Studies on the Araceae of the Lesser Sunda Islands I: New distribution records for *Alocasia alba*

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ABSTRACT. *Alocasia alba* Schott is a new record for the islands of Bali and Lombok, in the Indonesian Lesser Sunda Islands. An expanded description is given, and the species illustrated from living plants. A key to species of *Alocasia* for the Lesser Sunda Islands is provided.

Keywords. *Alocasia alba*, aroids, Indonesia, Lesser Sunda Islands, new record

Introduction

The Lesser Sunda Islands (LSI) comprise many small islands of two countries, Indonesia (the majority of the islands), and Timor Leste (comprising the eastern portion and a discrete north western enclave of Timor Island). In Indonesia, administratively, the LSI belong to three provinces: Bali, Nusa Tenggara Barat (comprising Lombok and Sumbawa Islands), and Nusa Tenggara Timur (comprising Sumba and Flores Islands, and most of the western half of Timor Island). The LSI are among the least well investigated parts of Malesia for many families, including the Araceae, although in the past five years fieldwork in the LSI focusing on Araceae has been undertaken by the first and second authors. One aim of this fieldwork has been to establish a living research collection in the Bali Botanical Garden, an essential prerequisite for working on the aroid flora. From this so far three novelties from Sumbawa and Lombok have been identified (one species of *Alocasia* and two of *Homalomena*), all as yet undescribed, together with at least 10 new species records for Bali.

Alocasia comprises about 100 species of mainly understory herbs from humid evergreen tropical and subtropical forest in Asia and Australia (Boyce 2007, 2008; Hay 1998, 1999, 2000; Hay & Wise 1991; Kurniawan & Boyce 2011; Medecilo et al. 2007; Nauheimer et al. 2012). The latest monograph for *Alocasia* of West Malesia and Sulawesi is Hay (1998), since when several additional species have been described from Borneo (Hay 2000; Boyce 2007, 2008; Kurniawan & Boyce 2011). A recent phylogeny of *Alocasia* by Nauheimer et al. (2012) suggested several dispersal events leading to speciation in Malesia, and revealed that *Alocasia* and *Leucocasia* (formerly

Colocasia) *gigantea* (Blume) Schott formed a lineage separate from the rest of the Colocasieae *sensu* Mayo et al. (1997).

Hay (1998) records only one *Alocasia* species for the Lesser Sunda Islands, the widespread cultivated/feral and certainly non-indigenous *A. macrorrhizos* (L.) G.Don. Over the course of fieldwork on Bali and Lombok, plants of what are without doubt *A. alba* (Fig. 1) have been encountered in habitats well-away from possible human introduction, such that we are now confident that *Alocasia alba* is naturally occurring on these islands, representing a new distributional record for a species until now considered primarily a Javan species (Hay & Yuzammi 2000).

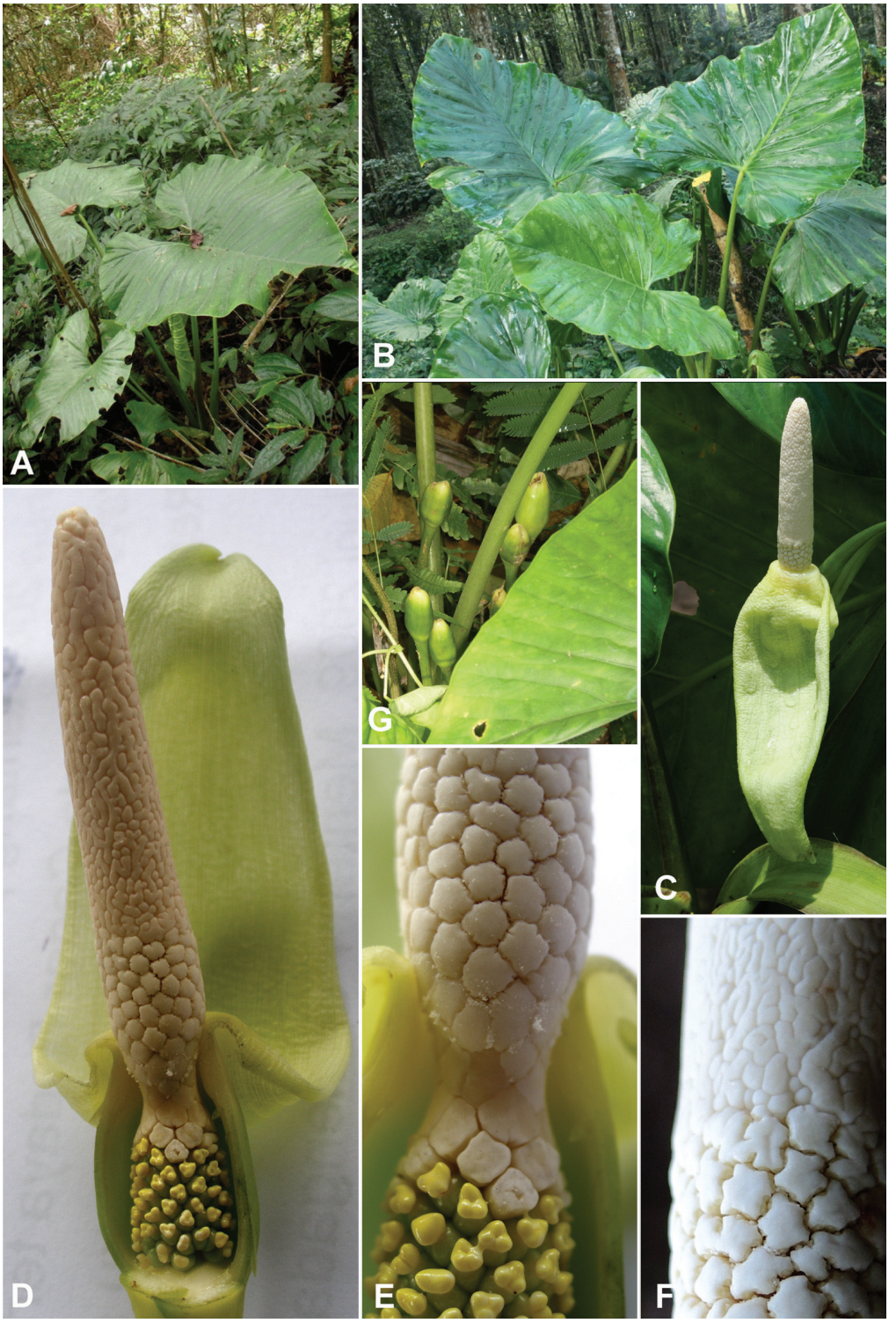
Alocasia alba Schott, Oesterr. Bot. Wochenbl. 2: 59 (1852); Miq., Fl. Ind. Bat. 210 (1856); Schott, Syn. Aroid. 48 (1856); Schott, Prod. Syst. Aroid. 149 (1860); Engl., in A. & C.DC., Monogr. Phan. 2: 500 (1879); Hook.f., Fl. Brit. India 6: 528 (1893); Hay, Gard. Bull. Singapore 50: 289 (1998); Hay & Yuzammi, Curtis's Bot. Mag. 17(3): 216–220, Pl. 403 (2000). TYPE: Schott Icones nos. 86–88 (neotype W, designated by Hay 1998). [fiche 68: d6–d8 in the microfiche edition].

Alocasia bantamensis Koord., Bull. Jard. Bot. Buitenzorg III, 1: 162 (1918); K. Krause, in Engl. & K. Krause, Pflanzenr. 71(IV.23E): 84 (1920); Koord., Exkurs.-Fl. Java 4: 195–196, fig. 395–396 (1923); Backer & Bakh.f., Fl. Java 3: 119 (1968). TYPE: *S. H. Koorders 41445β*, Indonesia, Java, Bantam, Danoe-moeras, 26 May 1912 (Lectotype L!, selected by Hay 1998).

Alocasia crassifolia Engl., in Engl., Pflanzenr. 71: 82 (IV.23E) (1920); Koord., Fl. Tjibodas 6 (1922). TYPE: *A. Engler 4101,* Indonesia, Java, Hort. Bogor, Jan–Feb 1906 (holo B!).

Large, stout, often helophytic, pachycaul, up to 2 m tall; ***leaves*** several together, held erect and declined near post mature, petiole green, whitish-greenish at the sinus, with scattered yellowish glands, up to 170 cm long, sheathing in the lower,1/4–1/3 of its length, persistent wings, green-purplish, straight to recurved; ***blade*** thick, rather stiff,

Fig. 1. *Alocasia alba* Schott. **A.** Plants in natural habitat in Bali's Batukaru Reserve. **B.** Plants from Mt. Rinjani, East Lombok in cultivation at the Bali Botanical Garden. **C.** Inflorescence at onset of staminate anthesis. Note that the spathe limb has reflexed and is just beginning to degrade. **D.** Plant from Bali, Munduk Pengubengan, with inflorescence at pistillate anthesis, nearside part of lower spathe artificially removed. Note the erect spathe limb; at this stage the stigmas are sticky. **E.** Detail of the spadix of same inflorescence as D, at staminate anthesis. Note that the spathe limb has reflexed (just visible) and that pollen release has started. At this stage the stigmas are hardly sticky. **F.** Detail of the upper portion of staminate flowers and lower part of appendix. **G.** Plant at early fruiting stage, West Lombok. Note that the infructescences are paired. A from *Ni Putu Sri Asih 30*; B from *Wayan Warnata 775*; C from *Agung Kurniawan 338*; D–F from *Bayu Adjie 753*; G no voucher. (Photos: A, D, E & F, Ni Putu Sri Asih; B–C, Gede Wawan Setiadi, used with permission; G, Agung Kurniawan).


A
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slightly bullate, green adaxially, greenish-green abaxially, broadly ovato-sagittate to cordato-sagittate, margin entire; ***anterior lobe*** c. 80 cm long, c. 75 cm wide at base, apex shortly acuminate; anterior midrib with up to 11 primary veins diverging at 40°–60°, prominent on both surface with conspicuous small flat glands in the axils abaxially; secondary veins impressed adaxially, prominent abaxially, interprimary collective vein well-defined; submarginal vein 1–2 mm from margin; ***posterior lobes*** obtuse c. 45 cm long from the sinus; ***inflorescence*** in groups of up to c. 10, not interspersed with foliage leaves (but occasionally occuring as a solitary pair of inflorescenecs); peduncle up to 38 cm long, with scattered small broadly elliptic glands; ***spathe*** to c. 17 cm long, constricted at level of sterile zone of the spadix, lower spathe broadly ovoid-cylindric, c. 5 cm from the base, green-ivory greenish, the limb reflexed between staminate zone and sterile zone, thinly leathery, greenish yellow to greenish white, up to 12 cm long; ***spadix*** cylindrical, c. 15 cm long, sessile to very shortly stipitate; ***pistillate flower zone*** c. 1.7–2.2 cm long, 1–1.4 cm wide, with c. 60–100 pistils, densely arranged; ovary green, ovoid to subglobose, 2–3 mm in diam.; style abruptly-differentiated from ovary and c. 1mm long, to lacking; stigma white-ivory-yellowish, 2–3 lobed, *sterile interstice* c. 1–1.6 cm long, with c. 5–6 whorls of rhombo-hexagonal synandrodia, the lowermost whorls isodiametric with pistillate zone and resembling sterile synandria; ***staminate flower zone*** ivory, c. 2.5–3.5 cm long, c. 1–1.5 cm wide; synandria white-ivory, swollen-topped, rhombo-hexagonal, 2 mm diam., thecae overtopped by synconnective; appendix ivory, c. 5.5–8 cm long, tapering, smooth to faintly rugose and composed of irregular sinuous staminode, basally isodiametric to or slightly narrower than the staminate zone; fruiting peduncle to c. 25 cm long; fruiting spathe broadly ovoid, to 6 cm long; fruit ellipsoid, orange, 5mm.

Distribution. Widespread at low to medium elevation on Java. Hay (1998) stated he saw plants likely to be *A. alba* near Telukbetung, on the Palembang road, SE Sumatera in 1996, but circumstances prevented preparation of a voucher. This observation is supported by a collection in Leiden (barcode L 0295537), determined by Schott as *A. alba*, with label data stating Telukbetung.

Specimens examined from LSI localities. INDONESIA. **Bali:** Tabanan District, Batukaru Reserve, 08°22′18″S 115°06′15″E, *Ni Putu Sri Asih 30 [Bali Botanical Garden Accession E2012100002]*; Tabanan District, Pengelengan Hill, 08°15′27″S 115°10′26″E, *Agung Kurniawan 338 [Bali Botanical Garden Accession E2011073]*; Karangasem District, Munduk Pengubengan, 08°21′31″S 115°27′48″ E, *Bayu Adjie 753 [Bali Botanical Garden Accession E20110952]*. **Lombok:** East Lombok District, Mt Rinjani, 08°19′42″S 116°30′08″E, *Wayan Warnata 775 [Bali Botanical Garden Accession E20100797]*.

The material listed above is vouchered by specimens kept in the Herbarium of the Bali Botanical Garden. In addition to the above vouchered material, the first author saw *A. alba* growing in Aik Nyet Village (08°32′01″S 116°14′05″E), West Lombok District in 2010.

Ecology. In open and shaded areas in forest, edge of forest, beside roads and fields, sandy-stony soil in river banks, on well-drained soils, in Bali and Lombok found at 300–1300 m asl.

Notes. *Alocasia alba* is known from four locations in the Lesser Sunda Islands: three on Bali, and one on Lombok. Plants at all sites are similarly characteristic with prominent primary veins on both surfaces of the blade, with the sinuous interprimary collective veins abaxially very well-defined, and the sinus of the posterior whitish in colour, the spadix with the lowermost whorls of synandrodia isodiametric with the pistillate zone, the style abruptly-differentiated from ovary, and 2–3 lobed stigmas. However there is some variation in plants between the four sites. Plants at Pengelengan Hill (Tabanan, Bali) have a sessile spadix with the sterile interstice and pistillate flower zones of equal length and some of the stigmas deeply lobed and ivory in colour, and the leaf blade cordato-sagittate. These morphological traits are shared by plants of *A. alba* at the Batukaru Reserve (Tabanan, Bali). Furthermore *A. alba* from Batukaru Reserve (Bali) has the longest staminate zone than other *A. alba*, a staminate zone of somewhat equal length to the sterile appendix, the most slender sterile interstice compared to other *A. alba*, and a sterile interstice almost equal to or shorter than the pistillate zone. Plants of *A. alba* from Munduk Pengubengan (Karangasem, Bali) have the spadix sessile, and white-yellowish stigmas, with the sterile interstice shorter than the pistillate zone, and a leaf blade ovato-sagittate in outline, with the petiolar sheath proportionately shorter than the other *A. alba* (c. 1/4 length of petiole).

Alocasia alba from Mount Rinjani (Lombok) has a very shortly stipitate spadix, white stigmas, a sterile interstice shorter than pistillate zone, but longer than in other populations, and a leaf blade cordato-sagittate in outline.

Key to Species of *Alocasia* in the Lesser Sunda Islands

1a. Leaf blades without interprimary collective veins or these poorly-defined; inflorescences paired among leaf bases, spathe 13–35 cm long, limb membranous; stigma yellow, 3–5-lobed, appendix yellowish (widespread in ruderal situations, naturalised) ..... *A. macrorrhizos*

1b. Leaf blades with well-defined interprimary collective veins, inflorescences forming a dense cluster at the apex of the stem, not interspersed with foliage leaves (sometimes a solitary pair of inflorescence); spathe c. 17 cm long, thin-leathery; stigma white-ivory-yellowish, 2–3-lobed, appendix ivory ..... *A. alba*

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