

## **A review of *Alocasia* (Araceae: Colocasieae) for Thailand including a novel species and new species records from South-West Thailand**

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**ABSTRACT.** A review of *Alocasia* in Thailand is presented. One new species (*A. hypoleuca*) and three new records (*A. acuminata*, *A. hypnosa* & *A. perakensis*) are reported. A key to *Alocasia* in Thailand is presented and the new species is illustrated.

### **INTRODUCTION**

*Alocasia* is a genus of in excess of 100 species of herbaceous, laticiferous, diminutive to gigantic, usually robust herbs. The genus has recently been revised for New Guinea (Hay, 1990), Australasia (Hay & Wise, 1991), West Malesia and Sulawesi (Hay, 1998), the Philippines (Hay, 1999) while post main-treatment novelties have been described for New Guinea (Hay, 1994) Borneo (Hay, Boyce & Wong, 1997; Hay, 2000; Boyce, 2007) & Sulawesi (Yuzammi & Hay, 1998). Currently the genus is least well understood in the trans-Himalaya (NE India to SW China) including the northern parts of Burma, Thailand, Lao PDR and Vietnam with only the flora of Bhutan (Noltie, 1994) partly covering this range. In the absence of extensive fieldwork the account presented here for Thailand can at best be regarded as provisional.

### **STRUCTURE & TERMINOLOGY**

*Alocasia* plants are often complex in vegetative and floral structure and some notes on their morphology (based here substantially on Hay, 1998) are useful to aid identification.

The stem of *Alocasia*, typically of most Araceae, is a physiognomically unbranched sympodium. The number of foliage leaves per module is variable between and within species and individuals, but during flowering episodes in some species it may be reduced to one. In some species, e.g. *A. peltata* M.Hotta (Borneo), foliage leaves alternate with cataphylls within a module. In such instances the cataphyll performs the role of protecting the subsequent emerging leaf. That role in other species is performed by the sheath of the previous foliage leaf. Those species with regularly interspersed cataphylls typically have very short leaf sheaths, while those without interspersed cataphylls have longer sheaths. A prophyll and usually at least one cataphyll is always associated with the initiation of a new vegetative module.

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The petiole divides, as it runs into the lamina, into three principal veins - the anterior costa (midrib) and two posterior costae which support the anterior and posterior lobes of the blade respectively. The shape of the posterior lobes of the leaf is sometimes of diagnostic importance. Terms used here to describe them are for the most part self-explanatory, such as 'acute', 'obtuse', etc. The posterior lobes are asymmetric, the outer sides being united with the anterior lobe, while the inner sides (i.e., those that face each other across the sinus) are free (unless the leaf is peltate). In some instances, such as the *Scabriuscula* Group, the shape of the piece of lamina on the inside of each posterior lobe may need to be used for identification purposes. For these parts I have used terms such as 'lanceolate', 'ovate', etc. even though the posterior lobe is not symmetrical about the posterior costa. Thus, 'inner side of posterior lobe lanceolate' means that the inside piece of lamina is shaped like a longitudinally bisected lanceolate leaf.

Primary veins run pinnately off both sides of the anterior costa and pedately off the outer (anterior) side of each posterior costa. Glands, of unknown function but perhaps involved with 'lubrication' of the new leaf as it emerges through the often very constraining petiolar sheath, are found in the axils of the primary veins on the abaxial side of the leaf, and may also occur scattered over the surface of the petiole. Secondary venation arises direct from the costae and from the primary veins and is typically colocasoid: secondary veins arising from the primary veins typically run initially at a wide angle from the primary venation and are then deflected towards the margin of the blade. In some species the secondary veins unite between the primary veins into more or less sinuous interprimary collective veins. These may be very well developed and distinct, and while they are a useful feature for distinguishing some species, the state intergrades with a complete absence of interprimary veins and some species evince a variety of intermediate states. In some species some secondary veins are intermediate in thickness between the normal secondary venation and the primary veins, and they may even bear glands in their axils like the primary venation. These are termed subsidiary veins. The primary and secondary veins run into a marginal vein, or in some species a distinct intramarginal vein.

In most, if not all species the rhizome produces at or below soil level a number of short to rarely greatly elongated, slender, branched or unbranched stolons terminating in more or less globose tuberules.

Except in the smallest species the vegetative module is terminated by a synflorescence composed of pairs of inflorescences. Each pair consists of a cataphyll subtending a terminating inflorescence (i.e., peduncle with spathe and spadix) and a second inflorescence arising in the axil of the cataphyll and itself subtended by a bicarinate prophyll. A relay axis develops from the axil of the leaf immediately below the first cataphyll of the bimodular subunit. The relay axis bears first a bicarinate prophyll and then, depending on whether or not the relay module is initially vegetative, a foliage leaf (which may or may not be preceded by one or more vegetative cataphylls) or another synflorescence. If a foliage leaf has been produced, the module may continue to produce foliage leaves and the flowering episode has consisted simply of two inflorescences. Alternatively, the foliage leaf may be followed immediately by another pair of inflorescences and another relay axis with a single foliage leaf and so on, so that the flowering episode consists of a compressed sympodium of flowering units displaced into lateral positions and interspersed with foliage leaves, as in *A. macrorrhizos*. If, however, the first relay axis is not initially vegetative, a second pair

of inflorescences follows upon the first, and a third and fourth and so on each arising from the axil of the prophyll subtending the previous pair. Eventually the flowering episode ceases and the last relay axis bears a foliage leaf which emerges from the centre of a larger or smaller sympodial cluster of inflorescence pairs - up to about 20 in robust species such as *A. sarawakensis* M.Hotta (Borneo). After rapid resumption of vegetative growth the stem may bear a ring of physiognomically lateral infructescences below the leaf crown of the new vegetative module, e.g., in *A. robusta* M.Hotta (Borneo, Anambas Islands).

The spathe is divided into a convolute thicker lower portion – the ‘lower spathe’ – which houses the female zone of the spadix and which persists into fruiting and a thinner, ephemeral open limb (this part is also convolute and persistent in some East Malesian species of the Xenophya Group). The two portions of the spathe are differentiated by a constriction so that the lower part is globose to ovoid. The spadix, as is the general case in Araceae, is protogynous and at the time of stigma receptivity the spathe constriction loosens, providing pollinators access to the pistils, simultaneously the inflorescence may emit a detectable scent – highly fragrant to an odour of decay. At this time the spathe limb is generally erect. At the end of female anthesis, the spathe constriction closes and grips the spadix and scent production ceases. There is a sterile zone between the male and female zones of the spadix and typically the spathe constriction is level with this so that after female anthesis the female zone is isolated from the male zone. Male anthesis then occurs. The pollen is mealy and drops to collect between the lip of the limb and the spadix or in a trough-like annular fold that has developed at the base of the limb.

The female zone of the spadix consists of naked pistils. The sterile zone, or interstice, is partly or entirely covered with truncate neuter organs (synandrodia), which often but not always appear to be of two types. The lower whorl(s) (with respect to the spadix) may be composed of smaller, often longer structures than the upper ones and they commonly react differently (remaining white) in alcohol to the larger upper ones which closely resemble the male flowers except for the absence of pollen thecae. This differentiation of the neuter organs is much clearer in *Alocasia odora*, where the lowermost neuter organs are not in connate groups, but instead partially encircle the uppermost pistils clearly in the positions of staminodes. The next whorl (with respect to the spadix) of neuter organs consists of united ‘staminodes’ with a central hole, seemingly where the pistil would be. There is then one or more similar whorls followed by an abrupt transition to structures resembling sterilised synandria (termed synandrodes). The rhombohexagonal synandria – fertile male flowers – are generally 4–6-merous and consist of connate truncate stamens. The body of the male flower is here termed the synconnective and the vertical pollen thecae are attached throughout their length to its flanks. Typically the thecae reach the top of the synandrium and open through apical pores. However, in some species the synconnective is expanded over the top of the thecae, which release pollen from apical slits into the spaces between the synandria.

The upper part of the spadix forms a well-developed sterile appendix, which is at least sometimes thermogenic (as the male zone may be). The appendix surface is occasionally smooth, but is more usually sinuously, longitudinally and finely channelled -apparently formed of irregular elongate compressed synandrodia.

After anthesis all rots and falls but for the female part of the spadix and the lower spathe. As the fruits develop and expand, the peduncle generally elongates and the lower spathe enlarges, sometimes becoming conspicuously coloured (e.g., *A. chailii* P.C.Boyce). When the fruits ripen, the fruiting spathe dehisces to reveal orange to red fruits, analogous to arillate seeds in a capsule, contrasting with the discoloured lower spathe interior. The fruits are odourless as far as is known, fleshy and contain one to several seeds a few millimetres in diameter.

### DISTINGUISHING ALOCASIA AND COLOCASIA

Traditionally, these two genera, which are undoubtedly closely allied and frequently confused with one another, have been separated on the basis of ovule number and placentation – many ovules on parietal placentas in *Colocasia*, few on basal placentas in *Alocasia* (e.g., Mayo, Bogner & Boyce, 1997: 90). These states are not really of practical use in field identification. However they translate in fruiting plants into markedly different dispersal syndromes, apparently (though not observed in West Malesia) involving birds in *Alocasia*, in marked contrast to the mammal dispersal syndrome of *Colocasia* where the fruits are smelly and inconspicuously coloured with many tiny seeds in slimy mucilage (see Hay, 1996).

In respect of synflorescence architecture, *Alocasia* may be readily distinguished from *Colocasia* by its bimodular synflorescence subunits. Inflorescence multiplication in *Colocasia* is achieved in such a way that the whole synflorescence is equivalent to one bimodular unit in *Alocasia*. Where the inflorescence terminating the vegetative module has only one further inflorescence in the axil of its subtending cataphyll in *Alocasia* (with the synflorescence being built up by relay axes), in *Colocasia* the second inflorescence has a third in the axil of its prophyll and so on up to c. 8 in *Colocasia gigantea*. The relay axis in *Colocasia* is vegetative and thus the whole synflorescence is displaced to a quasi-lateral position on one side of the shoot.

### ALOCASIA

(Schott) G. Don in R.Sweet, Hort. Brit., ed. 3: 631 1839 *nom. cons.*; Hook.f., Fl. Brit. India 6: 524. 1893; Ridley, Fl. Malay Penins. 5: 97. 1925; Gagnepain in H.Lecomte, Fl. Indo-Chine 6: 1142. 1942; Mayo, Bogner & Boyce, Genera of Araceae 283–286, Pl.104 i-iii & 130B, 1997; Hay, Gardens Bull. Singapore 50: 221–334. 1998.— *Ensolenanthe* Schott, Bonplandia 9: 368. 1861 — *Schizocasia* Schott, Bonplandia 10: 148. 1862.— *Xenophya* Schott, Ann. Mus. Bot. Lugduno-Batavi 1: 124 1863.— *Panzhuyuia* Z.Y.Zhu, J. Sichuan Chinese Med. School 4(5): 49 1985.

Diminutive to medium-sized, rarely arborescent and gigantic, evergreen or rarely seasonally dormant monoecious herbs with clear to milky latex. *Stem* thick, often ± hypogeal, sometimes stoloniferous and tuberiferous, when epigeal then stem usually erect, rarely elongated and creeping. *Leaves* few to several in terminal crown, rarely solitary, sometimes each leaf subtended by a cataphyll. *Petiole* long, sometimes asperate or glandular, *petiolar sheath* relatively long, mostly persistent, sometimes deciduous. *Lamina* sometimes

pubescent abaxially (not in Thailand), juvenile lamina peltate, at maturity usually sagittate, less often  $\pm$  hastate or cordate, peltate in some species, margin entire, sinuate or slightly to deeply pinnatifid (the last two states not in Thailand), posterior divisions ovate or triangular; basal ribs well-developed, waxy glands present in axils of primary lateral veins and midrib, primary lateral veins pinnate, forming submarginal collective vein, 1–2 closely adjacent marginal veins also present, secondary and tertiary lateral veins arising from the primaries at a wide angle, then arching strongly towards leaf margin, sometimes forming interprimary collective veins ('colocasiod venation'), higher order venation reticulate. *Inflorescences* 2–many in each floral sympodium, appearing with the leaves in seasonally dormant species. *Peduncle* usually shorter than petiole, erect, occasionally declinate at fruiting. *Spathe* strongly constricted between tube and limb, tube with convolute margins, shorter than blade, ovoid or oblong, persistent and then splitting irregularly in fruit; limb oblong, usually boat-shaped, rarely fornicate, at anthesis at first erect, then reflexing and later usually deciduous. *Spadix* sessile, or sometimes shortly stipitate, rarely obliquely adnate to lower spathe, mostly shorter than spathe, *female flower zone* short, conoid-cylindric, separated from male flower zone by a narrower zone of sterile flowers; *male flower zone* usually cylindric, *appendix* conoid to cylindrical. *Flowers* unisexual, perigone absent. *Male flowers* 3–12(–36)-merous, stamens connate into an obpyramidal, subhexagonal, truncate, rarely linear synandrium, thecae oblong to linear-oblong, lateral, dehiscing by apical pore. *Sterile male flowers* synandrodia, shallow, obpyramidal, compressed, truncate; *female flower* with ovary ovoid or oblong, 1-locular or partially 3–4-locular at apex, ovules 6–10, orthotropous, hemiorthotropous, hemianatropous or anatropous, funicle short, placenta basal, stylar region short, stigma depressed-capitate,  $\pm$  distinctly 3–4-lobed. Fruiting spathe ellipsoid, very rarely the whole spathe persistent (not in Thailand), fruit revealed by the lower spathe splitting longitudinally-basically. *Fruit* an ellipsoid or obconic-ellipsoid or subglobose berry, 1–5-seeded, stigma remnants persistent, generally ripening red. *Seed* subglobose to ellipsoid, testa thickish, smooth or scabrous, embryo broadly conoid, shortly cylindrical or elongate, endosperm copious.

In excess of 100 species distributed from the subtropical eastern Himalayas throughout subtropical and tropical Asia into the tropical western Pacific and eastern Australia. Many species are yet to be formally described. Nine species in Thailand, one (*A. hypoleuca*) endemic. Habitat in primary and secondary forests, early regrowth and open swamps, sometimes lithophytic, rarely rheophytic; primarily in everwet conditions, but some species tolerant of quite strong seasonality; predominantly in the lowlands, extending from sea level to lower and mid-montane zones. Two (*A. macrorrhizos* (L.) G. Don and *A. cucullata* (Lour.) G. Don) are found only in association with human disturbance and almost certainly ancient cultigens.

#### KEY TO THE SPECIES

1. Plants massive, pachycaul. At least 1m tall.
  2. Sinus between posterior leaves peltate
    3. Plant with short stolons at the base of the main stems, these stolons with tubercles at the tips.  
Spathes greenish white **8. *A. odora***
    3. Plant lacking stolons. Spathes deep yellow **7. *A. navicularis***
  2. Sinus between posterior leaves naked

4. Leaves concolorous green on both surfaces; stems reaching 1.5 m and thence always decumbent; spathe limb pale green, not glaucous; spadix not glaucous; synandria convex-topped, ca 2 mm diam.; stigmas 3–5 lobed, lobes conic, spreading; spathe limb deliquescent prior to fruiting; widespread but only known from areas of human disturbance **6. A. macrorrhizos**
4. Leaves abaxially glaucous; stems frequently exceeding 2 m and almost never decumbent; spathe limb interior glaucous; spadix weakly glaucous; synandria flat-topped 2 by 1 mm; stigmas blunt, deeply incised, erect; spathe limb marcescent during fruiting; endemic to Chantanaburi **4. A. hypoleuca**
1. Plants not so. If taller than 1 m then never massive
5. Plants always seasonally dormant; petioles green and leaf lamina not peltate; plant producing long (to 110 cm) horizontal or spreading stolons tipped with tubercles; spathe purple-pink **3. A. hypnosa**
5. Plants never seasonally dormant, if so then petioles mottled & leaf lamina peltate and plant never with long stolons; spathe green to white
6. Stems stoutly erect and basally much branched; lamina broadly ovate; only known from areas of human disturbance **2. A. cucullata**
6. Stems weakly erect to decumbent, not branching basally; lamina various but never broadly ovate; plants of natural forest
7. Stems without conspicuously elongated internodes; leaves clustered and not noticeably interspersed with cataphylls; lamina membranous
8. Petioles purple-brown to pink to green, strikingly obliquely mottled chocolate brown; leaf lamina pendent; stigmas conspicuously lobed **5. A. longiloba**
8. Petioles green; leaf lamina spreading; stigmas not conspicuously lobed **1. A. acuminata**
7. Stems with conspicuously elongated internodes; leaves several along the stem, irregularly interspersed with cataphylls; lamina coriaceous to thickly coriaceous and subsucculent **9. A. perakensis**

**1. *Alocasia acuminata*** Schott, Bonplandia 7: 28. 1859; Hook.f., Fl. Brit. India 6: 527. 1893.

Small to medium-sized, slightly robust, evergreen terrestrial herbs to 75 cm tall. *Stem* rhizomatous, generally elongate, erect later decumbent, ca 8–75 by 2–6 cm diam., older parts covered with remains of old leaf bases and cataphylls. *Leaves* up to 5 together, subtended by conspicuous lanceolate papery-membranous cataphylls. *Petioles* glabrous, bright green, ca 15–80 cm long, sheathing in the lower ca  $\frac{1}{4}$ .; *lamina* spreading, narrowly hastato-sagittate to ovato-hastate, 15–60 by 8–20 cm, bright green, posterior lobes  $\frac{1}{4}$ – $\frac{1}{3}$  the length of the anterior, peltate for 25–30% of their length, acute; anterior costa with 3–6 primary lateral veins on each side, the proximal ones diverging at ca 60–100°, the angle decreasing in distal veins and the course more or less straight to the margin; axillary glands hardly conspicuous abaxially; *secondary venation* initially wide-spreading, then sooner or later deflected towards the margin; *interprimary collecting* veins weakly defined. *Inflorescences* usually solitary. *Peduncles* 9–20 cm long, green, erect at first, then declinate, elongating and then erect in advanced fruit, subtended by a series of progressively larger cataphylls. *Spathe* 7–10 cm long, moderately constricted ca 1.5–2.5 cm from the base; *lower spathe* green, ovoid; *limb* lanceolate, canoe-shaped and longitudinally hooded, 5.5–7.5 cm, membranaceous, very pale green. *Spadix* subequalling the spathe, ca 6–9.5 cm long, sessile; *female flower zone* 1–1.5 cm; *ovaries* subglobose, ca 1.5–2 mm diam., green; stigma subsessile, white, not or only very slightly lobed; *sterile interstice* 7–10 mm, narrower than the fertile zones, corresponding with the spathe constriction; *lower synandrodia* often with incompletely connate staminodes, the rest elongate rhombo-hexagonal, flat-topped; *male flower zone* subcylindric, 1.2–2.5 by 4.5–8 mm, ivory white; *synandria* 4–6-merous, more or less hexagonal, ca 2 mm diam.; *appendix* 2.5–3.5 cm long, ca same thickness as male flower zone and demarcated from it by a strong constriction, elongate-conic, white. *Fruiting*

*spathe* ovoid, ca 3–4 cm long, green. *Fruits* globose-ellipsoid, ca 0.75 cm diam, green, ripening orange-red.

Thailand.—NORTHERN: Chiang Mai, Phrae; NORTHEASTERN: Khon Kaen; SOUTHWESTERN: Khanchanaburi.

Distribution.—NE India (Assam), Nepal, Bangladesh (Type), N Burma, N Lao PDR, N Vietnam (sight record but not confirmed), SW China (sight record not confirmed).

Ecology.—Moist areas in dry evergreen forest, sometimes on limestone & granite; altitude: 650–1175 m.

Vernacular.—None recorded.

Uses.—None recorded.

Notes.—Most similar to *A. longiloba* but readily separable by the unlobed or barely lobed stigma, bright green leaf laminae, plain green petioles and cataphylls and in always having several leaves together. The sessile spadix and unlobed stigmas are diagnostic in Thailand.

**2. *Alocasia cucullata*** (Lour.) G. Don in R. Sweet, Hort. Brit., ed. 3: 631. 1839; Hook.f., Fl. Brit. India 6: 525. 1893.—*Arum cucullatum* Lour., Fl. Cochinch 2: 536. 1790.—*Caladium cucullatum* (Lour.) Pers., Syn. Pl. 2: 575. 1807.—*Colocasia cucullata* (Lour.) Schott in H.W. Schott & S.L. Endlicher, Melet. Bot.: 18. 1832.—*Caladium rugosum* Desf., Tabl. École Bot., ed. 3: 386. 1829.—*Colocasia rugosa* Kunth, Enum. Pl. 3: 41. 1841.—*Caladium colocasia* Schott ex Wight, Icon. Pl. Ind. Orient. 3: t. 787. 1844.—*Colocasia cochleata* Miq., Index Seminum (AMD) 1853. 1853.—*Alocasia rugosa* Schott, Oesterr. Bot. Wochenbl. 4: 410. 1854.—*Panzhuyua omeiensis* Z.Y. Zhu, J. Sichuan Chinese Med. School 4(5): 50. 1985.

Small to medium sized, somewhat robust, evergreen clumping herb to 1 m. *Stems* erect, hypogeal, basally much-branched. *Leaves* many together. *Petiole* weakly D-shaped in cross-section, 25–30(–80) cm; *petiolar sheath* reaching to ca ½ way, margins membranous; *lamina* broadly ovato-cordate, 10–40 by 7–28 cm, apex acute, base shallowly cordate; *primary veins* 4 on each side, radiating from petiole, arching; *interprimary veins* not forming a collecting vein. *Inflorescences* rarely produced, usually solitary, sometimes paired, among the leaf bases, subtended by membranous cataphylls; *peduncle* 20–30 cm. *Spathe* 9–15 cm long, green; *lower spathe* 4–8 by ca 2.5 cm; *limb* narrowly cymbiform, 5–10 by 3–5 cm. *Spadix* 8–14 cm; *female flower zone* cylindric, 1.5–2.5 cm x 7 mm; *sterile interstice* 2–3 cm x 3 mm; *male flower zone* 3.4 cm x 8 mm, yellow; *appendix* narrowly conic ca 3.5 cm x 5 mm., yellowish. *Fruit* rarely produced, a subglobose berry, 6–8 mm diam., ripening red.

Thailand.—No specimens located, but see note below.

Distribution.—NE India (Sikkim) through to Taiwan and south to Sri Lanka.

Ecology.—Only found in association with human disturbance; altitude: 0–900 m.

Vernacular.—None recorded.

Uses.—In China all parts are used externally for treatment of snake bites, abscesses, rheumatism and arthritis.

Notes.— Very often cultivated in Thailand, most frequently seen as an ornamental in pots in temples and rural villages. In Lao PDR an important ‘totem’ plant in hilltribe villages. Never encountered in the wild away from human disturbance. See further notes under *A. macrorrhizos*.

The inflorescence description above is compiled from very poorly preserved material from Vietnam, hence it is incomplete with regard to floral details.

**3. *Alocasia hypnosa*** J.T.Yin, Y.H.Wang & Z.F.Yu, Ann. Bot. Fennici 42: 395. 2005. Fig. 2A–B.

Terrestrial or lithophytic, seasonally dormant herbs to 100 cm tall. *Stem* erect or tuber-like rhizome with numerous stolons and tubercles; *rhizome* 10 cm by 13.5 cm in diam.; *stolons* numerous per plant, simple, trailing horizontally or pendent, 56–110 cm long, pale green, internodes cylindrical, 5.5 cm long, to 1 cm diam., with light green cataphylls and tubercles produced terminally; *tubercles* to 4 cm by 3 cm in diam. *Leaves* 3–6 per plant. *Petiole* terete, to 104 cm by 3–7.5 cm diam., light greenish, glossy; *petiolar sheath* to 50 cm long, membranous; *lamina* triangular-sagittate, up 82 cm by 64 cm; basal lobes naked in the sinus, membranaceous, glossy bright green; *primary lateral veins* pinnate, 8 pairs per side, conspicuous; *interprimary veins* forming a feeble collecting vein. *Inflorescences* 2–3 together, appearing with leaves. *Peduncle* cylindrical, to 90 cm long, pale green. *Spathe* to 28 cm long, constricted between lower convolute part and limb; *lower spathe* fusiform, ca 6.5 cm by 3 cm diam., green; *limb* oblong-lanceolate, to 24 cm by 20 cm (flattened), fornicate, purple-pink, erect at anthesis, later flopping forwards, thence deliquescent. *Spadix* sessile, shorter than spathe; *female flower zone* cylindrical, 1.5 by 2 cm diam.; *ovaries* oblong, 5 mm long, style short, stigma 3–4-lobed; *sterile interstice* cylindrical, 5.5 by 1–1.5 cm diam.; *synandroides* depressed, apex nearly truncate or concave, oblong to ovate; *male zone* cylindrical, ca 3.5 by 2 cm, white; *synandria* 5–6-merous, truncate; *appendix* white, elongate-conic, to 16.5 cm long, 2.5 cm diam. *Fruiting spathe* ellipsoid, ca 3 by 2.5 cm. *Fruits* ellipsoid, ca 1.5 by 0.5 cm, green, ripening scarlet.

Thailand.— NORTHERN: Chiang Rai; SOUTHWESTERN: Kanchanaburi.

Distribution.— Lao PDR, S.W. China (Type).

Ecology.— Humid ledges and in exposed areas of forest regrowth and deciduous, bamboo-dominated forest on karst limestone; altitude: 800–970 m.

Vernacular.— None recorded.

Uses.— None recorded.

Notes.— *Alocasia hypnosa* is a remarkable species, both in its vegetative habit (deciduous with long runners) and in the distinctive purple-pink spathes. In habitat the long stolons enable the plants to colonize the near-vertical limestone outcrops that are their preferred habitat.

There is a possibility that *Arum montana* Roxb. (= *Alocasia montana* (Roxb.) Schott) treated by Hay as a synonym of *A. macrorrhizos* (Hay, 1998) is conspecific with and thus has priority over *A. hypnosa*. The colour plate (*Roxburgh drawing no. 248*) that constitutes the type of *Arum montanum* in many respects depicts a plant far more similar to *Alocasia hypnosa* than to *A. macrorrhizos*, especially in the inflorescence being comparatively large

compared to the leaf lamina, the pink spathe limb and the representation of elongate stolons arising from a semi-rhizomatous tuber.

**4. *Alocasia hypoleuca* P.C. Boyce sp. nov.**, ab *A. macrorrhizos* et alii speciebus Thailandensibus stature majore, foliis subtus glaucis, spatha intus et plus minusve extus glauca, spadice glaucis et synandrodiiis minoribus planis et spadice proportione brevior (1/3 minus partem longitudinis spathe) differt. *Alocasia macrorrhizos* propinquus est sed in habitu caulis erectis non decumbentis et spatha marcescenti distinguitur. Typus: Thailand, SOUTHEASTERN: Chanthaburi, Khao Soi Dao range, road to Ban Tamun, ex. Cult. Forest Herbarium sub. *Boyce* AL-204, 23 March 2008 (holotype BKF). Fig. 1.

Very large to massive pachycaul evergreen herb to 3 m with clear latex. *Stem* erect to ca 2 m or more, slender and self-supporting, very seldom decumbent. *Leaves* several together, clustered at the tips of stems of larger plants. *Petioles* to 0.75–1 m long, sheathing in lower 1/3–1/4. *Lamina* ovato-sagittate, bluntly triangular in general outline, held more or less erect, ca 100 by 50 cm, light green adaxially, conspicuously glaucous abaxially; *primary lateral veins* on each side of the anterior costa diverging at ca 60°; glands in axils of primary veins on abaxial side distinct; *secondary venation* flush with the lamina, forming poorly defined interprimary collective veins; posterior lobes ca 1/3–1/2 the length of the anterior, somewhat rotund, naked in the sinus in adult plants, peltate in juveniles. *Inflorescences* paired among the leaf bases, subtended by membranous cataphylls. *Peduncle* barely exceeding the cataphylls at anthesis. *Spathe* ca 24–26 cm long, constricted about 1/4 of the way from the base; *lower spathe* ovoid, glaucous yellow-green; limb narrowly oblongo-lanceolate, 20–22 cm long, cowl-like at anthesis, remaining hooded and then marcescent, pale green, conspicuously glaucous internally, less so externally. *Spadix* slightly shorter than the spathe, weakly glaucous, sessile; *female flower zone* ca 3 by 1.5 cm; *ovaries* globose, ca 2.5 mm diam., mid-green, stigma sessile, 3-lobed, the lobes blunt, deeply incised and erect, deep yellow; *sterile interstice* ca 2 times the length of the female zone, white, conspicuously narrowed corresponding to the spathe constriction; *synandrodia* elongated rhombo-hexagonal, ca 5 by 2 mm, the lower ones prismatic and not connate and thus staminodial, distinctly raised, proximally ivory and slightly glaucous, synandrodies on the main, narrowed part of the interstice white; *male flower zone* cylindrical, ca 8 by 1 cm., dirty whitish cream, slightly glaucous; *synandria* 3–5 androus, rhombo-hexagonal, synconnective flat, ca 1 by 2 mm diam.; *appendix* less than 1/3 the length of the spadix, very slightly thicker than the male zone at the base, thence tapering, with conspicuous brain-like patterning of longitudinal grooves, pale cream. *Fruiting spathe* ovoid, ca 6–9 cm long, green. *Fruits* not observed.

Thailand.— SOUTHEASTERN: Chanthaburi [typus: Khao Soi Dao range, road to Ban Tamun, ex. Cult. Forest Herbarium sub. *Boyce* AL-204, 23 March 2008 (holotype BKF)].

Distribution. — Endemic.

Ecology. — Dry evergreen forest on granite; altitude ca 500 m.

Vernacular. — None recorded.

Uses. — None recorded.

Notes. — *Alocasia hypoleuca* is evidently closely related to *A. macrorrhizos* but readily distinguished by the very tall, slender, leafless stems that remain self supporting

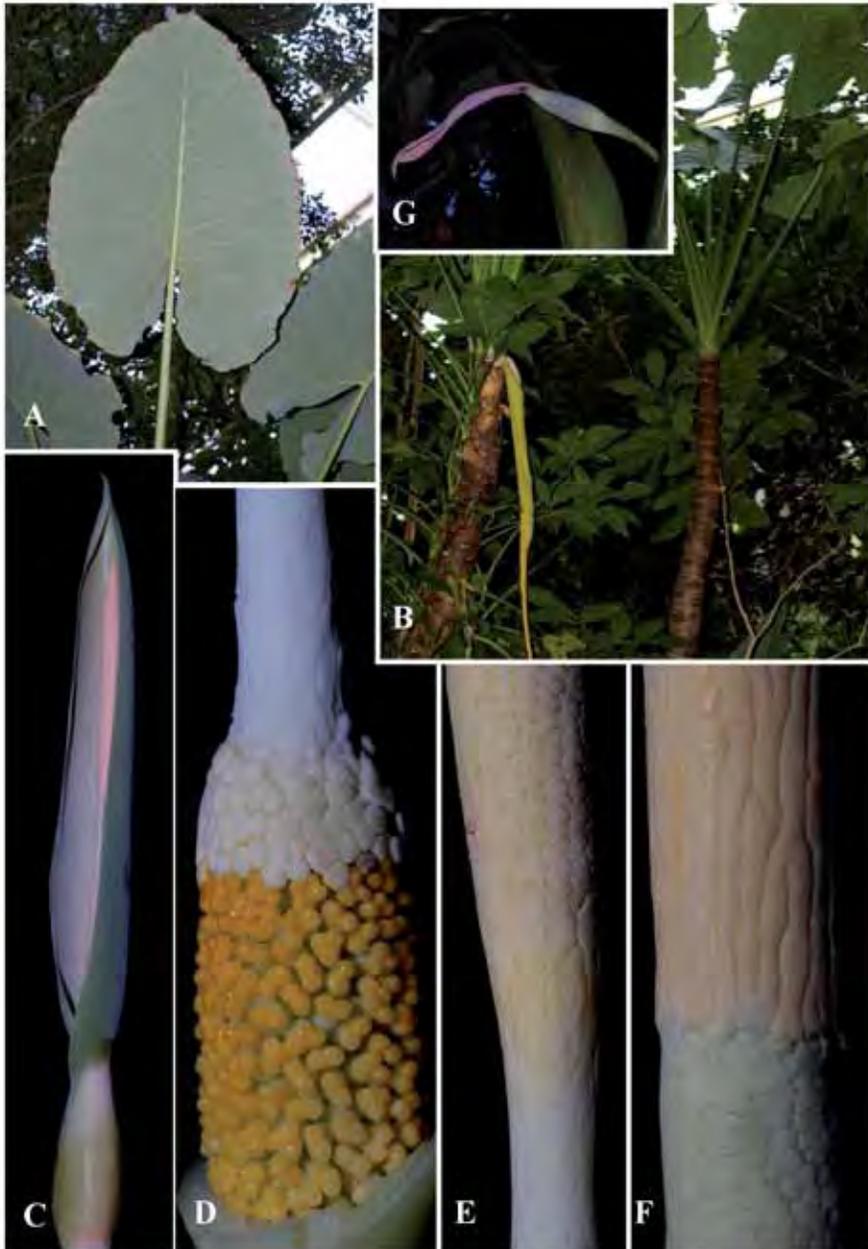


Figure 1. *Alocasia hypoleuca* P.C.Boyce. A. Leaf lamina showing glaucous abaxial surface; B. Mature plants. The naked portion of the stems exceeds 2 m tall; note that the left hand stem hosts a lianescent aroids, *Syngonium podophyllum*. C. Inflorescence at female anthesis. Note the glaucous exterior and particularly interior of the spathe limb. D. Detail of the female flower zone, the suprapistillar staminodes and the sterile interstice clothed with synandrodes. Note that the staminodes and synandrodes are slightly glaucous. E. Detail of the upper sterile interstice and the lower part of the male flower zone. F. Detail of the male flower zone and the appendix. Note the longitudinal grooves of the appendix giving a brain-like pattern. G. Semi-mature infructescence with spathe limb dry and persisting. Later the spathe limb will become marcescent.



Figure 2. *Alocasia hypnosa*: A. Inflorescence, side view; B. Inflorescence front view. *Alocasia perakensis*: C. Whole plant in early fruit with one emerging new inflorescence; D. Inflorescence at male anthesis. Images © Rachun Pooma, Forest Herbarium. Used with permission.

long after stems of similar length would be decumbent in *A. macrorrhizos*, the leaves conspicuously glaucous abaxially, the spathe limb internally and to an extent externally glaucous, the much more numerous and smaller synandria (ca 1 mm diam) with flat (not convex) synconnectives, the proportionately shorter (less than  $\frac{1}{3}$  spadix length) appendix and the deeply cleft, erect stigma lobes. The spathe is marcescent into fruiting (*vs.* deliquescent).

*Alocasia hypoleuca* has potential as a landscaping ornamental, and would make an excellent candidate for *ex situ* conservation (in a broad sense) through the medium of ornamental horticulture sustained by tissue culture.

**5. *Alocasia longiloba*** Miq., Fl. Ned. Ind. 3: 207. 1856 Hook.f., Fl. Brit. India 6: 527. 1893; Ridley, Fl. Malay Penins. 5: 97 (sub. *A. denudata*). 1925; Gagnepain in H.Lecomte, Fl. Indo-Chine 6: 1147. 1942; Hay, Gard. Bull. Singapore 50: 299. 1998.—*Alocasia cuspidata* Engl., Bot. Jahrb. Syst. 25: 25. 1898.—*Alocasia amabilis* W.Bull, Cat. 143: 9. 1878.—*Alocasia cochinchensis* Pierre ex Engl. & K.Krause in H.G.A.Engler, Pflanzenr., 4. 23E: 103. 1920.—*Caladium veitchii* Lindl., Gard. Chron. 1859: 740. 1859.—*Alocasia veitchii* (Lindl.) Schott, Ann. Mus. Bot. Lugduno-Batavi 1: 125. 1863.—*Alocasia lowii* var. *veitchii* (Lindl.) Engl. in A.L.P.de Candolle & A.C.P.de Candolle, Monogr. Phan. 2: 508. 1879.—*Alocasia amabilis* W. Bull, Retail List 143: 9. 1878.

Small to usually robust, evergreen to sometimes seasonally dormant terrestrial (occasionally lithophytic) herbs to 150 cm tall. *Stem* rhizomatous, generally elongate, erect to decumbent, often completely exposed, sometimes swollen and sub-tuberous, ca 8–60 by 2–8cm diam., usually bearing remains of old leaf bases and cataphylls. *Leaves* often solitary, occasionally up to 3 together, subtended by conspicuous lanceolate papery-membranaceous often purplish-tessellate cataphylls degrading to papery fibres. *Petioles* terete ca 30–120 cm long, sheathing in the lower ca  $\frac{1}{4}$  or less, glabrous, purple-brown to pink to green, often strikingly obliquely mottled chocolate brown. *Lamina* pendent, hastato-sagittate, rather narrowly triangular, 27–85 by 14–ca 40 cm, dark to very dark green, usually with the major venation grey-green adaxially, and abaxial surface either green or flushed purple, posterior lobes peltate for (5–)10–30% of their length, acute; anterior costa with 4–8 primary lateral veins on each side, the proximal ones diverging at ca 60–100°; axillary glands conspicuous abaxially; *secondary venation* initially widely spreading, then deflected towards the margin; *interprimary collective* veins weakly formed and zig-zag at widely obtuse angles. *Inflorescences* solitary to paired, up to 4 pairs in succession without interspersed foliage leaves. *Peduncle* 8–18 cm long, resembling petioles, erect at first, then declinate, elongating and then erect in advanced fruit, subtended by a series of progressively larger cataphylls. *Spathe* 7–17 cm long, abruptly constricted ca 1.5–3.5 cm from the base; *lower spathe* ovoid to subcylindric, green; *limb* lanceolate, canoe-shaped and longitudinally incurved, 5.5–7.5 cm, eventually reflexing after male anthesis, membranous, pale green. *Spadix* somewhat shorter than to subequalling the spathe, ca 6–13 cm long, stipitate, stipe conic, to 5 mm long, whitish; *female flower zone* 1–1.5 cm; *ovaries* subglobose, ca 1.5–2 mm diam., green; stigma sessile or on a slender style to ca 0.5 mm long, acutely and conspicuously 3–4-lobed, the lobes pointed, more or less spreading, white; *sterile interstice* 7–10 mm, narrower than the fertile zones, corresponding with the spathe constriction; *lower synandrodia* often with incompletely connate staminodes, the rest elongate rhombo-

hexagonal, flat-topped.; *male flower zone* subcylindric, somewhat tapered at the base, 1.2–2.5 by 4.5–8 mm, ivory white; *synandria* 4–6-merous, more or less hexagonal, ca 2 mm diam.; *appendix* 3.5–9 cm long, about the same thickness as the male zone, demarcated from it by a faint constriction, subcylindric, distally gradually tapering to a point, very pale orange to bright yellow. *Fruiting spathe* ovoid, ca 4–7 cm long, glossy green. *Fruits* globose-ellipsoid, ca 1.5 by 0.75 cm, green, ripening orange-red.

Thailand.— EASTERN: Nakhon Ratchasima; CENTRAL: Nakhon Nayok; SOUTHEASTERN: Prachin Buri, Chanthaburi, Trat; PENINSULAR: Songkhla, Narathiwat.

Distribution.— Cambodia, Lao PDR, S Vietnam north to S.W. China, south to Peninsular Malaysia, Sumatra, Borneo, Java (Type) and Sulawesi.

Ecology.— Rainforest and regrowth understorey, in swampy areas and well drained slopes, occasionally on rocks; altitude: 0–500 m.

Vernacular.— None recorded.

Uses.— None recorded.

Notes.— This species is very widespread. In Borneo and Peninsular Malaysia it intergrades with *A. lowii*, which typically has broader leaf blades and is generally lithophytic on limestone.

**6. *Alocasia macrorrhizos* (L.) G. Don** in R. Sweet, Hort. Brit., ed. 3: 631. 1839; Hook. f., Fl. Brit. India 6: 526. 1893; Ridley, Fl. Malay Penins. 5: 99. 1925; Gagnepain in H. Lecomte, Fl. Indo-Chine 6: 1145. 1942; Hay, Gard. Bull. Singapore 50: 283. 1998 — *Arum macrorrhizos* L., Sp. Pl. 965. 1753. — *Colocasia macrorrhiza* (L.) Schott in Schott & Endlicher, Melet. Bot. 1: 18. 1832. — *Arum indicum* Lour., Fl. Cochinch. 2: 536. 1790. — *Colocasia indica* (Lour.) Kunth, Enum. Pl. 3: 39. 1841. — *Alocasia indica* (Lour.) Spach, Hist. Nat. Vég. 12: 47. 1846.

Massive *pachycaul evergreen herb* to 4 m with slightly milky latex. *Stem* erect to ca 1.5 m, thence decumbent. *Leaves* several to rather many together, clustered at the tips of stems of larger plants. *Petioles* to 1.3 m long, sheathing in lower  $\frac{1}{3}$ – $\frac{1}{2}$ ; *lamina* ovato-sagittate, bluntly triangular in general outline, to 120 by 50 cm, held more or less erect, margin entire to very slightly sinuous, concolorous light green on both surfaces; *primary lateral veins* ca 9 on each side of the anterior costa, diverging at ca 60°; glands in axils of primary veins on abaxial side distinct; *secondary venation* flush with the lamina or but slightly raised abaxially, not forming interprimary collective veins or these only poorly defined; posterior lobes ca  $\frac{1}{3}$ – $\frac{1}{2}$  the length of the anterior, somewhat rotund, often overlapping, naked in the sinus in adult plants, weakly peltate in juveniles. *Inflorescences* paired among the leaf bases, subtended by membranous cataphylls. *Peduncle* barely exceeding the cataphylls at anthesis; *spathe* ca 13–35 cm long, constricted about 1/6th of the way from the base; *lower spathe* green, ovoid; *limb* broadly oblong-lanceolate, ca 10.5–29 cm long, cowl-like at anthesis, later reflexed, then deliquescent, membranous, pale yellow. *Spadix* slightly shorter than the spathe, shortly stipitate; *female flower zone* conic-cylindric, 1–2 by ca 1.5 cm diam.; *ovaries* pale green, ca 3 mm diam.; stigma sessile, 3–5-lobed, the lobes conic, yellow; *sterile interstice* slightly shorter than to equalling the female zone, whitish, very slightly narrowed corresponding to the spathe constriction; *synandrodia* rhombo-hexagonal, ca 2.5 mm diam., lower ones paler, incompletely connate

or with a central hole, the upper ones resembling synandria; *male flower zone* cylindric, ca 3–7 cm long, ca 2 cm diam., whitish; *synandria* 5–9-merous, rhombohexagonal, convex-topped due to cap-forming synconnective, ca 2 mm diam.; *appendix* slightly thicker than the male zone at the base, thence tapering, equalling to considerably exceeding half the length of the spadix, yellowish. *Fruiting spathe* oblong-ellipsoid, ca 8 cm long, green. *Fruits* ellipsoid, ca 12 by 8 mm, ripening scarlet.

Thailand.— PENINSULAR: Phuket. See note below.

Distribution.— Indomalaysia to Oceania. It is not clear where, if anywhere, this species 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

Ecology.— Roadside ditches, margins of wet fields, frequently cultivated as an ornamental in a number of selected forms; altitude: 0–500 m.

Vernacular.— None recorded.

Uses.— Stems formerly used as a subsistence crop in times of famine.

Notes.— Together with *Alocasia cucullata* this is the commonest aroid in Thailand, yet there are almost no collections in herbaria, probably because being so common and also difficult to voucher it is routinely ignored by fieldworkers.

*Alocasia macrorrhizos* is never encountered in the wild but is always closely associated with human settlement. Arguably both *Alocasia macrorrhizos* and *A. cucullata* are cultigens.

A number of ornamental varieties have been recognised, which were discussed by Furtado (1941).

**7. *Alocasia navicularis*** (K.Koch & C.D.Bouché) K.Koch & C.D.Bouché, Index Seminum (B) 1855(App.): 2. 1855. Hook.f., Fl. Brit. India 6: 524. 1893.— *Colocasia navicularis* K.Koch & C.D.Bouché, Index Seminum (B) 1853: 13. 1853.

Massive *pachycaul evergreen herb* to 1.5 m with milky latex. *Stem* erect to decumbent. *Leaves* several together, clustered at the tips of stems of larger plants. *Petiole* to 1.5 m long; petiolar sheath margins membranous; *lamina* peltate, cordato-ovate, 130 by 120 cm, apex short acuminate; *primary lateral veins* 9–12 on each side. *Inflorescences* 2–3 together among the leaf bases. *Peduncle* 40–45 cm, stout, much exceeding the cataphylls at anthesis. *Spathe* ca 10–20 cm long, constricted about 1/6th of the way from the base; *lower part* green, ovoid; *limb* broadly oblong-lanceolate, 18–15 by 4–8 cm, cowl-like at anthesis, dark yellow. *Spadix* shorter than the spathe, shortly stipitate; *female flower zone* 1–2 by ca 1.5 cm diam.; *ovaries* mid-green, ca 3 mm diam.; stigma sessile, 3–4-lobed, the lobes blunt, pale green. *Sterile interstice* equalling the male zone, ivory, narrowed corresponding to the spathe constriction; *synandrodia* rhombo-hexagonal, ca 2.5 mm diam., whitish, stained purple; *male flower zone* cylindric, ca 3–4 cm by 1.5 cm diam., white; *synandria* rhombo-hexagonal, convex-topped due to cap-forming synconnective, ca 1.5 mm diam.; *appendix* elongate-conic, 3–4 by 1–2 cm, equalling 1/3 length of the spadix, about the same thickness as the male flower zone at the base, white. *Fruiting spathe* ellipsoid, ca 5–11 cm long. *Fruits* ellipsoid, ca 10 by 6 mm, ripening dark red.

Thailand.— NORTHERN: Chiang Mai, Chiang Rai, Nan, Lampang, Tak.

Distribution.— N.E. India (Assam), Nepal, N. Bangladesh, N. Burma, N. Lao PDR, N. Vietnam, S.W. China (not confirmed).

Ecology.— Moist evergreen lower montane forest, sometimes on limestone; altitude: 600–1650 m.

Vernacular.— None recorded.

Uses.— None recorded.

Notes.— *Alocasia navicularis* is a common species in the wild but rather poorly represented in herbaria. It is most similar to *A. odora* but easily distinguished by the dark yellow spathe limb, and in lacking stolons at the base of the stems.

**8. *Alocasia odora*** (Lindl.) K. Koch, Index Seminum (B) 1854(App.): 2. 1854; Gagnepain in H. Lecomte, Fl. Indo-Chine 6: 1147. 1942.— *Caladium odorum* Lindl., Bot. Reg. 8: t. 641. 1822.— *Arum odorum* (Lindl.) Roxb., Fl. Ind. ed. 1832, 3: 499. 1832.— *Colocasia odora* (Lindl.) Brongn., Nouv. Ann. Mus. Hist. Nat. 3: 145. 1834.— *Alocasia tonkinensis* Engl., Pflanzenr., IV, 23E: 91. 1920.

Massive *pachycaul evergreen herb* to 2.5 m with slightly milky latex. *Stem* erect to decumbent, with short stolons terminating in tubercles arising from the base. *Leaves* several to rather many together, clustered at the tips of stems of larger plants. *Petiole* to 1.5 m long; *petiolar sheath* membranous; *lamina* peltate, cordato-sagittate or cordato-ovate, to 130 by 100 cm, apex short acuminate, base margins undulate; *primary lateral veins* 9–12 on each side; *interprimary veins* forming well-defined interprimary collecting veins. *Inflorescences* 2–3 together among the leaf bases, subtended by membranous cataphylls. *Peduncle* stout, ca 35 cm long, exceeding the cataphylls at anthesis. *Spathe* ca 13–25 cm long, constricted about  $\frac{1}{6}$ <sup>th</sup> of the way from the base; *lower part* ovoid, green; *limb* broadly oblong-lanceolate, 10–30 by 4–8 cm, cowl-like at anthesis, later reflexed, then deliquescent, membranous, greenish white. *Spadix* shorter than the spathe, shortly stipitate; *female flower zone* 1–2 by ca 1.5 cm diam.; *ovaries* pale green, ca 3 mm diam.; stigma sessile, weakly 3-lobed, the lobes blunt, pale green; *sterile interstice* equalling the male zone, ivory, very slightly narrowed corresponding to the spathe constriction; *synandrodia*, composed of rhombo-hexagonal, ca 2.5 mm diam.; *male flower zone* cylindric, ca 3–5 cm long, ca 2 cm diam., whitish; *synandria* rhombo-hexagonal, convex-topped due to cap-forming synconnective, ca 1.5 mm diam.; *appendix* elongate-conic, 3–5.5 by 1–2 cm, equalling  $\frac{1}{3}$  length of the spadix, markedly thicker than the male zone at the base, thence slowly tapering, white. *Fruiting spathe* ca 6 cm long. *Fruits* globose, ca 1 cm diam., ripening scarlet.

Thailand.— SOUTHWESTERN: Kanchanaburi; PENINSULAR: Phuket.

Distribution.— India (Assam) through to SW China, SW Cambodia and east to Japan (Ruykyu Is.).

Ecology.— Primary and secondary tropical rain forests, bamboo-thickets, riverbanks, swamps, sometimes on limestone; altitude: below 1700 m.

Vernacular.— None recorded.

Uses.— In China the rhizomes are used for the treatment of stomach ache and abdominal pain, cholera and hernia; externally to treat abscesses, snake or insect bites.

Notes.— *Alocasia odora* is a widespread and common species in the wild but, as with most of the macroherb Araceae is very poorly represented in herbaria due to the difficulty of collecting and preparing an adequate herbarium specimen.

*Alocasia odora* is often confused with *A. macrorrhizos* although as adult plants they are readily distinguished: *A. odora* has peltate leaves and proportionately much shorter spadix appendix. Further, *Alocasia macrorrhizos* never produces stolons from the base of the stems.

**9. *Alocasia perakensis*** Hemsl., J. Bot. 25: 205. 1887; Hay, Gard. Bull. Singapore 50: 316. 1998. Fig. 2C–D.

Semi-erect to decumbent, evergreen herb to ca 75 cm tall. *Stem* creeping to decumbent, somewhat elongate. *Leaves* several along the stem, irregularly interspersed with lanceolate cataphylls to 8 cm long drying red-brown. *Petiole* to ca 40 cm long, sheathing in the lower ¼, grey-green to purple-brown; *lamina* ovate to elliptic, peltate, coriaceous to thickly coriaceous and subsucculent, dark green to grey-green, apex broadly acute, acuminate for ca 1.5 cm, the margin mostly entire, occasionally somewhat sinuous in the lower part; *primary lateral veins* 2–3(–4) on each side of anterior costa, diverging at ca 45°–60°, running to a submarginal vein ca 1 mm from the margin; *secondary venation* not forming interprimary collective veins, mostly inconspicuous, but, like primary venation, adaxially impressed in dry state in thickly coriaceous leaves, posterior lobes completely united except for a shallow retuse notch, rarely with an acute notch to ca 1 cm deep. *Inflorescence* solitary to paired. *Peduncle* about half to subequalling the length of the petiole. *Spathe* ca 6 cm long; *lower spathe* ovoid, ca 3 cm long; *limb* narrowly ovate, ca 3 cm long, at first erect, then reflexed, greenish white. *Spadix* shorter than spathe, ca 5 cm long, stipitate for 4 mm. *Female flower zone* ca 7 mm long; *ovaries* globose, ca 2.5 mm diam. style 1.5 mm long; stigma prominently 2–3-lobed; *sterile interstice* ca 2.5 mm long, a single whorl of synandrodia; *male flower zone* 1.5 cm long, entirely within the lower spathe chamber, conic, ca 8 mm diam. at base narrowing to 5 mm at apex corresponding with spathe constriction; *synandria* 3–5-merous, ca 4 mm diam., more or less hexagonal; *appendix* narrowly cylindrical, ca 2.5 cm long, 4 mm diam., deeply grooved, white to yellowish. *Fruiting spathe* ovoid, ca 4 cm long. *Fruit* an ellipsoid berry ca 1 by 0.4 cm, ripening bright red.

Thailand.— PENINSULAR: Yala.

Distribution.— Peninsular Malaysia (Type).

Ecology.— In montane forests, in leaf litter and on rocks; altitude: 1100–1525 m.

Vernacular.— None recorded.

Uses.— None recorded.

Notes. — *Alocasia perakensis* is a new record for Thailand and another example of a link between the aroid flora of the Central Range of Peninsular Malaysia with the mountainous area near Yala; other examples of southern Thai/Central Range disjunction are *Piptospatha perakensis* (Engl.) Ridl., *Pothos curtisii* Hook.f., *P. kingii* Hook.f. *P. macrocephalus* Scort. ex Hook.f. & *Scindapsus scortechinii* Hook.f.

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### REFERENCES

- Boyce, P.C. (2007). Studies on the *Alocasia* Schott (Araceae-Colocasieae) of Borneo: I. Two new species from Sarawak, Malaysian Borneo. *Gardens Bull. Singapore* 58(2): 141–154.
- Furtado, C.X. (1941). *Alocasia macrorrhiza* and its varieties. *Gardens Bull. Singapore* 11: 244–257.
- Hay, A. (1994). *Alocasia simoniana*, a new species of Araceae from New Guinea. *Blumea* 38: 331–333.
- \_\_\_\_\_. (1996). A new Bornean species of *Colocasia* Schott (Araceae: Colocasieae) with a synopsis of the genus in Malesia and Australia. *Sandakania* 7: 31–48.
- \_\_\_\_\_. (1998). The genus *Alocasia* (Araceae-Colocasieae) in West Malesia and Sulawesi. *Gardens Bull. Singapore* 50: 221–334.
- \_\_\_\_\_. (1999). The genus *Alocasia* (Araceae-Colocasieae) in the Philippines. *Gardens Bull. Singapore* 51: 1–41
- \_\_\_\_\_. (2000). *Alocasia nebula*. *Bot. Mag., n.s.* 17(1): 14–18, pl. 381
- Hay, A., Boyce P.C. & Wong, K.M. (1997). *Alocasia melo*. *Bot. Mag., n.s.* 14(2): 82–86, pl. 315.
- Hay, A. & Wise, R. (1991). The genus *Alocasia* (Araceae) in Australasia. *Blumea* 35: 499–545.
- Noltie, H. (1994). Araceae. *Flora of Bhutan* 3(1): 121–158.
- Yuzammi & Hay, A. (1998). *Alocasia suhirmaniana* (Araceae-Colocasieae): a spectacular new aroid from Sulawesi, Indonesia. *Telopea* 7(4): 303–306.