; *Pothos heterophyllum* Roxburgh; *P. lasia* Roxburgh; *P. spinosus* (Linnaeus) Buchanan-Hamilton ex Wallich.

Herbs, 1–2 m tall. Stem long creeping and stoloniferous, erect or ascending, ca. 2.5 cm in diam., internodes with stout prickles. Petiole 32–125 cm, laxly prickly, sometimes almost smooth; pulvinus 15–35 mm, aculeate; leaf blade very variable, sagittate-hastate, 35–65 × 20–60 cm, simple or divided; anterior lobe entire or pedate to near midrib, acuminate; posterior lobes strongly downwardly directed to subspreading, once or twice bifid with 3 or 4 narrow to rather long acute or acuminate lateral segments; primary lateral veins 2–4, strong, secondary lateral veins thinner, higher order veins very numerous, all venation flush above, abaxially with rather small, straight to slightly curved prickles. Peduncle to 47 cm, laxly prickly. Spathe dull

orange to black-red outside, dull yellow to rarely dull crimson inside, 18–35 cm with caudate part to 28 cm, proximally widened, very much shorter, 3–10 cm wide. Stipe of spadix obscure; spadix cylindric, 3–5 cm, in fruit elongated to 8 cm. Tepals oblong, 1.5–3 mm, apex triangular hooded, keeled. Filaments ca. 1.5 × 0.8 mm; anthers ca. 0.8 × 0.8 mm. Ovary ovoid, ca. 1.5 mm high. Fruit obpyramidal, ca. 1 cm wide, densely warty-aculeate, sides unarmed, when dry irregularly ribbed, apex truncate. Seed ovoid-cordate, 5–7 mm. Fl. Jul–Sep.

Swamps, riverbanks, ditches, moist places in tropical and subtropical forests, sometimes cultivated along fish ponds and rice fields; below 1500 m. Guangdong, Guangxi, Hainan, Taiwan, S Xizang, Yunnan [Bangladesh, Bhutan, Cambodia, NE and SE India, Indonesia, Laos, Malaysia, Myanmar, Nepal, New Guinea, Sri Lanka, Thailand, Vietnam].

The Chinese record of *Cyrtosperma lasioides* Griffith (Fl. Hainan. 4: 129. 1977; FRPS 13(2): 13. 1979) was based on *W. T. Tsang* 553, collected in Hainan. This was, however, a misidentification, and the plants are actually *Lasia spinosa* (see H. Li et al., Acta Phytotax. Sin. 41: 577–581. 2003).

The young leaves are used as a vegetable. The rhizomes are used medicinally for treating tuberculosis of lymph nodes, swollen lymph nodes, stomach aches, snake and insect bites, injuries, and rheumatism.

10. CALLA Linnaeus, Sp. Pl. 2: 968. 1753.

水芋属 shui yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce, Josef Bogner

Aroides Heister ex Fabricius; *Callaria* Rafinesque; *Provenzalia* Adanson.

Herbs, perennial. Rhizome creeping. Leaves several, distichous; petiole sheathing; sheath ligulate, long; leaf blade broadly ovate-cordate to cordate-orbicular, apex acute to acuminate; venation parallel-pinnate. Inflorescence solitary, flowering with leaf appearance; peduncle erect. Spathe persistent, fully expanded, elliptic to ovate, base decurrent, apex acuminate. Spadix stipitate, cylindric, apex obtuse. Flowers numerous, densely arranged, bisexual, naked (perigone absent), only uppermost flowers often male. Stamens free, usually 6, sometimes more (9–12); filaments flattened; anthers dorsifixed; connective short and slender; thecae ellipsoid, dehiscing by longitudinal slit; pollen grains diaperturate, globose, small, exine foveolate and apertural exine verrucate. Pistil ovoid, 1-loculed; ovules 6–9 (rarely more), anatropous and oblong; funicle distinct; placenta basal; stylar region attenuate; stigma subhemispheric, small. Infructescence subglobose to broadly ellipsoid. Berry globose-conic, with many seeds (usually 4–9). Seed oblong-cylindric to somewhat ellipsoid; testa thick, scrobiculate toward chalaza and sulcate-striate toward micropyle; raphe prominent; embryo axile, elongate; endosperm copious. $2n = 36, 54, 72$.

One species: N temperate regions and subarctic areas of Asia, Europe, and North America, including China.

1. Calla palustris Linnaeus, Sp. Pl. 2: 968. 1753.

水芋 shui yu

Rhizome creeping, green, cylindric, to 50 cm, robust, 1–2(–3) cm in diam., somewhat spongy; nodes rooting. Cataphylls lanceolate, to 10 cm, apex acuminate. Petiole green, terete, (6–)12–24 cm (and longer to 30[–40] cm), base sheathing; sheath 7–8(–12) cm, with free ligule; leaf blade green, (4–)6–14 × (4–)6–14 cm; primary veins (8–)10–14(–18), pinnately arching from a strong midvein on each side, intra-marginal vein inconspicuous. Peduncle green, terete, 15–30 ×

0.8–1.2 cm. Spathe green outside, white inside, (3–)4–6(–8) × 3–3.5(–5) cm, apex with an acumen ca. 1 cm. Spadix 1.5–3 × 0.7–1.5 cm; stipe 5–7 mm. Flowers yellowish green, 2–2.2(–2.5) mm tall. Infructescence (2–)3–5 × (1.5–)2.5–3.5 cm. Berries red, (5–)6–12 × (4–)5–10 mm. Seed brown, 3–5 × ca. 2 mm. Fl. May–Jul, fr. Aug–Sep.

Creeping helophyte on swampy shores of streams, rivers, lakes, and ponds, forest swamps, swampy meadows, in shallow water, often with *Sphagnum* moss; below 1100 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Asia, N Europe, North America].

11. HOMALOMENA Schott in Schott & Endlicher, Melet. Bot. 20. 1832.

千年健属 qian nian jian shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, evergreen, aromatic. Stem creeping, erect or ascending. Leaves long petiolate; petiole sheathing up to halfway, usually longer than leaf blade, frequently distinctly articulate ca. halfway along; leaf blade oblong, elliptic, lanceolate, deltoid, or sagittate, thinly to rather stiffly leathery, base usually cordate, apex acuminate usually with tubular tip; primary veins all diverging from midrib, with rather few basal, secondary veins striate, tertiary veins often numerous and very much thinner, all veins straight over most of their length, only near apex arcing into a submarginal vein. Inflorescences usually several together. Spathe persistent, often constricted. Spadix elongate; stipe very short or absent; female flowers usually each with an associated staminode; distal male zone usually separated from female zone by a ring of staminodes, very rarely a naked or near naked interstice; flowers unisexual, naked; female flowers: ovary incompletely 2–5-loculed with parietal and axile (very rarely basal) placentation, ovules numerous, semi-anatropous with long, slender funicle, style minute, stigma sessile or terminating a minute style, disciform or lobed; sterile flowers sometimes present at base of male axis of spadix; male flowers (fertile) consisting of 2–6 stamens, thecae extrorsely dehiscent by a slit, connective broad or narrow. Berry few or many seeded. Seeds on a long funicle, longitudinally striate, ovoid-lageniform.

About 110 species: tropical America and Asia; four species (two endemic) in China.

Since the now long out-of-date full revision of Engler and Krause (in Engler, Pflanzenr. 55(IV. 23Da): 25–81. 1912), there have been fragmentary floristic accounts (Ridley, J. Straits Branch Roy. Asiat. Soc. 41: 169–188. 1905; Merrill, J. Straits Branch Roy. Asiat. Soc., Special Ed., 86–109. 1921; Alderwerelt van Rosenburgh, Bull. Jard. Bot. Buitenzorg 3: 163–229, 320–347. 1922; Furtado, Gard. Bull. Straits Settlem. 10: 183–238. 1939; Proc. 6th Pacific Sci. Congr. (California, 1939) 4: 577–578. 1941), an uncritical species listing for Malesia focusing primarily on Sumatra (Hotta, Gard. Bull. Singapore 38: 43–54. 1985), a revision for New Guinea and the Bismarck Archipelago (Hay, Blumea 44: 41–71. 1999), and various ad hoc new taxa (Hotta, Diversity Dynam. Pl. Life Sumatra, 73–120. 1986; Acta Phytotax. Geobot. 44(2): 93–96. 1993; Boyce, Kew Bull. 49: 793–801. 1994; Hay & Herscovitch, Gard. Bull. Singapore 54: 171–178. 2002), but no attempt has been made to undertake a full revision of *Homalomena*. The lack of a reliable taxonomy poses considerable problems for field workers given that *Homalomena* is one of the most speciose and taxonomically intractable aroid genera in the Asian tropics.

The problems presented by a lack of reliable taxonomy are compounded by the poor state of preservation of many of the historical types; the cryptic nature of most of the systematically significant morphologies, notably the presence, absence, and disposition of sterile flowers; the generally large and complex vegetative structures that do not lend themselves readily to traditional herbarium voucherizing methodologies; and the fleeting anthesis period such that even well-prepared herbarium specimens are frequently taxonomically useless because inflorescences were prepared post-anthesis, by which time many significant structures had deliquesced or been subject to pre-preservation damage by the most frequent inflorescence visitors, chrysomelid beetles, and post-preservation destruction by herbarium beetles.

Homalomena is a taxonomically complex group and, notwithstanding the above difficulties, is in urgent need of a rigorous study aimed at resolving the taxonomy and phylogeny. This is imperative not only because *Homalomena* is one of the most abundant, speciose, and least well understood of the mesophytic aroid genera in tropical Asia, but also because the genus is now becoming the focus of interest for pharmaceutical research due to the terpenoids and flavonoids occurring in the plant tissues; such studies must have a basis in sound taxonomic understanding or they risk being futile.

- 1a. Leaf blade rounded at base, ovate, ca. 18 × 12 cm.
 - 2a. Inflorescences 1 or 2 together; staminode equaling associated pistil 1. *H. aromatica*
 - 2b. Inflorescences up to 6 together; staminode exceeding associated pistil 4. *H. hainanensis*
- 1b. Leaf blade sagittate at base.
 - 3a. Spadix ca. 3.5 cm × 4–6 mm 2. *H. occulta*
 - 3b. Spadix 4–5 cm × ca. 12 mm 3. *H. kelungensis*

1. Homalomena aromatica (Sprengel) Schott in Schott & Endlicher, Melet. Bot. 20. 1832.

芬芳千年健 fen fang qian nian jian

Zantedeschia aromatica Sprengel, Syst. Veg. 3: 765. 1826;
Calla aromatica (Sprengel) Roxburgh; *Zantedeschia foetida* K. Koch.

Herbs somewhat robust, stemless to decumbent, to 60 cm tall, smelling of camphor. Stem initially erect, later decumbent, 1–3 cm in diam. Leaves several together; petiole pale to mid-green with slightly darker longitudinal streaks, to 35 cm; petiolar sheath persistent, 4–7 cm, margins membranous; leaf blade mid-green, drying distinctively pale green, ovate-sagittate to elliptic-sagittate or lanceolate-sagittate, 20–30 × 10–17 cm, thinly leathery, base sagittate, sinus broad, ca. 5 cm, apex acute to long acuminate, with a tubular mucro ca. 2 mm; venation variously differentiated, posterior costae with 4–6 primary lateral veins arising ± simultaneously, anterior costa with 4–6 primary lateral veins and a similar number of virtually indistinguishable interprimary veins diverging from midrib at 45°, secondary venation striate. Inflorescences 1 or 2 together; peduncle erect (developing and floral) to declinate (post-anthesis and fruiting), colored as petiole, 10–18 cm. Spathe oblong, 8–10 cm; limb gaping at anthesis, then closing again. Spadix tapering cylindric, 7–9 cm, subequaling spathe, stipitate; stipe ca. 5 mm; female zone 1.5–3 × ca. 1 cm; ovary pale green, ovoid-globose, ca. 2 mm in diam., with an associated clavate staminode subequaling height; stigma sessile, capitate; staminode ivory-colored; male zone 5.5–6 × ca. 0.5 cm; male flowers white, rhombic-hexagonal in apical view, 1–2 mm in diam., each comprising 2 stamens overtopped by a large connective. Infructescence when ripe shedding spathe by slightly ragged basal abscission. Berries ripening dull orange yellow, smelling of overripe plums.

Evergreen perhumid broad-leaved tropical and subtropical forests, less often in drier habitats such as seasonally partially deciduous perhumid forests, but then always associated with permanent water; 200–1000 m. ?Guangxi, S Yunnan (Xishuangbanna) [Bangladesh, NE India, Laos, N Myanmar, N Thailand, Vietnam].

2. Homalomena occulta (Loureiro) Schott in Schott & Endlicher, Melet. Bot. 20. 1832.

千年健 qian nian jian

Calla occulta Loureiro, Fl. Cochinch. 2: 532. 1790; *Spirospatha occulta* (Loureiro) Rafinesque; *Zantedeschia occulta* (Loureiro) Sprengel.

Rhizome creeping; terminal part of stem erect, 30–50 cm tall; cataphylls and prophylls linear-lanceolate, 15–16 × ca. 2.5 cm. Petiole 25–40 cm, proximal part with 2–5 mm wide sheath; leaf blade sagittate-cordate, 15–30 × (8–)15–28 cm or usually more; primary veins 7 per side, 2–4 of these basal, downward to basal lobes and then arching into leaf margin, secondary and tertiary ones thinner, numerous. Inflorescences 1–3 together; peduncle shorter than petioles, 10–15 cm. Spathe pale green,

oblong or elliptic, 5–6.5 × 3–3.2 cm, fusiform before anthesis, distal part slightly spreading and shortly boat-shaped at anthesis, 5–6 cm wide when spread out completely, apex with a beak ca. 1 cm. Spadix sessile or shortly stipitate, 3–5 cm; female zone 1–1.5 cm × 4–5 mm; ovary oblong, 3-loculed, with 1 staminode at side of base; ovules numerous; placentation axile; stigma disciform; male zone 2–3 cm × 3–4 mm. Seeds brown, oblong. Fl. Jul–Sep.

Dense valley forests, bamboo forests, mountain shrub forests; below 100–1100 m. Guangdong, Guangxi, Hainan, Yunnan [Laos, Thailand, Vietnam].

One of us (Boyce) notes that the correct application of the name *Homalomena occulta* is obscure. The type (that almost certainly came from Hué in Vietnam) is lost, and the material that Schott annotated as being *H. occulta* consists of at least three species. The above description appears to be based on at least two species.

The aromatic rhizomes are used medicinally to treat traumatic injuries, fractures, stomach aches, lumbago, intestinal parasites, and rheumatic arthralgia.

3. Homalomena kelungensis Hayata, Icon. Pl. Formosan. 8: 135. 1919.

台湾千年健 tai wan qian nian jian

Leaves 4 or 5; petiole ca. 60 cm, base sheathing; leaf blade broadly ovate, ca. 33 × 25 cm, membranous, base sagittate-cordate, margin entire, apex triangular-acute; veins almost parallel. Peduncle ca. 35 cm. Spathe pale green, ca. 6 cm, apex acute. Spadix cylindric, 4–5 × ca. 1.2 cm; female zone ca. 1.2 × 1.2 cm; ovary obovoid, 2–2.5 mm, apex obtuse; staminodes clavate; male zone ca. 3 × 1.3 cm, obtuse; stamens flattened, ca. 1.5 mm. Fl. Mar.

• N Taiwan (Jilong).

4. Homalomena hainanensis H. Li, Acta Phytotax. Sin. 15(2): 103. 1977.

海南千年健 hai nan qian nian jian

Stem erect, ca. 40 cm tall, ca. 1.2 cm in diam. Petiole ca. 46 cm, basal 10–12 cm sheathing; leaf blade green, ovate-oblong, ca. 18 × 11–12 cm, base broadly rounded, apex abruptly acuminate, acute with tubular tip 2–3 mm; primary lateral veins 5 or 6 per side, secondary veins numerous, parallel. Inflorescences several (up to 6) together; peduncle 4–5 cm, slender, 1–2 mm in diam. Spathe yellow-green, cymbiform, ca. 3.5 × 1.2 cm, apex with rostrum 3–4 mm. Spadix shorter than spathe, ca. 2.5 cm; female zone cylindric, ca. 10 × 3 mm; ovary ovoid; stigma subsessile, capitate; usually 1 staminode exceeding associated pistil; male zone clavate, ca. 2 cm × 1.5–3 mm, apex obtuse. Fl. Oct.

• Open forests on mountains. Hainan.

Homalomena hainanensis differs from other Chinese species in its leaf blade base broadly rounded (not cordate), spathe small (ca. 3.5 cm), spadix shorter (ca. 2.5 cm), and male zone clavate (ca. 2 cm).

12. SCHISMATOGLOTTIS Zollinger & Moritzi in Moritzi, Syst. Verz. 83. 1846.

落檐属 luo yan shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, evergreen, creeping, stoloniferous, erect or rarely ascending, colony-forming, clump-forming, or solitary, terrestrial or rheophytic. Leaves ± crowded; petiole much longer than leaf blade, proximally sheathing; leaf blade usually paler or even glaucous abaxially, green adaxially, frequently with discolored banding along midrib or between midrib and submarginal veins, less often variously spotted, cordate, sagittate, less often lanceolate, softly subfleshy to thinly leathery; primary, secondary, and tertiary lateral veins parallel, or secondary and tertiary ones partly diverging at a narrow angle from primary veins, all reaching into a submarginal vein. Inflorescences usually several together; peduncle shorter than petioles. Spathe constricted, part below constriction persistent, enveloping female zone of spadix, distal spathe circumscissile and caducous [elsewhere variously caducous, marcescent, or less often persistent]. Stipe of spadix short or absent; proximal part of spadix axis equivalent to all or part of female zone adnate to spathe; spadix elongate; proximal part female, distal part male, these separated or not by an interstice either with staminodes or less often naked; male zone of spadix fertile proximally, sterile distally, falling off later than distal part of spathe. Flowers numerous, unisexual, naked; female flowers: ovary 1-loculed, ovules rather few to very numerous, on 2–4 parietal to subbasal placentae, stigma sessile, disciform; interpellular staminodes sometimes present and female zone often with 1 or 2 rings of staminodes basally; male flowers: fertile flowers consisting of 2 or 3 connate stamens, filaments fused, connective thick, thecae excavate in center, dehiscing by a terminal pore, pollen shed in strings. Berry few to many seeded. Seeds subellipsoid, densely longitudinally grooved.

About 120 species: mostly in SE Asia, a few species in South America (although these possibly not congeneric); two species (one endemic) in China.

- 1a. Leaf blade elliptic or oblong-lanceolate, rounded or obtuse at base; spathe ca. 7 cm; spadix ca. 5 cm 1. *S. hainanensis*
- 1b. Leaf blade oblong, cordate at base; spathe 12–15 cm; spadix longer than 10 cm 2. *S. calyprata*

1. Schismatoglottis hainanensis H. Li, Acta Phytotax. Sin. 15(2): 103. 1977.

落檐 luo yan

Herbs, stoloniferous, forming dense colonies. Petiole 20–30 cm, proximal half sheathing; leaf blade glaucous abaxially, dark green adaxially, elliptic or oblong-lanceolate, 16–17 × 5.5–7 cm, both surfaces densely and minutely impressed punctate, base rounded or obtuse, apex acuminate; primary veins 8–10 per side, adaxially always raised toward midrib; secondary and tertiary veins arising mostly from midrib. Peduncle shorter than petioles, ca. 13 cm. Spathe convolute, pale green or white, ca. 7 cm; proximal part elliptic, ca. 2.5 × 0.6 cm, persistent; distal part convolute, horn-shaped; limb caducous. Spadix ca. 5 cm; female zone adnate to spathe, ca. 2.5 cm × 4–5 mm, attenuate toward apex; pistil oblong, ca. 1 mm, 1-loculed, with 2 parietal placentae; ovules numerous, anatropous, obovoid, with longitudinal striations; funicle long and slender, carried on placentae in 2 ranks; distal sterile zone clavate, ca. 13 × 5 mm, attenuate toward base, apex obtuse; staminodes cylindric; male zone cylindric, ca. 15 × 4 mm; fertile stamens with anthers subcuneate, dehiscing by a terminal pore. Fl. Aug–Oct.

- Dense tropical forests, on rocks; 100–200 m. Hainan.

One of us (Li) notes that *Schismatoglottis hainanensis* differs from “*S. cadieri*” (Buchet & Gagnepain in Lecomte et al., Fl. Indo-Chine 6: 1118. 1942), from Vietnam, in having an elliptic or oblong-lanceolate leaf blade and a spadix with a sterile terminal appendix. The latter name was not validly published because no Latin description or diagnosis was provided (*Vienna Code*, Art. 36.1).

One of us (Boyce) is very doubtful that *Schismatoglottis hainanensis* is distinct from *S. calyprata*. A final decision is deferred pending examination of the type of *S. hainanensis*.

2. Schismatoglottis calyprata (Roxburgh) Zollinger & Moritzi in Moritzi, Syst. Verz. 83. 1846.

广西落檐 guang xi luo yan

Calla calyprata Roxburgh, Fl. Ind., ed. 1832, 3: 514. 1832; *Colocasia humilis* Hasskarl; *C. kotoensis* Hayata; *C. neoguineensis* Linden ex André; *Homalomena calyprata* (Roxburgh) Kunth; *Schismatoglottis acutangula* Engler; *S. angustifolia* Alderwerelt van Rosenburgh; *S. bitaeniiata* Engler; *S. calyprata* var. *ornata* Ridley ex Engler; *S. calypratoides* Alderwerelt van Rosenburgh; *S. cordifolia* Ridley; *S. djamuensis* Engler; *S. dorensis* Gibbs; *S. emarginata* Engler; *S. hellwigiana* Engler; *S. hellwigiana* var. *subcordata* Engler; *S. klossii* Ridley; *S. kotoensis* (Hayata) T. C. Huang, J. L. Hsiao & H. Y. Yeh; *S. longipes* Miquel; *S. maculata* Alderwerelt van Rosenburgh; *S. neoguineensis* (Linden ex André) N. E. Brown; *S. nieuwennuisii* Engler; *S. parvifolia* Alderwerelt van Rosenburgh; *S. picta* Schott; *S. potamophila* Alderwerelt van Rosenburgh; *S. pseudocalyprata* Alderwerelt van Rosenburgh; *S. riparia* Schott; *S. ruttenii* Alderwerelt van Rosenburgh; *S. sublaxiflora* Alderwerelt van Rosenburgh; *S. tenuifolia* Engler; *S. vanvurenii* Alderwerelt van Rosenburgh; *Zantedeschia calyprata* (Roxburgh) K. Koch.

Herbs, stoloniferous, 15–60 cm tall. Petiole 5–50 cm, smooth, proximal 1/3 sheathing, sheath persistent; leaf blade mid-green, sometimes variegated, cordate to sagittate, 7–35 × 4–18 cm; midrib abaxially prominent, primary lateral veins 6–15 per side, entirely raised abaxially, nearly always raised adaxially toward midrib, marginally impressed, secondary venation arising mostly from midrib. Inflorescences 1–8 together; peduncle erect at anthesis, then deflexed, 6–20 cm. Spathe 3.5–12 cm, basal part green, narrowly ovoid, ca. 1/2 length of whole spathe limb, differentiated by an abrupt constriction, at female anthesis much inflated, creamy to pale greenish yellow, narrowing and

turbinate, completely surrounding spadix and gaping ventrally or with margins loosely overlapping, conspicuously mucronate at apex, caducous immediately after female anthesis. Spadix ca. 3/4 length of spathe, narrowly hourglass-shaped; female zone ca. 1/2 length of spadix, obliquely inserted or partially adnate to spathe, 5–8 mm in diam., distally tapering; pistils congested, pale green, flask-shaped, ca. 1 × 0.5 mm, distally more widely spaced and subglobose; interpellular staminodes few, white, clavate, taller than pistils; sterile zone absent; male zone ivory, narrowly obconic, ca. 1/2 length of female zone, distally 0.5–1

cm in diam.; anthers dumbbell-shaped, ca. 0.5 × 1 mm; appendix creamy yellow, bullet-shaped, basally somewhat wider than apex of male zone; appendix staminodes columnar, irregularly polygonal, ca. 0.5 mm in diam. Fruiting spathe declined, urceolate. Fl. Jun.

Dense tropical forests, forest undergrowth, on rocks; 700–900 m. Guangxi (Longling, Longzhou), Taiwan [SE Asia, Pacific islands].

The stems are used as a tonic medicine to treat lumbago and arthralgia.

13. CRYPTOCORYNE Fischer ex Wydler, Linnaea 5: 428. 1830.

隐棒花属 yin bang hua shu

Li Heng (李恒 Li Hen); Niels Jacobsen

Herbs, amphibious, monoecious. Rhizome creeping, stoloniferous (usually subterranean). Leaves in a rosette, linear to spatulate to oblanceolate to cordate; veins arching from base of blade and connected by transverse veinlets. Peduncle very short, elongating at maturity. Spathe tubular with margins fused for most of length, proximally swollen forming a chamber (kettle) enclosing spadix; limb varying in shape, a collar or collar zone often present, in some species limb spirally twisted. Spadix at first fused at apex to base of spathe flap closing kettle (later breaking loose), much shorter than spathe; basal part with naked, connate gynoecia; intermediate zone naked; male zone apical; appendix conic, short. Female flowers 4–8, each 1-loculed; ovules many, subbasal (adaxial); styles free; stigma globose to elongate. Olfactory bodies immediately above stigmas regular or irregular structures. Male flowers naked; stamens solitary; thecae each dehiscent by an apical pore. Fruit syncarp-like, multiple; each part ultimately splitting at adaxial part and becoming star-shaped, follicle-like; a few species splitting in a septical/sepifragal-ceratium-like way. Seeds many, ellipsoid, small; endosperm usually copious.

More than 50 species: tropical Asia, from India to Malesia; one variable species in China.

Cryptocoryne cruddasiana Prain (J. Asiatic Soc. Bengal, Pt. 2, Nat. Hist. 69: 174. 1901; *C. retrospiralis* (Roxburgh) Kunth var. *cruddasiana* (Prain) de Wit; *C. burmensis* Rataj) occurs in N Myanmar, where it grows on riverbanks. It has not yet been recorded from China but may be distinguished as follows. Leaves strap-shaped, up to 30 × 0.5–1 cm, smooth to somewhat undulate at margin (sometimes also finely denticulate), green to brownish marmorate, apex rather abruptly acute; leaves disappearing during rainy period or becoming small, 2–4 cm, and terete. Spathe 8–12 cm; kettle 2–2.5 cm, with a constriction just below male flowers, proximally whitish, distally purplish and also with alveolae in wall; tube 4–5 cm, grayish outside; limb to 3.5 cm, upright to somewhat bent backward, with irregular, purplish or red-brown, rounded protuberances sometimes ± transversely oriented, base color of surface dark yellowish to red-brown, throat spotted, collar absent. Spadix: female flowers 5 or 6, with vertical, elliptic stigmas. Olfactory bodies cream-colored, finely spotted, irregularly lobed to subtoothed. Male flowers 80–120. Fruit not seen. Fl. Dec–Feb. 2n = 36.

- 1a. Limb of spathe ± spirally twisted, smooth, white or with regular to irregular reddish to purplish to violet markings 1. *C. crispata*
- 1b. Limb of spathe ± obliquely recurved, rugose from somewhat irregular, rounded, purplish or red-brown protuberances *C. cruddasiana* (see note above)

1. ***Cryptocoryne crispata*** Engler, Pflanzenr. 73(IV. 23F): 247. 1920.

旋苞隐棒花 xuan bao yin bang hua

Rhizome sometimes with a metallic blue-gray color, 0.5–1 cm in diam., irregularly thickened. Root system sometimes with many finely branched upright roots. Leaves green to brown, very variable, narrowly linear to lanceolate, 10–70 × 0.2–4 cm, smooth to undulate to bullate, margin entire to finely, irregularly denticulate; broader leaf blades mostly with conspicuous lateral veins. Generally, two ecological leaf forms occur: 1) plants that grow submerged for most of year, thus developing long flaccid-lax submerged leaves (sometimes also developing shorter, stiffer emergent leaves); 2) plants that develop short terete leaves during rainy season and, when water level decreases, form normal emergent leaves at anthesis. Spathe outside greenish to brownish, 10–40(–60) cm; kettle 1–2.5 cm, inside somewhat constricted below male flowers, inside ± reddish (especially distally) and with alveolae (depressions in wall) in distal part; flap closing kettle sometimes ± purple spotted; tube

slightly to somewhat twisted, 5–30(–45) cm; limb ± spirally twisted, yellowish to grayish, with short to long, purple to reddish markings, sometimes markings almost completely covering surface, or few and faint, or absent, (1.5–)3–8(–12) cm; collar not present. Spadix: female flowers 4–6, with horizontal to vertical, round to ovoid stigmas; olfactory bodies ± irregularly lobed with protruding cells; male flowers 90–130, thecae rough from protruding cells. Fruit splitting in a septical/sepifragal-ceratium-like way, greenish to purplish, narrowly globose, 1–1.5 cm, smooth. Seeds brownish, 5–8 mm, rugose; endosperm present; embryo cone-shaped with an undifferentiated plumule. 2n = 36, 54.

Rivers, streams; near sea level to 600 m. Guangdong, Guangxi, Guizhou, Yunnan [Bangladesh, Cambodia, Laos, Myanmar, Thailand, Vietnam].

Cryptocoryne crispata s.l. is here interpreted as one species comprising different ecological races, i.e., leaf forms that are adapted to the water supply and the overall topography of the rivers in which they grow. In rivers with more constant water-bearing, and not too steep a

fall, the more aquatic ones occur, viz. the long, narrow-leaved forms with an undulate or bullate leaf blade. In rivers with a seasonal variation in the waterbearings, the more amphibious ones occur, characterized by having shorter, \pm smooth leaves. The variation within *C. crispata* is very complex, with more than six recognizable forms in mainland Asia, some more readily distinguishable from the next than others. There are transitions between the various forms. The here recognized varieties represent the more distinctive ones, and admittedly specific plants may only with some difficulty be referred unambiguously to a definite variety. The number of varieties accepted is subjective. This is not meant as an excuse for an insufficient treatment but is merely recognition of the complexity of *C. crispata*.

It is important to note that the leaves can vary in size during the flowering season; therefore, herbarium material should be studied with this in mind.

In the present circumscription, *Cryptocoryne crispata* is recognized as different from the tetraploid *C. retrospiralis* (Roxburgh) Kunth from India. If *C. crispata* were not recognized as different from *C. retrospiralis*, the mentioned varieties of *C. crispata* would then be considered as varieties of *C. retrospiralis*.

In addition to the four varieties here recognized in China, *Cryptocoryne crispata* var. *tonkinensis* (Gagnepain) N. Jacobsen (*Aqua Pl.* 16: 29. 1991; *C. tonkinensis* Gagnepain, *Notul. Syst. (Paris)* 9: 133. 1941; *C. retrospiralis* (Roxburgh) Kunth var. *tonkinensis* (Gagnepain) de Wit) occurs in Thailand and Vietnam, where it grows along rivers and streams. It has not yet been recorded from China, but may be distinguished as follows. Leaves usually submerged, green to brownish, flaccid, $20\text{--}30 \times 0.2\text{--}0.4$ cm, smooth or slightly undulate. Emergent leaves shorter and broader compared to submerged ones. Spathe mostly with a tube (5)–15–30 cm; limb with a long open spiral with a yellowish base color with irregular, dark reddish lines of varying intensities. Fl. Dec–Apr. $2n = 36$.

- 1a. Plants with short, rather stiff, upright emergent leaves ($10\text{--}30 \times 0.6\text{--}2$ cm), submerged leaves short, terete, $2\text{--}10$ cm.
 - 2a. Spathe with short, thick limb spiral, with distant to dense red spots 1b. var. *yunnanensis*
 - 2b. Spathe usually with a long, thin/narrow limb spiral, with regular to irregular shorter or longer purplish to reddish lines (or limb pure white) 1a. var. *crispata*
- 1b. Plants with long, flaccid-lax submerged leaves ($20\text{--}70 \times 0.2\text{--}4$ cm).
 - 3a. Leaves $0.2\text{--}0.4$ cm wide var. *tonkinensis* (see note above)
 - 3b. Leaves $0.5\text{--}4$ cm wide.
 - 4a. Leaves $0.5\text{--}1.2$ cm wide, smooth to undulate 1d. var. *flaccidifolia*
 - 4b. Leaves $1.5\text{--}4$ cm wide, \pm bullate 1c. var. *balansae*

1a. *Cryptocoryne crispata* var. *crispata*

旋苞隐棒花(原变种) xuan bao yin bang hua (yuan bian zhong)

Cryptocoryne bertelbansenii Rataj; *C. crispata* var. *sinensis* (Merrill) N. Jacobsen; *C. retrospiralis* (Roxburgh) Kunth var. *crispata* (Engler) de Wit; *C. sinensis* Merrill.

Leaves upright to flat on soil surface, rather stiff (in shaded habitats more lax), mostly green but often brownish (to brown) with markings in sun-exposed habitats, lanceolate to strap-shaped, $10\text{--}30 \times 0.5\text{--}1.5\text{--}2.5$ cm, smooth to somewhat finely undulate to crenulate along margin, entire or distinctly irregularly serrulate. During times of high water, leaves become small and terete, and when becoming emergent, leaves and spathes develop. Spathe with a tube 10–20 cm; limb with a rather long, somewhat tight to open spiral, usually grayish, mostly with shorter or longer purplish markings of varying intensities, but also a completely white limb has been found. Fl. Nov–Apr. $2n = 36, 54$.

Stream and river banks and beds. Guangdong, Guangxi, Guizhou [Bangladesh, Cambodia, Laos, Myanmar, Thailand, Vietnam].

1b. *Cryptocoryne crispata* var. *yunnanensis* (H. Li) H. Li & N. Jacobsen, comb. et stat. nov.

八仙过海 ba xian guo hai

Basionym: *Cryptocoryne yunnanensis* H. Li, *Acta Phytotax. Sin.* 15(2): 108. 1977.

Leaves upright to flat on soil surface, rather stiff, mostly green but sometimes brownish, $5\text{--}30 \times 0.5\text{--}1.5$ cm, smooth to slightly undulate. During times of high water, leaves become small and terete, and when becoming emergent, new larger leaves and spathes develop. Spathe with a rather short tube 8–12 cm; limb rather thick in texture and with a rather short spiral, with a yellowish base color and somewhat distant to very dense dark reddish spots that sometimes become longer irregular lines into throat. Fl. Nov–Apr. $2n = 36$.

Riverbanks, riverbeds; near sea level to 600 m. Yunnan [Laos, Thailand, Vietnam].

The plants are used medicinally for treating traumatic injuries, rheumatic arthralgia, and stomach aches.

1c. *Cryptocoryne crispata* var. *balansae* (Gagnepain) N. Jacobsen, *Aqua Pl.* 16: 29. 1991.

广西隐棒花 guang xi yin bang hua

Cryptocoryne balansae Gagnepain, *Notul. Syst. (Paris)* 9: 131. 1941; *C. kwangsiensis* H. Li; *C. longispatha* Merrill.

Leaves usually submerged, green to brownish to dark brown, rather flaccid, $15\text{--}70 \times 1\text{--}4$ cm, slightly to strongly bullate; midrib conspicuous, lateral veins less so. Emergent leaves shorter and often not as bullate as submerged ones. Spathe with a long tube 10–30(–40) cm; limb with a rather long and rather open to somewhat tight spiral, usually grayish or yellowish, mostly with shorter or longer purplish markings of varying intensities. Fl. Dec–Apr. $2n = 36$.

Rivers, streams. Guangxi [Laos, Thailand, Vietnam].

1d. *Cryptocoryne crispata* var. *flaccidifolia* N. Jacobsen, *Aqua Pl.* 16: 26. 1991.

柔叶隐棒花 rou ye yin bang hua

Leaves usually submerged, green to reddish brown, flac-

cid, 20–50 × 0.5–1.2 cm, somewhat undulate to almost smooth. Emergent leaves shorter and rather smooth compared to submerged ones. Spathe with a long tube (15–)20–30 cm; limb with a rather long, open spiral, usually grayish, mostly with

shorter or longer purplish markings of varying intensities. Fl. Dec–Apr. $2n = 36$.

Rivers, streams. Guangxi [Thailand, Vietnam].

14. HAPALINE Schott, Gen. Aroid. 44. 1858, nom. cons.

细柄芋属 xi bing yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Hapale Schott.

Herbs, seasonally dormant or evergreen, small to medium sized, slender. Stems tuberous-stoloniferous with stolons terminating in further small, depressed-globose tubers. Leaves usually solitary, or few; petiole sheath short; leaf blade pale to deep green with or without silvery or paler variegation, cordate-sagittate, sagittate, or hastate, rarely elliptic and cuneate, primary lateral veins pinnate or mostly arising at petiole insertion, forming arching submarginal collective vein, 1 or 2 marginal veins also present; higher order venation reticulate. Inflorescences 1–5 per each floral sympodium, appearing with leaf; peduncle subequal to or longer than petioles, slender. Spathe slender, not distinctly constricted; tube persistent, very slender, tightly convolute around female flowers; limb erect to reflexed and ± revolute at anthesis, oblong-lanceolate, longer than tube, marcescent. Spadix subequal to or longer than spathe, slender; female zone adnate to spathe, few flowered (2–7), ± biserrate, separated from male zone by short sterile zone; male zone subulate to cylindric, fertile to apex or with a few sterile flowers at apex or with a long, terminal appendix [*Hapaline appendiculata* Ridley]. Flowers unisexual, naked. Gynoecium oblong to lageniform; ovary 1-loculed; ovule 1, anatropous; funicle very short; placenta parietal to subbasal (morphologically basal); stylar region very short; stigma subcapitate. Male flowers 3-androus; synandrium peltate, truncate, hexagonal, elongated in direction of spadix axis, shallow, stipitate; connective strongly dilated; thecae remote, sub-globose, short, almost pendent from margin, dehiscing by pore; synandrodes with proximal ones very few, ± remote, apiculiform; distal ones very few, consisting of tiny, peltate synandrodes. Fruit an ellipsoid to globose berry; style persistent; pericarp thin, 1-seeded, white. Seed ellipsoid; testa smooth, very thin; embryo light green, ellipsoid, large; endosperm absent.

Six species: SE Asia; one species (endemic) in China.

1. **Hapaline ellipticifolium** C. Y. Wu & H. Li, Acta Phytotax. Sin. 15(2): 104. 1977.

细柄芋 xi bing yu

Herbs, perennial. Tuber cylindric, 1–2 cm × ca. 5 mm, with many tubercles. Cataphylls lanceolate, 3–4 cm, membranous. Leaves 2 or 3; leaf blade oblong-elliptic, 10–17 × 5–8.5 cm, base 2-lobed, apex abruptly acuminate; lobes deltoid, 2–4 × 1–3 cm; primary veins multiple, pinnately diverging from midrib, secondary venation arching-anastomosing, intramarginal veins 3, conspicuous. Peduncles 2 or 3, 18–30 cm, very

slender; cataphylls ca. 8 cm. Spathe ca. 5 cm; tube convolute, ca. 2 cm × 1–2 mm; limb spreading and finely reflexed, lanceolate, ca. 8 cm × 8 mm. Spadix ca. 4.5 cm; female zone ca. 1.5 cm, adnate to tube of spadix; ovaries 4–12, oblong, multistriate, 1-loculed, 1-ovuled; stigma disciform; sterile zone between male and female inflorescences ca. 7 mm, naked; male zone ca. 1.5 cm; male flowers peltate, hexagonal, apex ca. 5 mm; sterile male zone at apex of spadix ca. 7 mm, with minute synandrodes. Fl. Apr.

• Tropical forest; ca. 300 m. SE Yunnan (Hekou).

15. AGLAONEMA Schott, Wiener Z. Kunst 1829: 892. 1829.

广东万年青属 guang dong wan nian qing shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, evergreen, sometimes robust. Stem epigeal, erect to decumbent and mostly unbranched or creeping and often branched, internodes green, becoming brown with age, smooth, often rooting at nodes when decumbent. Leaves several, forming an apical crown; petiole shorter than leaf blade, sheath usually long; leaf blade often with striking, silvery and pale green variegated patterns, ovate-elliptic or narrowly elliptic, rarely broadly ovate or sublinear, base often unequal, attenuate to rounded, rarely cordate; primary lateral veins pinnate, often weakly differentiated, running into marginal vein, higher order venation parallel-pinnate. Inflorescences 1–9 per each floral sympodium; peduncle shorter or longer than petioles, sometimes deflexed in fruit. Spathe caducous, persistent, or marcescent, erect, green to whitish, boat-shaped to convolute, not differentiated into tube and blade, ovate to ± globose, slightly to strongly decurrent, often apiculate. Spadix cylindric to clavate, shorter or longer than spathe, stipe long to almost absent; female zone rather few flowered, either separated by staminodes or contiguous with, and much shorter than, male zone; male zone fertile to apex, rarely with staminodes basally. Flowers unisexual, naked. Female flowers: ovary subglobose, 1-loculed; ovule 1, anatropous, broadly ovoid; funicle very short; placenta basal; stylar region short, thick; stigma broad, disciform, concave centrally. Male flowers: stamens free, not forming clear floral groups; filaments usually distinct, connective thickened; thecae opposite, obovoid, short, dehiscing by

apical pore or reniform transverse slit. Fruit an ellipsoid berry, outer layer fleshy green but turning yellow, rarely white and finally red. Seed solitary, ellipsoid, almost as large as berry; testa thin, \pm smooth; integument inconspicuous; embryo large; endosperm absent.

Twenty-one species: tropical and subtropical Asia; two species in China.

Aglaonema ovatum Engler (Bot. Jahrb. Syst. 25: 21. 1898) is abundant in N Laos next to the Chinese border and so is expected to be found eventually in SW China.

Many species are widely cultivated in gardens as evergreen ornamental plants.

- 1a. Spadix shorter than spathe, ca. 2/3 spathe length, male zone of spadix cylindric, 20–30 \times 3–4 mm 1. *A. modestum*
 1b. Spadix equaling to longer than spathe, male zone of spadix conic, ca. 23 \times 9–10 mm 2. *A. simplex*

1. Aglaonema modestum Schott ex Engler in A. Candolle & C. Candolle, Monogr. Phan. 2: 442. 1879.

广东万年青 guang dong wan nian qing

Plants erect. Stems green, 40–70 cm, 1.5–2 cm in diam. Leaves mostly crowded at stem apex; petiole green, 5–20 cm, sheathing for more than 1/2 length; leaf blade pale green abaxially, green adaxially, ovate to ovate-lanceolate, base obtuse or broadly cuneate, apex acuminate; primary lateral veins 4 or 5 per side, ascending and arching, secondary ones indistinct, parallel to primary veins. Peduncle (5–)10–12.5 cm. Spathe oblong-lanceolate, (5.5–)6–7 \times 1.5–2 cm, apex long acuminate. Spadix cylindric, ca. 2/3 of spathe length, with a stipe ca. 10 mm; female zone 5–8 mm; ovary subglobose; style short; stigma disciform; male zone elongate, 2–3 cm \times 3–4 mm; stamen apex truncate, quadrangular; anthers dehiscent by a pore. Berry green to yellow-red, red when ripe, oblong, ca. 20 \times 8 mm. Seed oblong, ca. 1.7 cm. Fl. May, fr. Oct–Nov.

Dense forests, also widely cultivated in gardens as evergreen ornamental plants; 500–1700 m. Guangdong, Guangxi, Guizhou [N Laos, N Thailand, N Vietnam].

The plant is used externally as a medicine to treat snake and insect bites, hydrophobia, abscesses, and swelling.

2. Aglaonema simplex (Blume) Blume, Rumphia 1: 152. 1837.

越南万年青 yue nan wan nian qing

Caladium simplex Blume, Catalogus, 103. 1823; *Aglaonema angustifolium* N. E. Brown; *A. birmanicum* J. D. Hooker; *A. fallax* Schott ex Engler; *A. longicupidatum* Schott; *A. pierreanum* Engler; *A. schottianum* Miquel f. *angustifolium* (N.

E. Brown) Engler; *A. siamense* Engler; *A. simplex* f. *angustifolium* (N. E. Brown) R. N. Jervis; *A. tenuipes* Engler; *Scindapsus tonkinensis* K. Krause.

Plants perennial, erect. Stems dark green, cylindric, 40–80 cm tall, 1–2 cm in diam., rooting at nodes; internodes 2–3 cm, at distal part 5–10 mm; cataphylls early caducous, broadly linear, 4–7 cm, apex abruptly acute. Leaves usually 5 or 6, densely crowded at stem apex; petiole green, 6–15 cm, proximally sheathing; leaf blade initially involute, afterward spreading, pale green abaxially, dark green adaxially, ovate-oblong, 10–25 \times 5.5–11 cm, thinly leathery, base truncate-rounded, subcordate, or decurrent, apex caudate-acuminate or abruptly long acuminate; primary lateral veins 6–8 per side, ascending and arching. Peduncle green, 2–6 cm. Spathe initially involute-tubular, afterward opening by a slit, cymbiform, ovoid, 3–4.5 \times ca. 1.3 cm. Spadix 2.5–4.5 cm, slightly longer than or equaling spathe; female zone ca. 5 mm; ovary globose; ovule basal; stigma sessile, circular; male zone 2–3 cm; stamens 4; anthers 2-celled. Berry oblong, 12–18 \times 7–10 mm. Seed oblong, 11–15 mm. Fl. Apr–Jun, fr. Sep–Oct.

Dense valley forests; below 1500 m. SW Yunnan [Cambodia, India (Nicobar Islands), Indonesia, Laos, Malaysia, Myanmar, Philippines (Palawan), Thailand, Vietnam].

Nicolson (Smithsonian Contr. Bot. 1: 38–41. 1969) maintained *Aglaonema tenuipes* and *A. simplex* as separate species primarily on inflorescence size and to a much lesser extent on phytogeography (*A. simplex* being a Sundaic element with *A. tenuipes* a N Thai/Indochinese species). However, there is complete introgression between even the extremes of the spathe size, while the presence of populations intermediate between "*A. tenuipes*" and *A. simplex* in the mountainous parts of C and SE Thailand seriously weakens the phytogeographical arguments.

16. AMORPHOPHALLUS Blume ex Decaisne, Nouv. Ann. Mus. Hist. Nat. 3: 366. 1834, nom. cons.

魔芋属 mo yu shu

Li Heng (李恒 Li Hen); Wilbert L. A. Hetterscheid

Brachyspatha Schott; *Candarum* Reichenbach ex Schott & Endlicher; *Conophallus* Schott; *Hydrosme* Schott; *Kunda* Rafinesque; *Pythion* Martius.

Herbs, terrestrial, small to massive. Stem subterranean, tuberous, rarely a chain of tubers or a true rhizome; rhizome \pm creeping. Leaves usually solitary, rarely paired or more; petiole terete, rarely angulate, shallowly grooved, or partly rugulose, rarely entirely verrucate or hairy; leaf blade decomound, divided into 3 main segments; main segments equally long or anterior shorter than posterior ones (blade \pm subpedate); rachises naked, narrowly or broadly winged and often carrying supernumerary leaflets on proximal parts; bulbils sometimes developing on leaves, either epiphyllar, intercalary (developing inside rachis), or half-epiphyllar (base developing in rachis, apex exposed beyond rachis). Inflorescence 1, rarely 2 or 3 (synflorescence) or more per season (then

developing from different buds on stem), epigeal, rarely partly buried, solitary or simultaneous with or directly preceding leaf development, rarely emerging after leaf development. Spathe base convolute, rarely open or connate, not or clearly separated from limb by a constriction, outside variously colored, variously shaped, often cymbiform or campanulate, rarely funnel-shaped; limb erect, spreading, oblique, or arching. Spadix sessile or shortly stipitate; female zone contiguous with male zone or separated from it by a sterile zone; flowers sometimes surrounded by staminodes; female flowers consisting of 1 pistil; ovary sessile or shortly stipitate, 1–4-loculed, with 1 ovule per locule, basifix, or rarely axillary ca. halfway up ovary; style present or (nearly) absent, clearly separated from ovary or less so, sometimes with apical projections (“branches”) extending beyond stigma; sterile zone (when present) covered with staminodes, rarely partly or entirely naked; male zone cylindric, fusiform, conic, or obconic; male flowers consisting of (1–)3–6(–8) stamens; stamens depressed or elongate; filaments present or nearly absent, separated or partly or entirely fused within a flower or rarely fused between adjacent flowers; anthers bithecal; thecae 2-celled (with 2 pollen sacs), rarely 1-celled; pores apical, rarely lateral or subterminal; pollen inaperturate, globose or elliptic, exine rarely absent, psilate, striate, verrucate, echinate, areolate, porate, fossulate, reticulate, or scabrous; appendix rarely absent, contiguous with male zone or separated by a constriction or a short stipe, sometimes with large longitudinal folds or ± irregular deep cracks. Berries crowded or distant, ripening red, rarely blue, globose, ovoid, or narrowly elliptic, smooth or rarely verrucate, 1–4-seeded. Seeds usually with a distinct raphe; endosperm absent.

About 200 species: paleotropical, W to E Africa, S and SE to E Asia, N Australia, Pacific islands; 16 species (seven endemic) in China.

Amorphophallus stipitatus Engler (Notizbl. Bot. Gart. Berlin-Dahlem 8: 457. 1923) was described based on cultivated material in the Berlin Botanical Garden, originally from Guangdong. The holotype (*Mell. s.n.*, B) has been destroyed, and Engler's protologue does not give enough clues as to the identity of the species to which the name refers. It is no doubt a member of the *A. yunnanensis* alliance, but the differences between species recognized in this group are too subtle to leave room for any guessing about the identity of *A. stipitatus*. So as not to confuse matters, this name is here treated as of uncertain application.

The status of *Amorphophallus zengianus* C. Long & H. Li (Novon 10: 125. 2000), described from S Yunnan (Jinping), is uncertain. H. Li notes that the morphology of the inflorescence might be misleading because it was damaged while in the bud stage. She considers it to be conspecific with *A. yunnanensis*, based on morphological similarity of the petiole and leaf blade. On the other hand, Hettnerseid considers *A. zengianus* to represent a less-than-optimal specimen of *A. krausei*, based on photographs provided by H. Li of living material of *A. zengianus*. This identity with *A. krausei* could be confirmed if there exists a staminodal zone between the male and female zones of the spadix. However, H. Li notes that the living material no longer exists and the holotype specimen cited in the protologue (*C. L. Long 98003, KUN*) never existed.

“*Amorphophallus tiennushanensis*” (Y. Z. Tao, Compreh. Invest. Rep. Nat. Resource Tianmu Mount. Nat. Reserve, 130. 1992) was described from Zhejiang (Tianmu Shan). The present authors consider this name to be not validly published because the requirement of Art. 36.1 of the ICBN (*Vienna Code*) was not fulfilled. The intended validating description given by Tao is a mixture of Latin and English. The code requires “a Latin description or diagnosis.” D. H. Nicolson (pers. comm.) is of the opinion that a percentage of non-Latin is admissible; a similar view was held by R. K. Brummitt and D. E. Boufford (pers. comm.; for further discussions see Plant Press 45, Jan. 1994 and Plant Press 45, Feb. 1994). We consider as quite disturbing the discussion about the acceptance of a percentage of non-Latin in a diagnosis where “a Latin description or diagnosis” is required, especially given that non-English users of the ICBN will not be able to read between subtle English lines. The ICBN must be unambiguous at an international level, and the phrase “a Latin description or diagnosis” should be clear to all, as it is to us, to mean 100% Latin.

The following species were recorded in FRPS but are, in fact, not distributed in China: *Amorphophallus bangkokensis* Gagnepain (FRPS 13(2): 91, 99. 1979), *A. mekongensis* Engler & Gehrmann (p. 91), *A. oncophyllus* Prain ex J. D. Hooker (p. 98; *A. muelleri* Blume), and *A. variabilis* Blume (p. 95).

- 1a. Underground part a terete rhizome or chain of tubers.
 - 2a. Underground part a terete creeping rhizome 5. *A. hayi*
 - 2b. Underground part a chain of tubers 2. *A. coactaneus*
- 1b. Underground part a single tuber.
 - 3a. Peduncle shorter than or equal to spathe.
 - 4a. Spathe limb erect, concave or straight; appendix whitish or pinkish.
 - 5a. Spathe limb concave; spadix shorter than spathe; appendix whitish, conic 14. *A. yuloensis*
 - 5b. Spathe limb straight, distally slightly widening; spadix longer than spathe; appendix whitish or pinkish, conic or fusiform-conic and laterally compressed 15. *A. xiei*
 - 4b. Spathe limb horizontal, campanulate; appendix dark purple.
 - 6a. Appendix narrowly conic, sometimes with scattered hairs 6. *A. henryi*
 - 6b. Appendix globose or broadly conic 12. *A. paeonifolius*
 - 3b. Peduncle distinctly longer than spathe.
 - 7a. Spadix distinctly stipitate.
 - 8a. Appendix with a strongly cerebriform (brainlike) surface 3. *A. corrugatus*
 - 8b. Appendix glabrous, shallowly or deeply fissured, partly or entirely echinate.
 - 9a. Appendix deeply fissured/cracked lengthwise 8. *A. kachinensis*
 - 9b. Appendix glabrous, with shallowly concave sides, or partly or entirely echinate.
 - 10a. Appendix variously laterally compressed, sides shallowly or more deeply concave, glabrous; stigma hardly broader than style 16. *A. yunnanensis*

- 10b. Appendix terete or dorsiventrally compressed, sides convex, glabrous or entirely or distally echinate; stigma distinctly broader than style 4. *A. dunnii*
- 7b. Spadix sessile.
- 11a. Male and female zones separated by sterile zone with ovate or elliptic, slightly convex staminodes. 11. *A. krausei*
- 12a. Male zone distinctly longer than appendix 11. *A. krausei*
- 12b. Male zone equaling appendix 1. *A. albus*
- 11b. Male and female zones contiguous or with different types of staminodes in between.
- 13a. Spathe erect; spadix shorter than or equaling spathe.
- 14a. Male zone at most twice as long as female zone 13. *A. tonkinensis*
- 14b. Male zone (including sterile zone when present) at least $2.5 \times$ as long as female zone 11. *A. krausei*
- 13b. Spathe oblique; spadix longer than spathe.
- 15a. Stigma sessile or nearly so; appendix glabrous or with a few scattered hairs 9. *A. kiusianus*
- 15b. Style distinct; appendix densely covered with long hairs or glabrous.
- 16a. Appendix densely covered with long hairs 7. *A. hirtus*
- 16b. Appendix glabrous 10. *A. konjac*

1. Amorphophallus albus P. Y. Liu & J. F. Chen, J. S. W. Agric. Coll. 1984(1): 67. 1984.

白磨芋 bai mo yu

Tuber brown, subglobose, 5–6 cm high, 7–10 cm in diam., seasonally producing long rhizomatous offsets, these to 23×1.5 cm. Leaf solitary; petiole pale green with grayish green, irregular, elongate or rounded spots, and whitish dots, 40–70 \times 1.5–2 cm, glabrous; leaf blade ca. 80 cm in diam., rachises winged; leaflets elliptic-lanceolate, 2–12 \times 1–3 cm, acuminate. Inflorescence solitary, long pedunculate; peduncle 16–30 \times 1–2 cm. Spathe cymbiform, narrowly ovate, 12–22 \times 6–10 cm, acute; proximal margin of limb recurved, outside base green to pale green, inside creamy white; outside limb pale green, spotted with dark green and near margin with numerous indistinct white punctiform dots, inside creamy white with a faint pale green flush, base within densely verruculose. Spadix producing a heavy gaseous smell during female anthesis, sessile, bright pale green, turning yellowish during male anthesis, slightly curved, shorter than spathe, ca. 13.5 cm; female zone cylindric, ca. 1 \times 1.2–1.3 cm, flowers congested; ovary bright green, depressed, angulate in cross section, ca. 1.5 mm high, 2.5–3 mm in diam., 2-loculed, but 1 locule reduced and sterile; style strongly oriented parallel to spadix axis, bright green, distally pale to yellowish green, 2–2.5 \times ca. 1 mm; stigma lateral, slightly arching, whitish disciform, ca. 1.5 mm in diam., ca. 0.8 mm thick, entire, strongly scabrous; sterile zone between male and female zone swollen, slightly conic, 1–2.5 \times 1–1.8 cm; staminodes congested; staminodes consisting of sterile entire flowers, off-white, slightly hemispheric, irregular, largest ca. 12 \times 7 mm, with shallow irregular depressions, or with a few irregular grooves; male zone narrowly conic, apex slightly expanded, ca. 4 \times 0.8 cm, ca. 1.5 cm in diam. at base, flowers congested; male flowers consisting of 3 or 4(or 5) stamens; stamens ca. 2 mm; filaments entirely fused, off-white, ca. 1.3 mm; anthers ca. 0.7 \times 2 mm, truncate; thecae off-white, opening with apical rounded pores; connective dirty pale yellowish, flat, raised after anthesis; appendix narrowly conic, ca. 6 \times 1.6 cm, finely rugulose, apex obtuse. Berries orange-red when mature, ovoid.

- Open forests, arid thickets; 800–1000 m. S Sichuan, NE Yunnan.

This species is used as a crop plant and is cultivated in Yunnan.

2. Amorphophallus coactaneus S. Y. Liu & S. J. Wei, Guihaiia 6: 183. 1986.

桂平磨芋 gui ping mo yu

Amorphophallus arnautovii Hetterscheid; *A. pingbianensis* H. Li & C. L. Long.

Tuber persistent, dark brown to blackish, depressed globose, to 3 cm high, to 6 cm in diam., chained with others to form a pseudorhizome of 2–6 modules, each 3–5 cm in diam. Leaves 1–3, lasting up to 3 years; petiole uniformly dark green, terete, 60–120 \times 1–2 cm, turgid, glabrous; leaf blade to ca. 100 cm in diam.; rachises only winged distally, common base of 3 main branches sometimes developing into an intercalary bulbul; leaflets dark green, oblanceolate, 15–20 \times 4–6 cm, acuminate. Inflorescence long pedunculate; peduncle colored as petiole, 10–50 \times 0.6–1.3 cm. Spathe shortly convolute at base, outside green, dirty green flushed with dirty brownish purple or distal half entirely brownish purple; inside uniformly green or background color dirty green, at base and along midrib flushed dirty dark purplish, near apex less so, or base pale green and rest flushed with brownish purple, narrowly triangular to triangular-ovate, 7.5–15 \times 3–7 cm, base within glabrous or nearly glabrous with a few scattered, small, punctiform warts, apex acute. Spadix giving off a heavy gaseous stench at female anthesis, sessile, pale yellowish green with a very faint greenish flush, as long as or longer than spathe, 10–19.5 cm; female zone cylindric, 1–2 \times 1–1.6 cm, flowers congested; ovary green or pale whitish green, strongly depressed, depressed globose, or subglobose, 1.5–2 mm high, 1.5–4 mm in diam., angulate or irregularly orbicular in cross section, 1- or 2-loculed; style straight or slightly upcurved, pale green, 1–2 \times ca. 0.8 mm; stigma pale yellowish or pale greenish, flattened, disciform or nearly so, 0.7–0.8 mm high, 0.8–2 mm in diam., irregularly orbicular or elliptic in cross section, entire with a shallow, elongate, central depression or shallowly 2-lobed, or more distinctly bilabiate, margin with 2 small notches or a few small lobes, densely verruculose or echinulate; male zone cylindric, apex slightly widened, terete or slightly compressed, 2.3–4.5 \times 0.7–1.5 cm, flowers congested; male flowers consisting of 3 or 5 stamens; stamens ca. 2 \times 1–2 mm; filaments ca. 0.7 mm, connate or largely free; anthers off-white, ca. 1.3 mm, truncate; pores apical, elongate and connected to margin of anther by a groove; appendix narrowly fusiform-conic, 5.5–14.5 cm, base

0.7–2.3 cm in diam., sometimes slightly compressed, glabrous or shallowly corrugate, base glabrous or with some flattened staminodes, separated by grooves, base constricted, apex acute. Fruiting zone at least $5 \times$ ca. 4 cm. Berries dark blue, oval or oval-ellipsoid, ca. 1×0.8 cm, 1- or 2(or 3)-seeded. Fl. Mar.

Moist forested valleys, along water, thickets; 300–900 m. Guangxi (Guiping, Rongshui), Yunnan [E and N Vietnam].

The inclusion of *Amorphophallus arnautovii* and *A. pingbianensis* in the synonymy of *A. coetaneus* has been published and discussed by Hetterscheid and van der Ham (Blumea 46: 279–281. 2001).

In the protologue of *Amorphophallus coetaneus*, the specific epithet was given in error as “*guipingensis*” in the figure caption on p. 186.

3. *Amorphophallus corrugatus* N. E. Brown, Bull. Misc. Inform. Kew 1912: 269. 1912.

田阳蘑菇 tian yang mo yu

Amorphophallus tianyangensis P. Y. Liu & S. L. Zhang; *Thomsonia sutepensis* S. Y. Hu.

Tuber dark brown, globose, ca. 7 cm high, to 8 cm in diam., weighing up to 850 g, developing seasonal offsets; offsets long, rhizomatous, ca. 9 cm, slender, ca. 0.8 cm in diam., not apically thickened. Leaf solitary; petiole background color dirty white or pale green with a very faint, pale brownish hue overlain with numerous tiny and fewer large, partly confluent, irregular, dark chocolate-brown or grayish spots, 10–95 cm, slender, to 2 cm in diam. at base, longitudinally, shallowly ridged; leaf blade green adaxially, moderately dissected, 10–150 cm in diam.; rachises only winged in distal 1/3; main segments subdichotomous; terminal segments oblong or lanceolate, base long decurrent in most distal ones, other segments narrowly sessile, 10–28 × 4–9 cm, apex acuminate. Inflorescence long pedunculate; cataphylls to 40 cm; peduncle colored as petiole, 30–70 cm, 0.8–2 cm in diam. at base. Spatha shortly convolute at base, outside pale greenish, grayish purple, or white, sometimes to base with whitish spots, or with gray-green or pale olive-brown spots, either only margin purplish red or also large parts reddish brown, inside pale greenish white with several irregular, purplish red spots and a purplish red margin, base inside often purplish red, or utmost base whitish, ovate or elliptic-ovate, concave, 7–26 × 4–16 cm, apex acute or obtuse, glabrous. Spadix white or with some pale brownish spots and a pinkish hue, much shorter than spathe, stipitate, 4–11 cm; stipe 0.2–1.5 cm, slender; flowers unisexual; female zone cylindric or slightly obconic, 1.3–3.5 cm, 0.8–2 cm in diam. (including styles), flowers congested; ovary dark purple with pale whitish green base, globose, depressed, or subpyriform, orbicular, diamond-shaped, or irregularly angulate in cross section, 1–2 mm high, 1.5–2(–3) mm in diam., ± gradually tapering to style but after fertilization developing an annular articulation, 1-loculed, occasionally 2-loculed, with 1 basal ovule per locule; style straight or ± strongly curved toward spadix axis, entirely dark purple or apical half bright pale green, slender, cylindric or slightly conic, apex oblique and sometimes tricuspidate or drawn out in a slender point reaching beyond stigma, 2–4 mm, ca. 0.8 mm in diam. at base; stigma subapical or lateral, superficial or subcapitulate, usually transversely bilabiate, rarely longi-

tudinally oval, shallowly but densely verrucate or echinate, occasionally with elongate, fleshy, conic verrucae, pale yellowish or dirty whitish, 0.5–1 mm in diam., 0.2–0.5 mm high; male zone cylindric to fusiform-obconic, 1.3–4 × 0.7–2.2 cm, flowers densely congested; male flowers consisting of 3–5 stamens; stamens 3–3.5 mm; filaments 1.8–2 mm, proximal half connate, whitish; anthers whitish, pinkish, or flesh-colored, elongate, subquadangular or strongly biconcave in cross section, 1.3–1.5 × 1–1.3 mm, apex truncate; connective pale violet, massive; pores transversely elongate, lateral; appendix hardly to distinctly stipitate, globose, ovoid, elliptic, or conic, obtuse or truncate, at first turgid but during female anthesis weakening quickly and soon shriveling and drying, turning brown, 1–5 × 1–3 cm, with several irregular grooves (not associated with staminodes), longitudinal ones deepest, between usually with a complex and dense pattern of elongate, convolute staminodes, separated by narrow grooves, whole appearing brainlike, yellowish white or pale grayish green, occasionally with a pale violet hue; stipe of appendix cylindric or obconic, 0.1–0.6 × 0.3–1 cm. Infructescence cylindric, ca. 4 × 2 cm. Berries at first green, maturing orange, elliptic, 1- or 2-seeded. Fl. Mar–May, fr. Apr–Jun.

Shaded places in primary evergreen forests, on granite bedrock; 800–1700 m. Guangxi, SE Yunnan [N Myanmar, N Thailand].

4. *Amorphophallus dunnii* Tucher, J. Bot. 49: 273. 1911.

南蛇棒 nan she bang

Amorphophallus mellii Engler; *A. odoratus* Hetterscheid & H. Li.

Tuber dark brown, subglobose or depressed globose, to 10 cm high, to 12 cm in diam., developing numerous offsets annually, these shortly narrowly fusiform, 1–3 × ca. 1 cm. Leaf solitary; petiole green or grayish green with numerous elongate, confluent, pale green or brownish green spots, 30–60 × 1–1.5 cm, glabrous; leaf blade to ca. 100 cm in diam., rachises winged throughout; leaflets dark green adaxially, elliptic-lanceolate, 3–21 × 1.5–7 cm, acuminate. Inflorescence solitary, long pedunculate, producing a scent of fresh carrots; peduncle colored as petiole, 20–60 cm, 0.7–1.8 cm in diam. at base. Spatha shortly convolute at base, outside bright pale green, basally with rounded white spots, these distally grading to whitish green, inside base or a larger patch reddish purple, remainder and limb as outside but paler, broadly ovate, strongly concave, 8.5–24 × 8.5–23 cm, base within ridged-verruculose, apex acute, overarching spadix. Spadix stipitate or rarely nearly sessile, slightly shorter than spathe, 8–20 cm; stipe colored as peduncle but much paler, 0.5–1.5 cm; female zone cylindric, distal part occasionally broadened, 0.5–2.5 × 1–2.2 cm, flowers congested; ovary pale green, depressed, angulate in cross section, 1–1.5 mm high, 2–3 mm in diam., 2- or 3-loculed, with 1 basal ovule per locule; style pale green, 0.5–1 × 0.8–1 mm; stigma yellowish, flattened, ca. 1 mm high, ca. 2 mm in diam., 2- or 3(4)-lobed, oval or triangular in cross section, scabrous-verrucate, lobes obtuse; male zone broadly fusiform, 1.8–3 × 1.3–3.5 cm, flowers congested; male flowers consisting of 4 or 5 stamens; stamens ca. 3 mm; filaments ca. 1.5 mm, basal 1/3 connate; anthers butterfly-shaped in cross section, ca. 1.5 × 1.5–1.8 mm; pores elongate, apical but near margin, sometimes connected by

an eccentric groove; pollen striate; appendix ivory-white, narrowly to broadly conic, usually slightly dorsiventrally compressed, occasionally substipitate, variable, hollow, 3–14 cm, 1.3–4.5 cm in diam. near base, glabrous or entirely echinate or verruculose, or only distal 1/3 so, base constricted and sometimes grooved, apex subacute or obtuse. Inflorescence: fruiting zone cylindric, ca. 12 × 5 cm. Berries crowded, shortly stalked, glossy dark blue, elongate, to ca. 1.8 × 1.5 cm.

• Guangdong, Guangxi.

H. Li (in FRPS 13(2): 92–95. 1979) treated *Amorphophallus dumii* and *A. mellii* separately, but the descriptions indicate to Hetterscheid that they represent one variable species. The placement of *A. mellii* as well as *A. odoratus* in the synonymy of *A. dumii* was explained by Hetterscheid (Blumea 46: 281. 2000).

5. *Amorphophallus hayi* Hetterscheid, Blumea 39: 258. 1994.

红河磨芋 hong he mo yu

Rhizome horizontal, brown and green, to ca. 25 × 5 cm, branching infrequently, internodes 1–1.3 cm, leaf scars transversely oval; offset tubers long lasting, depressed, broadly attached; roots mainly developed from ventral side. Leaves solitary or paired or simultaneous with inflorescence, latter emerging from petiole sheath; petiole moderately glossy, background color dirty grayish green but nearly totally hidden by large, oval, confluent, reddish brown spots, 40–60 × 1–1.5 cm, turgid, glabrous; leaf blade 50–70 cm in diam., anterior segment less strongly developed than posterior ones; rachises short, unwinged except for distalmost parts; leaflets paler green abaxially, moderately glossy green adaxially, lanceolate, 8–32 × 2.5–7 cm, margin crispate-undulate, apex acuminate; venation quite strongly impressed. Inflorescence solitary or with leaf, long pedunculate; peduncle reddish brown to yellowish brown, densely covered with dark reddish brown, narrowly oval, often confluent spots, ca. 50 cm, ca. 1.5 cm in diam. at base, ca. 0.8 cm in diam. at apex, glabrous. Spathe erect, basally loosely convolute, apical 1/3 horizontally spreading, outside base very pale purplish brown on a ± cream-colored background, with numerous small and slightly larger, punctiform, rounded, partly confluent, dark purplish brown spots, distally outside dirty cream-colored with less numerous rounded spots but numerous tiny ones, to margin flushed with gray, inside base dark maroon, distally ± cream-colored with few tiny dark purple spots, to margin flushed with dirty dark brownish green, ovate, funnel-shaped, margin involute, base and limb not differentiated, 16–20 × 12–15 cm, base within with very shallow, interconnected ridges, apex narrowly acute. Spadix emitting a strong cheesy smell, shortly stipitate, longer than spathe, 20–28 cm; female zone cylindric or slightly obconic, 1.8–2.2 × 1–1.3 cm, distal limit irregular, flowers congested; ovary bright pale green with tiny reddish purple dots near stigma, very broadly ovoid, 2–2.3 × ca. 2 mm, rounded in cross section, 1-loculed, ovule on a heavy placenta, running on one side to apex of ovary; style absent; stigma acroscopic on ovary, pale dirty yellowish, ± reniform, ca. 1 × 0.8 mm, very thin, scaberulose; male zone fusiform or fusiform-obconic, 2–3 × 1.2–1.5 cm, proximal and/or distal limit irregular, flowers congested; stipe ca. 2 mm; appendix 16–23 cm, basal part 1–1.7 cm in diam., distal part ca. 4 mm in diam., narrowly fusiform, upper half tail-like and

horizontal, flexed or nearly erect, apex obtuse, all ± cream-colored with a faint bright greenish hue, base with flattened staminodes separated by shallow grooves, distally diminishing, remainder glabrous; male flowers consisting of ca. 4 stamens; stamens 1.5–1.8 mm; filaments whitish, ca. 0.3 mm, basally connate; anthers dark pink to purplish, 1.2–1.5 × ca. 1 mm, truncate, pores elongate, apical; pollen irregular, in tetrads, psilate to verrucate.

Secondary forests; below 1100 m. SE Yunnan [N Vietnam].

6. *Amorphophallus henryi* N. E. Brown, J. Linn. Soc., Bot. 36: 181. 1903.

台湾磨芋 tai wan mo yu

Amorphophallus niimurae Yamamoto.

Tuber dark brown, depressed globose, 2–6 cm high, 3–11 cm in diam., weighing up to 500 g, seasonally producing several globose offset tubers, these 0.5–1 cm in diam. Leaf solitary; petiole dull or moderately glossy, mid- or dark green with several ± oval or irregular, whitish spots, with or without numerous small, white dots in between, 30–60 cm, near base 1–2 cm in diam., glabrous; leaf blade moderately or highly dissected, 30–100 cm in diam.; rachises narrowly winged; leaflets abaxially pale green, adaxially mid- or dark green, dull or glossy, margin at first reddish pink, later usually turning green or whitish, elliptic-ovate, elliptic, or lanceolate, 4–26 × 1.5–5.5 cm, apex acuminate or long acuminate; major veins strongly impressed. Inflorescence solitary, shortly pedunculate; peduncle colored as petiole, 4–20 × 0.8–1.5 cm, lengthening in fruit. Spathe strongly convolute at base, outside glossy pale green, with or without a purplish flush, with or without a few small, paler spots; inside dark maroon, near constriction dirty whitish or greenish purple, campanulate, constricted between base and limb, broadly triangular-ovate, 9–25 × 8–23 cm, thickly walled, apex acute or obtuse; limb horizontal, irregularly wavy, outside pale green, with a variable, pinkish purplish hue, maroon near margin, inside dark maroon, dull or glossy, near margin greenish or pale purplish, base within densely covered with large, irregular verrucae; venation strongly impressed. Spadix producing a smell of decaying meat or cow dung at female anthesis, sessile, longer than spathe, 20–52 cm, female and male zones contiguous or separated by a short (ca. 0.5 cm) (partly) sterile zone; female zone cylindric or slightly conic, 1.5–4 cm, 2–3 cm in diam. (including styles), flowers congested or all or partly ± remote; ovary: base or larger part greenish, rest dark purple, depressed, orbicular or suborbicular in cross section, 1.5–3 mm high, 2–3(–4.5) mm in diam., 2-located, with 1 basal ovule per locule; funicle long, strongly coiled; style brownish purple or blackish, 2–3 mm, slender, 0.8–1.2(–1.5) mm in diam.; stigma grayish purple, large, orbicular or oval in cross section, 0.8–1.5 mm high, ca. 2 mm in diam., 2- or 3(or 4)-lobed, densely scabrous-papillate; lobes conic, obtuse or subacute; sterile zone with variously transformed male flowers (staminodes), sometimes intermixed with a few sterile remnants of bisexual flowers, often accompanied by all possible transitional stages from adjacent zones; appendix pale or dark brown, narrowly fusiform, 15–42 cm, 1.4–3 cm in diam. near base, 1.8–4 cm in diam. ca. 1/3 from base, oval in cross section, thinly walled and hollow after anthesis, apex ± obtuse or acute, with regular or

irregular, shallow, strongly wrinkled and/or with elongate depressions, these in basal half of appendix with or without a short, pale or dark purplish or whitish hair (0.5–2.5 mm); sterile flowers (when present) between male and female zone either pale green or purple, to 5 mm, hairlike, or reduced bisexual flowers, these consisting of a reduced pistil surrounded by several stamens; male zone ± obconic, 1.5–4.5 cm, 0.9–1.9 cm in diam. at base, 1.5–3.5 cm in diam. at apex, flowers congested or proximal ones distant, free or in distal part fused into low-angled spirals; male flowers consisting of (2 or)3–6 stamens; stamens ivory-white, oval in cross section, ca. 2 × 1.8 mm; filaments ca. 1 mm, basally connate; anthers ca. 1 mm, truncate or rostrate (elongation of connective); connective minutely verrucate, after anthesis more strongly rostrate by differential shrinking of lateral sides of anthers; pores apical, elongate prior to anthesis, oval at anthesis, opening by deepening of lower margin, after anthesis ± laterally displaced. Berries blue or violet, elliptic.

- Broad-leaved forests, mixed forests, bamboo plantations, orchards, in heavily to lightly shaded places, on thin soils on limestone bedrock or in karst areas; sea level to 700 m. Taiwan.

7. *Amorphophallus hirtus* N. E. Brown, J. Linn. Soc., Bot. 36: 181. 1903.

密毛磨芋 mi mao mo yu

Tuber whitish, turning grayish brown upon exposure, globose or depressed globose, 2–9 cm high, 3–15 cm in diam., weighing up to ca. 1500 g, seasonally producing numerous thin, rhizomatous offset tubers, these to 3 × ca. 1 cm. Leaf solitary; petiole dark green with numerous tiny, blackish green spots or with larger, ± diamond-shaped, pale grayish green spots, these filled with numerous dark green, elongate dots, 20–100 cm, 1–2.6 cm in diam. at base, turgid, glabrous; leaf blade 30–120 cm in diam., highly dissected; rachises only in distal half of blade winged, wings sinuous; leaflets adaxially dark emerald green with a pinkish violet margin, ± obovate or elliptic-oval, 5.5–11 × 2.5–4.5 cm, ± fleshy, long acuminate; venation impressed adaxially. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 38–125 cm, 1–4 cm in diam. at base. Spatha strongly convolute at base, outside pale green, faintly flushed with purple or dark grayish green with numerous pale whitish green spots, proximal ones confluent, veins dark green, inside blackish maroon, campanulate, constricted between base and limb, broadly triangular, 13–53 × 12–45 cm, covered with numerous shortly ridgelike, laterally compressed, fleshy warts, base obliquely urceolate, thickly walled, apex acute; limb horizontally spreading or obliquely upturned, outside pale green, flushed with purple-brown or dark grayish green with angulate, whitish green spots and margins dirty purple, without spots, inside ± maroon, flushed with green or with numerous small, rounded, sometimes confluent, whitish greenish spots, veins maroon, margin undulate. Spadix emitting a strong smell of old socks or strong compost, ± stipitate, much longer than spathe, 31–88.5 cm, stipe 0.2–1 cm, female and male zones separated by a narrow sterile zone; female zone slightly obconic or cylindric, 1.6–6.5 cm, 1.1–3.5 cm in diam. at base, 1.2–3.7 cm in diam. at apex, flowers lax; ovary: basal half white, apical half blackish maroon, ± globose, ca. 2.5 mm high, ca. 2.5 mm in diam., orbicular in cross section, ± gradually tapering to style,

2-loculed, with 1 basal ovule per locule; style maroon, thick, ca. 1 × 1.5 mm; stigma ± pyramidal, orbicular in cross section, ca. 1.8 mm high, ca. 2.5 mm in diam., shallowly 2(or 3)-lobed, lobes pale olive-green, rounded, scabrous; sterile flowers between male and female zone consisting of 1–7 staminodes, these consisting of a swollen, often depressed, white base and a purple hair 5–10 mm; male zone urceolate, terete or slightly laterally compressed, distal margin straight or very irregular, 3–9 cm, 0.9–3.7 cm in diam. at base, 2–7 cm in diam. at apex, flowers congested, with scattered, purple hairs between; male flowers consisting of 3–6 stamens; stamens very shallowly hemispheric, ca. 2 mm, some uppermost stamens intermediate with hairs on appendix, carrying a short hair on connective or reduced to a slightly concave, broad base, carrying a hair (staminode); filaments short, ca. 0.5 mm, connate; anthers ca. 1.5 × 3–3.5 mm, polygonal in cross section, apex very shallowly rounded, ivory-white, producing a clear fluid from top during female anthesis; connective brownish; pores apical, elongate, oval after anthesis; appendix very narrowly conic, 25.5–73 cm, 2–7 cm in diam. at base, entirely purple or with numerous dirty greenish, small spots, with numerous laxly disposed hairs, these directed perpendicular to appendix axis, 0.2–1.5 cm, purple, in shallow pockets, base not swollen, apex obtuse, producing a clear fluid during female anthesis.

- Dense grasslands; below 100–100 m. Taiwan.

8. *Amorphophallus kachinensis* Engler & Gehrmann, Pflanzenr. 48(IV. 23C): 91. 1911.

勐海磨芋 meng hai mo yu

Amorphophallus bannaensis H. Li.

Tuber brown, depressed globose, 3–5 (or more) cm high, 5–30 cm in diam., developing offsets; offsets incompletely known but probably rhizomatous. Leaf solitary; petiole dirty white with dark green to reddish brown spots, ca. 20 cm (?or longer), glabrous; leaf blade to 100 cm in diam.; leaflets elliptic, 6–9 × 2–3 cm, acute-acuminate. Inflorescence solitary, long pedunculate; cataphylls 9–20 cm; peduncle ivory-white, grayish, or greenish with brown or purple blotches and greenish patches, 24–80 cm, 0.7–1 cm in diam. at base. Spatha shortly convolute at base, outside green or greenish brown with green spots or purplish red stripes and spots, apex purple, concave, 8–29 × 7–14 cm, base inside with scattered, shallow, punctiform warts. Spadix emitting an unpleasant, rancid smell, much shorter than spathe, 6.5–18 cm; stipe 0.2–1 × 0.4–1 cm; flowers unisexual; female zone slightly obconic or cylindric, 1.3–5 × 0.6–1.4 cm, flowers congested, proximal ones often more loosely arranged; ovary dark purple, globose or subpyriform, after anthesis (?fertilization) articulate to style, ca. 2 mm high, ca. 1.5 mm in diam., 1-loculed, with 1 basal, anatropous ovule; style strongly curved, dark purple, 1–2 mm, slender; stigma superficial, semi-globose, triradiate or flattened, subapical, often transversely expanded beyond style and subbilabiate, ca. 0.4 mm high, 0.7–1 mm in diam., verrucate, verrucae sometimes elongate and “catcher”-like; male zone obconic, occasionally fusiform, base often constricted, flowers congested, 2–4 × 1.2–3 cm; male flowers consisting of 3–6 stamens; stamens ca. 3 mm; filaments ca. 2 mm, basal half connate, occasionally entirely connate; anthers white, 1–1.5 × ca. 0.8 mm, apex subtruncate; pores api-

cal to sublateral, marginal, elongate; appendix stipitate, occasionally sessile, dirty white, ovoid or conic, occasionally nearly globose, $5.5\text{--}7 \times 2\text{--}4$ cm, often with a few deep, longitudinal grooves or with a few shallow folds, glabrous, base constricted, apex truncate, rounded, or rarely acute; stipe $0.3\text{--}1.5 \times 0.8\text{--}2$ cm. Fl. Mar-May.

Dense climax forests, on limestone rocks; 1000–1500 m. S and W Yunnan [Laos, N Myanmar (Kachin State), N Thailand].

9. *Amorphophallus kiusianus* (Makino) Makino, Bot. Mag. (Tokyo) 27: 244. 1913.

东亚磨芋 dong ya mo yu

Amorphophallus konjac K. Koch var. *kiusianus* Makino, Bot. Mag. (Tokyo) 25: 16. 1911; *A. hirtus* N. E. Brown var. *kiusianus* (Makino) M. Hotta; *A. sinensis* Belval.

Tuber depressed globose, to ca. 20 cm in diam., to ca. 12 cm high, [no offset development (Japanese specimens) or] with a few sessile, globose offsets (mainland Chinese specimens). Leaf solitary; petiole glossy, dirty olive-green or grayish green, with narrowly oval or irregular whitish or very pale greenish spots and numerous tiny dark green dots, to ca. 65×4 cm, glabrous; leaf blade $60\text{--}90$ cm in diam., rachises winged, distal from basal main branchings; leaflets adaxially bright green with a narrow pale violet margin, narrowly elliptic to lanceolate, $6\text{--}20 \times 3\text{--}4.5$ cm, margin undulate, apex moderately to long acuminate. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 40–100 cm (in fruit to ca. 120 cm), 1.5–4 cm in diam. Spathe outside dark greenish, greenish pinkish, or glossy dark purplish brown, with small, whitish spots, margin with a narrow, reddish violet line, inside pale pinkish with a purplish base, purplish and greenish, or entirely dark brown, with or without a greenish margin, latter sometimes flushed pinkish, sometimes only medially pale green, otherwise with rounded, whitish spots, base outside dark green or dark greenish brown, with small, rounded whitish spots and blackish green veins, triangular, base rounded, $9\text{--}25 \times 4\text{--}13$ cm, shallowly or clearly constricted between base and limb; limb at first oblique, then reflexing and bending downward, margin reflexed or undulate; base within dark purple and with numerous ± distant, conic warts, occasionally with small, whitish spots. Spadix sessile or subsessile, shorter than, equal to, or longer than spathe, 9–22 cm; female zone slightly conic, $1\text{--}4 \times 0.5\text{--}2$ cm; ovary bright pale green, ± obovoid, angulate in cross section, ca. 2.5 mm high, ca. 2 mm in diam., 2-loculed; style bright pale green or dark brown, nearly absent, ca. 0.2×1 mm, bifurcate at apex; stigma pale greenish gray, shallowly or distinctly 2-lobed-sinuous, slightly oval in cross section, ca. 0.8 mm high, ca. 1.5 mm in diam., minutely papillate; staminodes between male and female zone isolated or in groups of 2–4, or together with functional stamens as part of lowermost male flowers, consisting of a highly reduced stamen and a long, brown hair on connective, those in groups often forming one common disciform base with grooves corresponding with limits of defunct stamens, those on appendix consisting of only a brown hair and each from a shallow depression; male zone cylindric or slightly obconic, $2.5\text{--}4.5 \times 0.5\text{--}2$ cm; male flowers consisting of 4 or 5 stamens; stamens pale yellow, ca. 1.5 mm; filaments ca. 0.5

mm, entirely connate; anthers subtruncate or truncate, mostly subrectangular in cross section, $1\text{--}2 \times$ ca. 1 mm; connective brownish; pores apical, elongate; appendix fusiform-conic or narrowly fusiform, $4\text{--}16$ cm, 1–3 cm in diam. near base, apex acute or obtuse, entirely blackish or with scattered, tiny green spots, or entirely dark greenish, glossy, glabrous or with shallow depressions, base grooved, otherwise naked or with scattered, thin, violet-brown hairs, emerging from depressions, these to ca. 1 cm; pollen striate-areolate, released in strings. Inflorescence with dried spathe base sometimes remaining, cylindric, $5\text{--}22 \times 3\text{--}4.5$ cm. Berries glossy, at first bright green, turning pinkish purple and finally deep blue, rounded or oval, ca. $1 \times 0.8\text{--}1$ cm, 2-seeded. Seeds oval in longitudinal section, flattened on one side, ca. $8 \times 6 \times 4$ mm; testa black, moderately glossy, minutely rugulose. Fl. Apr-Jun, fr. May-Jul.

Shaded, semishaded, or sun-exposed places, plantations, secondary forests, mixed bamboo and broad-leaved forests, orchards; 300–900 m. Anhui, Fujian, Guangdong, Hunan, Jiangxi, Taiwan, Zhejiang [S Japan].

10. *Amorphophallus konjac* K. Koch, Wochenschr. Gärtnerei Pflanzenk. 1: 262. 1858.

花磨芋 hua mo yu

Amorphophallus mairei H. Léveillé; *A. nanus* H. Li & C. L. Long; *A. rivieri* Durieu ex Riviere; *Brachyspatha konjac* (K. Koch) K. Koch; *Hydrosme rivieri* (Durieu ex Riviere) Engler; *Proteinophallus rivieri* (Durieu ex Riviere) J. D. Hooker.

Tuber brown, slightly glossy, depressed globose, to ca. 20 cm high, to ca. 30 cm in diam., seasonally producing numerous long rhizomatous offsets with swollen apical part, these to ca. 50×3 cm. Leaf solitary; petiole background color dirty whitish pinkish or dirty cream-colored, often nearly entirely covered by large, elongate, dark green confluent spots and smaller white dots, or with numerous small, blackish green spots, very variable, to ca. 100×8 cm, glabrous or with scattered punctiform warts at base; leaf blade highly dissected, to ca. 200 cm in diam., rachises narrowly winged; leaflets dull green adaxially, elliptic, $3\text{--}10 \times 2\text{--}6$ cm, acuminate. Inflorescence long pedunculate (rarely short); peduncle colored as petiole, to ca. 110×5 cm. Spathe outside base dirty pale brownish with blackish green spots, or dirty pale whitish grayish with a few scattered blackish green dots, near margin flushed with purple; inside base maroon with or without a paler whitish purplish zone above, elliptic-lanceolate to broadly ovate-triangular, $10\text{--}60 \times 10\text{--}55$ cm, base and limb ± separated by a shallow constriction, margin ± strongly sinuous, apex acute; base within densely verrucate, verrucose tiny, punctiform; limb erect, outside uniformly dark purplish brown, or with scattered blackish green spots, inside uniformly dark brown, glossy, undulate and/or longitudinally folded, basal margin spreading. Spadix during female anthesis producing a strong smell of rotting meat and producing small, clear, slightly viscous droplets, sessile, 15–110 cm; female zone cylindric or narrowly conic, $2\text{--}11$ cm, 1–4 cm in diam. at base and to ca. 6 cm in diam. at apex, flowers congested or distant; ovary whitish or pale pinkish, apex purplish, depressed globose, oval or suborbicular in cross section, $2\text{--}2.5$ mm high, $2\text{--}4$ mm in diam., 2- or 3-loculed; style purplish, 1–5

mm, ± slender, 0.7–1 mm in diam., often distinctly branched at apex; stigma dirty yellowish brown, depressed, strongly undulate, often sunk between enlarged style branches, 2- or 3(or 4)-lobed, oval or triangular in cross section, ca. 0.5 mm high, 1.5–2 mm in diam., verruculose-scabrous; transitional zone between female and male zones occasionally with partly staminodal male flowers and/or pistillodial female flowers or flowers showing all intermediate stages; male zone cylindric, slightly fusiform, or slightly obconic, 2–12 × 1–6 cm, flowers congested; male flowers consisting of 3–5 stamens; stamens 2–2.5 mm; filaments pale orangish yellow or whitish, 0.5–1 mm, basally or entirely connate or slightly diverging at apex; anthers dirty whitish grayish, or ± cream-colored, truncate or subtruncate, 1–1.5 × 0.8–2 mm, rectangular in cross section; connective purplish, turning grayish at anthesis, slightly raised; pores apical, oval or reniform; appendix narrowly fusiform-conic, often laterally compressed and with irregular, shallow longitudinal furrows, 10–85 × 1.5–6 cm, acute, dark purplish brown or paler, densely rugulose, base often with several diamond-shaped, flattened staminodes. Fl. Apr.

- Open situations or forest margins and thickets, secondary forests; 200–3000 m. Yunnan.

The species occurs wild in Yunnan; other occurrences are regarded as plants escaped from cultivation. It is an important crop plant, also cultivated in Japan.

11. *Amorphophallus krausei* Engler, Pflanzennr. 48(IV. 23C): 94. 1911.

西盟魔芋 xi meng mo yu

Amorphophallus sutepensis Gagnepain; *A. ximengensis* H. Li.

Tuber dirty pale yellowish, brownish, or orangish, yellow inside, globose, sometimes slightly subcylindric, with a deep central depression, 4–8 cm high (or more), 5–25 cm in diam., weighing up to 750 g (?or more), seasonally developing several offsets; offsets rhizomatous, long and thin, 2–27 × 0.4–1 cm, apically slightly thickened or not. Leaf solitary; cataphylls 3, to 25 cm, proximally pale pink, distally grading into off-white, covered with pale blackish green, elongate spots; petiole background color pale green, at base often pale pink or with a reddish brown or reddish hue, with many smaller and larger, partly or nearly entirely confluent, elliptic to narrowly elliptic, blackish green or paler green or rarely reddish brown spots and several small, white dots, intensity of color and extension of pattern variable, 20–190 cm, 1–5 cm in diam. at base, glabrous; leaf blade 100–200 cm in diam.; rachises broadly winged; leaflets paler green abaxially, green or grayish green adaxially, lanceolate to elliptic-lanceolate, more rarely elliptic, 11–48 × 2–11 cm, base decurrent, apex acuminate. Inflorescence solitary; peduncle colored as petiole but smaller, 25–100 cm, 0.8–2 cm in diam. at base. Spathe erect, convolute at base, outside pale green, toward base slightly darker, inside pale yellowish green, base sometimes ± maroon, cymbiform, ovate to ovate-lanceolate, 11–40 × 6–26 cm, basal convolute part 4–6 cm, base inside with many small, slightly elongate or irregularly ridge-shaped warts, apex acute-acuminate. Spadix developing considerable heat at female anthesis and producing a heavy, gaseous, nau-

seating stench, yellowish white or pale green, nearly as long as spathe, rarely distinctly shorter or slightly longer, 8–35 cm; flowers unisexual, naked; female zone cylindric or slightly obconic, 0.6–5 cm, 0.6–2.3 cm in diam. (including styles), flowers congested; ovary pale green, occasionally pale magenta-purple near style base, globose or slightly depressed, 1.5–2 mm high, 2–2.5 mm in diam., 1-loculed (rarely 2-loculed), with 1 basal ovule; style green or magenta-purple, cylindric or conic, 1–2 mm; stigma globose or semiglobose, ca. 1 mm in diam., entire or with a shallow central depression or shallowly 2- or 3-lobed; lobes pale yellowish white, yellow, or brownish, rounded, scabrous, margin sinuous; sterile zone between female and male zones rarely absent, cylindric, 0.6–2 × 0.8–1.8 cm, staminodes congested; appendix fusiform or fusiform-conic, sometimes slightly laterally compressed, 3–17 × 0.9–5 cm, sometimes with a small stipelike part, glabrous, apex rounded or ± acute, base occasionally stipelike, at base sometimes with a few rounded staminodes or staminodal remnants, separated by small grooves; staminodes often with a droplet as on connectives at female anthesis, ivory-white or creamy orange, occasionally flushed with pale purple, ovate or diamond-shaped in cross section, semiglobose, 1–4.5 × 1–3.1 mm in cross section; male zone cylindric-fusiform or slightly obconic, sometimes slightly laterally compressed, 3.5–13 × 0.8–3 cm, flowers congested; male flowers consisting of (1–)3 or 4(or 5) stamens, ivory-white; stamens 2–2.2 mm high; filaments short, 0.75–1 mm, thick, connate, in lowermost flowers greatly enlarged and with reduced thecae, grading into staminodes; anthers with a rounded apex or subtruncate, 1–1.3 mm high, 1–1.75 mm in diam.; pores apical, elongate; connectives often with a clear, slightly sticky droplet at female anthesis. Infructescence cylindric, ca. 10 cm. Berries 1-seeded (rarely 2-seeded), bright red, ca. 1 cm. Seeds silvery gray with small, black dots, elliptic-ovoid, 6–9 × 3–5 mm. Fl. Jun–Aug, fr. Nov–Dec.

Shaded to open, often fire-prone, places in mixed primary evergreen/deciduous forests and deciduous dipterocarp forests, forest margins, bamboo thickets, on granite bedrock, sometimes near streams, lowlands; below 1500 m. Yunnan [Bangladesh, Laos, N Myanmar, N Thailand].

This species is used as a food resource by ethnic minorities in China (H. Li, J. Wuhan Bot. Res. 6: 212. 1988, under *Amorphophallus ximengensis*).

12. *Amorphophallus paeoniifolius* (Dennstedt) Nicolson, Taxon 26: 338. 1977.

疣柄魔芋 you bing mo yu

Dracontium paeoniifolium Dennstedt, Schlüssel Hortus Malab. 13: (21, 38). 1818 [“*paeoniaefolium*”]; *Amorphophallus campanulatus* Decaisne; *A. gigantiflorus* Hayata; *A. microappendiculatus* Engler; *A. paeoniifolius* var. *campanulatus* (Decaisne) Sivadasan; *Arum campanulatum* Roxburgh, nom. illeg. superfl.; *A. rumphii* Gaudichaud, nom. illeg. superfl.; *Candarum rumphii* Schott, nom illeg. superfl.; *Hydrosme gigantiflora* (Hayata) S. S. Ying.

Tuber dark brown, depressed globose, ca. 20 cm high, to ca. 30 cm in diam., weighing up to ca. 15 kg; root scars prominent, annulate; offsets produced every season, thick and rhi-

zomatous, to ca. 10×4 cm. Leaves 1 or 2; petiole background pale to dark green or blackish green, usually with large and small pale blotches and numerous tiny dark dots, large blotches often confluent, especially near base, petiole to ca. $2 \text{ m} \times 20$ cm, shallowly corrugate to strongly echinate-verrucate; leaf blade highly dissected, to ca. 3 m in diam.; rachises narrowly or broadly winged almost to base; leaflets abaxially mid-green or pale green, adaxially mid-green, orbicular, oval, ovate, obovate, elliptic, elliptic-oblong, elliptic-lanceolate, or lanceolate, $3-35 \times 2-12$ cm, apex acuminate. Inflorescence shortly pedunculate; peduncle $3-20 \times 1-8$ cm, usually paler and more glabrous than petioles. Spathe campanulate, broader than long, $10-45 \times 15-60$ cm, base and limb often separated by a shallow constriction; limb spreading, background ranging from pale green to dark brown, usually with both large and small, orbicular paler spots, base inside proximal part deep maroon, distal part dirty whitish or very pale pinkish, limb outside as base but with more prominent maroon flushes, especially near margin, limb inside usually glossy dark maroon, strongly undulate, base outside very variable, base within densely verrucate, verrucae variable, mostly conic, fleshy. Spadix giving off a stench of rotting meat, sessile, shorter or longer than spathe, 7–70 cm; female zone cylindric, $3-25 \times 1-12$ cm, flowers congested or slightly distant; ovary entirely pale green or largely maroon with a whitish base, depressed, orbicular in cross section, 1.5–2.5 mm high, 3–5 mm in diam., 2- or 3-loculed; style maroon, 3–15 mm, slender, 1–1.5 mm in diam.; stigma pale or deep yellow, oval or triangular in cross section, large, 3–5 mm high, 4–7 mm in diam., often strongly laterally compressed, then cordate in longitudinal section, verruculose, shallowly or deeply 2- or 3-lobed, lobes rounded or conic, sometimes with a strong groove on outward side; male zone cylindric or strongly obconic, 2.5–15 cm, 1–10 cm in diam. at base, 1–20 cm in diam. at apex, flowers congested; male flowers consisting of 4–6 stamens; stamens 4–6 mm; filaments ca. 0.5 mm, connate; anthers off-white, cylindric, $3.5-5.5 \times$ ca. 1.5 mm, subtruncate; pollen psilate; appendix very variable, glossy dark maroon, rarely pinkish or yellow, inflated, globose, depressed globose, ovoid, or triangular-conic (pyramidal), 1.5–30 cm, 1.2–30 cm in diam. (slightly above base), minutely granulate, glabrous or with various folds and/or irregular shallow depressions, base often with flattened, staminodal structures, apex obtuse or ± acute. Infructescence long pedunculate; peduncle stretching strongly after fertilization, 20–100 cm, becoming uniformly tan, with very numerous narrow, transverse cracks; fruiting zone cylindric, $10-50 \times 3-8$ cm. Berries closely set or slightly distant, ripening from green through yellow to bright red, elongate, $1.5-2 \text{ cm} \times 8-10$ mm. Fl. Apr–May, fr. Oct–Nov.

Secondary conditions, secondary forests or highly disturbed areas, in dappled shade or fully exposed; sea level to 800 m. Guangdong, Guangxi, Hainan, Taiwan, Yunnan [Bangladesh, India, Indonesia, Laos, Myanmar, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; N Australia, Pacific islands; naturalized in Indian Ocean islands (Seychelles)].

This taxon is extensively cultivated as a tuber crop, serving as an important food for humans and as animal feed.

13. *Amorphophallus tonkinensis* Engler & Gehrmann, Pflanzren. 48(IV. 23C): 87. 1911.

东京磨芋 dong jing mo yu

Tuber brown, somewhat glossy, depressed globose, at least 9 cm in diam., root scars slightly raised, no offsets observed. Leaf solitary; petiole uniformly pale green or background pale grayish green with a clear bluish flush near base and on subterranean part, and with whitish spots, these often broader than long, irregularly shaped, and scattered over entire surface with short, longitudinal, blackish dots, these in proximal part often raised, petiole $80-200 \times 2.5-7$ cm, glabrous, turgid; leaf blade highly dissected, $80-200$ cm in diam.; rachises winged only distally from basal main branchings, sometimes some nodes swollen and forming intercalary bulbils; leaflets elliptic-lanceolate to lanceolate, $8.5-24 \times 3.5-6$ cm, long acuminate. Inflorescence solitary, long pedunculate; peduncle colored as petiole, 22–50 cm (but probably longer), ca. 1 cm in diam. Spathe (all dimensions based on relatively small specimens) shortly convolute at base, erect or arching over spadix apically, outside green with a few transverse, whitish spots, inside whitish green with small, punctiform or slightly elongate verrucae, oval, $8-20 \times 5-17$ cm, strongly concave; outside limb dark green with an obscure blackish purplish flush and a few scattered, small whitish dots, inside bright green with a few small, whitish spots. Spadix sessile, shorter than or nearly as long as spathe, 7.5–17 cm; female zone cylindric or slightly obconic, $1-1.5 \times 1-2$ cm, flowers congested; ovary bright pale green, depressed globose, ca. 2 mm high, 2.5–3 mm in diam., 2-loculed; style whitish, straight, short, $0.8-1 \times$ ca. 0.8 mm; stigma dirty pale yellowish brownish, depressed, large, ca. 1.5 mm high, 2–2.5 mm in diam., orbicular or oval in cross section, verruculose, entire, with an acroscopic shallow depression, or shallowly or distinctly 2-lobed, lobes rounded; male zone slightly or strongly obconic, 1.5–4 cm, 1.5–2 cm in diam. at base, 1.6–3 cm in diam. at apex, flowers congested; male flowers consisting of 4 or 5 stamens; stamens $3-3.5 \times 1-1.5$ mm; filaments ca. 1.5 mm, connate; anthers 1.5–2 mm, truncate; pores apical or subapical, elliptic, small, with a groove running from every pore to margin of anther; connective large, raised; appendix conic, oval-elliptic, or narrowly fusiform, $4.5-12 \times 2.2-5$ cm, obtuse, white, with many shallow, often longitudinally confluent depressions and with or without scattered, tiny, punctiform pustules, base with sterile stamens, gradually merging to form appendix wall. Fl. May.

Dense tropical forests, moist shaded places; 800–900 m. SE Yunnan [N Vietnam].

14. *Amorphophallus yuloensis* H. Li, J. Wuhan Bot. Res. 6: 211. 1988.

攸乐磨芋 you le mo yu

Tuber depressed globose, to ca. 10 cm in diam., without offset development. Petiole uniformly olive-green to pale green, $10-75 \times 0.5-2$ cm, smooth; leaf blade pale green abaxially, mid green adaxially, $10-100$ cm in diam.; rachises winged distally from basal branchings, central branching point and several more distal nodes becoming intercalary bulbils, producing new plants after detachment; leaflets elliptic to elongate elliptic, $2-25 \times 2-10$ cm, apex acuminate, veins impressed adaxially. Peduncle dark olive-green with fine, darker, short striations/

spots, ca. 10 cm × 8 mm, glabrous. Spatha erect, outside base pale greenish with small, blackish green dots, center very pale pinkish with similar dots, distally dirty creamish with scattered, grayish black dots, inside base pale pink with numerous white verrucae, distal part dirty cream, concave, broadly ovate, ca. 11 × 10 cm, margins incurved, obtuse; spathe on second day open to base. Spadix subsessile, shorter than spathe, ca. 8.5 cm; female zone cylindric, distal margin very irregular, 1–2 × ca. 1.3 cm, flowers congested or just touching; ovary depressed, orbicular in cross section, 2–2.5 mm high, ca. 4 mm in diam., pale green with very thin, scattered pinkish, short stripes in apical half, 2-loculed, with 1 basal ovule per locule; style ivory-white, short but distinct, ca. 0.8 × 1.1 mm; stigma pale dirty yellow, disciform, rounded in cross section, ca. 1 mm high, ca. 2.5 mm in diam., densely verrucate, with a shallow central depression; male zone slightly fusiform, 2.5–4 × ca. 11.5 cm, flowers mostly separated but distally congested, occasional flowers transformed into conic-pyramidal staminodes; male flower consisting of (2 or)3(or 4) stamens; stamens ca. 2 mm; filaments ivory-white, ca. 0.8 mm, basally connate; anthers dirty ivory-white, truncate, ca. 1 × 2 mm, rectangular in cross section; pores apical, elliptic; staminodes representing one stamen each; appendix ivory-white, broadly conic, massive, 3.2–4 × ca. 1.8 cm, glabrous, base irregular, apex obtuse. Fr. Jun.

- Dense primary evergreen valley forests on limestone; 200–2400 m. Yunnan.

15. *Amorphophallus xiei* H. Li & Z. L. Dao, Novon 16: 240. 2006.

谢君蘑菇 xie jun mo yu

Tuber dark brown outside, pink inside, depressed globose, 7–8 cm high, ca. 16 cm in diam., root scars not swollen, without offset development. Leaf solitary; petiole pink at base, green to deep green apically, sometimes with some inconspicuous, paler, rhombic, linear, or irregular spots with a dark center or with scattered very small, dark green dots, 60–80 cm, glabrous; leaf blade 60–120 cm in diam.; leaflets pale abaxially, green adaxially, elliptic, to ca. 23 × 8 cm, apex acuminate; main branching points in leaf blade with an epiphyllar bulbil, these brown, depressed globose to subglobose, to 3 cm in diam. Inflorescence solitary; peduncle colored as petiole, to 18 × 1.3–1.5 cm. Spatha almost erect, outside very pale whitish pinkish with scattered punctiform dark brown dots, with purple base, and margin sometimes reddish, inside dark pink, campanulate, ca. 18 × 10 cm, base minutely verruculose. Spadix sessile, longer than spathe, 23–24 cm; flowers unisexual, naked; female zone cylindric, 4–4.5 × 1.5–2 cm, flowers congested; ovary pink to reddish pink, obconic, ca. 3 mm high, ca. 2 mm in diam., 1-loculed; style almost absent; stigma nearly sessile, yellow, strongly depressed, disciform, ca. 0.5 mm high, ca. 3 mm in diam., wider than ovary, slightly 5- or 6-lobed to irregularly 8-lobed; male zone cylindric or slightly obconic, 6.5–7 × 2.6–3.7 cm; male flower consisting of 4 or 5 stamens; stamens almost entirely free, ca. 2 × 1.5 mm; filaments ca. 1 mm; anthers off-white with a pinkish apex, truncate, ca. 1 mm; pores apical, slightly elongate; appendix off-white or pale pink, fusiform-conic, laterally compressed in larger individuals, ca. 11 × 5 cm,

smooth. Fruit red when mature, ovoid, ca. 1.5 cm × 5 mm. Fl. Apr, fr. May–Nov.

- Forest margins, tropical thickets; 900–1100 m. W Yunnan (Longchuan).

This species is cultivated as a food crop in the valleys of the Nanwan and Husa rivers of the Irrawaddy system.

The species status of *Amorphophallus xiei* is doubted by one of us (Hettterscheid). It differs only in color from *A. bulbifer* Blume (N, NE, and S India), an otherwise variable species forming a close relationship with *A. muelleri* Blume (NE India, N Thailand southward to the lesser Sunda islands of Indonesia). Both species also produce the same epiphyllar bulbils unique in *Amorphophallus*. Molecular analysis indicates that *A. xiei* is most closely related to *A. bulbifer*, if not just a somaclonal variant of it (both *A. bulbifer* and *A. muelleri* are apomicts with $2n = 39$) taken up for cultivation and possibly escaped to non-agricultural terrain.

16. *Amorphophallus yunnanensis* Engler, Pflanzenr. 48(IV. 23C): 109. 1911.

滇磨芋 dian mo yu

Amorphophallus kerrii N. E. Brown.

Tuber dark brown, white or yellow inside, depressed globose, to 9 cm high, to 13 cm in diam., weighing up to 500 g, root scars with an annular thickening, seasonally developing several offsets; offsets sessile, rounded or elliptic, ca. 2.5 × to 1.2 cm. Leaf solitary; cataphylls 3, dark grayish green, largely covered with pale pinkish, rhombic spots, 6–35 cm; petiole medium to dark olive-green or dark olive-brown with several rhombic or narrowly elliptic, pale whitish greenish spots, 10–80 cm, 0.5–2.5 cm in diam. at base, glabrous; leaf blade highly dissected, to 190 cm in diam.; rachises broadly winged except below basal branching points, basal branching points sometimes developing intercalary bulbils after disturbance; leaflets abaxially paler, adaxially dark green, often with a bluish sheen when young, margin often narrowly violet, elliptic, 10–40 × 5–13 cm, base broadly decurrent, apex acuminate. Inflorescence solitary, long pedunculate; cataphylls as with leaf; peduncle colored as petiole, 13–60 cm, 1–2 cm in diam. at base. Spatha shortly convolute at base, erect, concave, arching over spadix, outside white or pale greenish white, rarely dark green, sometimes near base with paler, occasionally ringlike spots, or sometimes flushed with pale pinkish, margin sometimes lined pinkish, inside pale greenish white without spots; limb outside dirty creamish, sometimes with faint spots, margin sometimes pale pinkish violet, inside ± cream-colored or pale greenish white, margin sometimes pale pinkish violet, broadly ovate, 9–29 × 4–20 cm, inside base glabrous or with a few scattered, punctiform warts, apex obtuse or acute. Spadix creamy white or pale pinkish, much shorter than spathe, 3–18 cm; stipe pale green with whitish spots, 0.5–2.5 cm; flowers unisexual; female zone cylindric, slightly conic or obconic, 0.8–3.5 × 0.5–2 cm, flowers congested but in proximal part sometimes loosely arranged; ovary green, pale green, brownish green, or purplish, near style insertion sometimes dirty creamish, globose, subglobose, or depressed, orbicular or angulate in outline, 2–2.5 mm high, 2–4 mm in diam., 2-loculed; style straight or curved, green or dirty pale pinkish, narrowly to broadly conic, base

(articulation) thickened, $1\text{--}2.5 \times 0.3\text{--}1$ mm; stigma pale yellowish or dirty brownish, variable, usually distinctly broader than style diam., disciform to subhemispheric, more rarely superficial, punctiform, orbicular or oval in outline, with a shallow central depression to clearly 2-lobed, verrucate; lobes rounded, 0.4–0.6 mm high, 0.6–1.2 mm in diam.; male zone conic or fusiform-cylindric, rarely obconic, sometimes (partly) laterally compressed, $1\text{--}4 \times 0.6\text{--}3.5$ cm, flowers congested; male flowers consisting of 3–5 stamens; stamens 3–3.5 mm; filaments 0.5–2 mm, basally or up to 2/3 of length connate; anthers creamy white, $1.5\text{--}3 \times 1\text{--}2$ mm; connectives flat or with a ridgelike extension, perpendicular to long axis, either small or very large, maroon or dark brown; pores apical, elongate; appendix ovoid, conic, or triangular-ovoid, rarely subcylindric,

inflated or strongly laterally compressed, $3\text{--}11 \times 1.5\text{--}5$ cm, glabrous or verruculose, rarely entirely echinate, often with a few longitudinal shallow or deep, broad folds, or irregularly folded throughout, base strongly truncate, apex obtuse, rarely acute, usually with a few broadly conic staminodes. Infructescence cylindric or subglobose, $4\text{--}11 \times 3.5\text{--}5$ cm, dried male zone and appendix often remaining, as well as dried spathe. Berries 1- or 2-seeded, at first green, at maturity turning blue and finally violet, at apex with dried style and stigma remaining. Fl. Apr–May.

Shaded places in primary evergreen or mixed evergreen/deciduous forests, on metamorphic bedrock, in rich soils, or secondary forests, thickets, forest margins; 100–3300 m. Guangxi, Guizhou, Yunnan [Laos, N Thailand, N Vietnam].

17. ARUM Linnaeus, Sp. Pl. 2: 964. 1753.

疆南星属 jiang nan xing shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, tuberous. Cataphylls several. Leaves 2, simple; petiole sheathing; leaf blade hastate-sagittate or sagittate. Inflorescences 1(or 2), pedunculate; peduncle long or short. Spathe ultimately marcescent, convolute, base (tube) separated from limb by a constriction; spathe tube oblong or ovate; limb initially erect, cymbiform, concave or arched, later flopping forward or actively reflexing, ovate-lanceolate to oblong-lanceolate. Spadix sessile, shorter than to subequaling spathe; flowers unisexual, naked; female zone cylindric; ovary oblong, 1-loculed; ovules few on 2 or 3 parietal placentae; stigma sessile; sterile flowers (staminodes) usually present between female and male zones and also above male zone; appendix dark purple or yellow, cylindric-conic, cylindric, or clavate; male zone shorter; stamens 3 or 4, nearly tetragonal, short; connective convex; anthers obovoid, shorter than filaments, opening by an apical pore or longitudinal slit; sterile flowers broadly conic, filiform, ± thickened, verrucose, these between female and male zones recurved, those at distal part of male zone reflexed upward. Berries ovoid, few seeded. Seeds with endosperm; embryo axile.

Twenty-eight species: N Africa, SW Asia extending to C Asia, Europe; one species in China.

1. *Arum jacquemontii* Blume, Rumphia 1: 118. 1836.

疆南星 jiang nan xing

Arum griffithii Schott.

Herbs, tuberous, sprouting in late autumn from a disciform, vertically oriented tuber 2–5 cm in diam., 2–2.5 cm thick. Petiole mid-green, stained dull purple, terete, $10.5\text{--}28 \times 2.5\text{--}4.4$ mm. Leaf blade dark to mid-green, sagittate to sagittate-hastate, $11\text{--}30 \times 4\text{--}12$ cm, apex acute. Inflorescence not scented; peduncle exceeding leaves, pale green proximally, deep green distally, terete, $11\text{--}32 \times 5\text{--}7$ mm. Spathe 12–22 cm; tube outside green, inside white, oblong-cylindric, $2.5\text{--}4 \times 1.2\text{--}1.6$ cm, slightly constricted apically; limb erect at first but soon flopping forward, outside mid-green with faint purple staining, inside dull purple, deeper purple along middle, paler proximally, brownish purple to purple distally, narrowly lanceolate, $9\text{--}18 \times 1\text{--}3$ cm, acuminate. Spadix $2/3\text{--}3/4$ as long as spathe limb, $9\text{--}20$ cm in total length; female flowers in an oblong-cylindric cluster $15\text{--}17 \times 5\text{--}6$ mm; ovary pale greenish yellow, oblong, 2–3 mm; stigma pale grayish mauve; pistillodes in 3 or 4 whorls forming a zone 3–4 mm; bristles glossy deep violet, subulate-filiform, 3–4.5 mm; bases dark purple, bulbiform, ver-

rucate; staminodes in 2 or 3 whorls forming a zone 3–5 mm; bristles flexuose, glossy deep violet, filiform, 2–2.5 mm; bases dark purple, barely conic, verrucate; interstices: proximal 2.5–3 mm cream-colored, longitudinally ridged; distal 1.5–2 mm cream-colored, smooth; appendix dull yellow to orange-brown, purple, or brownish purple, base paler, cylindric, tapering basally, $6\text{--}17 \times 3\text{--}7$ mm; male flowers in an oblong zone $6\text{--}7 \times 4\text{--}5$ mm; anthers and connectives maroon. Infructescence cylindric, $4\text{--}4.5 \times 1.8\text{--}2.2$ cm. Berries oblong, $4\text{--}9 \times 3\text{--}4$ mm. Fl. Apr–May.

Among rocks in damp soil pockets and crevices, occasionally along damp field edges; 1600–3700 m. SW Xinjiang, W Xizang [N Afghanistan, N India, Kashmir, W Nepal, N Pakistan, Tajikistan, E Turkmenistan, SE Uzbekistan; SW Asia (NE Iran)].

Arum jacquemontii has a wide distribution, occurring from the NE corner of Iran to the W Himalayas (Boyce, Gen. Arum, 139, map 17. 1993). *Arum korolkowii* Regel as reported in FRPS (13(2): 100–101. 1979) is, in fact, *A. jacquemontii*. Although similar to *A. korolkowii*, *A. jacquemontii* is readily distinguished by its dull purple, not striped, petioles, the purple spathe limb, longer spadix appendix, and purple, not green, staminode and pistillode bases. Further, the pollen exine of *A. jacquemontii* is spinulose and not scabrous as in *A. korolkowii*. An important geographic difference is that *A. jacquemontii* grows farther south and east and at higher elevations than *A. korolkowii*.

18. TYPHONIUM Schott, Wiener Z. Kunst 1829: 732. 1829.

犁头尖属 li tou jian shu

Li Heng (李恒 Li Hen); Wilbert L. A. Hetterscheid

Herbs, seasonally dormant. Underground part a long or short tuberous rhizome. Leaves entire, sagittate-hastate, 3-lobed or -partite. Inflorescence simultaneous with or preceding leaves; peduncle short or long. Spathe divided into a strongly convolute basal part with a ± strong apical constriction and a spreading lanceolate to ovate-triangular limb. Spadix as long as or longer than spathe, with 4 zones: a proximal female zone, an intermediate sterile zone with staminodes all over (in *Typhonium flagelliforme* only) or only at base, a male zone, and a sessile or stipitate appendix. Female flowers 1-loculed with 1 or 2(3) orthotropous basal ovules. Staminodes variable, spatulate to filamentous or variously reduced. Male flowers with 1-3 stamens opening by slits or pores; connective sometimes prolonged. Fruiting zone with spathe remaining (sometimes splitting open at maturity); berries ovoid, 1(2)-seeded. Seeds with endosperm.

About 50 species: from India to Polynesia; distributions in Africa and the West Indies are the result of human introductions; nine species (four endemic) in China.

The number of species given here for China is expected to be a considerable underestimation in view of the high species numbers in N Thailand and N Vietnam.

Recent molecular investigation of the tribe Areae (Cusimano et al, Taxon 59: 439-447. 2010) suggested that *Typhonium* sensu Hetterscheid and Boyce (Aroideana 23: 48-55. 2000) is polyphyletic and transferred several species to *Sauromatum*. The latter genus in its new monophyletic circumscription was shown not to be the direct sister genus to *Typhonium* sensu stricto.

- 1a. Sterile zone between female and male zone fully covered by staminodes 4. *T. flagelliforme*
- 1b. Sterile zone between female and male zone with basal staminodes only, rest naked.
 - 2a. Staminodes vermiciform, thin, long, irregularly curving and twisting in all directions.
 - 3a. Staminodes numerous, proximal ones covering most of female zone; spathe limb broadly triangular; underground part a short, tuberous rhizome 9. *T. trilobatum*
 - 3b. Staminodes few, female zone readily visible; spathe limb lanceolate; underground part a long, cylindric rhizome 5. *T. hunanense*
 - 2b. Staminodes different, when filiform then not curving in all directions.
 - 4a. Spathe limb broadly triangular, or basal part triangular and apical part lanceolate, purple.
 - 5a. Basal part of spathe limb triangular, apical part narrowed, lanceolate; leaf entire and linear, or deeply 3-lobed, lobes linear 8. *T. trifoliatum*
 - 5b. Spathe limb broadly triangular, not narrowed to apex; leaf entire and triangular to triangular-hastate or triangular-sagittate, or ± deeply 3-lobed, lobes ovate or ovate-lanceolate.
 - 6a. Staminodes downcurved 7. *T. roxburghii*
 - 6b. Staminodes upcurved 3. *T. blumei*
 - 4b. Spathe limb lanceolate, pale purple or ± cream-colored.
 - 7a. Staminodal flowers present just below base of appendix, a naked axis part between these and male zone, staminodes above female flowers 3-4 mm 2. *T. baoshanense*
 - 7b. Staminodal flowers absent above male flowers.
 - 8a. Staminodes few, all vertical, parallel to spadix axis, 3-4 mm 1. *T. albidinervium*
 - 8b. Staminodes numerous, at least partly oblique or horizontally spreading, 6-7 mm 6. *T. jipingense*

1. *Typhonium albidinervium* C. Z. Tang & H. Li, Acta Phytotax. Sin. 15(2): 105. 1977.

白脉犁头尖 bai mai li tou jian

Underground part a short tuberous rhizome, ca. 2 cm, producing annual offsets. Petiole pale green or pale dull brownish, 15-25 cm; leaf blade ovate-cordate to ovate-hastate, 4-13 × 3.5-8 cm, base cordate, apex acute. Peduncle 2-5 cm. Spathe outside yellowish green, with reddish stripes and spots, inside ± cream-colored, base ovoid or conic, 1.5-1.8 × 1-1.2 cm, distinctly constricted at apex; limb arching forward, purplish brown or pale brown outside, dark to pale brown inside, margins sometimes ± cream-colored, apex pale green, ovate-lanceolate, 9-15 cm, ca. 1.5 cm in diam. at base, tapering to apex. Spadix ± as long as spathe; female zone conic, 3-4 mm, 3-4 mm in diam. at base; ovary pale green, broadly cylindric,

ca. 1 mm; stigma sessile; sterile zone 1.3-2.5 cm, with 2 or 3 whorls of staminodes at base, rest naked and terete; staminodes solitary or 2 or 3 fused with their bases, ± cream-colored to yellowish, base violet or dark pink, fusiform-clavate, 3-4 mm; male zone cylindric, 5-6 × 2-3.5 mm; anthers yellow; appendix brownish purple or pale brown, filiform, 9-16 cm, ca. 2 mm in diam. at base. Infructescence obconic, with spathe base persistent. Berries pale green, obconic, ca. 6 mm. Fl. May.

Guangdong, Hainan; also cultivated in Guangdong and Yunnan [N Thailand].

2. *Typhonium baoshanense* Z. L. Dao & H. Li, Acta Phytotax. Sin. 45: 236. 2007.

保山犁头尖 bao shan li tou jian

Underground part a short tuberous rhizome, irregularly

shaped, ca. 3×2 cm, developing several small globose offsets with leaves. Petiole greenish, 8–14 cm, smooth; leaf blade 2–10 × 2–10 cm, variable, ovate, hastate or sagittate to 3-lobed, deeply cordate at base, apex acute; lateral lobes (when present) ovate-oblong, ca. 4.5×3 cm. Inflorescence appearing with leaves; peduncle whitish, hidden in soil, 1.3–4.5 cm. Spathe pale green outside, ca. 18 cm; tube ellipsoid, ca. 2×1.5 cm; limb convolute at base, purple on both surfaces, margins and apical part pale green, lanceolate, to $15 \times$ ca. 3 cm, tapering to apex. Spadix sessile, as long as spathe or slightly longer, 18–20 cm; female zone conic, ca. 5 mm, ca. 7 mm in diam. at base; ovary yellowish, ovoid; stigma brown; sterile zone to 2.5 cm, basal part with staminodes, rest naked, terete; staminodes yellow, fusiform, 3–4 × ca. 1 mm, obtuse; male zone cylindric, ca. 5 mm, ca. 3 mm in diam.; stamens yellow; anthers subsessile; appendix dark purple, filiform, ca. 14.5 cm, ca. 3 mm in diam. at base, base with 2 verticils of dysfunctional stamens; sterile male flower at base of appendix subglobose or fusiform, without pollen; anthers yellow; connective purple. Fl. Jun–Jul. $2n = 10^*$.

- About 1700 m. W Yunnan (Gaoligong Shan: Baoshan).

3. *Typhonium blumei* Nicolson & Sivadasan, Blumea 27: 494. 1981.

犁头尖 li tou jian

Underground part a broad and flattened rhizome, to 5×2.5 cm, to 1.8 cm high, producing numerous small, fusiform offsets. Petiole green, 20–40 cm; leaf blade pale green abaxially, green adaxially, entire, cordate-hastate, ovate or deltoid in outline, 7–10 × 7–9 cm, terminal lobe ovate, basal lobes ovate to deltoid. Inflorescence appearing alongside leaves; peduncle pale green, 9–11 cm. Spathe convolute at base, green, ellipsoid to ovoid, 1.6–4 cm × 8–15 mm, distinctly constricted at apex; limb spreading, inside greenish purple to dark purple, ovate, 12–18 × 4–5 cm, long cuspidate. Spadix erect, subequaling spathe; female zone conic, 1.5–3 mm, 3–4 mm in diam. at base; ovary cream-colored; stigma sessile, reddish or pale pinkish; sterile zone 1.7–4 cm, proximal 7–8 mm covered with densely congested staminodes, rest naked, terete; staminodes ascending or variously curved, yellow or basal part reddish, narrowly fusiform, ca. 4 mm; male zone 4–9 mm; stamens yellow, subsessile; anthers orange; appendix narrowly conic, 10–13 cm, proximally corrugate, distally smooth, tapering to sharply acute apex, base truncate or obliquely truncate, usually with a stipe 5–7 mm. Fl. May–Jul. $2n = 52$.

Croplands, grasslands, between rocks; below 1200 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Cambodia, India, Indonesia, Japan, Myanmar, Thailand, Vietnam; introduced in Africa, Nepal, Neotropics, Philippines, and Pacific islands].

In FRPS (13(2): 111. 1979), the name *Typhonium divaricatum* (Linnaeus) Decaisne was misapplied to this species.

4. *Typhonium flagelliforme* (Loddiges) Blume, Rumphia 1: 134. 1837.

鞭檐犁头尖 bian yan li tou jian

Arum flagelliforme Loddiges, Bot. Cab. 4: t. 396. 1819; *A. cuspidatum* Blume; *Typhonium cuspidatum* (Blume) Decaisne.

Underground part a short, tuberous rhizome, depressed, 1–2 cm. Petiole green, 15–30 cm; leaf blade 5–25 × 0.5–18 cm, extremely variable, linear, lanceolate, elliptic, or hastate. Inflorescence appearing alongside leaves; peduncle 5–20 cm, thin. Spathe convolute at base, green, ovoid, globose, or depressed, 1.5–3.5 × 1.2–2 cm, constricted at apex, outside with 1 or a few keels; limb convolute-tubular at base, expanded and sharply flexed horizontally at apex, green on both sides or base flushed purple, lanceolate, 7.5–25 cm, tapering to long acuminate apex. Spadix shorter than, as long as, or slightly longer than spathe; female zone subcylindric, slightly fusiform, 1.5–1.8 cm × 8–10 mm; ovary pale green, elongate, angulate; sterile zone 1–2 cm, entirely covered with staminodes, these distant; staminodes dimorphic; proximal ones ca. 6 mm, with a horizontal white base, apically sharply upcurved, spatulate-lingulate and with or without a purple apex; distal ones downcurved, white, subulate, aristate; male zone ca. 5 mm; appendix subsessile, 16–17 cm, base swollen and often deeply grooved, apically filiform, erect, horizontal, or downcurved. Berries pale greenish, 2- or 3-seeded. Fl. Apr–May.

In shallow water by streams, water fields, moist meadows; sea level to 400 m. Guangdong, Guangxi, SE Yunnan [Bangladesh, Bhutan, Cambodia, NE and S India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, N Thailand; N Australia].

5. *Typhonium hunanense* H. Li & Z. Q. Liu, Bull. Bot. Res., Harbin 3(2): 155. 1983.

湖南犁头尖 hu nan li tou jian

Rhizome cylindric, 3–6 cm × 4–10 mm, usually curved and branched. Petiole 11–26 cm; leaf blade green, sometimes purple, oblong-sagittate to ovate, distal part ovate, 6–14 × 5–6 cm, base cordate or truncate, apex abruptly acuminate or acute; basal lobes, if present, spreading, ovate, deltoid, or oblong. Peduncle 6–9 cm, slender. Spathe convolute at base, yellowish, with purple spots, 6–10 cm, basal 2–3 cm ovoid, constricted at apex; limb spreading or slightly recurved, purple, lanceolate, 4–6 cm, apex long acuminate. Spadix shorter than spathe, 5–7 cm; female zone ca. 3 mm; ovary subglobose, 1-loculed, 1-ovuled; stigma subsessile, violet; sterile zone 1.5–2 cm, proximal 5–7 mm with densely congested staminodes, rest naked; staminodes variously curled, filiform, 3–4 mm; male zone cylindric, 6–8 × 1.5–2 mm; appendix sessile, erect, narrowly conic, 2–3.9 cm × 3–4 mm, base truncate. Fl. Apr–May, fr. Jun.

- Bamboo forests, thickets; ca. 100 m. Hunan.

6. *Typhonium jinpingense* Z. L. Wang, H. Li & F. H. Bian, Novon 12: 287. 2002.

金平犁头尖 jin ping li tou jian

Underground part a short, tuberous rhizome, 2–2.5 × 0.7–1 cm, producing annual offsets. Petiole green, 10–17 × ca. 0.1 cm, smooth; leaf blade cordate, 5–8 × 4–10 cm, base usually cordate-hastate or deeply cordate. Peduncle ca. 1 cm. Spathe pale green, dark purple at apex, base ovoid, ca. 1.5 × 0.5 cm; limb slightly arching, whitish with purple base, narrowly lanceolate, ca. 11 cm, ca. 1 cm in diam. at base, apex long acuminate. Spadix slightly longer than spathe, to ca. 14 cm; female zone ca. 5 mm; ovary with short style and dark purple stigma; sterile zone ca. 2.4 cm, densely covered with staminodes at

base, rest naked; staminodes erect or spreading, yellowish, clavate, 6–7 mm; male zone ca. 5 mm; male flowers yellow; appendix erect, purple, cylindric, ca. 10 cm × 2 mm. Fl. late Apr–Aug. $2n = 10^*$.

• Yunnan (Jinping).

7. *Typhonium roxburghii* Schott, Aroideae, 12. 1855.

金慈姑 jin ci gu

Underground part a short, tuberous rhizome, subglobose or globose. Petiole 10–35 cm; leaf blade yellowish green abaxially, dark green adaxially, reniform-hastate, triangular in outline, shallowly or deeply 3-lobed; terminal lobe ovate, (5)–9–17 × 4–14 cm, acuminate; lateral lobes spreading, obliquely ovate or narrowly ovate. Inflorescence appearing after leaves; peduncle creamy red with dark purple dots, 2–9 cm. Spathe outside whitish or pale green with purple striae, inside purple, base ovoid, 2–3.5 × ca. 1.5 cm; limb outside purplish mixed with dirty green flush or striae, or purple all over, inside deep rich purple, ovate-lanceolate, abruptly tapering from below middle, usually twisted at tip, 13–15 × ca. 5 cm. Spadix subequaling spathe; female zone 4–5.5 mm; ovary white or yellowish, ovoid; stigma purple, 1-loculed, 1-ovuled; sterile zone 1.5–2.2 cm, proximal 5–7 mm densely covered with staminodes, rest naked; staminodes downcurved, yellow or pale yellow, subcylindric, 8–9 mm, acute; male zone 7–12 mm; male flowers consisting of 2 or 3 stamens, yellow; anthers sessile, opening with apical pore; appendix dark purple, narrowly conic, 12–15 cm, 3–4 mm in diam. at base, base truncate with a pale red stipe ca. 2 mm. Berries pale green at first, white when mature, ovoid or ellipsoid, 1-seeded. Fl. and fr. May–Aug.

Taiwan, Yunnan [Bangladesh, India, Indonesia, Japan (Bonin Islands), Malaysia, New Guinea, Philippines, Sri Lanka, Thailand; introduced in E Africa, W Australia, and South America].

8. *Typhonium trifoliatum* Wang & Lo ex H. Li, Y. Shiao & S. L. Tseng, Acta Phytotax. Sin. 15(2): 105. 1977.

三叶犁头尖 san ye li tou jian

Underground part a short, tuberous rhizome, ca. 1.5 × 1.2 cm. Petiole 6–12 cm; leaf blade rarely entire and then linear, usually deeply 3-lobed or 3-partite; segments sessile, linear; terminal segment 8–10 cm × 3–8 mm, acuminate; lateral segments horizontally spreading, 1.7–4.5 cm × 3–4 mm. Inflores-

cence appearing after leaves; peduncle 8–10 cm. Spathe convolute at base, dark purple, basally ovoid, ca. 1.5 × 1.2 cm, apex constricted; limb ovate-lanceolate, ca. 17 × 5–6 cm, distal half narrowed, linear, recurved. Spadix shorter than spathe, 13–17 cm; female zone ca. 5 mm; ovary ovoid, 1-loculed, 1-ovuled; stigma disciform; sterile zone ca. 1.4 cm, proximal 1–2 mm covered with staminodes, rest naked; staminodes downcurved, filiform; male zone 8–18 mm; appendix shortly stipitate, suberect, 10–13 cm, base swollen, 3–5 mm in diam., subtruncate. Berries ovoid, 1-seeded. Fl. and fr. Jul–Aug.

• Hebei, Nei Mongol, Shaanxi, Shanxi.

9. *Typhonium trilobatum* (Linnaeus) Schott, Wiener Z. Kunst 1829: 732. 1829.

马蹄犁头尖 ma ti li tou jian

Arum trilobatum Linnaeus, Sp. Pl. 2: 965. 1753.

Underground part a short, tuberous rhizome, subglobose or subcylindric, producing few annual offsets or splitting up. Petiole green or variously flushed with purple, 25–40 cm; leaf blade cordate-ovate in outline, usually deeply 3-lobed, rarely 5-lobed; central lobe ovate, 10–15 × 6–11 cm, acuminate, sometimes mucronate; lateral lobes 8–13 cm. Inflorescence appearing after leaves; peduncle 5–10 cm, elongating in fruit. Spathe convolute at base, outside green, inside green, to 30 cm, ovoid or ellipsoid, 2.5–3.5 × 1–1.5 cm, constricted at apex; limb spreading, outside green, inside dark purple to reddish purple, ovate-lanceolate, ca. 15 × 5–8 cm, apex acuminate. Spadix shorter than spathe; female zone slightly conic, 7–10 mm; ovary yellowish green; stigma sessile, dark or mid-purple, disciform; sterile zone 2–3 cm, proximal half densely covered with staminodes, distal half naked; staminodes strongly curled but mostly directed downward and covering most of female zone, filiform, 7–12 mm; male zone 1.5–2 cm; stamens pink; appendix shortly stipitate, glossy purple or reddish, narrowly conic, 5–12 cm × 4–7 mm, base truncate, apex acute or subacute. Fruiting zone with spathe remaining; berries at first green with purple spots, white when mature, ellipsoid, 1- or 2-seeded. Fl. May–Jul.

Tropical secondary forests, thickets, grasslands, roadsides; below 700 m. Guangdong, Guangxi, Hainan, S Yunnan [Bangladesh, Bhutan, Cambodia, India, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand; introduced in W Africa, W Borneo, Neotropics, Philippines, and Singapore].

19. *SAUROMATUM* Schott in Schott & Endlicher, Melet. Bot. 17. 1832.

斑龙芋属 ban long yu shu

Li Heng (李恒 Li Hen); Wilbert L. A. Hetterscheid

Herbs, seasonally dormant. Underground part a depressed-globose tuber. Leaves entire, sagittate-hastate, 3-lobed or -partite to pedatisect. Inflorescence simultaneous with or preceding leaves; peduncle short. Spathe divided into a connate or strongly convolute basal part with a ± strong apical constriction and a spreading lanceolate to ovate-triangular limb. Spadix as long as spathe, with 4 zones: a proximal female zone, an intermediate sterile zone with staminodes all over or only at base, a male zone, and a sessile or stipitate appendix. Female flowers 1-loculed with 1 or 2(or 3) orthotropous basal ovules. Proximal staminodes clavate, distal ones (when present) irregularly cristate or elongate aristate. Male flowers with 1–3 stamens opening by slits or pores; connective sometimes prolonged. Fruiting zone with spathe caducous or remaining; berries ovoid, 1(or 2)-seeded. Seeds with endosperm.

Eight species: Bhutan, Cambodia, China, India, Indonesia, Laos, Myanmar, Nepal, Thailand, Vietnam; seven species (two endemic) in China.

See the comment under *Typhonium* above.

- 1a. Sterile zone between male and female zones largely smooth and terete or grooved, except for proximal part carrying staminodes.
- 2a. Leaf and outside of spathe densely hirsute 5. *S. hirsutum*
- 2b. Leaf and outside of spathe glabrous.
- 3a. Spathe base fully closed (margins connate), limb inside with background off-white, almost entirely hidden by numerous strongly confluent, oval, deep maroon spots; leaves always pedate 7. *S. venosum*
- 3b. Spathe base convolute (margins overlapping), limb inside uniformly whitish green, or with purple stripes, or uniformly purple; leaves varying (often in one plant) from entire to pedate 2. *S. diversifolium*
- 1b. Sterile zone between male and female zones fully covered with staminodes, distally gradually becoming smaller.
- 4a. Leaves simple, cordate, at least 10 cm 4. *S. giganteum*
- 4b. Leaves pedate.
- 5a. Spathe base convolute 6. *S. horsfieldii*
- 5b. Spathe base fully closed, margins connate.
- 6a. Proximal staminodes gradually changing upward from clavate through irregularly short and curved to irregularly cristate or strongly reduced to almost absent; petiole often with 1 or a few intercalary bulbils near base 3. *S. gaoligongense*
- 6b. Intermediate staminodes absent between proximal (clavate) and distal (irregularly cristate) staminodes 1. *S. brevipes*

1. Sauromatum brevipes (J. D. Hooker) N. E. Brown, Gard. Chron., ser. 3, 34(2): 93. 1903.

短柄斑龙芋 duan bing ban long yu

Typhonium brevipes J. D. Hooker, Fl. Brit. India 6: 511. 1893.

Tuber globose, 1–1.5 cm in diam., producing numerous tiny, annual bulbils. Petiole pinkish or dull purplish red, 15–30 cm × ca. 2 mm; leaf blade green adaxially, 5–9-pedatifid; lobes ± fused at base; central lobe linear-lanceolate or narrowly elliptic, 6.5–25 × 1–5 cm, margin undulate, with or without a purple midrib; outermost lobes progressively smaller. Inflorescence(s) appearing alongside developing leaves; peduncle pale green, 2–2.5 cm. Spathe outside base ocher or yellow-brown with purple spots or faint pinkish spots, inside ± cream-colored or dark pink, closed, subglobose, 1.4–3.5 × 1.5–2.5 cm; limb inside ± cream-colored with a purple zone at apex, base partly closed, partly convolute, margins sinuous, distal part arching and twisting, outside and inside as spathe base, or grayish, lanceolate, 10–15 × 1.2–2 cm. Spadix as long as spathe; female zone subcylindric, ca. 6 mm; ovary green or ± cream-colored, depressed obovoid, 2-ovuled; sterile zone 4–6 mm, with a few staminodes at base, rest grooved-ridged and set with irregular, pale purple warts; staminodes clavate, ca. 4 mm; male zone 3–5 mm; appendix pink to yellow, with or without a pinkish base, slender, filiform, 5–14 cm, 0.6–3 mm in diam. at base, apex obtuse. Fl. Jun.

Mountain grasslands; 1500–2700 m. S Xizang [Bangladesh, India (Sikkim), Nepal].

2. Sauromatum diversifolium (Wallich ex Schott) Cusimano & Hettterscheid, Taxon 59: 445. 2010.

高原犁头尖 gao yuan li tou jian

Typhonium diversifolium Wallich ex Schott, Aroideae, 13. 1855; *Heterostalis foliolosa* Schott; *T. alpinum* C. Y. Wu ex H. Li, Y. Xiao & X. L. Zeng; *T. austrotibeticum* H. Li; *T. diversifolium* var. *huegelianum* (Schott) Engler; *T. foliolosum* (Schott) Engler; *T. huegelianum* Schott.

Underground part a subglobose tuber, 1–1.5 cm high, 0.5–1.2 cm in diam., producing annual offsets. Petiole 10–30 cm; leaf blade simple and ovate-lanceolate, 2–22 × 1–25 cm, cuneate to hastate, 3–5-lobed or pedately 5–9-sect, lobes elliptic to linear. Inflorescence appearing just before or alongside leaves; peduncle 3–14 cm. Spathe base oblong-ovoid, 2–4 × 1–2 cm; limb outside green, sometimes flushed with purple or purple all over, inside dark purple or greenish with dark purple veins and flushes, oblong-lanceolate, 4–13 × 2–5 cm, apex acuminate to shortly caudate. Spadix shorter than spathe, 4–12 cm; female zone cylindric, 0.5–1.5 cm × 4–7 mm; ovary: basal half white, apical half purple, ellipsoid; stigma sessile, white; sterile zone 1–3 cm, base swollen and with long staminodes, rest fusiform, with verrucate staminodal structures; proximal staminodes clavate, with only apical part distinctly and abruptly swollen, basal part filiform, whitish with purple flushes, clavate part yellow with a purple tip or purple; staminodal structures consisting of narrowly elliptic, shallow ridges with verrucate-corrugate surface, white, pale purple, or violet; male zone cylindric, 0.6–1.3 cm × 1.5–7 mm; appendix blackish purple, broadly to narrowly cylindric, 1–7 cm × 2–8 mm, obtuse or subacute.

Open grasslands, meadows, alpine damp open ground; [ca. 2300 m in Bhutan] 3300–4000 m. W Sichuan, S Xizang (Gyirong), NC Yunnan (Dayao) [Bhutan, Cambodia, NE and NW India, Myanmar, Nepal].

3. Sauromatum gaoligongense Z. L. Wang & H. Li, Acta Bot. Yunnan., Suppl. 11: 61. 1999.

贡山斑龙芋 gong shan ban long yu

Typhonium gaoligongense (Z. L. Wang & H. Li) Hettterscheid & P. C. Boyce.

Tuber depressed globose, ca. 2 cm high, 2.5–3.5 cm in diam., producing several annual offsets. Petiole uniformly green or dark purple, to 40 cm, proximally often developing intercalary, irregular bulbils; leaf blade deeply 5–13-pedatifid; central lobe elliptic to obovate, to 12 × 5 cm; lateral lobes progressively smaller. Inflorescence appearing before leaves; pe-

duncle largely subterranean, yellowish green with a few scattered purple spots, 4–5 cm × 3–6 mm. Spathe closed at base, outside purplish brown, inside whitish, base triangular-ovate, to 3 × 2.8 cm, tapering to constricted apex; limb strongly convolute at base, slightly arching, outside brownish purple with a few darker spots, inside pale purple, narrowly oblong, ca. 7 × 2.5 cm, apex long acuminate. Spadix shorter than spathe, ca. 6 cm; female zone cylindric, ca. 4 × 5–6 mm; ovary ovoid, 1-loculed, 2-ovuled; sterile zone narrowly conic, ca. 3 cm, carrying staminodes in proximal half, these distally progressively shorter and finally disappearing, distally grooved, verruculose; staminodes clavate, distally changing to aristate and upcurved; male zone oblong, ca. 1 cm × 3 mm; male flowers purple, with 1 stamen, pores apical; appendix stipitate, clavate, ca. 1.6 cm, apex narrowly fusiform-conic, rugose.

- Broad-leaved evergreen forests, shaded ravines; ca. 2200 m. W Yunnan (Gaoligong Shan: Baoshan, Longling, Tengchong).

In all respects, this species is similar to *Typhonium horsfieldii* (*Sauromatum horsfieldii*) except for the closed spathe base.

4. Sauromatum giganteum (Engler) Cusimano & Hettner-scheid, Taxon 59: 445. 2010.

独角莲 du jiao lian

Typhonium giganteum Engler, Bot. Jahrb. Syst. 4: 66. 1883; *T. giganteum* var. *giraldii* Baroni; *T. giraldii* (Baroni) Engler; *T. stoliczkae* Engler.

Underground part a rhizome, 5–8 × 2–5 cm, producing numerous annual fusiform offsets. Petiole green, with or without numerous purple spots, 20–60 cm; leaf blade ovate, cordate to hastate, 15–45 × 9–25 cm, margin entire, apex acuminate. Inflorescence preceding or simultaneous with leaves; peduncle 13–17 cm. Spathe convolute at base, erect, oblong-ovate, 4–8 cm; limb erect or recurved, ovate, to 15 cm, margin sinuous, apex acuminate. Spadix sessile or nearly so, slightly shorter than spathe, to 14 cm; female zone cylindric, 1–1.5 cm × ca. 8 mm; ovary: basal part whitish, apical part purple, cylindric, apex truncate, 2-ovuled; stigma sessile, gray, disciform; sterile zone 2–3 cm, covered by distant staminodes of different types; proximal staminodes with clavate apical part, middle ones with subulate apical part, distal ones with apical part reduced to a stump; male zone ca. 2 cm × 8 mm; male flowers sessile; anthers ± cream-colored, with pinkish flushes, ovoid, opening by apical pore; appendix sessile, cylindric, to 6 cm, ca. 5 mm in diam. at base, base slightly attenuate, apex obtuse. Fruiting zone elongate, naked, ca. 5 × 3 cm; berries crowded, violet-purple, keeled, apex acute. Fl. Jul.

- Grasslands, field sides, streamsides, grassy slopes; below 1500 m. Anhui, Gansu, Hebei, Henan, Jilin, Liaoning, Shandong, Shanxi, Sichuan, S Xizang; cultivated in Guangdong, Guangxi, Jilin, and Yunnan as a medicinal plant.

5. Sauromatum hirsutum (S. Y. Hu) Cusimano & Hettner-scheid, Taxon 59: 445. 2010.

毛犁头尖 mao li tou jian

Arisaema hirsutum S. Y. Hu, Dansk Bot. Ark. 23: 454. 1968; *Typhonium hirsutum* (S. Y. Hu) J. Murata & Mayo.

Herbs, cormous, with single-celled hairs ca. 0.5 mm. Underground part a depressed-globose tuber, 1.5–2.5 cm in diam., producing numerous annual, subglobose, angulate offsets. Petiole 20–25 cm; leaf blade pedately 5–7-foliolate; leaflets almost sessile; central leaflet elliptic, 7–31 × 2.5–10 cm, apex acuminate; lateral leaflets elliptic, oblique at base, outermost one ca. 2/3 length of central one. Inflorescence appearing alongside first developing leaf; peduncle very short, 1–1.5 cm. Spathe hirsute outside, smooth inside; basal part convolute but lower ca. 1 cm with fused margin, ca. 4 × 2 cm, slightly constricted at apex; limb laterally incurved, lanceolate-ovate, 8–13 × 5–8 cm. Spadix shorter than spathe; female zone broadly cylindric-conic, to 6.5 × 10 mm; ovary subcylindric, 1-loculed, with 2 or 3 ovules; stigma white or ± cream-colored, disciform; sterile zone to 3.5 cm, proximal 0.5–1 cm densely covered with staminodes, rest naked, grooved; proximal staminodes pale pinkish purple or dark brownish purple, clavate, to 7 mm, apex obtuse; male zone 1–1.7 × ca. 0.8 cm; appendix sessile or sub-sessile, brown or grayish brown, narrowly conic, to 10.5 cm, to 6 mm in diam. at base, base truncate. Infructescence naked, globose, to 4 cm in diam. Berries with distinct angulate distal part, ca. 1 × 0.5 cm; style remnant sharply acute, ca. 1 mm. Fl. May, fr. Jul.

Secondary evergreen forests, tea plantations; 500–1100 m. S Yunnan [N Thailand].

6. Sauromatum horsfieldii Miquel, Fl. Ned. Ind. 3: 196. 1856.

西南犁头尖 xi nan li tou jian

Arisaema submonoicum Gagnepain; *Typhonium calcicola* C. Y. Wu ex H. Li, Y. Shiao & S. L. Tseng; *T. fallax* N. E. Brown; *T. hongyanense* Z. Y. Zhu; *T. horsfieldii* (Miquel) Steenis; *T. kerrii* Gagnepain; *T. kunmingense* H. Li; *T. kunmingense* var. *alatum* H. Li ex H. Peng & S. Z. He; *T. kunmingense* var. *cerebriforme* H. Li ex H. Peng & S. Z. He; *T. larsenii* S. Y. Hu; *T. omeiene* H. Li; *T. pedatum* Schott.

Underground part a subglobose to depressed-globose tuber, producing annual offsets. Petiole variable in color, uniform, striped, or spotted, ranging from green to purple, 35–60 cm; leaf blade abaxially pale to gray-green, sometimes with scattered reddish purple spots, adaxially mid- to dark rich velvety green, with or without reddish main vein or splashed with golden spots along main vein, pedatisect, 7–13-lobed; lobes elliptic to lanceolate, margin flat or sinuous, entire or occasionally crenate, apex acute. Peduncle 4.5–20 cm. Spathe convolute at base, outside pale or mid-green or dull mid- to dark brown, with or without a few reddish or blackish brown spots or stripes, inside white or whitish green, base ovoid, occasionally with 1 or a few shallow keels, apex ± constricted; limb slightly arching, outside pale or mid-green, dirty greenish, or dirty pale brownish, with or without a few indistinct darker spots, inside whitish, pale green, with or without a few scattered blackish purple spots, ovate to oblong-ovate, cymbiform, 6–17 × 4–6 cm, often keeled at midrib, apex acuminate to caudate. Spadix shorter than spathe; female zone cylindric or slightly conic, 2.5–10 × 4–8 mm; ovary ovoid to oblong-ovoid, 1-loculed, 1- or 2-ovuled; stigma very small, in a depression of apex of ovary or ringlike surrounding depression; sterile zone

narrowly fusiform-conic, 2–6 cm, 3–7 mm in diam. at base, entirely covered by staminodes; proximal staminodes with rhombic, flat base and aristate to clavate process, latter strongly bent upward, white, clavate part yellowish white or occasionally dark red; subbasal staminodes exclusively aristate, strongly pointing upward parallel to spadix axis, ± cream-colored; distal staminodes fused into vertical ridges with numerous irregular short processes, often arranged in ridges, white; male zone cylindric, 6–10 × 2–7 mm; male flowers white, distal ones often sterile and subclavate to spatulate or occasionally aristate; appendix subsessile or more distinctly stipitate, cream-colored or more rarely grayish brown with purple spots, cylindric or rarely fusiform, 1.5–4.5 cm × 2–6 mm, slightly tapering to obtuse apex, smooth or strongly corrugate, base attenuate to stipe; stipe sometimes ridged-verrucate. Fruiting zone with spathe base remaining; berries pale green when mature, obovoid to ellipsoid, corrugate and shallowly grooved.

Evergreen, bamboo, or secondary forests, grasslands, between rocks; 100–3100 m. Guangxi, Guizhou, Sichuan, NE, SE, and W Yunnan [Cambodia, Indonesia, Laos, Myanmar, Thailand, Vietnam].

7. Sauromatum venosum (Aiton) Kunth, Enum. Pl. 3: 281. 1841.

斑龙芋 ban long yu

Arum venosum Aiton, Hortus Kew. 3: 315. 1789; *Arisaema venosum* (Aiton) Blume; *A. guttatum* Wallich (1831), not Salisbury (1796); *Desmesia venosa* (Aiton) Rafinesque; *Jaimenostia fernandopoana* Guinea & Gómez Moreno; *Sauromatum abyssinicum* Schott; *S. angolense* N. E. Brown; *S. guttatum* Schott; *S. guttatum* var. *pulchrum* (Miquel) Engler; *S. guttatum* var. *simlense* (Schott) Engler; *S. guttatum* var. *venosum* (Aiton) Engler; *S. nubicum* Schott; *S. nubicum* var.

angolense (N. E. Brown) Engler; *S. pulchrum* Miquel; *S. punctatum* K. Koch; *S. simlense* Schott; *Typhonium venosum* (Aiton) Hetterscheid & P. C. Boyce.

Tuber depressed globose, to ca. 9 cm high and ca. 15 cm in diam., producing numerous annual offsets, these globose or depressed globose. Petiole yellowish green, with rounded purplish brown spots, 20–100 cm; leaf blade 9–11-pedatifid; central lobe oblong or oblong-elliptic to oblanceolate, 10–40 × 4–20 cm, acuminate; lateral leaflets elliptic, gradually smaller toward distal end of rachis. Inflorescence appearing before leaves; peduncle greenish white, with or without a few brown spots, 3–7 cm, sometimes elongating during fruiting. Spathe base outside dull dark violet, inside rich reddish purple, ellipsoid, 5–10 × 2–4 cm; limb convolute at base, ca. 10 cm, distally outside as base but slightly darker and with a few violet longitudinal stripes, inside background color yellowish, almost entirely covered by numerous orbicular to elliptic, confluent dark purple spots, lanceolate, 30–70 × 8–10 cm, apex acuminate. Spadix slightly shorter than or as long as spathe; female zone subcylindric, 2–2.5 × 1–1.5 cm; ovary violet or pale purple, obovoid, 2–4-ovuled; sterile zone 8–8.5 cm, proximal 2–2.5 cm sparsely covered with long staminodes, distally grooved and with a few distant conic projections, proximally whitish, distally pale brownish violet; staminodes yellow, clavate, 4–10 mm; male zone 1–2 × 1–1.5 cm; stamens yellow; appendix at first erect, finally recurved, pale brown to pale violet or lead-colored, terete, to 30 cm, ca. 1 cm in diam. at base, obtuse. Fruiting zone globose or subcylindric, naked, to ca. 9 cm in diam.; berries crowded, bright purple, cylindric, 5–10 × 2–4 mm, angulate, apex truncate. Fl. Apr–May, fr. Jul.

Primary evergreen forests, meadows by rivers, secondary thickets, path sides; 1300–2000 m. Xizang, Yunnan [Bhutan, NE and NW India, Myanmar, Nepal; Africa].

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, $6–33 \times 4–22$ cm 1. *P. polyphylla*
 - 7b. Leaf blade ovate or oblong, base obtuse or shallowly cordate, $5–19 \times 1.5–6$ 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, $6–33 \times 4–22$ 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 funnel-form, $1–2.5 \times$ ca. 0.5 cm; limb broadly lanceolate, $3.5–5 \times 0.8–1.2$ 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 subsessile, 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, $5–19 \times 1.5–6$ 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, $4–25 \times 2–7.5$ 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 $1–1.3 \times 1–1.3$ cm; limb erect or

slightly incurved, elliptic, $3\text{--}4.5 \times 1.2\text{--}3$ 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. $2n = 26^*$, 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, $10\text{--}17 \times 5.5\text{--}12$ 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, $3\text{--}4 \times 0.5\text{--}0.8$ cm, apex obtuse to acute. Spadix 11–13 cm; female zone ca. 0.8 cm, adnate to spathe; female flowers densely arranged; pistil obovoid, $2.5\text{--}3 \times 1.2\text{--}1.5$ 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. $2n = 78^*$.

- 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 ovoid 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, $7\text{--}13.5 \times 4.5\text{--}10$ cm, apex long acuminate; basal lobes divaricate, subtriangular, $4\text{--}7 \times 2.5\text{--}3.5$ cm; primary lateral veins 6 or 7(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, $3.5\text{--}4 \times$ 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 outward-curving, 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. $15 \times 4\text{--}7$ 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. $3.5 \times 1\text{--}1.25$ 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. $2n = 26, 52$.

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 ornationally.

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

鹤落坪半夏 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-foliate, sometimes also pedate; leaflets 3–5; central leaflet oblong-elliptic or obovate-elliptic, $5\text{--}10 \times 3\text{--}4.5$ cm, base cuneate, apex acuminate or acute; lateral leaflets sessile, smaller, $5.5\text{--}7.3 \times$ ca. 4 cm, with 4 or 5 primary lateral veins per side, forming a collective vein along margin. Inflores-

cences 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. 2n = 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. 2n = 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. Wochenschr. 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, ovoid, 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, ovoid, ca. 3.5 × 2.5 mm; funicle robust. Fl. May–Jun, fr. Jul–Sep. 2n = 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.

21. ARISAEMA Martius, Flora 14: 459. 1831.

天南星属 tian nan xing shu

Li Heng (李恒 Li Hen), Zhu Guanghua (朱光华); Jin Murata

Herbs with tuber or rhizome, paradioecious (sex depending on nutrition and therefore variable from one year to another). Tuber usually renewed seasonally and producing some tubercles around, these separated from old tuber at end of growth season. Rhizome usually cylindric, with many nodes, not renewed every year, usually preceding evergreen or wintergreen leaves. Roots usually growing at apex of tuber around cataphylls or at new nodes of rhizome. Cataphylls 3–5, herbaceous or membranous, surrounding basal part of shoot. Pseudostem consisting of basal cylindric part of petiole present or absent. Leaves 1–3, long petiolate; petiole usually mottled, stout, smooth or verrucose; leaf blade 3-foliate, palmate, pedate, or radiate. Inflorescence borne with or before leaves, solitary, pedunculate, emerging from pseudostem in tuberous or some rhizomatous plants or separately from petiole and directly surrounded by cataphylls in some rhizomatous plants; peduncle (excluding part within pseudostem) erect, stout, usually shorter than or sometimes equaling or longer than petioles (excluding part forming pseudostem). Spathe tubular proximally, expanded limb distally, deciduous, withering or rarely semipersistent; throat of spathe tube often widely spreading outward, with or without an auricle on each side, margins of throat ciliate or not; spathe limb occasionally with a long tail at apex. Spadix sessile, unisexual or bisexual; bisexual spadix female proximally, male distally, neuter (sterile) flowers sometimes present on appendix; appendix variable in shape, base stipitate or not, apex sometimes ending in long filiform flagellum. Ovaries with 1 basal locule with several orthotropous ovules; style usually indistinct; stigma peltate, papillose. Synandria of 2–6 fused stamens, sessile or on a united filament; anthers dehiscing by 2 apical pores or a single horseshoe-shaped slit or circumscissile into a ring. Neuter flowers filiform, subulate. Infructescence upright or nodding. Berries reddish, several seeded.

About 180 species: NE Africa, Asia (including Arabian Peninsula), E North America and Mexico; 78 species (45 endemic) in 12 sections in China; one additional species (endemic) is incompletely known.

Many Chinese species of *Arisaema* are of medicinal importance. For example, the tuber of *A. flavum* is used to treat fractures, traumatic injuries, and swellings; the tuber of *A. franchetianum* is used to treat enlarged lymph nodes, intestinal parasites, and snake and insect bites; the tubers of *A. erubescens*, *A. heterophyllum*, and *A. yunnanense* are used to treat coughs, epilepsy, and tetanus. Many species of *Arisaema* have been found to possess anticancer properties.

The following taxa were recorded in FRPS but are, in fact, not distributed in China: *Arisaema amurense* Maximowicz var. *serratum* Nakai (FRPS 13(2): 174. 1979); *A. amurense* f. *denticulatum* Makino; *A. amurense* var. *denticulatum* (Makino) Engler; *A. nikoense* Nakai, *A. angustatum* Franchet & Savatier (p. 171), *A. griffithii* Schott (p. 148), *A. griffithii* var. *verrucosum* (Schott) H. Hara (p. 149; *A. verrucosum* Schott), *A. japonicum* Blume (p. 179), *A. propinquum* Schott (p. 140), *A. serratum* (Thunberg) Schott var. *viridescens* Nakai (p. 180), *A. sikokianum* Franchet & Savatier (pp. 174–175), and *A. sikokianum* var. *serratum* (Makino) Handel-Mazzetti (p. 175; *A. sazensoo* (Blume) Makino var. *serratum* Makino).

- 1a. Plant basically evergreen; underground stems rhizomatous, purplish inside; pseudostem absent or present; phyllotaxy spiro-distichous 1. *A. sect. Anomala*
- 1b. Plant basically deciduous; underground stems tuberous or rarely rhizomatous, whitish inside; pseudostem present; phyllotaxy quincuncial or spiro-distichous.
 - 2a. Summer dormant; underground stems rhizomatous 9. *A. sect. Decipientia*
 - 2b. Winter dormant or semievergreen; underground stems tuberous or rarely rhizomatous.
 - 3a. Spadix appendix sessile, or if stipitate then leaf blade radiate.
 - 4a. Phyllotaxy spiro-distichous; leaf blade radiate; spadix appendix sessile or rarely stipitate 12. *A. sect. Sinarisaema*
 - 4b. Phyllotaxy quincuncial; leaf blade 3-foliate or pedate; spadix appendix sessile.
 - 5a. Spadix appendix with neuter flowers at least in female inflorescence, or if not then leaf blade 3-foliate and spadix bisexual.
 - 6a. Axillary buds solitary; leaf blade trisect 2. *A. sect. Fimbriata*
 - 6b. Axillary buds accompanying accessory buds; leaf blade pedatisect 3. *A. sect. Clavata*
 - 5b. Spadix appendix without neuter flowers, unisexual or bisexual.
 - 7a. Spadix appendix gradually tapered to apex, usually filiform, exserted from spathe, recurved or sigmoid 7. *A. sect. Tortuosa*
 - 7b. Spadix appendix subglobose, not exserted from spathe 8. *A. sect. Dochafa*
 - 3b. Spadix appendix stipitate; leaf blade trisect or pedatisect.
 - 8a. Phyllotaxy spiro-distichous 10. *A. sect. Pistillata*
 - 8b. Phyllotaxy quincuncial.
 - 9a. Leaf blade 3-foliate, palmate 11. *A. sect. Trifolia*
 - 9b. Leaf blade 3-foliate, radiate 12. *A. sect. Sinarisaema*

- 9a. Leaf blade palmate or rarely radiate; ovary fusiform 11. *A. sect. Tenuipistillata*
 9b. Leaf blade trisect, or rarely palmate; ovary bottle-shaped.
 10a. Leaf blade 3-foliate or palmate; inflorescence exceeding leaf blade 5. *A. sect. Nepenthoidea*
 10b. Leaf blade 3-foliate; inflorescence below leaf blade.
 11a. Appendix apex usually flagelliform, much exceeding spathe, pendulous,
 proximally thick and base expanded into a stipitate disk; anthers dehiscing
 by horseshoe-shaped or lunate slits 4. *A. sect. Arisaema*
 11b. Appendix obclavate, nearly erect or slightly recurved, obtuse at apex and
 gradually narrowed at base into a stipe; anthers dehiscing by rounded or
 oblong pores 6. *A. sect. Franchetiana*

1. Arisaema sect. Anomala Gusman & L. Gusman, Aroideana 26: 40. 2003.

根茎组 gen jing zu

Plants with rhizome. Rhizome reddish purple inside. Phyllotaxy spiro-distichous. Leaf blade 3-foliate or pedate, rarely simple. Spadix bisexual or rarely unisexual when mature; appendix sessile, terete, attenuate or long and pendulous distally, usually with numerous filiform neuter flowers.

About 20 species: wet tropical and subtropical Asia; 11 species (seven endemic) in China.

- 1a. Pseudostem distinct (more than 10 cm).
 2a. Leaf blade pedate or rarely 3-foliate; neuter flowers occurring partly on spadix appendix.
 3a. Spathe basically green, throat of spathe tube not auriculate 8. *A. grapsospadix*
 3b. Spathe basically green, or dark purple dotted with paler purple, throat of spathe tube auriculate 9. *A. hainanense*
 2b. Leaf blade 3-foliate; neuter flowers covering whole of spadix appendix.
 4a. Neuter flowers (distal ones) 3–5.5 cm 5. *A. victoriae*
 4b. Neuter flowers less than 0.7 cm.
 5a. Rhizome stout, more than 3 cm in diam.; spathe semitranslucent, without white mark 1. *A. petelotii*
 5b. Rhizome less than 2.5 cm in diam.; spathe opaque, with white mark 7. *A. rubrirhizomatum*
 1b. Pseudostem absent or very short (less than 5 cm).
 6a. Budlike structure present at axil of neuter flowers 2. *A. smitinandii*
 6b. Budlike structure absent at axil of neuter flowers.
 7a. Apex of spadix appendix simple or nearly so.
 8a. Spathe tube throat broadly auriculate; spadix appendix with neuter flowers 11. *A. bannaense*
 8b. Spathe tube throat without auricles; spadix appendix without neuter flowers 10. *A. petiolulatum*
 7b. Apex of spadix appendix brushlike, covered with numerous neuter flowers.
 9a. Spathe limb basically purplish, tube thick; spadix appendix pendulous 4. *A. lihengianum*
 9b. Spathe limb basically green, tube slender; spadix appendix upright.
 10a. Spathe limb with single white mark at base 6. *A. pingbianense*
 10b. Spathe totally greenish, without marks 3. *A. menglaense*

1. Arisaema petelotii K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 11: 332. 1932.

紫根南星 zi gen nan xing

Plants dioecious. Rhizome lying underground or half underground, dark brown outside, purplish in section, thickly cylindric, 7–18 × 4–6 cm. Leaves usually 2; petiole green or purplish green, to 60 cm, proximal 20–30 cm sheathing into pseudostem, encircled by several cataphylls; leaf blade green, 3-foliate; central leaflet with petiolule 1–4 cm, blade elliptic to ovate, to 30 × 17 cm, base rounded; lateral leaflets similarly petiolulate, obliquely ovate, apex acuminate. Peduncle colored as petiole, 7–12 cm. Spathe green, without stripes, semitranslucent; tube narrowly funnelform, 4–7 cm, throat 2–3 cm in diam.; limb deltoid-ovate, to 7 × 5 cm, apex acute and cuspidate. Spadix bisexual when mature; appendix basically green, 4–6 cm, slender, covered with rather numerous filiform neuter flowers, brushlike. Berries reddish, ovoid, ca. 5 mm in diam. Fl. Jun–Jul, fr. Oct–Nov.

Humid forest floors and gravel slopes in shade; 800–1000 m. S Yunnan [Vietnam].

2. Arisaema smitinandii S. Y. Hu, Dansk Bot. Ark. 23: 455. 1968.

披发南星 pi fa nan xing

Arisaema tsangpoense J. T. Yin & Gusman.

Plants perennial, evergreen, basically dioecious. Rhizome ca. 5 × 2.5 cm. Pseudostem absent. Leaves 1–4 together; petiole dull dark brown to violet, with light brown transverse markings, cylindric, ca. 25 × 0.5–1 cm; leaf blade pedate with 3–5 segments; leaflets petiolulate, greenish, lanceolate, membranous, apex acute ending in a short arista; central leaflet with petiolule to 3 cm, blade ca. 15 × 5 cm, lateral veins numerous, base cuneate; lateral leaflets with petiolule to 5 mm, blade 12–15 × 3–4 cm, base obliquely cuneate. Peduncle whitish, cylindric, much shorter than petioles, ca. 2 × 0.5 cm, surrounded by 3 cataphylls; cataphylls light brown, oblong, ca. 2, 4, and 6 cm,

respectively. Spathe: tube white-green, with numerous green longitudinal stripes, cylindric, ca. 3×1.5 cm, throat margin widely recurved; limb arched over tube, green, with darker longitudinal veins, ovate-lanceolate, ca. 7×4 cm, apex acuminate, ending in a tail ca. 1 cm. Spadix unisexual; female zone conic, $13-15 \times 5-10$ mm; ovaries congested, green, fusiform, with 1 basal locule, each locule containing 3 ovules, fusiform and slightly curved; stigma disciform, borne on a short style; male zone cylindric, ca. 2×0.5 cm; stamens loosely arranged, each consisting of 3–6 anthers, stipitate; thecae yellowish, subglobose, dehiscing by oblong pores; appendix sessile, dark green to purple, slender, $15-40 \times 1.5-3$ mm, covered with numerous ascending filiform neuter flowers throughout its length; neuter flowers in distal section accompanied by an axillary budlike structure. Fl. Nov.

Forests; 800–900 m. SE Xizang (Mêdog) [S Thailand].

Arisaema smitinandii was recorded from China by H. Li (Aroideana 30: 45–48. 2007). The specimens on which this record was based (*Mêdog Expedition 1090*, KUN [3 sheets]) are paratypes of the name *A. tsangoense* J. T. Yin & Gusman (Ann. Bot. Fenn. 43: 156. 2006; and see subsequent discussion by Gusman, Aroideana 31: 124. 2008). One of us (Murata) agrees with Gusman (loc. cit.) in recognizing the Chinese plants as a distinct species, *A. tsangoense*, unique in having a budlike structure present at the axil of the neuter flowers, whereas no such structure has been described or illustrated for *A. smitinandii*; furthermore, the peduncle is very short in *A. tsangoense* but longer than the petiole in *A. smitinandii*. Murata believes that true *A. smitinandii* is actually a synonym of *A. chumponense* Gagnepain, which is endemic to Thailand. On the other hand, one of us (Li) believes that *A. smitinandii* and *A. tsangoense* are conspecific because they have the same filiform neuter flowers on the spadix appendix. Li also believes that the budlike structure at the axil of the neuter flowers is merely an additional neuter flower and that differences in the number and shape of neuter flowers in *Arisaema* should not be used to distinguish species. Moreover, Li notes that variation in peduncle length is known in other species of *Arisaema* and, in the case of *A. smitinandii*, is probably the result of differing climatic conditions in the disjunct areas of the distribution. Li notes a similar disjunction in the distribution of *A. cuspidatum* Engler, known from the Naga Hills in NE India and from Penang and Selangor in W Peninsular Malaysia. However, P. Boyce (in reviewing this treatment) believes that *A. cuspidatum* is a junior synonym of *A. roxburghii* Kunth, which was described from Penang, and that the plant in the Naga Hills is *A. album* N. E. Brown.

3. *Arisaema menglaense* Y. H. Ji, H. Li & Z. F. Xu, Ann. Bot. Fenn. 41: 133. 2004.

勐腊南星 meng la nan xing

Plants perennial, evergreen, monococious or male. Rhizome erect, light brown outside, violaceous in section, oblique or horizontal, cylindric, $5-6 \times 2.5-3$ cm, with numerous nodes bearing buds, roots 10–15 cm. Pseudostem absent. Cataphylls 5, flesh-colored, $5-8 \times 1.5-2$ cm, membranous, 2 encircling petiole and peduncle, 3 enclosing peduncle directly. Leaves 1 or 2, arising at different seasons from different rhizome nodes; petiole viridescent with inconspicuous white spots, cylindric, ca. $45 \text{ cm} \times 5-8$ mm; leaf blade green, 3-foliolate; central leaflet with petiolule ca. 1.7 cm, blade elliptic, ca. 21×11 cm, base cuneate, apex acuminate with acumen ca. 1 cm; lateral leaflets with petiolule ca. 1.5 cm, blade obliquely broadly lanceolate, ca. 20×8 cm, base broadly cuneate, apex acuminate with acumen

0.9–1 cm; lateral veins 7–9 on each side, collective vein 4–9 mm from margin. Peduncle green, cylindric, shorter than petioles, ca. 20×0.5 cm. Spathe green, with numerous longitudinal veins; tube funnel-shaped, ca. $7 \times 1.5-3$ cm, throat margin recurved to 8 mm wide; limb bent forward, oblong, ca. 6.5×4 cm. Bisexual spadix ca. 3.5 cm; female zone ca. 1.5 cm; female flowers densely arranged; ovary greenish, obovoid, ca. $2.5 \times 1-2$ mm; ovules 4, erect; male zone ca. 2 cm; synandria sparse; synandria of 2 or 3 fused stamens; stalk ca. 2 mm; anthers 3, each comprising 2 thecae; thecae subglobose, ca. 1 mm in diam., dehiscing by an apical slit; appendix sessile, erect, proximally purple, distally green, ca. $5.5 \text{ cm} \times 1-4$ mm, usually exserted from spathe tube by ca. 1 cm, wholly covered by filiform neuter flowers; neuter flowers erect, green, 5–10 mm. Male spadix ca. 3 cm \times 2 mm; appendix ca. 5 cm. Fl. Dec–Feb.

• Tropical seasonal forests; 1000–1100 m. S Yunnan (Mengla).

This taxon is very close to *Arisaema omkoiense* Gusman (Syst. Geogr. Pl. 71: 3. 2001), from N Thailand, and *A. pingbianense*.

4. *Arisaema lihengianum* J. Murata & S. K. Wu, J. Jap. Bot. 78: 83. 2003 [“*lihenganum*”].

李恒南星 li heng nan xing

Plants to 50 cm tall, monoecious or male. Rhizome creeping horizontally, purplish to brownish outside, red-purple inside, subcylindric, to $13 \times$ ca. 4 cm, branching. Cataphylls to 20 cm, some encircling peduncle directly. Leaf 1, expanding simultaneously with inflorescence; petiole purplish brown, mottled with green, to 30 cm, lacking pseudostem; leaf blade 3-foliolate; petiolules 3.5–4.5 cm; leaflets subequal in size, to 25×15 cm; central leaflet oblong-elliptic, base rounded-cuneate, apex acuminate and caudate; lateral leaflets oblique. Peduncle 11–20 cm. Spathe tube white or pale green, narrowly funnel-form, $4.5-6 \times 7-9$ cm when opened; limb proximal half white, distal half dark red-purple, narrowly deltoid to narrowly deltoid-ovate, $15-20 \times 5-6.5$ cm, apex acuminate. Spadix bisexual after sex change; female zone $20-30 \times$ ca. 10 mm; female flowers green, bottle-shaped; male zone $10-20 \times$ ca. 8 mm; male flowers basically white; appendix sessile, 13–16 cm, slender, exserted from throat of spathe and pendulous, proximally white, distally dark red-purple, throughout with numerous filiform neuter flowers 3–5 cm.

• Limestone crevices under bushy evergreen forests; ca. 1000 m. W Guangxi (Napo).

5. *Arisaema victoriae* V. D. Nguyen, Aroideana 23: 38. 2000.

马尾南星 ma wei nan xing

Arisaema hippocaudatum S. C. Chen & H. Li.

Rhizome oblique or horizontal, light brown outside, violaceous in section, cylindric, $3-6 \times 2-3$ cm. Cataphylls 3 or 4, grayish brown with purplish and black spots, longest one 10–15 cm, apex mucronate. Leaves 2; petiole green, marked with purple, to 30 cm, proximal 15–25 cm forming pseudostem; leaf blade 3-foliolate, paler and evidently veined abaxially, shiny green adaxially; central leaflet elliptic, $9.5-10 \times 3.2-3.5$ cm, aristate at apex, with a tip 8–11 mm; lateral ones slightly smaller. Peduncle erect, overtopping leaves. Spathe green tinged

except for white center, ca. 12 cm, with proximal margins incurved or \pm overlapping to form a cylindric tube to 6×2.7 cm, scarcely or slightly auriculate at throat; limb subovate-lanceolate, ca. 8×4 cm, apex aristate and recurved. Male spadix subsessile, ca. 16 cm; fertile zone green, subterete, gradually attenuate distally, ca. 4 cm, loosely flowered; male flowers stipitate, usually diandrous; stipe 0.2–0.9 mm; thecae ellipsoid, 0.4–0.7 mm; appendix extending beyond throat of spathe tube, recurved, greenish, horsetail-shaped, ca. 12 cm, with many filiform subulate neuter flowers; proximal neuter flowers scattered, 3–4 mm; distal ones numerous and crowded, 2.5–5.5 cm. Female spadix unknown. Fl. Jun.

Limestone crevices on hilltops; 600–700 m. Guangxi (Du'an) [Vietnam].

One of us (Murata) recognizes *Arisaema hippocaudatum* S. C. Chen & H. Li (Acta Bot. Yunnan. 24: 607. 2002) as a rare Chinese species known only from the type and *A. victoriae* as endemic to Vietnam. In *A. victoriae*, the main axis of the spadix appendix is distinct and much longer than the branches (neuter flowers) as in *A. lihengianum*, whereas in *A. hippocaudatum*, the main axis is not clear and (if still present) is of a similar size and shape to the branches in its distal part. On the other hand, one of us (Li) believes that the two entities are conspecific, based on observations of cultivated plants.

6. *Arisaema pingbianense* H. Li, Bull. Bot. Res., Harbin 8(3): 99. 1988.

屏边南星 ping bian nan xing

Plants monoecious and male. Rhizome prolonged and thin, $10\text{--}15 \times 1\text{--}2$ cm, nodes swollen and globose. Cataphylls 3, pale green with violet spots, encircling peduncle. Leaves 2, arising at different seasons from different rhizome nodes; petiole green, cylindric, to 20 cm \times 3–4 mm, base shortly sheathing; leaf blade 3-foliolate, green, membranous; central leaflet with petiolule ca. 1.7 cm, blade elliptic, $9\text{--}13.5 \times 4\text{--}5.5$ cm, base cuneate; lateral leaflets with petiolule 3–6 mm, blade obliquely ovate-lanceolate, base oblique, apex acuminate with acumen 1.5–2 cm; lateral veins 5–7 on each side, collective vein 1–2 mm from margin. Peduncle encircled by cataphyll, green, cylindric, shorter than petioles, ca. 15 cm. Spathe tube subcylindric, $4\text{--}4.5 \times$ ca. 1 cm, throat margins spreading outward; limb green, with a rounded white area ca. 1.5 cm in diam. at proximal part, oblong, 3.5–4 cm, apex abruptly acuminate with a filiform tip. Spadix bisexual after sex change; proximal female zone congested with female flowers; ovary green, obovoid; distal male zone with sparse male flowers; synandria of 2 or 3 fused stamens; anthers brown to creamy white, globose, dehiscing by 2 apical pores; appendix nearly filiform, ca. 3 cm, distal ca. 1 cm covered with numerous filiform neuter flowers, brushlike; neuter flowers slightly recurved, brown or green, filiform, 2–3 mm. Fl. Dec.

• Secondary evergreen forests; 1000–1600 m. SE Yunnan.

7. *Arisaema rubrinhizomatum* H. Li & J. Murata, sp. nov.

红根南星 hong gen nan xing

Type: China. Yunnan: Malipo, Xiaojinchang, 1700–1850 m, limestone area along stream, 21 Feb 1994, S. K. Wu, Y. P. Yang, J. Murata & T. Kawahara 243 (holotype, TI).

Haec species Arisaemati victoriae V. D. Nguyen et A. hip-

pocaudato S. C. Chen & H. Li similis, sed ab eis appendice spadicis ex ore tubi spathae non exserta atque floribus neutris brevibus minus quam 7 mm longis differt.

Plants basically dioecious. Rhizome erect, oblique, or horizontal, dark brown outside, purple in section, cylindric or conic, $2\text{--}5 \times 1\text{--}2$ cm. Cataphylls 3, encircling pseudostem, lanceolate, membranous, outermost one 1–2 cm, innermost one 18–19 cm. Leaves 1 or 2; petiole purplish green or olive-green with pale green spots, 30–50 cm, proximal 20–30 cm sheathing into pseudostem; leaf blade green, leathery, 3-foliolate; central leaflet with petiolule 1–4 cm, blade elliptic or oblong to lanceolate, $12\text{--}26 \times 5\text{--}12$ cm, base cuneate; lateral leaflets sessile or with short petiolule 1–4 cm, blade oblong-lanceolate or obliquely ovate, $10\text{--}20 \times 3.5\text{--}11$ cm, apex acuminate. Peduncle colored as petiole, slightly longer than petioles, 30–50 cm. Spathae green with a white area ca. 2 cm in diam. at proximal part of limb; tube $3\text{--}5 \times 1.5\text{--}1.8$ cm, throat spreading outward; limb deltoid-ovate, $5\text{--}7 \times 3.5\text{--}5$ cm, apex acute. Spadix basically unisexual; female zone ca. 2.2×1.5 cm; ovary obconic; ovules 2–4; synandria of 5 stamens, sessile; male zone ca. $3.5 \text{ cm} \times 5$ mm, rarely with a few male flowers above; anthers ovoid, dehiscing by 2 apical slits; appendix dark purplish, 4–5 cm, slender, from base to apex covered with rather numerous filiform or sub-clavate neuter flowers, brushlike. Berries reddish, ovoid, ca. 5 mm in diam. Seed 1, yellowish, ca. 3.5 mm in diam., rugose. Fl. Feb–May, fr. Jul.

• Evergreen forests, thickets, along streams, in limestone mountain areas; 1000–1900 m. SE Yunnan.

8. *Arisaema grapsospadix* Hayata, Icon. Pl. Formosan. 5: 244. 1915.

毛笔南星 mao bi nan xing

Arisaema nanjenense T. C. Huang & M. J. Wu; *A. quinquefolium* Hayata.

Rhizome oblong-ovoid, $3\text{--}5 \times 1.5\text{--}2.2$ cm. Leaves 2(or 3); petiole 18–30 cm, proximal 13–25 cm sheathing into pseudostem, dull purplish green, mottled with dark purple and orange, surrounded by several cataphylls; leaf blade 3- or 5-foliolate; leaflets base rounded to cuneate, margin entire, apex acute to acuminate, often mucronate at tip; central leaflet with petiolule 1–2.5 cm, blade elliptic to lanceolate; lateral leaflets with petiolule 3–10 mm, blade lanceolate to oblong, oblique at base. Spathae greenish on both surfaces with a semilunate white spot in throat; tube cylindric, $(3\text{--})4\text{--}6 \times 1\text{--}1.7$ cm; limb triangular-ovate, 1.5–2 cm wide, apex acute. Spadix bisexual in mature plants; female zone ca. $2.5 \text{ cm} \times 5$ mm; ovary obliquely conic-ovoid; stigma subsessile, pilose; ovules 4; male zone ca. $1.8 \text{ cm} \times 4\text{--}5$ mm; synandria lax, of 3 stamens; anthers dehiscing by 2 apical pores; appendix narrowly pyramidal, 6–7 cm, distal part filiform and weakly curved, distal 1.2–2 cm covered with filiform neuter flowers ca. 3 mm. Berries red, conic-ovoid. Seeds 2 or 3, cream-yellow spotted with dark purple. Fl. Mar, fr. Jul.

• Low to middle elevations. S Taiwan.

9. *Arisaema hainanense* C. Y. Wu ex H. Li, Y. Shiao & S. L. Tseng, Acta Phytotax. Sin. 15(2): 107. 1977.

黎婆花 li po hua

Rhizome cylindric, ca. $5 \times 2\text{--}3$ cm. Leaves 2; petiole dull green, unmarked or mottled with brown-purple, to 50 cm, proximal 10–30 cm sheathing into pseudostem; leaf blade pedate, papery; leaflets pale green abaxially, dull green adaxially; central leaflet with petiolule 1–2 cm, blade elliptic, $14\text{--}16 \times 6\text{--}8$ cm, base broadly cuneate, apex abruptly acuminate, sometimes caudate; lateral leaflets subsessile or with petiolule 5–10 mm, blade $13\text{--}15 \times 5\text{--}6$ cm; outermost ones obliquely elliptic, ca. 10×3 cm. Peduncle green, equaling or longer than petioles by 3–5 cm. Spatha tube green, with longitudinal white stripe on back up to base of limb, funneliform, 4–5.2 cm, throat obliquely truncate, outcurved for ca. 2 mm; limb dark purple with purplish spots, or green with purple reticulation, or totally olive-green, ovate, $4\text{--}4.7 \times$ ca. 2.7 cm, acuminate and caudate at apex. Spadix bisexual when mature; female zone 2–2.5 cm; male zone 1–1.5 cm; synandria lax; anthers 1–3, stipitate; thecae oblong, dehiscing by lateral slits; appendix sessile, erect or sometimes recurved at apex, narrowly cylindric or fusiform, 4–5 cm \times 1.5–2.5 mm, proximal 3–4 mm covered with many erect filiform neuter flowers 3–4 mm. Inflorescence 4–5 cm. Berries reddish, ovoid, ca. 6×4 mm. Fl. Jun, mature fr. Nov.

- Evergreen rain forests in valleys and on slopes; 400–2100 m. Hainan.

10. Arisaema petiolatum J. D. Hooker, Fl. Brit. India 6: 498. 1894.

三匹箭 san pi jian

Arisaema inkiangense H. Li; *A. inkiangense* var. *maculatum* H. Li.

Plants monoecious and male, evergreen. Rhizome pale yellow outside, purple or violet in section, cylindric. Cataphylls withering, yellowish red to creamy red, narrowly lanceolate, membranous. Leaf 1; petiole encircled by cataphylls, pale, unspotted, to 40 cm, base sheathing for ca. 1.5 cm; leaf blade pale green abaxially, green adaxially, papery, 3-foliolate; central leaflet with petiolule ca. 2 cm, blade elliptic, $9\text{--}25 \times 5.8\text{--}10$ cm, base obtuse or shortly cuneate, apex acuminate; lateral leaflets with petiolule 5–10 mm, blade elliptic-lanceolate, $8\text{--}20 \times 3.5\text{--}9.5$ cm, base obliquely rounded. Peduncle encircled by 2 cataphylls, separated from petiole, terete, $25\text{--}35 \times 1.2\text{--}1.5$ cm. Spatha tube greenish white, with ca. 1 cm white base, ca. 5 cm \times 8 mm, throat margin narrowly auriculate, outwardly recurved, auricle ca. 8 mm wide; limb arching, green with a large rounded white area at base, ovate-lanceolate, ca. 6×3 cm, membranous, with a tail ca. 5 mm. Spadix bisexual in mature plants, unisexual (male) in small plants. Bisexual spadix: basal female zone cylindric, ca. 1.5 cm, ca. 5 mm in diam. at base, densely flowered; ovary oblong; ovules 2–4, basal, erect; style short but distinct; stigma capitate, pilosulous; continual male zone ca. 1.5 cm with sparse male flowers; synandria of 2 or 3 stamens; an-

thers sessile, or filaments ca. 1 mm; thecae subglobose, opening by an apical slit; appendix erect, sessile, green, narrowly cylindric, without neuter flowers, distally slightly rugose. Unisexual spadix: male zone ca. 2 cm, ca. 3.5 mm in diam. with a stipe ca. 2 mm; appendix as in bisexual spadix, with or without 2 or 3 subulate neuter flowers in proximal part. Fl. Oct–Nov.

Dense forests, in mountain valleys; 400–1700 m. Yunnan [NE India, N Myanmar].

11. Arisaema bannaense H. Li, Bull. Bot. Res., Harbin 8(3): 101. 1988.

版纳南星 ban na nan xing

Plants evergreen. Rhizome yellowish outside, purplish inside, robust, $8\text{--}9 \times 3\text{--}4$ cm, rooting on whole surface and in different directions. Leaves 3–5 together, separately arranged on rhizome back, perhaps from different seasons; petiole pale green with dark green striae and whitish spots, or pinkish brown with black or dark brown short striae and sparse spots, cylindric, $28\text{--}60 \times 0.4\text{--}2$ cm, encircled by cataphylls; leaf blade pale green abaxially, green adaxially, subpapery, 3-foliolate; leaflets entire, base obtuse, apex acuminate with acumen 1–2 cm; central leaflet with petiolule 2.8–4.6 cm, blade green with scattered pale brown and black spots, elliptic to oblanceolate, $14\text{--}24 \times 6\text{--}10$ cm, base cuneate to rounded; lateral leaflets with petiolule 5–10 mm, blade lanceolate, oblique, $12\text{--}24 \times 4.5\text{--}10$ cm, base obliquely rounded; cataphylls 2 or 3, colored as petiole, 5–20 cm. Peduncle encircled in cataphylls, colored as petiole, to 70 cm. Spatha green; tube $6\text{--}8 \times 1.5\text{--}2$ cm, throat margins spreading, auriculate; limb arching, obovate, ca. $5 \times 3.5\text{--}4$ cm, apex acuminate or acute. Spadix bisexual and unisexual (male). Bisexual spadix: female zone ca. 2 cm \times 7 mm; ovary pale green, ovoid; style short; stigma pale white, disciform; male zone ca. 1.5 cm \times 3 mm, sparsely covered by male flowers; appendix erect, greenish white, cylindric, ca. 3 cm \times 1.5–3 mm, apex subclavate, verrucose to echinate. Male spadix: male zone ca. 6.7 cm, base ca. 6 mm in diam.; male flowers dense, of 2–4 stamens, subsessile; anthers violet to cream-yellow, ovoid or subglobose, dehiscing by an apical united slit; appendix cylindric, ca. 4.2 cm \times 3 mm, base usually with some male flowers, apex subclavate, rugose, ca. 4 mm in diam. Berry orange-red, obovoid, ca. 5×4 mm. Fl. Feb–Mar, fr. Oct.

- Primary tropical rain forests; 700–1000 m. S Yunnan.

Arisaema bannaense is quite similar to *A. garrettii* Gagnepain, from Thailand. The species are possibly distinct only in the shape of the apical part of the spadix appendix. According to observations by Murata in S Yunnan, the appendix of *A. bannaense* is always subclavate, acuminate, and verrucose to muricate, and the apex is exerted from the spathe tube so that it is clearly seen from outside. In specimens examined by Murata, the appendix of *A. garrettii* is columnar, with a rounded apex, and equaling the spathe tube in length so that the apex is hardly seen from outside. The two taxa may be allopatric varieties.

2. Arisaema sect. Fimbriata (Engler) H. Li in C. Y. Wu & H. Li, Fl. Reipubl. Popularis Sin. 13(2): 123. 1979.

线花组 xian hua zu

Arisaema [unranked] *Fimbriata* Engler, Pflanzenr. 73(IV. 23F): 151. 1920.

Tuber subglobose. Leaf blade 3-foliolate. Spadix appendix sessile, attenuate distally, with neuter flowers at least in female inflorescence, or if lacking then spadix bisexual.

About 14 species: tropical and subtropical Asia; six species (four endemic) in China.

- 1a. Epiphyte; leaves appearing much later than inflorescences; spathe with long filiform tail to 60 cm 17. *A. lackneri*
- 1b. Geophyte; leaves coetaneous with inflorescences; spathe without tail.

 - 2a. Spadix bisexual when mature; neuter flowers absent 12. *A. lidaense*
 - 2b. Spadix unisexual; neuter flowers present at least in female inflorescences.

 - 3a. Spathe totally green, throat margins auriculate 16. *A. sinii*
 - 3b. Spathe color contrasted with white and green, throat margins not auriculate.
 - 4a. Spathe with white mark at base of limb 15. *A. calcareum*
 - 4b. Spathe limb color transversely demarcated between proximal white part and distal green part.
 - 5a. Spathe limb deltoid-ovate, not narrowed at base 13. *A. penicillatum*
 - 5b. Spathe limb ovate, narrowed at base 14. *A. austroyunnanense*

12. Arisaema lidaense J. Murata & S. K. Wu, J. Jap. Bot. 78: 81. 2003.

文山南星 wen shan nan xing

Plants to 30(–40) cm tall, but usually smaller. Tuber depressed globose, 1–2 cm in diam., with distinct axillary buds. Cataphylls 2 or 3, surrounding pseudostem, purplish green, without distinct marks. Leaf usually 1, expanding earlier than inflorescence; petiole 20–40 cm, proximal (3–)5–12(–15) cm sheathing into pseudostem; leaf blade 3-foliolate; leaflets subsessile, subequal in size; central one narrowly elliptic, 7–14(–16) × 2–4.5(–5.5) cm, base attenuate, apex long acuminate; lateral ones oblique. Inflorescence bisexual after sex change; peduncle usually shorter than petioles (much shorter in bisexual inflorescence), 8–15 cm, downcurved when fruiting. Spathe green with white patch on back of throat, 4–9 cm; tube narrowly cylindric, 2.5–5 cm, not expanded at throat; limb ovate to broadly ovate, 1.5–4 cm, apex acuminate. Bisexual spadix narrowly cylindric; female zone to 1.4 cm; female flowers congested, green, ellipsoid; male zone to 10 mm; male flowers with white or purple anthers; appendix upright or weakly incurved, green, usually without projections, gradually narrowed to apex, not exserted from spathe, 3–4.5 cm. Infructescence pendulous. $2n = 24^*$.

• Limestone crevices; ca. 1300 m. SE Yunnan (Wenshan).

13. Arisaema penicillatum N. E. Brown, J. Linn. Soc., Bot. 18: 248. 1880.

画笔南星 hua bi nan xing

Arisaema matsudae Hayata.

Tuber globose, 1–2(–3) cm in diam. Cataphylls lanceolate, ca. 8 cm. Leaves 2; petiole 25–30 cm, below middle sheathing into pseudostem; leaf blade 3-foliolate; central leaflet petiolulate, elliptic, ca. 14 × 6 cm; lateral ones subsessile, shorter than terminal, oblong-lanceolate, ca. 10 × 4 cm, base oblique, apex acuminate; collective vein 0.3–2 mm from margin. Peduncle as long as or longer than petioles. Spathe tube pale green, cylindric, 4–6 × 1.2–2 cm, throat margins spreading but not recurved; limb transversely demarcated between proximal white part and distal green part, oblong, 2–5 cm, apex acuminate with tip. Spadix unisexual. Female spadix: female zone green, pyramidal, ca. 1.5 cm; ovary ovoid; ovules 5, apex constricted into a short style; stigma capitate; appendix green, narrowly cylindric, 4–5 cm × 2–3 mm, base ca. 2 cm and apex 8–10 mm, covered with broadly filiform neuter flowers (1.5–2 mm). Male spadix: male zone narrowly conic, 3–4 cm, with sparse male flowers;

synandria of 3 stamens; anthers ovoid, opening by longitudinal apical slits; appendix filiform, 3–4 cm, at apical 1–1.5 cm covered with filiform or subulate neuter flowers (1–2 mm). Fl. Apr–Jun.

• Understories of dense forests; below 1000 m. Guangdong, Guangxi, Hainan, Taiwan.

A Chinese record of *Arisaema laminatum* Blume (Bentham, Fl. Hongk. 342. 1861) is referable to *A. penicillatum*.

14. Arisaema austroyunnanense H. Li, Acta Phytotax. Sin. 15(2): 105. 1977 [“*austro-yunnanense*”].

滇南南星 dian nan nan xing

Tuber globose, 1–2 cm in diam. Cataphylls green, acute. Leaf 1; petiole green, proximally sheathing into pseudostem; leaf blade 3-foliolate; leaflets glaucous abaxially, green adaxially; central leaflet with petiolule ca. 15 mm, blade ovate or ovate-oblong, 8–10 × 2.8–6 cm, base obtuse, apex abruptly acuminate; lateral leaflets with petiolule 3–5 mm, blade ovate-lanceolate, 9–10 × 4.8–5 cm, base rounded, oblique, apex acuminate. Peduncle as long as petioles, slender. Spathe small, ca. 6.5 cm in total; tube pale green, funnelform, ca. 2.8 cm, throat ca. 1.5 cm in diam., margins obliquely truncate, not auriculate; limb erect, dark green, ovate-lanceolate, ca. 3 × 1.5 cm, apex acuminate with a short tail at tip, base slightly constricted, with a white ca. 5 mm high basal zone. Spadix unisexual. Male spadix slender; male flowers sparse; synandria of 2–4 stamens, subsessile; thecae subglobose, opening by an apical slit; appendix erect, ca. 2.2 cm, slender, with several scattered, short, subulate neuter flowers from base to apex; neuter flowers less than 1 mm. Female spadix unknown. Fl. May.

Tropical forests; ca. 800 m. S Yunnan (Jinghong, Simao) [Vietnam].

Chinese records of *Arisaema balansae* Engler (H. Li, Bull. Bot. Res., Harbin 8(3): 99. 1988) and *A. ramulosum* Alderwerelt van Rosburgh (Gusman & Gusman, Gen. *Arisaema*, 220. 2006; Gusman, Aroideana 30: 43. 2007, p.p., as to Vietnamese element; Yin & Gusman, Aroideana 31: 98–100. 2008) are referable to *A. austroyunnanense*. In the treatment of *Arisaema* in Flora Malesiana (Murata, in press), *A. laminatum* will be recognized in a broad sense including *A. ramulosum* and *A. austroyunnanense*. Gusman et al. (loc. cit.) separated *A. ramulosum* from *A. laminatum*; they did not refer to *A. austroyunnanense*, but it may have been included in their concept of *A. ramulosum*. In the present treatment, however, it seems best to recognize *A. austroyunnanense* as a separate species because it has been known by a single specimen (the type) and we cannot consider variation in China. Gusman et al. (loc. cit.) also reported *A. barbatum* Buchet (Notul. Syst. (Paris) 1: 366. 1911) from S Yunnan (Xishuang-

banna) by presenting a photograph. However, this record requires confirmation because it does not seem to fit typical *A. barbatum*, from Java, and no herbarium specimen is available at present.

15. Arisaema calcareum H. Li, Acta Phytotax. Sin. 15(2): 106. 1977.

金江南星 jin jiang nan xing

Arisaema jinshajiangense H. Li.

Plants deciduous, to 120 cm tall and 60 cm wide. Tuber subglobose or cylindric, 2.5–6 cm in diam. Cataphylls 3, flesh-colored, longitudinally striped and mottled, lanceolate, 2–40 cm, apex obtuse for shortest. Leaves 2, subopposite; petiole light green, plain or stained with purple, to 60 cm, proximal part to 45 cm sheathing into pseudostem; leaf blade 3-foliate; leaflets abaxially paler, sometimes flushed carmine, adaxially green and with impressed, thin, and light green veins and a broad, white-green central midvein, margins entire, base convex and petiolulate, apex acuminate; central leaflet with petiolule to 4 cm, blade subrhombic, shorter than lateral ones, 20–50 × 10–25 cm, base cuneate; lateral leaflets with petiolule to 2 cm, blade ovate, 20–55 × 10–25 cm. Inflorescence unisexual, emerging when leaves unfold and held nearly at foliage level; peduncle pale green, shorter than petioles, 10–20 × ca. 1 cm. Spathe tube green with white stripes, basally white, cylindric, ca. 7 × 1.5 cm, throat not expanded; limb curved forward, green with conspicuous white stripes and a white spot at throat level, oblong-lanceolate, ca. 6 × 2.5 cm, apex long acuminate. Spadix: ovaries congested, ovoid, ca. 2.5 × 2 mm; ovules ca. 2; stigma penicillate, borne on a short style; male flowers unknown; appendix slightly exserted from tube, erect, pale green, cylindric, 6–8 cm × ca. 5 mm, slightly narrowed to both ends, base with scattered hornlike projections (these curved, 3–5 mm, often brown and bifid at apex), apex rounded. Fruiting spike upright. Fl. Jun–Jul, fr. Oct.

• Among shrubs. Yunnan.

16. Arisaema sinii K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 10: 1047. 1930.

瑶山南星 yao shan nan xing

Plants dioecious. Tuber depressed globose, ca. 2 × 1.5 cm, renewed seasonally, proceeding from a whorl of roots and a few globose offsets at apex around shoot. Cataphylls 2 or 3, whitish green, 5–12 cm, membranous, apex acuminate. Leaves 1 or 2; petiole light green, unspotted, 20–30 cm, basal 10–12 cm sheathing into pseudostem; leaf blade glaucous abaxially, green adaxially, 3-foliate; leaflets sessile, apex acuminate, with a short tail at tip; collective vein distinct, 3–7 mm from margin; central leaflet rhombic, 8–15.5 × 6–13 cm, base cuneate; lateral leaflets obliquely ovate-rhombic, 9–18 × 6–11 cm, base obtuse on outer side, attenuate on inner side. Peduncle emerging from

pseudostem, green without spots, 21–25 cm, shorter than petioles, curved forward after flowering. Spathe pale green; tube white at base, funnelform, 3.3–5 cm × 10–15 mm, throat margins auriculate, recurved outward; limb arching forward and downward, ovate, 4–6 × 2.6–3.9 cm, with longitudinal white lines inside, apex occasionally with a tubular tail 5.5–7.5 cm. Spadix unisexual. Female spadix: female zone green, conic, ca. 15 × 8 mm; ovaries densely distributed, globose; stigma sessile and rounded with serrate margin; appendix sessile, erect, pale green, cylindric, ca. 2.5 cm × 3.5 mm, attenuate to base, usually with a few subulate neuter flowers ca. 3 mm at base. Male spadix: male zone 1–1.5 cm; synandria of 2 or 3 stamens, violet; thecae globose, dehiscing by apical pore; appendix as in female spadix, erect, 2.2–3 cm, without neuter flowers. Infructescence curved forward or pendulous. Fl. May.

• Evergreen forests, secondary *Pinus* forests, grasslands in limestone areas; 1000–2600 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan.

17. Arisaema lackneri Engler, Notizbl. Königl. Bot. Gart. Berlin 2: 186. 1898.

勐海南星 meng hai nan xing

Arisaema menghaiense J. T. Yin, H. Li & Z. F. Xu.

Epiphytes, dioecious. Tuber depressed globose, ca. 5 × 10 cm, renewed seasonally, purple outside with brown spots 1–1.5 mm in diam.; roots whitish, 2–7 cm × 1–2 mm. Leaf solitary, coetaneous with fruit; petiole green, without spots, cylindric, 20–30 × ca. 1 cm, smooth; leaf blade greenish, membranous, 3-foliate; leaflets petiolulate; central leaflet with petiolule ca. 15 mm, blade ovate, ca. 20 × 10 cm, base cuneate, apex acute; lateral veins numerous; collective vein 2–3 mm from margin; lateral leaflets with petiolule 8–11 mm, blade obliquely ovate-lanceolate, ca. 21 × 8 cm, base obliquely cuneate, apex acuminate with filiform tail 5–8 mm. Inflorescences unisexual, appearing before leaf; peduncle white, terete, ca. 26 × 0.3 cm (male), ca. 25 × 1 cm (female), surrounded by cataphylls; cataphylls 3, pale green, oblong, 18–23 cm, membranous, apex obtuse. Spathe tube green, cylindric, ca. 6 × 1.5 cm, throat margin broadly auriculate, strongly outwardly recurved; limb arched, greenish purple, ovate-lanceolate, ca. 6 × 5 cm, apex acuminate with a purple tail to 60 cm. Female spadix densely flowered; ovaries green, 1-located, ovoid; stigmas subsessile, disciform; ovules 5 or 6, basal, erect; appendix as in male spadix. Male spadix with basal fertile part cylindric, ca. 3.8 × 0.5–0.6 cm, densely flowered; synandria subsessile, purple; anthers 4–6, subglobose, dehiscing by an apical slit; appendix sessile, greenish, cylindric, ca. 3.8 × 0.3 cm, apex obtuse, with a few subulate neuter flowers in basal part. Infructescence cylindric, ca. 5.2 × 1–1.5 cm. Fl. Apr, fr. May.

About 1800 m. S Yunnan (Menghai) [N Myanmar].

3. Arisaema sect. Clavata (Engler) H. Hara, Bull. Univ. Mus. Univ. Tokyo 2: 347. 1971.

云台南星组 yun tai nan xing zu

Arisaema [unranked] *Clavata* Engler, Pflanzenr. 73(IV. 23F): 171. 1920.

Underground stems tuberous, whitish inside, axillary buds with accessory buds. Phyllotaxy quincuncial, normal leaves pedate. Spadix appendix sessile, with neuter flowers in proximal part.

Six species: C China to Japan; four species (all endemic) in China.

- 1a. Appendix narrowly fusiform, attenuate distally, slightly bent outward 20. *A. hunanense*
- 1b. Appendix cylindric, erect, apex rounded, capitate or creased.
 - 2a. Appendix slender, erect, apex abruptly capitate and echinate, slightly exserted from spathe tube 21. *A. clavatum*
 - 2b. Appendix stout, not capitate, long exserted from spathe tube.
 - 3a. Appendix smooth 18. *A. silvestrii*
 - 3b. Appendix twisted and creased in distal section 19. *A. ilanense*

18. Arisaema silvestrii Pampanini, Nuovo Giorn. Bot. Ital., n.s., 22: 262. 1915.

云台南星 yun tai nan xing

Arisaema dubois-reymondiae Engler; *A. zanolanscianense* Pampanini.

Tuber subglobose, ca. 2 cm in diam. Cataphylls 3, greenish brown, membranous, apex obtuse. Leaves 2; petiole green, 24–35 cm, basal 10–18 cm sheathing and forming pseudostem, free part 13–30 cm; leaf blade pedate; leaflets 7–9, sessile to subsessile, oblanceolate or oblong to elliptic, base cuneate, margin entire, apex acuminate; rachis between central and lateral leaflets 1–2.5 cm, rachis between outer leaflets 5–10 mm; central leaflet subsessile, 7–20 × 2.5–5 cm; outermost leaflets 5–12 × 1.5–2.5 cm. Peduncle shorter than petioles, 13–17 cm, exserted from pseudostem 3–5 cm. Spathe greenish white with 3–5 white stripes inside or (in female) dark purple with pinkish white stripes, ca. 15 cm in total; tube funnelform, 5.5–6 × 2–2.5 cm at throat; limb oblong or oblong-ovate, 7–8 × 3–3.5 cm, acute at apex with an acumen 5–10 mm. Spadix unisexual; male zone ca. 2 cm; synandria lax; anthers 2–4, thecae globose, dehiscing by apical pores; female zone ca. 2 × 1 cm; ovary green; style short; stigma punctate. Appendix sessile, erect, greenish or purplish, cylindric, 4–7(–14) cm × 2–5 mm, proximal part covered with a few acute neuter flowers. Fl. Apr–May.

• Bamboo forests, evergreen forests, thickets; below 1800 m. Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shanxi, Zhejiang.

19. Arisaema ilanense J. C. Wang, Bot. Bull. Acad. Sin. 37: 71. 1996.

宜兰南星 yi lan nan xing

Tuber depressed globose, 1.3–3 cm in diam. Cataphylls 3–5, whitish to greenish, fleshy, apex mucronate. Leaves 2; petiole terete, 20–55 cm, basal 10–30 cm sheathing and forming pseudostem; leaf blade pedate; leaflets 7–15, sessile, oblanceolate to elliptic, base cuneate, apex acuminate; central one 10–22 × 2–4.5 cm, longer than or equal to adjacent one. Peduncle 11.5–37 cm, free part 1.5–7 cm, usually much shorter than free part of petiole. Spathe tube pale to greenish yellow outside, dark purple inside, gradually becoming pale to reddish brown proximally, cylindric, slightly auriculate at throat, 6–9 × 1.3–2 cm; limb pale greenish yellow outside, dark purple inside, ovate, 6–10 × 3–5 cm, apex acute or sometimes acuminate. Spadix unisexual, 1.5–2.4 cm in male, 1.5–3.4 cm in female. Appendix distinctly exserted from spathe tube, proximally reddish, distally dark purple to black, clavate, 9–15 cm, proximally gradually narrowed toward floriferous part or sometimes stipitate at base with some echinate neuter flowers, distally bent outward or

slightly downward. Fl. Feb–Mar.

• Broad-leaved forests; 1600–1900 m. N Taiwan.

20. Arisaema hunanense Handel-Mazzetti, Symb. Sin. 7: 1365. 1936.

湘南星 xiang nan xing

Tuber depressed globose, ca. 2 cm in diam. Cataphylls to 15 cm. Leaves 2; petiole 45–55 cm, proximal half sheathing and forming pseudostem; leaf blade pedate; leaflets 7–9, oblanceolate; central leaflet shortly petiolulate, larger than lateral ones; rachis between central and lateral leaflets 4–6 mm. Peduncle shorter than petioles, free part 3–6 cm. Spathe reddish inside; tube cylindric, ca. 7 × 2 cm, throat slightly recurved, not auriculate; limb ovate-lanceolate, ca. 6 cm, apex long acuminate. Spadix unisexual; male ca. 1.5 cm; female ca. 2.5 cm; ovary elliptic, ca. 3 mm; style short; stigma small, pilose. Appendix sessile, suberect or slightly recurved, narrowly pyramidal, 4–7 cm × ca. 4.5 mm, narrowed toward base and apex, basal ca. 1.5 cm in female spadix usually with acute neuter flowers 4–5 mm, smooth in male spadix. Fl. Mar–May.

• Forests, streamsides; 200–800 m. Chongqing, Guangdong, Hubei, Hunan, E Sichuan.

21. Arisaema clavatum Buchet, Notul. Syst. (Paris) 2: 121. 1911.

棒头南星 bang tou nan xing

Tuber subglobose or ovoid-globose, 2–4 cm in diam. Cataphylls green, to 20 cm, membranous, apex obtuse or acute. Leaves 2; petiole green, 40–60 cm, proximal half sheathing; leaf blade pedate; leaflets (7–)11–15, sessile, oblong or oblanceolate, papery, base cuneate, margin entire, apex abruptly acuminate and caudate; central 5 leaflets nearly equal, 10–19 × 3–6 cm, outward gradually smaller, outermost one 2–4 × 0.5–1.5 cm; rachis between leaflets 5–15 mm. Spathe green, sometimes purplish, with white stripes or not, 7.5–16 cm in total; tube cylindric or narrowly funnelform, 3.5–8 × 1.3–2.5 cm, throat obliquely truncate or rounded, not recurved; limb oblong, 5–8 × 3–3.5 cm, apex acute. Spadix unisexual; male cylindric, 1.2–1.7 cm × ca. 3 mm; synandria purple; anthers 2 or 3; thecae globose, dehiscing by apical pores; female conic or elliptic, 2–2.5 cm × 7–8 mm; ovary greenish, obovoid; ovules 3 or 4; stigma subglobose, ca. 1 mm. Appendix sessile, green to purple, narrowly cylindric, 2.6–7 cm, slender, ca. 1.5 mm in diam., basal 2–3 cm sparsely covered with acute and hooked neuter flowers (1–3 mm), apex abruptly swollen into a clavate head 3–10 × 2–4 mm, densely clavate-echinate. Fl. Apr–Jun.

• Bamboo thickets, broad-leaved forests; 600–1400 m. Chongqing, N Guizhou, W Hubei, Sichuan.

4. Arisaema sect. Arisaema

天南星组 tian nan xing zu

Plants with tuber or rarely with robust rhizome. Leaf usually solitary; leaf blade 3-foliate, or rarely quinate. Spathe tube sometimes lamellate inside; limb curved forward, usually widened into wings, sometimes galeate. Spadix appendix proximally swollen into a disk and stipitate, distally usually filiform and long exserted from spathe, or subcylindric and not exserted from spathe. Thecae united at apex, dehiscing by a single horseshoe-shaped slit.

About 17 species: mostly in Himalayan region and SW China; 16 species (seven endemic) in China.

- 1a. Lateral veins of leaflets numerous, parallel 26. *A. costatum*
- 1b. Lateral veins not parallel.
 - 2a. Central leaflet obovate, obcordate, or obdeltate, shorter than wide.
 - 3a. Spadix appendix not or slightly exserted from spathe.
 - 4a. Spadix appendix filiform 32. *A. bonatianum*
 - 4b. Spadix appendix subcylindric, apex rounded.
 - 5a. Pseudostem, petiole, and peduncle verrucose or finely asperate 33. *A. asperatum*
 - 5b. Pseudostem, petiole, and peduncle smooth 34. *A. brucei*
 - 3b. Spadix appendix distinctly exserted from spathe.
 - 6a. Inflorescence ca. as high as leaf blade 35. *A. wilsonii*
 - 6b. Inflorescence distinctly below leaf blade.
 - 7a. Spadix appendix basally densely rugose 31. *A. handelii*
 - 7b. Spadix appendix smooth throughout.
 - 8a. Spathe smaller, tube 1.5–3.5 cm 37. *A. parvum*
 - 8b. Spathe larger, tube 3–5 cm 36. *A. elephas*
 - 2b. Central leaflet elliptic, ovate, or rhombic, longer than wide and as long as lateral lobes.
 - 9a. Underground stems rhizomatous or spathe throat galeate-auriculate; all leaflets petiolulate.
 - 10a. Spathe limb not winged sideways; stems thickly rhizomatous 30. *A. speciosum*
 - 10b. Spathe limb winged sideways and galeate-auriculate.
 - 11a. Underground stems rhizomatous, cylindric 23. *A. dahaiense*
 - 11b. Underground stems tuberous, subglobose 22. *A. lingyunense*
 - 9b. Underground stems tuberous; spathe throat not galeate-auriculate; leaflets basically sessile.
 - 12a. Spathe tube lamellate inside.
 - 13a. Spathe limb not winged sideways 27. *A. utile*
 - 13b. Spathe limb winged sideways and vexillate 28. *A. vexillatum*
 - 12b. Spathe tube not lamellate inside.
 - 14a. Spathe limb ovate-lanceolate, apex long acuminate to caudate 25. *A. intermedium*
 - 14b. Spathe limb obovate, apex cucullate or 3-lobed.
 - 15a. Leaflets covered with golden scales abaxially; spathe limb cucullate 24. *A. pianmaense*
 - 15b. Leaflets without trichomes; spathe limb distinctly 3-lobed 29. *A. tengzungense*

22. Arisaema lingyunense H. Li, Acta Phytotax. Sin. 15(2): 107. 1977.

凌云南星 ling yun nan xing

Plants dioecious. Tuber subglobose, 3–7 cm in diam., with many small tubercles. Leaf solitary, emerging after anthesis; petiole ca. 30 cm, basal part forming pseudostem; leaf blade 3-foliate; leaflets with petiolules 1–1.5 cm; central leaflet rhombic, ca. 24 × 14 cm; lateral leaflets oblique, outer side often ca. 2 × as wide as inner side, ca. 20 × 13 cm, base cuneate at inner side, rounded at outer side. Peduncle shorter than petioles, ca. 25 cm × 5 mm. Spathe purple with white lines; tube funnel-form, ca. 8 × 2.5 cm, without lamella inside; limb incurved, galeate, lateral margins elongated into broad wings, with whitish reticulate networks on both sides, ca. 20 × 20 cm, base constricted, apex rounded with an acumen 3–4 cm. Spadix unisexual; female zone conic, ca. 3 × 2 cm; ovary cylindric, ca. 5 mm; ovules 2, basal, erect, fusiform; style short; stigma disciform; male zone cylindric, ca. 3 cm × 9 mm; synandria of 2 or 3

stamens; anthers stipitate, dehiscing by horseshoe-shaped slit; appendix purple, flagellate, ca. 44 cm (female) to 143 cm (male) in total, proximal 13–14 cm subcylindric, ca. 1.5 cm in diam., base attenuate, not truncate, stipe ca. 1.8 cm × 8 mm (female), ca. 4 × 3 mm (male), distal filiform part ca. 30 cm (female) to 130 cm, pendulous. Berries red. Fl. Apr–Jun, fr. Jul.

Swamps by mountain streams; 1400–3000 m. Guangxi [W Myanmar].

23. Arisaema dahaiense H. Li, Acta Phytotax. Sin. 15(2): 107. 1977.

会泽南星 hui ze nan xing

Arisaema dulongense H. Li.

Plants dioecious. Rhizome horizontal, outside pale brown, inside yellowish, cylindric, 7–8 × 5.5–8 cm, bearing some offsets around. Cataphylls 2 or 3, deciduous, transparent, pink, 30–60 cm, membranous. Leaf 1; petiole violet, greenish distally, smooth and not spotted, ca. 80 cm, ca. 3 cm in diam. in prox-

mal pseudostem part; leaf blade 3-foliate; leaflets with petioles 2–3.5 cm, blade greenish abaxially, green adaxially, papery, usually covered with hairs; central leaflet narrowly ovate, to 25×18 cm, base rounded, apex acuminate with a long tail; lateral leaflets obliquely ovate, to 18×17 cm in outline, base outside ca. $2 \times$ as wide as inside, auriculate. Peduncle erect, pinkish green, not spotted, to 25 cm. Spathe dark purple with whitish longitudinal lines; tube cylindric, $8–9 \times 2–3$ cm, throat margins slightly recurved, smooth on both sides; limb galeate, oblong, $8–10$ cm, apex acuminate, tip with an acumen 2.5–5 cm; lateral sides widened, membranous, as wings, with whitish reticulate networks, whitish longitudinal lines from tube connected at middle of limb. Spadix unisexual; female zone subconic, ca. 2.2×1.3 cm; ovary pale green, cylindric; stigma sessile; appendix violet, base truncate with a stipe ca. 8 mm, proximally narrowly pyramidal, distally pendulous, filiform, to 50 cm or more in total, somewhat longer in female spadix, smooth; male zone cylindric, ca. $4 \text{ cm} \times 3–8$ mm (ca. 8 mm in diam. at base), dark violet; synandria violet consisting of 3 or 4 stamens; connected filaments violet, ca. 1.5 mm; thecae fused, violet, dehiscing by horseshoe-shaped slit. Fl. Mar–Apr. $2n = 26$.

Evergreen forest margins; 1400–2600 m. NE and NW Yunnan (Dulong Jiang, Huize) [N Myanmar].

24. Arisaema pianmaense H. Li, Acta Bot. Yunnan., Suppl. 5: 9. 1992.

片马南星 pian ma nan xing

Plants dioecious. Tuber depressed globose, 3–4 cm in diam. Cataphylls 2 or 3, whitish with purple spots, to 21 cm, membranous, apex acute. Leaf solitary; petiole pale green, with purple spots, terete, 30–50 cm, basal part forming pseudostem; leaf blade 3-foliate; leaflets subsessile, abaxially grayish green and densely covered with matted hairs and sparse golden scales, adaxially green and with dense papillae; central leaflet elliptic, $15–35 \times 8–19$ cm, base cuneate, apex acute; lateral leaflets obliquely ovate-oblong, outer base ca. $2 \times$ as wide as inner side, rounded. Peduncle terete, 18–32 cm. Spathe purple with whitish longitudinal lines; tube cylindric, $6–7 \times 1.5–2$ cm, throat margins slightly recurved; limb obovate-spatulate, $7–8 \times 4–5$ cm, apex abruptly acuminate with a tail 2–3 cm, strongly downcurved. Spadix unisexual; female zone ca. 2.5 cm; ovary pale green, subcylindric; stigma sessile, concave; appendix subsessile, purple, proximally narrowly conic, distally tapering and drawn into flagellum, in total 24–30 cm, pendulous, base truncate; male zone ca. 2 cm; synandria of 2 or 3 stamens, connected filaments distinct; anther purple, fused from 2 thecae, dehiscing by horseshoe-shaped slit. Fl. May.

• Mixed forests; ca. 2700 m. W Yunnan (Lushui).

25. Arisaema intermedium Blume, Rumphia 1: 102. 1835.

高原南星 gao yuan nan xing

Plants dioecious. Tuber depressed globose, 2–4 cm in diam. Cataphylls 2 or 3, green to purple, 16–20 cm. Leaves 1 or 2; petiole green, $15–50 \times 1–1.5$ cm, basal part forming pseudostem; leaf blade 3-foliate; leaflets sessile or shortly petiolulate; central leaflet ovate, rhombic, or elliptic, $(7–)9–12 \times 3–$

11 cm, base cuneate, apex acute to acuminate; lateral leaflets obliquely ovate or rhombic, as large as central leaflet. Peduncle green and unmarked, shorter than petioles, 10–26 cm. Spathe green, rarely dark purple, with green or white lines; tube broadly cylindric, $(3–)4–8 \times 1.5–2.5$ cm, smooth inside, throat margins obliquely truncate, not auriculate; limb dark purple, yellowish green, or green, $7–16 \times 2–6.5$ cm, apex acuminate-caudate into a tail 2–20 cm. Spadix unisexual; female zone ca. 1.5 cm; ovary ovoid; style short; stigma small; male zone ca. 2 cm; synandria of 4 stamens, yellow, dehiscing by horseshoe-shaped slit. Appendix dark purple, narrowly flagellate, 15–60 cm in total, proximally swollen fusiform or cylindric, smooth, distally curving and exserted from tube, gradually drawn into flagellum, sigmoid and pendulous in distal part. Fl. May, ?Sep. $2n = 28$.

Mountain slopes, grassy places; 2600–3400 m. S Xizang, Yunnan [India (Darjeeling, Himachal Pradesh, Uttarakhand), Kashmir, Nepal].

26. Arisaema costatum (Wallich) Martius ex Schott & Endlicher, Melet. Bot. 17. 1832.

多脉南星 duo mai nan xing

Arum costatum Wallich, Tent. Fl. Napol. 28. 1824.

Plants dioecious. Tuber brown outside, white inside, depressed globose, 3–5 cm in diam. Cataphylls 3, ca. 50×25 cm, membranous. Leaf solitary; petiole green, often slightly purplish, terete, 30–50 cm, proximal 1/4–1/3 sheathing into pseudostem, ca. 1 cm in diam.; leaf blade 3-foliate; leaflets pale green abaxially, deep green adaxially, shortly petiolulate or subsessile; terminal elliptic or oblong, $16–30 \times 9–16$ cm, base auriculate and rounded, inner base narrowly cuneate, apex acuminate; lateral veins very numerous and running almost parallel, distinctly raised abaxially, impressed adaxially. Peduncle emerging from pseudostem, shorter than petioles, 25–45 cm. Spathe dark purple, with white longitudinal lines; tube cylindric, 4–8 cm, slightly costate inside, but in Xizang specimens almost smooth inside, throat margins slightly recurved; limb incurved, narrowly ovate-oblong, 3–4 cm, apex acuminate with a filiform tail. Spadix unisexual; female zone 2.4–3.5 cm; ovary green; style short; stigma white, disciform; appendix pendulous from spathe, dark purple, very long flagelliform, 20–50 cm, inflated toward base, base truncate, swollen disciform, with a stipe 3–5 mm, smooth throughout; male zone 2–3.7 cm; synandria of 3–5 stamens; connected filaments distinct; thecae dehiscing by a horseshoe-shaped slit. Fl. Jul.

Grasslands in forest areas; 2300–2400 m. S Xizang (Dinggyé, Nyalam) [Nepal].

Molecular phylogeny has revealed that *Arisaema costatum* is not closest to the other members of *A. sect. Arisaema* but is instead monophyletic with African species that have radiate leaves (Renner, Zhang & Murata, Amer. J. Bot. 91: 881–888. 2004).

27. Arisaema utile J. D. Hooker ex Schott, Prodr. Syst. Aroid. 30. 1860.

网檐南星 wang yan nan xing

Plants dioecious. Tuber depressed globose, 3–10 cm in diam., with small tubercles. Cataphylls to 9 cm, membranous.

Leaf solitary; petiole green with dark purple spots, 20–40 cm, proximal 1/3 sheathing into pseudostem; leaf blade 3-foliolate; leaflets sessile or subsessile, green with reddish margin; veins raised, often reddish abaxially; central leaflet broadly rhombic or ovate-rhombic, sometimes broader than long, 7–15 × 6–11 cm, base broadly cuneate, apex acuminate; lateral leaflets obliquely ovate, 11–14 × 7–9 cm, base rounded to subtruncate, apex acuminate. Peduncle shorter than petioles, 20–22 cm. Spatha tube purplish brown with longitudinal whitish lines, cylindric, 4–5 × 1.5–2 cm, longitudinally lamellate inside, throat margins slightly recurved; limb strongly incurved, dark purple with white longitudinal and reticulate lines (at margin), obovate, 7–8 × 3–5 cm, apex acuminate. Spadix unisexual; female zone conic, 2.6–6 cm; ovary green, ovoid; stigma subsessile, dark purple; male zone 1.5–2 cm × ca. 4 mm; synandria of 2–5 stamens; connected filaments distinct, 0.5–1 mm; anther dehiscing by horseshoe-shaped slit. Appendix brown, flagelliform, 11–20 cm, thickened toward base 5–15 mm wide, base truncate and stipitate. Fl. May.

Tsuga forest margins, thickets; 2800–3100 m. Xizang, Yunnan [Bhutan, N India, Kashmir, Myanmar, Nepal, Pakistan].

28. *Arisaema vexillatum* H. Hara & H. Ohashi, J. Jap. Bot. 48: 99. 1973.

细腰南星 xi yao nan xing

Plants dioecious. Tuber brown outside, white inside, depressed globose, 1.5–3 cm in diam. Cataphylls 2 or 3, pink to purple, to 8 cm, membranous. Leaf solitary; petiole greenish, not spotted, terete, 15–18 cm, basal part forming pseudostem, smooth, not verrucose; leaf blade 3-foliolate; leaflets subsessile, green usually with bluish margins; central leaflet broadly obovate or rhombic, 4–5(–11) × 4–5(–10.5) cm, apex abruptly acuminate or rounded with an acumen 2–3 mm; lateral leaflets larger than central one, ovate or rhombic, 8–9(–15) × 4(–9) cm, base cuneate, slightly oblique, apex acuminate. Peduncle greenish as petiole, shorter than petioles, 6–10 cm. Spatha tube dark purple with whitish longitudinal lines, cylindric, 4.5–5 × 1.5–2 cm, throat obliquely truncate, slightly recurved, not auriculate, inside distinctly lamellate, throat abruptly constricted into an intermediate zone 1.5–2 cm wide; limb above intermediate zone strongly dilated, reniform or subcordate, 3–5 × 4–7 cm, purple with whitish reticulate networks, apex rounded with a tubular tail 3–4 cm. Spadix unisexual; female zone conic, ca. 1.2 cm × 8 mm; ovary green; stigma subsessile, dark purple, ovoid; male zone cylindric, ca. 2 cm × 5 mm; synandria of 3 or 4 stamens; connected filaments purple, distinct; anthers yellowish, globose, dehiscing by horseshoe-shaped slit. Appendix purple, flagellate, recurved distally following spathe limb, 9–11 cm, base swollen, 4–5 mm in diam., truncate and stipitate; stipe 8–10 mm. Fl. Jun.

Thickets, grasslands on slopes; 3500–3700 m. S Xizang [E Nepal].

29. *Arisaema tengtsungense* H. Li, Acta Phytotax. Sin. 15(2): 106. 1977.

腾冲南星 teng chong nan xing

Arisaema tengtsungense var. *pentaphyllum* H. Li.

Plants dioecious. Tuber globose, 1–2 cm in diam. Cataphylls 2, whitish pink, short, 2–4 cm, membranous. Leaf solitary; petiole terete, 14–77 cm, basal part forming pseudostem; leaf blade 3-foliolate or rarely quinate; leaflets sessile, pale green abaxially, green adaxially; central leaflet elliptic or ovate-elliptic, 5–14 × 3–7 cm, base cuneate, apex acuminate; lateral leaflets obliquely ovate to ovate-lanceolate, 6–12 × 3–9 cm, base cuneate at inner side, rounded at outer side. Peduncle shorter than petioles, 7–25 cm, emerging from pseudostem. Spatha tube purple with white longitudinal lines, funnel-shaped, ca. 7 × 1.9 cm, throat oblique, not auriculate, slightly recurved; limb dark purple with indistinct whitish lines, galeate, oblong in outline, 5–6.6 × 3–3.5 cm, incurved, apex deeply 3-lobed; middle lobe smaller, lanceolate, ca. 5 × 2 mm; lateral lobes oblong, ca. 1.5 × 1.3 cm, apex rounded. Spadix unisexual; male zone cylindric, 1–1.5 cm; synandria of 2 or 3 stamens; anthers subsessile, globose, dehiscing by horseshoe-shaped slit; appendix pendulous, flagelliform, 8–15 cm, basal 2–3 cm narrowly conic, 2–3.5 mm in diam., base truncate and stipitate; stipe slender, 3–4 mm. Female spadix unknown. Fl. Jun–Jul.

Evergreen forests, *Rhododendron* thickets on mountain summits; 2600–3200 m. W Yunnan (Jingdong, Lushui, Tengchong) [N Myanmar].

30. *Arisaema speciosum* (Wallich) Martius ex Schott & Endlicher, Melet. Bot. 17. 1832.

美丽南星 mei li nan xing

Arum speciosum Wallich, Tent. Fl. Napal. 29. 1824; *A. eminens* Schott; *A. speciosum* var. *eminens* (Schott) Engler.

Plants dioecious. Rhizome cylindric, 4–10 × 2–4 cm. Cataphylls 2 or 3, reddish brown, inner one to 15 cm. Leaf solitary; petiole pale green, not spotted, 15–50 cm, base forming pseudostem, 1–1.5 cm in diam.; leaf blade 3-foliolate; leaflets with petiolules 1–1.5 cm, pale green with narrow red margin, not spotted; central leaflet dull adaxially, ovate or oblong, 11–13 × 4–7 cm, base cuneate, apex acuminate or acute; lateral leaflets obliquely oblong to lanceolate, larger than central leaflet, 13–16 × 4.5–6.5 cm, base strongly oblique (one side cuneate, other deeply cordate), apex abruptly shortly acuminate. Peduncle whitish with tiny brown dots, much shorter than petioles, 2.5–10 cm. Spatha dark purple, with whitish longitudinal lines; tube cylindric, 4–10 × 1–3 cm, throat margins obliquely truncate, slightly outcurved; limb arching over spadix, oblong-lanceolate, 8–20 × 6–8 cm, margins narrowly recurved, apically gradually acuminate, drooping. Spadix unisexual; female zone subconic, ca. 1.7 × 1.2 cm; ovary ovoid; stigma sessile, punctate; male zone cylindric, ca. 2.5 cm × 5 mm; male flowers purple; synandria of 3–5 stamens; connected filaments distinct; thecae dehiscing by a single horseshoe-shaped slit. Appendix pink to dark purple, very narrowly conic, filiform distally, 20–80 cm, base to 8 mm in diam., narrowed into a stipe ca. 1 cm. Fruiting peduncle erect. Berries red, ovoid-obconic, angulate. Fl. Apr–Jun, fr. Oct.

Broad-leaved forests; 2400–2800 m. S Xizang [Bhutan, NE India, Nepal].

31. Arisaema handelii Stapf ex Handel-Mazzetti, Symb. Sin. 7: 1367. 1936.

疣序南星 you xu nan xing

Plants dioecious. Tuber depressed globose, 2–4.5 cm in diam., with many fimbriate roots. Cataphylls 1 or 2, whitish green, flushed purplish, 17–36 × 1–1.5 cm, membranous, apex acute, sometimes obtuse. Leaf solitary; petiole dark green, unmarked, 17–55 cm, smooth, base forming pseudostem; leaf blade 3-foliolate; leaflets pale green abaxially, green adaxially, margin crisped or shallowly crenulate, petiolulate; central leaflet with petiolule 1–3 cm, blade obovate to obcordate, ca. 16 × 20 cm, apex depressed or concave with a short mucro; lateral leaflets with petiolule winged and 1–2 cm, blade broadly rhombic or obliquely ovate, 19–26 × 15–20 cm, base obliquely rounded or truncate, decurrent to petiolule, apex abruptly acuminate or acute, sometimes with filiform tail ca. 1.5 cm. Peduncle whitish green to dark green, unmarked, much shorter than petioles, emerging from pseudostem, 15–20 cm, smooth. Spathe green, purple, or dark green with broad white stripes; tube funnelform, 5–6 cm, ca. 2 cm in diam. at base, ca. 4 cm in diam. at throat, not auriculate; limb slightly incurved or suberect, oblong, ca. 15 × 4–6 cm, apex acuminate, sometimes with a filiform tail 2–3 cm. Spadix unisexual; female zone 3–4.5 cm; ovaries dense; stigma sessile; male zone cylindric, 3.4–4 × 1–1.5 cm; synandria with stipe 2–3 mm; anthers usually 4, globose, each dehiscing by horseshoe-shaped slit. Appendix whitish, narrowly conic, basal 4–6 cm densely papillose or rugose, ca. 1.5 cm in diam., abruptly narrowed at base into stipe ca. 6 × 5 mm, distal part smooth and gradually drawn into flagellum to 38 cm in total, exserted from spathe tube and tortuous, pendulous in distal flagellate part. Fl. May–Jun.

• *Picea* forests, secondary forests; 2800–3500 m. SE Xizang (Zayü), NW Yunnan (Dêqên, Weixi).

32. Arisaema bonatianum Engler, Pflanzenr. 73(IV. 23F): 214. 1920.

丹珠南星 dan zhu nan xing

Arisaema danzhuense H. Li; *A. salwinense* Handel-Mazzetti; *A. smithii* K. Krause.

Plants perennial, dioecious. Tuber brown outside, subglobose, 1.5–5 cm in diam., bearing 5–10 tubercles 0.5–1 cm in diam. Cataphylls 2 or 3, greenish, oblong-elliptic, to 20 × 5 cm, membranous. Leaf solitary; petiole greenish, cylindric, 40–60 × 0.5–2.5 cm, densely verruculose with whitish spinules, sheathed in proximal 1/3 forming pseudostem; leaf blade 3-foliolate; leaflets sessile or subsessile, greenish abaxially, green adaxially with dark purple spots, margins purple; midrib and lateral veins raised abaxially, verruculose with whitish spinules; central leaflet depressed rhombic, 15–21 × 16–20 cm, base broadly cuneate, apex acute; lateral veins 7 per side; collective veins 3, 1–15 mm from margin; lateral leaflets obliquely ovate, 20–30 × 15–21 cm, base broadly cuneate, apex acuminate. Peduncle emerging from pseudostem, greenish, 40–50 × 0.7–1.2 cm, verruculose and spinulescent. Spathe greenish or dark purple with white stripes, adaxially with ca. 20 longitudinal lamellae 1–3 mm wide; tube cylindric, ca. 5 × 3 cm, throat margins slightly recurved; limb incurved, oblong, ca. 8 × 2–5 cm, apex

rounded with acumen ca. 0.5 cm. Spadix unisexual; female zone cylindric, ca. 5.5 × 0.7–1.6 cm; ovary pale green with green stripes, oblong-ovoid, ca. 5 × 2 mm; ovules 9, subbasal; style short; stigma white, pilose; male zone cylindric, ca. 3 × 0.8 cm; synandria stipitate; stipe ca. 1 mm; anthers 3–5 (mostly 4), whitish, ovoid, dehiscing by a horseshoe-shaped slit. Appendix flagelliform, ca. 14 cm, distal part greenish, tortuous, smooth, base swollen to 6 mm in diam., truncate and stipitate, stipe ca. 3 mm.

• Mountains, among shrubs on slopes, meadows by rivers; 2800–3000 m. S Sichuan, NW Yunnan.

33. Arisaema asperatum N. E. Brown, J. Linn. Soc., Bot. 36: 176. 1903.

刺柄南星 ci bing nan xing

Arisaema cochleatum Stapf ex H. Li.

Plants dioecious. Tuber depressed globose, ca. 3 cm in diam. Cataphylls 2 or 3, purplish, 15–20 cm. Leaf solitary; petiole 30–50 cm, with dense whitish papillose spines, basal ca. 5 cm sheathing into pseudostem; leaf blade 3-foliolate; central leaflet broadly obovate, 16–23 × 18–27 cm, base cuneate, apex truncate or concave with acute acumen; lateral leaflets rhombic-oblong, 17–28 × 15–22 cm; all leaflets spinose at midrib abaxially. Peduncle 25–60 cm, verrucose, scabrid. Spathe dark purple, with whitish green stripes; tube cylindric, 5–6 cm, throat margins not recurved or auriculate; limb suberect, oblanceolate or ovate-lanceolate, 8–12 cm, apex acuminate. Spadix unisexual; female zone conic, 2–3 cm; ovary subcylindric; stigma sessile, disciform; male zone cylindric, ca. 3 cm; synandria lax, shortly stipitate; anthers 2 or 3, yellowish, depressed globose, dehiscing by horseshoe-shaped slit. Appendix cylindric, 6.5–9 cm, base abruptly thickened, 2.5–4 mm in diam., truncate, with stipe 3–5 mm, apex slightly recurved, not pendulous. Fl. May–Jun.

• Forests, thickets; 1300–2900 m. Chongqing, S Gansu, W Henan, W Hubei, NE Hunan, Shanxi, E Sichuan.

34. Arisaema brucei H. Li, R. Li & J. Murata, sp. nov.

贝氏南星 bei shi nan xing

Type: China. Yunnan: Gongshan, Gaoligong Shan, Dulong Jiang valley, between Xishaofang and Bapo, 2570 m, evergreen broad-leaved forest, 17 Jul 2002, H. Li, R. Li & Z. L. Dao 15020 (holotype, KUN; isotype, CAS).

Haec species Arisaemati asperato N. E. Brown similis, sed ab eo planta glabra, foli segmento intermedio elliptico, spathae lamina oblonga bruneaque ad apicem albido-reticulata differt.

Plants dioecious. Tuber subglobose, 1.8–2 cm in diam. Cataphylls not seen. Leaf solitary; petiole 24–30 cm, glabrous, proximal 5–7 cm sheathing into pseudostem; leaf blade 3-foliolate; leaflets subsessile, green with purple margins, glabrous, margins subcrenulate or crenate; terminal leaflet elliptic, ca. 11 × 4–6 cm, base cuneate, apex acuminate; lateral veins 12–15 per side, collective vein 0.5–1.5 mm from margin; lateral leaflets lanceolate, oblique, ca. 11 × 3.3–3.5 cm, base cuneate, apex long acuminate. Peduncle shorter than petioles, 12.5–16 cm. Spathe suberect, 12–13 cm; tube brown with whitish stripes, obconic, 4.5–5 × 1.7–2 cm, throat margins obliquely truncate,

slightly recurved, not auriculate; limb slightly incurved, dark brown with whitish stripes, oblong, $7.5\text{--}8 \times 2.4\text{--}3$ cm, base not constricted, apex acuminate with white reticulate stripes. Spadix unisexual; male zone cylindric, 1.3–1.7 cm; synandria lax, stipitate; filaments 1.5–2 mm; anthers 2–4, dehiscing by horseshoe-shaped slits; appendix distally curved, cylindric, ca. 6 cm in total, proximal 2.5–3 cm suberect, ca. 3 mm in diam., abruptly swollen toward base, base conic, 4–5 mm in diam., truncate, with stipe ca. 4.5 × 1.3 mm, apex attenuate, obtuse. Female spadix unknown. Fl. Jul.

- Evergreen broad-leaved forests slightly disturbed by roads, 2500–2600 m. NW Yunnan (Gongshan).

This species is named in honor of Dr. Bruce Bartholomew of the California Academy of Sciences, U.S.A., a senior researcher of the biodiversity of the Gaoligong Shan in W Yunnan, where he has collected extensively almost every year since 1998.

35. *Arisaema wilsonii* Engler, Pflanzenr. 73(IV. 23F): 212. 1920.

川中南星 chuan zhong nan xing

Arisaema wilsonii var. *forrestii* Engler.

Plants dioecious. Tuber dark brown outside, whitish inside, globose, 5–7 cm in diam., bearing some tubercles around. Cataphylls 3 or 4, dark purple, with tiny greenish stripes, to 30 × 7 cm, apex obtuse. Leaf 1(or 2); petiole to 130 cm, basal part sheathing into short pseudostem; leaf blade 3-foliolate; leaflets sessile, dull abaxially, light green adaxially, margins usually cristate or crenulate; midrib and lateral veins raised abaxially; central leaflet depressed obovate, 15–26 × 18–28 cm, base cordate, apex nearly truncate with a broad and short acumen; lateral leaflets rhombic or obliquely ovate, longer than central one, to 37 × 24 cm, apex abruptly acuminate. Peduncle yellowish green, shorter than petioles, ca. 35 cm, papillose. Spathe purple with yellowish stripes; tube cylindric, 6–8 × ca. 3 cm, throat margins slightly recurved; limb oblong or obovate-oblong, 10–15 × 5–8 cm, apex abruptly acute with an acuminate tail 3–4 cm, incurved. Spadix unisexual; female zone conic, ca. 2 × 1.3 cm; ovary green, obconic; style distinct; stigma purple; male zone 5.5–6 cm × 6–7 mm; synandria stipitate, lax; anthers 3 or 4, reniform, dehiscing by horseshoe-shaped slit. Appendix robust, greenish dark purple, to 23 cm in total, proximally narrowly pyramidal, ca. 1.4 cm in diam., base truncate with a stipe ca. 10 × 7–8 mm, distally gradually narrowed into flagellum, tortuous, sometimes pendulous. Berries red, oblong, ca. 10 × 7 mm when mature. Fl. May, fr. Jun.

- Broad-leaved forests, forest margins, grassy slopes; 1900–3200 m. Gansu, Sichuan (Emei Shan), SE Xizang, W Yunnan.

The long peduncle, which lifts the inflorescence as high as the leaf blade, is probably an adaptation to its grassy habitat and makes this species comparable to the Himalayan *Arisaema propinquum* Schott.

5. *Arisaema* sect. *Nepenthoidea* (Engler) H. Hara, Bull. Univ. Mus. Univ. Tokyo 2: 325. 1971.

猪笼南星组 zhu long nan xing zu

Arisaema [unranked] *Nepenthoidea* Engler, Pflanzenr. 73(IV. 23F): 208. 1920.

36. *Arisaema elephas* Buchet, Notul. Syst. (Paris) 1: 370. 1911.

象南星 xiang nan xing

Arisaema dilatatum Buchet; *A. rhombiforme* Buchet.

Plants dioecious. Tuber subglobose, 2–5 cm in diam. Cataphylls usually 2, reddish brown, to 13 cm, acute. Leaf solitary; petiole green, 20–30 cm, often verrucose, base forming pseudostem, ca. 2 cm in diam.; leaf blade 3-foliolate; leaflets green with cristate margins; central leaflet sessile, obovate to obcordate, 5–10 × 6–13 cm, base narrowly cuneate, apex abruptly acute; lateral leaflets obliquely oblong or ovate, 7–14 × 5–10 cm, base broadly cuneate, apex acute. Spatha purple with green or whitish stripes; tube cylindric, 3–5 × 2–2.5 cm, throat margins obliquely truncate, neither recurved nor auriculate; limb incurved or suberect, dark purple, oblong, 7–10 × ca. 4 cm, apex abruptly acuminate. Peduncle green, 11–15 cm, often verrucose. Spadix unisexual; female zone cylindric, ca. 2 × 1.2 cm; ovary green, oblong-ovoid; style green, short; stigma white or purple, pilose; male zone cylindric, ca. 3 × 1.1 cm; synandria stipitate; stipe reddish, 2–3 mm; anthers 2–5, yellow, obovoid, dehiscing by a horseshoe-shaped slit. Appendix sigmoid, to 20 cm in total, proximal 4–5 cm whitish or purplish to dark purple, cylindric, ca. 8 mm in diam., abruptly narrowed at base into stipe ca. 8 mm, distally narrowed into flagellum. Berries red, oblong. Seeds 5–8, pale brown, ovoid. Fl. Jun–Jul, fr. Aug.

Coniferous forests, bamboo forests, meadows, usually among mossy rocks; 1800–4000 m. Chongqing, Gansu, Guizhou, Sichuan, Xizang, Yunnan [Bhutan, Myanmar].

37. *Arisaema parvum* N. E. Brown, J. Linn. Soc., Bot. 29: 320. 1893.

小南星 xiao nan xing

Plants dioecious. Tuber globose, 1.2–1.8 cm. Cataphylls 3–4.5 cm, acute. Leaf solitary; petiole green, 6–18 cm, smooth, base forming pseudostem; leaf blade 3-foliolate; central leaflet obovate or obcordate, 1.8–5.5 × 2–6 cm, base cuneate usually with red margins, apex truncate or concave, with a short acumen; lateral leaflets obliquely ovate, 3–8 × 3–7 cm, acuminate. Peduncle green, shorter than petioles, 5–12 cm, smooth. Spatha tube color rather demarcated between dark purple (or dark carmine) proximal part and greenish distal part with whitish stripes, cylindric, 1.5–3.5 × 1.3–1.5 cm, throat obliquely truncate, not recurved; limb greenish, broadly lanceolate, 3–6 × ca. 3.5 cm, apex acute or acuminate, incurved. Spadix unisexual; male zone ca. 6 mm; synandria stipitate; anthers usually 2, yellow, dehiscing by horseshoe-shaped slit; appendix shorter than spathe, 5–6 cm, slender, base suddenly expanded into a disk, stipitate, distally recurved. Female spadix unknown. Fl. May–Jun.

- Alpine grasslands, meadows; 3000–3600 m. W Sichuan (Kanding), SE Xizang, Yunnan (Dali, Luquan, Yangbi).

Underground stems tuberous. Phyllotaxy quincuncial. Leaves 3-foliate or pedate (to 9-foliate), usually glaucous abaxially. Inflorescence emergent and unfolded before leaves. Spadix appendix erect, terete, base stipitate.

Three species: SW China to E Himalayas; three species (one endemic) in China.

- 1a. Leaves 7–9-foliate; peduncle shorter than petioles 40. *A. meleagris*
- 1b. Leaves 3–5(–7)-foliate; peduncle longer than petioles.
 - 2a. Leaves 3-foliate 38. *A. wattii*
 - 2b. Leaves (3–)5(–7)-foliate 39. *A. nepenthoides*

38. *Arisaema wattii* J. D. Hooker, Fl. Brit. India 6: 498. 1893.

双耳南星 shuang er nan xing

Arisaema bicoloratum W. W. Smith ex Handel-Mazzetti; *A. pangii* H. Li.

Plants dioecious. Tuber depressed globose, 2.3–5 cm in diam. Cataphylls 3 or 4, green or violet, with purplish spots, 15–20 cm, apex acute or obtuse. Leaves 2; petiole yellow-green with dark brown spots consisting of tiny striae, finally to 60 cm, proximal 1/3–1/2 forming pseudostem; leaf blade 3-foliate; leaflets sessile, green; central leaflet elliptic, 15–30 × 4–10 cm, base cuneate, apex acuminate; lateral leaflets narrowly obovate, oblique, as long as central one, base auriculate, rounded on outer side, narrowly cuneate on inner side. Inflorescence emerging before leaves; peduncle as long as petioles. Spathe purplish brown or purplish green, 11–13 cm in total; tube cylindric, 4.5–6.5 × 1–2 cm, throat margins with horizontal auricle 1.5–2.5 cm wide; limb broadly ovate, 6–7 × 3.5–5 cm, base slightly constricted, apex shortly acuminate. Spadix unisexual; female zone conic, 1.5–2 × ca. 1 cm; ovary obovoid; ovules 4, basal; style short; stigma disciform; male zone 1.5–3 cm; synandria lax; anthers 2, shortly stipitate, purple, dehiscing by apical pore. Appendix erect, whitish green, cylindric, 2.5–4.5 cm × 4.5–5 mm, base truncate with a stipe 5–7 mm, middle part slightly constricted, apex obtuse. Berries red. Seeds 4, ovoid. Fl. Apr–May, fr. Jun–Sep.

Mixed broad-leaved forests, mossy evergreen forests, grassy slopes; 2100–3300 m. SE Xizang (Mêdog), Yunnan [NE India (Assam, Manipur), NE Myanmar (W slope of Gaoligong Shan)].

39. *Arisaema nepenthoides* (Wallich) Martius ex Schott & Endlicher, Melet. Bot. 17. 1832.

猪笼南星 zhu long nan xing

Arum nepenthoides Wallich, Tent. Fl. Napal. 26. 1824.

Tuber depressed globose, 6–7 cm in diam. Cataphylls, petioles, and peduncle reddish or greenish, densely covered with dark green, dark brown, or black irregular spots consisting of parallel striae. Cataphylls 3, to 25 cm, obtuse at apex. Petiole to 90 cm, basal 10–50 cm sheathing, forming pseudostem; leaf blade digitate; leaflets 5(–7), glaucous abaxially, dull green adaxially, central leaflet with petiolule 2–3 cm, lateral 2 leaflets sessile; central leaflet oblanceolate, 16–20 × 4–5 cm; outermost leaflets 12–14 × 3–4 cm, extremely oblique, narrowly cuneate at inner base, distinctly auriculate semiovate at outer side. Peduncle emerging from pseudostem, shorter or longer than

petioles. Spathe tube yellowish with brownish or dark brown spots at both sides, cylindric, 3–8 × 1.2–2.5 cm, throat broadly auriculate, auricles semiorbicular, to 2 cm wide, outcurved; limb arching, yellowish with numerous black spots, triangular-ovate, 3–10 × 2–5 cm, apex acuminate. Spadix unisexual; female zone cylindric, 2–2.5 cm × 8–12 mm; ovaries dense, green, obovoid; stigma yellowish; male zone ca. 1.5 cm; synandria lax; anthers 1–3, violet, shortly stipitate; thecae globose, dehiscing by apical pores. Appendix erect, whitish green, cylindric, 6–8 cm × 4.5–5 mm, base truncate with stipe 5–7 mm, middle part slightly constricted, apex obtuse. Fl. May–Jun. 2n = 26, 26 + 1B.

Tsuga or *Quercus* forests, forest banks and margins; 2700–3600 m. S Xizang, Yunnan [Bhutan, NE India (Darjeeling, Sikkim), N Myanmar, Nepal].

A Chinese record of *Arisaema ochraceum* Schott (Lacaita, J. Linn. Soc., Bot. 43: 483. 1916) is referable to *A. nepenthoides*.

40. *Arisaema meleagris* Buchet, Notul. Syst. (Paris) 2: 122. 1911.

褐斑南星 he ban nan xing

Arisaema meleagris var. *sinuatum* Buchet; *A. paichuanense* Z. Y. Zhu; *A. shimienense* H. Li.

Tuber subglobose or depressed globose, 1–2.5 cm in diam. Cataphylls 2.4–12 cm, membranous, apex obtuse. Leaf solitary, pedate; petiole green with brown spots, 10–23 cm, proximally forming pseudostem; leaflets 7–9(–12), lanceolate, 3 cm (outermost one) to 10 × 1–2.5 cm, base acute, margin entire, usually erose, apex acuminate; central 3 subequal, remote, sessile; rachis between leaflets 5–10 mm. Peduncle green with brown spots, shorter than petioles, 5–15 cm. Spathe purplish brown with numerous dark brown spots, 6–9 cm in total; tube cylindric, 3–4 cm × 8–12 mm, throat auriculate and outcurved; limb suberect, dark purple at apex, ovate to elliptic, ca. 3.5 × 2 cm, apex acute or acuminate. Spadix unisexual; female zone ca. 7 × 4 mm; ovary yellow-green, obovoid; stigma subsessile, subglobose; male zone ca. 7 mm; synandria lax; anthers 2–4, sessile; thecae subglobose, dehiscing by lateral slits. Appendix erect, purple in basal and apical parts, whitish with purple spots at base, subcylindric, 2.5–3.5 mm, base narrowed into stipe 5–10 mm, apex obtuse. Fl. May–Jun.

• Broad-leaved forests, bamboo thickets; 2000–3000 m. Chongqing (Chengkou), Sichuan, Yunnan (Dali, Zhenxiong).

This species is similar to *Arisaema auriculatum* in *A.* sect. *Tortuosa* in its small size, range of variation of leaf shape, and coloration of the spathe.

6. Arisaema sect. Franchetiana (Engler) H. Hara, Bull. Univ. Mus. Univ. Tokyo 2: 326. 1971.

象头花组 xiang tou hua zu

Arisaema [unranked] *Franchetiana* Engler, Pflanzenr. 73(IV. 23F): 148. 1920.

Tuber purple outside, globose, base of axillary buds swelling. Leaves 1 or 2; leaf blade 3-foliolate. Spadix unisexual; thecae opening by an apical pore or slit; appendix suberect or apex outwardly recurved, pyramidal or subcylindric, robust, base attenuate into a stipe.

Four species: SW China, N Myanmar; four species (three endemic) in China.

Putative intraspecific hybrids are frequently observed.

- | | |
|---|-----------------------------|
| 1a. Spathe unfolded before leaf blade, limb shorter than tube, erect or curved forward but not galeate. | |
| 2a. Spathe basically white, tube thick | 41. <i>A. candidissimum</i> |
| 2b. Spathe basically purple, tube slender | 43. <i>A. lichiangense</i> |
| 1b. Spathe unfolded after leaf blade, limb longer than tube, arched and pendulous. | |
| 3a. Spathe arched and galeate, enclosing spadix appendix | 42. <i>A. franchetianum</i> |
| 3b. Spathe arched but not galeate, spadix appendix seen from outside | 44. <i>A. fargesii</i> |

41. Arisaema candidissimum W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10: 8. 1917.

白苞南星 bai bao nan xing

Plants dioecious. Tuber depressed globose, 3–5 cm in diam. Cataphylls 3 or 4, pinkish brown, sparsely spotted with whitish dots, 5–24 × 4–5 cm, membranous, apex obtuse, convolute, encircling pseudostem. Leaf solitary; petiole entirely green, 15–35 cm, base forming pseudostem, ca. 1.2 cm in diam., smooth; leaf blade 3-foliolate, papery; leaflets sessile, ovate or nearly orbicular, apex rounded or acute; central leaflet 6–8 × 7–9 cm (at anthesis and much expanded later), base shortly cuneate; lateral leaflets slightly oblique, 5–6 × 4–8 cm. Inflorescence arising before leaves. Spathe pale green or white with green or purple longitudinal lines; tube cylindric, 3–4 × ca. 2 cm, throat margins recurved; limb ovate to ovate-lanceolate, 5–6 × 3–4 cm, apex with a tail 2–3 cm. Spadix unisexual; female zone oblong, ca. 2 × 1 cm; ovary green, obovoid; stigma subsessile, rounded; male zone cylindric, 1.6–2 cm × 3–4 mm; synandria consisting of 2 or 3 anthers; thecae yellow, subglobose, opening by apical pores. Appendix suberect or erect, white or pale green, funnel-shaped, subcylindric, 3–4.5 cm × 2–5 mm, naked, base attenuate, subsessile to stipitate, apex acute or obtuse.

• *Quercus* forests, valley thickets; 2200–3300 m. Sichuan, Xizang, Yunnan.

42. Arisaema franchetianum Engler, Bot. Jahrb. Syst. 1: 487. 1881.

象头花 xiang tou hua

Arisaema delavayi Buchet; *A. purpureogaleatum* Engler.

Plants dioecious. Tuber renewed seasonally, creamy red outside, depressed globose, 1–6 cm in diam., bearing many tubercles around. Cataphylls 2 or 3, pale brown with purplish spots, membranous. Leaf solitary; petiole creamy red or pale green, without spots, 20–50 cm, base forming pseudostem, 1–2 cm in diam.; leaf blade 3-foliolate; leaflets sessile or subsessile, subleathery; central leaflet ovate, broadly elliptic, or subovate, 7–23 × 6–22 cm, base shortly cuneate to rounded, apex abruptly

attenuate; lateral leaflets obliquely elliptic, 6–20 × 5–19 cm, base cuneate. Peduncle erect in flowering, recurved at fruiting, brown with white dots, shorter than petioles, 10–30 cm. Spathe dirty purple or dark purple with white or greenish white longitudinal lines; tube cylindric, 4–6 × 1.2–2 cm, throat margins slightly recurved; limb galeate-recurved, 4.5–11 × 3–5 cm, apex long acuminate with a tubular tail 5–6 cm, whiplike, pendulous. Spadix unisexual; female zone cylindric, 1.2–3.8 cm × 8–20 mm; ovaries dense, greenish purple, ca. 5 mm; ovules 2, basal, erect; stigma convex; male zone narrowly conic. Appendix recurved from middle, sometimes suberect, 1.5–4 cm × 2.5–6 mm, base attenuate into short stipe, 4–8 mm in diam., apex 1–2 mm in diam. Fl. May–Jul, fr. Sep–Oct.

Forests, thickets, grasslands; 900–3000 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan [N Myanmar].

43. Arisaema lichiangense W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 178. 1914.

丽江南星 li jiang nan xing

Plants dioecious. Tuber renewed seasonally, brown outside, yellowish white inside, subglobose, 3–4.5 cm in diam., usually with tubercles. Cataphylls 3, brown with purple dots, membranous, inner one 7–15 cm, purplish brown with whitish spots. Leaf solitary; petiole purplish brown with some whitish dots, 20–37 cm, basal 4–5 cm sheathing into pseudostem; leaf blade 3-foliolate; leaflets sessile, sometimes shortly petiolulate, green, broadly ovate or subrhombic, subleathery, base broadly cuneate or rounded, margin entire, apex acute or abruptly acuminate; central leaflet 6–15 × 6.5–13 cm; lateral leaflets smaller, 5.5–13 × 4.5–10 cm, base oblique. Peduncle purplish brown with tiny whitish dots, shorter than petioles, 13–24 cm. Spathe purple or purplish red, with whitish or greenish longitudinal lines, 7–10 cm in total; tube broadly cylindric, ca. 2.5 × 1.3–1.5 cm, throat margins slightly recurved; limb erect or slightly recurved, ovate-lanceolate, 3.5–4 cm, apex long acuminate, with a connective whitish intramarginal line along distal part. Spadix unisexual; female zone subconic, ca. 10 × 6–7 mm; ovary green, obconic; ovules 3, basal, erect; stigma sessile, disciform; male zone cylindric, 9–15 × 2–3 mm; synandria of 1 or 2 stamens; anthers sessile or distal ones subsessile; thecae

purple, globose, opening by an apical pore. Appendix whitish purple proximally, dark purple distally, 6–7 cm (including stipe), base swollen, 3–4 mm in diam., attenuate into stipe ca. 10 × 1 mm. Fl. Jun–Jul.

• *Pinus* forests, deciduous broad-leaved forests in valleys, secondary thickets; 2400–3200 m. SW Sichuan, NW Yunnan.

44. Arisaema fargesii Buchet, Notul. Syst. (Paris) 1: 371. 1911.

螃蟹七 pang xie qi

Arisaema bogneri P. C. Boyce & H. Li.

Plants dioecious. Tuber subglobose, 3–5 cm in diam., with a few tubercles. Cataphylls 3, brown, inner one ca. 15 cm. Leaf solitary; petiole 20–40 cm, base 6–7 mm in diam., proximal 1/4 sheathing into pseudostem; leaf blade 3-foliolate; leaflets sessile, membranous; central leaflet rhombic or ovate-oblong to ovate, 12–32 × 9–27 cm, base shortly cuneate or combined with

lateral leaflets, apex acute; lateral leaflets obliquely elliptic, outer side semiovate, 9–23 × 6–16 cm. Peduncle emerging from pseudostem, slender and shorter than petioles, 18–26 cm. Spathe purple with whitish longitudinal lines; tube subcylindric, 4–8 × 1.5–2 cm, throat margins recurved and auriculate; limb arching or suberect, narrowly triangular, 6–12 × 4–4.5 cm, apex long acuminate with a tail 1–4 cm. Spadix unisexual; female zone ca. 2 cm; ovary ovoid; stigma subsessile, papillose; male zone cylindric, 2.5–3 cm × 4–5 mm; synandria of 2–4 stamens; thecae ovoid, opening by an apical pore. Appendix robust, suberect or slightly recurved, narrowly conic, long acuminate toward apex, 4.5–9 cm, proximal part 7–15 mm in diam., base attenuate into a short stipe, apex obtuse, ca. 5 mm in diam. Fl. May–Jun.

• Forests, thickets, in rocks; 900–2000 m. Chongqing, S Gansu, W Hubei, Hunan, Sichuan, E Xizang, NW Yunnan (Gongshan).

7. Arisaema sect. Tortuosa (Engler) H. Hara, Bull. Univ. Mus. Univ. Tokyo 2: 344. 1971.

曲序组 qu xu zu

Arisaema [unranked] *Tortuosa* Engler, Pflanzenr. 73(IV. 23F): 185. 1920; *Flagellarisema* Nakai.

Underground stems tuberous. Phyllotaxy quincuncial. Leaves 1 or 2(or 3); leaf blade 3-foliolate or pedate. Spathe limb erect or incurved, usually ovate. Spadix: thecae dehiscing by apical lunate slit or by pore; appendix elongate, sigmoid, tortuous, base gradually attenuate and sessile, without neuter flowers.

About 18 species: E Asia, North America; 12 species (seven endemic) in China.

- 1a. Spathe basically purplish.
 - 2a. Flowering in autumn; spathe throat not auriculate 55. *A. thunbergii*
 - 2b. Flowering in spring; spathe throat broadly auriculate.
 - 3a. Spathe limb basally narrowed, not united with oblong auricles, showing 3-lobed appearance 49. *A. auriculatum*
 - 3b. Spathe limb basally expanded and united with expanded part of spathe throat, showing single cordate appearance 56. *A. cordatum*
- 1b. Spathe basically green or white.
 - 4a. Spathe white.
 - 5a. Leaf blade 3-foliolate; mature spadix bisexual 53. *A. odoratum*
 - 5b. Leaf blade pedately 5–7(–9)-foliolate; mature spadix female 54. *A. mairei*
 - 4b. Spathe green.
 - 6a. Central leaflet much smaller than adjacent lateral leaflets 51. *A. heterophyllum*
 - 6b. Central leaflet ca. as large as or larger than adjacent lateral leaflets.
 - 7a. Spadix bisexual when mature 50. *A. tortuosum*
 - 7b. Spadix female when mature.
 - 8a. Leaf blade (1–)3–5-foliolate; leaflets linear to narrowly oblong; ovary fusiform 45. *A. saxatile*
 - 8b. Leaf blade 3- or 5- or more foliolate; leaflets lanceolate to oblong; ovary bottle-shaped.
 - 9a. Spadix appendix filiform, 8–16 cm, usually pendulous.
 - 10a. Leaf blade 3-foliolate; mature spadix bisexual 48. *A. prazeri*
 - 10b. Leaf blade 5–9-foliolate; mature spadix female 52. *A. aridum*
 - 9b. Spadix appendix narrowly attenuate, less than 7 cm, curved forward.
 - 11a. Leaf blade 3-foliolate 46. *A. yunnanense*
 - 11b. Leaf blade 5-foliolate 47. *A. quinquelobatum*

45. Arisaema saxatile Buchet, Notul. Syst. (Paris) 2: 124. 1911.

银南星 yin nan xing

Arisaema bathycoleum Handel-Mazzetti; *A. lineare* Buchet.

Plants dioecious. Tuber renewed seasonally, depressed globose, 1–2 cm in diam. Cataphylls 2, creamy green, mem-

branous, acute. Leaves 1 or 2; petiole green without spots, 9–25 cm, proximally forming pseudostem; leaf blade 3-foliolate or pedately 5-foliolate; leaflets sessile or subsessile, green, narrowly lanceolate or elliptic, papery, margin entire; terminal leaflet 4–12 × 0.5–2.5 cm. Peduncle emerging from pseudostem, green, usually longer than petioles, 15–28 cm. Spathe green or pale green; tube funnelform, 5–6 × 1–2 cm, throat mar-

gin obliquely truncate, slightly recurved; limb ovate-lanceolate, apex acute or acuminate. Spadix unisexual; female zone cylindric, $2\text{--}2.5 \times \text{ca. } 0.7$ cm; ovary yellowish green, fusiform, style short; stigma capitate; male zone cylindric, ca. $2.2 \text{ cm} \times 4$ mm; male flower of 2 or 3 stamens; anthers violet, globose, 2-thealous, dehiscing by apical pore; appendix in male spadix sessile, recurved or twining, pale green, proximally narrowly cylindric, distally filiform, to 20 cm, naked, base ca. 3 mm in diam.; appendix in female spadix recurved, usually purple, 4–5 cm, much shorter than appendix in male spadix. Berries red, 1–4-seeded. Fl. Jun, fr. Aug.

• *Pinus* forests, grassy slopes, alpine grasslands; 1600–3400 m. Sichuan, Yunnan.

46. *Arisaema yunnanense* Buchet, Notul. Syst. (Paris) 1: 367. 1911.

山珠南星 shan zhu nan xing

Arisaema talense Engler; *A. talense* var. *latisectum* Engler.

Plants dioecious. Tuber renewed seasonally, pale brown outside, white inside, depressed globose or globose, 0.5–4 cm in diam., with some offsets above; offsets sessile, globose. Cataphylls 2, green, sometimes purplish, 3–25 cm, papery, apex obtuse. Leaves 1(or 2); petiole green, without spots, 40–70 cm, basal 2/3 sheathing into pseudostem, encircled by cataphylls; leaf blade green on both surfaces, 3-foliolate; central leaflet with petiolule 0–1.5 cm, blade elliptic, sometimes ovate, 10–19 × 5–12 cm, base cuneate or obtuse, apex acuminate; lateral leaflets sessile or shortly petiolulate, ovate to lanceolate, 9–15 × 5.5–9 cm, base obliquely cuneate. Peduncle emerging from pseudostem, green, without spots, longer (male) or shorter than petioles, 20–75 cm. Spathe green, with longitudinal white lines; tube $2\text{--}2.5 \times 1\text{--}1.4$ cm, throat margin obliquely truncate, not auriculate; limb arching from base, ovate, ca. 5×3.5 cm, apex acuminate. Spadix unisexual; female zone conic, ca. 1.5 cm; ovary green, obovoid; ovules 3, basal; style ca. 0.5 mm; stigma depressed globose; male zone pyramidal, 1.5–2 cm, base 3–5 mm in diam.; synandria of 2 or 3 stamens; thecae violet, globose, opening by an apical pore. Appendix recurved outward or downward, pale green, cylindric, narrowed distally, 3.5–6 cm, base 2–2.5 mm in diam., naked. Berries red, subcylindric. Seeds 2 or 3, ovoid-globose. Fl. May–Jul, mature fr. Aug–Sep. $2n = 48$.

Pinus and *Pinus-Quercus* forests, grassy slopes, roadsides, thickets; 700–3200 m. Guizhou, Sichuan, Yunnan [N Myanmar].

47. *Arisaema quinquelobatum* H. Li & J. Murata, sp. nov.

五叶山珠南星 wu ye shan zhu nan xing

Type: China. Yunnan: Lijiang, Hutiaoxia (虎跳峡, “Tiger Leaping Gorge”), 1860 m, 20 Jun 1995, J. Murata, X. Cheng, H. Takahashi, J. Ohno & H. Murata s.n. (holotype, TI).

Haec species quoad inflorescentiam eadem ac Arisaema yunnanense Buchet est, sed ab eo foliis 5-foliolatis et chromosomatum numero diploideo $2n = 24$ differt.

Plants dioecious, 10–40 cm tall. Tuber depressed globose, 1–5 cm in diam., with some tubercles around. Leaves 1 or 2;

petiole 10–45 cm, proximal 6–28 cm forming pseudostem, usually greenish, unspotted; leaf blade palmately 5-foliolate; leaflets green, narrowly elliptic to elliptic, $4\text{--}13.5 \times 1\text{--}7$ cm, base cuneate, margin entire, apex acuminate. Inflorescence unfolding after leaf blade; peduncle longer than petioles. Spathe green, with longitudinal white lines; tube $2\text{--}2.5 \times 1\text{--}1.4$ cm, throat margin obliquely truncate, not auriculate; limb arching from base, ovate, ca. 5×3.5 cm, apex acuminate. Spadix unisexual; female zone conic, ca. 1.5 cm; ovary green, bottle-shaped; ovules 3, basal; style ca. 0.5 mm; stigma depressed globose; male zone pale green, pyramidal, 1.5–2 cm, base 3–5 mm in diam.; synandria of 2 or 3 stamens; thecae violet or cream-colored, globose, opening by apical pore; pollen verrucate between conic spines. Appendix recurved outward or downward, green, narrowly conic, 3.5–6 cm, base 2–2.5 mm in diam. Berries red, subcylindric. Seeds 2 or 3, ovoid-globose. Fl. May–Jul, mature fr. Aug–Sep. $2n = 24^*$.

• *Pinus-Quercus* forests, grassy slopes, roadsides, thickets; 1800–2100 m. NC and NW Yunnan (Lijiang, Wuding, Yuanmou, Zhongdian).

This species is considered to be the diploid ancestor of *Arisaema yunnanense*, which is tetraploid, with $2n = 48$ chromosomes. It also differs from *A. yunnanense* in having always quinate leaves.

48. *Arisaema prazeri* J. D. Hooker, Fl. Brit. India 6: 501. 1893.

河谷南星 he gu nan xing

Arisaema prazeri var. *variegatum* Engler; *A. prazeri* var. *viride* Engler.

Plants monoecious and male. Tuber renewed seasonally, subglobose, 1–3 cm in diam. Cataphylls 2 or 3, grayish green, with dark purple striae and spots, 10–28 cm. Leaves 1 or 2; petiole grayish with purple striae and spots, 25–70 cm, proximal 1/2–3/4 sheathing into pseudostem; leaf blade green, membranous, 3-foliolate; leaflets subsessile; central leaflet ovate-lanceolate, $22\text{--}25 \times 9\text{--}10$ cm, base cuneate, apex acuminate; lateral leaflets obliquely ovate, $17\text{--}18 \times 5\text{--}10$ cm. Peduncle shorter than petioles. Spathe green with white longitudinal stripes on back; tube cylindric, $4\text{--}5 \times \text{ca. } 1$ cm, throat margin obliquely truncate, not auriculate; limb erect, lanceolate, $6\text{--}10 \times 1.5\text{--}2.5$ cm, apex acuminate, with short tail. Spadix bisexual or male. Male spadix: male zone ca. 3 cm, base 4–5 mm in diam.; synandria of 2 stamens; thecae purple, ovoid, opening by an apical longitudinal slit. Bisexual spadix: female zone proximal, cylindric, $2.3\text{--}3 \text{ cm} \times 5\text{--}6$ mm; ovary green, obovoid; ovules 3; stigma subsessile; male zone distal, $1\text{--}3.5 \text{ cm} \times \text{ca. } 4$ mm; synandria as in male spadix. Appendix pendulous, usually dark purple, filiform, to 80 cm. Fl. Jun.

Tropical thickets, evergreen forests, in limestone areas; 100–1500 m. Yunnan [Myanmar, Thailand].

49. *Arisaema auriculatum* Buchet, Notul. Syst. (Paris) 2: 123. 1911.

长耳南星 chang er nan xing

Arisaema auriculatum var. *hungyaense* (H. Li) Gusman & L. Gusman; *A. hungyaense* H. Li; *A. omeiene* P. C. Kao.

Plants dioecious. Tuber globose, small, 1–2 cm in diam., shortly stoloniferous. Cataphylls 3, brownish purple with tiny

black striae, to 18 cm, apex obtuse. Leaf solitary; petiole greenish with some grayish spots, 20–30 cm, proximal 1/3 sheathing into pseudostem; leaf blade pedate; leaflets (7–)9–15, sessile, oblanceolate or oblong, base attenuate, margin entire or erose, apex acuminate; central leaflet usually larger than or equaling lateral ones; lateral leaflets 10–12 × 2.5–3.5 cm, outermost ones 1.5–4 × 0.3–1.5 cm. Inflorescence emerging before leaf; peduncle grayish green with whitish spots, shorter than petioles, 12–25 cm. Spathe 7–12 cm in total; tube green or pale brown, densely flushed with dark purple or dark brown spots, narrowly cylindric, 4–6 cm × 7–15 mm; limb deeply 3-lobed; lobes green or purple, often flushed with dark purple or black spots on back; lateral lobes oblong or oblanceolate, 20–25 × ca. 7 mm, spreading into auricles at tube throat; central lobe ovate to elliptic, 2–3 × 1.4–1.8 cm, base constricted, apex acuminate, incurved. Spadix unisexual; female zone conic, 12–15 × 6–7 mm; ovaries dense, green, ovoid; stigma subsessile; male zone 1.5–2 cm, slender; synandria lax; anthers sessile, violet, globbose; thecae dehiscing from apical pore. Appendix sessile, ascending, sigmoid, dark violet, flagelliform to filiform, 7–12 cm, 1–2 mm in diam. in basal part. Infructescence subglobose. Berries red. Fl. Apr–Jun.

• Mixed evergreen forests, bamboo forests, secondary forests, wet places in valleys; 1400–3100 m. NW Hunan, Sichuan, Yunnan.

50. Arisaema tortuosum (Wallich) Schott in Schott & Endlicher, Melet. Bot. 17. 1832.

曲序南星 qu xu nan xing

Arum tortuosum Wallich, Pl. Asiat. Rar. 2: 10. 1831; *Arisaema helleborifolium* Schott; *A. tortuosum* var. *helleborifolium* (Schott) Engler.

Plants monoecious or male. Tuber depressed globose, 2–6 cm in diam. Cataphylls and petiole variously blotched with pinkish, gray dark brownish, or purplish. Leaves (1 or) 2 or 3; petiole 5–30(–180) cm, proximal 2/3–5/6 sheathing into pseudostem; leaf blade pedate; leaflets 5–17, shortly petiolulate or sessile, greenish abaxially, dull green adaxially, variously shaped, rhombic-ovate or oblong to lanceolate, base cuneate, apex abruptly acuminate; central leaflet 5–30 × 1–7 cm; lateral leaflets gradually smaller to outermost. Peduncle emerging from pseudostem, 30–45(–200) cm, usually exceeding leaves. Spathe light green, usually glaucous green or dark purple; tube cylindric or funnelform, 2.5–7 × 1.5–3 cm, throat margins obliquely truncate, not recurved; limb slightly incurved, ovate or oblong, 4–12 × 2–5 cm, apex shortly acuminate. Spadix bisexual or male. Bisexual spadix: proximal part female, 2–4 cm; ovary broadly ovoid; style short; stigma disciform; male zone 2–3 cm. Male spadix: male zone ca. 4 cm; synandria widely spaced, stalked (1–3 mm), cream to orange, consisting of 2 or 3(–5) anthers; thecae dehiscing by lateral slits. Appendix ascending, sigmoid, green, glaucous, or dark purple, gradually tapering from sessile base to very acute apex, 7–23 mm, 3–12 mm in diam. at base, smooth. Infructescence upright, subglobose. Berries red. Seeds 3–5. Fl. Jun, fr. Aug.

Rocky slopes, path sides, streamsides, especially in disturbed areas; 1300–2900 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal].

51. Arisaema heterophyllum Blume, Rumphia 1: 110. 1835.

天南星 tian nan xing

Arisaema ambiguum Engler; *A. brachyspathum* Hayata; *A. kwangtungense* Merrill; *A. limprichtii* K. Krause; *A. manshuricum* Nakai; *A. multisectum* Engler; *A. stenospathum* Handel-Mazzetti; *A. takeoi* Hayata; *A. thunbergii* Blume var. *heterophyllum* (Blume) Engler; *Heteroarisaema heterophyllum* (Blume) Nakai; *H. manshuricum* (Nakai) Nakai.

Plants monoecious and male. Tuber depressed globose, 2–6 cm in diam. Cataphylls 4 or 5, membranous. Leaf usually solitary; petiole glaucous, 30–60 cm, proximal 3/4 sheathing into pseudostem; leaf blade pedate; leaflets 11–19(–21), shortly petiolulate or sessile, pale greenish abaxially, dull green adaxially, variously shaped, oblanceolate, oblong, or linear-oblong, base cuneate, apex acuminate; central leaflet 3–15 × 0.7–5.8 cm, often much shorter than lateral leaflets; first outer leaflets 7.7–24.2(–31) × (0.7–)2–6.5 cm, gradually smaller to outermost leaflets, distance between leaflets 0.5–5 cm. Peduncle usually longer than petioles, 50–80 cm. Spathe tube glaucous outside, whitish green inside, cylindric, 3.2–8 × 1–2.5 cm, throat slightly recurved; limb strongly incurved, pale greenish to pale yellow abaxially, deep green adaxially, ovate, 2.5–8 × 4–9 cm. Spadix bisexual or male. Bisexual spadix: female zone proximal, 1–2.2 cm; ovary globose; style distinct; stigma punctate; ovules 3 or 4; male zone distal, 1.5–3.2 cm; synandria lax; occasionally with echinate neuter flowers. Male spadix: male zone 3–5 cm × 3–5 mm; synandria stalked, consisting of 2 or 3 anthers, each with 2 thecae dehiscing by apical slits. Appendix ascending, sigmoid, pale whitish, gradually tapering from sessile base to very acute apex, ca. 20 cm, 5–11 mm in diam. at base. Berries yellowish red or red, cylindric, ca. 5 mm. Seed usually 1, clavate. Fl. Apr–May, fr. Jul–Sep.

Forests, thickets, grasslands; below 2700 m. Almost throughout China, except Xizang [Japan, Korea].

52. Arisaema aridum H. Li, Acta Phytotax. Sin. 15(2): 107. 1977.

旱生南星 han sheng nan xing

Arisaema yunnanense Buchet var. *aridum* (H. Li) Gusman & L. Gusman.

Plants dioecious. Tuber nearly globose, 1–3 cm in diam. Cataphylls 2 or 3, to 17 cm. Leaves 1 or 2; petiole green, unmarked, 16–50 cm, proximal 1/4–1/2 sheathing into pseudostem; leaf blade pedate; leaflets 5–9, pale greenish abaxially, green adaxially, linear to narrowly lanceolate, sessile; central leaflet 15–20 × 1–1.5 cm; lateral leaflets gradually smaller and shorter toward outermost, outermost ones 2–3 cm × 1–5 mm. Peduncle green, 10–50 cm, shorter or longer than petioles. Spathe yellowish green, 5–15 cm in total; tube narrowly cylindric, 2.2–6 cm × 4–20 mm, throat obliquely truncate, not recurved; limb suberect, ovate to narrowly ovate, 4–7 × 1–2 cm, apex acuminate. Spadix unisexual; female zone 1.2–2.5 cm; ovary whitish green, obovoid; ovules 3; stigma with short stipe;

male zone cylindric, 1.8–3 cm, densely flowered; synandria sessile, consisting of 2–4 anthers, each with 2 thecae dehiscing by apical pores. Appendix sessile, sigmoid or simply curved forward, yellowish green to violet, 4–17 cm × 2.5–4 mm. Fl. Apr–Jun.

- Grassy slopes, valley thickets along Jinsha Jiang; 1800–2800 m. NW Yunnan.

53. Arisaema odoratum J. Murata & S. K. Wu, J. Jap. Bot. 69: 153. 1994.

香南星 xiang nan xing

Plants monoecious or male. Tuber subglobose. Cataphylls 2 or 3, membranous. Leaves 1 or 2; petiole green to purplish, unmarked, 13–22 cm, basal 4–7 cm sheathing into pseudostem; leaf blade 3-foliolate; leaflets sessile, ovate to oblong, base cuneate, margin entire, apex acuminate. Inflorescence fragrant; peduncle green, nearly as long as petiole. Spathe white, 7–8 cm; tube funnelform, gradually opening to blade; limb ovate or oblong to narrowly oblong, 5.5–6 × 1.7–4 cm, apex acute to acuminate, bending forward. Spadix male or bisexual; female flowers green or cream-colored, congested in basal part of spadix; male flowers white. Appendix extremely fragrant, sessile, dull green, becoming orange, whip-shaped, 5–9 cm, bent down from throat of spathe. $2n = 22^*$.

- Humid grassy slopes at forest margins; ca. 1400 m. NC Yunnan (Dayao).

54. Arisaema mairei H. Léveillé, Cat. Pl. Yun-Nan, 10. 1915.

乌蒙南星 wu meng nan xing

Arisaema maireanum Engler; *A. wumengense* H. Li.

Plants dioecious. Tuber renewed seasonally, dark brown outside, whitish inside, depressed globose, ca. 3 × 4–5 cm. Cataphylls 2 or 3, greenish with pink and whitish blotches or whitish with brownish apex, 17–18 × ca. 2.7 cm, papery, apex obtuse. Leaves 2; petiole green but sheathing part often with dark brown short stripes, 30–40 cm, proximal 25–30 cm sheathing into pseudostem, encircled in cataphylls; leaf blade pedate, 5–7-foliolate or palmate-digitate; leaflets sessile, base connected and closed, light green abaxially, dull green adaxially; central leaflet subsessile, elliptic to broadly oblong, base acute, apex acute or acuminate; lateral leaflets as central one but somewhat smaller, outermost ones ca. 8 × 3 cm. Peduncle green, unmarked or with whitish dots, usually shorter than petioles, 33–36 cm. Spathe emerging from pseudostem; tube greenish outside, white inside, unmarked, cylindric, ca. 4 × 1.4–2 cm, smooth, throat slightly recurved, not auriculate; limb white, unmarked, narrowly ovate, 9–11 × 3.7–5.5 cm, apex acute or acuminate, slightly incurved. Spadix unisexual; female zone greenish, conic, ca. 1.5 × 1 cm; ovary ovoid; style pyramidal, short; stigma small, papillose; male zone cylindric, 1.5–2 cm × ca. 3 mm; synandria dense, subsessile; anthers 2 or 3, yellowish, thecae globose, dehiscing by apical pores. Appendix sessile, dark green throughout or whitish in basal 2–3 cm, green in middle ca. 1.5 cm, dull brownish purple distally, cylindric,

narrowed distally, ca. 14 cm in total, 3–5 mm in diam., part exserted from spathe tube recurved and pendulous, apex filiform. Fl. Jun–Jul.

- Thickets, grassy slopes, riversides; 1900–2000 m. S Sichuan (Huidong), Yunnan (Huize, Luquan).

55. Arisaema thunbergii Blume subsp. **autumnale** J. C. Wang, J. Murata & H. Ohashi, Bot. Bull. Acad. Sin. 37: 75. 1996.

东台南星 dong tai nan xing

Plants dioecious. Tuber depressed globose, 3–6 cm in diam. Cataphylls purplish to brownish, membranous, apex mucronate. Leaf solitary; petiole terete, 25–50 cm, proximally forming pseudostem; leaf blade pedate; leaflets 11–15, oblanceolate to elliptic, base cuneate, apex acuminate; central leaflet 10–28 × 2–7.5 cm. Peduncle usually shorter than petioles, 15–35 cm. Spathe white or pale yellow with dark to bronze-purple or reddish purple stripes; tube white or pale yellow with longitudinal purple stripes outside and dark purple stripes inside, cylindric, auriculate at throat, 5–7 × 2–2.5 cm; limb triangular-ovate, 7–10 × 4–5 cm, apex acute to acuminate. Spadix unisexual; female zone cylindric, 1.5–2 cm; male zone 3–4 cm; synandria stipitate, consisting of 4 anthers, thecae dehiscing from lateral slits. Appendix long exserted from spathe, filiform, 40–60 cm, proximally narrowly cylindric, smooth, gradually narrowed at both ends, distally bent downward and pendulous. Fl. May–Jul.

- Forests, thickets; near sea level to 1100 m. E and N Taiwan.

A Chinese record of *Arisaema thunbergii* subsp. *urashima* (H. Hara) H. Ohashi & J. Murata from Taiwan (J. C. Wang, Taiwania 37: 54–57. 1992) is referable to *A. thunbergii* subsp. *autumnale*.

56. Arisaema cordatum N. E. Brown, J. Linn. Soc., Bot. 36: 177. 1903.

心檐南星 xin yan nan xing

Arisaema brevistipitatum Merrill.

Plants dioecious. Tuber globose, 1–1.5 cm in diam. Cataphylls 2 or 3, ca. 5 cm, membranous. Leaf solitary; petiole 10–30 cm, slender, base forming short pseudostem; leaf blade pedate; leaflets (5–)7, sessile, light greenish, oblong, 7–10 × 1.5–3 cm, membranous, base broadly cuneate, apex acute to abruptly acuminate. Inflorescence emerging before leaf unfolds; peduncle 3–10 cm, slender. Spathe basically purplish; tube cream-colored, outside stained with purplish, inside dark purple, funnelform, 3–3.5 × 1–1.4 cm, throat margins broadly expanded to limb; limb broadly cordate, ca. 6 × 4 cm, apex acuminate and involute, surrounding spadix appendix. Spadix unisexual; female zone ca. 1 cm; ovary fusiform; male zone ca. 1 cm × 3 mm, shortly stipitate; synandria consisting of 2 anthers, thecae globose, dehiscing by apical pores. Appendix sessile, 15–27 cm, proximally fusiform, to 4 mm in diam., distally upright, exserted through involute apex of spathe limb, filiform. Fl. Apr.

- Guangdong, Guangxi.

8. Arisaema sect. Dochafa (Schott) H. Hara, Bull. Univ. Mus. Univ. Tokyo 2: 344. 1971.

黃檜組 huang yan zu

Dochafa Schott, Syn. Aroid. 24. 1856.

Tuber subglobose. Leaves 1 or 2; leaf blade pedate. Spathe small; tube ovoid; limb incurved, ovate. Spadix bisexual and male. Appendix ellipsoid, small. Infructescence nodding.

One species: arid and cool areas at high elevations (2200–4000 m) in Africa, SW Asia (Arabian Peninsula), and the Sino-Himalayan region.

57. Arisaema flavum (Forsskål) Schott subsp. **tibeticum** J. Murata, J. Jap. Bot. 65(3): 71. 1990.

黃苞南星 huang bao nan xing

Arisaema daochengense P. C. Kao; *A. flavum* var. *tibeticum* (J. Murata) Gusman & L. Gusman.

Plants monoecious and male. Tuber subglobose, 1.5–2.5 cm in diam. Cataphylls 3–5, green, 8–25 cm. Leaves 1 or 2; petiole green to purplish, unmarked, 11–35 cm, sheathing for ca. 4/5 length forming pseudostem; leaf blade pedate; leaflets 5–11(–15), sessile, glaucous abaxially, green adaxially, oblong-lanceolate or obovate-lanceolate, base cuneate, apex acuminate; central leaflet largest, 9–12 × 3–5 cm; outer (lateral leaflets) gradually decreasing to outermost (1.5–4 × 1–1.2 cm). Peduncle emerging from pseudostem, green, 15–30 cm. Spathe smallest in genus, 2.5–6 cm in total; tube yellowish green, ovoid to globose, 1–1.5 × 1–1.4 cm, constricted at dark purple throat with nectar inside; limb yellow or green, inside dark purple at least at basal part, oblong-ovate, 1.5–4.5 × 0.8–2 cm,

apex acuminate, slightly incurved. Spadix bisexual or male, very short, 1–2 cm in total; female zone proximal, 3–7 × 5–7 mm; ovaries congested, greenish, obovoid; stigma sessile; male zone distal, light yellow, cylindric, 3–7 × 2–3 mm; synandria congested, usually consisting of 2 anthers; thecae sessile, dehiscing by apical pore. Appendix yellowish or yellow green, ellipsoid, 2–5 × ca. 1.5 mm, very short, rugose when dry. Mature infructescence nodding, subglobose, ca. 4 cm in diam. Berries obovoid, 3–4 × 3–5 mm. Seeds 3, pale yellowish, 2–2.5 mm. Fl. May–Jun.

Rocky slopes, thickets, croplands, field sides; 2200–4400 m. W Sichuan, SE Xizang, NW Yunnan [Bhutan, NE India].

According to chromosome number and plant size, Murata (J. Jap. Bot. 65(3): 65–73. 1990) divided *Arisaema flavum* into three subspecies: subsp. *abbreviatum* (Schott) J. Murata ($2n = 56$, tetraploid) including C and W Himalayan (Afghanistan to Nepal) and Arabian (Oman) plants; subsp. *flavum* ($2n = 56$, tetraploid) including African and Arabian plants; and subsp. *tibeticum* ($2n = 28$, diploid) including plants from Bhutan, China, and NE India.

9. Arisaema sect. Decipientia (Engler) H. Li in C. Y. Wu & H. Li, Fl. Reipubl. Popularis Sin. 13(2): 166. 1979.

雪里見組 xue li jian zu

Arisaema [unranked] *Decipientia* Engler, Pflanzenr. 73(IV. 23F): 195. 1920.

Underground stem a cylindric rhizome, branched. Leaves 2, pedate. Spathe auriculate at throat, long caudate at apex. Appendix stipitate, erect with truncate base, obtuse or narrowed at apex.

One species: SW China, NE India, Myanmar, Vietnam.

58. Arisaema decipiens Schott, Oesterr. Bot. Wochenschr. 7: 373. 1857.

雪里見 xue li jian

Arisaema guixiense S. Y. Liu; *A. rhizomatum* C. E. C. Fischer; *A. rhizomatum* var. *nudum* C. E. C. Fischer; *A. rhizomatum* var. *viride* C. E. C. Fischer.

Rhizome cylindric, to 9 × 2.5 cm. Cataphylls 3 or 4, yellowish purple with dark brown or whitish spots, 2–15 cm. Leaves 2; petiole greenish or reddish with dark green or dark purple spots, 15–90 cm; leaf blade pedate, palmate; leaflets (3)–5–7, petiolulate, greenish and sometimes with purple spots abaxially, dark green adaxially, narrowly oblong to elliptic, base cuneate, apex acuminate; central leaflet with petiolule devel-

oped to 5 cm, blade 8–18 × 3–8 cm; outermost leaflets 5–6 × 1.5–2 cm. Spathe green, usually with dark purple dots; tube cylindric, white toward base, 4–6 × 1.5–2 cm, throat obliquely truncate, slightly outcurved; limb deep green, lanceolate to ovate-lanceolate, 4–9.5 × 3–3.5 cm, apex acuminate and caudate, tail 6–10 cm, curved forward. Spadix unisexual; female zone conic, 1.5–2 cm, 7–13 mm in diam. at base; ovary green, bottle-shaped; stigma sessile, purple; male zone 2–2.5 cm; synandria lax; anthers 2 or 3; thecae dehiscing by lateral slits. Appendix erect, green, usually with dark purple dots, terete, 5–7 × ca. 0.7 cm, rugose or echinate, base stipitate, apex rounded. Berries red. Seeds 1–3, obovoid, ca. 5 mm. Fl. Sep–Jan.

Evergreen forests, mossy forests, thickets, bamboo thickets, on and between rocks; 600–1600 m. Guangxi, Guizhou, Hunan, Sichuan, SE Xizang, Yunnan [NE India, Myanmar, Vietnam].

10. Arisaema sect. Pistillata (Engler) Nakai, Bot. Mag. (Tokyo) 43: 525. 1929.

花南星組 hua nan xing zu

Arisaema [unranked] *Pistillata* Engler, Pflanzenr. 73(IV. 23F): 151. 1920.

Plants with tubers, paradioecious. Phyllotaxy spiro-distichous. Leaves 1 or 2; leaf blade 3-foliolate or pedately multifoliolate.

Spadix unisexual; thecae dehiscing by an apical elliptic or oblong slit; appendix erect, slightly exserted from spathe tube, cylindric, base nearly truncate and stipitate, apex obtuse.

About 57 species: E Asia, North America; six species (three endemic) in China.

- 1a. Spathe blade cucullate-galeate 61. *A. ringens*
- 1b. Spathe blade flat, not cucullate-galeate.
 - 2a. Underground stem ovoid, stoloniferous 59. *A. xuanweiense*
 - 2b. Underground stem a subglobose tuber, not stoloniferous.
 - 3a. Tuber bluish green outside; leaf blade always 3-foliate, glaucous abaxially, always entire; inflorescence nodding 60. *A. lobatum*
 - 3b. Tuber whitish outside; leaf blade pedate with 5 or more leaflets, or rarely 3-foliate, usually not glaucous abaxially, occasionally serrate or dentate; inflorescence upright.
 - 4a. Pseudostem much shorter than petioles (except sheath part) 62. *A. amurense*
 - 4b. Pseudostem longer than petioles.
 - 5a. Leaflets usually 5–7; spathe tube funnelform, throat oblique, scarcely recurved 63. *A. bockii*
 - 5b. Leaflets usually 7 or more; spathe tube cylindric, throat horizontal, narrowly recurved 64. *A. peninsulae*

59. *Arisaema xuanweiense* H. Li, Kew Bull. 55: 419. 2000.

宣威南星 xuan wei nan xing

Plants dioecious. Rhizome vertical, 3–5 cm × 7–10 mm, producing stolons. Cataphylls 2 or 3, whitish green, 3–8 cm, membranous, acuminate at apex. Leaves 1 or 2; petiole greenish, 15–18 cm, proximally forming pseudostem; leaf blade 3-foliate, pale green abaxially, green adaxially; leaflets sessile, serrate; central leaflet suborbicular, 8.8–11 × 6–8.5 cm, base obtuse, apex acute; lateral veins 5 per side, parallel, collective vein 2–3 mm from margin; lateral leaflets obliquely ovate, 8.5–10.8 × 5.8–8.2 cm, base rounded, apex acuminate. Peduncle greenish, terete, to 18 cm. Spathe nearly erect, ca. 9.5 cm; tube green, cylindric, ca. 4 × 1.5 cm, basal ca. 1 cm white, throat obliquely truncate, straight or slightly recurved; limb green with whitish stripes, abaxially with a large (ca. 1 cm) oblong white area, incurved, ovate, ca. 5.5 × 4 cm, apex acuminate with a tail ca. 8 cm. Spadix unisexual; female zone subconic, ca. 15 mm; flowers dense; ovary green; stigma sessile; appendix erect, whitish green, cylindric, ca. 35 × 3.5 mm in total, base subtruncate, ca. 5 mm in diam., stipitate; stipe ca. 3 × 2 mm. Male spadix unknown. Fl. Apr.

• About 2200 m. NE Yunnan (Xuanwei).

60. *Arisaema lobatum* Engler, Bot. Jahrb. Syst. 1: 487. 1881.

花南星 hua nan xing

Arisaema lobatum var. *latisectum* Engler; *A. lobatum* var. *rosthornianum* Engler; *A. onoticum* Buchet; *A. pictum* N. E. Brown ex Hemsley.

Plants dioecious. Tuber bluish green outside, globose, 2–4 cm in diam. Cataphylls 3, brown, usually with reddish spots, 15–20 cm, apex acute or obtuse. Leaves 1 or 2; petiole greenish or olive-green with purple spots, 17–35 cm, proximal 1/3–1/2 sheathing into pseudostem; leaf blade 3-foliate, pale greenish with pink raised veins abaxially, green with pale green veins adaxially; central leaflet with petiolule 1.5–5 cm, blade oblong or elliptic, 8–22 × 4–10 cm, base narrowly attenuate or obtuse, apex acuminate; lateral leaflets sessile, oblique, oblong, 3–23 × 2–8 cm, outer base auriculate and rounded. Inflorescence unfolded before leaves; peduncle nearly as long as petiole, but usually shorter. Spathe pale purplish or pale olive-green with

purple stripes; tube funnelform, 4–7 × 1–2.5 cm, throat not auriculate, obliquely truncate, narrowly recurved or not; limb incurved or nearly erect, usually with whitish stripes inside, broadly lanceolate or ovate, 4–7 × 2.5–3 cm, constricted to base, apex acuminate, usually with a tail 3–5 cm. Spadix unisexual; female zone cylindric or subglobose, 1–2 cm; ovary green, ovoid; style short; stigma disciform; male zone cylindric, 1.5–2.5 cm; synandria lax; anthers 2 or 3, stipitate; thecae violet, ovoid, dehiscing by apical pore. Appendix erect, pale green to whitish green, cylindric, middle slightly constricted, base truncate and stipitate, apex obtuse; stipe 6–8 mm. Inflorescence nodding. Fl. Apr–Jul. 2n = 28*, 56*, 84*.

• Forests, thickets, grassy slopes; 600–3300 m. Anhui, Chongqing, Gansu, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shanxi, Sichuan, Yunnan, Zhejiang.

61. *Arisaema ringens* (Thunberg) Schott in Schott & Endlicher, Melet. Bot. 17. 1832.

普陀南星 pu tuo nan xing

Arum ringens Thunberg, Trans. Linn. Soc. London 2: 337. 1794; *Arisaema arisanense* Hayata; *A. taihokense* Hosokawa.

Plants dioecious. Tuber depressed globose, 2–5 cm in diam. Cataphylls greenish to purplish. Leaves 2; petiole greenish and unmarked, 15–35 cm, proximal 1/3 sheathing into pseudostem; leaf blade 3-foliate; leaflets sessile, glaucous abaxially, green adaxially, margin entire, apex long acuminate with a tail ca. 2 cm; central leaflet ovate-lanceolate to rhombic-elliptic, 16–22 × more than 10 cm, base cuneate; lateral leaflets obliquely ovate, 15–18 × 10–13 cm, apex filiform-caudate. Peduncle greenish, unmarked, shorter than petioles, to 25 cm. Spathe yellowish green to green; tube yellowish green to green outside, purplish red with white or pale yellowish green striations inside, cylindric, gradually opening to an auriculate throat, 3–3.5 × 1–2 cm; limb concave and incurved, saccate, apex caudate. Spadix unisexual; female zone conic, ca. 1.8 × 1.2 cm; ovary greenish, ovoid; stigma subsessile, pilose; male zone sessile, cylindric, ca. 1.5 cm × 8 mm; synandria subsessile; anthers 2 or 3; thecae globose, dehiscing by an apical pore. Appendix erect, white, narrowly conic, 2–6 cm × 5–10 mm, base truncate and stipitate, apex obtuse; stipe 3–10 mm. Inflorescence erect. Fl. Apr. 2n = 28.

Low elevations. Jiangsu, Taiwan, Zhejiang [Japan, Korea].

62. Arisaema amurense Maximowicz, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 264. 1859.

东北南星 dong bei nan xing

Arisaema amurense var. *robustum* Engler; *A. amurense* var. *violaceum* Engler.

Tuber depressed globose, 6–7 cm in diam. Leaves 2(or 3); petiole (5–)7–30 cm, proximal 3/4 sheathing and forming pseudostem; leaf blade 3-foliolate or pedately 5-foliolate; rachis between leaflets 0–6 cm; leaflets sometimes covered with fine whitish marks, obovate to narrowly oblong, 7–11 × 4–7 cm, base cuneate, margin entire or serrate, occasionally denticulate, apex acute; central leaflet with petiolule 5–25 mm; lateral leaflets remote from central one for 1–30 mm; outermost leaflets sessile, 9–15 cm, oblique, cuneate at base on inner side, auriculate or rounded on outer side. Peduncle shorter than petioles. Spathe greenish to dark purple, usually with pale purplish stripes; tube funnelform to cylindric, ca. 5 cm, ca. 2 cm in diam. at throat, throat obliquely truncate, not auriculate; limb ovate-lanceolate to oblong, 3–4 cm, apex acuminate. Spadix unisexual; female zone subconic, ca. 2 cm, ca. 1 cm in diam. at base; ovary ovoid; ovules 4; stigma spherical; male zone cylindric, ca. 2 cm × 2–3 mm; synandria lax, nearly sessile; anthers 2 or 3; thecae globose, dehiscing by apical pores. Appendix stipitate, erect, cylindric and robust, 3–5.5 cm × 4–5(–7) mm, base truncate, apex obtuse. Berries yellow, oblong-conic, 7–8 mm in diam. Seeds 2–4, ovoid, smooth. Fl. May, mature fr. Oct. $2n = 26^*$.

• Forest margins, streamsides, on rocks, in valleys; 600–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

64. Arisaema peninsulae Nakai, Bot. Mag. (Tokyo) 43: 537. 1929.

细齿南星 xi chi nan xing

Arisaema angustatum Franchet & Savatier var. *peninsulae* (Nakai) Nakai.

Tuber depressed globose, 1.5–5.5 cm in diam. Cataphylls 3, brownish with purple spots, 3–10 cm. Leaves 2; petiole 35–93 cm; pseudostem (sheathing part) 29–77 cm; leaf blade pedate; leaflets 7–17(–23); rachis well developed between terminal and lateral ones, and between lateral ones; leaflets narrowly elliptic, obovate-lanceolate, or ovate-oblong, base cuneate, margin entire or serrate, apex acuminate; central leaflet with petiolule 1–4 cm, blade 9–18 × 3.5–9 cm, gradually smaller outward; lateral leaflets remote from central one for 1–4 cm, shortly petiolulate or sessile, ca. as large as central one; outer lateral leaflets sessile and much smaller than central leaflet. Peduncle erect, 30–80 cm. Spathe usually green with white stripes, or purplish to dark purple with whitish stripes; tube 5–8 × ca. 1.5 cm, throat obliquely truncate, scarcely recurved; limb incurved, usually green, or dark purple, oblong, 5–6 × 4–5 cm, apex acuminate. Spadix unisexual; female zone 1.5–3 cm × 5–7 mm; ovaries dense, narrowly ovoid; style short; stigma disciform; male zone 1–1.5 cm; synandria dense, sessile; anthers 2 or 3; thecae globose, dehiscing by apical pores. Appendix erect, cylindric, 3.5–4 cm × 3–6 mm, base truncate and stipitate, apex obtuse; stipe 4–5 mm. Berries reddish yellow, ovoid-globose, ca. 8 × 7 mm. Seeds 2 or 3, yellow-brown, ca. 4 mm in diam., rugose. Fl. May–Jun, mature fr. Sep.

Forests; below 500 m. Heilongjiang, Henan, Jilin [Japan, Korea].

Chinese records of *Arisaema serratum* (Thunberg) Schott (e.g., in FRPS 13(2): 179. 1979) are referable to *A. peninsulae*.

11. Arisaema sect. Tenuipistillata Engler, Pflanzrenr. 73(IV. 23F): 151, 195. 1920.

细柄组 xi bing zu

Plants dioecious. Tuber subglobose. Phyllotaxy quincuncial. Leaves 1 or 2, pedate or palmate. Spathe limb ovate or ovate-lanceolate, involute. Ovary bottle-shaped. Thecae dehiscing by lateral slits or by apical pores. Appendix erect or slightly incurved, narrowly cylindric, thickened to base, stipitate.

Three species: Himalayas and Xizang-Qinghai plateau; three species (two endemic) in China.

- 1a. Spathe throat margin auriculate; leaflet apex long acuminate with tail ca. 6 cm 67. *A. souliei*
 1b. Spathe throat margin oblique or slightly recurved; leaflet apex acuminate.
 2a. Spadix appendix exserted from spathe throat, distally often suddenly recurved; leaflets 3(or 7 or 9) 65. *A. jacquemontii*
 2b. Spadix appendix included in spathe tube, cylindric, erect; leaflets 3–6 66. *A. wardii*

65. Arisaema jacquemontii Blume, Rumphia 1: 95. 1835.

藏南绿南星 zang nan lü nan xing

Tuber subglobose, 1.2–3 cm in diam. Cataphylls 1 or 2, whitish, occasionally brown, to 20 cm, membranous, apex acute or obtuse. Pseudostem, petiole, and peduncle pale green, unmarked. Leaves 1 or 2; petiole (2.5–)20–52 cm, proximal 4/5 sheathing and forming pseudostem; leaf blade palmate; leaflets 5(or 7 or 9), sessile, ovate, oblong, or lanceolate, base attenuate, apex acuminate; central leaflet 7–18 × 2.5–7 cm; lateral leaflets 3–7 × 0.8–2.5 cm. Peduncle as long as petioles. Spathe green outside, greenish inside; tube cylindric, 2.5–8 cm × 8–20 mm, throat obliquely truncate, not recurved; limb arching over spadix, ovate to narrowly ovate or oblong-triangular, 2.5–5(–9) × 1.2–5(–3.5) cm, apex acuminate into ascending filiform tail 2.5–6 cm. Spadix unisexual; female zone 1.5–3 cm × 5–7 mm; ovary greenish, narrowly ovoid; stigma spherical; male zone cylindric, 2–3 cm × 3–3.5 mm; synandria sessile, lax, cream-colored or tinged dark purplish; anthers 2–4, dehiscing by apical pores or slits. Appendix greenish proximally, purplish distally, 2–8 cm × ca. 1 mm, distal part emergent from spathe tube horizontal to decurved, tapering, base swollen, truncate to 3–5 mm in diam., shortly stipitate, smooth. Fl. Jun–Jul. 2n = 52.

Coniferous forests, open grassy places in forests, *Juniperus* or *Rhododendron* thickets, forest margins; 3000–4300 m. S Xizang [Afghanistan, Bangladesh, Bhutan, N India, Kashmir, Nepal, Pakistan].

66. Arisaema wardii C. Marquand & Airy Shaw, J. Linn. Soc., Bot. 48: 228. 1929.

隐序南星 yin xu nan xing

Tuber globose, 1.5–2.2 cm in diam. Cataphylls 2 or 3, 9–10 cm, obtuse at apex. Petiole 12–25 cm, proximal 2/3 sheathing into pseudostem; leaf blade radiate to palmate; leaflets 3–6, sessile, oblong, 2–11 × 1–3 cm, base cuneate, apex acuminate, usually caudate. Peduncle shorter or longer than petioles, 10–18 cm. Spathe green, unmarked or with whitish stripes; tube funneliform, 2–6.5 × ca. 1.5 cm, throat obliquely truncate, not auriculate, not recurved; limb triangular-ovate or

ovate-lanceolate, 2–7 × 1.5–4 cm, apex acuminate and caudate with filiform tail 3–5 cm. Spadix unisexual; female zone cylindric, ca. 2.2 cm × 5–6 mm; ovary green, ovoid; style short; stigma spherical; male zone cylindric, 1.5–2.5 cm × 2–3 mm; synandria dense, sessile; anthers 2 or 3, dehiscing by lateral slits. Appendix erect, green, cylindric, 2–3.2 cm, 2.3–5 mm in diam. at base, base swollen and stipitate, apex obtuse; stipe 1.5–3 mm. Infructescence cylindric, ca. 5 × 1.5 cm. Berries yellowish red, ovoid, ca. 5 mm in diam. Seeds 1–3, pale brownish or brown, ovoid, reticulate rugose. Fl. May–Jul.

• Coniferous forests, grassy places; 2400–4200 m. E Qinghai, S Shanxi, S Xizang, W Yunnan.

67. Arisaema souliei Buchet, Notul. Syst. (Paris) 2: 127. 1911.

东俄洛南星 dong e luo nan xing

Arisaema brevispathum Buchet; *A. xiangchengense* H. Li & A. M. Li.

Tuber subglobose, ca. 3 cm in diam. Cataphylls obtuse at apex. Leaves 1 or 2; petiole 40–70 cm, proximal half sheathing into pseudostem; leaf blade radiate to palmate; leaflets 6–9, usually 7, broadly oblong-lanceolate, base long cuneate, apex acuminate and caudate with filiform tail ca. 6 cm; central leaflet 10–25 × ca. 5.8 cm. Peduncle shorter than petioles, 20–40 cm. Spathe green or distally dark brown with whitish stripes, 15–20 cm (including tail); tube cylindric, 5–10 × 1–2 cm, throat obliquely truncate, slightly recurved or not; limb suberect, ovate to ovate-lanceolate, 4.5–5 × ca. 3.5 cm, apex acuminate into filiform tail to 4–5 cm. Spadix unisexual; female zone 2.5–3 cm × 6–7 mm; ovules 5–9, bottle-shaped; male zone ca. 2 cm × 2.5 mm; synandria sessile; anthers 2. Appendix stipitate, ca. 9 cm in male spadix, 5–6 cm in female, base whitish, swollen, ca. 3 mm in diam. in male spadix, ca. 6 mm in diam. in female, gradually narrowed distally, apex exserted from tube, erect or recurved, dark brown, 1–1.5 mm in diam.

• *Quercus* thickets, deforested slopes; ca. 3500 m. Chongqing (Chengkou), Sichuan.

12. Arisaema sect. Sinarisaema Nakai, J. Jap. Bot. 25: 6. 1950.

伞叶组 san ye zu

Tuber subglobose. Phyllotaxy spiro-distichous. Leaves 1 or 2, radiate. Spathe limb incurved or erect. Spadix unisexual; anthers dehiscing by apical pores or rarely circumscissile; appendix cylindric, terete, or clavate, or rarely degenerate, sessile or rarely stipitate, usually with acute neuter flowers at proximal part.

About 14 species: S and SE Asia, Himalayas; 11 species (seven endemic) in China.

- 1a. Apex of spadix appendix distinctly echinate or rugose; spathe margin entire.
 2a. Spadix appendix rugose 77. *A. taiwanense*
 2b. Spadix appendix echinate.
 3a. Tuber stoloniferous 72. *A. echinoides*
 3b. Tuber not stoloniferous 71. *A. echinatum*
- 1b. Apex of spadix appendix smooth, or rarely slender and slightly creased, or degenerate, if apex rugose then spathe margin ciliate around throat.

- 4a. Spadix appendix degenerate; spathe limb ± erect, involute 68. *A. exappendiculatum*
 4b. Spadix appendix terete, stipitate or not.
 5a. Pseudostem and peduncle much shorter than petioles, inflorescence positioned just above ground 69. *A. zhui*
 5b. Pseudostem and/or petiole long, inflorescence distant from ground.
 6a. Spathe basically yellow.
 7a. Underground stem subglobose tuber; spathe not striped; (?neuter flowers absent;
 ?infructescence nodding) 76. *A. jingdongense*
 7b. Underground stem subcylindric, longer than wide; spathe tube longitudinally striped
 with white and purple; neuter flowers present; infructescence upright 75. *A. muratae*
 6b. Spathe basically green or purple.
 8a. Plants stoloniferous; spadix appendix upright or curved forward.
 9a. Spadix appendix slender, frequently curved forward at apex; infructescence upright 78. *A. concinnum*
 9b. Spadix appendix cylindric; spathe margin ciliate around throat; infructescence nodding 73. *A. ciliatum*
 8b. Plants without stolons; spadix appendix upright.
 10a. Spathe tube cylindric, basically greenish, limb occasionally tinged with purple 74. *A. erubescens*
 10b. Spathe tube funnelform, usually purple outside, white inside 70. *A. sukotaiense*

68. Arisaema exappendiculatum H. Hara, J. Jap. Bot. 40: 21. 1965.

圈药南星 quan yao nan xing

Tuber depressed globose, 2–5 cm in diam., sometimes with thick creeping stolons. Cataphylls purple. Leaf solitary; petiole green, sometimes dark purple, 23–55 cm, proximally sheathing into pseudostem; leaf blade radiate; leaflets 7–13, sessile, oblanceolate, 8–22 × 2–4 cm, base cuneate, apex long acuminate. Peduncle green, sometimes purplish, much shorter than petioles. Spathe green, occasionally dark purple, slightly glaucous inside; tube pale green, without distinct stripes, cylindric, 2–7 × 1.2–2 cm, not broadened nor spreading at throat; limb suberect, ovate-lanceolate, 8–15 × 2.5–3 cm (at base), generally with inrolled margins, convolute, tapering into a long caudate apex 5–8 cm. Spadix unisexual, 1.5–3 cm including appendix; female zone ca. 1.2 cm in diam. at base; ovary green, turbinate, slightly angular, apex apiculate; stigma small; male zone 7–8 mm in diam. at base; synandria lax; anthers stipitate, circumscissile at apex. Appendix absent, or very rarely broadly cylindric, to 1.5 cm. Fl. May–Jun.

Forests on slopes, grasslands between forests; 2400–2500 m. S Xizang [Nepal].

69. Arisaema zhui H. Li, Kew Bull. 55: 423. 2000.

维明南星 wei ming nan xing

Tuber depressed globose, 3–4 cm in diam., with a few tubercles around. Cataphylls, petiole, and peduncle greenish, unmarked. Cataphylls 2, membranous. Leaves 1 or 2; petiole 32–36 cm × 5–8 mm, basal 3–4 cm sheathing into pseudostem; leaf blade radiate; leaflets 11–13, sessile, pale green abaxially, green adaxially, narrowly elliptic, unequal, (including filiform tail) 1–1.5 × 1.1–2.2 cm. Peduncle emerging from pseudostem, much shorter than petioles, only ca. 7 cm. Spathe dark purple, with whitish stripes; tube whitish green inside, funnelform, short, ca. 3.8 × 1.5 cm, gradually opening to throat, throat obliquely truncate, not recurved; limb incurved, purple-green with indistinct stripes outside, dark purple with greenish stripes inside, triangular-ovate, 6.5–9 (male) × ca. 4 cm, apex abruptly acuminate and long caudate with filiform tail ca. 2 cm (female) to 4.5 cm (male). Spadix unisexual; female zone ca. 1.5 cm;

ovaries dense, green, ovoid-globose; ovules 4, basal, erect; stigma subsessile, punctate; male zone ca. 2.4 cm × 3–4 mm; synandria dense, subsessile; anthers 2–6, violet, globose, dehiscent by apical pores. Appendix yellowish or greenish, with tiny purple dots, cylindric, distally slightly swollen, 3–3.6 cm × 3–6 mm, base truncate with purple stipe ca. 5 mm, apex obtuse. Fl. Jun.

• About 4000 m. NW Yunnan (Dêqên: Meili Xueshan).

70. Arisaema sukotaiense Gagnepain, Notul. Syst. (Paris) 9: 129. 1941.

中泰南星 zhong tai nan xing

Plants deciduous. Tuber subglobose, cream-colored, 3–4 × 5–7 cm. Cataphyll pink, with brown mottling, 1–20 cm. Leaf solitary; petiole red-brown or olive-green with transverse paler mottling, 60–80 cm, proximal 35–45 cm forming pseudostem, ca. 1.5 cm in diam. at base; leaf blade radiate; leaflets 12–14, sessile to subsessile, glaucous with slightly prominent carmine or green veins abaxially, shiny green adaxially, elliptic, 20–30 × 3–4 cm, base cuneate, margin flat or undulate, green or red, apex acuminate, often prolonged into a carmine thread to 9 cm; veins slightly impressed adaxially. Peduncle green with paler mottling, becoming red-violet toward inflorescence, shorter than petioles, 35–60 cm × 4–5 mm. Spathe tube outside pruinose, dark purple or pale olive-green with thin white stripes, inside pale carmine with white stripes, funnelform, 7–8 cm, 1.2–1.5 cm in diam. at base, 3–4.5 cm in diam. apically; throat margins straight, dark carmine; limb horizontal, outside dark purple, with very faint paler stripes, inside dark purple, pale green at base, with broad white stripes anastomosing in a central white spot at throat level, ovate, 9–10 × 5–6 cm, nearly as long as tube, apex acuminate, prolonged into a purple, filamentous tail to 20 cm. Spadix unisexual; female zone of same shape and size as male zone; ovaries dense, pale green, bottle-shaped, 1.5–2 mm in diam.; stigma sessile, penicillate, surrounded by black annulus; male zone subcylindric, 2–3 × ca. 0.6 cm; synandria loosely arranged, consisting of 2–4 anthers; anthers lilac, subsessile or borne on a white-green short stalk; thecae dehiscent by an oblong pore; pollen white. Appendix sessile, slightly exserted from spathe tube, erect, cylindric, to 7 cm × 5 mm, middle part green sometimes with carmine

stripes above neuter flowers, apex white-green, rounded, even or spongy; neuter flowers upcurved, green, 3–4 mm, numerous in female spadix only. Inflorescence cylindric, ca. 5 × 1.5–2.5 cm, borne on a nodding peduncle. Berries dense, red-orange with black stigmatic remains, ca. 7 × 3 mm, 1- or 2-seeded. Seeds globose, ca. 2 mm; testa cream-colored. Fl. May–Jun, fr. Oct.

Mountain forests along roadsides, sometimes growing as an epiphyte on mossy tree trunks; 1200–2500 m. S Yunnan [N Thailand].

71. *Arisaema echinatum* (Wallich) Schott in Schott & Endlicher, Melet. Bot. 17. 1832.

刺棒南星 ci bang nan xing

Arum echinatum Wallich, Pl. Asiat. Rar. 2: 30. 1831.

Tuber depressed globose, 2–4 cm in diam. Cataphylls 2, green, 4–20 cm. Cataphylls, petiole, and peduncle green, unmarked. Leaf solitary; petiole ca. 30 cm, basal ca. 6 cm sheathing into pseudostem; leaf blade radiate; leaflets 7–11, sessile, glaucous abaxially, green adaxially, narrowly elliptic or oblanceolate, unequal, attenuate to base, apex long acuminate, sometimes caudate with a short filiform tail; central leaflet ca. 12.5 × 2.8 cm; outer leaflets 7–8.5 × ca. 1.4 cm. Peduncle emerging from petiole sheath, much shorter than petioles, ca. 17 cm. Spathe green, not marked by spots or stripes; tube cylindric, ca. 5.5 × 1.5 cm, slightly recurved at throat; limb slightly outcurved at base, otherwise incurved, ovate, ca. 8 × 5 cm, long caudate, with filiform tail to 8 cm. Spadix unisexual; female zone conic, ca. 2.3 × 1.4 cm, flowers dense; ovary green, sub-globose; stigma punctate, violet; male zone 1.5–3 cm, 3–5 mm in diam. at base; synandria lax; anthers 4, dehiscing by apical pores. Appendix green, cylindric, ca. 4 cm × 5–6 mm, base abruptly narrowed and stipitate, apex obtuse and echinate; stipe ca. 5 mm. Fl. Jun.

Forested slopes; 2600–3100 m. S and SE Xizang (Gyirong, Nyingchi, Zayü), W Yunnan (Baoshan, Gaoligong Shan, Lijiang) [Bhutan, India (Sikkim), Nepal].

Himalayan plants differ from those in Gaoligong Shan in having the spathe green, white striped outside, and dark purple inside.

72. *Arisaema echinoides* H. Li, Kew Bull. 55: 425. 2000.

拟刺棒南星 ni ci bang nan xing

Tuber subglobose, ca. 2 cm in diam., stoloniferous. Cataphylls membranous, acute at apex. Leaf solitary; petiole ca. 24 cm, proximally forming pseudostem; leaf blade radiate; leaflets 9, sessile, oblanceolate, 13–16 × 2–3 cm, base cuneate, apex acuminate. Peduncle shorter than petioles, ca. 10 cm. Spathe tube purple with numerous longitudinal white stripes, cylindric, ca. 5.1 cm, broadly auriculate and recurved at throat; limb dark purple with white midrib, oblong-ovate, ca. 7 × 4 cm, base slightly constricted, apex abruptly acuminate; pinnate veins 4 or 5 on each side, ascending and connected into intramarginal vein remote from margin for 2–3 mm. Spadix white, unisexual; female zone conic, ca. 1.8 cm × 7 mm, flowers dense; male zone ca. 1.8 cm; synandria sessile; anthers 2 or 3, globose, dehiscing by apical pores. Appendix erect, ca. 3 cm × 5–7 mm, thickened, base truncate and stipitate, apex obtuse and densely echinate; stipe ca. 7 × 3 mm. Fl. May–Jun.

- Forests, thickets, in shade; 2900–3300 m. NW Yunnan (Lijiang).

73. *Arisaema ciliatum* H. Li, Acta Phytotax. Sin. 15(2): 108. 1977.

缘毛南星 yuan mao nan xing

Arisaema ciliatum var. *liubaense* Gusman & Gouda.

Tuber depressed globose, 2–2.5 cm in diam., stoloniferous. Cataphylls 3, 10–20 cm, membranous. Cataphylls, petiole, and peduncle green, occasionally purplish, unmarked. Leaf solitary; petiole 20–70 cm, basal 15–40 cm sheathing into pseudostem; leaf blade radiate; leaflets 11–14, sessile, narrowly elliptic, base cuneate, apex acuminate and caudate. Peduncle shorter than petioles, 20–50 × 1.2–1.4 cm. Spathe purple or dark purple, with numerous white stripes, or green; tube cylindric, 4–5 × 1–1.2 cm, throat obliquely truncate, not auriculate, ciliate; limb suberect to incurved, narrowly lanceolate, 4.5–5.5 × 2.1–4 cm, apex long acuminate and caudate with violet filiform tail 2–5 cm. Spadix unisexual; female zone conic, ca. 1.5 cm, ca. 7 mm in diam. at base; ovary green; style conic; stigma purple, punctate; male zone narrowly conic, 2–3 cm, ca. 3 mm in diam. at base; synandria lax, shortly stipitate; anthers 2 or 3, yellow, dehiscing by apical pores. Appendix erect, violet, occasionally greenish, cylindric, 3.2–5.5 cm × 3–4 mm, gradually narrowed to base, apex obtuse and verrucose, with acute neuter flowers on proximal part. Inflorescence nodding. Fl. Jun.

- *Pinus* forests, *Quercus* thickets, grasslands; 2600–3600 m. Sichuan (Baoxing, Gongga Shan), NW Yunnan (Lijiang, Zhongdian).

74. *Arisaema erubescens* (Wallich) Schott in Schott & Endlicher, Melet. Bot. 17. 1832.

一把伞南星 yi ba san nan xing

Arum erubescens Wallich, Pl. Asiat. Rar. 2: 30. 1831; *Arisaema alienatum* Schott var. *formosanum* Hayata; *A. biradiatifoliatum* Kitamura; *A. brevipes* Engler; *A. consanguineum* Schott; *A. consanguineum* subsp. *kelung-insulare* (Hayata) Gusman; *A. erubescens* var. *consanguineum* (Schott) Engler; *A. formosanum* (Hayata) Hayata; *A. formosanum* var. *bicolorifolium* T. C. Huang; *A. formosanum* f. *stenophyllum* Hayata; *A. fraternum* Schott; *A. hypoglaucum* Craib; *A. kelung-insulare* Hayata; *A. kerrii* Craib (1912); *A. kerrii* Gagnepain (1941); *A. linearifolium* J. T. Yin & Gusman; *A. oblongatum* Kitamura; *A. tatarinowii* Schott; *A. undulatum* K. Krause; *A. vituperatum* Schott.

Tuber depressed globose, 2–7 cm in diam. Cataphylls 3, dark green, with whitish striae or spots, to 55 cm, acute at apex. Petiole and peduncle green, smooth, unmarked. Leaf solitary, occasionally 2; petiole to 100 × ca. 2 cm, proximal ca. 50 cm sheathing into pseudostem; leaf blade radiate; leaflets 18–23, sessile, green abaxially, dull green adaxially, narrowly elliptic or narrowly linear, 16–28 cm × 2–20 mm, base cuneate, apex long acuminate and caudate, with filiform tail 7–10 cm; veins raised abaxially, impressed adaxially; lateral veins numerous, obliquely ascending. Peduncle shorter than petioles, to 75 cm, free part ca. 9 cm. Spathe green, with indistinct whitish stripes or not; tube cylindric, 6–7 × ca. 1.5 cm, auriculate and recurved

at throat; limb deep green sometimes with purple margin outside, pale green inside, triangular-ovate, $8-12 \times 4-8$ cm, apex acuminate with long purple filiform tail, arching; tail to 35 cm, pendulous. Spadix unisexual; female zone conic, ca. 3.5×1.5 cm; ovary green, obovoid; stigma sessile, spherical, pilose; male zone cylindric, $4-4.5 \text{ cm} \times 4-5$ mm; synandria dark violet; anthers subsessile, 2 or 3, dehiscent by apical pores. Appendix pale green, cylindric or narrowly conic, ca. $7 \text{ cm} \times 2-4$ mm, with some acute neuter flowers at base. Infructescence nodding. Berries red. Fl. Jun-Jul.

Pinus forests, mixed forests, thickets, grassy slopes, lakesides, between rocks; below 3200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, NE India, Laos, Myanmar, Nepal, N Thailand, Vietnam].

H. Hara (Bull. Univ. Mus. Univ. Tokyo 2: 321-354. 1971) noted that *Arisaema consanguineum* is characterized by having a threadlike appendage at the apex of the leaflets and spathe (but sometimes absent), a sessile spadix appendage with neuter flowers at least in the female spadix, and a nodding infructescence, whereas *A. erubescens* lacks a threadlike appendage on the leaflets and spathe, has a stipitate spadix appendage without neuter flowers, and has an upright infructescence. In the present treatment, we follow many Chinese floras in recognizing a wide range of variation for Chinese *A. erubescens* including both types of plants. One of us (Murata), until recently, considered that only true *A. consanguineum* is distributed in China, but he found the second type of plants, which share some characteristics with *A. erubescens*, north of Kunming City. However, these plants have a threadlike appendage on the leaflets and spathe and do not fit true *A. erubescens* (nor *A. consanguineum* in the strict sense) and could represent a new species. A revision of the whole *A. erubescens*-*A. consanguineum* group is now required.

75. *Arisaema muratae* Gusman & J. T. Yin, Ann. Bot. Fenn. 44: 231. 2007.

邑田南星 yi tian nan xing

Plants to 1 m tall and 50 cm in diam. Tuber green and brown outside, subcylindric, ca. $5 \times 5-6.5$ cm, with short globose offsets. Cataphylls olive-green or pink with dark and pale transverse markings, to 50 cm. Leaf usually solitary; petiole similar in color and pattern to pseudostem, cylindric, to 80 cm, proximally forming pseudostem to $40 \times$ ca. 3 cm, green with cream-colored stripes and transverse vermillion markings; leaf blade radiate, with up to 11 segments; leaflets subsessile or shortly petiolulate, glaucous abaxially, shiny green adaxially, elliptic, $20-25 \times 6-7$ cm, base cuneate, margin undulate, green, entire or serrate, apex long acuminate; veins deeply impressed adaxially. Inflorescence emerging when leaf unfolds and carried beneath foliage; peduncle olive-green, flushed pink and pruinose apically, to 55 cm, shorter than petioles, ca. 1 cm in diam. at base. Spathe tube carmine outside with longitudinal pale stripes, with white ring at base and yellow-green near throat, yellow-green inside with dotted purple stripes mainly in proximal half, cylindric, broadly recurved at throat margin, to $8 \times$ ca. 1.8 cm, at middle ca. 1.2 cm in diam.; limb horizontal, slightly translucent, yellow-green with paler veins both outside and inside, yellow at apex and turning carmine at tip, lanceolate, ca. 5×4 cm, shorter than tube, acuminate into tail to 15 cm. Spadix unisexual; female zone slightly conic, $2-3 \times 1-1.5$

cm; ovaries dense, pale yellow-green, bottle-shaped, 1-loculed; ovules ca. 3, basal, fusiform; stigma sessile, white, penicillate; neuter flowers absent or few in male spadix, numerous in female, located just above fertile part, upcurved, stiff, ca. 5 mm; male zone cylindric to slightly conic, $4-5.5 \times 1-1.3$ cm; synandria dense, each consisting of 2-4 anthers, stalked; thecae purple proximally and carmine distally, dehiscent by elongated pores; pollen blue; appendix sessile, slightly protruding from spathe tube, whitish with carmine longitudinal stripes, obscurely crimson and wrinkled at apex, cylindric, clavate, 4-5 cm in male spadix, 5-6 cm in female, ca. 4 mm in diam. at base, ca. 7 mm in diam. at apex. Infructescence borne on upright peduncle, cylindric, ca. 10×4 cm; rachis pale pink. Berries dense, red-orange, ca. 14×8 mm, distally rounded and smooth, up to 3-seeded. Seeds globose, ca. 6 mm in diam.; testa gray.

- Evergreen broad-leaved forests; 1200-2400 m. Yunnan (Yingjiang).

76. *Arisaema jingdongense* H. Peng & H. Li, Acta Phytotax. Sin. 33: 97. 1995.

景东南星 jing dong nan xing

Arisaema cangshanense X. D. Dong.

Tuber subglobose, ca. 2.5 cm in diam. Cataphylls 3, pale green with purple spots, to 30 cm. Leaf solitary; petiole greenish, unmarked, ca. 65 cm, proximal 3/4 sheathing into pseudostem; leaf blade radiate; leaflets 7, sessile, pale green abaxially, deep green adaxially, oblong-lanceolate, $7-8 \times 1.4-1.6$ cm, margin entire, apex acuminate. Peduncle shorter than petioles, ca. 55 cm \times 2.5-3 mm. Spathe yellowish, without white stripes; tube cylindric, ca. $4 \text{ cm} \times 9$ mm, recurved at throat; limb arching, triangular-oblong, ca. 7.5×3 cm, apex acuminate with a filiform tail 4-5 cm. Spadix unisexual; male zone ca. 3 cm; synandria dense; appendix hidden in spathe tube, orange-yellow, clavate, ca. $3.5 \text{ cm} \times 4$ mm, smooth, apex obtuse. Female spadix unknown. Fl. Jun.

- Evergreen broad-leaved forests; 2400-2500 m. Yunnan (Diancang Shan, Jingdong).

77. *Arisaema taiwanense* J. Murata, J. Jap. Bot. 60: 353. 1985.

蓬莱南星 peng lai nan xing

Tuber depressed globose, 2-6 cm in diam. Cataphylls greenish or reddish, often with purple-brown marks. Leaf solitary; petiole white or pale green, usually mottled with purple-brown marks, 12-70 cm, proximal 2-30 cm sheathing into pseudostem; leaf blade radiate; leaflets 7-15, glaucous abaxially, green adaxially, oblanceolate, apex filiform, caudate, with a threadlike pendulous tail at tip. Peduncle distinctly shorter than petioles, 3-45 cm. Spathe purplish red to dark purple, with fine green dots between veins outside; tube white or pale yellowish green with purple stripes inside, obconic, gradually opening to auriculate throat, $2-6 \times 3.7-8$ cm; limb dark purple, ovate to broadly ovate, $3-8 \times 3.5-8$ cm, scarcely with pale veins on inner surface, apex acute to acuminate with a prolonged filiform tail to 40 cm. Spadix 3-10 cm including appendix, unisexual; female zone conic, $2.8-3 \text{ cm} \times$ ca. 12 mm, base

narrower, with abundant acute neuter flowers, apex slightly enlarged, strongly rugose; male zone cylindric, ca. 4 cm × 7 mm; synandria consisting of 3 or 4 subsessile anthers; appendix sessile, whitish distally, broadly cylindric, 1.7–7 cm × 4–13 mm, strongly or weakly rugose at apex. Fl. May–Jun.

- Common throughout the island; middle elevations. Taiwan.

- 1a. Peduncle 10–45 cm, 5–15 cm exserted from pseudostem; petiole and peduncle mottled with purple-brown marks; spadix appendix 5–7 cm 77a. var. *taiwanense*
- 1b. Peduncle 3–15 cm, 1–5 cm exserted from pseudostem; petiole and peduncle unmarked; spadix appendix 1.8–2.5 cm 77b. var. *brevipedunculatum*

77a. Arisaema taiwanense var. ***taiwanense***

蓬莱南星(原变种) peng lai nan xing (yuan bian zhong)

Cataphylls, petiole, and peduncle mottled with purple-brown marks. Peduncle 10–45 cm, 5–15 cm exserted from pseudostem. Spathe tube 3.8–5 × 5–8 cm when opened; limb weakly concave and arched, 5–7 cm except for threadlike tip, 4–6.5 cm wide. Spadix appendix 5–7 cm × 4–13 mm. Fl. May. $2n = 28^*$.

- Taiwan.

77b. Arisaema taiwanense var. ***brevipedunculatum*** J. Murata, J. Jap. Bot. 60: 356. 1985.

Incompletely known species

Arisaema nangtiangense Pampanini, Nuovo Giorn. Bot. Ital., n.s., 22: 261. 1915.

南漳南星 nan zhang nan xing

Tuber globose. Cataphylls 7–10 cm, obtuse and cuspidate at apex. Leaves 2; petiole slender, ca. 20 cm, proximal ca. 15

短梗蓬莱南星 duan geng peng lai nan xing

Cataphylls, petiole, and peduncle unmarked. Peduncle 3–15 cm, 1–5 cm exserted from pseudostem. Spathe tube 2–4 × 3.7–6 cm when opened; limb concave and arched, 3–5 cm except for threadlike tip, 3.5–7 cm wide. Spadix appendix 1.8–2.5(–3.5) cm × 4–8 mm. Fl. May–Jun.

- Middle elevations. E and S Taiwan.

78. Arisaema concinnum Schott, Bonplandia (Hannover) 7: 27. 1859.

皱序南星 zhou xu nan xing

Tuber depressed globose, to 5 cm in diam., stoloniferous. Cataphylls 3, 10–20 cm, membranous. Leaf solitary; petiole 30–50 cm, proximal 20–30 cm forming pseudostem, green or purplish, scarcely marked; leaf blade radiate; leaflets 7–13, sessile, oblanceolate to elliptic, base cuneate, apex acuminate and caudate. Peduncle shorter than petioles, 15–20 cm. Spathe dark purple or green, with longitudinal white stripes; tube cylindric, 4–8 × 1.5–2 cm, throat obliquely truncate, not auriculate; limb ovate to deltoid-ovate to narrowly deltoid-ovate, 2–4 cm wide, apex long acuminate and caudate, to 15 cm including filiform tail. Spadix unisexual; female zone conic, 1.5–2 cm, 7–10 mm in diam. at base; ovary green; male zone narrowly conic, 2–3 cm; synandria lax; anthers 2 or 3, dehiscing by apical pores; appendix erect, dark purple or green, narrowly cylindric-clavate, 4–7 cm × 2–4 mm, apex bent forward and verrucate. Inflorescence upright. Fl. Jun.

- Alpine meadows; 2000–3500 m. Xizang.

cm sheathing; leaf blade pedate; leaflets 7, lanceolate, 14–20 × 5.5–6 cm, entire, acuminate; central leaflet shortly petiolulate, larger than lateral ones. Peduncle ca. 15 cm, nearly equaling sheath. Female zone in spadix ca. 2 cm (in fruit), shortly stipitate; appendix ca. 3.5 cm.

- Humid places. Hubei (“Nangqiang”).

22. STEUDNERA K. Koch, Wochenschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten 5: 114. 1862.

泉七属 quan qi shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Herbs, medium sized to robust, latex-bearing, usually evergreen, sometimes seasonally dormant. Stem epigeal, erect or creeping, stout, covered with fibrous remains of leaves and cataphylls. Leaves solitary or few to several together; petiole sheath very short; leaf blade peltate, ovate or ovate-oblong, base often emarginate, apex acuminate; basal veins short, well developed, primary lateral veins pinnate, forming a submarginal collective vein very near margin, marginal vein also present, secondary and tertiary laterals arising from primaries at a wide angle, then arching toward leaf margin and forming a ± conspicuous interprimary collective vein, higher order venation reticulate. Inflorescence solitary; peduncle shorter than petioles. Spathe barely convolute at base, ± fully expanded at anthesis, yellow, yellow and red or ± dark purple within, ovate or ovate-lanceolate, not constricted, apex acuminate; basal part persistent to fruiting stage; apical part becoming reflexed and revolute, marcescent. Spadix much shorter than spathe, densely flowered; female zone cylindric, often longer than male zone, mostly adnate to spathe; male zone contiguous with female zone, cylindric, ellipsoid, or subglobose, fertile to apex, obtuse. Flowers unisexual, naked. Gynoecium surrounded by whorl of 2–5 short, claviform staminodes, more rarely staminodes absent; ovary subglobose to ovoid, 1-located; ovules numerous, hemiorthotropous; funicle distinct; placentae 2–5, parietal, in basal part only or extending from base to apex, defined stylar region ± lacking; stigma strongly 2–

5-lobed. Male flowers 3–6-androus; stamens connate into a strongly lobed, apically truncate synandrium; common connective relatively small, impressed at apex; thecae contiguous, oblong, dehiscing by apical pore. Fruit ovoid, many seeded. Seeds ovoid to ellipsoid; testa costate; embryo axile, conic, short; endosperm copious.

About nine species: tropical and subtropical Asia; four species in China.

- 1a. Spathe inside concolorous purple 3. *S. kerrii*
- 1b. Spathe inside variously yellow.
 - 2a. Spathe inside greenish yellow, inside basal half brownish; stigma 2-lobed 4. *S. henryana*
 - 2b. Spathe inside golden yellow with or without a red basal patch; stigma entire or 4- or 5-lobed.
 - 3a. Female flowers with associated staminodes, stigma 4- or 5-lobed; leaves paler but not glaucous abaxially 1. *S. colocasiifolia*
 - 3b. Female flowers without associated staminodes, stigma entire; leaves strikingly white glaucous abaxially 2. *S. griffithii*

1. Steudnera colocasiifolia K. Koch, Wochenschr. Vereines Beförd. Gartenbaues Königl. Preuss. Staaten 5: 114. 1862 [*coccosiaeefolia*].

泉七 quan qi

Gonathanthus peltatus Van Houtte.

Stem short, creeping and ascending; persistent cataphylls brown, not netted. Petiole green, cylindric, 30–50 cm, slender, base sheathing; leaf blade paler but not glaucous abaxially, green adaxially, ovate or obovate, 20–30 × 12–17 cm, subleathery, base obtuse, apex acuminate or acute. Peduncle green or violet, much shorter than petioles, 8–15 cm. Spathe reflexed, concolorous yellow, ovate-lanceolate or oblong-lanceolate, 10–15 × 5–7 cm, apex long acuminate. Spadix 3–4 cm; female zone cylindric, 2–2.5 cm, 2–3 mm in diam., ca. 3/4 of length adnate to spathe; ovary subglobose, stigma 4- or 5-lobed, mixed with clavate staminodes; male zone ellipsoid, 1–1.5 cm × 5–6 mm, obtuse. Fl. Mar–Apr.

Dense forests, wet meadows, by streams; 600–1400 m. Guangxi, Yunnan [Bangladesh, NE India, N Laos, N Myanmar, N Thailand, N Vietnam].

The poisonous stem is used to treat injuries, cuts, snake and insect bites, vasculitis, and skin ulcers.

2. Steudnera griffithii (Schott) Schott, Bonplandia (Hannover) 10: 222. 1862.

全缘泉七 quan yuan quan qi

Gonathanthus griffithii Schott, Prodr. Syst. Aroid. 143. 1860.

Stem creeping, 10–20 cm, 3–10 mm in diam. Petiole 25–30 cm; leaf blade strikingly white glaucous abaxially, pale green adaxially, ovate-oblong, 10–25 × 6–15 cm, base emarginate or shortly 2-lobed, apex acute or cuspidate. Peduncle ca. 12 cm. Spathe reflexed, yellow-green on both surfaces, brown-purple below middle inside, 7–10 × 2.8–3 cm. Spadix 2–3.5 cm; female zone 15–25 × 1–2 mm, ca. 2/3 of length adnate to spathe; ovary without staminodes; stigma entire; some sterile flowers on distal part of female zone; male zone cylindric, ellipsoid, 5–6 mm. Berry yellowish green, broadly obovoid-cylindric, apex with persistent stigma, 1-loculed. Seeds 4–12. Fl. Mar–Jun.

Open forests, brushwood in valleys, wet places; 100–500 m. SE Yunnan [NE India, Myanmar].

3. Steudnera kerrii Gagnepain, Notul. Syst. (Paris) 9: 140. 1941.

广西泉七 guang xi quan qi

Herbs, evergreen. Stem rhizomatous, epigeal, erect, later decumbent with age, 2–40 × 1–1.5 cm, densely covered with tattered cataphyll and leaf remains, older parts eventually naked. Leaves solitary to several together at shoot tips; petiole pale green, terete, 35–40 cm × 3–7 mm, sheath very short; leaf blade strongly glaucous abaxially, deep olive-green adaxially, peltate, ovate, 10–35 × 8–14 cm, membranous, base emarginate, sinus very shallow, posterior lobes almost absent, apex cuspidate. Inflorescence solitary, very strongly fragrant of naphtha; peduncle mid-green, terete, 6–12 cm. Spathe outside deep yellow, inside deep purple, lanceolate, 9–10 × 2–5 cm, reflexed on opening, apex long acuminate, distal part soon withering, marcescent, proximal part persistent into fruiting. Spadix ca. 2.5 cm × 5 mm; female zone pale creamy white, cylindric, dorsally adnate to spathe; pistil subglobose, 2–3 mm high, 0.5–1 mm in diam.; style very short; stigma 4-lobed, exceeding style width, style and stigma tinged purple; male zone pale creamy white, clavate, free; synandria 4–6-androus, 1–2 mm high, 1.5–2.5 mm in diam., 10–16-lobed, shortly stipitate. Infructescence consisting of few to many berries partially covered by persistent spathe base. Berry ripening dull red, ovoid, 6–11 × 4–7 mm.

Wet areas in seasonal evergreen forests, almost always associated with limestone; 400–600 m. SW Guangxi [N Thailand, N Vietnam].

One of us (Boyce) has collected *Steudnera kerrii* on the Chinese border in N Vietnam. The population almost certainly extends into adjacent Guangxi.

4. Steudnera henryana Engler, Pflanzenr. 71(IV. 23E): 13. 1920.

滇南泉七 dian nan quan qi

Herbs, evergreen, medium sized, to 45 cm. Stems short, densely covered with fibrous cataphyll remains. Leaves few together at shoot tips; petiole mid-green, terete, 30–45 cm × 4–5 mm, sheath very short; leaf blade slightly paler abaxially, mid-green adaxially, peltate, somewhat stiffly membranous, base sometimes somewhat truncate, apex acuminate. Inflorescence solitary, rarely paired; peduncle pale green, terete, 8–15 cm. Spathe golden yellow, inside with a red patch, ovate to ovate-lanceolate, 5–8 × ca. 4 cm, apex cuspidate-acuminate.

Spadix up to 2.3 cm; female zone cylindric, ca. 15×3 mm, dorsally adnate to spathe; pistil mid-green, depressed globose, ca. 2 mm in diam.; style very short; stigma pale yellow, 2-lobed, exceeding style; staminodes 4 or 5 per pistil, white, shorter than pistil, stoutly spatulate and very shortly apiculate;

male zone ivory, bluntly cylindric, free; synandria 6- or 7-androus, ca. 2×3.5 mm. Infructescence and fruit unknown.

Wet shaded areas in seasonal evergreen forests, habitually on limestone; 300–700 m. Yunnan [N Laos, N Vietnam].

23. REMUSATIA Schott in Schott & Endlicher, Melet. Bot. 18. 1832.

岩芋属 yan yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Gonatanthus Klotzsch.

Herbs, small to medium sized, seasonally dormant, epiphytic or lithophytic, rarely terrestrial, latex-bearing. Tuber subglobose, producing erect to spreading, unbranched or branching stolons from axils of scarious, deciduous cataphylls; stolons producing small, ovoid tubercles at nodes, each invested by numerous apically hooked scales (minute cataphylls). Leaves 1 or 2; petiole sometimes slender, sheath relatively short; leaf blade peltate, cordate-lanceolate to cordate-ovate, apex acuminate; basal veins well developed, primary lateral veins pinnate, forming submarginal collective vein very close to margin, marginal vein also present, secondary and tertiary laterals arising from primaries at a wide angle, then arching toward leaf margin and forming inconspicuous interprimary collective veins, higher order venation reticulate. Inflorescences solitary or up to 3 together, appearing with or without leaf; peduncle shorter than petioles. Spathe strongly constricted between tube and blade, sometimes with secondary constriction above spadix (this group formally recognized as a separate genus: *Gonatanthus*); tube with convolute margins, persistent, enclosing female zone and sterile zone of spadix; limb yellow or red, longer than tube, fully expanded or remaining convolute and opening only at base, sometimes becoming reflexed (in *Remusatia vivipara* and *R. yunnanensis*), later deciduous. Spadix sessile or subsessile, much shorter than spathe; female zone subcylindric, ca. 1/2 as long as spathe tube, separated from male zone by much narrower zone of sterile male flowers; male zone ellipsoid or subclavate, fertile to apex, obtuse. Flowers unisexual, naked. Male flowers 2- or 3-androus; stamens connate into cuneate-clavate, 4–6-sulcate synandrium; fused filaments distinct; common connectives somewhat excavated at apex; thecae 4–6, oblong to ellipsoid, dehiscing by apical porelike slit; synandrodes each ± elongated. Pistils lacking associated staminodes; ovary subcylindric to subglobose, 1-loculed or partially 2–4-loculed at apex; ovules many, hemiorthotropous; funicle short to long; placentae 2–4 and parietal or placenta 1 and basal; stylar region very shortly attenuate or appearing lacking; stigma disciform-subcapitate or slightly 3- or 4-lobed. Fruit an obovoid to globose, many-seeded berry; infructescence ellipsoid, borne within persistent spathe tube. Seed ellipsoid to subglobose, covered by thick, fleshy sarcotesta or testa verruculose to irregularly costate; embryo axile, ovoid to subglobose, short; endosperm copious. $2n = 28, 42$.

Four species: S and SE Asia, one (*Remusatia vivipara*) extending from Africa and Madagascar to tropical Asia, Australia, and the Pacific islands; four species (one endemic) in China.

- 1a. Spathe with 2 constrictions, 1 separating tube and limb, 1 separating limb into 2 parts, proximal part subglobose, distal part narrowly lanceolate, apex long acuminate 4. *R. pumila*
- 1b. Limb of spathe with only 1 constriction separating tube and limb.
 - 2a. Bulbiferous stolons erect, simple, stout 1. *R. vivipara*
 - 2b. Bulbiferous stolons creeping or pendulous, simple or much branched, slender.
 - 3a. Limb of spathe semispreading to erect, not reflexed 2. *R. hookeriana*
 - 3b. Limb of spathe initially erect, later spreading and soon reflexed 3. *R. yunnanensis*

1. Remusatia vivipara (Roxburgh) Schott in Schott & Endlicher, Melet. Bot. 18. 1832.

岩芋 yan yu

Arum viviparum Roxburgh, Hort. Bengal. 65. 1814 [“*viviparum*”]; *Caladium viviparum* (Roxburgh) Nees; *Colocasia vivipara* (Roxburgh) Thwaites; *Remusatia bulbifera* Vilmorin; *R. formosana* Hayata.

Tuber depressed globose, $2–4 \times 3.5–5$ cm; stolons erect, simple, stout; bulbils ellipsoid, $0.5–2.5$ mm, stout; bristles to 1.5 mm, stout. Cataphylls 4 or more, brownish, broad, concealing peduncle, ca. 15×3 cm. Petiole 19–42 cm, proximal 1/4 sheathing; leaf blade glossy on both sides, pale green abaxially, green adaxially, oblong-ovate or lanceolate, $11–33 \times 7–19.5$

cm, sinus 1.5–3 cm; intramarginal vein indistinct. Flowering before leaves develop. Peduncle 6–12 cm. Spathe tube green outside, $3–5 \times 1.3–2$ cm; limb initially erect, later reflexed, yellow inside, obovate, $5.3–11.5 \times 2.5–9$ cm, narrowed to base, apex acute, apiculate. Spadix: female zone $1.7–2 \text{ cm} \times 7–9$ mm, with 3 or 4 whorls of sterile ovaries at apex and 1 or 2 whorls at base; sterile zone $1.1–2.5$ cm, slender, tapering distally; male zone yellowish, clavate, cylindric, $1.5–2.2 \text{ cm} \times 4–7$ mm. Fl. Apr–Sep. $2n = 28, 42$.

Subtropical forests, epiphytic, on rocks, cliff ledges; 700–1900 m. Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, India, Indonesia (Java), N Laos, Nepal, Sri Lanka, N Thailand, N Vietnam; Africa, SW Asia, N Australia, Madagascar, Pacific islands].

The tubers are poisonous. They are used externally to treat mastitis, traumatic injuries, abscesses, and swellings.

2. Remusatia hookeriana Schott, Oesterr. Bot. Z. 8: 133. 1858.

早花岩芋 zao hua yan yu

Gonathanthus ornatus Schott; *Remusatia ornata* (Schott) H. Li & Q. F. Guo.

Herbs, cormous. Tuber dark outside, white inside, depressed globose, $0.5\text{--}3 \times 0.5\text{--}3$ cm; new roots and buds appearing at apex in Apr–May; stolons much branched, spreading, pendulous, sometimes simple and creeping; bulbils numerous, smaller. Cataphylls white, lanceolate, ca. 9 cm, membranous, convolute around both leaf and flower buds. Leaves 2, appearing in Jun (after anthesis), spreading one after another; petiole tinged reddish, with darker markings, up to $45 \text{ cm} \times \text{ca. } 8 \text{ mm}$; leaf blade becoming purple abaxially, green adaxially, ovate-lanceolate, first leaf up to 30×13 cm, membranous, peltate and cordate at base, long acuminate at apex; second leaf appearing from sheath in proximal part of petiole of first leaf, petiole $10\text{--}20$ cm, leaf blade smaller, ca. 14×4.5 cm. Flowering before leaves develop. Peduncle greenish, $4\text{--}13 \text{ cm} \times 1.5\text{--}3.5$ mm. Spathe 3–7 cm; tube convolute, green outside, dark purple inside, ovoid, $1.3\text{--}2.7 \text{ cm} \times 5\text{--}10$ mm; limb deciduous, semispreading to erect, entirely yellow-green, ovate, $2\text{--}4.5 \times \text{ca. } 3.3$ cm, apex acute. Spadix sessile, yellow-green, shorter than spathe; female zone yellow-green, ca. 11×4 mm; female flowers partly 4-loculed; ovary ovoid, ca. 1.1 mm in diam.; stigma sessile, disciform; placenta parietal; ovules many, orthotropous; sterile zone attenuate, yellow, ca. 7×2 mm; sterile male flowers rhombic or elliptic, apex truncate; male zone capitate, ellipsoidal, to 9×5 mm, apex obtuse; male flowers clavate or cuneate, apex truncate, with fleshy connective, with 4–6 oblong thecae opening by a terminal pore. Fl. May. $2n = 28, 42$.

Evergreen forests, on mossy rocks or tree stumps; 1800–2800 m. Yunnan [Bhutan, India (Assam, Himachal Pradesh), Nepal, N Thailand].

The plants from C Yunnan have a triploid chromosome number of 42, but plants from Dulongjiang and from Dali are diploid with different karyotypes.

3. Remusatia yunnanensis (H. Li & A. Hay) A. Hay, World Checkl. & Bibliogr. Araceae, 442. 2002.

云南岩芋 yun nan yan yu

Gonathanthus yunnanensis H. Li & A. Hay, Acta Bot. Yunnan. 14: 375. 1992.

Herbs, cormous, lithophytes. Tuber purple outside, white inside, globose, ca. 4 cm in diam.; bulbiferous stolons 2–4, creeping, simple, to $100 \text{ cm} \times \text{ca. } 4$ mm, internodes $5\text{--}3.5$ cm; bulbils ellipsoid, 1–3 mm, covered by 4 or 5 scales, bristles filiform and hooked, in scale axils bearing some secondary small bulbils. Leaves 2–4; petiole cylindric, 40–60 cm; leaf blade pale green abaxially, green adaxially, ovate, $20\text{--}30 \times 17\text{--}20$ cm, subleathery, base peltate and cordate, sinus 4–7 cm; primary veins 4 or 5 on each side, radiating from petiole and pinnately from midrib of main lobe, secondary venation arching-anastomosing, fine intramarginal vein absent. Inflorescences 1–3, flowering when leaves develop; peduncle green, cylindric, 11–17 cm. Spathe tube green outside and inside, ovate-elliptic, ca. 3×1.2 cm, leathery, apex strongly constricted; limb initially erect, later spreading and soon reflexed,

light purple within and dull purple beneath, base yellowish on both surfaces, obovate-oblong, ca. 8.5×3 cm. Spadix: female zone subcylindric, ca. 15×6 mm, densely flowered; female flowers 4-carpellate; ovary 1-loculed, green, ovoid, ca. 2 mm; ovules many, basal, suberect; stigma sessile, circular; sterile zone yellow, ca. 14 mm, slender; male zone yellow, broadly cylindric, ca. 17×4 mm, attenuate toward base, apex obtuse; synandria of 4 or 5 fused stamens; common filament obconic, apex truncate; thecae 8–10, obovoid, adnate to outside of filament and opening by a terminal pore. Fl. Aug–Sep. $2n = 28^*$.

- Dense rain forests; ca. 1100 m. Yunnan (Yingjiang).

The combination *Remusatia yunnanensis* was attempted twice before but was not validly published (*Vienna Code*, Art. 33.4) because the basionym reference was omitted (H. Li & A. Hay, Moscow Aroid Conference 1992 Programme & Abstracts, 36. 1992) and the page number of the basionym reference was omitted (H. Li & A. Hay, Acta Bot. Yunnan., Suppl. 5: 28, 32. 1992).

4. Remusatia pumila (D. Don) H. Li & A. Hay, Acta Bot. Yunnan., Suppl. 5: 32. 1992.

曲苞芋 qu bao yu

Caladium pumilum D. Don, Prodr. Fl. Nepal. 21. 1825; *Colocasia pumila* (D. Don) Kunth; *Gonathanthus pumilus* (D. Don) Engler & K. Krause; *G. sarmentosus* Klotzsch; *Remusatia garrettii* Gagnepain.

Tuber yellowish brown outside, globose, $1\text{--}2.5$ cm in diam.; bulbiferous stolons spreading, creeping, slender, branched; bulbils many, covered by brown scales; bristles filiform, hooked. Leaves 3 or 4; petiole green, cylindric, 15–40 cm, proximal $1/4\text{--}1/3$ sheathing; leaf blade dull green on both surfaces, areas between primary veins sometimes purple abaxially and/or adaxially, ovate to oblong-ovate, $8\text{--}23.5 \times 7\text{--}14.5$ cm, papery, base peltate and shallowly cordate, apex acute or slightly acuminate, sinus 5–45 mm; primary veins 4 or 5 on each side, radiating from petiole and pinnately from midrib of main lobe, secondary venation pinnate from primary veins, fine intramarginal vein present. Inflorescence solitary, flowering when leaves develop; peduncle green, 6–10 cm. Spathe tube green, narrowly ovoid, $12\text{--}15 \times \text{ca. } 10$ mm; limb semispreading to erect, yellow or yellow-green on both surfaces, elongate, 13–21 cm, membranous; proximal part of limb separated into 2 parts by a constriction; proximal part subglobose, $1.5\text{--}2.5$ cm, opening to reveal male zone of spadix; distal part narrowly lanceolate, $11.5\text{--}21 \text{ cm} \times 6\text{--}15$ mm, apex long acuminate, fully opening only for a short time (less than 3 or 4 hours). Spadix sessile; female zone $5.5\text{--}7.5 \times 3.5\text{--}4.5$ mm; ovary green; ovules many, oblong, basal; stigma sessile; sterile zone yellow, 4–5 mm, slender; sterile flowers rhombic or oblong, flat; male zone violet, clavate, ca. 10×4 mm; synandria 0.6–1 mm in diam.; filaments ca. 0.7 mm. Fl. May–Jul. $2n = 28$.

Dense evergreen forests, on damp mossy rocks, trees, and banks; 1000–2800 m. S Xizang, Yunnan [Bhutan, India, Nepal, N Thailand].

This species is readily distinguished from the other three species by the spathe limb being constricted above the spadix as well as between the female and male zones forming a chamber enclosing the male zone of the spadix.

24. COLOCASIA Schott in Schott & Endlicher, Melet. Bot. 18. 1832, nom. cons., not Link (1795).

芋属 yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Leucocasia Schott.

Herbs, seasonally dormant or evergreen, small, medium sized, or gigantic, latex-bearing. Stem either a hypogea, subglobose or subcylindric tuber or mostly epigeal, massive. Leaves several, rosulate in acaulescent plants, forming a terminal crown in arborescent species. Petiole glabrous, sometimes strikingly glaucous, rarely pubescent, sheath rather long; leaf blade peltate, ovate-cordate to sagittate-cordate, abaxially glabrous, glaucous, pruinose, rarely pilose; posterior lobes rounded, shortly to almost entirely connate; basal ribs well developed, primary lateral veins pinnate, forming submarginal collective vein, 1 or 2 marginal veins also present, secondary and tertiary laterals arising from primaries at a wide angle, then arching strongly toward leaf margin and forming inconspicuous interprimary collective veins, higher order venation reticulate. Inflorescences 1 to many per each floral syodium, appearing with leaves; peduncle mostly shorter than petioles. Spathe constricted between tube and limb, sometimes with a second weaker constriction above male zone of spadix; tube persistent, enlarging in fruit and then splitting open irregularly from apex, with convolute margins, usually much shorter than limb, ovoid or oblong; limb either remaining erect, and ± furled, or opening and then reflexed at anthesis, later deciduous, white or yellow, very narrowly lanceolate to oblong or boat-shaped. Spadix sessile, shorter than spathe; female zone short, separated from male by narrower zone of sterile male flowers or contiguous with male zone; male zone cylindric to fusiform; terminal appendix erect, ± smooth, narrowly conic to fusiform or subulate, sometimes reduced to a small, mucronate stub, or absent. Flowers unisexual, naked. Ovary ovoid or oblong, 1-loculed; ovules many, hemiorthotropous; funicles relatively long; placentae 2–5, parietal; stylar region short, narrowed or not, sometimes ± absent; stigma disciform-capitate or weakly lobed. Interpistillar staminodes present in some species, these weakly clavate, equaling associated pistil; interfloral synandrodes (where present) depressed obpyramidal, laterally compressed, truncate. Male flowers 3–6-androus; stamens connate into ± truncate synandrium; thecae lateral, oblong-linear, dehiscing by apical pore. Infructescence erect or declined by flexing of peduncle. Fruit a greenish to whitish or dull orange, obconic or oblong, strongly fruit-smelling berry, many seeded; stigma remnants persistent. Seed tiny, ovoid to ellipsoid; testa thickish, costate; embryo axile, cylindric; endosperm copious.

About 20 species: tropical and subtropical Asia; six species in China.

- 1a. Petioles and peduncle pubescent; leaf blade abaxially pilose 1. *C. menglaensis*
- 1b. Plants glabrous.
 - 2a. Plants gigantic, often exceeding 2 m tall; petioles and abaxial surface of leaves white pruinose; inflorescence arising as a fan of 5–13 inflorescences; spathe limb pure white 2. *C. gigantea*
 - 2b. Plants small to large (very rarely exceeding 1.5 m tall); petioles and abaxial surface of leaves at most grayish glaucous; inflorescence solitary or in pairs, rarely 4 together and then not in a fan; spathe limb not pure white.
 - 3a. Plants large, with tuberous, rhizomatous, or stoloniferous stems; spathes yellow.
 - 4a. Leaf blade adaxially matte waxy-glaucous and water-shedding (water sometimes forming “mercury droplets”); spathe limb dull yellow, opening only at base slightly above constriction, remainder staying furled; infructescence declined 3. *C. esculenta*
 - 4b. Leaf blade adaxially glossy and wettable (water forming an even coating); spathe limb bright yellow, spreading and opening flat; infructescence erect 4. *C. antiquorum*
 - 3b. Plants small, stoloniferous; spathes pale green or somewhat purplish or purplish brown.
 - 5a. Stolons very slender, much branched; leaves frequently with dark patches between primary lateral veins; female and male zones contiguous 5. *C. affinis*
 - 5b. Stolons robust, little branched; leaves usually concolorous green; female and male zones separated by a zone of synandrodes 6. *C. fallax*

1. Colocasia menglaensis J. T. Yin, H. Li & Z. F. Xu, Ann. Bot. Fenn. 41: 223. 2004.

勐腊芋 meng la yu

Herbs, terrestrial, stoloniferous. Rhizome 20–40 × 3–7 cm; stolons 6–10 per plant, pale green, trailing horizontally, simple, 15–20 cm × ca. 4 mm; internodes cylindric, ca. 4 cm, without tubercles. Leaves 5 or 6 together; petiole pale greenish, cylindric, ca. 50 × 1 cm, pubescent, proximal half sheathing; leaf blade pale green abaxially, glossy green adaxially, peltate, ovate-cordate, ca. 40 × 25 cm, membranous, pilose; primary lateral

veins 7–9 pairs, sharply raised abaxially; marginal vein 1–3 mm from margin, inconspicuous. Inflorescences (2 or) 3 (or 4); peduncle pale green, cylindric, shorter than petioles, ca. 20 cm, pubescent. Spathe greenish, constricted between proximal tubular part and limb, proximal part nearly fusiform, 3–6 × ca. 1.2 cm; limb basally open, apically convolute, erect, not reflexed, yellowish, oblong-lanceolate, 13–18 × 4–6 cm. Spadix sessile, shorter than spathe; female zone green, cylindric, ca. 2 × 1 cm, separated from male zone by a narrower zone of synandrodes; ovary ovoid to oblong, ca. 1.5 mm, 1-locular; placentae 4 or 5, parietal; stylar region short; stigma disciform-capitate; sterile

zone between female and male zones cylindric, ca. 1 cm × 6 mm; sterile male flowers: synandodes depressed obpyramidal, apex subtruncate; male zone yellowish, cylindric, ca. 3.5 cm × 7 mm; male flowers 8–11-androus; thecae oblong-linear, dehiscent by apical pore; appendix pale yellowish, narrowly conic, ca. 3.5 × 0.5 cm, rugose at base. Berry not seen. Fl. Mar–Jun.

By streams at humid forest margins; 1000–1100 m. Yunnan (Mengla) [Laos, N Myanmar (Bhamo), N Thailand].

2. *Colocasia gigantea* (Blume) J. D. Hooker, Fl. Brit. India 6: 524. 1893.

大野芋 da ye yu

Caladium giganteum Blume, Cat. Gew. Buitenzorg, 103. 1823; *Leucocasia gigantea* (Blume) Schott.

Herbs, large to gigantic, evergreen, with massive, stout epigeal stem. Leaves very large; petiole pale green, strikingly pruinose, to 2.5 m, proximal half sheathing; leaf blade white pruinose abaxially, especially when immature, green or pale green adaxially, ovate-cordate, 25–250 × 17–150 cm, membranous, base cordate, peltate, margin undulate, apex shortly acuminate. Inflorescences 5–13 arising from leaf axil (actually terminal on shoot and displaced by new shoot); peduncle pruinose, cylindric, 30–80 × 1–2 cm, each with a membranous cataphyll nearly equaling length of peduncle. Spathe 12–24 cm; tube green, ellipsoid, 3–6 × 1.5–2 cm; limb erect, white, oblong-boat-shaped, distinctly constricted, 8–19 × 2–3 cm. Spadix 9–20 cm; female zone white or cream-colored, conic; sterile zone 3–4.5 cm, slender; male zone 5–14 cm; appendix very short, 1–5 mm, apex acute. Berry oblong, ca. 5 mm. Seeds many, fusiform, with many distinct longitudinal striations. Fl. Apr–Jun, fr. Sep. $2n = 28$.

Valley forests, limestone-associated, usually on moist but well-drained sites, also cultivated; 100–700 m. Fujian, Guangdong, Guangxi, Jiangxi, Yunnan; cultivated in Anhui, Guizhou, Hunan, Sichuan, and Zhejiang [Cambodia, Laos, Malaysia (Peninsular), Myanmar, Thailand, Vietnam; widely cultivated in SE Asia].

3. *Colocasia esculenta* (Linnaeus) Schott in Schott & Endlicher, Melet. Bot. 18. 1832.

芋 yu

Arum esculentum Linnaeus, Sp. Pl. 2: 965. 1753; *A. colocasia* Linnaeus; *Caladium colocasia* (Linnaeus) W. Wight; *C. esculentum* (Linnaeus) Ventenat; *Calla gaby* Blanco; *Colocasia antiquorum* Schott var. *esculenta* (Linnaeus) Schott ex Seemann; *C. formosana* Hayata; *C. konishii* Hayata; *C. neocaldonica* Van Houtte.

Rhizome vertical to horizontal, tuberous, 3–5 cm or more (up to 15 cm) in diam. Stolons long or absent. Leaves 2 or 3 or more; petiole green, 25–80 cm, sheathing for 1/3–2/3 length; leaf blade adaxially matte waxy-glaucous and water-shedding (water sometimes forming “mercury droplets”), oblong-ovate to suborbicular, 13–45 × 10–35 cm, base shallowly cordate (sinus 1–4 cm), apex broadly and shortly cuspidate. Peduncle usually solitary, 16–26 cm. Spathe tube green, 3.5–5 × 1.2–1.5 cm;

limb open proximally, cream-colored to golden yellow, lanceolate or elliptic, 10–19 × 2–5 cm, apex acuminate. Spadix: female zone conic, 3–3.5 × ca. 1.2 cm; ovary 1–3 mm in diam.; stigma sessile, narrower than apex of ovary; sterile zone narrowly cylindric, 3–3.3 cm; sterile flowers (pistils) seen from above elongate, ca. 0.5 mm in diam.; male zone cylindric, 4–6.5 cm × ca. 7 mm; appendix narrowly conic, 15–45 × ca. 2 mm. Berry green, ca. 4 mm. Seeds few; synandria ca. 1 mm high, ca. 0.8 mm in diam. Fl. Feb–Apr (Yunnan), or Aug–Sep (Qin Ling area). $2n = 26, 28, 30, 36, 38, 42, 44, 46, 48, 52, 58, 84, 116$.

Widely cultivated usually near farmhouses or in water fields; also naturalized or perhaps native in wet places in forests, valleys, swamps, wastelands, and at watersides. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [widely cultivated in tropics and subtropics].

This very variable species is widely cultivated throughout the tropics, and many wild or naturalized clones are found in S Asia, Malesia, and the Pacific islands. The spathes, spadices, and spadix appendages vary considerably, although the floral organs have not been observed in many cultivated clones. This wide variation is attributable to cultivation selections, escapes, naturalizations, and re-domestications. It seems best, therefore, to treat *Colocasia esculenta* as a single species rather than formally recognize infraspecific taxa or segregate species (see Hay, Sandakania 7: 31–48. 1996).

The rhizomes, petioles, and inflorescences are used as a vegetable. The rhizomes are used medicinally for treating swellings, abscesses, snake and insect bites, and swollen lymph nodes in the neck.

4. *Colocasia antiquorum* Schott in Schott & Endlicher, Melet. Bot. 18. 1832.

滇南芋 dian nan yu

Colocasia esculenta (Linnaeus) Schott var. *antiquorum* (Schott) F. T. Hubbard & Rehder; *C. fontanesii* Schott; *C. gaoligongensis* H. Li & C. L. Long; *C. gongii* C. L. Long & H. Li; *C. lihengiae* C. L. Long & K. M. Liu; *C. tonoimo* Nakai.

Herbs, perennial, terrestrial, with stolons (stoloniferous runners) and a usually erect rhizome. Rhizome 120–135 × 12–18 cm; stolons (stoloniferous runners) 6–12, trailing horizontally, pale green to pale purple, simple, thin, 70–80 × ca. 0.5 cm; internodes cylindric, 15–25 cm, without tubercles. Leaves 4–8 together; petiole light green to reddish purple, 55–140 cm, sheathing in basal 1/2; leaf blade pale green or yellow-green abaxially, sometimes with a purple margin, green or yellow-green adaxially, glossy and wettable (water forming an even coating), peltate, ovate-cordate to sagittate-cordate, 30–80 × 18–70 cm, membranous; primary lateral veins 5–9, pale green or purple, interprimary veins inconspicuous. Inflorescences 3–5(or 6); peduncle green or purple, cylindric or subtrigonous, shorter than petioles, 40–70 × 1.5–2 cm. Spathe constricted between tube and blade; tube yellowish green or purple, oblong, 4–12 × 1.4–4.5 cm, subcylindric; limb convolute at base, suberect to reflexed, golden yellow, sometimes with purple margin, oblong, oblong-lanceolate, or obovate, 7–24 × 4–14 cm, apex obtuse or acute. Spadix sessile, shorter than spathe; female zone golden yellow, cylindric, 2–3 × 0.3–0.75 cm, ca. 1/2 as long as spadix, with a few yellow interpellular staminodes; female flowers ovoid; ovary 1-loculed; placentae 2; stigma

sessile or subsessile, disciform, 6-lobed; sterile zone whitish, cylindric, $1\text{--}5 \times 0.3\text{--}1.8$ cm; synandrodes depressed obpyramidal; male zone yellow, cylindric, $3.5\text{--}14 \times 0.4\text{--}1.5$ cm; synandria 3–10-androus, yellow, 1–2 mm; appendix absent or erect, narrowly conic, ca. 5 cm. Fruit not seen. Fl. May–Sep. $2n = 28$.

Dense rain forests, evergreen broad-leaved forests, and forest margins in valleys in limestone areas, along streams in evergreen broad-leaved forests, moist shaded thickets; 600–1200 m. S and W Yunnan (Mengla, Tengchong, Yingjiang) [NE India, N Laos, N Myanmar, N Thailand].

5. *Colocasia affinis* Schott, Bonplandia (Hannover) 7: 28. 1859.

卷苞芋 juan bao yu

Colocasia bicolor C. L. Long & L. M. Cao.

Herbs, perennial, terrestrial, with stolons and tubercles. Stolons trailing horizontally, pale green, thin, $3.7\text{--}40$ cm \times ca. 4 mm, branched; internodes cylindric, 2.7–9 cm, with tubercles; tubercles triangular or ovate, ca. 2 cm in diam. Leaves 3–7; petiole light green or greenish white, without transverse purple lines, cylindric, 20–45 cm; leaf blade pale green abaxially, green or light green adaxially, with 4–6 pairs of large purple spots (lighter when growing in a very shady environment), peltate, ovate-cordate, (5–)16–21 \times (4.7–)13–16 cm, membranous; primary lateral veins in 3 or 4 pairs, marginal veins inconspicuous. Inflorescences 1–3; peduncle pale green, cylindric, much shorter than petioles, 6.4–15 cm. Spathe constricted; tube convolute, green, almost cylindric, 1.3–2.7 \times 0.6–1.8 cm; limb usually reflexed at anthesis, yellow, greenish white, or yellowish, oblong-lanceolate, 4.2–7.8 \times 1.6–3.3 cm. Spadix sessile, shorter than spathe; female zone cylindric, short, 0.9–1.7 cm \times 3–8 mm; female flowers green; ovary ovoid; ovules ca 30; funicle long; placentae parietal; stigma sessile; sterile zone absent between female and male zones or cream-colored, 0.5–0.8 cm \times 0.8–2 mm; male zone yellowish, pale pink, or cream-colored, 1–1.7 cm \times 2.5–5 mm; male flowers 6–8-androus; stamens connate into a synandrium, yellow; appendix reddish purple, greenish white, or light yellow, cylindric in proximal part but conic in distal part, 1.7–5.1 cm \times 1.5–6 mm. Young berry green. Fl. Jun–Aug, fr. Jul–Oct. $2n = 28$.

Moist shaded places in forests and at forest margins, hillsides in limestone areas; 800–1400 m. S Yunnan (Jinghong, Lancang, Mengla, Simao) [N Bangladesh, NE India, N Myanmar, Nepal].

6. *Colocasia fallax* Schott, Bonplandia (Hannover) 7: 28. 1859.

25. ALOCASIA (Schott) G. Don in Sweet, Hort. Brit., ed. 3, 631. 1839, nom. cons.,
not Necker ex Rafinesque (1837).

海芋属 hai yu shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Colocasia sect. *Alocasia* Schott in Schott & Endlicher, Melet. Bot. 18. 1832; *Ensolenanthe* Schott; *Panzhuyuia* Z. Y. Zhu; *Schizocasia* Schott ex Engler; *Xenophya* Schott.

Herbs, evergreen, rarely seasonally dormant, latex-bearing, medium sized to rarely arborescent and gigantic. Stem thick, often hypogea, sometimes stoloniferous and bulbiferous, epigeal stem usually erect and later decumbent, rather less often elongated and creeping. Leaves few to several in terminal crown, less often scattered, sometimes each subtended by a cataphyll; petiole long [sometimes minutely asperous, minutely puberulent, or glandular], sheath relatively long; leaf blade sometimes pubescent abaxially,

假芋 jia yu

Colocasia heterochroma H. Li & Z. X. Wei; *C. kerrii* Gagnepain; *C. tibetensis* J. T. Yin; *C. yunnanensis* C. L. Long & X. Z. Cai.

Herbs, small to somewhat robust, stoloniferous. Rhizome erect, up to $7 \times 1\text{--}1.5$ cm; stolons pale green or pale purple, erect or creeping, mostly simple, 5–60 cm \times up to 6 mm, internodes 0.5–1.5 cm, bearing ovoid or cylindric-ovoid tubercles to 3.5 cm in diam., or without tubercles. Leaves 3–8; petiole green, sometimes with transverse purple lines, cylindric, 12–57 cm, sheathing for almost 1/2 length; leaf blade paler or slightly glaucous abaxially, green or with dark purple patches between primary veins adaxially, cordate-peltate, ovate-cordate, or narrowly oblong-ovate, 8–36 \times 3.3–29 cm, membranous, apex apiculate; primary lateral veins 5–7. Inflorescences 1–5 together; peduncle green, cylindric, 4–23 cm, slender. Spathe constricted or not between tube and limb; tube green, funnel-form or subcylindric, 1.7–4.2 \times 0.7–1.7 cm, margins convolute; limb at anthesis proximally gaping, distally convolute, erect, sometimes slightly reflexed after anthesis, orange-yellow, golden yellow, or yellowish basally, violet apically, narrowly lanceolate to oblong-lanceolate, 5–11.2 \times 2.7–4.8 cm, apex long acuminate. Spadix sessile, to 6.5 cm, shorter than spathe; female zone yellow, pale yellowish, or green, conic or cylindric, 1–2.6 cm \times 4–6 mm, with 4–6 rows of whitish or yellow staminodes at base; ovary green, speckled white, subglobose or ovoid to oblong, ca. 1 mm, 1-located; placentae 3; stigma sessile or subsessile, disciform-capitate, or disciform at base and tapering distally into a linear point to 0.5 mm; sterile zone present between female and male zones; male zone yellow, cylindric, 1.1–4.6 cm \times 3–6 mm; synandria golden yellow, polygonal, 6–12-androus; distal sterile zone (between male zone and appendix) cream-colored, cylindric, 0.5–1.2 cm \times 1–3 mm, with white hairs, hairs 10–15 mm at anthesis, disappearing on drying; synandrodes broadly oblong to depressed ovate or depressed obpyramidal, apex truncate or subtruncate; appendix absent or yellowish, cylindric or narrowly conic, 2.5–4.5 cm \times 1–2.5 mm, scaly-rough, base distinctly constricted or not, apex acute. Berry ripening yellow, ovoid, ca. 2 mm. Fl. Mar–Sep, fr. Jul–Oct. $2n = 28$.

Dense forests, humid forest margins, moist mossy rock faces in forests, valley scrub, moist shaded places along streams; 700–1400 m. SE Xizang (Mêdog), S and W Yunnan [N Bangladesh, Bhutan, NE India, Nepal, Thailand].

juvenile blade peltate, at maturity usually sagittate, less often \pm hastate or cordate, but remaining peltate in some species, margin entire or sinuate [or slightly to deeply pinnatifid]; posterior divisions ovate or triangular; basal ribs well developed, wax glands present in axils of primary lateral veins and midrib; primary lateral veins pinnate, forming submarginal collective vein, 1 or 2 closely adjacent marginal veins also present, secondary and tertiary lateral veins arising from primaries at a wide angle, then arching strongly toward leaf margin, sometimes forming interprimary veins, higher order venation reticulate. Inflorescences 1 or 2 to many in each floral syodium; peduncle usually shorter than petioles. Spathe persistent, erect, convolute, gaping only basally, strongly constricted between tube and blade, rarely not; tube with convolute margins, shorter than limb, ovoid or oblong, persistent and then splitting irregularly in fruit; limb oblong, usually boat-shaped, rarely arching, at anthesis at first erect, then reflexing and later usually deciduous. Spadix sessile, sometimes shortly stipitate, rarely obliquely adnate to spathe, shorter than spathe; female zone conic-cylindric, short, separated from male by a much narrower zone of sterile flowers; male zone usually cylindric; appendix conic to cylindric, with irregular, labyrinthine network of fissures. Flowers unisexual, naked. Pistil ovoid or oblong, 1-loculed or partially 3- or 4-loculed at apex; ovules 6–10, orthotropous, hemiorhorthopous, hemianatropous, or anatropous; funicle short; placenta basal; stylar region short; stigma depressed capitate, \pm distinctly 3- or 4-lobed. Male flowers 3–12(–36)-androus; stamens connate into obpyramidal, subhexagonal, truncate, rarely linear, synandria; thecae oblong to linear-oblong, lateral, dehiscing by apical pore; synandrodes shallow, obpyramidal, compressed, truncate. Fruit a reddish, ellipsoid or obconic-ellipsoid or subglobose odorless berry, 1–5-seeded; stigma remnants persistent. Seed subglobose to ellipsoid, rather large; testa thickish, smooth or scabrous; embryo broadly conic, broadly cylindric, or elongate; endosperm copious.

About 80 species: tropical Asia and Malaysia; eight species in China.

The genus *Alocasia* is vegetatively similar to *Colocasia* but may be readily differentiated by the presence of wax glands present in axils of the primary lateral veins and midrib on the abaxial surface of the leaf and by the mature fruit that are orange or red, odorless, and contain a few large seeds, this in marked contrast to *Colocasia* in which the fruits are inconspicuously colored, smelly, and contain many tiny seeds in slimy mucilage. In addition, the placentation is basal in *Alocasia* and parietal in *Colocasia*.

In respect to synflorescence architecture, *Alocasia* may be distinguished by the inflorescences that are generally paired, with each pair oriented \pm tangential to the stem, whereas *Colocasia* has numerous inflorescences arising in a centrifugal sequence radial to the stem.

In China, *Alocasia cucullata* and *A. macrorrhizos* are never found away from human disturbance.

- 1a. Plants massive, pachycaul, at least 1 m tall.
- 2a. Sinus between posterior leaves naked 4. *A. macrorrhizos*
- 2b. Sinus between posterior leaves peltate.
 - 3a. Plants lacking stolons; spathe deep yellow 3. *A. navicularis*
 - 3b. Plants with short stolons at base of main stems, these stolons with tubercles at tips; spathe greenish white.
 - 4a. Petiole to 150 cm; leaf blade ca. 130 \times 100 cm; appendix conic, 3–5.5 \times 1–2 cm 1. *A. odora*
 - 4b. Petiole 28–30 cm; leaf blade ca. 25 \times 13 cm; appendix narrowly conic, ca. 1.1 \times 0.3–0.4 cm 2. *A. hainanica*
- 1b. Plants not as above, or if taller than 1 m then never massive.
 - 5a. Plants always seasonally dormant; petiole green, leaf blade not peltate; plant producing long (up to 110 cm) horizontal or spreading stolons tipped with tubercles; spathe purple-pink or whitish, not constricted 6. *A. hypnosa*
 - 5b. Plants rarely seasonally dormant, if so then petiole mottled, leaf blade peltate, and plant never with long stolons; spathe green or white, constricted.
 - 6a. Stems stoutly erect and basally much branched; leaf blade broadly ovate; only known from areas of human disturbance 5. *A. cucullata*
 - 6b. Stems weakly erect to decumbent, not branching basally; leaf blade various but never broadly ovate; plants of natural forest.
 - 7a. Petiole purple-brown to pink to green, strikingly obliquely mottled chocolate-brown; leaf blade pendent; stigmas conspicuously lobed 7. *A. longiloba*
 - 7b. Petiole green; leaf blade spreading; stigmas not conspicuously lobed 8. *A. acuminata*

1. *Alocasia odora* (Roxburgh) K. Koch, Index Seminum Hort. Berol. 1854(App.): 5. 1854.

海芋 hai yu

Arum odoratum Roxburgh, Fl. Ind., ed. 1832, 3: 499. 1832; *Alocasia commutata* Schott; *A. tonkinensis* Engler; *Arum odoratum* Heynhold; *Caladium odoratissimum* K. Koch; *C. odoratum* Ker Gawler (1822), not Loddiges (1820); *Colocasia odora* (Roxburgh) Brongniart.

Pachycaul herbs, massive, to 2.5 m, evergreen, with slightly milky latex. Stem erect to decumbent, with short sto-

lons terminating in tubercles arising from base. Leaves several to rather many together, clustered at tips of stems of larger plants; petiole up to 1.5 m, sheath membranous; leaf blade peltate, cordate-sagittate or cordate-ovate, up to 130 \times 100 cm, basal margins undulate, apex shortly acuminate; primary lateral veins 9–12 on each side, interprimary veins forming well-defined interprimary collective veins. Inflorescences 2 or 3 together among leaf bases, subtended by membranous cataphylls; peduncle stout, ca. 35 cm, exceeding cataphylls at anthesis. Spathe 13–25 cm, constricted ca. 1/6 of way from base; proximal part green, ovoid; limb cowl-like at anthesis, later

reflexed, then deliquescent, greenish white, broadly oblong-lanceolate, 10–30 × 4–8 cm, membranous. Spadix shorter than spathe, shortly stipitate; female zone 1–2 × ca. 1.5 cm; pistil pale green, ca. 3 mm in diam.; stigma sessile, weakly 3-lobed, lobes blunt, pale green; sterile zone equaling male zone, ivory, very slightly narrowed corresponding to spathe constriction; synandrodes rhombic-hexagonal, ca. 2.5 mm in diam.; male zone whitish, cylindric, 3–5 × ca. 2 cm; synandria rhombic-hexagonal, convex-topped due to cap-forming synconnective, ca. 1.5 mm in diam.; appendix white, narrowly conic, 3–5.5 × 1–2 cm, equaling ca. 1/3 length of spadix, markedly thicker than male zone at base, slowly tapering toward apex. Fruiting spathe ca. 6 cm. Fruit ripening scarlet, globose, ca. 1 cm in diam.

Primary and secondary tropical rain forests, bamboo thickets, riverbanks, swamps, also on limestone; below 1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan [Bangladesh, Bhutan, Cambodia, NE India (Assam), Japan (Ryukyu Islands), Laos, Myanmar, Nepal, Thailand].

Alocasia odora differs from *A. macrorrhizos* in having shortly peltate leaves (vs. deeply cordate at the base with the lateral lobes partially naked in the sinus in *A. macrorrhizos*).

The rhizomes are used for treating stomach aches, abdominal pains, cholera, and hernias, and are used externally to treat abscesses and snake and insect bites.

2. *Alocasia hainanica* N. E. Brown, J. Linn. Soc., Bot. 36: 183. 1903.

南海芋 nan hai yu

Alocasia hainanensis K. Krause.

Herbs, medium sized to rather small, evergreen. Stem short, epigeal. Leaves few together; petiole 28–32 × ca. 1 cm, slender, sheathing to ca. 1/2 length; leaf blade weakly peltate, ovate-sagittate, ca. 25 × 13 cm, thinly membranous, apex acute; posterior lobes ovate-oblong, 8–10 × ca. 5 cm; lateral veins 4 or 5 on each side. Inflorescences solitary; peduncle cylindric, slender, ca. 18 cm × 4–5 mm. Spathe ca. 6.5 cm, weakly constricted; tube narrowly ovoid, ca. 15 × 8 mm, glaucous; limb erect, narrowly oblong, ca. 5 × 2 cm, apex long acuminate. Spadix slightly shorter than spathe; female zone cylindric, 1–1.2 cm; pistil ovoid; style short; stigma ± 3- or 4-lobed; sterile zone narrowly cylindric, 6–7 cm × ca. 2 mm; synandrodes depressed, rhombic-hexagonal in outline, ca. 2 × 2.5 mm; male zone ca. 15 × 5 mm; synandria comprised of 6 stamens, rhombic-hexagonal, ca. 2 × 2 mm; appendix narrowly conic, ca. 1.1 × 0.3–0.4 cm, acute. Infructescence and fruit unknown. Fl. Nov.

Secondary forests in valleys. Hainan [N Vietnam].

Alocasia hainanica is very doubtfully distinct from *A. odora* and is apparently based on a depauperate form of that species. The Berlin isotype is in better condition than the Kew holotype and shows clearly the glaucous proximal spathe outside, which is typical of *A. odora*. The spadix, while depauperate, fits well with that of *A. odora*. As with several other species of Araceae described from Hainan, field work is required to verify its taxonomic status. The drawing that accompanies the Berlin isotype is somewhat stylized, especially in the depiction of the female zone.

In publishing *Alocasia hainanensis*, Krause appears to have been unaware of Brown's earlier publication; Krause's and Brown's names are homotypic.

3. *Alocasia navicularis* (K. Koch & C. D. Bouché) K. Koch & C. D. Bouché, Index Seminum Hort. Berol. 1855(App.): 2. 1855.

黃苞海芋 huang bao hai yu

Colocasia navicularis K. Koch & C. D. Bouché, Index Seminum Hort. Berol. 1853: 13. 1853.

Pachycaul herbs, massive, to 1.5 m, evergreen, with milky latex. Stem erect to decumbent. Leaves several together, clustered at tips of stems of larger plants; petiole up to 1.5 m, sheath margins membranous; leaf blade peltate, cordate-ovate, ca. 130 × 120 cm, apex shortly acuminate; primary lateral veins 9–12 on each side. Inflorescences 2 or 3 together among leaf bases; peduncle 40–45 cm, stout, much exceeding cataphylls at anthesis. Spathe 10–20 cm, constricted ca. 1/6 of way from base; proximal part green, ovoid; limb dark yellow, broadly oblong-lanceolate, 18–15 × 4–8 cm, cowl-like at anthesis. Spadix shorter than spathe, shortly stipitate; female zone 1–2 × ca. 1.5 cm; pistil mid-green, ca. 3 mm in diam.; stigma sessile, 3- or 4-lobed, lobes blunt, pale green; sterile zone equaling male zone, ivory, narrowed corresponding to spathe constriction; synandrodes whitish, stained purple, rhombic-hexagonal, ca. 2.5 mm in diam.; male zone white, cylindric, 3–4 × ca. 1.5 cm; synandria rhombic-hexagonal, convex-topped due to cap-forming synconnective, ca. 1.5 mm in diam.; appendix white, narrowly conic, 3–4 × 1–2 cm, equaling ca. 1/3 length of spadix, ± same thickness as male zone at base. Fruiting spathe ellipsoid, 5–11 cm. Fruit ripening dark red, ellipsoid, ca. 10 × 6 mm.

Moist evergreen lower-montane forests, sometimes on limestone. S Yunnan [N Bangladesh, NE India (Assam), N Laos, N Myanmar, Nepal, N Thailand, N Vietnam].

4. *Alocasia macrorrhizos* (Linnaeus) G. Don in Sweet, Hort. Brit., ed. 3, 631. 1839 [“*macrorhizon*”].

热亚海芋 re ya hai yu

Arum macrorhizon Linnaeus, Sp. Pl. 2: 965. 1753; *Alocasia cordifolia* (Bory) Cordemoy; *A. grandis* N. E. Brown (1886), not Clémenceau (1868); *A. indica* (Loureiro) Spach; *A. indica* var. *diversifolia* Engler; *A. indica* var. *heterophylla* Engler; *A. indica* var. *metallica* (Schott) Schott; *A. indica* var. *rubra* (Hasskarl) Engler; *A. indica* var. *variegata* (K. Koch & C. D. Bouché) Engler; *A. marginata* N. E. Brown; *A. metallica* Schott; *A. pallida* K. Koch & C. D. Bouché; *A. plumbea* (K. Koch) Van Houtte; *A. uhinkii* Engler & K. Krause; *A. variegata* K. Koch & C. D. Bouché; *Arum cordifolium* Bory; *A. indicum* Loureiro; *A. mucronatum* Lamarck; *A. peregrinum* Linnaeus; *Caladium indicum* (Loureiro) K. Koch; *C. macrorhizos* (Linnaeus) R. Brown; *C. metallicum* (Schott) Engler; *C. odoratum* Loddiges (1820), not Ker Gawler (1822); *C. plumbeum* K. Koch; *Calla badian* Blanco; *C. maxima* Blanco; *Colocasia boryi* Kunth; *C. indica* (Loureiro) Kunth; *C. indica* var. *rubra* Hasskarl; *C. macrorhizos* (Linnaeus) Schott; *C. mucronata* (Lamarck) Kunth; *C. peregrina* (Linnaeus) Rafinesque; *C. rapiformis* Kunth; *Philodendron peregrinum* (Linnaeus) Kunth; *P. punctatum* Kunth.

Pachycaul herbs, massive, to 4 m, evergreen, latex slightly milky. Stem erect, to ca. 1.5 m, decumbent. Leaves several together, clustered at tips of stems in larger plants; petiole to 1.3 m, sheathing in proximal 1/3–1/2; leaf blade light green on both surfaces, ovate-sagittate, bluntly triangular, up to 120 × 50 cm, ± erect, margin entire to very slightly sinuous; posterior lobes 1/3–1/2 length of anterior, somewhat rotund, often overlapping, naked in sinus in mature plants, weakly peltate in juveniles; primary lateral veins ca. 9 on each side of anterior lobe, axillary glands distinct, secondary venation not forming interprimary collective veins. Inflorescences paired among leaf bases, subtended by membranous cataphylls; peduncle barely exceeding cataphylls at anthesis. Spathe 13–35 cm, constricted ca. 1/6 from base; proximal spathe green, ovoid; limb cowl-like at anthesis, later reflexed, then deliquescent, pale yellow, broadly oblong-lanceolate, 10.5–29 cm. Spadix slightly shorter than spathe, shortly stipitate; female zone conic-cylindric, 1–2 × ca. 1.5 cm; pistil pale green, ca. 3 mm in diam.; stigma yellow, sessile, 3–5-lobed; sterile zone slightly equaling female zone, whitish; synandrodes rhombic-hexagonal, ca. 2.5 mm in diam.; male zone whitish, cylindric, 3–7 × ca. 2 cm; synandria 5–9-merous, rhombic-hexagonal, convex-topped, ca. 2 mm in diam.; appendix yellowish, slightly tapering, at least 1/2 length of spadix. Fruiting spathe green, oblong-ellipsoid, ca. 8 cm. Fruit ripening scarlet, ellipsoid, ca. 12 × 8 mm.

Ditches and wet areas of farmlands and wastelands, never away from human disturbance; sea-level to 800 m. S Fujian, Guangdong, Guangxi, Guizhou, Hainan, S Sichuan, Taiwan, S Xizang, Yunnan [originally from tropical Asia; now pantropical].

It is not clear where, if anywhere, *Alocasia macrorrhiza* occurs wild. It has evidently been prehistorically distributed widely in tropical Asia as a subsistence crop and is now pantropical by introduction as an ornamental.

5. *Alocasia cucullata* (Loureiro) G. Don in Sweet, Hort. Brit., ed. 3, 631. 1839.

尖尾芋 jian wei yu

Arum cucullatum Loureiro, Fl. Cochinch. 2: 536. 1790; *Alocasia rugosa* (Desfontaines) Schott; *Caladium cucullatum* (Loureiro) Persoon; *C. rugosum* Desfontaines; *Colocasia cochleata* Miquel; *C. cucullata* (Loureiro) Schott; *C. rugosa* (Desfontaines) Kunth; *Panzhuyua omeiensis* Z. Y. Zhu.

Herbs, clumping, small to medium sized, somewhat robust, to 1 m, evergreen. Stems erect, hypogea, basally much branched. Leaves many together; petiole weakly D-shaped in cross section, 25–30(–80) cm, sheath reaching to ca. 1/2 way, margins membranous; leaf blade broadly ovate-cordate, 10–40 × 7–28 cm, base shallowly cordate, apex acute; primary veins 4 on each side, radiating from petiole, arching, interprimary veins not forming a collective vein. Inflorescences rarely produced, usually solitary, sometimes paired, among leaf bases, subtended by membranous cataphylls; peduncle 20–30 cm. Spathe green, 9–15 cm; proximal spathe 4–8 × ca. 2.5 cm; limb narrowly cymbiform, 5–10 × 3–5 cm. Spadix 8–14 cm; female zone cylindric, 1.5–2.5 cm × ca. 7 mm; sterile zone 2–3 cm × ca. 3 mm; male zone yellow, ca. 3.4 cm × 8 mm; appendix yellowish, narrowly conic, ca. 3.5 cm × 5 mm. Fruit rarely produced, a subglobose berry, 6–8 mm in diam., ripening red. Fl. May.

Watersides, by fields, ?wild or cultivated; below 2000 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Sichuan, Taiwan, Yunnan [Bangladesh, NE India (Khasi Hills, Sikkim), Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The plants are used externally for detoxifying viper bites and are also used for treating abscesses, rheumatism, and arthritis. It is an important good-luck plant in Buddhist temples in Laos and Thailand.

6. *Alocasia hypnosa* J. T. Yin, Y. H. Wang & Z. F. Xu, Ann. Bot. Fenn. 42: 395. 2005.

紫苞海芋 zi bao hai yu

Herbs, terrestrial or lithophytic, to 100 cm tall, seasonally dormant. Stem erect or a tuberlike rhizome; rhizome ca. 10 × 13.5 cm; stolons numerous per plant, pale green, simple, trailing horizontally or pendent, 56–110 cm, internodes cylindric, ca. 5.5 × up to 1 cm, with light green cataphylls, tubercles produced terminally, to 4 × 3 cm. Leaves 3–6 together; petiole light greenish, glossy, terete, to 104 × 3–7.5 cm, sheath to 50 cm, membranous; leaf blade triangular-sagittate, to 82 × 64 cm; basal lobes naked in sinus, membranous, glossy bright green; primary lateral veins 8 per side, conspicuous, interprimary veins forming a feeble collective vein. Inflorescences 2 or 3 together, appearing with leaves; peduncle pale green, cylindric, to 90 cm. Spathe to 28 cm, not constricted between basal convolute part and limb; proximal spathe green, fusiform, ca. 6.5 × 3 cm; limb arched, erect at anthesis, later flopping forward, then deliquescent, purple-pink or whitish, oblong-lanceolate, to 24 × 20 cm. Spadix sessile, shorter than spathe; female zone cylindric, ca. 1.5 × 2 cm; pistil oblong, ca. 5 mm; style short; stigma 3- or 4-lobed; sterile zone cylindric, ca. 5.5 × 1–1.5 cm; synandrodes depressed oblong to depressed ovate, apex truncate or concave; male zone white, cylindric, ca. 3.5 × 2 cm; synandria 5- or 6-merous, rhombic-hexagonal, truncate; appendix white, narrowly conic, to 16.5 × 2.5 cm. Fruiting spathe ellipsoid, ca. 3 × 2.5 cm. Fruit ellipsoid, ca. 1.5 × 0.5 cm, ripening scarlet.

Humid forest margins and exposed areas of forest regrowth in limestone mountains; 900–1000 m. SW Yunnan (Menglian) [N Laos, N Thailand].

7. *Alocasia longiloba* Miquel, Fl. Ned. Ind. 3: 207. 1856.

尖叶海芋 jian ye hai yu

Alocasia amabilis W. Bull; *A. cochinchinensis* Pierre ex Engler & K. Krause; *A. cuspidata* Engler; *A. lowii* Hooker var. *veitchii* (Lindley) Engler; *A. veitchii* (Lindley) Schott; *Caladium veitchii* Lindley.

Herbs, terrestrial, small to robust, to 150 cm tall, evergreen or seasonally dormant. Stem rhizomatous, elongate, erect to decumbent, sometimes subtuberous, 8–60 × 2–8 cm. Leaves 1–3 together, subtended by lanceolate papery-membranous cataphylls; petiole terete, 30–120 cm, glabrous, sheathing in proximal 1/4, purple-brown to green, strikingly obliquely mottled chocolate-brown; leaf blade pendent, green or flushed with purple abaxially, dark green often with major venation gray-green adaxially, narrowly hastate-sagittate, 27–85 × 14–40 cm; posterior lobes peltate for (5–)10–30% of their length, acute, anterior lobe with 4–8 primary lateral veins on each side, axillary glands conspicuous, interprimary collective veins weak. In-

florescences solitary or paired; peduncle 8–18 cm, resembling petioles, subtended by cataphylls. Spatha 7–17 cm, abruptly constricted 1.5–3.5 cm from base; proximal spathe green, ovoid; limb erect, later reflexing, pale green, lanceolate, canoe-shaped, 5.5–7.5 cm. Spadix somewhat shorter than spathe, 6–13 cm, stipitate, stipe whitish, conic, ca. 5 mm; female zone 1–1.5 cm; pistil green, subglobose, 1.5–2 mm in diam.; stigma white, subsessile or on a slender style to ca. 0.5 mm, 3- or 4-lobed; sterile zone 7–10 mm, narrower than fertile zones; synandrodes mostly rhombic-hexagonal, flat-topped; male zone ivory, subcylindric, tapered at base, 1.2–2.5 cm × 4.5–8 mm; synandria 4–6-merous, ± hexagonal, ca. 2 mm in diam.; appendix pale orange, 3.5–9 cm, subcylindric, tapering to a point. Fruiting spathe glossy green, ovoid, 4–7 cm. Fruit ripening orange-red, globose-ellipsoid, ca. 1.5 × 0.75 cm. Fr. Aug–Oct.

Tropical forests, thickets; 100–1000 m. Guangdong, Hainan, S Yunnan [Cambodia, Indonesia, Laos, Malaysia, S Myanmar, Singapore, Thailand, Vietnam].

8. Alocasia acuminata Schott, Bonplandia (Hannover) 7: 28. 1859.

越境海芋 yue jing hai yu

Herbs, terrestrial, small to medium sized, slightly robust, to 75 cm tall, evergreen. Stem rhizomatous, generally elongate,

erect, later decumbent, 8–75 × 2–6 cm. Leaves to 5 together, subtended by lanceolate papery-membranous cataphylls; petiole bright green, 15–80 cm, glabrous, sheathing in proximal 1/4; leaf blade spreading, bright green, narrowly hastate-sagittate to ovate-hastate, 15–60 × 8–20 cm; posterior lobes 1/4–1/3 length of anterior, peltate for 25–30% of their length, acute; anterior lobe with 3–6 primary lateral veins on each side, axillary glands hardly conspicuous, interprimary collective veins weakly defined. Inflorescences usually solitary; peduncle green, 9–20 cm, subtended by cataphylls. Spatha 7–10 cm, moderately constricted 1.5–2.5 cm from base; proximal spathe green, ovoid; limb pale green, lanceolate, canoe-shaped, 5.5–7.5 cm. Spadix subequaling spathe, 6–9.5 cm, sessile; female zone 1–1.5 cm; pistil green, subglobose, 1.5–2 mm in diam.; stigma white, subsessile, very slightly lobed; sterile zone 7–10 mm, narrower than fertile zones; synandrodes narrowly rhombic-hexagonal, flat-topped; male zone ivory, subcylindric, 1.2–2.5 cm × 4.5–8 mm; synandria 4–6-merous, ± hexagonal, ca. 2 mm in diam.; appendix white, 2.5–3.5 cm, demarcated from male zone by a strong constriction, narrowly conic. Fruiting spathe green, ovoid, 3–4 cm. Fruit ripening orange-red, globose-ellipsoid, ca. 0.75 cm in diam.

Everwet to seasonal perhumid evergreen forests, usually in deep shade, less often on track sides; 600–1800 m. S Yunnan [Bangladesh, NE India, N Laos, N Myanmar, Nepal, N Thailand, ?N Vietnam].

26. PISTIA Linnaeus, Sp. Pl. 2: 963. 1753.

大漂属 da piao shu

Li Heng (李恒 Li Hen); Peter C. Boyce

Apiospermum Klotzsch; *Kodda-Pail* Adanson.

Herbs, small, free-floating, evergreen, stoloniferous, acaulescent, with spreading feathery roots. Leaves several in a rosette, densely pubescent; petiole very short, almost absent; sheath ligulate, very short, very thin, scarious at base; leaf blade obovate-cuneate to obovate-oblong, somewhat spongy, apex rounded, truncate, or retuse; midrib absent, primary veins subparallel, all arising from base, diverging slightly and running into margin near apex, strongly prominent abaxially, higher order venation reticulate. Inflorescence solitary, very small, much shorter than leaves; peduncle very short, pubescent. Spatha somewhat constricted centrally, pubescent outside, glabrous inside, proximal margins connate with each other and with ovary wall forming tube, free margins between tube and blade folded between stigma and male organs forming a partition between a distal male partial chamber and a proximal female one; limb erect, ovate, expanded, acute-acuminate. Spadix shorter than spathe, mostly adnate to spathe, only apical male zone free; female zone with single gynoecium at base and a thin, green, pouch-shaped flap just below spathe partition; male zone subtended by a thin, marginally lobed, green, annular flap, consisting of a basally naked spadix axis supporting a single whorl of 2–8 flowers, naked axis sometimes extending slightly beyond. Flowers unisexual, naked. Gynoecium obliquely adnate to spadix axis; ovary ovoid, 1-loculed; ovules numerous, orthotropous; placenta broad, apparently parietal, probably morphologically basal; stylar region attenuate, bending inward toward male flowers; stigma disciform-subcapitate, small. Male flower a synandrium consisting of 2 connate stamens; thecae dehiscing by single apical slit. Fruit a thin-walled, utricular, several-seeded, ellipsoid berry, irregularly breaking up and decaying to release seeds. Seed barrel-shaped, ± subtruncate and excavated at apex and base; testa thick, reticulate-alveolate, thicker and with operculum at micropylar end; embryo obovoid to conic; endosperm copious.

One species: widely distributed in tropical and subtropical regions, including China.

1. Pistia stratiotes Linnaeus, Sp. Pl. 2: 963. 1753.

大漂 da piao

Apiospermum obcordatum Klotzsch, nom. illeg. superfl.; *Pistia obcordata* Schleiden, nom. illeg. superfl.

Morphological characters are the same as those of the genus. Plants aquatic, floating. Roots many, pendulous in water,

feathery. Leaves in rosettes, 1.3–10 × 1.5–6 cm. Spatha white, 5–12 mm. Fl. May–Nov.

Water fields, lakes, ponds. Fujian, Guangdong, Guangxi, Taiwan, Yunnan; cultivated in Anhui, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan [tropical and subtropical regions worldwide].

The plants are cultivated for animal feed and are used to treat swelling and urinary tract infections.