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LECYTHIDACEAE

(G.T. Prance, Kew & E.K. Kartawinata, Bogor)[1]

Lecythidaceae A.Rich. in Bory, Dict. Class. Hist. Nat. 9 (1825) 259 ('Lécythidées'), nom. cons.; Poit., Mém. Mus. Hist. Nat. Paris 13 (1835) 141; Miers, Trans. Linn. Soc. London, Bot. 30, 2 (1874) 157; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 30; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 26; Whitmore, Tree Fl. Malaya 2 (1973) 257; R.J.F.Hend., Fl. Australia 8 (1982) 1; Corner, Wayside Trees Malaya ed. 3, 1 (1988) 349; S.A.Mori & Prance, Fl. Neotrop. Monogr. 21, 2 (1990) 1; Chantar., Kew Bull. 50 (1995) 677; Pinard, Tree Fl. Sabah & Sarawak 4 (2002) 101; H.N.Qin & Prance, Fl. China 13 (2007) 293; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 175. — *Myrtaceae* tribus *Lecythideae* (A.Rich.) A.Rich. ex DC., Prodr. 3 (1828) 288. — *Myrtaceae* subtribus *Eulecythideae* Benth. & Hook.f., Gen. Pl. 1, 2 (1865) 695, nom. inval. — Type: *Lecythis* Loefl.

Napoleaeonaceae A.Rich. in Bory, Dict. Class. Hist. Nat. 11 (1827) 432. — *Lecythidaceae* subfam. *Napoleonoideae* Nied. in Engl. & Prantl., Nat. Pflanzenfam. 3, 7 (1893) 33. — Type: *Napoleonaea* P.Beauv.

Scytopetalaceae Engl. in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. 1 (1897) 242. — *Lecythidaceae* subfam. *Scytopetaloideae* (Engl.) O.Appel, Bot. J. Linn. Soc. 121 (1996) 225. — Type: *Scytopetalum* Pierre ex Engl.

Lecythidaceae subfam. *Foetidioideae* Nied. in Engl. & Prantl, Nat Pflanzenfam. 3, 7 (1892) 29. — *Foetidiaceae* (Nied.) Airy Shaw in Willis & Airy Shaw, Dict. Fl. Pl., ed. 8 (1973) 465. — Type: *Foetidia* Comm. ex Lam.

For *Barringtoniaceae* see under subfam. *Barringtonioideae*.

Small to large trees, rarely shrubs. *Leaves* alternate and distichous or spiral (to rarely opposite and clustered), simple, the margins usually entire, pinnately nerved; stipules absent or minute and caducous. *Inflorescences* terminal, axillary or cauline, simple racemes, panicles with 2–3 orders of racemose or spicate branches or fascicles, or flowers solitary. *Flowers* actinomorphic or zygomorphic, hermaphrodite; sepals 2–6 or calyx rarely unlobed; petals 3–6(–8), infrequently 12 or 18, (absent in *Foetidia*); stamens numerous 10–1210, connate at base into a short or long staminal ring, the ring actinomorphic or prolonged on one side into a strap-like structure arching over the summit of the ovary in some Neotropical species; anthers bilocular, latrorse, introrse or rarely poricidal; ovary inferior or semi-inferior, usually 2–6-locular with 2–115 anatropous ovules in each locule; the axillary placenta at the apex, base or throughout the length of the locule; ovules bitegmic, tenuinucellate; style short or long, undivided. *Fruits* indehiscent, then dry, fleshy or woody, or dehiscent by a circumscissle operculum (Neotropics), then woody; seeds winged or without wings; endosperm lacking or very scanty; embryo undifferentiated or with plano-convex or foliaceous cotyledons.

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1) With contributions by P. Baas & F. Lens (wood anatomy) and R.W.J.M. van der Ham (pollen morphology). — Drawings by M. Anwar, R. van Crevel, Damhuri, A. Fahruroji, H. Jelles, J. Pao, Priyono, Sukirno, R. Wise. Photos on page 116–118 were published with permission from M. Leti, S. Hul, J.-G. Fouché, S.K. Cheng & B. David. 2013. Flore Photographique du Cambodge: 324–326. Editions Privat.

DISTRIBUTION

Twenty four genera in three subfamilies with about 285 species. Only members of the subfamily Barringtonioideae in five genera with 71 species occur in Malesia. The Neotropical species *Bertholletia excelsa*, *Couroupita guianensis*, and a few species of *Gustavia* L. are sometimes cultivated in the region.

HABITAT AND ECOLOGY

Predominantly a lowland rainforest family ranging from swampy coastal areas to submontane forest. Many species are found beside streams and behind mangrove forest. A few high altitude species occur in New Guinea, for example, *Barringtonia acutangula* subsp. *acutangula* up to 1600 m, *B. monticola* up to 2000 m and *B. jebbiana* at 1450 m.

POLLINATION AND DISPERSAL

Most species of *Barringtonia* are night-flowering and visits by bats and moths have been recorded for several species. Norio (2004) recorded the pollination of *Barringtonia racemosa* by moths in Iriomoto Island, Japan. He concluded that this species was able to establish itself so far out of the range of bats because of the visits from the moths *Asota heliconia riukiuana*, *Erasmia pulchella fritzei*, *Milionia basalis pyreri* and *Nevrina procopia*. The fruits of some of the lowland species are distributed by water including the two most widespread ones, *Barringtonia asiatica* and *B. racemosa*, that have both reached many islands in the Pacific and to Madagascar and in the case of the latter to the East African coast. Stocker & Irvine (1983) reported finding seeds of *Barringtonia calyptrata* in casowarie dung in Northern Australia and it is probable that some of the New Guinea species are dispersed by these giant birds.

References: Norio, T., Pollination of Barringtonia racemosa (Lecythidaceae) by moths on Iromote Island Japan. Ann. Tsukuba Bot. Gard. 23 (2004) 17–20. — Stocker, G.C. & A.K. Irvine, Seed dispersal by cassowaries (Casuarius casuarius) in North Queensland's rainforests. Biotropica 15 (1983) 170–176.

TAXONOMY

Traditionally placed in the Myrtales. Thorne (1968) suggested a Thealean relationship and Cronquist (1981) and Takhtajan (1997) both established the order Lecythidales somewhere between the Theales and Malvales. Tsou (1994) was the first to suggest a relationship with the small African family Scytopetalaceae. The Lecythidaceae, Scytopetalaceae and Napoleonaceae are all closely related and are considered as one family by some authors and separate but closely related families by others. Molecular studies (Anderberg et al. 2002, Schönenberger et al. 2005) have shown the three subfamilies Lecythidoideae, Planchonioideae and Foetidoideae to be a monophyletic group and sister to the Sapotaceae within the broadly defined Ericales sensu APG (1998, 2009). The most recent molecular study of Lecythidaceae is Mori et al. (2007) and it shows the Napoleonaeaceae, Scytopetalaceae and Lecythidaceae conform to highly supported clades.

The Malesian species have generally been referred to the subfamily Planchonioideae of Lecythidaceae, but Reveal (1996) showed that there was an older subfamily name Barringtonioideae, which must now be used and is applied here.

The Barringtonioideae has syntricolpate pollen, the cortical bundles have a reversed orientation (with the xylem outside the phloem), the secondary xylem lacks chambered crystals. The Lecythidoideae of the New World has tricolpate pollen, the cortical bundles are of normal orientation and the xylem usually has crystal chains of two types. Most of the neotropical genera, including *Couroupita* and *Bertholletia*, differ from the Barringtonioideae in the highly zygomorphic flowers with the androecium consisting of a basal ring of stamens and a hood with either more stamens or nectariferous staminodes. *Gustavia* has 6–12 petals whereas the Barringtonioideae has 3–4.

The genus *Barringtonia* was revised by Payens (1967) and recently by Prance (2013) and *Planchonia* by Kuswata (1965). The Malaysian genus *Abdulmajidia* was transferred to *Barringtonia* by Prance (2010), because the only difference establishing the genus was that the fruits had more than one seed. However, some species in *Barringtonia* have also been found with two or more seeds.

References: Anderberg, A.A., C. Rydin & M. Källersjö, Phylogenetic relationships in the order Ericales s.l.: analyses of molecular data from five genes from the plastid and mitochondrial genomes. Amer. J. Bot. 89 (2002) 677–687. — Angiosperm Phylogeny Group (APG), An ordinal classification for the families of flowering plants. Ann. Missouri Bot. Gard. 85 (1998) 531–533. — Angiosperm Phylogeny Group III, An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. Bot. J. Linn. Soc. 161 (2009) 105–121. — Cronquist, A., An integral system of classification of flowering plants. Columbia Univ. Press, New York (1981). — Kuswata Kartawinata, E., The genus Planchonia Blume (Lecythidaceae). Bull. Bot. Surv. India 7 (1965) 162–187. — Mori, S., C.-H. Tsou, B. Cronholm & A.A. Anderberg, Evolution of Lecythidaceae: information from combined ndhF and trnL-F sequence data. Amer. J. Bot. 94 (2007) 289–301. — Payens, J.P.D.W., A monograph of the genus Barringtonia (Lecythidaceae). Blumea 15 (1967) 157–263. — Prance, G.T., Notes on the Lecythidaceae of Peninsular Malaysia. Blumea 55 (2010) 14–17. — Prance, G.T., A revision of Barringtonia (Lecythidaceae). Allertonia 12 (2013) 1–184. — Reveal, J.L., Latest news on vascular plant family nomenclature. http://www.plantsystematics.org/reveal/pbio/fam/OLDNEWS98.html. 1996, last updated 1 Jan. 1999, last checked May 2012. — Schönenberger, J., A.A. Anderberg & K.J. Systma, Molecular phylogenetics and patterns of floral evolution in the Ericales. Int. J. Pl. Sci. 166 (2005) 265–288. — Takhtajan, A., Diversity and classification of flowering plants. Columbia Univ. Press, New York (1997) — Thorne, R.F., Synopsis of a putative phylogenetic classification of flowering plants. Aliso 6 (1968) 57–66. — Tsou, C.-H., The embryology, reproductive morphology, and systematics of Lecythidaceae. Mem. New York Bot. Gard. 71 (1994) 1–110.

REPRODUCTIVE MORPHOLOGY

The embryology and reproductive morphology of the entire Lecythidaceae were studied in detail by Tsou (1994). She found the floral morphology of the five genera of the Barringtonioideae to be quite similar and well defined. The common characters of the group are: actinomorphic flowers; ovary inferior throughout development; calyx 3–5-lobed except for a few species of *Barringtonia* in which the calyx is unlobed; petals 3–5, free; aestivation imbricate; stamens numerous and monadelphous with a basal staminal ring; filaments filiform, incurved and twisted before anthesis; style slender and as long or longer than the filaments and often persistent in fruit; intrastaminal nectary disc annular;

stamens widely spreading at anthesis; fruit indehiscent with a persistent calyx at the distal end, winged in *Petersianthus* Merr. Most genera can be distinguished by their floral structures but *Planchonia* and *Careya* can only be distinguished by their embryo types and are questionably separate. The embryo is undifferentiated in *Careya* and with two foliaceous cotyledons in *Planchonia*. Tsou showed that the stamens of *Barringtonia racemosa* are initiated from an androecial ring independently and centripetally rather than centrifugally as reported by Thompson (1927). *Barringtonia* has apical axile placentation, *Careya* has the numerous ovules in a single locule aligned along the ovarian axis, *Chydenanthus* has basal, axile placentation with a very short placenta situated in the lower portion on the axis, *Petersianthus* and *Planchonia* have central axile placentation. Tsou concludes that *Chydenanthus* merits generic rank because of its unusual ovary structure that is two-celled, is cylindrical and as thick as the pedicel. The disc of *Petersianthus* differs from other genera of Barringtonioideae and is short and in cross section more or less triangular, from its summit toward the base of the style is a gentle slope thus forming a shallow nectar cavity that is still above the average level of the receptacle.

References: Thompson, J.M., Studies in advancing sterility: [III] a study in advancing gigantism with staminal sterility with special reference to the Lecythidaceae. Publ. Hartley Bot. Lab. 4 (1927) 5–44. — Tsou, C.-H., The embryology, reproductive morphology, and systematics of Lecythidaceae. Mem. New York Bot. Gard. 71 (1994) 1–110.

CHROMOSOMES

The basic chromosome number of the Barringtonioideae is n = 13 whereas in the Neotropical Lecythidoideae n = 17 (Prance & Mori 1979). The following chromosome numbers for Malesian species have been reported and were summarized in Kowal (1989):

Barringtonia asiatica n = 13 (Morawetz 1986).

Barringtonia racemosa n = 26 (Morawetz 1986).

Careya arborea Roxb. n =13 (Mehra 1972).

Petersianthus macrocarpus (P.Beauv.) Liben (from Africa) n = 13 (Mangenot & Mangenot 1962).

Planchonia valida Blume n = 13 (Sarkar et al. 1976).

References: Kowal, R.R., Chromosome numbers of Asteranthos and the putatively related Lecythidaceae. Brittonia 41 (1989) 131–135. — Mangenot, S & G. Mangenot, Enquête sur les nombres chromosomiques dans une collection d'espèces tropicales. Rev. Cytol. Biol. Veg. 25 (1962) 411–447. — Mehra, P.N., Cytogenetical studies of hardwoods. Nucleus 15 (1972) 64–83. — Morawetz, W., Remarks on karyological differentiation patterns in tropical woody plants. Pl. Syst. Evol. 152 (1986) 49–100. — Prance, G.T. & S. Mori, Fl. Neotrop. Monogr. 21 (1979) 102–106. New York Botanical Garden, New York. — Sarkar, R., R. Mallick & U. Chatterjee, Lecythidaceae: Planchonia valida Blume; in: A. Löve (ed.), IOPB chromosome number reports LXXVI. Taxon 31 (1976) 631–649.

WOOD ANATOMY

(P. Baas & F. Lens)

All five Malesian genera of the Lecythidaceae belong to the wood anatomically rather homogeneous subfamily Barringtonioideae (formerly Planchonioideae). The informa-

tion below is abstracted from Lens et al. (2007), who published a detailed wood anatomical analysis of the Lecythidaceae s.l., partly based on the unpublished manuscripts of Carl de Zeeuw, the PROSEA timber volume 5 (3) on lesser-known SE Asian Timbers (Sosef et al. 1998), as well as the regularly updated Insidewood web database (2002 and onwards). For a full bibliography of the older literature see Gregory (1994).

Characters shared by the Malesian Lecythidaceae are: wood diffuse-porous, with generally indistinct growth rings. Vessels solitary and in radial multiples or rarely also in clusters. Perforations almost exclusively simple. Intervessel pits alternate, non-vestured. Vessel-ray pits of two types: round to oval or irregularly shaped and with reduced borders to simple, and smaller and distinctly bordered. Tyloses often present. Tracheids absent.

Axial parenchyma generally diffuse-in-aggregates or in bands of mostly 1–3 cells wide, sometimes with a tendency to paratracheal parenchyma in *Chydenanthus* and *Petersianthus*.

Fibres mostly non-septate, but sometimes septate in *Chydenanthus*, *Careya* and *Planchonia*, with simple to minutely bordered pits restricted to the radial walls.

Rays uniseriate (rare) and multiseriate (2–7-seriate), heterocellular. Prismatic crystals fairly common in non-chambered ray cells, less commonly also in non-chambered axial parenchyma cells.

The following wood anatomical features hold some promise for generic or even species identification, although it should be realised that not all Malesian species have been studied from a wood anatomical point of view. Intervessel pit size: 6–10 μm in *Planchonia*, 10–12 μm in *Careya*, 10–15 μm in *Chydenanthus*, 12–16 μm in *Petersianthus* and up to 20 μm in *Barringtonia*. Tyloses containing large crystals in some samples of *Barringtonia* only. Axial parenchyma diffuse-in-aggregates to narrowly banded (1 cell wide) in *Careya* and *Planchonia;* conspicuously banded (1–6-seriate) and with a tendency to unilateral paratracheal and vasicentric in *Chydenanthus*, and highly variable in *Barringtonia* and *Petersianthus*. Silica bodies found in ray and axial parenchyma cells of *Petersianthus quadrialatus*.

The fossil wood record includes a number of Eocene and Miocene Barringtonioideae (Gregory et al. 2009).

References: Gregory, M., Bibliography of systematic wood anatomy of Dicotyledons. IAWA J., Suppl. (1994) 1–265. — Gregory, M., I. Poole & E.A. Wheeler. Fossil dicot wood names – an annotated list with full bibliography. IAWA J., Suppl. 6 (2009) 1–220. — Insidewood database. http://insidewood.lib.ncsu.edu (2002 onwards). — Lens, F., P. Baas, S. Jansen & E. Smets, A search for phylogenetically informative wood characters within Lecythidaceae s.l. Amer. J. Bot. 94 (2007) 483–502. — Sosef, M.S.M., L.T. Hong & S. Prawirohatmodjo (eds.), Plant Resources of South-East Asia 5, 3. Timber trees: Lesser-known timbers (1998) 859. Backhuys Publishers, Leiden.

POLLEN MORPHOLOGY

(R.W.J.M. van der Ham)

The Napoleonaeaceae, Scytopetalaceae and Lecythidaceae s.str. are highly supported clades, which together make up a monophyletic group that might be considered as the extended family Lecythidaceae s.l. in the order Ericales (APG III 2009; Stevens 2012).

The set of relationships [Napoleonaeaceae [Scytopetalaceae [Lecythidoideae [Barringtonioideae + Foetidioideae]]]] was recovered by Morton et al. (1998) and Mori et al. (2007).

Pollen data of many genera of the Lecythidaceae s.l. were provided by Erdtman (1952) and Muller (1972). Studies presenting detailed pollen descriptions and/or scanning electron micrographs of smaller groups include: Muller (1973: *Barringtonia calyptrocalyx*), Muller (1979: *Allantoma*, *Asteranthos*, *Cariniana*, *Grias*, *Gustavia*), Straka & Friedrich (1984: *Foetidia*), Mori & Boeke (1987: *Corythophora*, *Eschweilera*, *Gustavia*), Tsou (1994a, b: Barringtonioideae), Appel (1996: Scytopetalaceae) and Frame & Durou (2001: *Napoleonaea*).

Pollen grains of the Napoleonaeaceae are medium-sized monads (P by E = 23–42 by 27–38 μm). Pollen grain shape is suboblate to subprolate (P/E = 0.85–1.20). The aperture system is 3-colporate or 3-colporoidate. The exine is tectate and columellate. The tectum is scabrate-verrucate in *Crateranthus* and finely reticulate to sparsely perforate in Napoleonaea. Frame & Durou (2001) reported the presence of fine threads connecting the mature pollen grains in Napoleonaea.

Pollen grains of the Scytopetalaceae are small to medium-sized monads (P by E = 16–37 by 18–37 μm). Pollen grain shape is oblate to prolate spheroidal (P/E = 0.67–1.12). The aperture system is 3-colporoidate in *Brazzeia*, *Pierrina* and *Rhaptopetalum*, and 3-colpate in *Asteranthos*, *Oubanguia* and *Scytopetalum*. The exine is tectate and columellate. The tectum is finely reticulate to fossulate, usually with duplicolumellate muri.

Pollen grains of the Lecythidoideae are small to medium-sized monads (P by E = 17–35 by 16–44 μm) or sometimes tetrads (see below). Pollen grain shape is spheroidal to prolate (P/E = 1.00–1.44). The aperture system is nearly always 3-aperturate (rarely 4-aperturate in *Gustavia*) and colporate to colporoidate. The exine is tectate and columellate. The tectum is usually perforate to reticulate, sometimes scabrate (*Gustavia*). Pollen dimorphism has been demonstrated in *Couroupita* and *Lecythis* (Jacques 1965, Mori et al. 1980, Tsou 1994b): the fertile pollen from the ring stamens is white, shed as monads, colporoidate and perforate to reticulate, while the sterile pollen (fodder pollen collected by bees to feed their larvae) from the hood stamens is yellow, due to droplets of pollenkitt, shed as tetrahedral tetrads, colpate and scabrate-verrucate. The morphology of the sterile pollen grains seems to be immature. Similarly, sterile pollen from staminodes has been considered immature in several sapindaceous genera (Van der Ham 1990).

Pollen grains of the Foetidioideae are medium-sized prolate monads (P by E = 36 by 25 μm, P/E = 1.44). The aperture system is 3-colporoidate or 3-colpate. The exine is tectate and columellate. The tectum is perforate to foveolate.

The pollen of the Barringtonioideae is the most diverse within the family. It is shed as medium-sized to large monads (P by E = 30–65 by 29–55 μm). Pollen grain shape is suboblate to prolate (P/E = 0.75–1.45). The aperture system is 3-syncolpor(oid)ate. The colpi, except for being connected at the poles, may show several specialised structures: marginal ridges, which may form three polar cushions at the tips of the mesocolpia around the poles, and marginal grooves between the ridges and the mesocolpium centres. The tectum is perforate to reticulate (marginal ridges, polar cushions and sometimes also the mesocolpium centres psilate). Muller (1973) made a comprehensive

study of a single species, *Barringtonia calyptrocalyx*, possessing the above pollen type, using light microscopy and scanning and transmission electron microscopy. The exine appeared to be tectate and columellate, with a relatively thick tectum and thin nexine. He interpreted the specialised structures as solutions to accommodate mechanical stress during dispersal of the pollen grains (harmomegathy).

Erdtman (1952) and Muller (1972) already distinguished between the *Lecythis* pollen type (Foetidioideae, Lecythidoideae, Napoleonaeaceae) and the *Planchonia* pollen type (Barringtonioideae). *Asteranthos* – now in the Scytopetalaceae, but then in the Napoleonaeaceae – has *Lecythis* type pollen, and also the pollen of the other Scytopetalaceae matches this type. The *Lecythis* type conforms to the basic angiosperm pollen type present in many families. However, the *Planchonia* type is a unique and highly specialized pollen type and represents a sound synapomorphy of the Barringtonioideae clade (Morton et al. 1997). Within the *Planchonia* pollen type much variation exists (Tsou 1994a, b). It would be interesting to know whether species in which the derived pollen characters are less advanced (Muller 1972: *Planchonia* type A; Tsou 1994a: type I) are basal in the Barringtonioideae clade.

The unique pollen morphology of the Barringtonioideae lends this group a reliable fossil record. The oldest material is from the Eocene of Borneo, India and Cameroon (Muller 1981, Tsou 1994a), where nowadays representatives of the subfamily still occur.

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PHYTOCHEMISTRY

There are numerous reports of the presence of saponins in *Barringtonia* and *Planchonia*, which accounts for their extensive use as fish poisons. Hegnauer (1966) reported the presence of saponins in fruit, seeds and bark of *Barringtonia acutangula*, *B. asiatica*, *B. racemosa* and in the bark of *Careya arborea*. Darnley Gibbs (1974) records the saponins Barringenol-R and Barringtogenic acid both derivatives of ß-amyrin in *Barringtonia racemosa* and barringtogenols B-D in *B. acutangula*. Rumampuk et al. (2003) isolated a triterpene ester saponin from the seed of *B. asiatica*. Ragasa et al. (2011) reported two new triterpenes from *B. asiatica* germanicol caffeoyl ester and camelliagenone. They also found many other compounds, germanicol trans-coumaroyl ester, spinasterol and trinolein from the fruits and spinasterol, squalene, linolei acid and trinolein from the seeds. Some of these compounds exhibited antifungal activity against *Candida albicans* and caffeoyl ester, camelliagenone and germanicol show antibacterial activity against *Staphylococcus aureus*. Rijai et al. (2004) reported a new triterpenoid saponin from the seeds of *Chydenanthus excelsus* Miers. The seeds of both *B. asiatica* and *C. excelsus* are used in Indonesia to poison fish. Phytochemical isolation of the bark of *Planchonia careya* (F.Muell.) R.Knuth produced 16-deoxybarring-togenol C, barringtogenol C and the previously unreported 16α,21β,22α,28-tetrahydroxyolean-12-en-3-one (Khong & Lewis 1977). Crublet et al. (2003) reported that the leaves of *Planchonia grandis* Ridl. contain three acylated flavonol glycosides. The bark of *Planchonia careya* is saponaceous and infusions show the characteristic frothing at great dilution, 1 : 1000 (Webb 1949). A separated sapotoxin fraction gave a characteristic cherry red colour with concentrated sulphuric acid, but was devoid of haemolytic power (Hamlyn-Harris and Smith 1916, cited by Webb 1949). Webb (1949) reported (under *Careya australis* (Benth.) F.Muell.) that the leaves of this species do not contain any alkaloid. The bark and leaves of *Careya australis*? contain triterpenes and free triterpenes, respectively (Simes et al. 1959).

Sun et al. (2006) isolated and identified five compounds from *Barringtonia racemosa*: 3,3'-dimethoxy ellagic acid, dihydromycetin, gallic acid, bartogenic acid, and stigmasterol.

Cyanogensis is recorded in *Barringtonia racemosa* and *Planchonia spectabilis* Merr. (Darnley Gibbs 1974).

Tannins are present in many species and Hegnauer (1966) mentions tannic acid in the seeds of *Barringtonia asiatica* and in the bark of *B. acutangula*. In Madagascan material of *B. racemosa* the tannin content of the fruit was 13.4 % and the bark 4.4 % and in bark of Indian material 18 %. The tannin content of the leaves of *Careya arborea* is 19 %.

References: Crublet, M., C. Long, T. Sévenet, H.A. Hadi & C. Lavaud, Acylated flavonol glycosides from leaves of Planchonia grandis. Phytochemistry 64 (2003) 589–594. — Darnley Gibbs, R., Chemotaxonomy of flowering plants, 4 vols. McGill-Queens University Press, Montreal (1974). — Hegnauer, R., Chemotaxonomie der Pflanzen 4 (1966) 381–386. Birkhäuser Verlag, Basel. — Khong, P.W. & K.G. Lewis, New chemical constituents of Planchonia careya. Aust. J. Chem. 30 (1977) 1311–1322. — Ragasa, C.Y., D.L. Espineli & C.C. Shen, New triterpenes from Barringtonia asiatica. Chem. Pharm. Bull. (Tokyo) 59 (2011) 778–782. — Rijai, L., S. Sutardjo, H.H. Bahti, U. Supratman, R.J. Rumampuk & W.C. Taylor, A triterpenoid saponin from seeds of Kolowe (Chydenanthus excelsus).

Indones. J. Chem. 4 (2004) 201–205. — Rumampuk, R.J., E.J. Pongoh, P. Tarigan, A.J. Herlt & L.N. Mander, A triterpene ester saponin from the seed of Barringtonia asiatica. Indones. J. Chem. 3 (2003) 149–155. — Simes, J.J.H., J.G. Tracey, L.J. Webb & W.J. Duston, Australian phytochemical survey. III. Saponins in Eastern Australian flowering plants. Bulletin (CSIRO) 281 (1959). — Sun, H.Y., L.J. Long & J. Wu, Chemical constituents of mangrove plant Barringtonia racemosa. Zhong Yao Cai 29 (2006) 671–672. — Webb, L.J., An Australian phytochemical survey. I. Alkaloids and cyanogenetic compounds in Queensland plants. Bulletin CSIRO 241 (1949) 10.

USES

Many species of *Barringtonia* and *Planchonia* are used as fish poisons throughout the region. Both fruit and bark are used to stun fish. The young leaves of some species of *Barringtonia* and *Planchonia* are used in salads and chutnies. The seeds of *B. edulis*, *B. novae-hiberniae* and *B. procera* are widely eaten in the Pacific region and in New Guinea and all three species are cultivated for this purpose (Jebb & Wise 1992). The wood of a few species has limited uses in furniture, house building and other local uses. The straight trunks of some monopodial species from New Guinea are popular for poles. Many local medicinal uses are recorded for several species.

Reference: Jebb, M & R. Wise, Edible Barringtonias. Curtis's Bot. Mag. 9 (1992) 164–172.

KEY TO THE GENERA

1a. Androecium consisting of a ring of free or slightly fused stamens in up to 12 whorls; native to Malesia (subfamily Barringtonioideae) 2
b. Androecium consisting of a hood of sterile or anther bearing stamens; introduced from the Neotropics (subfamily Lecythidoideae) 6
2a. Inflorescence racemose, often pendulous 3
b. Inflorescence paniculate, usually erect 5
3a. Ovules at or near apex of carpel, anatropous or apotropous . . . . **1. Barringtonia**
b. Ovules inserted on whole length or mid part or base of carpel, campylotropous . 4
4a. Embryo undivided, without cotyledons . . . . . **2. Careya**
b. Embryo circinnate, with foliaceous, plicate cotyledons . . . . . **5. Planchonia**
5a. Fruits not winged; pedicel not articulate . . . . . **3. Chydenanthus**
b. Fruit distinctly 4-winged; pedicel articulate . . . . . **4. Petersianthus**
6a. Staminal hood with sterile appendages. Calyx with two lobes. Fruit with hard woody endocarp and free seeds . . . . . **6. Bertholletia**
b. Staminal hood with anther bearing appendages. Calyx with six lobes. Fruit with fragile exocarp and seeds embedded in pulp . . . . . **7. Couroupita**

Subfamily Barringtonioideae

Subfamily *Barringtonioideae* (DC.) Beilschm., Flora (Beibl.) 16 (1833) 97. — Tribus *Barringtonieae* DC., Linnaea 2 (1827) 505. — *Barringtonieae* (DC.) Rudolphi, Syst. Orb. Veg. (1830) 56. — *Barringtoniaceae* (DC.) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 10; A.C.Sm., Fl. Vit. Nova 2 (1981) 594. — *Planchonioideae* Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 30. — Type: *Barringtonia asiatica* (L.) Kurz.

Small to large trees, rarely shrubs, pachycaul or leptocaul. *Leaves* alternate or spirally in whorls at apex or at apex of branches, simple, margins entire or serrate-crenulate, pinnately nerved, usually brochidodromous; stipules absent or minute and caducous. *Inflorescences* terminal, axillary or cauline, simple, often pendulous racemes, or panicles in *Chydenanthus* and *Petersianthus*, or rarely flowers solitary. *Flowers* actinomorphic, hermaphrodite, sessile or pedicellate; bracts and bracteoles usually small and caducous. *Calyx-tube* most frequently campanulate or conical, very rarely winged; sepals 2–6 often circumscissile, unlobed in a few *Barringtonia* species. *Petals* 3–5, free, most often 4, aestivation imbricate. *Stamens* numerous, inserted in 3–8(–12) whorls, usually far-exserted and equalling filaments, connate at base into short staminal ring, the ring actinomorphic, inner whorls often staminodal; anthers bilocular, longitudinally dehiscent, latrorse or introrse. *Disc* an intrastaminal annular ring. *Ovary* inferior, usually 2–4-locular with 2–6 anatropous ovules in each locule, rarely more; the ovules attached at the apex or axially, basal in *Chydenanthus*; ovules bitegmic, tenuinucellate; style slender equalling or usually far exceeding calyx, undivided. *Fruits* indehiscent, dry or fleshy, rarely winged. *Seeds* 1–5(–many in *Planchonia*), without wings except in *Petersianthus*; endosperm lacking or very scanty; embryos undifferentiated (*Careya*) or with plano-convex or foliaceous cotyledons.

Distribution — Five genera distributed from India to the Pacific. Four genera are relatively small and *Barringtonia* much larger with 69 species. *Petersianthus* also has one species in Africa.

1. BARRINGTONIA

(G.T. Prance)

Barringtonia J.R.Forst. & G.Forst., Char. Gen. Pl. (1775) 75, nom. cons.; Thunb., Nov. Gen. Pl. 2 (1782) 46 (‘*Barringtona*’); Murray, Syst. Veg. ed. 14 (1784) 620; Schreb., Gen. Pl. 2 (1791) 473; J.F.Gmel., Syst. Nat. 2 (1791) 1000, 1039; Willd., Sp. Pl. 2 (1807) 30; J.St.-Hil., Expos. Fam. Nat. 2 (1805) 166; Pers., Syn. Pl. 2 (1807) 30; J.Presl, Prir. Rostlin Aneb. Rostl. 2 (1825) 401; Spreng., Syst. Veg. 3 (1826) 288; Sweet, Hort. Brit. (1826) 159; Blume, Bijdr. (1826) 1096; DC., Prodr. 3 (1828) 288; Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1534; Meisn., Pl. Vasc. Gen. 4 (1838), t. 109; Endl., Gen. Pl. 10 (1839) 755; Steud., Nomencl. Bot. 2, 10 (1841) 402; Lindl., Veg. Kingd. (1846) 755; Blume in Van Houtte, Fl. Serres 4 (1848) 483; Walp., Ann. Bot. Syst. 2 (1842) 641; Blume in Van Houtte, Fl. Serres 7 (1851) 22; Miq., Fl. Ned. Ind. 1, 1 (1855) 483; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 859; Miq., Fl. Ned. Ind., Eerste Bijv. (1860) 315; Benth. & Hook., Gen. Pl. 1 (1865) 695; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 55; Kurz, J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 69; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 506; T.Durand, Index Gen. Phan. (1888) 129; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 31; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 2; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 134; Koord., Exkurs.-Fl. Java 2 (1912) 664; Ridl., Fl. Malay Penins. 1 (1922) 712, 756; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 10; Corner, Wayside Trees Malaya 1 (1940) 350; Backer & Bakh.f., Fl. Java 1 (1963) 352; Whitmore, Tree Fl. Malaya 2 (1973) 260; J.A.R.Anderson, Checkl. Sarawak (1980) 230; Cockburn, Trees Sabah 2 (1980) 44; Ng, Man. For. Fr. Seeds Seedlings (1991) 417; Kessler & Sidiy., Tropenbos-Kalimantan Ser. 2 (1994) 159; Chantar., Kew Bull. 50 (1995) 677; Coode et al., Checkl. Pl. Brunei (1996) 158; Beaman et al., Pl. Mt. Kinabalu 4 (2001) 419; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 102; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 175; Prance, Allertonia 12 (2013) 4. — Type: *Barringtonia speciosa* J.R.Forst. & G.Forst. [= *B. asiatica* (L.) Kurz].

Huttum Adans., Fam. Pl. 2 (1763) 88, nom. rejic.; Britten, J. Bot. 39 (1901) 67. — Type: Not designated.

Commersona Sonn., Voy. Nouv. Guinée 1 (1763) 14 (‘*Commerçona*’); Salisb., Prod. Stirp. Chap. Allerton (1796) 355. — *Butonica* sect. *Commersona* T.Post & Kuntze, Lex. Gen. Phan. (1901) 85. — Invalid, no species name given, but illustration is of *Barringtonia asiatica* (L.) Kurz.

Menichea Sonn., Voy. Nouv. Guinée 1 (1776) 133; J.F.Gmel., Syst. Nat. 1 (1791) 770, 799. — Type: *Menichea rosata* Sonn. [= *Barringtonia racemosa* (L.) Spreng.].

Butonica Lam., Encycl. 1, 2 (1785) 521; Juss., Gen. Pl. (1789) 326; Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1535; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 65; T.Post & Kuntze, Lex. Gen. Phan. (1903) 8. — *Barringtonia* J.R.Forst. & G.Forst. subg. *Butonica* (Lam.) Endl., Gen. Pl. 10 (1839) 1233; Kurz, J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 69; Nied. in Engl. & Prantl, Pflanzenfam. 3, 7 (1892) 32. — *Barringtonia* J.R.Forst. & G.Forst. sect. *Butonica* (Lam.) Miq., Fl. Ned. Ind. 1, 1 (1855) 485; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 507; T.Durand, Index Gen. Phan. (1888) 129; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 134; Koord., Exkurs.-Fl. Java 2 (1912) 665; Ridl., Fl. Malay Penins. 1 (1922) 756; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 12. — Type: *Butonica acutangula* (L.) Lam. [=*Barringtonia acutangula* (L.) Gaertn.].

Stravadium Juss., Gen. Pl. (1789) 326; J.St.-Hil., Expos. Fam. Nat. 2 (1805) 166; Pers., Syn. Pl. 2 (1807) 30 (‘*Stravadia*’); J.Presl, Prir. Rostlin Aneb. Rostl. 2 (1825) 400; Sweet, Hort. Brit. (1826) 159; DC., Prodr. 3 (1828) 289; Steud., Nomencl. Bot. 2, 10 (1841) 645; Lindl., Veg. Kingd. (1846) 755; Blume in Van Houtte, Fl. Serres 7 (1851) 23; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 80. — *Barringtonia* J.R.Forst. & G.Forst. subg. *Stravadia* (A.Juss.) Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1535; Meisn., Pl. Vasc. Gen. 4 (1838) t. 109, Comm. 77; Endl., Gen. Pl. 10 (1839) 1233; Kurz, J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 69; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 3. — *Barringtonia* J.R.Forst. & G.Forst. sect. *Stravadia* (A.Juss.) Miq., Fl. Ned. Ind. 1,1 (1855) 488; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 508; T.Durand, Index Gen. Phan. (1888) 129; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 134; Koord., Exkurs.-Fl. Java 2 (1912) 665; Ridl., Fl. Malay Penins. 1 (1922) 756. — *Butonica* Lam. sect. *Stravadium* (A.Juss.) T.Post & Kuntze, Lex. Gen. Phan. (1903) 85. — Type: *Eugenia racemosa* L. [= *Barringtonia racemosa* (L.) Spreng.].

Meteorus Lour., Fl. Cochinch. 2 (1790) 410; Spreng., Syst. Veg. 3 (1826) 127. — Type: *Meteorus coccineus* Lour. [= *Barringtonia acutangula* (L.) Gaertn.].

Mitraria J.F.Gmel., Syst. Nat. 1 (1791) 771, 799, non Cav. (1801). — Type: *Mitraria commersonia* J.F.Gmel. [= *Barringtonia asiatica* (L.) Kurz].

Botryoropis C.Presl, Epimel. Bot. (1851) 220; Walp., Ann. Bot. Syst. 2 (1852) 641. — Type: *Botryoropis luzonensis* C.Presl [= *Barringtonia acutangula* (L.) Gaertn.].

Agasta Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 59. — *Barringtonia* J.R.Forst. & G.Forst. sect. *Agasta* (Miers) T.Durand, Index Gen. Phan. (1888) 129; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 10. — Type: *Agasta splendida* Sol. ex Miers [= *Barringtonia asiatica* (L.) Kurz].

Doxomma Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 98. — *Barringtonia* J.R.Forst. & G.Forst. sect. *Doxomma* (Miers) T.Durand, Index Gen. Phan (1888) 129; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 3; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 26. — *Barringtonia* J.R.Forst. & G.Forst. subsect. *Doxomma* (Miers) Koord., Exkurs.-Fl. Java 1 (1912) 665, pro subsect. — Type: *Doxomma pendula* (Griff.) Miers [= *Barringtonia pendula* (Griff.) Kurz].

Megadendron Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 109. — *Barringtonia* J.R.Forst. & G.Forst. sect. *Megadendron* (Miers) T.Durand, Index Gen. Phan. (1888) 129. — Type: *Megadendron macrocarpa* (Hassk.) Miers [= *Barringtonia macrocarpa* Hassk.].

Michelia Kuntze, Revis. Gen. Pl. 1 (1891) 240, non L. (1753). — *Barringtonia* J.R.Forst. & G.Forst. sect. *Eustravadium* Nied. in Engl. & Prantl, Nat. Planzenfam. 3, 7 (1892) 33, nom. illeg.; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 42. — Type: *Michelia acutangula* (L.) Kuntze [= *Barringtonia acutangula* (L.) Gaertn.].

Careya Roxb. sect. *Barringtoniopsis* Nied. in K.Schum., Notizbl. Königl. Bot. Gart. Berlin 2 (1898) 137. — Type: *Careya niedenzuana* K.Schum. [= *Barringtonia niedenzuana* (K.Schum.) Knuth].
Abdulmajidia Whitmore, Kew. Bull. 26 (1973) 207; El-Sherif & Latiff, Folia Malaysiana 7 (2006) 41. — Type: *Abdulmajidia chaniana* Whitmore [= *Barringtonia chaniana* (Whitmore) Prance].

Shrubs or trees, bark often fissured; growth in flushes with an open terminal bud, each flush often provided with reduced leaves (cataphylls) in the basal part; leaf scars distinct. *Stipules* very small, triangular, acute, caducous. *Leaves* spirally arranged, often clustered at end of branches; petioles flat above, semi-terete beneath, often with decurrent leaf bases, or leaves sessile; blades usually obovate to linear-lanceolate or lanceolate in 2 species, base usually cuneate, margins serrate-crenulate or entire, apex acute or acuminate, midrib prominent on both surfaces. *Inflorescences* racemes, spikes or rarely clustered, terminal, lateral or cauliflorous, usually pendulous, erect in only a few species, glabrous or pulverulent; peduncle often with a tuft of cataphylls at base; bracts small, sessile, caducous; bracteoles very small, caducous. *Flowers* sessile or pedicellate; buds globular. *Calyx* tube (ovary) obconical, mostly 4-angular, sometimes 4-winged, glabrous or pulverulent; calyx chartaceous, parallel-veined, convex, in bud either connate and closed sometimes with a small circular apical pore and at anthesis rupturing into 2–5 persistent segments or with circumscissile rupturing above the base to leave a cup-shaped ring (the calyptra entire or rarely lobed) or with 4(–5) free calyx lobes inserted on a ring-shaped tube slightly elevated above the torus, in bud imbricate, persistent, free sepals always fimbriate, the margin of apical pore similar in structure to that of free sepals. *Petals* usually 4, sometimes 3 or 5, cochlear-imbricate, convex, alternate with free sepals, adnate to the short staminal tube. *Stamens* numerous, strongly folded in bud, connate at base, inserted in 3–8 or rarely up to 12 whorls, the inner whorl or sometimes 2–3 reduced to shorter staminodia, staminodia sometimes connate for up to half their length and then generally exceeding the staminal tube in length; anthers basifixed, 2-celled, latrorse. *Disc* a thin or thick undulating ring surrounding the style base. *Style* long, terete, filiform, folded in bud, persistent often even in fruit, the stigma slightly knob-like, sometimes with an apical pore. *Ovary* inferior, usually tapering into the pedicel, 2–4-celled but the septa often incomplete; ovules usually 2–6 per locule, rarely more, attached apically and axially towards apex only on upper portion, pendent, anatropous, apotropous. *Fruits* obovoid, ellipsoid or fusiform, terete or angled to winged; exocarp thin; mesocarp fibrous or rarely spongy with few fibres; endocarp thin or a layer of fibres. *Seeds* 1–5, large; testa brownish, membranaceous; embryo developing from a pro-embryo, originally with abundant nuclear endosperm which later disintegrates; in later stages embryo solid, spindle-shaped, without cotyledons but with a spiral of minute scales towards apex. — **Fig. 1.**

Distribution — Mainly in the Malesian and Pacific regions also in S Asia and Australasia, with one common species reaching East Africa and 2 in Madagascar.

Habitat & Ecology — Many species are found in fresh-water swamps, near rivers and lakes and other inundated areas and *B. asiatica* is an abundant littoral species. Only a few species occur in upland forest up to 2000 m.

Uses — The bark and fruit of many species are used for fish poisons almost throughout the range of the genus. The young leaves of several species (for example *B. acutangula* and *B. fusiformis*) are used in salads and chutnies. Three species, *B. edulis*,

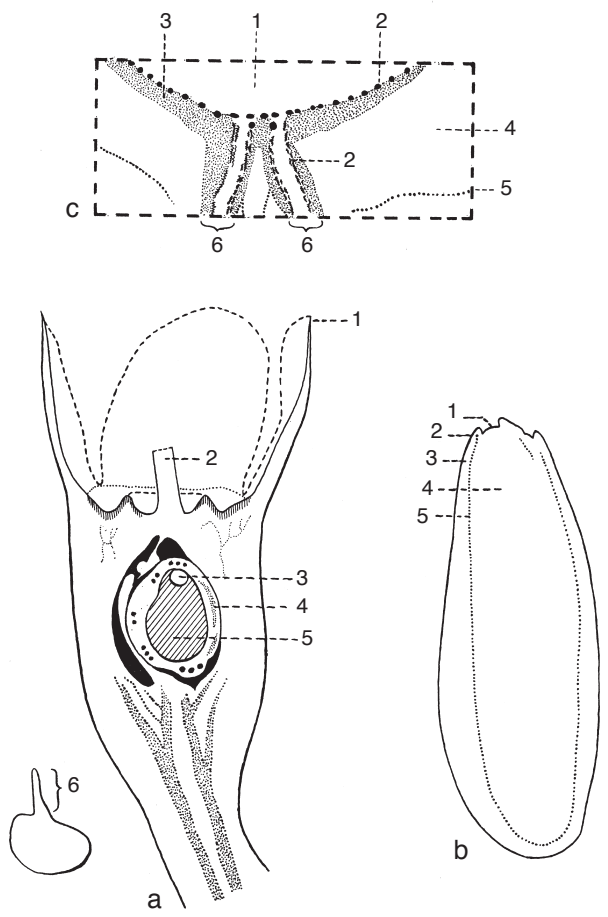


Fig. 1. a. Section of very young fruit of *Barringtonia racemosa* (L.) Spreng. 1. Sepal; 2. style; 3. embryo; 4. young testa; 5. nuclear endosperm; 6. pro-embryo. — b. Section of embryo of *B. asiatica* (L.) Kurz. 1. Apex (apical meristem); 2. scale; 3. cortex; 4. core; 5. vascular traces. — c. Section of base of developing embryo. 1. Core; 2. xylem; 3. vascular tissue; 4. cortex; 5. periderm?; 6. adventitious roots (from Payens 1967).

B. novae-hiberneae and *B. procera* have edible seeds and are often cultivated for them (see Jebb, Bot. Mag. 9, 1992: 164–172). Many local medicinal uses for different parts of the plants have been recorded. The wood of a few species has limited uses.

Taxonomy — *Barringtonia* is clearly closely related to the other Indo-Malesian genera *Careya*, *Planchonia*, *Chydenanthus*. *Adulmajidia*, which was described by Whitmore (1973), nests within *Barringtonia*. *Abdulmajidia* was based on having several vs a single seed. This study has shown that quite often other species have more than one seed, for example *B. conoidea*. In a recent phylogenetic study of the Lecythidaceae, Mori et al. (Amer. J. Bot. 94, 2007: 289–301) based on a molecular study of two genes, *Barringtonia* grouped with the other Old World genera including the African genus *Petersianthus* and the Madagascarian *Foetidia* (Prance, Brittonia 60, 2008: 336–348).

The Old World group of Lecythidaceae are most closely linked to *Grias* and *Gustavia* in the New World, which is hardly surprising given many morphological similarities (such as actinomorphic flowers and the tendency to pachycaul arrangement of the leaves).

The genus *Barringtonia* was established by J.R. & G. Forster (Char. Gen. Pl., 1775: 75), but prior to that date Linnaeus (Sp. Pl., 1753: 471, 512) had described two species in *Eugenia* (Myrtaceae) and one in *Mammea* (*M. asiatica*) that are now placed in *Barringtonia*.

Payens (Blumea 15, 1967: 157–263) recognized two sections in *Barringtonia* based on whether the calyx lobes are free or closed in bud. Those with a free calyx were placed in the Section *Stravadium* (A.Juss.) Miq., which coincides with the genus *Stravadium* of De Jussieu (Gen. Pl., 1789: 326) and later recognized by Miers (Trans. Linn. Soc. London, Bot. 1, 1875: 80) and many others. This group of species certainly belongs within *Barringtonia* and the sections *Stravadium* and *Barringtonia* are maintained here, because it does seem to divide the genus into two distinct groups of related species. Payens also recognized 11 groups of related species to which he gave no taxonomic rank and which have not been separated here.

KEY TO THE SPECIES[1]

1a. Flowers and fruits sessile 2
b. Flowers and fruits pedicellate 29
2a. Calyx in bud closed or closed with an apical pore 3
b. Calyx open with free sepals in bud 13
3a. Leaf margins serrate-crenulate 4
b. Leaf margins entire 8
4a. Calyx in bud with an apical pore . . . . . **20. B. gigantostachya**
b. Calyx in bud completely closed 5
5a. Fruit distinctly 4-winged, hypanthium tetragonous, winged or sharply angled . . . . . **46. B. pterita**
b. Fruit circular in section to subtetragonous, not winged; hypanthium at most only slightly angled 6
6a. Calyx and inflorescence rachis glabrous; fruit ovoid, subtetragonous, lightly winged when young . . . . . **47. B. racemosa**
b. Calyx and inflorescence rachis densely short-pubescent; fruit cylindrical–8-sided, not winged 7
7a. Leaf laminas 100–190(–228) by 22–42 cm; staminal whorls 8–12; hypanthium velvety pubescent, rounded-cupular; fruit without basal hooks . . . **30. B. lumina**
b. Leaf laminas 29–62 by 8–24 cm; staminal whorls 5–6; hypanthium pulverulent, tetragonous; fruit with hooks near base on alternate ribs . . . . . **45. B. procera**
8a. Staminal whorls 8, 3 innermost staminodal, inner whorl exceeding staminal tube . . . . . **40. B. papeh**
b. Staminal whorls 3–7, 1(–2) staminodal, inner whorl not exceeding staminal tube (except in *B. calyptrata*) 9

1) Key excludes *B. flagellata* and *B. payensiana* as they were described from inadequate material.

9a. Inflorescence cauline to ramiflorous; calyx and inflorescence rachis densely fulvous-pubescent or sparsely grey puberulous; calyx circumscissile 10
b. Inflorescence terminal; calyx and rachis glabrous or slightly pulverulent; calyx opening in 2–5 segments 11
10a. Inflorescence densely fulvous or grey-green pulverulent; staminal whorls 4–5(–7) . . . . . **8. B. calyptrata**
b. Inflorescence sparsely grey-puberulous; staminal whorls 3 . . . . . **38b. B. novae-hiberniae** subsp. **kassamii**
11a. Inflorescence with flowers grouped at apex; leaf apex mucronate . . . . . **21. B. glomerata**
b. Inflorescence with flowers spaced along rachis; leaf apex rounded to cuspidate 12
12a. Primary leaf veins 8–15 pairs; twigs 2–4 mm diam.; staminal tube 1–2 mm high . . . . . **3. B. ashtonii**
b. Primary leaf veins 12–50 pairs; twigs 7–20 mm diam.; staminal tube 4–5 mm high . . . . . **53. B. sarcostachys**
13a. Fruit with 3–5 seeds (unknown for *B. terengganuensis*) 14
b. Fruit single seeded 19
14a. Leaf petiole 4–5 mm long . . . . . **58. B. terengganuensis**
b. Leaf petiole 10 mm or more long 15
15a. Leaf margins entire; petioles 1–9 cm long; primary leaf veins 6–9 pairs; inflorescence usually short, 3–12(–26) cm long; fruits large, 9–16 cm diam. 16
b. Leaf margins serrate-crenulate; petioles 3–12 cm long; primary leaf veins 11–30 pairs; inflorescence more than 20 cm long; fruits 3–5 cm long 17
16a. Leaf laminas elliptic; petioles 2 cm or more long; inflorescence 5–12(–26) cm long; fruit 9 cm diam. . . . . **10. B. chaniana**
b. Leaf laminas obovate; petioles 1–2 cm long; inflorescence 2–3 cm long; fruit c. 16 cm diam. . . . . **34. B. maxwelliana**
17a. Leaf laminas linear-lanceolate . . . . . **59. B. zainudiniana**
b. Leaf laminas ovate to elliptic to oblanceolate 18
18a. Leaf laminas elliptic, chartaceous; petioles less than 6 cm long, slightly winged; primary leaf veins 14 pairs or less; ovary 4-locular . . . . . **26. B. latiffiana**
b. Leaf laminas ovate to oblanceolate, coriaceous; petioles 4 cm or more long, not winged; primary leaf veins 14–30 pairs; ovary 3-locular . . . . . **51. B. rimata**
19a. Hypanthium glabrous 20
b. Hypanthium pubescent or pulverulent 23
20a. Leaf margins entire to slightly serrate-crenulate; inflorescence an erect ramiflorous cluster of spikes, 0.5–2.5 cm long. . . . . **25. B. lanceolata**
b. Leaf margins serrate-crenulate; inflorescence a pendulous raceme or spike . . 21
21a. Ovary 2–(3–4)-locular; stamens in 3 whorls **1b. B. acutangula** subsp. **spicata**
b. Ovary 4-locular; stamens in 4–5 whorls 22
22a. Fruit dull, teretish, at most with 4 ribs, mostly with convex sides, 5.5–9 by 2–4 cm; leaf laminas 10–45 by 4–10 cm, chartaceous with flattish margin . . . . . **32. B. macrostachya**

b. Fruit rather smooth, shiny, conspicuously tetragonous with clear angles and flat or depressed sides, 6–10.5 by 2.5–7 cm; leaf laminas 11–22 by 3–8 cm, coriaceous, with recurved margin . . . . . **48. B. reticulata**
23a. Ovary 2–(3–4)-locular; stamens in 3 whorls 24
b. Ovary 3–4-locular; stamens in 4–7 whorls 26
24a. Leaf laminas 26–28.5 by 7–7.5 cm . . . . . **58. B. terengganuensis**
b. Leaf laminas 6–18 by 2–13 cm 25
25a. Leaf laminas elliptic or obovate-oblong, broadest below middle, 6–16 by 2–8 cm, glabrous beneath; petiole 4–15 mm . . . . . **1b. B. acutangula** subsp. **spicata**
b. Leaf laminas obovate-spathulate, broadest above middle, 14–18 by 6–13 cm, densely hirsute on venation beneath; petiole 0–8 mm long . . . . . **6. B. badia**
26a. Hypanthium tetragonous, angled, conspicuously winged on corners 27
b. Hypanthium teretish and grooved or tetragonous, terete or angled but without wings or grooves 28
27a. Primary leaf veins 16–30 pairs; petioles 0.3–2 cm long; stamens in 5–6 whorls; fruit tetragonous or trigonous, 5–7 cm long . . . . . **5. B. augusta**
b. Primary leaf veins 7–10 pairs; petioles 0.5–5 cm long; stamens in 4–5 whorls; fruit usually ovoid, rarely tetragonous, 10–12 cm long . . . . . **54. B. scortechinii**
28a. Hypanthium tetragonous, terete or angled, but without grooves, pubescent but not ferrugineous; inflorescence terminal; primary veins 15–30 . . . . **16. B. curranii**
b. Hypanthium teretish to tetragonous, with 4 distinct grooves, ferrugineous pubescent; inflorescence ramiflorous; primary veins 8–18 . . . . . **43. B. pendula**
29a. Calyx in bud closed or with a small apical pore 30
b. Calyx open in bud with free sepals 59
30a. Leaf margins serrate-crenulate throughout 31
b. Leaf margins entire (to slightly, sometimes partly crenulate) 44
31a. Primary leaf veins 32–95; leaf laminas linear-lanceolate or obovate-lanceolate 32
b. Primary leaf veins 8–45; leaf laminas usually oblong to oblong-lanceolate to obovate-lanceolate or linear lanceolate (except *B. boridiensis* and *B. pinnifolia* where narrowly lanceolate) 33
32a. Primary leaf veins 32–65 pairs; inflorescence pendulous; flowers pink or red . . . . . **9. B. calyptrocalyx**
b. Primary leaf veins 70–95 pairs; inflorescence more or less erect; flowers white . . . . . **41. B. papuana**
33a. Leaf laminas narrowly lanceolate; primary veins 18–38 34
b. Leaf laminas elliptic, narrowly obovate, oblong-obovate, oblong to oblong-lanceolate; primary veins 8–45 35
34a. Monocaulous tree; leaf laminas tapering from mid point; primary veins 18–38 . . . . . **7. B. boridiensis**
b. Branched tree; leaf laminas tapering from 4/5 to 5/6 of length; primary veins 21–26 . . . . . **44. B. pinnifolia**
35a. Staminal whorls 2–3 36
b. Staminal whorls 4–8 to numerous 38

36a. Primary leaf veins 38–45 pairs; leaf laminas 80–90 by 19–22 cm . . . . . **33. B. magnifolia**
b. Primary leaf veins 8–28 pairs; leaf laminas 3–52 by 1.5–9 cm 37
37a. Primary leaf veins 8–10; ovary 2-locular, not winged; fruit c. 2.5 by 0.5 cm . . . . . **18. B. filirachis**
b. Primary leaf veins 15–28; ovary 3–4-locular, 4-winged; fruit 4–6 by 1–2.5 cm . . . . . **46. B. pterita**
38a. Mature fruit conoid with 8 wings at emarginate base; hypanthium with 8-winged appendages . . . . . **14. B. conoidea**
b. Mature fruit tri- or tetragonous or oblong-cylindric, not winged or only slightly 4-winged when young (fruit unknown for *B. serenae*); hypanthium without appendages 39
39a. Leaf margin distinctly revolute; staminal whorls 4; fruit distinctly pedicelled . . . . . **49. B. revoluta**
b. Leaf margin flat; staminal whorls 5 or more (except 4 in *B. monticola*); fruit often sessile except in *B. clemensii* 40
40a. Style much shorter than stamens; pedicel articulate . . . . . **56. B. serenae**
b. Style equalling or exceeding stamens; pedicels not articulate 41
41a. Calyx not circumscissile; fruit ovoid, subtetragonous . . . . . **47. B. racemosa**
b. Calyx circumscissile, fruit ellipsoid, cylindric or rounded-ovoid to ovoid . . . 42
42a. Small branching tree, 6–15 m tall; flowers subsessile, pedicels 1–5 mm long; hypanthium tetragonous, pulverulent . . . . . **17. B. edulis**
b. Trees, monocaulous (not branching), to 4 m tall, or leptocaulous (few branches), to 20 m tall; pedicels 1–2 or 8–15 mm long; hypanthium cone-shaped, glabrous 43
43a. Monocaulous tree; leaf laminas 65–85 by 13–19 cm; primary veins 25–35, montane . . . . . **35. B. monticola**
b. Leptocaulous (branching) tree; leaf laminas 16–33 by 5–12 cm; primary veins 12–17, lowland . . . . . **57. B. tagala**
44a. Calyx in bud with an apical pore 45
b. Calyx in bud without an apical pore 47
45a. Fruit ellipsoid; leaf blade margin flat, apex acuminate; staminal whorls 5–8 (introduced in New Guinea for edible seeds) . . . . . **17. B. edulis**
b. Fruit (sub)tetragonous; leaf blade margin (slightly) revolute, apex usually acuminate (Borneo) or cuspidate to caudate (New Guinea); staminal whorls 4 (Borneo) or 8–10 (New Guinea) 46
46a. Staminal whorls 4; fruit oblong, tetragonous, 13–14 by 5–5.5 cm; inflorescence rachis yellowish puberulous . . . . . **29. B. longisepala**
b. Staminal whorls 8–10; fruit subtetragonous, 4–7.5 by 1.5–3.5 cm; inflorescence rachis pulverulent to glabrous **38a. B. novae-hiberniae** subsp. **novae-hiberniae**
47a. Inflorescence erect 48
b. Inflorescence pendulous 49
48a. Fruit markedly tetragonous at base, ovate, 8.5–11 cm long; petioles 0–5 mm long; venation cladodromous; sepals 3–4 by 2–3 cm . . . . . **4. B. asiatica**

b. Fruit not tetragonous at base, ovate-oblong to 4 cm long; petioles 6–12 mm long; venation brochidodromous; sepals 1.2–1.4 by 0.9–1.1 cm **52. B. sarawakensis**
49a. Leaves subsessile, petioles 0–7 mm 50
b. Leaves distinctly petiolate; petioles 0.5–8 cm long 51
50a. Inflorescence infrafoliar; primary veins 16–27 pairs; hypanthium glabrous; leaf laminas (14.5–)27–41.5 by (3.5–)5–9.5 cm . . . . . **24. B. jebbiana**
b. Inflorescence terminal; primary leaf veins 9–11 pairs; hypanthium puberulous; leaf laminas 15–27.5 by 3.5–6.5 cm . . . . . **39. B. palawanensis**
51a. Inflorescence rachis 3–7 cm long . . . . . **27. B. lauterbachii**
b. Inflorescence rachis 10–80 cm or more long. 52
52a. Hypanthium glabrous 53
b. Hypanthium pubescent 54
53a. Leaf margins flat, primary veins 7–14 pairs . . . . . **2. B. apiculata**
b. Leaf margins distinctly revolute; primary veins 14–16 pairs . . . **49. B. revoluta**
54a. Hypanthium terete to slightly tetragonous; inflorescence axillary, terminal or ramiflorous 55
b. Hypanthium tetragonous, trigonous or angled (terete in *B. confusa*, then primary veins 17–28 pairs); inflorescence cauliflorous, ramiflorous or axillary. 57
55a. Leaf margins flat; primary veins 11–20 pairs . . . . . **55. B. sepikensis**
b. Leaf margins revolute; primary veins 11–13 pairs 56
56a. Inflorescence axillary or ramiflorous; petals creamy yellow **11. B. chantaranoi**
b. Inflorescence terminal; petals red . . . . . **50. B. ridsdalei**
57a. Primary leaf veins 7–14 pairs . . . . . **2. B. apiculata**
b. Primary leaf veins 17–28 pairs 58
58a. Leaf laminas 16–29 cm broad, widest at 2/3 of length, flowers borne on 1 mm long bosses and pedicels 8–10 mm long . . . . . **12. B. clemensii**
b. Leaf laminas 6–17 cm broad, widest at mid point; pedicels 6–16 mm . . . . . **13. B. confusa**
59a. Leaves sessile or subsessile 60
b. Leaves distinctly petiolate (most over 5 mm) 62
60a. Leaf margins entire; adventitious roots on stem; inflorescence erect when young becoming pendulous only in fruit . . . . . **15. B. corneri**
b. Leaf margins serrate-crenulate; without adventitious roots on stem; inflorescence pendulous 61
61a. Inflorescence and hypanthium ferrugineous pubescent; fruit usually fusiform . . . . . **19. B. fusiformis**
b. Inflorescence and hypanthium glabrous; fruit ovoid with 4 knobs at base . . . . . **37. B. norshamiae**
62a. Primary leaf veins 35–45 pairs; petioles 9–14 cm; buds c. 1.5 cm diam. . . . . **22. B. hallieri**
b. Primary leaf veins 7–32 pairs; petioles 0.1–11 cm; buds 0.5–1 cm diam. . . . 63
63a. Ovary 2-locular; primary leaf veins 7–12 pairs; fruit acutely angled, slightly winged when young . . . . . **1a. B. acutangula** subsp. **acutangula**
b. Ovary 3–4-locular; primary leaf veins 10–32 pairs; fruit ovoid or spindle-shaped, tetragonous, obovate, not winged except in *B. macrocarpa* (fruit unknown for *B. havilandii*) 64

64a. Inflorescence erect, 4.5–7 cm long . . . . . **42. B. pauciflora**
b. Inflorescence pendulous, exceeding 20 cm long 65
65a. Leaf laminas 19–70 by 6–18 cm; primary veins 16–32 pairs; petals 17.5–30 by 7.5–16 mm 66
b. Leaf laminas 9.5–26 by 2.5–9 cm; primary veins 11–18 pairs; petals 12–20 by 6–11 mm 67
66a. Inflorescence and hypanthium pulverulent . . . . . **23. B. havilandii**
b. Inflorescence and hypanthium glabrous . . . . . **31. B. macrocarpa**
67a. Leaf lamina slightly decurrent; inflorescence, rachis and hypanthium glabrous . . . . . **28. B. longipes**
b. Leaf lamina not decurrent; inflorescence rachis puberulous; hypanthium ferrugineous . . . . . **36. B. niedenzuana**

1. Barringtonia acutangula (L.) Gaertn.

Barringtonia acutangula (L.) Gaertn., Fruct. Sem. Pl. 2 (1791) 97, t. 101; Blume, Bijdr. (1826) 1097; Roxb., Fl. Ind. 2 (1832) 635; Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1535; Graham, Cat. Pl. Bombay (1839) 74; Span., Linnaea 15 (1841) 204; Oken, Allg. Naturgesch. 3, Bot. 2, 3 (1841); Hassk., Cat. Hort. Bot. Bogor (1844) 263; Voigt, Hort. Suburb. Calcutt. (1845) 51; Thwaites, Enum. Pl. Zeyl. 2 (1859) 119; Dalzell & A.Gibson, Bombay Fl. (1861) 95; Benth., Fl. Australia 3 (1866) 288; Bedd., Fl. Sylv. S. India 2 (1869) t. 204; Fl. Sylv. S. India 3 (1869) 112; Brandis, Forest Fl. N.W. India (1874) 235; Kurz, Prelim. Rep. Forest Pegu (1875) App. lxvi, App. B, 52; J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 71; Forest Fl. Burma 1 (1877) 497; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 508; Fern.-Vill., Nov. App. (1880) 86; Laness., Pl. Util. Col. Franc. (1885) 317; Warb., Bot. Jahrb. Syst. 13 (1891) 388; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Nairne, Fl. Pl. W. India (1894) 115; Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 462; F.M.Bailey, Queensl. Fl. 2 (1900) 666; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 140; Fisher, J. Bombay Nat. Hist. Soc. 15 (1904) 546; Brandis, Indian Trees, ed. 1 (1906) 330; Strachey, Cat. Pl. Kumaon, ed. 2 (1906) 66; Bamber, J. Bombay Nat. Hist. Soc. 19 (1909) 69; Haines, Forest Fl. Chota Nagpur (1910) 353; Talbot, For. Fl. Bombay 2 (1911) 47; Kanjilal, Forest Fl. Siwalik & Jaunsar Forest (1911) 216; F.M.Bailey, Compr. Cat. Queensland Pl. (1913) 209; Witt, Descr. List Trees North. & Berar For. Circles Centr. Prov. (1916) 116; Ewart & O.B.Davies, Fl. N. Territory (1917) 199; Kirt. & B.B.Das, Indian Med. Pl. 1 (1918) 558, pl. 427; Gamble, Fl. Madras 1 (1919) 487; Troup, Silvic. Ind. Trees 2 (1921) 590, f. 222; Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 860; Lauterb., Bot. Jahrb. Syst. 57 (1922) 347, 353; Haines, Bot. Bihar Orissa 3 (1922) 368; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 141; Craib, Fl. Siam. 1 (1931) 667; Bentall, Trees Calcutta (1933) 252; Merr., Comm. Fl. Cochinch. (1935) 280; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 43; Corner, Wayside Trees Malaya 1 (1940) 353, f. 123; J.E.Vidal, Véget. Laos (1956); Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 106; Payens, Blumea 15 (1967) 157; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 179; Prance, Allertonia 12 (2013) 85, f. 18, 19. — [*Tsjeria-samstravadi* Rheede, Hort. Malab. 4 (1683) 15, t. 7, nom. inval.] — *Eugenia acutangula* L., [Fl. Zeyl. (1748) 85, no 190, nom. inval.] Sp. Pl. (1753) 471; Sp. Pl., ed. 2 (1762) 673; Willd., Sp. Pl. 2, 2 (1800) 966. — *Butonica acutangula* (L.) Lam., Tabl. Encycl. (1794) t. 591. — *Stravadium acutangulum* (L.) J.St.-Hill., Expos. Fam. Nat. 2 (1805) 166; Sweet, Hort. Brit. (1826) 159. — *Stravadium rheedii* Blume in Van Houtte, Fl. Serres 7 (1851) 24, excl. syn., nom. inval.; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 82. — *Michelia acutangula* (L.) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — *Butonica rubra* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 70, t. 14, f. 1–3. — *Barringtonia rubra* (Miers) Baill. ex Laness., Pl. Util. Col. Franc. (1885) 621, nom. nud., non Blume 1851). — *Huttum acutangulum* (L.) Britten, J. Bot. 39 (1901) 67. — Lectotype (Payens 1967): *Herb. Hermann 190* (hololecto BM), Sri Lanka.

Butonica terrestris [Rumph., Herb. Amboin. 3 (1743) 181, t. 115, nom. inval.]; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 69, excl. syn., specimen & t. 14, f. 4–9. — *Stravadium rubrum* Pers., Syn. Pl. 2 (1807) 30, pro tab. Rumph. 115, nom. illeg.; DC., Prodr. 3 (1828) 289, nom. illeg. — *Barringtonia terrestris* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19, excl. syn. p.p.; excl. specimen. — Type: Rumphius, Herb. Amboin. 3 (1743) t. 115.

Meteorus coccineus Lour., Fl. Cochinch. 2 (1790) 410; ed. 2, 2 (1793) 499; Spreng., Syst. Veg. 3 (1826) 127. — *Stravadium coccineum* (Lour.) DC., Prodr. 3 (1828) 289; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 83. — *Barringtonia coccinea* (Lour.) Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1536; Laness., Pl. Util. Col. Franc. (1885) 747; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44. — *Careya coccinea* (Lour.) A.Chev., Jard. Bot. Saigon (1919) 64. — Type: *Loureiro s.n.* (holo BM), Vietnam.

Stravadium album Pers., Syn. Pl. 2 (1807) 30, nom. illegit. — *Barringtonia alba* (Pers.) Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1536. — Type: Rumphius, Herb. Amboin. 3 (1743) t. 116.

Stravadium costatum Blume in Van Houtte, Fl. Serres 7 (1851) 24; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 88. — *Barringtonia costata* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1855) 489; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Koord. & Valeton, Bull. Dépt. Agric. Indes Néerl. 10 (1907) 37; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 49. — *Michelia costata* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Anonymous s.n.*, s.d. (holo L, sheet 898.204.161), Indonesia.

Botryoropis luzonensis C.Presl, Epimel. Bot. (1851) 220; Walp., Ann. Bot. Syst. 2 (1852) 642; Miq., Fl. Ned. Ind. 1, 1 (1855) 492. — *Stravadium luzonense* (C.Presl) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 84. — *Barringtonia luzonensis* (C.Presl) S.Vidal, Phan. Cuming. Philipp. (1885) 13, 43, 113; Rolfe, J. Bot. 23 (1885) 213; S.Vidal, Revis. Pl. Vasc. Filip. (1886) 133; Merr., Fl. Manila (1912) 346; Enum. Philipp. Fl. Pl. 3 (1923) 141; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 47. — *Michelia luzonensis* (C.Presl) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: *Cuming 653* (holo PRC; iso BM, CGE, K, L, OXF, P, W), Philippines, Luzon, Prov. Albay.

Stravadium demissum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 81. — *Barringtonia demissa* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, 105 (1939) 46. — Lectotype (Prance 2013): *J.W. Helfer*, *Herb E India Company 2422* (hololecto K).

Stravadium pubescens Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 83. — *Barringtonia pubescens* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44. — Lectotype (Prance 2013): *Wight KD 1062* (hololecto K; isolecto BM, HBG, L, P, W), India.

Stravadium gracile Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 86. — *Barringtonia gracilis* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44; S.T.Blake, Austral. J. Bot. 2 (1954) 104, pl. I, f. 4; Specht, Rec. Amer.-Austral. Sci. Exped. Arnhem Land 3 (1958) 263, 324, 331, 400, 465, 495. — Type: *F. Mueller s.n.* (holo K; iso BM, fragm.), Australia, Mt Adam range, Victoria run.

Stravadium denticulatum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 88. — *Barringtonia denticulata* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44. — Type: *Hahn 195* (holo K; iso BM, fragm.), Australia, Queensland, Cape York.

Barringtonia tetaptera Lauterb., Nova Guinea 8 (1910) 315; Bot. Jahrb. Syst. 57 (1922) 348; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 47. — Lectotype (Prance 2013): *Branderhorst 71* (holo B†; hololecto L; isolecto BO, WRSL), Indonesia, Papua, south coast near Okabe.

Symplocos multiflora Eberh. & Dubard, Agron. Colon. n.s. 1 (1913) 76, f. 2. — *Barringtonia eberhardtii* Gagnep., Bull. Mus. Natl. Hist. Nat. 26 (1920) 72, nom. superfl.; in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 857; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 48. — *Barringtonia multiflora* Guillaumin, Bull. Soc. Bot. France 71 (1924) 287. — Type: *Eberhardt s.n.* (holo P), Vietnam, Cay Mun, 1911.

Barringtonia micrantha Gagnep., Notul. Syst. (Paris) 3 (1914) 385; Bull. Mus. Natl. Hist. Nat. 26 (1920) 72; in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 856, f. 93; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44. — Lectotype (Prance 2013): *Thorel 2036* (hololecto P; isolecto BM, K), Vietnam, Compau Luong.

Barringtonia pedicellata Ridl., J. Fed. Malay States Mus. 10 (1920) 134; Fl. Malay Penins. 1 (1922) 759; Craib, Fl. Siam. 1 (1931) 671; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 33. — Type: *Evans s.n.* (holo K), Malaysia, May 1917.

Barringtonia kermodei C.E.C.Fisch., Kew Bull. (1929) 311; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 46; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 106. — Type: *Kermode 7190* (holo K), Myanmar, Distr. Bassein, near Bawni.

Barringtonia martensii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 46, ex descr. — Type: *Van Martens 100* (holo B†), Indonesia, Kalimantan, Pulo Matjan.

Barringtonia kedahensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) op. cit. 47. — Type: *Haniff & Nur 7555* (holo K; iso SING), Malaysia, Kedah, Lankawi, Bukit Penarak.

Barringtonia balansae R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) op cit. 48. — Lectotype (Prance 2013): *Balansa 1138* (holo B†; hololecto K; isolecto L, P), Vietnam, near Hanoi.

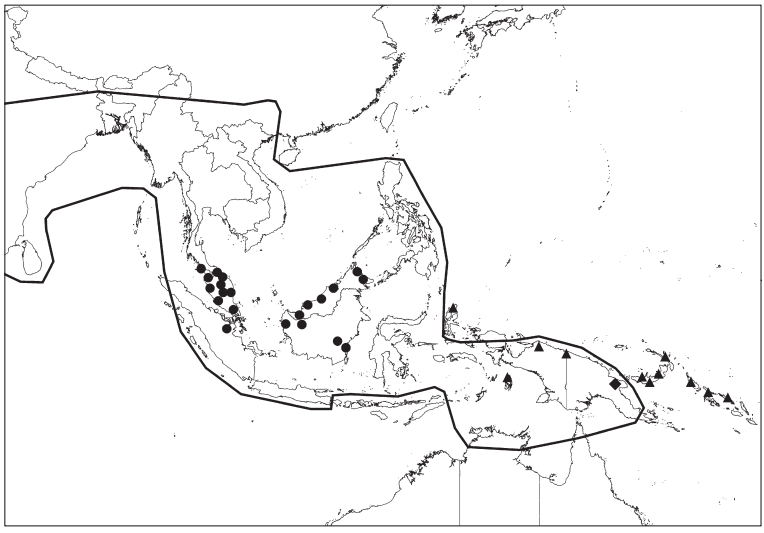
Barringtonia merguiensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) op. cit. 48. — Lectotype (Prance 2013): *Parker 2571* (holo B†; hololecto K; isolecto DD), Myanmar.

Stravadium reticulatum auct. non Blume: Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 87, excl. syn.

Barringtonia reticulata auct. non (Blume) Miq.: S.Vidal, Phan. Cuming. Philipp. (1885) 113; Rolfe, J. Bot. 23 (1885) 213; S.Vidal, Revis. Pl. Vasc. Filip. (1886) 133.

See for further synonyms under the subspecies.

Shrubs or small trees, 2–13(–25) m tall, often many stemmed. *Leaves*: petiole 4–15 mm long; lamina elliptic or obovate-oblong, 6–16(–22) by 2–8 cm, papyraceous, base cuneate, decurrent onto petiole, margin finely serrate-crenulate, apex acute to acuminate, acumen 4–12 mm long, lower surface glabrous or hairy; midrib prominulous above, prominent beneath, primary veins 7–20 pairs, brochidodromous, not conspicuously merging, intercostal veins slightly prominulous on both surfaces, reticulate. *Inflorescences* pendulous racemes, 20–45(–78) cm long, densely flowered with up to 75 flowers; rachis 1–2 mm diam., glabrous, longitudinally striate; bracts elliptic-lanceolate, 1–5 by 0.75–2 mm, acute; bracteoles 0.5–1 mm. *Calyx* open in bud, with free sepals. *Flowers* sessile or with pedicels 3–7 mm; buds c. 5 by 5 mm; hypanthium



Map 1. Distribution of *Barringtonia* species: *B. niedenzuana* (K.Schum.) R.Knuth (▲); *B. scortechinii* King (●); *B. tagala* Jebb & Prance (◆); general distribution of the two varieties of *B. acutangula* (L.) Gaertn (line).

tubular, 4–5-gonous, glabrous or pulverulent; sepals 3–5 by 3–5 mm; petals red; stamens deep pink to dark red, staminal whorls 3, the inner one staminodal, staminal tube 1–4.5 mm high, staminodia 3–6 mm; disc c. 0.5 mm high; ovary 2–(3–4)-locular, ovules 2–4(–5) per locule; style 1–2 cm long. *Fruits* angled or ovoid, 4-winged when young, 2–6 by 1–3 by 1–3 cm, tapering to truncate apex. *Seeds* 1, ovoid, 1–4 by 0.5–1.5 cm. — **Map 1.**

Distribution — Afghanistan, Pakistan, India, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam; in *Malesia*: throughout.

KEY TO THE SUBSPECIES

1a. Flowers distinctly pedicelled; fruit oblong, acutely angled . **a.** subsp. **acutangula**
b. Flowers sessile; fruit almost globular, 4- or 8-ribbed or slightly winged . . . . . **b.** subsp. **spicata**

a. subsp. **acutangula**

Barringtonia acutangula (L.) Gaertn. subsp. *acutangula*: Prance, Allertonia 12 (2013) 88; Leti et al., Fl. Photogr. Cambodge (2013) 324.

For more nomenclature see under species.

Shrubs or small trees. *Flowers* distinctly pedicelled. *Fruits* oblong, acutely angled. — **Plate 1a–c.**

Distribution — As the species.

Habitat & Ecology — Mainly in moist places along rivers, swamps and fresh water mangrove forest. Found inland and up to 1600 m in Papua. The fruit is often found floating in rivers.

Vernacular names — Malay Peninsula: Putat (Malay). Borneo: Langkong (Iban); Putat rawang, Jempalang, Tampalang (Dusun). Indonesia: Putat (*Barringtonia* in general). Sulawesi: Alakang (Bugis); Salinsa (Minahasa). New Guinea: Katjuk (Je); Lata (Gogodala); Poiningillia (Waskuk); Tapuo (Wagu).

Uses — Wood is used and marketed as Indian oak. It is used for boat building, carts and for cabinets. Bark used as a fish poison. Many local medicinal uses are also recorded from India.

b. subsp. **spicata** (Blume) Payens

Barringtonia acutangula (L.) Gaertn. subsp. *spicata* (Blume) Payens, Blumea 15 (1967) 231; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 182; Allertonia 12 (2013) 90. — *Barringtonia spicata* Blume, Bijdr. (1826) 1097; Hassk., Cat. Hort. Bot. Bogor. (1844) 263; Flora 27, 2 (1844) 594; Korth., Ned. Kruidk. Arch. 1 (1846) 206; Miq., Fl. Ned. Ind. 1, 1 (1855) 489; de Vriese, Pl. Ind. Bat. Orient. 1 (1856) 79; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 15; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 141; Backer, Schoolfl. Java (1911) 529; Hallier f., Meded. Rijks-Herb. 12 (1912) 26; Koord., Exkurs.-Fl. Java 2 (1912) 666; Merr., Bibliogr. Enum. Born. Pl. (1921) 420; Ridl., Fl. Malay Penins. 1 (1922) 759; Craib, Fl. Siam 1 (1931) 669; Ochse & Bakh., Veg. Dutch East Indies (1931) 358, f. 227; Burkill, Dict. Econ. Prod. Malay

Penins. 1 (1935) 306; M.R.Hend., J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 45; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 49; Corner, Wayside Trees Malaya 1 (1940) 355, f. 123; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 107; Backer & Bakh.f., Fl. Java 1 (1963) 353. — *Stravadium spicatum* (Blume) Blume in DC., Prodr. 3 (1828) 289; in Van Houtte, Fl. Serres 7 (1851) 24; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 85. — *Michelia spicata* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: *Anonymous s.n.* (holo L, sheet 898.204-229; iso U), Indonesia, Java, s.d.

Barringtonia horsfieldii Miq., Fl. Ned. Ind. 1, 1 (1855) 489; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 17; Koord., Exkurs.-Fl. Java 2 (1912) 666; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 44. — *Stravadium horsfieldii* (Miq.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 85. — *Michelia horsfieldii* (Miq.) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *T. Horsfield s.n.* (holo U; iso BM, CGE, K as *20* & *157*, U as *20*), Indonesia, Java, Prowoto.

Barringtonia nitida Miq., Fl. Ned. Ind. 1, 1 (1855) 490; de Vriese, Pl. Ind. Bat. Orient. 1 (1856) 78; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 18; Backer, Schoolfl. Java (1911) 529; Koord., Exkurs.-Fl. Java 2 (1912) 666; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 49. — *Stravadium lucidum* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 88, nom. superfl. — Type: *Reinwardt s.n.* (holo L, sheet 908.146-417; iso U), Indonesia, Java.

Stravadium globosum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 86, *excl. syn.* Span. — *Barringtonia globosa* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 50, *excl. syn.* — Type: *T. Anderson s.n.* (holo K; iso BM, fragm.), Indonesia, Java, cultivated in Hortus Bogoriensis.

Barringtonia schmidtii Warb. ex Craib, Bot. Tidsskr. 32 (1915) 332; Fl. Siam. 1 (1931) 669, 672; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 49. — Type: *Schmidt 186* (holo K; iso C), Thailand, Koh Chang, plains at Lem Dau.

Barringtonia edaphocarpa Gagnep., Bull. Mus. Natl. Hist. Nat. 26 (1920) 73, f. 95; in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 862, f. 95; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 305; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 48; Corner, Wayside Trees Malaya 1 (1940) 354, f. 123. — Type: *Lemarié s.n.* (holo K), Vietnam.

Barringtonia bicolor Craib, Kew Bull. (1929) 118; Fl. Siam. 1 (1931) 668, 673; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 31. — Type: *Kerr 5874* (holo K; iso BM), Thailand, Nakuan Tui.

Barringtonia edaphocarpa Gagnep. var. *ladelli* Craib, Fl. Siam. 1 (1931) 669. — Type: *Ladell 227* (holo K), Thailand, Upper Pron River.

Barringtonia dentata R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 46. — Lectotype (Prance 2013): *Yates 1617* (holo B†; hololecto S; isolecto BO, BRI), Indonesia, Sumatra, Limpang Kawat.

Barringtonia winkleri R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 20. — Type: *Hubert Winkler 3427* (holo B†), Indonesia, Kalimantan, between Bandjarmasin and Martapura.

Chydenanthus dentato-serratus R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 59. — Lectotype (Prance 2013): *Bakhuizen van den Brink Sr. 1870* (holo B†; hololecto L; isolecto K, P, SING, U, W), Indonesia, Java, Sawangan; *cf.* Airy Shaw, Kew Bull. (1949) 152; Backer & Bakh.f., Fl. Java 1 (1963) 353.

Shrub or small trees. *Flowers* sessile. *Fruits* almost globular, 4- or 8-ribbed or slightly winged.

Distribution — India to Myanmar and Thailand, Laos, Vietnam, throughout *Malesia*.

Habitat & Ecology — Growing along rivers in floodplains or riverbanks and swampy, inundated areas, occasionally up to 400 m altitude.

Vernacular names — Malaysia: Putat. Indonesia: Ipil, Pangpanik, Poetat, Putat tayap.

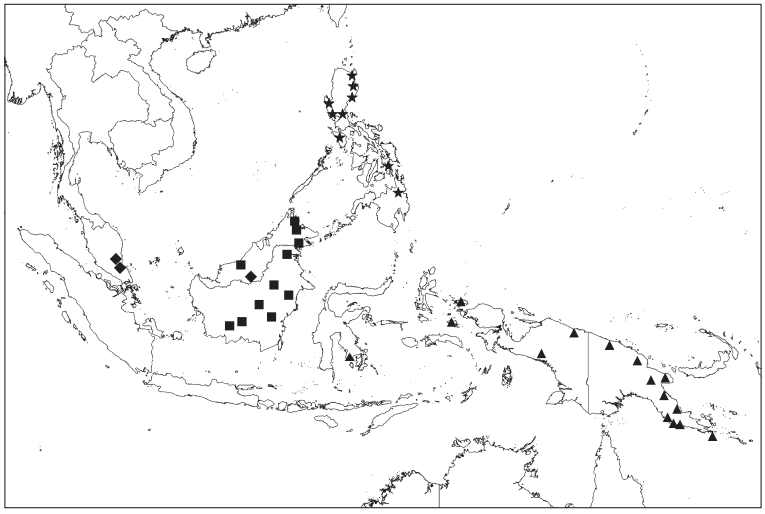
Uses — Leaves are edible and eaten as a vegetable in Java.

2. Barringtonia apiculata Lauterb.

Barringtonia apiculata Lauterb., Bot. Jahrb. Syst. 57 (1922) 350; Prance, Allertonia 12 (2013) 27, f. 1, 2. — Type: *Ledermann 9959* (holo WRSL; iso K), Papua New Guinea, Sepik River region, Lordberg.

Barringtonia mengkokaensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 16, f. 4. — Type: *Heinrich 349* (holo B†), Indonesia, Sulawesi, Mt Mengkoka.

Small to medium sized trees, 3–25 m tall. *Leaves*: petioles 1–5 cm long, slightly swollen at base; lamina elliptic to obovate-oblong or obovate-lanceolate, 13–40(–50) by 5–16 cm, chartaceous or coriaceous, base cuneate, decurrent onto petiole, margin entire, flat, apex obtuse or acute, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins (7–)10–14 pairs, brochidodromous, weakly merging near margin, prominulous on both surfaces, intercostal veins prominulous and conspicuously reticulate on both surfaces. *Inflorescences* pendulous, glabrous, ramiflorous or cauliflorous racemes, below leaves, 10–45 cm long with up to 40 flowers; rachis 2–3 mm diam., glabrous or grey-pulverulent; bracts lanceolate, c. 7 by 1.5 mm; bracteoles triangular, c. 1 by 0.5 mm. *Calyx* closed in bud, with a small acute beak at apex, glabrous, either rupturing circumscissile above base to discard cap, or rarely rupturing into 4 irregular segments, 2.5–5 by 6–13 mm, leaving a cup 2–8 mm high. *Flowers* with pedicels 4–27 mm long, usually articulate; hypanthium obpyramidal, 3–4-gonous, glabrous or pulverulent; petals elliptic, 22–40 by 7–18 mm, fimbriate, white tinged red; stamens white, yellowish towards apex, staminal whorls 5, 7 or 8, 1–2 inner ones staminodal, staminal tube 2–6(–11) mm high, staminodia connate up to 5–11 mm and free part 1–6(–10) mm; disc a thick grooved ring; ovary 3–4-locular, 0–6 ovules per locule; style 1.6–4 cm long, pale at base, violet-red towards apex. *Fruits* ovoid, c. 4.5 by 2.3 by 2.1 cm, truncate and tapering at base. *Seeds* ovoid, 3.5 by 1.3 by 1.3 cm. — **Map 2.**



Map 2. Distribution of *Barringtonia* species: *B. apiculata* Lauterb. (▲); *B. ashtonii* Payens (■); *B. filirachis* Payens (◆); *B. pterita* Merr. (★).

Distribution — *Malesia*: SE Sulawesi, Moluccas (Misool) to New Guinea and Rossel I.

Habitat & Ecology — Rainforest, sea level to 1000 m.

Vernacular names — New Guinea: Kusap (Jal in Madang); Me-a, Numbinyangra (Timbunke); Punda (Orne); Toplie.

3. **Barringtonia ashtonii** Payens

Barringtonia ashtonii Payens, Blumea 15 (1967) 218; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 107; Prance, Allertonia 12 (2013) 29, f. 2. — Type: *Kostermans 5289* (holo L; iso BO), Indonesia, Kalimantan.

Small trees, 4–17 m tall; twigs 2–4 mm diam. *Leaves*: petioles 1–3 cm long, not swollen at base, not winged; lamina elliptic or oblong, 8–21 by 3–9 cm, subcoriaceous, base cuneate, margin entire, apex acuminate or cuspidate, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 8–15 pairs, brochidodromous, merging 2–5 mm from margin, prominulous on both surfaces, more so beneath, intercostal veins plane above, slightly prominent beneath. *Cataphylls* triangular, 5–7 by 3–4 mm. *Inflorescences* terminal spikes, pendulous, 30–77 cm, glabrous or slightly pulverulent, with c. 40 flowers; rachis 0.5–1 mm diam., longitudinally striate; bracts linear-lanceolate, 10–12 by 1.5–2 mm. *Calyx* closed in bud, separating into 2–3 equal lobes, 6–8 by 4–6 mm, ovate. *Flowers* sessile, hypanthium tetragonous, with 4 ribs, 3–4 by 1–2 mm, glabrous; sepals 2–3, ovate, 6–8 by 4–6 mm, glabrous, mucronate; petals 4, elliptic, 11–13 by 6–8 mm, pink or red; staminal whorls 3–4, the inner one staminodal, staminal tube 1–2 mm, staminodia 11–13 mm; disc thick, 0.5–2 mm high; ovary 3(–4)-locular, 1–2 ovules per locule; style 2.25–2.75 cm long. *Fruits* ovoid, slightly tapering at both ends, 4.5–7 by 2–3 by 2–3 cm, 4–5-ribbed. *Seeds* ovoid, c. 2.75 by 2 cm. — **Map 2.**

Distribution — *Malesia*: Borneo (Sarawak, Sabah, Kalimantan).

Habitat & Ecology — Along rivers in primary mixed dipterocarp forest in lowlands to 200 m.

Vernacular name — Tampalang (Dusun).

4. **Barringtonia asiatica** (L.) Kurz

Barringtonia asiatica (L.) Kurz, Prelim. Rep. Forest Pegu (1875) App. A, 65, App. B, 52; J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 70; Druce, Rep. Bot. Exch. Club Soc. Brit. Isles 3 (1914) 414; Merr., Interpr. Herb. Amboin. (1917) 384; Enum. Philipp. Fl. Pl. 3 (1923) 142; Setch., Pap. Dept. Mar. Biol. Carnegie Inst. Washington 20 (1924) 63; Merr., Philipp. J. Sci. 29 (1926) 405; Booberg, Bot. Jahrb. Syst. 66 (1933) 18; Wilder, Bull. Bernice P. Bishop Mus. 120 (1934) 35; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 304; Christoph., Bull. Bernice P. Bishop Mus. 128 (1935) 154; F.Br., Bull. Bernice P. Bishop Mus. 130 (1935) 203; Kaneh., J. Dept. Agric. Kyushu Imp. Univ. 4 (1935) 376; M.R.Hend., J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 45; Guillaumin, Bull. Soc. Bot. France 86 (1939) 174; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 10, f. 3J, K; Corner, Wayside Trees Malaya 1 (1940) 353, pl. 72; Yunck., Bull. Bernice P. Bishop Mus. 178 (1943) 88; Bull. Bernice P. Bishop Mus. 184 (1945) 53; F.S.Walker, For. British Solomon Is. (1948) 130; Guillaumin, Ann. Mus. Colon. Marseille 55/56 (1948) 38; Fl. Nouv.-Calédonie (1948) 226; Meijer Drees, Commun. Forest Res. Inst. 33 (1951) 63; Glassman, Bull. Bernice P. Bishop Mus. 209 (1952) 62; Borss.Waalk., Trop. Natuur 32 (1952) 37, f. 1; Merr., Chron. Bot. 14 (1954) 348, 351; F.G.Browne, Forest Trees Sarawak & Brunei (1955) 217; Yunck., Bull. Bernice P. Bishop Mus.

220 (1959) 196; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 106; Fosberg & Sachet, Atoll Res. Bull. 92 (1962) 28; Backer & Bakh.f., Fl. Java 1 (1963) 352; Parham, Pl. Fiji Isl. (1964) 143; M.Neal, Gard. Hawaii (1965) 622, f. 241; Payens, Blumea 15 (1967) 184; Whitmore, Tree Fl. Malaya 2 (1973) 258; A.C.Sm., Fl. Vit. Nova 2 (1981) 595; Macnae & Fosberg in Dassan., Revis. Handb. Fl. Ceylon 3 (1981) 196; R.J.F.Hend. in A.S.George, Fl. Australia 8 (1982) 4; H.N.Qin & Prance, Fl. China 13 (2007) 293; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 183; Allertonia 12 (2013) 30, f. 3–5, 33–35. — *Mammea asiatica* L., Sp. Pl. 1 (1753) 512; Osbeck, Dagb. Ostind. Resa (1757) 278; Murray, Syst. Veg., ed. 13 (1774) 409. — *Barringtonia littorea* Oken, Allg. Naturgesch. 3 (1841) 1925, nom. superfl. — *Agasta asiatica* (L.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 61, t. 12, f. 10–16. — *Michelia asiatica* (L.) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Osbeck s.n.* (holo LINN; iso S), Indonesia, Prinsen Island.

[*Fructus peregrinus tetragonus* Clus., Exot. lib. 2 (1605) cap. 5, 26, nom. inval.; Bauhin, Hist. 1, lib. 3 (1650) 397.]

[*Butonica* Rumph., Herb. Amboin. 3 (1743) 179, t. 114, nom. inval.; Lam., Encycl. 1 (1785) 521; Tabl. Encycl. 3 (1794) t. 590, 591 f. I.] — *Butonica rumphiana* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 68, t. 13, f. 23, p.p., pro syn. Rumph. — Type: Rumphius, Herb. Amboin. 3 (1743) 180, pl. 114.

[*Butonica splendida* Sol., Prim. Flor. Ins. Oc. Pac. (1769) 281, unpubl.]. — *Agasta splendida* Sol. ex Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 60, t. 11. — Type: *Banks & Solander s.n.* (holo BM; iso P), Tahiti.

Barringtonia speciosa J.R.Forst. & G.Forst., Char. Gen. (1776) 76, t. 38; J.F.Mill., Icon. Anim. Pl. 2 (1776) t. 7 (in BM); L.f., Suppl. Pl. (1781) 312; Thunb., Nov. Gen. Pl. 2 (1782) 47; Murray, Syst. Veg., ed. 14 (1784) 620; G.Forst., Fl. Ins. Austr. (1786) 47; Gaertn., Fruct. Sem. Pl. (1791) 96, t. 101; J.F.Gmel., Syst. Nat. 2 (1791) 1000, 1039; J.Kern., Hort. Sempervirens 1 (1796) t. 28; Willd., Sp. Pl. 3, 1 (1800) 845; Roxb., Hort. Bengal. (1814) 52; Spreng., Syst. Veg. 3 (1826) 127; Blume, Bijdr. (1826) 1096; DC., Prodr. 3 (1828) 288; Gaudich., Voy. Uranie, Bot. 5 (1830) 483; Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 333; Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1535; Guill., Zephyritis 2, 7 (1837) 358; Blanco, Fl. Filip. (1837) 533; Span., Linnaea 15 (1841) 204; Paxton, Paxton's Mag. Bot. 10 (1843) 241, ic. col.; Wight, Icon. Pl. Ind. Orient. 2 (1843) 3, t. 547; Hassk., Flora 27 (1844) 594; Cat. Hort. Bot. Bogor. (1844) 262; Voigt, Hort. Suburb. Calcutt. (1845) 51; Lindl., Veg. Kingd. (1846) 755, t. 503; Miq., Anal. Bot. Ind. 1 (1850) 28; Blume in Van Houtte, Fl. Serres 4 (1848) 409, ic. col.; in Van Houtte, Fl. Serres 7 (1851) 23; Walp., Ann. Bot. Syst. 2 (1852) 641; A.Gray, U.S. Expl. Exped., Atlas Phan. 1 (1854) 508; Miq., Fl. Ned. Ind. 1, 1 (1855) 485, 492, 1087; Pl. Jungh. (1855) 413; de Vriese, Pl. Ind. Bat. Orient. 1 (1856) 78; Müll. Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; Thwaites, Enum. Pl. Zeyl. 2 (1859) 119; Pancher in Cuzent, Tahiti (1860) 232; Montrouz., Mém. Acad. Imp. Sci. Lyon, Sect. Sci. 10 (1860) 209; Seem., Viti (1862) 436; Kurz, Natuurk. Tijdschr. Ned.-Indië 27 (1864) 164; Seem., Fl. Vit. 1 (1866) 82; Bedd., Fl. Sylv. S. India 3 (1869) 112; Nadeaud, Énum. Pl. Tahiti (1873) 79; F.Muell., Fragm. 9 (1875) 118, 190; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 56, t. 10; Kurz, J. Roy. Asiat. Soc. Bengal 45, 2 (1876) 131; Forest Fl. Burma 1 (1877) 496; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 507; Grevelink, Pl. Ned.-Indië (1883) 158; K.Schum., Bot. Jahrb. Syst. 9 (1887) 213; K.Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 91; Warb., Bot. Jahrb. Syst. 13 (1891) 388; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33, f. 13; Drake, Fl. Polynésie Franç. (1893) 68; Engl., Notizbl. Königl. Bot. Gart. Berlin 1 (1897) 225; K.Schum., Notizbl. Königl. Bot. Gart. Berlin 2 (1898) 136; Reinecke, Bot. Jahrb. Syst. 25 (1898) 660; F.M.Bailey, Queensl. Fl. 2 (1900) 666; Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 463; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 135; Merr., Publ. Bur. Sci. Gov. Lab. 27 (1905) 46; Saff., Contr. U.S. Natl. Herb. 9 (1905) 196, pl. 38; A.Usteri, Vierteljahrsschr. Naturf. Ges. Zürich 50 (1906) 440; Brandis, Indian Trees ed. 1 (1906) 330; Matsum. & Hayata, Enum. Pl. Formosa (1906) 145; Valeton, Meded. Dept. Landb. Ned.-Indië 10 (1907) 37; Rech., Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 85 (1910) 320; Guillaumin, Ann. Mus. Colon. Marseille 19 (1911) 155; Backer, Schoolfl. Java (1911) 539; Hayata, Icon. Pl. Formosan. 2 (1912) 21; F.M.Bailey, Compr. Cat. Queens-

land Pl. (1913) 209; C.T.White, Proc. Linn. Soc. New South Wales 44 (1919) 822; Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 854; Lauterb., Bot. Jahrb. Syst. 56 (1921) 528; Bot. Jahrb. Syst. 57 (1922) 350; Ridl., Fl. Malay Penins. 1 (1922) 756; C.T.White, Proc. Roy. Soc. Queensland 38 (1927) 248; J. Arnold Arbor. 10 (1929) 246; J.G.Watson, Malayan Forest Rec. 6 (1928) 94; Malm, Repert. Spec. Nov. Regni Veg. 34 (1933) 283; Floyd & Aiken, Bull. Lloyd Libr. Bot. 33 (1934) 79, f. 79, 80; Parham, Bull. Dept. Agric. Fiji 21A (1942) 42, 70; Peekel, Ill. Fl. Bism. Arch. (1945) 1285, f. 1284 (ined.); T.S.Liu, Ill. Lign. Pl. Taiwan 1 (1960) 280, t. 232, photogr. — *Commersonia speciosa* (J.R.Forst. & G.Forst.) Salisb., Prod. Stirp. Chap. Allerton (1796) 355. — *Butonica speciosa* (J.R.Forst. & G.Forst.) J.St.-Hil., Expos. Fam. Nat. 2 (1805) 166. — *Barringtonia butonica* J.R.Forst. & G.Forst ex Cuzent, Tahiti (1860) 213, nom. inval.; Drake, Ill. Fl. Ins. Pacif. (1890) 171; Cheeseman, Trans. Linn. Soc. London, Bot. 6 (1903) 280; Wilder, Bull. Bernice P. Bishop Mus. 86 (1931) 79; H.Perrier, Fl. Madagasc. 149 (1954) 2. — *Huttum speciosum* (J.R.Forst. & G.Forst.) Britten, J. Bot. 39 (1901) 67. — Type: *Forster s.n.* (holo BM), Tahiti.

Mitraria commersonia J.F.Gmel., Syst. Nat. 1 (1791) 799. — Type: Sonnerat, Voy. Nouv. Guinée 1 (1776) f. 8, 9.

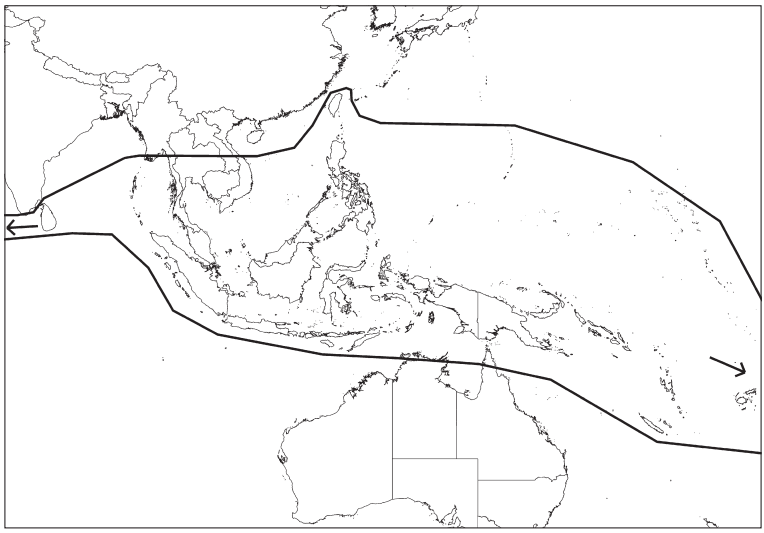
[*Barringtonia lévequii* Jard., Mém. Soc. Imp. Sci. Nat. Cherbourg 5 (1857) 296, 311, nom. nud.] — *Barringtonia senequei* Jard., Bull. Soc. Linn. Normandie Sér. 2, 9 (1875) 305; B.D.Jacks., Index Kew. 1 (1875) 276 (‘*senequli*’); R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 50 (‘*seneguli*’); Guillaumin, Bull. Soc. Bot. France 86 (1939) 174 (‘*senequili*’). All these variations are nominae nudae.

Agasta indica Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 63, t. 12, f. 1–9. — Type: Hermann, Icon. f. 241 (BM).

Trees, 7–20(–30) m tall. *Leaves*: petioles 0–5 mm long; lamina subsessile, obovate or obovate-oblong, 15–52 by 7–21 cm, subcoriaceous, base cuneate, margin entire, apex obtuse or rarely cuspidate, lower surface glabrous; midrib plane or prominulous above, prominulous beneath, primary veins 6–10 pairs, cladodromous, prominulous on both surfaces, branching dichotomously towards margin, intercostal veins slightly prominulous on both surfaces, reticulate. *Cataphylls* 1.5–3 by 0.75–1 cm long. *Inflorescences* terminal or subterminal racemes, erect, 2–20 cm long, with 3–20 flowers; rachis 4–6 mm diam., accrescent to 10 mm, glabrous, longitudinally striate; bracts sessile, oval, 8–20 by 4–15 mm, papyraceous; bracteoles triangular, 4–15 by 1.5–5 mm. *Calyx* closed in bud, apex rounded, rupturing into 2 unequal segments. *Flowers* with pedicels 4–8 cm; hypanthium tetragonous or slightly winged, 5–9 mm long, glabrous; sepals glabrous, 3–4 by 2–3 cm; petals elliptic, 5.5–8.5 by 2.5–4.5 cm, white; stamens white with pink, red or purple at apex, staminal whorls 6, the inner one staminodal, staminal tube 1.5–6 mm high, staminodia 2–3.5 cm; disc a thick glabrous ring, c. 1 mm high; ovary 4(–5)-locular, 4(–5) ovules per locule; style 9–13.5 cm long. *Fruits* ovate, 8.5–11 by 8.5–10 cm, tapering to apex, sharply tetragonous to the emarginated base. *Seeds* oblong, 4–5 cm long. — **Fig. 1b; Plate 1d, e; Map 3.**

Distribution — A most widespread species: Comores, Madagascar, Seychelles, Mauritius, India, Sri Lanka, Andaman Is., Thailand, Cambodia, Vietnam, Marianas, Carolines, N Australia, Solomon Is., New Caledonia, Vanuatu, Fiji, Tonga, Samoa, Cook Is., Society Is.; in *Malesia* throughout. Introduced to Hawaii and various Caribbean Islands and Saint Helena, occasionally cultivated.

Habitat & Ecology — A littoral species characteristic of seashores and in some places growing further inland in forest. The seeds float and are water dispersed.



Map 3. Line showing the general distribution of *Barringtonia asiatica* (L.) Kurz.

Vernacular names — Peninsular Malaysia: butong, butun, pertun, putat-laut, putat gajah, putat ayer. Java: Butun (Sunda, Java); Keben (Java). Philippines: Butun (Sulu Is.). Sulawesi: Bitung, Witung (Minahasa); Butung (Bugis); Hutu (Gorontalo). Talise (Makassar). Lesser Sunda Islands: Keben-keben (Bali Isl.). Moluccas: Hutun (Ambon Isl.); Jaga, Jina (Aru Is.); Keptun, Mijimu, Mijiu, Pitu (Halmahera Is.); Mojiu (Ternate Is.); Tahu (Wetar Is.).

Uses — Wood much used. Fruit and bark used as a fish poison. Bark, fruit and leaves used variously as a medicine to treat headaches, sores, bad dreams.

5. **Barringtonia augusta** Wall. ex Kurz

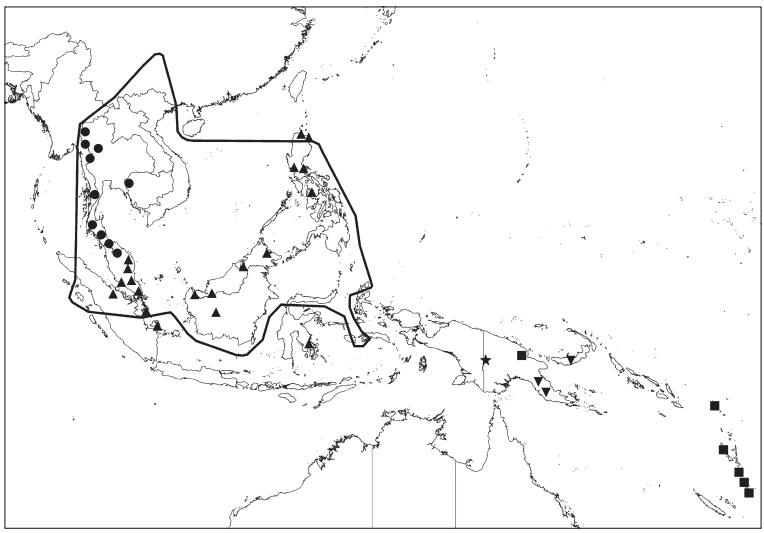
Barringtonia augusta Wall. ex Kurz, J. Roy. Asiat. Soc. Bengal 42, 2 (1874) 233; Prelim. Rep. Forest Pegu (1875) App. A, lxvi, App. B, 52; J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 70; Forest Fl. Burma 1 (1877) 498; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 509: Craib, Fl. Siam. 1 (1931) 671; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 20 (‘*angusta*’); Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 106; Payens, Blumea 15 (1967) 254; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 185; Allertonia 12 (2013) 91, f. 20. — [*Stravadium augustum* Wall., Numer. List (1831) 3637, nom. nud.] — *Doxomma angustatum* Wall. ex Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 105, nom. superfl. — *Michelia angusta* (Wall. ex Kurz) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Wallich 3637* (holo K; iso BM, fragm.), Myanmar, Tenasserim, Amherst.

Barringtonia pterocarpa Kurz, J. Roy. Asiat. Soc. Bengal 42, 2 (1874) 234; Prelim. Rep. Forest Pegu (1875) App. A, lxvi, App. B, 52; J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 70; Forest Fl. Burma 1 (1877) 498; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 509; Nied. in Engl. & Prantl, Nat. Pflanzenfam 3, 7 (1892) 33; Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 858; Craib, Fl. Siam. 1 (1931) 671; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 21; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 107. — *Michelia pterocarpa* (Kurz) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: *S. Kurz 3031* (holo K; iso BM), Myanmar, Pegu, Martaban.

Doxomma magnificum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 106 (non *Barringtonia magnifica* Lauterb. 1911). — *Barringtonia miersiana* R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 30. — Type: *Parish s.n.* (holo K; iso BM), Myanmar, Tenasserim.

Barringtonia marcanii Craib, Kew Bull. 1928 (1928) 237; Fl. Siam. 1 (1931) 671; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 21. — Type: *Marcan 1285* (holo K; iso BM), Thailand, Koh Chang.

Small pachycaul trees, 8–15 m tall. *Leaves*: petioles 3–20 mm, swollen at base; lamina obovate-oblong or obovate-lanceolate, 24–70 by 7–19 cm, chartaceous, base cuneate to almost shortly auriculate, confluent onto petiole, margin slightly serrate-crenulate towards apex, apex shortly acuminate or obtuse, acumen to 1 cm long, lower surface glabrous; midrib prominent on both surfaces, primary veins 16–30 pairs, brochidodromous, not really merging, prominent on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* lanceolate to triangular, 10–20 by 5–6 mm, acute, convex, glabrous. *Inflorescences* terminal spikes, pendulous, 40–220 cm long, with up to 370 flowers; rachis thick, 5–8 mm diam., finely dense-fulvous pulverulent; bracts sessile, lanceolate, c. 5 mm long, accrescent to 12 mm, persistent, fulvous-pulverulent, fimbriate. *Calyx* open in bud, pulverulent. *Flowers* sessile; hypanthium tetragonous, conspicuously winged on corners, fulvous pulverulent; sepals broadly elliptic, 3–11 by 3–9 mm, fulvous pulverulent on exterior; petals 4, white or pink; stamens greenish or white, staminal whorls 5–6, the inner one staminodal, staminal tube 2–5 mm high, staminodia 11–13 mm; disc an undulating grooved ring, 0.5–1 mm high; ovary (3–)4-locular, 2–4(–8) ovules per locule; style 3–7 cm, persistent. *Fruits* oblong, tetragonous or trigonous, 5–7 by 2–2.5 by 1.5–2 cm, tapering towards apex, truncate at base, with undulating wings 3–5 mm wide. *Seeds* single, ovoid, subtrigonous, c. 2.2 by 1 by 0.9 cm, fissured, rounded at apex. — **Map 4.**



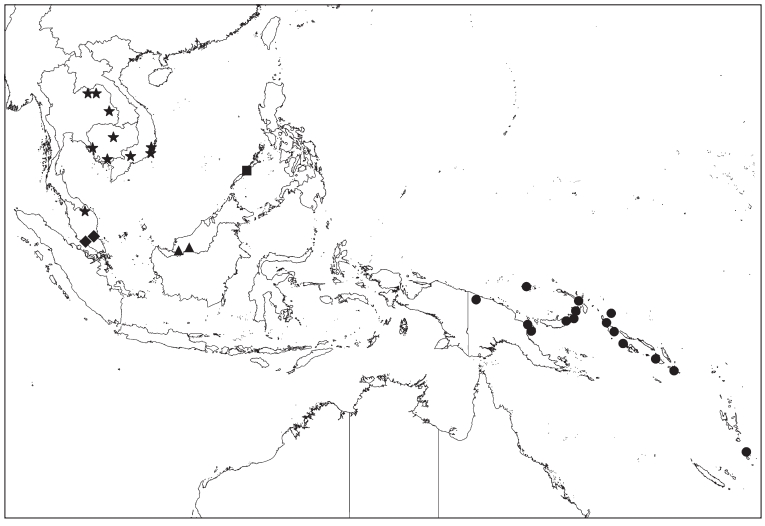
Map 4. Distribution of *Barringtonia* species: *B. augusta* Wall. ex Kurz (●); *B. reticulata* (Blume) Miq. (▲); *B. jebbiana* W.N.Takeuchi (★); western part of distribution of *B. edulis* Seem. (■); *B. boridiensis* R.Knuth (▼); general distribution of *B. macrostachya* (Jack) Kurz (line).

Distribution — S Myanmar, Thailand; in *Malesia*: Northern Peninsular Malaysia.
Habitat & Ecology — Along rivers in evergreen forest up to 300 m.
Vernacular name — Peninsular Malaysia: Putat jambu.
Uses — Wood used for fuel.

6. **Barringtonia badia** Prance

Barringtonia badia Prance, Blumea 55 (2010) 14; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 185; Allertonia 12 (2013) 93, f. 17. — Type: *KEP FRI (Everet) 14310* (holo KEP; iso K, L), Malaysia, Johore, E boundary of Segamat Wildlife Reserve, NE of Segamat.

Trees, to 35 m tall; bark grey/brown patched, smooth, inner bark pink. *Leaves* clustered at end of branches; petioles 0–8 mm long, not swollen at base; lamina subsessile, obovate-spathulate, broadest well above middle, 14–28 by 6–13 cm, subcoriaceous, base tapering sharply, decurrent onto petiole, margin serrate-crenulate, apex mucronate, mucro 10–16 mm long, surfaces drying reddish brown, lower surface densely hirsute on venation; midrib prominulous above, prominent beneath, primary veins 16–21 pairs, brochidodromous, merging 2–9 mm from margin, prominulous on both surfaces, more so beneath and almost forming an intercostal vein, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* lanceolate, 8–10 mm long. *Inflorescences* terminal, pendulous; rachis to 1 m long, 2–2.5 mm diam., densely ferrugineous pubescent. *Calyx* open in bud. *Flowers* sessile, small, 3–4 mm long; hypanthium teretish with 4 distinct grooves, latter and sepals densely ferrugineous pubescent on exterior; petals ovate, c. 5 mm long; stamens 1.5–2 cm long, in 3 whorls, the inner one staminodal; ovary 2-locular. *Fruits* ovoid, 7–10 by 3–5 cm, green turning brown with age, exocarp smooth, ferrugineous puberulous, rounded or tapering towards apex and base. *Seeds* single, ovoid. — **Map 5.**



Map 5. Distribution of *Barringtonia* species: *B. badia* Prance (◆); *B. longipes* Gagnep. (★); *B. procera* (Miers) R.Knuth (●); *B. ridsdalei* Chantar. (■); *B. sarawakensis* Chantar. (▲).

Distribution — *Malesia*: Endemic to Peninsular Malaysia (Terengganu, Pahang and Johore).

Habitat & Ecology — Collected in disturbed forest and secondary forest at lowland altitudes on non-flooded ground.

7. Barringtonia boridiensis R.Knuth

Barringtonia boridiensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 24; Prance, Allertonia 12 (2013) 36, f. 29. — *Barringtonia calyptrocalyx* K.Schum. var. *boridiensis* (R.Knuth) Payens, Blumea 15 (1967) 213. — Lectotype (Prance 2013): *Carr 13351* (holo B†; hololecto K; isolecto BM, L, NY, SING), Papua New Guinea, Boridi.

Barringtonia carrii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23. — Lectotype (Prance 2013): *Carr 12444* (holo B†; hololecto K; isolecto BM, L, NY, SING), Papua New Guinea, Rouna.

Small trees, to 7 m tall, monocaulous. *Leaves* clustered at branch ends; petioles 1–3 cm long, slightly swollen at base; lamina narrowly lanceolate, tapering to both ends at mid point, 19–44 by 2.5–9 cm at broadest point near apex, chartaceous, base cuneate, tapering, decurrent, margin slightly serrate-crenulate, apex acuminate to mucronate, apiculum 5–15 mm long, lower surface glabrous; midrib flattened and prominulous above, prominent beneath, primary veins 18–38 pairs, brochidodromous, merging 1–2 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* not seen. *Inflorescences* cauliflorous and ramiflorous, pendulous, emerging below leaves, 50–65 cm long with sparse flowers; rachis thin, 1–1.5 mm diam., glabrous; bracts not seen. *Calyx* closed in bud, apex rounded, undivided into lobes and persistent in old flowers, red. *Flowers* with pedicels 3–6 mm long, articulate near base; hypanthium conical, slightly ridged, puberulous or glabrous on exterior, 4–5 mm broad at apex by 4–5 mm long; petals elliptic, 1.5–2.5 by 1–1.5 cm, lilac-pink, apex obtuse; stamens deep salmon pink; disc an annular raised ring; ovary 4-locular, with 1–2 ovules per locule; style red, c. 2 cm long. *Fruits* and *seeds* not seen. — **Map 4.**

Distribution — *Malesia*: SE New Guinea.

Habitat & Ecology — Rainforest understorey in lowland, montane and secondary forest up to 1950 m.

Vernacular name — Papua New Guinea: Megu.

Note — This species was included as a variety of *B. calyptrocalyx* by Payens (1967), but it seems to be quite distinct with the narrow leaves, usually with fewer primary veins.

8. Barringtonia calyptrata (Miers) R.Br. ex F.M.Bailey

Barringtonia calyptrata (Miers) R.Br. ex F.M.Bailey, Queensland Agric. J. 18 (1907) 125; Compr. Cat. Queensland Pl. (1913) 209; C.T.White, Proc. Linn. Soc. New South Wales 44 (1919) 823, 825; Proc. Roy. Soc. Queensland 34 (1923) 46; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19; R.J.F.Hend. in A.S.George, Fl. Australia 8 (1982) 4; Prance, Allertonia 12 (2013) 37, f. 22. — *Butonica calyptrata* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 76. — *Michelia calyptrata* (Miers) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — *Huttum calyptratum* (Miers) Britten, J. Bot. 39 (1901) 67; in Banks & Sol., Ill. Austral. Pl. Cook's Voy. 2 (1901) 40, t. 123. — Type: *Banks & Solander s.n.* (holo BM; iso K), Australia, Queensland, Cape Fear Islands, Lizard Is.

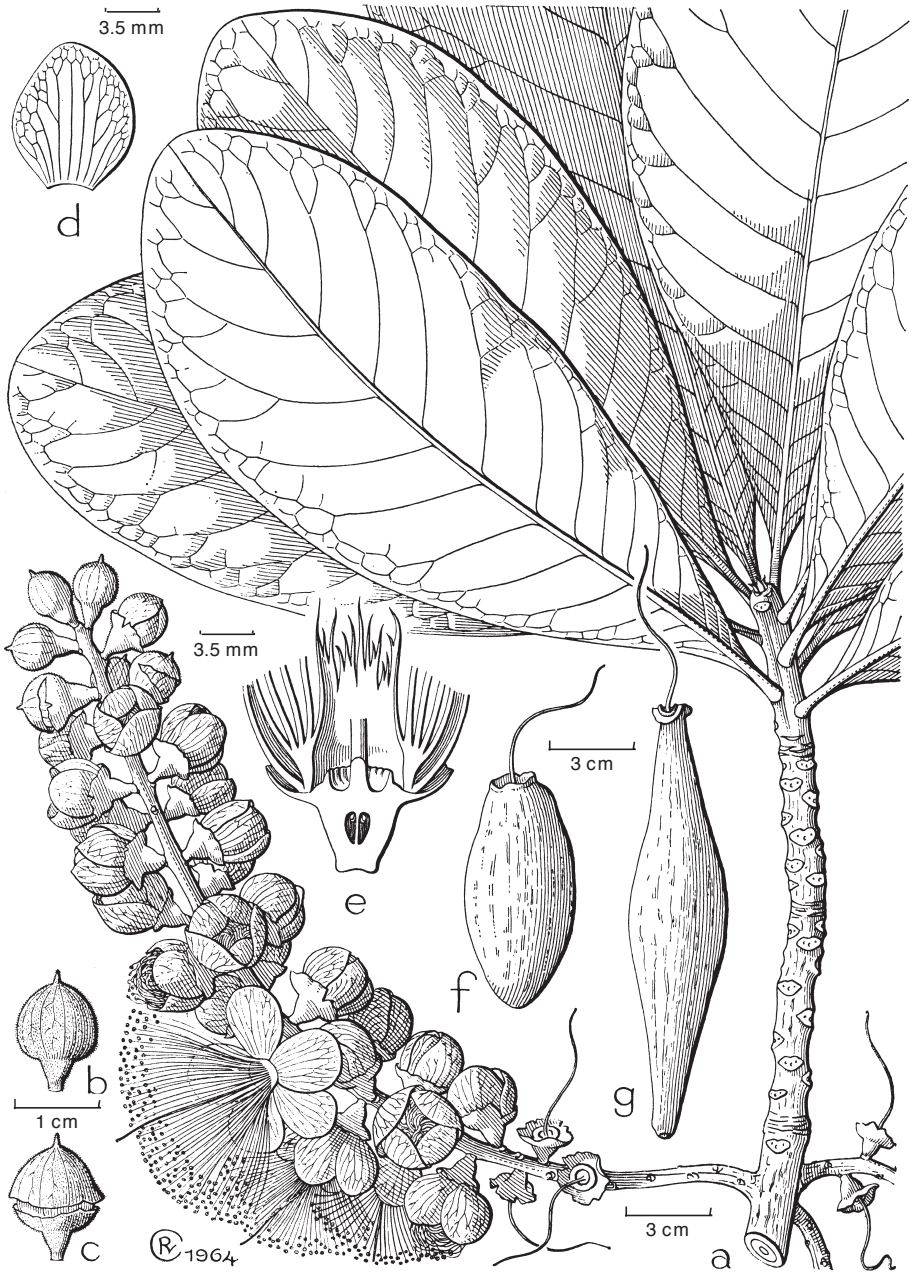


Fig. 2. *Barringtonia calyptrata* (Miers) R.Br. ex F.M.Bailey. a. Habit; b. bud; c. circumscissile calyx; d. petal; e. flower section; f, g. fruits (a–e: *Darbyshire 749*, L; f: *Blades s.n.*; g: *Womersley NGF 14043*, L).

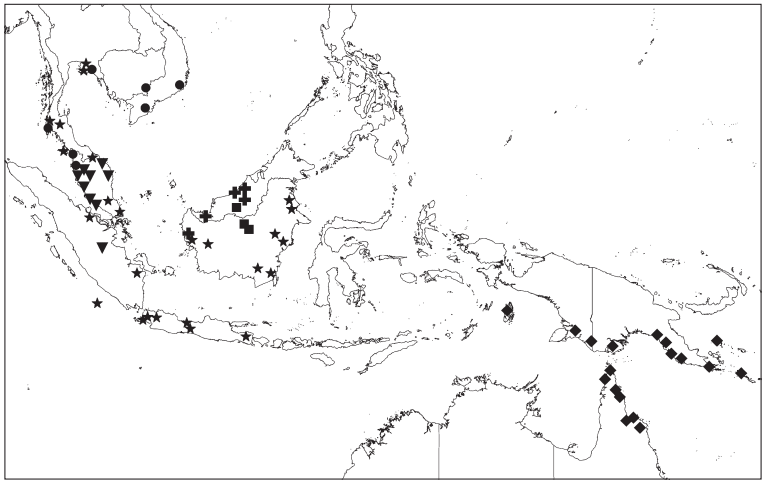
Barringtonia flava Lauterb., Nova Guinea 8 (1910) 314; Bot. Jahrb. Syst. 57 (1922) 350; C.T.White, J. Arnold Arbor. 10 (1929) 246; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 20. — Type: *Versteeg 1827* (holo WRSL; iso BO, K, L, U), Indonesia, Irian Jaya, near Merauke.

Barringtonia forbesii Baker f., J. Bot. 61, Suppl. (1923) 20 — Type: *H.O. Forbes 803* (holo K; iso BM, L), Papua New Guinea, Sogeri Region, S9°28'45", E147°31'37".

Barringtonia racemosa auct. non (L.) Spreng.: F.Muell., Fragm. 9 (1875) 118.

Barringtonia edulis auct. non Seem.: F.M.Bailey, Queensland Agric. J. 18 (1907) 125, t. 11; Compr. Cat. Queensland Pl. (1913) 209.

Small to medium sized trees, 10–20 m tall, twigs 5–10 mm diam. *Leaves* grouped towards apex of branches; petioles 0.5–3 cm long, slightly swollen at base; lamina obovate-oblong, 10–29 by 4–13 cm, coriaceous, base cuneate, decurrent almost to base of petiole, margins entire, apex obtuse or rarely cuspidate, lower surface glabrous; midrib flattened prominulous above, prominent beneath, primary veins 8–20 pairs, brochidodromous, merging only through network of intercostal veins, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* triangular, 2–5 by c. 2 mm. *Inflorescences* ramiflorous spikes, pendulous, 30–40 cm long, with up to 60 flowers, densely distributed; rachis 3–7 mm diam., densely fulvous or grey-green pulverulent; bracts sessile, lanceolate, 8–20 by c. 3 mm. *Calyx* closed in bud, apex rounded, pulverulent, rupturing into a circumscissile, caducous cap, 3–8 by 10–12 mm and a low slightly divided ring. *Flowers* sessile; hypanthium grooved, 3–4 by 3–4 mm, grey-green to fulvous pulverulent; petals 4–5, elliptic, 1.25–2.5 by 0.5–1.75 cm, red or white; stamens white, staminal whorls 4–5(–7), the inner 1–2 staminodal, staminal tube 2–3 mm high, staminodia connate up to 4–10 mm, free filiform part 2–5 mm, bent inwards against the style; disc 1–2 mm high; ovary (2–)3–4-locular, 2–4 ovules per locule; style 3–4.5 cm long, white. *Fruits* ovoid or spindle-shaped, 5–9.5 by 1.75–2.5 by 1.5–2.25 cm, truncate. *Seeds* subglobular, c. 2 by 1.5 cm. — **Fig. 2; Map 6.**



Map 6. Distribution of *Barringtonia* species: *B. calyptrata* (Miers) R.Br. ex F.M.Bailey (◆); *B. fusiformis* King (▼); *B. hallieri* R.Knuth (■); *B. havilandii* Ridl. (✚); *B. macrocarpa* Hassk. (★); *B. pauciflora* King (●).

Distribution — N Australia (Lizard Is.); in *Malesia*: Moluccas (Aru Is.), New Guinea.

Habitat & Ecology — Mainly open savanna, also in streambeds and riverine, gallery forests and behind mangrove.

Vernacular names — Aru Is.: Tufan. New Guinea: Bervakah (Tehid); Fofora, Kootree, Tolamiai (Elema, Toaripi); Go-oh (Matapali). Australia: Corned beef wood.

Uses — Wood soft and with an even grain and used for making fruit cases and flooring. Boiled leaves used for chest pain in New Guinea.

9. **Barringtonia calyptrocalyx** K.Schum.

Barringtonia calyptrocalyx K.Schum. in K.Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 91; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 462, 464; Lauterb., Nova Guinea 8 (1910) 314; Bot. Jahrb. Syst. 45 (1911) 363; Bot. Jahrb. Syst. 57 (1922) 351; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 25; Payens, Blumea 15 (1967) 211; Prance, Allertonia 12 (2013) 38, f. 6, 7. — Type: *Hollrung 551* (holo B, fruit preserved only; iso WRSL), Papua New Guinea, Constantinhafen.

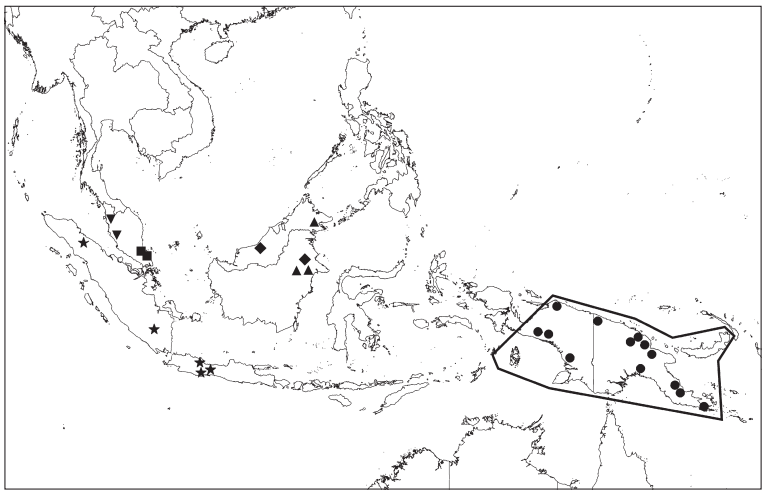
Barringtonia calophylla K.Schum. in Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 463; Lauterb., Nova Guinea 8 (1910) 315; Bot. Jahrb. Syst. 57 (1922) 347, 352; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 24. — Lectotype (Prance 2013): *Tappenbeck 22* (holo B†; lecto WRSL, fruit only and tracing of leaf), Papua New Guinea, near River Ramu.

Shrubs or small trees, 2–10 m tall. *Leaves*: petioles 1–13 cm long, slightly winged, slightly swollen at base; lamina obovate-lanceolate or linear-lanceolate, 32–135 by 6–25 cm, coriaceous, base cuneate, confluent often to petiole base, margin serrate-crenulate, apex acuminate, lower surface glabrous; midrib prominent on both surfaces more so beneath, primary veins 32–65 pairs, brochidodromous, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* 2–5 by c. 2 mm, triangular. *Inflorescences* cauliflorous racemes, pendulous, 30–135 cm long, with up to 71 flowers; rachis 1–4 mm diam., accrescent, puberulous; bracts sessile, lanceolate, 8–20 by c. 3 mm; bracteoles narrowly triangular, 2–3 by c. 1 mm. *Calyx* closed in bud, rounded or with fine pointed beak at apex, rupturing into a caducous circumscissile cap of 5–6 by 8–12 mm and a cup-shaped ring, or more rarely into 2–3 irregular segments of 5–11 by 5–14 mm. *Flowers* with pedicels 2–17 mm; hypanthium tetragonous, 3–5 by 3–7 mm, pulverulent; petals elliptic, 1.75–2.5 by 1–1.5 cm, obtuse, white-pink, rose-red; stamens dark red, staminal whorls 4–6, the inner one staminodal, staminal tube 2–3 mm high, staminodia connate up to 4–10 mm, free part 2–10 mm; disc annular, 0.5–1 mm high; ovary 2–3(–4)-locular, 2–4(–6) ovules per locule; style 3–4.5 cm, dark red. *Fruits* ovoid or spindle-shaped, truncate, 3.5–7 by 1.5–4 by 1–3.5 cm, often with up to 8 parallel ribs. *Seeds* ovoid, c. 2.4–3.5 by 1.25–2 cm.

Note — For differences with *B. magnifolia*, see note under latter.

KEY TO THE VARIETIES

1a. Leaves glabrous beneath, lowland to highland . . . . . **a.** var. **calyptrocalyx**
b. Leaves pubescent beneath, lowland . . . . . **b.** var. **mollis**



Map 7. Distribution of *Barringtonia* species: two varieties of *B. calyptrocalyx* K.Schum. (line); *B. chantaranoi* Prance (◆); *B. corneri* Kiew & K.M.Wong (■); *B. gigantostachya* Koord. & Valeton var. *gigantostachya* (★); *B. gigantostachya* Koord. & Valeton var. *megistophylla* (Merr.) Payens (▲); *B. papuana* Lauterb. (●); *B. payensiana* Whitmore (▼).

a. var. **calyptrocalyx**

Barringtonia calyptrocalyx K.Schum. var. *calyptrocalyx*: Prance, Allertonia 12 (2013) 40.

For more nomenclature see under species.

Leaves glabrous beneath. Found in lowland to highland. — **Map 7.**

Distribution — *Malesia*: New Guinea incl. New Britain.

Habitat & Ecology — Understorey tree of marshy forest along creeks and submontane rainforest 0–1400 m.

Vernacular names — Papua New Guinea: Bura bura (Musa); New Britain: Papao.

b. var. **mollis** Lauterb.

Barringtonia calyptrocalyx K.Schum. var. *mollis* Lauterb., Bot. Jahrb. Syst. 57 (1922) 352; C.T.White, Proc. Roy. Soc. Queensland 38 (1927) 248; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 25; Payens, Blumea 15 (1967) 212; Prance, Allertonia 12 (2013) 41. — Lectotype (Prance 2013): *Ledermann 10525* (holo B†; lecto WRSL, flower & leaf fragm.), Papua New Guinea, Sepik River, Malu.

Leaves pubescent beneath. Found in lowlands. — **Map 7.**

Distribution — *Malesia*: Moluccas (Aru Is.), New Guinea incl. New Britain.

Habitat & Ecology — Understorey shrub or small tree of primary and secondary rainforest, 0–100 m.

Vernacular names — Papua New Guinea: Kala (Sentani-taal); Kusap (Jal); Sehsega (Orokaiva); Sesewa (Oitatandi); Sjedon (Kamtuk); New Britain: La malo malo (W Nakanai).

Uses — Bark boiled and used as a fish poison.

10. **Barringtonia chaniana** (Whitmore) Prance

Barringtonia chaniana (Whitmore) Prance, Blumea 55 (2010) 14; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 186; Allertonia 12 (2013) 94, f. 21. — [Lecythidaceae species A in Whitmore, Tree Fl. Malaya 2 (1973) 266.] — *Abdulmajidia chaniana* Whitmore, Kew Bull. 29 (1974) 210; El-Sherif & Latiff, Folia Malaysiana 7 (2006) 44. — Type: *KEP FRI (Chan) 17564* (holo KEP), Malaysia, Johore, Gunung Pulai Forest Reserve.

Small trees, to 10 m tall. *Leaves*: petioles 2–9 cm long, slightly swollen at base, slightly winged near apex; lamina elliptic, 14–29 by 7–11 cm, base cuneate, margin entire, slightly undulate, apex acute to acuminate, acumen 5–15 mm long, both surfaces glabrous, yellowish green when dry; midrib prominulous above, prominent beneath, primary veins 6–9 pairs, brochidodromous, merging through network of intercostal veins, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Inflorescences* an axillary spike, pendulous; rachis to 26 cm long, 2.5–3 mm diam., c. 4 mm diam. at base, minutely puberulous, longitudinally fissured. *Calyx* open in bud. *Flowers* sessile; hypanthium conoid, trigonous, c. 10 mm tall, glabrous, slightly tetragonous; sepals 3, ovate, 5–6 by 2–3 mm, margins fimbriate; petals 3–4, ovate, c. 2.5 by 1.8 cm, pink, margins fimbriate; staminal whorls 7–8, filaments to 4 cm long; disc raised 0.6 mm; ovary 3-locular; style to 3 cm long, pink. *Fruits* obovoid, c. 9 by 6 cm, reddish. *Seeds* 5, 4–6 by 2–4 cm. — **Map 8.**

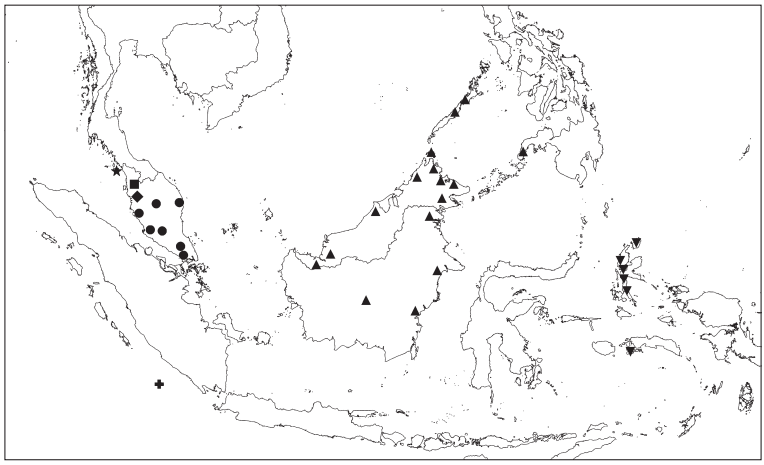
Distribution — *Malesia*: Endemic in Peninsular Malaysia (Johore, Pahang, Selangor).

Habitat & Ecology — Lowland forests, especially on hillsides to 570 m altitude.

Vernacular name — Putat.

11. **Barringtonia chantaranoi** Prance

Barringtonia chantaronoi Prance, Allertonia 12 (2013) 42, f. 7. — Type: *S (Sibat ak Luang) 23267* (holo L; iso K), Malaysia, Sarawak, 4th Division, Bukit Mentagai, Bok-Tisam, Marudi.



Map 8. Distribution of *Barringtonia* species: *B. chaniana* (Whitmore) Prance (●); *B. confusa* Lütjeh & Ooststr. (▼); *B. curranii* Merr. (▲); *B. flagellata* Lütjeh. & Ooststr. (✚); *B. latiffiana* (El-Sherif) Prance (★); *B. maxwelliana* (Whitmore) Prance (◆); *B. zainudiniana* (El-Sherif & Latiff) Prance (■).

Large trees, to 30 m tall. *Leaves*: petioles 0.8–1.5 cm long, terete, glabrous, not swollen at base; lamina oblong-elliptic, 12–25 by 4–8.5 cm, chartaceous, base cuneate, decurrent, margins entire, slightly revolute, with small glands at vein endings, apex abruptly acuminate, acumen 5–7 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 12–13 pairs, brochidodromous with marginal vein 1–2 mm from margin, prominulous above, prominent beneath, intercostal veins slightly prominulous on both surfaces, reticulate. *Cataphylls* linear, 3–5 mm long. *Inflorescences* axillary on young wood, pendulous, c. 60 cm long; rachis sparsely short-puberulous, 2–2.5 mm diam., longitudinally striate when dry; bracts minute, linear, c. 1 mm long. *Calyx* closed in bud, without apical pore, splitting into 2, ovate-elliptic lobes, 1–1.2 by c. 0.8 cm at base, puberulous. *Flowers* on thin pedicels, 7–10 mm long, c. 0.5 mm thick, non-articulate; hypanthium turbinate, not angled or winged, puberulous on exterior; petals 4, oblong, c. 1.5 cm long, creamy yellow; stamens pale yellow, staminal whorls 4–5, the inner one staminodal, staminal tube c. 1 mm high; disc annular, 1–1.5 mm high, c. 3 mm diam.; ovary 4-locular, 3–4 ovules per locule; style 3.5–4 cm long. *Fruits* narrowly musoid when young (*Anderson 4330*) to ovoid when mature, c. 9 by 5.5 cm (*Kostermans 21750*); exocarp glabrous, pedicel 1.5 cm long. — **Map 7.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Lowland forest to 200 m.

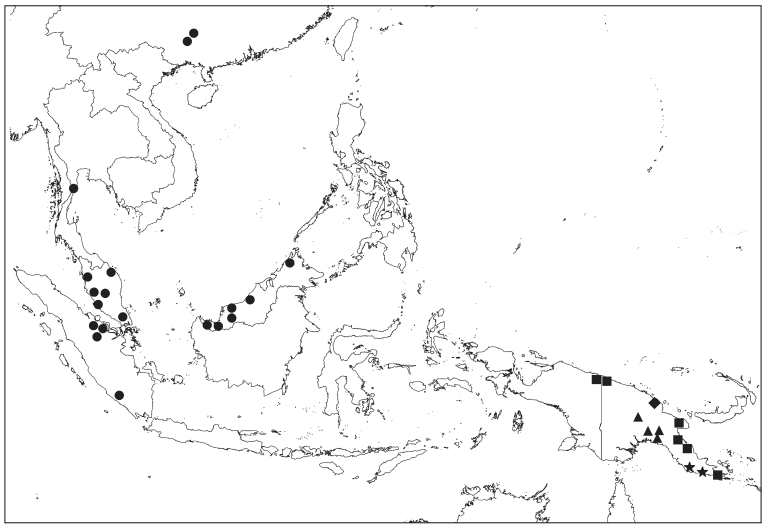
Vernacular name — Karut (Iban).

12. Barringtonia clemensii R.Knuth

Barringtonia clemensii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23; Prance, Allertonia 12 (2013) 43, f. 8, 25. — Lectotype (Prance 2013): *M.S. Clemens 198* (holo B†; hololecto L; isolecto A, ZT), Papua New Guinea, Morobe Distr., Sattelberg.

Monopodial treelets, 3–10 m tall; bark papery-scaley, pale grey-brown. *Leaves* in a terminal whorl; sessile or petioles 10–60 mm, pulvinate; lamina obovate, 55–85 by 16–29 cm, widest at 2/3 of length, base tapering, abruptly rounded, confluent, margin entire, wavy undulate or slightly crenulate, flat; apex acuminate, acumen to 2.5 cm; midrib prominent above, rounded and more prominent beneath, primary veins 20–27 pairs, brochidodromous, ± straight near base, more oblique above, curved, arched and joined at margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* unknown, but above whorls leaf-like, lanceolate, c. 15 by 3.5 cm. *Inflorescences* cauliflorous, solitary to clustered, pendulous racemes, to 45 by 0.3 cm, densely flowered, 16–24 flowers per 10 cm; the rachis sparsely farinose-puberulous, terete, drying striate; bracts caducous. *Calyx* closed in bud, apex rounded, circumscissile, tearing into triangular lobes. *Flowers* 20–80, borne on 1 mm long bosses; pedicels 8–10 mm, not articulate; hypanthium tetragonous, sparsely farinose-puberulous; sepals 3, to 6 mm long; petals 4; staminal whorls 3–4, ovary 4-locular. *Fruits* ovoid to lanceolate, c. 5 by 2.5 cm, apex and base acutely tapering, strongly tetragonous, square in cross section, becoming sunken when dry; with calyx remains at apex, green, becoming more rounded, white and fleshy when ripe; pedicel c. 12 mm long, c. 1 mm diam. — **Map 9.**

Distribution — *Malesia*: Papua New Guinea (Morobe, Northern, Milne Bay Provinces).



Map 9. Distribution of *Barringtonia* species: *B. clemensii* R.Knuth (★); *B. monticola* Jebb & Prance (▲); *B. lumina* Jebb & Prance (■); *B. pendula* (Griff.) Kurz (●); *B. serenae* Jebb & Prance (◆).

Habitat & Ecology — Understorey of lowland forest 40–900 m.

Note — Payens (Blumea 15, 1967: 201) reduced this species to the synonymy of *B. samoensis*. The two species have the typical Section *Stravadium* flowers, with a tetragonal hypanthium and 4 triangular calyx lobes. This species has far larger leaves however, and exhibits a different architecture.

13. Barringtonia confusa Lütjeh. & Ooststr.

Barringtonia confusa Lütjeh. & Ooststr., Blumea 3 (1938) 100; Prance, Allertonia 12 (2013) 45, f. 21. — *Barringtonia rubra* Miq., Fl. Ned. Ind. 1, 1 (1855) 487, nom. illeg. — Type: *Zippelius 53d* (holo L), Indonesia, Ambon.

Small to medium sized trees, to 20 m tall. *Leaves*: petioles 0.5–8 cm long, often slightly winged, distinctly swollen at base; lamina oblong to oblong-lanceolate, 18–66 by 6–17 cm, widest at mid point, chartaceous, base cuneate, decurrent, margin undulate to wavy, slightly crenulate near base, flat, apex bluntly acuminate, acumen 8–20 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 17–28 pairs, brochidodromous, merging through network of intercostal veins, prominulous on both surfaces, intercostal veins prominulous on both surfaces, mostly parallel and arranged at right angles to veins. *Cataphylls* linear, to 1 cm long. *Inflorescences* axillary or cauliflorous, pendulous, rachis 1.5–2 mm diam., sparsely short-puberulous, 25–70 cm long; bracts not seen. *Calyx* closed in bud, without apical pore, rupturing into three unequal segments. *Flowers* with puberulous pedicels 6–16 mm long; hypanthium obconical, pulverulent on exterior, terete; sepals 3, 4–5 mm long, glabrous on both surfaces; petals greenish white; stamens pale pink, staminal

whorls 3, the inner one staminodal, staminal tube 1 mm high; disc thick, c. 0.5 mm high, many-knobbed; ovary 3-locular, 1–3 ovules per locule; style 2.5–3 cm long, red. *Fruits* oblong-ovoid, tapering towards apex and base, 4–6 by 2–3 cm, slightly 6-ridged towards apex; exocarp glabrous; calyx-lobes persistent at apex. *Seeds* ovoid, c. 3.5 by 1.5 cm, fissured. — **Map 8.**

Distribution — *Malesia*: Moluccas (Halmahera and Ambon).

Habitat & Ecology — Lowland forest.

Vernacular name — Moluccas: Halmahera: O pangaha, Pangaha menauru.

Uses — Bark used as a fish poison.

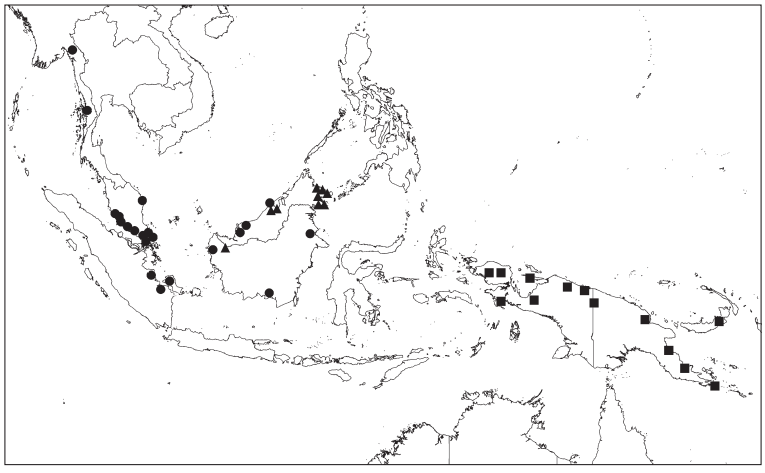
Note — For differences with *B. magnifolia*, see note under latter.

14. Barringtonia conoidea Griff.

Barringtonia conoidea Griff., Notul. Pl. Asiat. 4 (1856) 656; Icon. Pl. Asiat. 4 (1854) t. 635, 636, f. 1; Kurz, J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 70; Forest Fl. Burma 1 (1877) 497; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 508; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 136; Brandis, Indian Trees, ed. 1 (1906) 330; Merr., J. Malayan Branch Roy. Asiat. Soc. 77 (1917) 204; Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 854; Merr., Bibliogr. Enum. Born. Pl. (1921) 419; Ridl., Fl. Malay Penins. 1 (1922) 757; Corner, Wayside Trees Malaya 1 (1940) 354, f. 122; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 106; Payens, Blumea 15 (1967) 189; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 187; Allertonia 12 (2013) 46, f. 9. — *Michelia conoidea* (Griff.) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Griffith KD 2423* (holo K; iso P), Malaysia.

Butonica alata Wall. [Numer. List (1831) 3633, nom.nud.] ex Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 70, t. 14, f. 10–15. — Type: *Wallich 3633* (holo K; iso BM, flowers only, CGE), Myanmar, Moulmein.

Small shrubs or trees, 3–15 m tall, often multi-stemmed. *Leaves*: petioles 1–7 mm, sometimes winged; lamina obovate-oblong, 12–28 by 4–10 cm, chartaceous, base tapering to round or auriculate, margin serrate-crenulate, apex rounded or short acuminate,



Map 10. Distribution of *Barringtonia* species: *B. conoidea* Griff. (●); *B. longisepala* Payens (▲); *B. sepikensis* Lauterb. (■).

acumen 0–5 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 10–15 pairs, brochidodromous arching and merging 1–3 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* triangular, 5–10 by 3–4.5 mm. *Inflorescences* terminal or ramiflorous racemes, pendulous, 5–60 cm long, with up to 12 flowers; rachis 1.5–2 mm

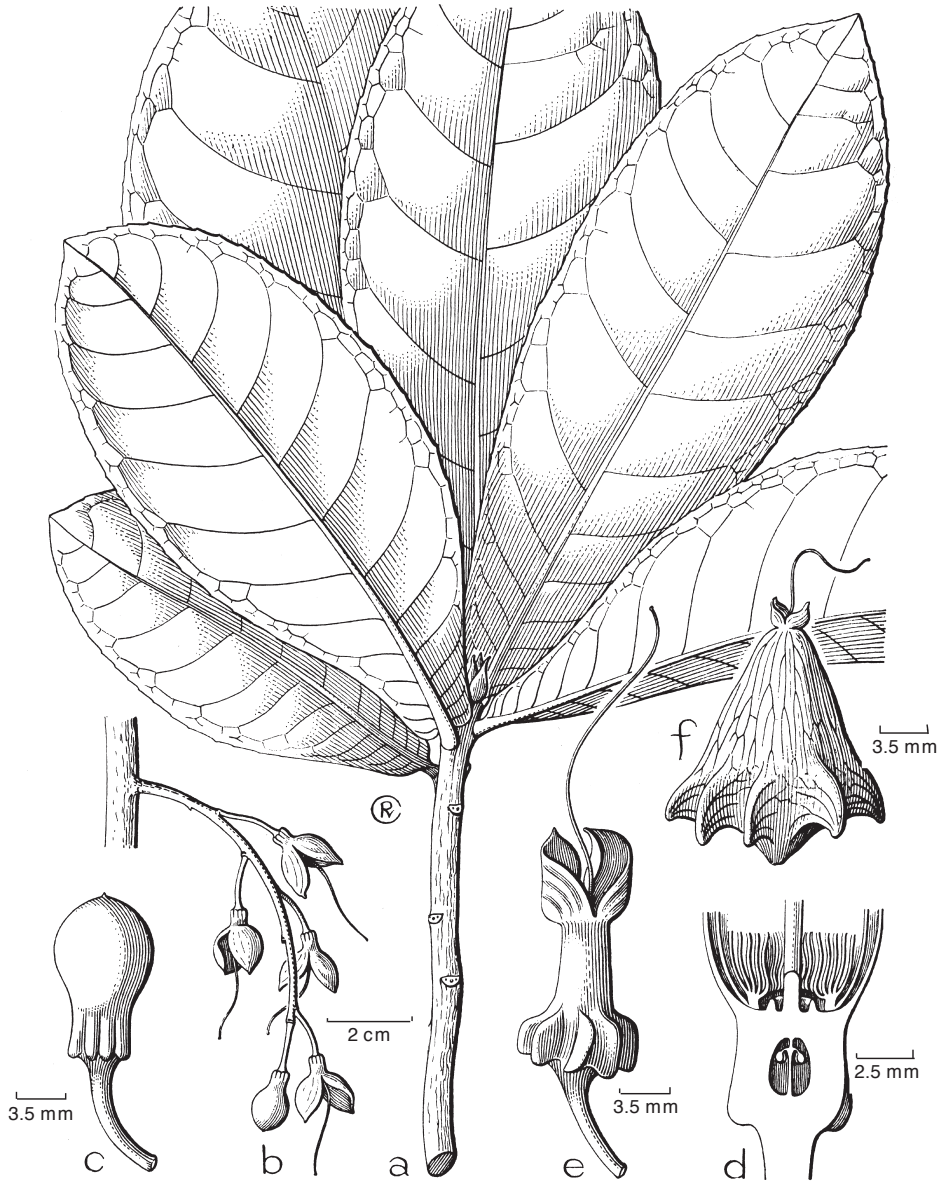


Fig. 3. *Barringtonia conoidea* Griff. a. Habit; b. inflorescence; c. bud; d. bud in section; e. very young fruit; f. fruit (a, b: *Goodenough s.n.*, 15-III-1890; c, d, f: *BRUN (Corner) 5382*, L; e: *SFN (Spare) 36739*).

diam., finely sparse-puberulous, longitudinally striate; bracts triangular, c. 5 by 2 mm, mucronate. *Calyx* closed in bud, rupturing into 2 equal segments. *Flowers* with pedicels 5–15 mm; hypanthium more or less cylindrical, 3–4 mm long, glabrous or finely puberulous, with 8 wing-like appendages at base; petals white; staminal whorls 5–6, the inner one staminodal, staminal tube c. 3 mm high, staminodia c. 4 mm; disc a thin ring, 0.75–2 mm high; ovary 4-locular, 1–3 ovules per locule; style 2.5–3.25 cm long. *Fruits* conoid, 3–5 by 2.5–4.5 cm, distinctly 8-winged, wings 12–17 by 6–13 mm. *Seeds* usually 1, rarely 2, ovoid, c. 3 cm long, fissured, pointed at apex. — **Fig. 3; Map 10.**

Distribution — Myanmar, in *Malesia*: Sumatra, Peninsular Malaysia and Borneo.

Habitat & Ecology — Growing in water or frequently inundated areas near limit of saline influence especially along tidal rivers.

Vernacular names — Peninsular Malaysia: Nasik, Putat ayer, Putat nasi, Putat sungei.

15. Barringtonia corneri Kiew & K.M.Wong

Barringtonia corneri Kiew & K.M.Wong, Malayan Nat. J. 44 (1988) 467; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 175; Allertonia 12 (2013) 95, f. 7, 37, 38. — Type: *Corner & Verdoorn s.n.* (holo SING), Malaysia, Johore, Gunung Panti.

Small pachycaul trees, initially monopodial, 5–10 m tall; adventitious roots from stem at the base of the leaf whorls. *Leaves*: lamina sessile or subsessile, oblanceolate, 35–66 by 8–15 cm, chartaceous, base cuneate, tapering, margin entire, apex acuminate, acumen 1–2.5 cm long, lower surface glabrous; midrib prominent on both surfaces, primary veins 30–40 pairs, brochidodromous, forming arched marginal vein 2–5 mm from margin, prominulous on both surfaces, more so beneath, intercostal veins prominulous on both surfaces, finely reticulate. *Inflorescences* terminal or axillary spikes, 6–40 cm long, more or less erect in flower, becoming pendulous in fruit. *Calyx* open in bud. *Flowers* with pedicels 2–7 mm long; hypanthium tetragonous, puberulous; petals yellow; staminal whorls 3–4, staminal tube less than 1 mm high; disc a ring around the style base, c. 0.5 mm high; ovary 4-locular; style 1.2–2.5 cm long. *Fruits* narrowly ellipsoid, tapering to base, c. 5 by 2 cm, 4-angled. *Seeds* single. — **Map 7.**

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Streambanks or swampy lowland forest.

Vernacular name — Putat.

Note — This species is unique in the genus for producing adventitious roots in the base of the leaf rosettes to absorb the nutrients from the copious amount of litter that accumulates there.

16. Barringtonia curranii Merr.

Barringtonia curranii Merr., Philipp. J. Sci. 1, Suppl. (1906) 211; Bibliogr. Enum. Born. Pl. (1921) 419; Enum. Philipp. Fl. Pl. 3 (1923) 142; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 22; Payens, Blumea 15 (1967) 255; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 109; Prance, Allertonia 12 (2013) 96, f. 21. — Type: *FB (Curran) 3596* (holo lost; iso K), Philippines, Palawan, Puerto Princesa.

Barringtonia rhodochlamys Airy Shaw, Kew Bull. 5, 1 (1950) 137. — Type: *P.W. Richards 1400* (holo K), Malaysia, Sarawak, Mount Dulit.

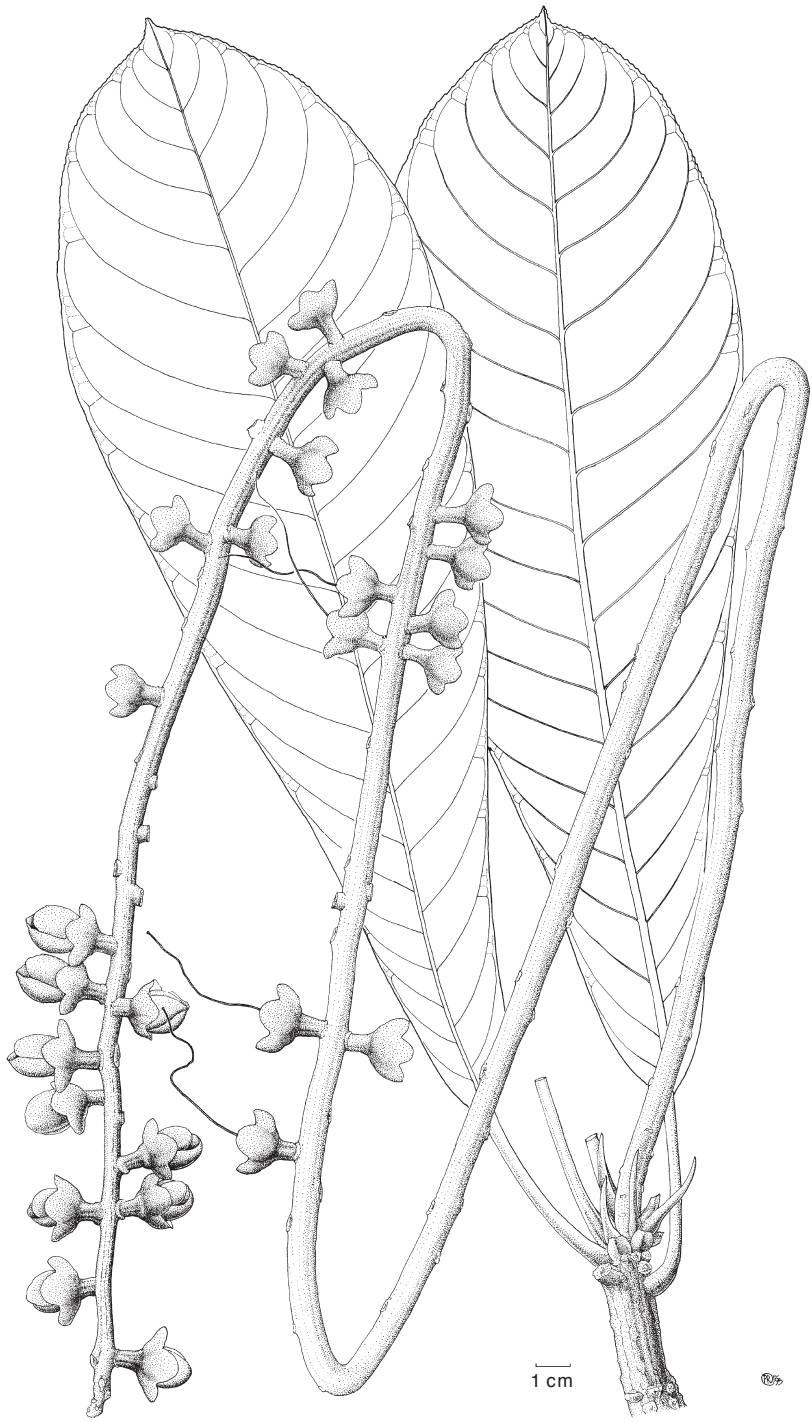


Fig. 4. *Barringtonia curranii* Merr. Habit with inflorescence (*Ambriansyah & Arifin AA 115*, WAN).

Small to medium sized trees, 13–25 m tall. *Leaves* clustered at end of branches; petioles 1–2.5(–7) cm long, winged on upper portion; lamina obovate-lanceolate or rarely obovate-oblong, 24–90 by 9–21 cm, chartaceous, base cuneate, margin serrate-crenulate, apex acuminate or obtuse, acumen c. 10 mm long, lower surface glabrous; midrib prominent on both surfaces, more so beneath, primary veins 15–30 pairs, brochidodromous, running almost to margin and merging through network of intercostal veins, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* on sterile twigs triangular, 7–20 by c. 4 mm, on fertile twigs lanceolate or triangular, 8–50 by 4–12 mm, serrate, acute; bracts and bracteoles caducous. *Inflorescences* terminal spikes, 40–110 cm long, pendulous, with 50–60 flowers; rachis 10–15 mm diam. at base, 4–7 mm at apex, finely fulvous-pulverulent. *Calyx* open in bud, fulvous-pulverulent, red. *Flowers* sessile; hypanthium tetragonous, without wings and grooves, semi-amplexicaul at base by a thickened ring, 6–8 by 4–7 mm, thickly fulvous pulverulent; sepals ovate-orbicular, 4–7 by 4–11 mm, pulverulent on exterior, fimbriate; petals pink or red; staminal whorls 5–6, the inner one staminodal, staminal tube 4–5 mm high, staminodia 12–23 mm; disc annular, undulating, grooved, 1–1.5 mm high; ovary 4-locular, 4–7 ovules per locule; style 4–7 cm long. *Fruits* ovoid, tetragonous or terete, tapering at both ends, ferrugineous-pulverulent, 7–11 by 4–7.5 by 4.5–7.5 cm. *Seeds* single, ovoid, 4–5 by 2–3 cm, with longitudinal fissures. — **Fig. 4; Map 8.**

Distribution — *Malesia*: Borneo (Sarawak and Sabah), Philippines (Palawan).

Habitat & Ecology — Understorey tree in rainforest and secondary forest and hills, 0–1670 m.

Vernacular name — Borneo: Kalambuk (Bajau).

17. Barringtonia edulis Seem.

Barringtonia edulis Seem., Fl. Vit. (1866) 82; Payens, Blumea 15 (1967) 208; A.C.Sm., Fl. Vit. Nova 2 (1981) 597; Prance, Allertonia 12 (2013) 47, f. 10, 20. — *Butonica edulis* (Seem.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 76. — *Huttum edule* (Seem.) Britten, J. Bot. 39 (1901) 67. — Type: *Seemann 150* (holo BM; iso K, P), Fiji, Vitu Levu.

Small branching trees, 6–15 m tall. *Leaves* grouped in whorls at end of branches; petioles 0.5–3 cm long, winged, slightly swollen at base; lamina obovate-oblong, 25–52 by 7–20 cm, chartaceous, base cuneate, decurrent onto petiole, margin usually wavy and entire or rarely slightly serrate-crenulate, flat, apex acuminate, acumen 5–15 mm long, lower surface glabrous; midrib plane or prominulous above, very prominent beneath, primary veins 15–20 pairs, brochidodromous, merging through network of intercostal veins 1–4 mm from margin, intercostal veins slightly prominent on both surfaces, reticulate. *Cataphylls* linear-elliptic, 5–16 by 1–4 cm, caducous. *Inflorescences* 65–180 cm long, ramiflorous and terminal racemes, pendulous; rachis c. 5 mm diam., accrescent to 1 cm, fissured, yellowish grey-green pulverulent, 20–50 cm long, densely flowered with c. 40 flowers; bracts lanceolate. *Calyx* with an apical pore in bud, apex rounded, pulverulent, circumscissile, often rupturing into 2–3 elliptic lobes, 8–11 by 5–12 mm. *Flowers* with pedicels 0.2–0.5 cm long, not articulate; hypanthium tetragonous or not, greyish yellow pulverulent, 4–7 by 3–5 by 5–12 mm; petals 4, elliptic, 2.75–3 by 1.75–2 cm, white; stamens red, staminal whorls 5–8, the inner one staminodal, staminal

tube 7–12 mm high, staminodia connate up to 8 mm, free filiform part c. 15 mm; disc annular ring, c. 0.25 mm high, c. 8 mm diam.; ovary (3–)4-locular, 2–4 ovules per locule; style 5–7 cm long. *Fruits* sessile, ellipsoid, truncate, tapering towards base, 4.5–9 by 2–4.5 cm, exocarp glabrous to sparsely puberulous, remains of calyx persistent; mesocarp c. 8 mm thick, woody. *Seeds* ovoid, c. 3 cm long, distinctly fissured. — **Map 4.**

Distribution — Probably endemic to Fiji (Viti Levu, Kandavu, Ovalau, Lakemba) and much cultivated in other places for the edible seed, which probably accounts for its presence in New Guinea.

Habitat & Ecology — Forest, woodland and pasture, 0–400 m.

Uses — The seed is edible. Many cultivars exist.

18. Barringtonia filirachis Payens

Barringtonia filirachis Payens, Blumea 15 (1967) 198; Whitmore, Tree Fl. Malaya 2 (1973) 259; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 190; Allertonia 12 (2013) 49, f. 2. — Type: *SFN (Corner) 25890* (holo SING; iso BO, K), Malaysia, Johore, Sungai Sedili, above Mawai.

Small trees, to 8 m tall. *Leaves*: petioles 0.5–3.5 cm, not winged, not swollen at base; lamina elliptic, obovate or obovate-oblong, 3–13 by 1.5–5.5 cm, chartaceous, base cuneate or acute, margin serrate-crenulate, apex acute or acuminate, acumen 0–10 mm long, lower surface glabrous; midrib prominulous on both surfaces, primary veins 8–10 pairs, brochidodromous, arching and merging 2 mm from margin, slightly prominulous above, prominulous beneath, intercostal veins slightly prominulous above, prominulous beneath, reticulate. *Cataphylls* triangular, c. 1.5 mm long. *Inflorescences* terminal racemes, pendulous, 3–35 cm long; rachis 0.5–1 mm diam.; bracts 1–1.5 by c. 1.5 mm. *Calyx* closed in bud, disrupting into 2–4 unequal segments. *Flowers* with short pedicels 4–8 mm long; petals and stamens red to deep crimson pink; staminal whorls 3, the inner one staminodal, staminal tube 0.5–3 mm, staminodia 1–2 mm; disc a very small ring, 0.25 mm high; ovary 2-locular, not winged; style c. 1.5 cm long. *Fruits* tetragonous, distinctly 4-winged, truncate, tapering at base, c. 2.5 by 0.5 by 0.5–0.75 cm. — **Map 2.**

Distribution — *Malesia*: Sumatra and Peninsular Malaysia.

Habitat & Ecology — Swampy lowland and mixed dipterocarp forest.

19. Barringtonia fusiformis King

Barringtonia fusiformis King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 140; Ridl., Fl. Malay Penins. 1 (1922) 759; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 305; M.R.Hend., J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 45; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 46; Corner, Wayside Trees Malaya 1 (1940) 354; Payens, Blumea 15 (1967) 240; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 191; Allertonia 12 (2013) 97, f. 22, 39. — Lectotype (Payens 1967): *King's Collector 10388* (hololecto K; isolecto BM, E, P, SING), Malaysia, Perak, Ulu Bulong.

Small trees or shrubs, 3–16 m tall, without adventitious roots. *Leaves*: petioles 2.5–5 mm long; lamina obovate-oblong to obovate-lanceolate, 9–44 by 2.5–8.5 cm, papyraceous, base tapering to round or auriculate, margin finely serrate-crenulate at least when young, apex acute to acuminate, acumen 5–20 mm, lower surface glabrous; midrib prominulous on both surfaces; primary veins 16–25 pairs, brochidodromous, merging

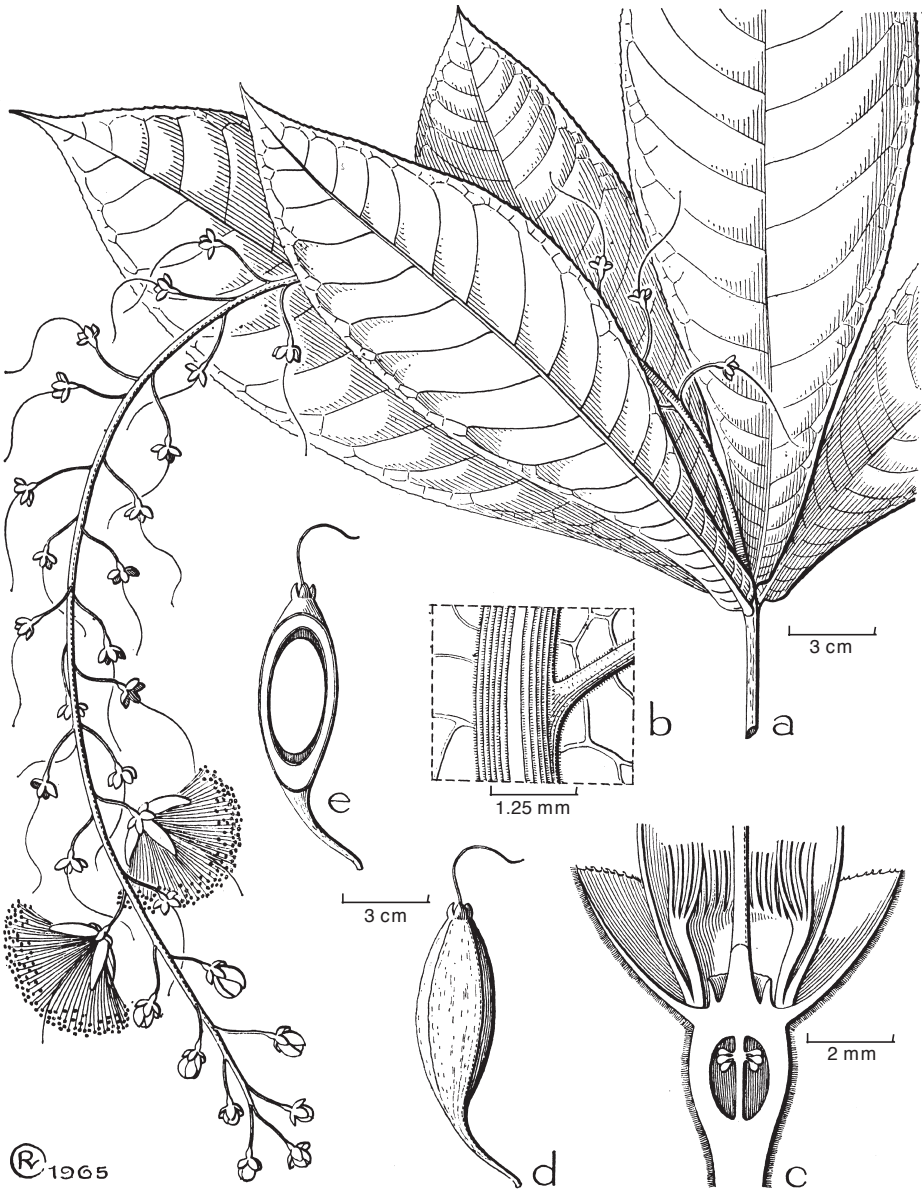


Fig. 5. *Barringtonia fusiformis* King. a. Habit; b. leaf undersurface; c. bud section; d. fruit; e. fruit section (a, b: *Pahang 3208*; c: *SFN (Henderson) 24848*; d, e: *SFN (Symington) 23133*).

through network of intercostal veins 2–3 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, finely reticulate. *Cataphylls* many at inflorescence base. *Inflorescences* terminal racemes, pendulous, 20–85 cm long, with up to 65 flowers; rachis 1–3 mm diam., minutely ferrugineous-pubescent; bracts lanceolate, 4–9 by 1–3.5 mm, acute; bracteoles triangular, 0.5–1 mm. *Calyx* open in bud,

minutely ferrugineous-pubescent just as hypanthium. *Flowers* with pedicels 0.5–3.5 cm long; petals pink to red, stamens crimson to dark red, staminal whorls 4, the inner one staminodal, staminal tube 1–2 mm high, staminodia c. 5 mm; disc annular, 0.5–1 mm high; ovary 4-locular, subglobular, 3–5 ovules per locule. *Fruits* fusiform (to ovoid), tetragonous, truncate at apex, not winged, 3–9 by 0.75–2 by 0.75–2 cm. *Seeds* ovoid, 2.5–3.5 by 1–2 cm. — **Fig. 5; Map 6.**

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Riverbanks and in dense lowland bamboo forest, 0–200 m, and occasionally as high as 700 m.

Vernacular names — Malacca: Pokô, Putat padi; Selangor: Putat.

Uses — The leaves are eaten with chutnies.

Note — See note under *B. terengganuensis*.

20. Barringtonia gigantostachya Koord. & Valeton

Barringtonia gigantostachya Koord. & Valeton, Bull. Inst. Bot. Buitenzorg 2 (1899) 9; Meded. Dept. Landb. Ned.-Indië 17 (1900) 11; Backer, Schoolfl. Java (1911) 530; Koord., Exkurs.-Fl. Java 2 (1912) 665; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 22; Backer & Bakh.f., Fl. Java 1 (1963) 353; Payens, Blumea 15 (1967) 206; Prance, Allertonia 12 (2013) 50, f. 7, 30, 31. — Lectotype (Payens 1967): *Koorders 5408* (lecto L), Indonesia, Java, Banjoemas.

Small trees, 10–15 m tall. *Leaves*: lamina sessile or subsessile, obovate-lanceolate or rarely obovate-oblong, 30–100 by 9–24 cm, chartaceous to subcoriaceous, base cuneate, margin crenulate, apex cuspidate or obtuse, lower surface glabrous; midrib prominulous and sunken above, prominent beneath, primary veins 22–40 pairs, brochidodromous, conspicuously merging 2–5 mm from margin by connecting veins, almost plane above, prominent beneath, intercostal veins slightly prominulous above, prominulous beneath, arranged parallel at right angles to veins. *Cataphylls* lanceolate, some triangular, 1.5–9 by 0.5–1.5 cm. *Inflorescences* terminal, lax-flowered spikes, pendulous, 60–125 cm long; rachis 7–10 mm diam. at base, 3–5 mm at apex, fissured, glabrous, not winged to densely winged in pairs under each flower; bracts sessile, narrow-triangular, 3–20 by 2–8 mm, serrate; bracteoles triangular, 2–4 by 1–1.5 mm. *Calyx* closed with an apical pore, rupturing into 3–5 unequal lobes of 5–15 by 6–15 mm. *Flowers* sessile; hypanthium tetragonous or subglobular, 6–10 by 4–6 mm, glabrous; sepals 3–4, unequal, 5–15 by 6–15 mm, glabrous; petals 4–5, elliptic, 2–3.5 by 1.5–2 cm, white; stamens white, pink near apex, anthers yellow, staminal whorls 5–6, the inner one staminodal, staminal tube 4–10 mm high, staminodia 0.5–1.5 cm; disc annular, undulating, slightly grooved, 1–2 mm high; ovary 4-locular, 4–7 ovules per locule; style 4–5 cm long. *Fruits* ovoid, tapering at both ends, 8.5–10 by 3–4.5 by 3.5–5 cm. *Seeds* ovoid distinctly fissured, c. 5 by 2–2.5 cm.

KEY TO THE VARIETIES

1a. Inflorescence rachis not winged . . . . . **a.** var. **gigantostachya**
b. Inflorescence rachis densely winged, the wings in pairs under each flower, 1.5–4.5 by c. 0.5 cm . . . . . **b.** var. **megistophylla**

a. var. **gigantostachya**

Barringtonia gigantostachya Koord. & Valeton var. *gigantostachya*: Payens, Blumea 15 (1967) 206; Prance, Allertonia 12 (2013) 51.

For more nomenclature see under species.

Inflorescences rachis not winged. — **Map 7.**

Distribution — *Malesia*: Confined to Central Java and therefore endangered.

Habitat & Ecology — Humid mixed forest and teak forest on red volcanic loam, 60–1000 m.

Vernacular name — Songgom.

Note — Quite distinct by the large leaves with thick short winged petioles almost confluent to lamina.

b. var. **megistophylla** (Merr.) Payens

Barringtonia gigantostachya Koord. & Valeton var. *megistophylla* (Merr.) Payens, Blumea 15 (1967) 207; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 110; Prance, Allertonia 12 (2013) 51. — *Barringtonia megistophylla* Merr., Pl. Elmer. Born. (1929) 213; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 22. — Lectotype (Prance 2013): *Elmer 21823* (holo lost; holo-lecto K; isolecto BISH, BM, BO, BRI, HBG, L, MO, NY, P, SING, U, UC), Malaysia, Sabah, Tawau, Elphinstone Prov.

Inflorescences rachis densely winged, the wings in pairs under each flower, 1.5–4.5 by c. 0.5 cm. — **Map 7.**

Distribution — *Malesia*: NE Borneo.

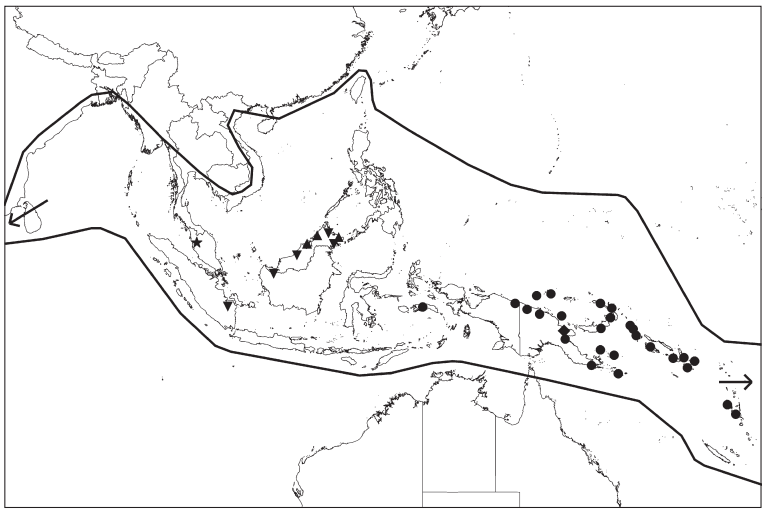
Habitat & Ecology — Dense humid dipterocarp forest on loam and limestone, 60–200 m.

Vernacular names — Kaju gĕdang, Putat, Tubang palong.

21. Barringtonia glomerata Prance

Barringtonia glomerata Prance, Blumea 55 (2010) 17; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 192; Allertonia 12 (2013) 51, f. 11. — Type: *SFN (Haniff) 21071* (holo SING 0100105; iso K, SING 0100106), Malaysia, Kedah-Perak Boundary, Bukit Kuala Bintang, Gunong Bintang.

Trees, c. 10 m tall, twigs 8–11 mm diam., glabrous. *Leaves* grouped towards end of branches; petioles 6–10 cm long, glabrous, swollen at junction with stem; lamina oblong, 30–38 by 11–15 cm, coriaceous, base cuneate, decurrent for c. 1.5 cm onto petiole, margins entire and slightly undulate, apex abruptly mucronate, mucro 5–6 mm long, surfaces glabrous; midrib prominulous above, prominent beneath, primary veins 16–19 pairs, brochidodromous, merging 2–3 mm from margin to form intermarginal vein, prominulous on both surfaces, intercostal veins prominulous on both surfaces, more so beneath, conspicuously reticulate on both surfaces. *Cataphylls* not seen. *Inflorescences* terminal; rachis (in bud) c. 25 cm long, 6–7 mm thick, glabrous, flaking when dry; bracts broadly ovate, c. 10 by 13 mm, with fine mucronate apex. *Calyx* closed in bud. *Flowers* grouped at extreme tip of rachis, sessile; hypanthium conical, c. 5 mm long, glabrous, slightly tetragonous; splitting into 2 sepals, broadly ovate, c. 1 cm long,



Map 11. Distribution of *Barringtonia* species: *B. glomerata* Prance (★); *B. novae-hiberniae* Lauterb. subsp. *novae-hiberniae* (●); *B. novae-hiberniae* Lauterb. subsp. *kassamii* Prance (◆); general distribution of *B. racemosa* (L.) Spreng. excluding Africa and part of west Pacific (line); *B. sarcostachys* (Blume) Miq. subsp. s*arcostachys* (▼); *B. sarcostachys* (Blume) Miq. subsp. *dolichophylla* (Merr.) Prance (▲).

mucronate; stamens in 4–5 whorls, the inner one staminodal, filaments c. 4 cm long. *Fruits* unknown. — **Map 11.**

Distribution — *Malesia*: Endemic to Peninsular Malaysia, known only from the type collection from the Kedah-Perak border.

Note — This species resembles *B. macrostachya* closest, but differs in the clustered flowers at the tip of the inflorescence rachis, the broader leaves with entire, not crenate margins, and the abrupt mucro at the apex, rather than a thin long acumen.

22. Barringtonia hallieri R.Knuth

Barringtonia hallieri R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 34; Payens, Blumea 15 (1967) 240; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 111; Prance, Allertonia 12 (2013) 98, f. 22. — Type: *Hallier 3067* (holo L), Malaysia, Sarawak, Liangagang.

Trees. *Leaves*: petioles 9–14 cm long, swollen at base; lamina obovate-lanceolate, 28–68 by 9–19 cm, chartaceous, base, cuneate, not confluent, margin entire, apex caudate, lower surface glabrous; midrib prominent on both surfaces, more so beneath, primary veins 35–45 pairs, brochidodromous, merging through network of veins 1–4 mm from margin, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, arranged parallel at right angles to veins. *Inflorescences* racemes, pendulous, to 55 cm long; rachis c. 5 mm diam., glabrous. *Buds* c. 1.5 cm diam. *Calyx* open in bud, the lobes fimbriate. *Flowers* with pedicels 2–6 cm long; hypanthium obpyramidal, slightly 4-gonous, glabrous, c. 8 by 6 mm; sepals broadly triangular, c. 8 by 8 mm, fimbriate; petals 4, elliptic, 25–30 by 15–20 mm, fimbriate; staminal whorls 4, the inner one staminodal, staminal tube c. 2 mm high, staminodia c. 7 mm; disc a thin

ring, c. 1.5 mm high; ovary 4-locular, obpyramidal, 11–13 ovules per cell; style c. 3 cm long. *Fruits* oblong to musiform, 11–14 by 2.8–3.5 cm, tapering narrowly to base. *Seeds* 6, fissured, 2.5–3.5 by 1.8–2.4 cm. — **Map 6.**

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — Beside rivers and in mixed dipterocarp forest to 900 m.

Note — The long petiole and pedicels, the large number of ovules and the caudate leaf apex distinguish this species

23. Barringtonia havilandii Ridl.

Barringtonia havilandii Ridl., Kew Bull. 1938 (1938) 284; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 34; Payens, Blumea 15 (1967) 242; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 111; Prance, Allertonia 12 (2013) 98, f. 22. — Type: *Haviland 2935* (holo SING; iso K, L, SAR), Malaysia, Sarawak, Kuching.

Barringtonia baramensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 33. — Lectotype (Prance 2013): *Hose 197 (194* in some sets), (holo B†; hololecto K; isolecto AA, BM, CGE), Malaysia, Sarawak, Baram.

Trees. *Leaves* in one or more whorls at end of branches; petioles 0.5–2(–11) cm long, not swollen at base; lamina obovate-oblong or rarely obovate-lanceolate, 19–37 by 8–11 cm, chartaceous, base cuneate to attenuate, margins serrate-crenulate, apex acuminate, acumen 5–15 mm long, lower surface glabrous; midrib prominent on both surfaces, more so beneath, primary veins 16–32 pairs, brochidodromous, merging through network of veins, prominulous on both surfaces, intercostal veins slightly prominulous on both surfaces, reticulate. *Cataphylls* triangular, 2.3–6 mm. *Inflorescences* terminal or lateral racemes, pendulous, 40–110 cm long; rachis 1.5–4 mm diam., pulverulent; bracts triangular, c. 3.5 by 0.5 mm. *Buds* c. 8 mm. C*alyx* open in bud. *Flowers* with pedicels 0.5–2 cm long; hypanthium tubular, trigonous or subtetragonous, 5–12 by 4–9 mm, pulverulent; sepals 3–4, semicircular, 3–6 by 3–5 mm; petals 3–4, elliptic, 23–30 by 10–16 mm, white or red; stamens pink, staminal whorls 3–4, the inner one staminodal, staminal tube 1–3 mm high, staminodia 1.5–7 mm; disc thin, 0.5–0.75 mm high; ovary 3–4-locular, trigonous or subtetragonous, pulverulent, 2–5 ovules per locule; style 2–3 cm long. *Fruits* and *seeds* unknown. — **Map 6.**

Distribution — *Malesia*: W Borneo.

Habitat & Ecology — Inland riverine forest.

Vernacular name — Jempalang (Dusun); Langkong (Iban).

Uses — Bark used as a fish poison.

24. Barringtonia jebbiana W.N.Takeuchi

Barringtonia jebbiana W.N.Takeuchi, Harvard Pap. Bot. 15 (2010) 27; Prance, Allertonia 12 (2013) 53, f. 20. — Type: *Takeuchi, Ama & Gamui 24620* (holo LAE; iso A), Papua New Guinea, Western Prov, Strickland drainage, Camp 2 bivouac, S5°39.610', E142°18.018'.

Trees, to 25 m tall. *Leaves* spiral in congested or loose pseudowhorls; petioles 0–7 by c. 4 mm, swollen at base; lamina linear-oblanceolate to linear-elliptic, (14.5–)27–41.5 by (3.5–)5–9.5 cm, subcoriaceous beneath, base cuneate-decurrent, margin obscurely callose-denticulate when immature, later entire, apex acute-acuminate, apiculate at top,

lower surface glabrous and papillate; midrib prominent on both surfaces, primary veins 16–23(–27) pairs, brochidodromous, abruptly arcuate near margins, usually merging. *Cataphylls* appressed. *Inflorescences* infrafoliar, 1–2(–4)-flowered, to 4 cm long, pendulous; rachis glabrous; basal bracts rotund to ovate, 2–5 by 1.5–2 mm, persistent; rachis bracts linear-deltate, to c. 9 by 2 mm, caducous. *Calyx* closed in bud, without an apical pore, calyptrate. *Flowers* with pedicels 4–8.5(–12) mm; hypanthium turbinate, not angled, glabrous; petals elliptic-ovate, 20–25 by 13–15 mm, subequal, pale red; staminal whorls 5–6, all fertile, staminal tube 2–4 by 7.5–9.5 mm, staminodes absent, filaments pink; disc annular, c. 1 by 4 mm; ovary 4-locular, 3–4 ovules per locule; style terete, 9.5–12 mm long. *Fruits* ellipsoid to globose, 2.7–3.6 by 2.8–3.2 cm, not ridged; epicarp black, rugose; calyx persistent; mesocarp fleshy, fibrous; endocarp crustaceous, 1–2 mm thick. *Seeds* single. — **Map 4.**

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — Known only from type in *Nothofagus* emergent montane forest, 1450 m.

Note — This species is remarkable for the very short, few-flowered inflorescences and the absence of staminodes.

25. Barringtonia lanceolata (Ridl.) Payens

Barringtonia lanceolata (Ridl.) Payens, Blumea 15 (1967) 250; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 112; Prance, Allertonia 12 (2013) 99, f. 23. — *Careya lanceolata* Ridl., Kew Bull. 1938 (1938) 285. — *Planchonia lanceolata* (Ridl.) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 54. — Type: *Haviland 2933* (holo K; iso SAR), Malaysia, Sarawak, near Kuching.

Barringtonia pseudoglomerata Chantar., Kew Bull. 50 (1995) 697. — Type: *S (Othman, Jugah & Anyie) 31858* (holo L; iso A, K), Malaysia, Sarawak, 4th Division, Ulu Sg. Tutoh on confluence of Sg. Melino Marudi.

Trees, 6–30 m tall. *Leaves*: petioles 1–8 cm long, swollen at base; lamina obovate-oblong to oblong, 9–20 by 3–8 cm, papyraceous, base cuneate, slightly confluent onto petiole, margin entire to slightly serrate-crenulate, apex acute or acuminate, acumen 5–14 mm long, lower surface glabrous; midrib equally prominent on both surfaces, primary veins 8–11 pairs, brochidodromous, merging by marginal veins 2–3 mm from margin, prominulous on both surfaces, intercostal veins slightly prominulous on both surfaces. *Cataphylls* oblong-lanceolate to lanceolate, c. 1.2 cm long, caducous. *Inflorescences* clusters of ramiflorous spikes, erect, with 2–14 flowers, 0.5–2.5 cm long; rachis 5–7.5 mm diam., glabrous; bracts lanceolate, 3–7 by c. 1.3 mm, apex round; bracteoles triangular, 1–1.5 by 1.5–2 mm. *Calyx* open in bud, red or partly pink. *Flowers* sessile; hypanthium subtetragonous, 5–11 by 4–9 mm, glabrous; sepals suborbicular, 3–6 by 5–9 mm; petals 4, elliptic, 2.3–3 by 1–1.6 cm, reddish white, pink or white; stamens white, staminal whorls 4–5, the inner one staminodal, staminal tube 3–4 mm, staminodia 12–20 mm; disc 0.5–1 mm high; ovary 4-locular, 3–6 ovules per locule; style 4.5–6 cm long. *Fruits* ovoid or almost fusiform, slightly truncate at apex, tapering towards base, 6–10.5 by 2.5–7 by 2.5–6 cm. *Seeds* single, ovoid to spindle-shaped, 3–4.5 by 1.5–3 cm, usually 5-ribbed. — **Fig. 6; Map 12.**

Distribution — *Malesia*: Borneo (Sarawak, Sabah, Brunei, E Kalimantan).

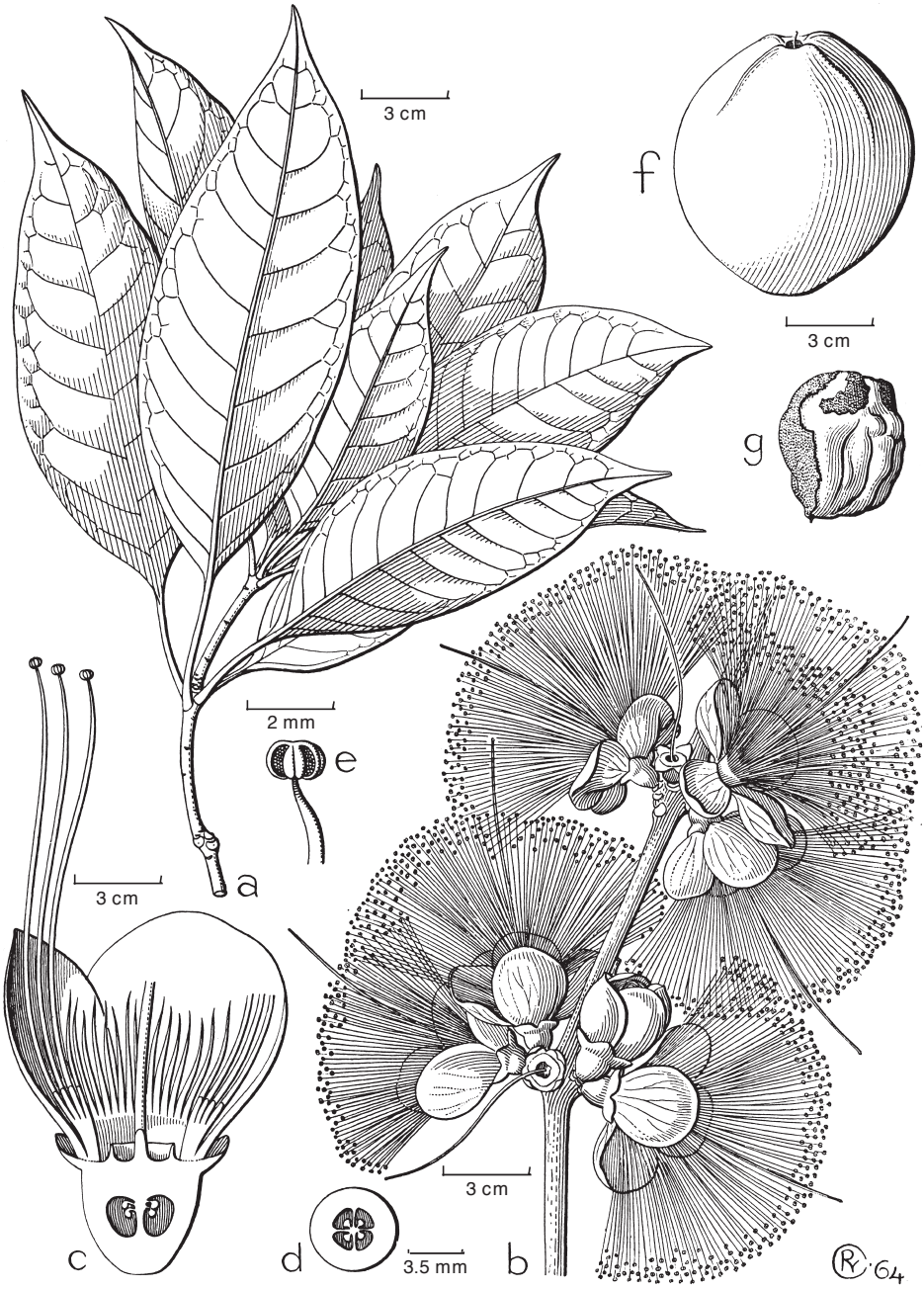
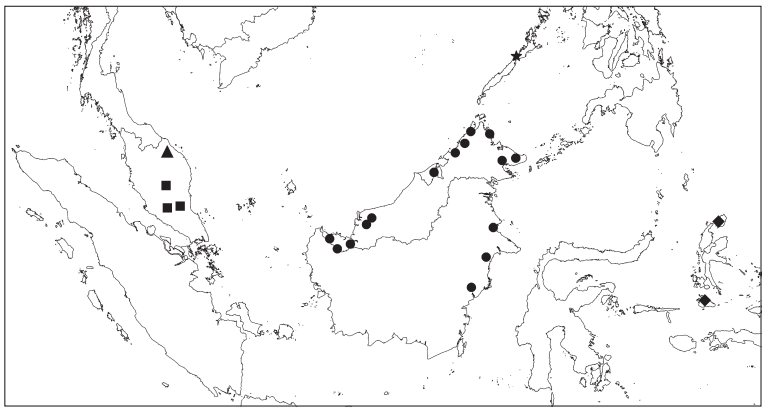


Fig. 6. *Barringtonia lanceolata* (Ridl.) Payens. a. Habit; b. inflorescences; c. flower section; d. ovary section; e. open anther ; f. fruit; g. seed (a–e: *S (Paie) 13309*, f, g: *BRUN (Ashton) 255*; all L).



Map 12. Distribution of *Barringtonia* species: *B. lanceolata* (Ridl.) Payens (●); *B. magnifolia* Prance (◆); *B. norshamiae* Prance (■); *B. palawanensis* Chantar. (★); *B. terengganuensis* Chantar. (▲).

Habitat & Ecology — Hillside forest and mixed dipterocarp forest, 0–1200(–1700) m.

Vernacular names — Sarawak: Putat (Malay); Sabah: Bingkudu bukit, Tampalang, Tatsai, Telisai sugud (Dusun); Bubunak (Murut); Jambu huton (Malay); Brunei: Jampalang, Jempalang apoi (Dusun); Langkong (Iban); Putat.

Uses — Bark used as a fish poison.

26. **Barringtonia latiffiana** (El-Sherif) Prance

Barringtonia latiffiana (El-Sherif) Prance, Blumea 55 (2010) 14; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 194; Allertonia 12 (2013) 101, f. 21. — *Abdulmajidia latiffiana* El-Sherif, Folia Malaysiana 7 (2006) 49. — Type: *Jaman & Salleh RJ 2052* (holo UKMB), Malaysia, Kedah, Pulau Langkawi, Gunung Raya Forest Reserve, via Sungei Kelian.

Small trees, to 5 m tall. *Leaves*: petioles 3–5 cm long, slightly winged; lamina elliptic, 12–20 by 8–10 cm, chartaceous, base cuneate, margin serrate-crenulate, apex acuminate at apex, lower surface glabrous; primary veins 12–14 pairs, brochidodromous. *Inflorescences* an axillary spike, pendulous; the rachis to 25 cm long, c. 1 mm diam., glabrous. *Calyx* open in bud. *Flowers* sessile; hypanthium c. 3 mm long, tetragonous, pubescent; sepals 4, elliptic, 4–5 by 2–3 mm, margin fimbriate, apex obtuse; petals 4, elliptic, 5–10 by 5–6 mm, margin fimbriate, apex obtuse, pink; staminal whorls 3, filaments to 3 cm long; disc ring thin; ovary 4-locular; style to 4 cm long, pink. *Fruits* ovoid to slightly rounded, 2–3 by 3–5 cm, turning yellowish red on maturity. *Seeds* 5, 1.1–2.5 by 0.6–1 cm. — **Map 8.**

Distribution — *Malesia*: Peninsular Malaysia (Kedah).

Habitat & Ecology — Primary low undulating forests up to 300 m.

27. **Barringtonia lauterbachii** R.Knuth

Barringtonia lauterbachii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 37; Payens, Blumea 15 (1967) 215; Prance, Allertonia 12 (2013) 54. — Lectotype (Prance 2013): *Ledermann 8801* (holo B†; lecto WRSL), Papua New Guinea, Sepik River, Aprilfluss.

Large canopy trees. *Leaves*: petiole to 2 cm long, not swollen at base; lamina ovate-lanceolate, 13–24 by 4–8 cm, chartaceous, base cuneate, slightly confluent onto petiole, margin entire, flat, apex acuminate, acumen 0–6 mm long, surfaces glabrous; midrib flattened prominulous above, prominent beneath, primary veins 9–15 pairs, brochidodromous, merging through network of veins 2–5 mm from margin, slightly prominulous above, prominulous beneath, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* absent. *Inflorescences* short and with 2–10 flowers, axillary or on stem just below leaf cluster, pendulous; the rachis 3–7 cm long, 2–2.5 mm diam., glabrous. *Calyx* closed in bud, apex rounded, without pore. *Flowers* with pedicels 0.8–2 cm long, glabrous, pink; hypanthium campanulate, tetragonous, glabrous; sepals rounded-ovate, c. 5 by 6 mm; petals 4, oblanceolate, 1.5–2 cm long, acute; staminal whorls 5–6, the inner one staminodal, staminal tube 0.5–1 mm high, stamens 3–3.5 cm long, pink; disc annular 2 mm high; ovary 4-locular, 3 ovules per locule; style to 3 cm long. *Fruits* and *seeds* unknown. — **Map 13.**

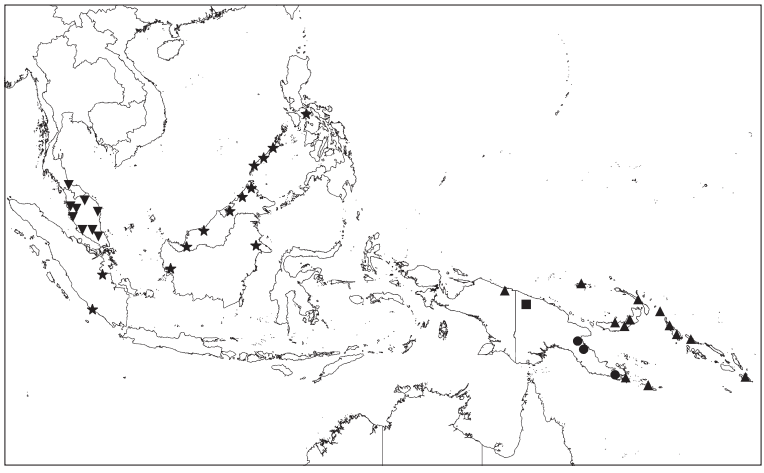
Distribution — *Malesia*: Papua New Guinea (Sepik).

Habitat & Ecology — Lowland floodplain forest near rivers.

Vernacular names — Battagail, Pottekap (Manikiong); Oesem (Biak); Salajie (Mooi); Sodon (Kemtoek).

Conservation status — Vulnerable.

Note — This species is notable for the very short inflorescence shared with only one other species from New Guinea, *B. jebbiana*. This species has been confused with *B. sepikensis*, but differs in many ways such as the shorter few-flowered inflorescence, the glabrous inflorescence rachis and hypanthium and the larger leaves. Much sterile material can be confused with *B. novae-hiberniae*, which differs in the terminal rather than cauliflorous inflorescence, the shorter leaves and in the petiole that is not winged or only slightly so. The buds of this species are firmly closed whereas those of *B. novae-hiberniae* have an apical pore.



Map 13. Distribution of *Barringtonia* species: *B. lauterbachii* R.Knuth (■); *B. papeh* Lauterb. (▲); *B. pinnifolia* Jebb & Prance (●); *B. revoluta* Merr. (★); *B. rimata* Chantar. (▼).

28. Barringtonia longipes Gagnep.

Barringtonia longipes Gagnep., Notul. Syst. 3 (1939) 383; Chantar., Kew Bull. 50 (1995) 686; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 195; Allertonia 12 (2013) 102, f. 17. — Lectotype (Prance 2013): *M. Krempf s.n.* (hololecto P; isolecto BO, P), Vietnam.

Trees, to 5 m tall, twigs 2–5 mm diam. *Leaves*: petioles 0.3–5 cm long, not swollen at base; lamina lanceolate to oblong-lanceolate, 9.5–22 by 2.5–8.1 cm, chartaceous, base cuneate, slightly decurrent, margin serrate, apex acuminate, acumen to 15 mm long; midrib prominulous on both surfaces, primary veins 11–18 pairs, brochidodromous, merging 1–3 mm from margin to form a fine intramarginal vein, prominulous on both surfaces, intercostal veins prominulous on both surfaces, finely reticulate. *Cataphylls* lanceolate, recurved. *Inflorescences* terminal racemes, pendulous, 30–40 cm long; rachis 4–5 mm diam. at base, 2–3 mm at apex, glabrous; bracts triangular, 2.5–3.5 by 2–3 mm. *Calyx* open in bud. *Buds* 0.6–1 cm. *Flowers* with pedicels 6–11 mm long; hypanthium funnel-shaped, glabrous; sepals broadly ovate to suborbicular, 4.3–4.5 by 3.5–5 mm; petals 4, orbicular, 1.2–1.25 by 0.75–1.15 cm, adhering to staminal tube for 4–5 mm; stamens 2–2.2 cm long, staminal whorls 5, staminal tube 2–6 mm high; disc annular, c. 0.5 mm tall; ovary 4-locular, 1–3 ovules per loculus. *Fruits* tetragonous, obovate, 5–6.5 by 2–3 cm, tapered to both ends, not winged, exocarp glabrous, calyx persistent. *Seeds* unknown. — **Map 5.**

Distribution — Thailand, Cambodia, Vietnam; in *Malesia*: Peninsular Malaysia (Terengganu).

Habitat & Ecology — Lowland forest.

Note — This species was included in *B. pauciflora* by Payens (Blumea 15, 1967: 243). While they are similar and related, I follow Chantaronothai (1995) who reinstated this as a species. It differs from *B. pauciflora* in the long thin, pendulous inflorescence and the pedicellate flowers. *Barringtonia pauciflora* has a short erect inflorescence, a rare feature in the genus.

29. Barringtonia longisepala Payens

Barringtonia longisepala Payens, Blumea 15 (1967) 192; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 114; Prance, Allertonia 12 (2013) 55, f. 9. — Type: *SAN (P.P. Sam) 26364* (holo L; iso K, SAN), Malaysia, Sabah, Distr. Sandakan, below Trig., Leila Forest Reserve.

Trees, 10–21 m tall. *Leaves*: petioles 1.5–5 cm long, slightly winged, slightly swollen at base; lamina obovate-oblong to obovate-lanceolate, 10–23 by 3–8 cm, thick-coriaceous, base cuneate, margin entire, revolute, apex acuminate or rarely acute or rounded, the lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 9–18 pairs, brochidodromous, merging by network of veins 1–2 mm from margin, weakly prominulous on both surfaces, intercostal veins prominulous and conspicuously reticulate on both surfaces. *Cataphylls* c. 6 by 1.5 mm. *Inflorescences* terminal racemes, pendulous, laxly flowered, 25–86 cm long; rachis 3–4 mm diam., yellow-puberulous, glabrescent; bracts lanceolate, 5–11 by 1–3 mm. *Calyx* closed in bud, with an apical pore when young, rupturing into 3–4 equal segments of 1–1.75 by 1–2 cm. *Flowers* with pedicels 0.5–1.5 cm long, slightly puberulous towards base; hypanthium tubular, tetragonous, glabrous or puberulous, 7–10 by 4–7 mm; sepals

oblong, 9–18 mm long, glabrous, enlarging and persisting on young fruit; petals 4, obovate to elliptic, 3.5–4.5 by 2–2.5 cm, red or white; stamens white with red or pink apex, staminal whorls 4, the inner one staminodal, staminal tube 2–3 mm, staminodia c. 1.25 cm; disc annular, 1–1.5 mm high; ovary 4-locular, 3–5 ovules per locule; style 4–5.5 cm long. *Fruits* oblong, tetragonous, truncate, 13–14 by 5–5.5 by 4.5 cm. *Seeds* ovoid, deeply fissured, c. 7 by 2.5 cm. — **Map 10.**

Distribution — *Malesia*: Borneo (Brunei, W Kalimantan and Sabah).

Habitat & Ecology — Primary and secondary forest on sandstone hills, also on edge of *Shorea albida* peat swamp, to 130 m.

Vernacular names — Sabah: Putat, Rengas binjai, Rengas putat (Iban); Tamapalang romanau (Dusun); W Kalimantan: Karut.

30. **Barringtonia lumina** Jebb & Prance

Barringtonia lumina Jebb & Prance, Blumea 56 (2011) 106; Prance, Allertonia 12 (2013) 56, f. 29. — Type: *Jebb 920* (holo K), Papua New Guinea, Morobe Prov., 1 km W of north end of Finschhafen airstrip, S6°36.9', E147°50.7'.

Monocaulous trees, to 15 m tall; bark flaky grey, pustular lenticels to 0.8 by 0.2 cm, pink within; axes segmented at 10–40 cm intervals. *Leaves* in a single whorl of 12–25 in mature trees, several in younger trees; leaf scars rounded, obovate-rhomboid, c. 2.5 by 2 cm; petiole scarcely present, but swollen at base; lamina narrowly-obovate, 100–190(–228) by 22–42 cm, widest at 2/3 of its length; coriaceous, base tapering to petiole, margins minutely crenulate, slightly recurved, apex rounded and abruptly acuminate, acumen to 3 cm; midrib prominulous above, prominent beneath, primary veins 50–65 pairs, brochidodromous, arising obliquely from midrib, straight and parallel, and arched and joining 2–5 mm from margin, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, more so beneath, towards margin parallel and arranged at right angles to veins; terminal bud a prominent spike to 30 by 5 cm. *Cataphylls* lanceolate, 5–19 by 3–4.5 cm, base auriculate, margin finely serrate, apex rounded to acute, pinkish red, caducous; venation reticulate, irregular. *Inflorescences* 80–100 cm long, lateral in groups of 2–6, usually arising from a single previous whorl of leaves, axillary to a former leaf base; rachis to 1.5 cm diam., scarcely tapered, fissured; bracts triangular, to 1.2 by 0.6 cm, base blunt, apex acuminate, dense velvety pubescent throughout, khaki green to light brown; inflorescence with buds compressed when young, and quadrangular form maintained through development; basal bracts oblong, c. 4.5 by 2.5 cm, apex ± bifurcate rounded, caducous. *Calyx* in bud oblate, entire, closed, without pores, but with a minute apical depression, square in apical view, with 4(–5) narrow sulci along the corners, to 1.5 by 0.4 cm, densely velvety pubescent, khaki-green; circumscissile, the persistent part becoming thickened in fruit. *Flowers* 80–100; hypanthium rounded-cupular, sessile, c. 0.7 by 0.7 cm, velvety pubescent; petals 4(–5), obtuse triangular to obovate, to 40 by 15 mm; apex rounded, white with a faint pink flush; stamens 450–500, staminal whorls 8–12, to 50 by 0.5 mm, innermost whorl staminodal 3–20 mm long, connate at their very base only, anthers elliptic, c. 0.75 by 0.5 mm, 4-celled; disc to 9.5 mm diam., the inner annulus c. 4 mm diam. and < 1 mm high, becoming strikingly hemispherically concave in fruit; ovary 4-locular, with 3 ovules

per locule; style slender, tapering, to 55 by 1 mm. *Fruits* sessile, obovate, to 7.5 by 3.5 cm, base tapering, acute, almost circular in section, apex blunt-rounded. — **Map 9.**

Distribution — *Malesia*: New Guinea (Jayapura, Sepik, Morobe, Milne Bay, Bougainville).

Habitat & Ecology — Forest, 0–300 m.

Note — This species is close to *B. procera* but differs in the much larger leaves, the quadrangular buds and the distinctive velvety pubescence of the hypanthium and calyx. It can commence flowering when 2 m tall. The prominent and pink coloured terminal bud is reminiscent of a candle flame atop the unbranched stem; the more so if the leaves have fallen (lumina (Latin) = candle or light).

31. Barringtonia macrocarpa Hassk.

Barringtonia macrocarpa Hassk., Flora 25, ii, Beibl. (1842) 36; Cat. Hort. Bot. Bogor. (1844) 263; Miq., Fl. Ned. Ind. 1, 1 (1855) 485; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; Teijsm. & Binn., Cat. Hort. Bot. Bogor. (1866) 248; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 8; Backer, Schoolfl. Java (1911) 528; Koord., Exkurs.-Fl. Java 2 (1912) 665; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23; Backer & Bakh.f., Fl. Java 1 (1963) 353; Payens, Blumea 15 (1967) 237; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 196; Allertonia 12 (2013) 103, f. 22. — *Megadendron macrocarpum* (Hassk.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 109, t. 15, f. 1–8. — *Michelia macrocarpum* (Hassk.) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: Description by Hasskarl (1842).

Stravadium insigne Blume in Van Houtte, Fl. Serres 7 (1851) 21, t. 654. — *Barringtonia insignis* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1855) 488; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33, f. 13A–H; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 13; Backer, Schoolfl. Java (1911) 528; Koord., Exkurs.-Fl. Java 2 (1912) 666; K.Heyne, Nutt. P1. Ned.-Ind., ed. 2 (1927) 1160; Ochse & Bakh., Veg. Dutch East Indies (1931) 357; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23, f. 3A–H; Backer & Bakh.f., Fl. Java 1 (1963) 353. — *Michelia insignis* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Van Hasselt s.n.* (holo L, sheet 898.204.167; iso L, 3 sheets-898.204.168–170), Indonesia, Java, Tjilangkahan, 14 Aug. 1823.

Barringtonia reinwardtii Miq., Fl. Ned. Ind. 1, 1 (1855) 488, only flowers. — Type: *Reinwardt s.n.* (holo L, sheet 908.146.1882) [leaves = *Helicia robusta* (Roxb.) R.Br. ex Blume].

Barringtonia serrata Miq., Fl. Ned. Ind. 1, 1 (1855) 488; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Koord., Exkurs.-Fl. Java 2 (1912) 666; Craib, Fl. Siam. 1 (1931) 673; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 48. — *Stravadium serratum* (Miq.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 87. — *Michelia serrata* (Miq.) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: *Zollinger 139* (holo U; iso L fragm., P, fragm. & tracing at WRSL), Indonesia, Java.

Megadendron pallidum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 110, p.p. quoad folia. — *Barringtonia pallida* (Miers) Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 12; Koord., Exkurs.-Fl. Java 2 (1912) 665; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 22. — Type: *Horsfield 260.209* (holo BM, leaves only; iso CGE, K, U), Indonesia, Java.

Barringtonia helferi C.B.Clarke in Hook.f., Fl. Brit. India 2 (1897) 509; Craib, Fl. Siam. 1 (1931) 670; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 21. — *Michelia helferi* (C.B.Clarke) Kuntze, Revis. Gen. Pl. 1 (1891) 241 — Type: *Helfer KD 2426* (holo K), Myanmar, Tenasserim.

Barringtonia comosa Gagnep., Notul. Syst. 3 (1914) 383; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 17. — Type: *Balansa 2884* (holo P; iso K), Vietnam, 3 km above Phuong-Lam, River Noire.

Shrubs or small trees, 1.5–13 m tall. *Leaves*: petioles 0.5–2 cm long, winged; lamina obovate-lanceolate or linear-lanceolate, 30–70 by 6–18 cm, chartaceous, base cuneate,

confluent onto petiole, margin distinctly serrate-crenulate, apex cuspidate, acumen 10–20 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 16–30 pairs, brochidodromous, merging through network of veins 2–3 mm from margin, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, with tendency to be parallel and arranged at right angles to veins. *Inflorescences* terminal racemes, pendulous, with c. 135 flowers, 26–112 cm long; rachis 5–7 mm diam. at base, 2–4 mm at apex, glabrous; bracts triangular, 1.5–5 by 0.5–2 mm. *Calyx* open in bud. *Buds* 5–7 mm. *Flowers* with pedicels 5–15 mm; hypanthium 3–4-gonous to globular, 7–11 mm long, glabrous; petals 1.75–2.75 by 0.75–1.5 cm, pale yellowish pink, white, pale pink; stamens pink to deep pink, staminal whorls 3–4, the inner one staminodal, staminal tube 0.5–5 mm high, staminodia 6–12 mm; disc a grooved small ring, 0.5–0.75 mm high; ovary 3–4-locular, 2–5 ovules per locule; style 3.5–4.2 cm. *Fruits* (immature) 3–4-gonous, 3–4-winged, 6–12.5 by 1.5–3 by c. 1.5 cm. *Seeds* ovoid, fissured, c. 3.5 by 0.75 by 1.5 cm. — **Map 6.**

Distribution — Myanmar, Thailand, Vietnam; in *Malesia*: Sumatra (Enggano Is.), Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — Along rivers and swampy forest and inundated areas, 0–300 m.

Vernacular name — Peninsular Malaysia: Putat.

Uses — Roots rubbed with ashes used as a fish poison.

32. **Barringtonia macrostachya** (Jack) Kurz

Barringtonia macrostachya (Jack) Kurz, Prelim. Rep. Forest Pegu (1875) App. A, lxvi, App. B, 52; Forest Fl. Burma 1 (1877) 498; J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 71; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 509; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 137; Brandis, Indian Trees, ed. 1 (1906) 330; Merr., Bibliogr. Enum. Born. Pl. (1921) 419; Ridl., Fl. Malay Penins. 1 (1922) 758; Craib, Fl. Siam. 1 (1931) 670; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 305; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 29; Corner, Wayside Trees Malaya 1 (1940) 355: Merr., J. Arnold Arbor. 33 (1952) 218; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 107; Payens, Blumea 15 (1967) 244; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 197; Allertonia 12 (2013) 104, f. 20, 35, 36. — *Careya macrostachya* Jack, Malayan Misc. 1, 5 (1821) 47; DC., Prodr. 3 (1828) 295; Jack, Hooker's J. Bot. Kew Gard. Misc. 2 (1830) 88; Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 333; Jack, Calcutta J. Nat. Hist. 5 (1843) 305. — *Doxomma macrostachyum* (Jack) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 104. — *Michelia macrostachya* (Jack) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: Jack's description (1821), Malaysia, Penang.

Eugenia acutangula Lour., Fl. Cochinch. 1 (1790) 307, excl. syn., non L. — Type: *Loureiro s.n.* (holo BM), Vietnam.

Barringtonia acuminata Wall. [Cat (1831) 3636, nom. nud.] ex Korth., Ned. Kruidk. Arch. 1 (1846) 206; Walp., Ann. Bot. Syst. 2 (1939) 31; Miq., Fl. Ned. Ind. 1, 1 (1855) 490; Merr., Philipp. J. Sci., Bot. 11 (1916) 295; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 32; Holthuis & H.J.Lam, Blumea 5 (1942) 143, 217. — *Stravadium acuminatum* (Wall. ex Korth.) Blume in Van Houtte, Fl. Serres 7 (1851) 24. — *Doxomma acuminatum* (Wall. ex Korth.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 102. — *Michelia acuminata* (Wall. ex Korth.) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — Type: *Korthals s.n.* (holo L, sheet 898.204.137; iso BO), Indonesia, Borneo, Pamatton.

Stravadium cochinchinense Blume in Van Houtte, Fl. Serres 7 (1851) 24. — *Doxomma cochinchinense* (Blume) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 101, t. 16, f. 1–5. — *Barringtonia cochinchinense* (Blume) Merr. ex Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 862; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 31. — Type: *Loureiro s.n.* (holo BM), Indochina.

Barringtonia cylindrostachya Griff., Notul. Pl. Asiat. 4 (1854) 655; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 30. — *Doxomma cylindrostachya* (Griff.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 100. — Type: *Griffith KD 2421* (holo K; iso P), Malaysia.

Doxomma sumatrana Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 103, non (Miq.) Miers. — Type: *Beccari PB 881* (holo K; iso BM, fragm., FI), Borneo.

Barringtonia balabacensis Merr., Philipp. J. Sci., Bot. 4 (1909) 299; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 142. — Lectotype (Prance 2013): *BS (Mangubat) 422* (holo PNH†; hololecto K; isolecto US), Philippines, Balabac I.

Barringtonia annamica Gagnep., Notul. Syst. 3 (1914) 383; in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 858, f. 94; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 31. — Type: *Eberhardt 1649* (holo P), Vietnam, Annam.

Barringtonia kratensis Craib, Kew Bull. (1930) 170. — Type: *Kerr 9456* (holo K; iso ABI, BK, BM, NY, P, TCD), Thailand, Baw Rai.

Barringtonia craibiana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 32. — Lectotype (Prance 2013): *Kerr 14558* (holo B†; hololecto K; isolecto BM, C, E), Thailand, Satun, Kao Kro Range.

Barringtonia olivacea R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 33. — Lectotype (Prance 2013): *Hose 144* (holo B†; hololecto K; isolecto BM), Malaysia, Sarawak, Baram; syntype: *Beccari s.n.* (K), Malaysia, Sarawak.

Barringtonia rosea Wall. ex R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 33, nom. inval., in syn.

Barringtonia wallichiana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 33. — Type: *Wallich 3636* (holo K; iso BM, CGE, K), India.

Barringtonia mollucana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 35. — Type: *W.H. de Vriese & Teijsmann 24* (holo L, sheet 908.146.1069), Indonesia, Ambon.

Barringtonia pendens R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 35. — Type: *W.H. de Vriese & Teijsmann s.n.* (holo L, sheet 908.154.843), Indonesia, Sulawesi, 1859–1860.

Barringtonia isabelensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 36. — Type: *Warburg 11894* (holo B†, n.v.), Philippines, Luzon, Prov. Isabela, Malum.

Barringtonia fusicarpa Hu, Acta Phytotax. Sin. 8 (1963) 200; H.N.Qin & Prance, Fl. China 13 (2007) 294). — Type: *Sino-Russian Exped. 3313* (n.v.), China, Yunnan, Makuan, Kan-gau.

Barringtonia sumatrana auct. non Miq.: Ridl., Fl. Malay Penins. 1 (1922) 758; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 307.

Shrubs or trees, 4–30 m tall. *Leaves*: petioles 2.5–17 cm long, slightly winged near lamina; lamina obovate-oblong to oblong, 10–45 by 4–10 cm, chartaceous, base cuneate, confluent onto petiole, margin shallowly serrate-crenulate, flattish, apex cuspidate or caudate, acumen 5–25 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 14–18(–21) pairs, brochidodromous, merging through network of veins 2–4 mm from margin, plane or impressed above, prominent beneath, intercostal veins prominulous on both surfaces, reticulate. *Inflorescences* terminal or ramiflorous spikes, pendulous with c. 60 flowers, 10–75 cm long; rachis thick, 5–8 mm diam., accrescent to 10 mm, glabrous; bracts triangular, lanceolate, 5–11 by 1.5–3 mm. *Calyx* open in bud. *Flowers* sessile; hypanthium tetragonous, 4–6 mm long, glabrous; petals pinkish red crimson or striped red; stamens pink or deep red, staminal whorls 4–5, the inner one staminodal, staminal tube 1.5–3 mm high, staminodia c. 7 mm; disc a distinct thin grooved ring, 0.5–1.5 mm high; ovary 4-locular, 2–4(–6) ovules per locule; style 4–4.5 cm long. *Fruits* obovoid, tetragonous, 5.5–9 by 2–4 by 2–3.5 cm, at most with 4 ribs, mostly with convex sides, dull. *Seeds* single, ovoid, 3–4.5 cm long. — **Fig. 7; Map 4.**

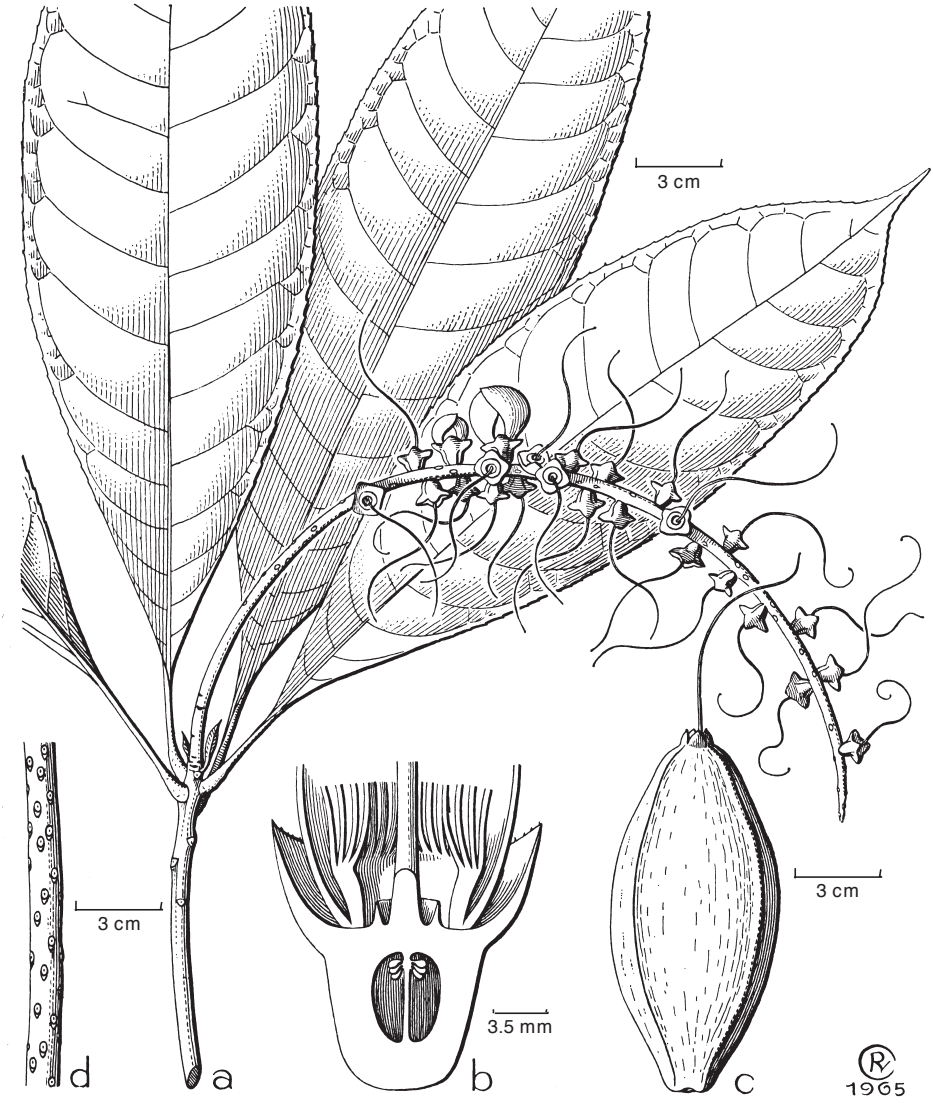


Fig. 7. *Barringtonia macrostachya* (Jack) Kurz. a. Habit; b. bud section; c. fruit; d. scars on rachis (a, b: *SFN (Burkill) 6577*; c, d: *SFN (Henderson) 21792*).

Distribution — China, Myanmar, Thailand, Vietnam; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Philippines, Sulawesi, Moluccas.

Habitat & Ecology — Primary and secondary forest along rivers and on hills or inundated forest and swampy areas, 0–750 m.

Vernacular names — Myanmar: Cây tam lang, Thay nya oo. Thailand: Chik, Chik nom, Chik nawn wan. Peninsular Malaysia: Buah putat, Jok, Pone tan, Putat, Putat bukit, Putat bukit putih, Putat gajah, Putat utan (Temuan). Sumatra: Kaju putat, Kaju

si marte ni uwo, Twah dotan; Borneo: Putat; Semuting (Dajak); Tuba tampalang, Tampalang (Dusun). Philippines: Apalang (Tagh.), Ulum (Moro).

Uses — Paste made from the roots used to treat sore eyes and also ring worm. Bark used as a fish poison.

Note — See for differences with *B. glomerata* and *B. rimata* notes under both species.

33. Barringtonia magnifolia Prance

Barringtonia magnifolia Prance, Allertonia 12 (2013) 57, f. 23. — Type: *Kostermans 7857* (holo L), Indonesia, Moluccas, Morotai, Sabatai.

Small trees, to 4 m. *Leaves*: petioles 1–5 cm long, slightly winged, swollen at base; lamina narrowly obovate, 80–90 by 19–22 cm, chartaceous, tapering to a narrow base, margin slightly serrate-crenulate, apex acuminate, acumen 25–35 mm long, lower surface glabrous; primary veins 38–45 pairs, brochidodromous. *Cataphylls* not seen. *Inflorescences* cauliflorous, pendulous; rachis shortly puberulous. *Calyx* closed in bud, rupturing into 3 deeply divided segments, c. 5 mm long, puberulous on exterior. *Flowers* with pedicels 5–10 mm long; hypanthium connate, not ridged or grooved, puberulous on exterior, 1.5–2 mm long; petals oblong, 8–9 mm long; stamens pink, staminal whorls 2–3, inner one staminodal, staminal tube c. 2 mm high; disc annular, c. 0.25 mm high; ovary 2-locular, ovules 4–6 per loculus; style 1.5–2 cm, dark red. *Young fruits* ovoid, endocarp c. 1.5 mm thick, woody; exocarp densely yellow-brown tomentellous. — **Map 12.**

Distribution — *Malesia*: Known only from the type from Morotai in the Moluccas.

Note — This species differs from *B. calyptrocalyx* in the smaller flowers, the divided calyx that is not circumscissile and the more densely flowered inflorescence. It differs from *B. confusa* in the larger leaves with thicker petioles, the shorter pedicels and the puberulous inflorescence rachis. It is large-leaved in comparison to many species of *Barringtonia*.

34. Barringtonia maxwelliana (Whitmore) Prance

Barringtonia maxwelliana (Whitmore) Prance, Blumea 33 (2010) 14; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 199; Allertonia 12 (2013) 108, f. 21. — Lecythidaceae species B in Whitmore, Tree Fl. Malaya 2 (1973) 266. — *Abdulmajidia maxwelliana* Whitmore, Kew Bull. 29 (1974) 210; El-Sherif & Latiff, Folia Malaysiana 7 (2006) 45. — Type: *KEP FRI (Kochummen) 2898* (holo KEP), Malaysia, Perak, Taiping, Maxwell's Hill.

Small trees, to 10 m tall. *Leaves*: petioles 1–2 cm long, slightly winged near lamina, not swollen at base; lamina obovate, 6–13 by 4–10 cm, chartaceous, base cuneate, margin entire, undulate or slightly serrate near apex, apex acuminate, both surfaces yellowish green; midrib prominulous above, prominent beneath, primary veins 7–8 pairs, brochidodromous, merging through network of veins 2–3 mm from margin, intercostal veins prominulous on both surfaces, reticulate. *Inflorescence* an axillary spike, pendulous; rachis 2–3 cm long, glabrous. *Calyx* open in bud. *Flowers* sessile; hypanthium c. 8 mm long, trigonous, pubescent; sepals 4, elliptic, 5–6 by 4–5 mm, margins fim-

briate, apex obtuse; petals 3–4, oblong, c. 2.8 by 1.4 cm, red, margins fimbriate, apex obtuse; staminal whorls 7–8, filaments to 5 cm long; disc thin, raised 1 mm; ovary 4-locular; style to 5 cm long, pink. *Fruits* oblong, c. 16 by 7 cm, thinly woody. *Seeds* 2–4, c. 4 by 3 cm. — **Map 8.**

Distribution — *Malesia*: Peninsular Malaysia (Perak).

Habitat & Ecology — Hill forests on ridges and hillsides to 600 m.

35. Barringtonia monticola Jebb & Prance

Barringtonia monticola Jebb & Prance, Blumea 56 (2011) 107; Prance, Allertonia 12 (2013) 58, f. 29. — Type: *NGF (Henty & Katik) 38894* (holo K; iso LAE), Papua New Guinea, Western Highlands, Dagarunga Ridge, Baiyer-Jimi Divide, S5°28', E144°14'.

Monocaulous treelets, to 4 m tall. *Leaves* in a single whorl in mature trees; petioles 1–3 cm long, winged almost to base, pulvinate; lamina oblong to oblong-lanceolate, 65–85 by 13–19 cm, widest at about 2/3 of its length, chartaceous and slightly bullate, base gradually tapering to short petiole, margin serrate-crenulate, flat, apex abruptly acuminate, acumen fine, slightly curved, 10–15 mm long; midrib prominulous above, prominent beneath, rounded, longitudinally ridged, primary veins 25–35 pairs, brochidodromous, arising obliquely from midrib, straight and parallel, confluent to a marginal vein, intercostal veins prominulous on both surfaces, near margins tending to be parallel and arranged at right angles to veins. *Cataphylls* lanceolate, to 5 cm long. *Inflorescences* cauliflorous, pendulous, 22–35 cm long; rachis c. 2 mm diam., accrescent to 4 mm, sparsely puberulous. *Calyx* closed in bud, pulverulent on exterior, circumscissile, leaving an irregularly lobed or fringed part. *Flowers* borne on short bosses; pedicels 1–2 mm, puberulous, not articulate; hypanthium cone-shaped, slightly 4-lobed, c. 3 mm tall by 3 mm diam., glabrous; petals 4, oblong, 10–14 by 4–6 mm; staminal whorls 4–5, the inner one staminodal, staminal tube c. 3 mm high; disk annular, c. 3 mm diam.; ovary 3-locular, 2 ovules per locule; style equalling filaments in length. *Fruits* ovoid, 3–5 by c. 4 cm, dark red when mature, slightly tetragonous, not tapered, not winged, exterior rugose when dry, with short pedicel 2–3 mm long, with concave calyx area at apex. — **Map 9.**

Distribution — *Malesia*: Papua New Guinea (Western, Eastern Highlands, Morobe Provinces).

Habitat & Ecology — Montane forest, 1200–1800 m.

36. Barringtonia niedenzuana (K.Schum.) R.Knuth

Barringtonia niedenzuana (K.Schum.) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 39, f. 6; Payens, Blumea 15 (1967) 236; Prance, Allertonia 12 (2013) 109, f. 18, 26. — *Careya niedenzuana* K.Schum., Notizbl. Königl. Bot. Gart. Berlin 2 (1898) 136; Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 462; Lauterb., Bot. Jahrb. Syst. 57 (1922) 345, f. 2. — *Cumbia niedenzuana* (K.Schum.) Kuntze, Deutsche Bot. Monatsschr. 21 (1903) 172. — Type: *Dahl s.n.* (holo B†), neotype (Payens 1967): *NGF (Floyd) 7012* (holoneo L; isoneo A, BO, BRI, K, LAE, SING), Papua New Guinea, New Britain, Keravat.

Barringtonia quadrigibbosa Lauterb., Bot. Jahrb. Syst. 57 (1922) 345, f. 2; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 40, f. 7; Peekel, Ill. Fl. Bism. Arch. (1945) 1294, f. 1293. — Lectotype (Prance 2013): *Peekel 647* (holo B†; lecto WRSL), Papua New Guinea, New Ireland.

Barringtonia bougainvilleana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 41. — Lectotype (Prance 2013): *Kajewski 2268* (holo B†; lecto A), Papua New Guinea, Bougainville I., Karngu, Buin.

Barringtonia araiorhachis Merr. & L.M.Perry, J. Arnold Arbor. 21 (1940) 293, f. 1c. — Type: *Brass 3190* (holo A; iso BISH, BM, BO, BRI, L), Solomon Is., Santa Isabel I., Meringe.

Small trees, 4–13 m tall. *Leaves*: petioles 1–4.5 cm long, slightly pulvinate at base; lamina obovate-oblong, 12–26 by 4–9 cm, papyraceous, base cuneate, slightly confluent onto petiole, not decurrent, margin serrate-crenulate, apex acuminate, acumen 5–12 mm long, lower surface usually glabrous, rarely pubescent; midrib prominulous above, prominent beneath, primary veins 13–18 pairs, brochidodromous, curbing and weakly united, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* few, triangular or lanceolate, 1–9 by 1–1.5 mm. *Inflorescences* terminal or ramiflorous racemes, pendulous, 20–90 cm long, sparsely flowered with c. 30 flowers; rachis very slender, 1–2 mm diam., puberulous; bracts linear-lanceolate, 5–7 by 1.5–2 mm; bracteoles minute, 0.25–1 mm. *Calyx* open in bud; green or green mottled red. *Buds* 5–7 mm diam. *Flowers* with pedicels 5–20 mm long, sometimes sessile when young; hypanthium subtetragonous, 1.5–3 by 1–3 mm, ferrugineous-pubescent; sepals 4, with small lobes 0.5–2.5 by c. 5 mm; petals 4, elliptic, 1.4–2 by 0.6–0.8 cm, purple, red to pink; stamens light purple to dark red or pink, staminal whorls 4–6, the inner one staminodal, staminal tube 2–8 mm, staminodia 4–8 mm; disc distinctly undulating, grooved outside, annular, c. 0.5 mm high; ovary (3–)4-locular, 2–4 ovules per locule; style 2–3.75 cm long. *Fruits* oblong, spindle-shaped, tetragonous, truncate, not winged, 4.5–6.5 by 1–1.75 by 0.75–1.25 cm. *Seeds* spindle shaped, slightly fissured, 3–3.75 cm by 5–7 mm. — **Map 1.**

Distribution — Solomon Is.; in *Malesia*: Moluccas, New Guinea (incl. New Britain, New Hanover, New Ireland).

Habitat & Ecology — Rainforest tree on limestone slopes or in low damp places or in low marginal forest, 0–700 m.

Vernacular names — Moluccas: Talaud: Buaro (Karatal). New Guinea: Papua (Irian Jaya): Sowiriw (Wandammen); Papua New Guinea: Tagal; New Hanover: Ta-autim; Bougainville: Ai ai chiram, Lususio. Solomon Is.: Santa Isabel: Cut nut (Pidgin); Fauro I.: Fala, Falangada (Kwara'ae); Falagori, Falangori (Maringe); Kenu (Kwara'ae).

37. **Barringtonia norshamiae** Prance

Barringtonia norshamiae Prance, Blumea 55 (2010) 17; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 199; Allertonia 12 (2013) 112, f. 23, 27. — Type: *KEP FRI (Everett) 14099* (holo KEP; iso K, L), Malaysia, Johore, Sungai Segamat, N of Kg. Tepoh, in Gunong Besar Massif, Labis Forest Reserve.

Barringtonia revoluta auct. non Merr.: Payens, Blumea 15 (1967) 199; Whitmore, Tree Fl. Malaya 2 (1973) 259.

Small trees, 8–18 m tall, without adventitious roots; bark brown to grey, thickly fissured, inner bark pink. *Leaves* grouped towards end of branches, arranged in storeys, subsessile, petioles 0–5 mm, slightly winged, not swollen at base; lamina narrowly oblong, 15–37 by 4–9 cm, chartaceous, base cuneate, confluent onto petiole margin serrate-crenulate, slightly revolute, apex acuminate, acumen 8–15 mm long,

both surfaces glabrous; midrib prominulous above, prominent beneath, primary veins 14–24 pairs, brochidodromous, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* lanceolate, to 3 cm long, membranaceous. *Inflorescences* terminal or ramiflorous, pendulous; rachis 1–1.5 mm diam., longitudinally striate, glabrous. *Calyx* open in bud. *Flowers* with pedicels 9–17 mm long; hypanthium conoid, 2–3 mm, glabrous; sepals ovate, c. 2.5 by 2 mm, glabrous; petals cream; stamens in 4 whorls, the inner one staminodal, pink. *Fruits* ovoid, 7.5–8 by 3–4 cm, terete, not winged, exocarp smooth, glabrous, green tinted pink when mature, with 4 knob-like protrusions at base. — **Map 12.**

Distribution — *Malesia*: Endemic to Peninsular Malaysia (Pahang and Johore).

Habitat & Ecology — Mixed lowland dipterocarp forest growing near rivers or among rocks, to 750 m.

Note — This species differs from *B. racemosa* in the larger, ovoid, not angled fruit, the much smaller flowers on long pedicels and the tapered leaf bases. The herbarium specimens of this species have been variously filed under *B. racemosa*, *B. revoluta* and *B. fusiformis* and Payens (1967) identified some of the material of *B. norshamiae* as *B. revoluta*, which differs in the thicker coriaceous leaves and the distinctly revolute leaf margins and much larger flowers. The latter species does not occur in Peninsular Malaysia and is only known from Borneo and the Philippines.

38. Barringtonia novae-hiberniae Lauterb.

Barringtonia novae-hiberniae Lauterb., Bot. Jahrb. Syst. 45 (1911) 362; Bot. Jahrb. Syst. 57 (1922) 351, 352; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 37, f. 5: Peekel, Ill. Pl. Bism. Arch. (1945) 1289, f. 1288; Payens, Blumea 15 (1967) 204; Sykes, Bull. New Zealand Dept. Sci. Industr. Res. 200 (1970) 49; Prance, Allertonia 12 (2013) 58, f. 11, 12. — Lectotype (Payens 1967): *G. Peekel 139* (syn B†; lecto WRSL), Papua New Guinea, New Ireland, Namatanai.

Barringtonia brosimos Merr. & L.M.Perry, J. Arnold Arbor. 12 (1931) 258. — Type: *Brass 2598* (holo A; iso BISH, BM, BO, BRI, L, SING), Solomon Is., San Cristoval Is., Waiamura.

Barringtonia oblongifolia R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 41. — Type: *Guppy 52* (holo K), Solomon Is., Treasury Is.

Barringtonia excelsa auct. non Blume: Guillaumin, J. Arnold Arbor. 12 (1931) 258.

Small to large trees. *Leaves*: petiole 0.5–6.5 cm long, not to slightly winged by decurrent lamina, not swollen at base; lamina ovate-oblong to obovate-oblong, 13–57 by 5.5–26 cm, chartaceous to coriaceous, base slightly confluent onto petiole, margin entire, slightly revolute, apex acute to caudate or obtuse, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 9–23 pairs, brochidodromous, merging through network of veins 2–5 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces. *Cataphylls* absent to few, triangular or lanceolate, 5–12 by 3–4 mm, fimbriate, apex acute. *Inflorescences* terminal racemes or borne on trunk well below leaf cluster, pendulous, 11–47 cm long, pulverulent, sparsely grey-puberulous or glabrous, c. 30-flowered. *Calyx* closed in bud, in subsp. *novae-hiberniae* with a large circular pore, sometimes rupturing into lobes, 6–10 mm high, green to pinkish to purple. *Flowers* sessile or with pedicels 2–10 mm long, in subsp. *kassamii* borne on raised knobs; hypanthium subtetragonous to campanulate, 3–8 by 4–6 by 4–6 mm, puberulous; sepals circumscissile, sparsely puberulous on exterior,

dark red; petals 4–5, elliptic, 2.5–4.5 by 1.5–2.25 cm, cream tinged purple or pink; stamens cream or white tinged red at apex, staminal whorls 3 or 8–10, the inner one with poorly developed anthers or staminodal, staminal tube 5–9 mm high, staminodia 1.5–2.25 cm; disc a flat wide ring, c. 2 mm high; ovary 4-locular, 1–3 ovules per locule; style 2–7 cm long. *Fruits* and *seeds* only known of subsp. *novae-hiberniae*, see there. — **Fig. 12g.**

Distribution — Solomon Is., Santa Cruz Is., Vanuatu; in *Malesia*: Moluccas (Seram), New Guinea (island plus Admiralty Is., Misima I., New Ireland, New Britain).

Note — For difference with *B. lauterbachii* see note under latter.

KEY TO THE SUBSPECIES

1a. Leaves chartaceous, apex acuminate; pedicels 4–10 mm long . . . . . **a.** subsp. **novae-hiberniae**

b. Leaves coriaceous, apex bluntly acute; pedicels c. 2 mm long **b.** subsp. **kassamii**

a. subsp. **novae-hiberniae**

Barringtonia novae-hiberniae Lauterb. subsp. *novae-hiberniae*: Prance, Allertonia 12 (2013) 60 (see under species for nomenclature).

Small trees, 5–20 m tall. *Leaves*: petioles 0.5–6.5 cm long, not swollen at base; lamina obovate-oblong, 13–57 by 5.5–26 cm, chartaceous, base slightly confluent onto petiole, margin entire, slightly revolute, apex cuspidate, caudate or obtuse, acumen 5–10 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 9–23 pairs, brochidodromous, merging through network of veins 2–5 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces. *Cataphylls* few, triangular or lanceolate, 5–12 by 3–4 mm, fimbriate, acute. *Inflorescences* terminal racemes, pendulous, pulverulent or glabrous, 20–47 cm, c. 30-flowered. *Calyx* closed in bud with a large circular pore, sometimes rupturing into lobes, 6–10 mm high, green to purple. *Flowers* sessile or with pedicels 2–10 mm long; hypanthium subtetragonous, 5–8 by 4–6 by 4–6 mm, puberulous; petals 4–5, elliptic, 3.5–4.5 by 1.5–2.25 cm, cream tinged purple; stamens cream or white tinged red at apex, staminal whorls 8–10, the inner one with poorly developed anthers or staminodal, staminal tube 5–9 mm high, staminodia 1.5–2.25 cm; disc a flat wide ring, c. 2 mm high; ovary 4-locular, 1–3 ovules per locule; style 4–7 cm long. *Fruits* subtetragonous, broadly obovoid, 7–8-ribbed, truncate, tapering to base, 4–7.5 by 1.5–3.5 by 2–3 cm. *Seeds* ovoid or spindle-shaped, fissured, 2–4 by 1–1.75 cm. — **Map 11.**

Distribution — Solomon Is., Santa Cruz Is., Vanuatu; in *Malesia*: Moluccas (Seram), New Guinea (island plus Admiralty Is., Misima I., New Ireland, New Britain).

Habitat & Ecology — Primary and secondary forests on rich alluvial soil, 0–200 m.

Vernacular names — Moluccas: Seram: Hansanae (Nuaulu). New Guinea: Huon Peninsula: Pao (Laluan); New Britain: Arpo, Pao; New Ireland: A pana kubar, A pana nasilsil; Bougainville: Hari, ai ai. Solomon Is.: Aikenu (Kwara'ae); Fala, Hari, Nonuvado, Vaha sela; New Georgia: Fala, Hala Kenu (Kwara'ae); San Cristobal: Hara; Treasury I.: Sioko. Vanuatu: Nevingen, Velingeh.

Uses — Commonly planted as ornamental and shade tree and for the fruit, seeds edible. The range of this species has been expanded by introduction to islands for its edible seeds.

b. subsp. **kassamii** Prance

Barringtonia novae-hiberniae Lauterb. subsp. *kassamii* Prance, Allertonia 12 (2013) 61. — Type: *NGF (Womersley) 43729* (holo K; iso L, LAE), Papua New Guinea, Morobe Province, Kassam Pass, Kaiapit, 901 m, S6°15', W146°0'.

Large trees. *Leaves*: petiole 2–3.5 cm long, slightly winged by decurrent lamina; lamina oblong-ovate, 14–23 by 8–11 cm, coriaceous, base cuneate, decurrent, margins entire, apex acute to bluntly acuminate-apiculate, the acumen 0–5 mm long, both surfaces glabrous; midrib prominulous above, prominent beneath, primary veins 9–11 pairs, prominulous above, prominent beneath, intercostal veins weakly prominulous on both surfaces, reticulate. *Cataphylls* absent. *Inflorescences* pendulous, borne on trunk well below leaf cluster, the rachis sparsely grey-puberulous, c. 2 mm diam. to 4 mm towards base, 11–22 cm long; calyx closed in bud, buds pinkish. *Flowers* sessile, borne on raised knobs; hypanthium campanulate, c. 3 mm tall, c. 4.5 mm diam., sparsely grey-pubescent glabrescent; sepals circumscissile, sparsely puberulous on exterior, dark red; petals 4, pink, c. 2.5 cm long; staminal whorls 3, inner one staminodal, stamens yellow, 2–2.5 cm long, staminal tube c. 5 mm tall and to 1 cm on inner staminal whorl; disc annular, c. 2 mm tall; style c. 2 cm long; ovary 4-locular, 3 ovules per locule. *Fruits* not seen. — **Map 11.**

Distribution — *Malesia*: Papua New Guinea (known only from the Kassam Pass).

Habitat & Ecology — High altitude: 900–2100 m.

39. Barringtonia palawanensis Chantar.

Barringtonia palawanensis Chantar., Kew Bull. 50 (1995) 697; Prance, Allertonia 12 (2013) 61, f. 23. — Type: *SMHI 1067* (holo L; iso K very young leaves), Philippines, Palawan, Puerto Princesa Mun., c. 36 km N of city, near Santa Cruz resthouse.

Trees. *Leaves*: petioles 1–6 mm long, slightly winged; lamina oblanceolate or obovate, 15–27.5 by 3.5–6.5 cm, coriaceous, base cuneate, slightly confluent onto petioles, margin entire, undulate, apex acute or acuminate, lower surface glabrous; midrib prominulous on both surfaces, primary veins 9–11 pairs, brochidodromous, prominulous on both surfaces. *Cataphylls* triangular or linear, variable in size, 8–20 by c. 0.3 mm. *Inflorescences* terminal racemes, pubescent, pendulous, 70–85 cm long, 40–50-flowered; bracteoles 0.5–0.7 by 0.3–2 mm, caducous. *Calyx* closed in bud, without an apical pore, pubescent. *Flowers* with pedicels 1.7–2.1 cm long; hypanthium funnel-shaped, 3-angled, sparsely puberulous, glabrescent, 2–2.5 mm long; sepals c. 3.5 mm long, puberulous; petals 3, red; ovary 3-locular, 3–4 ovules per locule. *Fruits* unknown. — **Map 12.**

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — Open broad-leaved forest.

Note — This species is distinct for having 3 petals and a 3-locular ovary, which is uncommon in the genus, but it is known only from poor type material.

40. Barringtonia papeh Lauterb.

Barringtonia papeh Lauterb., Bot. Jahrb. Syst. 57 (1922) 346; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 25; Peekel, Ill. Fl. Bism. Arch. (1945) 1292, f. 1291; Payens, Blumea 15 (1967) 222; Prance, Allertonia 12 (2013) 62, f. 13, 14. — Lectotype (Prance 2013): *Peekel 373* (holo B†; lecto WRSL), Papua New Guinea, New Ireland, Namatanai, Napanta, Burabire.

Barringtonia peekelii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 24. — Type: *Peekel 996* (holo B†), Papua New Guinea, New Ireland, Vunapope, Torin.

Trees, 3–20 m tall. *Leaves* clustered and tufted at branch ends; petioles 1–8 cm long, slightly winged, pulvinate; lamina obovate-lanceolate, 50–162 by 18–36 cm, chartaceous to subcoriaceous, base cuneate, confluent onto petiole, margin entire, apex finely acuminate, acumen 20–30 mm long, lower surface glabrous; midrib prominent above, strongly prominent beneath, primary veins 26–65 pairs, brochidodromous, merging by curved marginal vein 2–6 mm from margin, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, arranged parallel at right angles to veins. *Inflorescences* ramiflorous spikes, pendulous, 15–105 cm long, with up to 66 flowers; rachis 1.5–3 mm diam., accrescent to 4–9 mm, densely yellow-puberulous. *Calyx* closed in bud, apex with small beak, rupturing early into a circumscissile, persistent cup-shaped ring, 2–5 mm high and a caducous cap of c. 8 by 15 mm, rusty-puberulous. *Flowers* sessile (subsessile in fruit with pedicel to 3 mm long); hypanthium obpyriform, yellow puberulous; petals 4, elliptic, c. 3 by 1.5–1.75 cm, pink or white; stamens pale yellow, staminal whorls 8, of which 3 staminodal, staminal tube c. 7 mm high, staminodia c. 1.25 cm long; disc annular, c. 2 mm high; ovary 4-locular, 4–6 ovules per locule; style 3.5–4.75 cm long. *Fruits* ovoid, tetragonous, winged when young, truncate, tapering at base, 5–7.5 by 2.5–5.5 by 2.5–5.5 cm. *Seeds* ovoid, c. 3.25 by 2.25 cm, deeply grooved. — **Map 13.**

Distribution — Solomon Is.; in *Malesia*: SE New Guinea, New Britain, New Ireland, Rossel I.

Habitat & Ecology — Coastal undulating plain in rainforest on well-drained soil, also in secondary forest, 0–50 m.

Vernacular names — Papua New Guinea (main island): Yambe; New Ireland: A pape, Papeh (Pala); Taparoi (Lamekot); Bougainville: Turimu.

41. Barringtonia papuana Lauterb.

Barringtonia papuana Lauterb., Nova Guinea 8 (1910) 314; Nova Guinea 10 (1912) 845; Bot. Jahrb. Syst. 57 (1922) 349; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23; Payens, Blumea 15 (1967) 209; Prance, Allertonia 12 (2013) 64, f. 7, 15. — Lectotype (Prance 2013): *G.M. Versteeg 1759* (holo B†; hololecto K; isolecto BO, L, U, WRSL), Indonesia, Irian Jaya, Sabang N.

Barringtonia josephstaalensis W.N.Takeuchi, Sida 19 (2000) 9. — Type: *Takeuchi, Wiakaba, Gorrez & Towati 13796* (holo LAE; iso A, BRIT, K, NY), Papua New Guinea, Madang Prov., Josephstaal FMA area, Guam River.

Small trees, 3–10 m tall. *Leaves* clustered and tufted at branch ends; petioles 1.5–12 cm long, with decurrent lamina base; lamina linear-lanceolate, 47–126 by 1.5–8 cm, chartaceous, base long cuneate, margin serrate-crenulate, apex finely acuminate or cuspidate, acumen 15–25 mm long, lower surface glabrous; midrib prominent on both

surfaces, primary veins 70–95 pairs, brochidodromous, clearly merging 1–3 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* triangular, 9–11 by c. 3 mm. *Inflorescences* cauliflorous or ramiflorous racemes, more or less erect, 3–14 cm long, with c. 10 flowers; rachis 1.5–2 mm diam., glabrous; bracts lanceolate or linear-lanceolate, 2.5–10 by 0.5–2 mm; bracteoles triangular, c. 2 by 0.5–1 mm. *Calyx* closed in bud, rupturing into a persistent ring and a caducous cap, 6–8 by c. 10 mm, or into 2–4 persistent segments of 12–20 by 10–20 mm, green tinged purple. *Flowers* with pedicels 2–3 cm long; hypanthium subtetragonous or globular, 4–7 by 3–6 mm; petals 4, elliptic, 3–4 by 1.5–2 cm, white; stamens pink or creamy yellow, staminal whorls 5–6, the inner one staminodal, staminal tube 2.5–6 mm high outside, 15–18 mm inside, staminodia c. 3 mm; disc a narrow ring, 1.25–2.5 mm high; ovary 4-locular, 2–4 ovules per locule; style 3–4 cm long. *Fruits* ovoid, c. 6 cm long by 3 cm, exocarp shortly yellow-brown appressed pubescent, not ridged or grooved, endocarp c. 3 mm thick, 1-seeded. — **Map 7.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Along rivers in primary and secondary forest, 0–25 m.

Vernacular names — Papua New Guinea: Kun-job (Maian), Sehsegeh (Orokaiva).

Uses — The bark is used as a fish poison by Maian natives.

42. Barringtonia pauciflora King

Barringtonia pauciflora King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 137; Ridl., Fl. Malay Penins. 1 (1922) 757; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 29; Payens, Blumea 15 (1967) 243; Whitmore, Tree Fl. Malaya 2 (1973) 260; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 200; Allertonia 12 (2013) 114, f. 22. — Type: *King's Collector 6355* (holo SING; iso BM, K, US), Malaysia, Perak, Larut.

Small trees, 1–13 m tall. *Leaves*: petioles 2–9 cm long; lamina oblong or obovate-oblong, 7–13 by 2.5–5.5 cm, chartaceous, base cuneate, decurrent onto petioles, margin wavy to weakly serrate-crenulate, apex acute to cuspidate, acumen 10–18 mm long, lower surface glabrous; midrib prominulous on both surfaces, primary veins 10–15 pairs, brochidodromous, prominulous on both surfaces, intercostal veins weakly prominulous on both surfaces, reticulate. *Inflorescences* terminal or ramiflorous racemes, pendulous, erect, 4.5–7 cm long, densely flowered; rachis 5–8 mm diam. at base, 1–3 mm at apex, glabrous; bracts triangular, c. 1 by 1 mm. *Calyx* open in bud. *Buds* 0.5–1 cm. *Flowers* with pedicels 5–15 mm long, not articulate; hypanthium tetragonous, obpyramidal, glabrous; sepals semi-orbicular, 3–7 by 4–10 mm; petals white or pink; staminal whorls 4 or 7–8, the inner one staminodal, staminal tube 2–3 mm high, staminodia 2–10 mm; disc 0.75–1 mm high; ovary 4-locular, 2–10 ovules per locule; style 2–5.5 cm long. *Fruits* ovoid, tetragonous, not winged, apex truncate, tapering at base, 3.5–4.5 by 2–3 by 2–2.5 cm. *Seeds* ovoid, 3 by 1.5 by 1.5 cm. — **Map 6.**

Distribution — Thailand, Laos and Vietnam; in *Malesia*: Peninsular Malaysia.

Habitat & Ecology — Evergreen forest, 50–700 m.

Vernacular name — Peninsular Malaysia: Putat.

Note — For differences with *B. longipes* see note under latter.

43. Barringtonia pendula (Griff.) Kurz

Barringtonia pendula (Griff.) Kurz, J. Asiat. Soc. Bengal 46 (1877) 71; Forest Fl. Burma 1 (1877); Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 31; Payens, Blumea 15 (1967) 248; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 202; Allertonia 12 (2013) 114, f. 25. — *Careya pendula* Griff., Notul. Pl. Asiat. 4 (1854) 661. — *Doxomma pendula* (Griff.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 90, t. 15, f. 9–15. — Type: *Griffith s.n.* (holo K; iso W), Myanmar, Mergui.

Barringtonia musiformis King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 139; Ridl., Fl. Malay Penins. 1 (1922) 758; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 30; Corner, Wayside Trees Malaya 1 (1940) 355. — Lectotype (Prance 2013): *King's Collector 5746* (hololecto K; isolecto E, P, SING), Malaysia.

Large trees, 15–47 m tall. *Leaves*: petioles 1.5–6 cm long, slightly winged, slightly swollen at base; lamina obovate-lanceolate to obovate-oblong, 11–36 by 4–9 cm, chartaceous to subcoriaceous, base cuneate, margin serrate-crenulate, apex bluntly acuminate, acumen 5–15 mm long, lower surface glabrous and glaucous; midrib prominulous above, prominent beneath, primary veins 8–18 pairs, brochidodromous, merging through network of veins c. 2 mm from margin, slightly prominulous above, prominulous beneath, intercostal veins prominulous on both surfaces, reticulate. *Inflorescences* ramiflorous spikes, pendulous, 20–110 cm long, 40–50-flowered; rachis 5–6 mm diam. at base, c. 2 mm at apex, fissured, pulverulent; bracts triangular, c. 4 by 5 mm; bracteoles triangular, c. 4 by 3 mm. *Calyx* open in bud. *Flowers* sessile; hypanthium subterete to tetragonous, 6–12 by 5–8 mm, with 4 distinct grooves on corner, ferrugineous pubescent; petals white tipped pink; stamens white, staminal whorls 4–6, the inner one staminodal, staminal tube 3–8 mm high, staminodia filiform, 5–13 mm; disc annular, 1.5–2 mm high; ovary (3–)4-locular, 3–6 ovules per locule; style 4.5–6 cm. *Fruits* ovoid or musiform, fissured, pulverulent, truncate at both ends, 6–15 by 1.5–3.5 cm, single seeded. — **Map 9.**

Distribution — China, Myanmar, Thailand; in *Malesia*: W and S Sumatra, Peninsular Malaysia, Borneo (Sabah and Sarawak).

Habitat & Ecology — Mainly swamp forest and kerangas on white sand, also in hills and open forest, mixed forest, lowland dipterocarp forest, 0–200 m.

Vernacular names — Peninsular Malaysia: Putat, Putat bukit, Putat gajah.

Note — Some material of this species has been mistakenly identified as *Chydenanthus excelsus* (Blume) Miers, a species of Sumatra and Java that does not occur in Peninsular Malaysia (see Whitmore, Malaysian Forester 32, 1969: 70). This is the largest tree in the genus *Barringtonia*.

44. Barringtonia pinnifolia Jebb & Prance

Barringtonia pinnifolia Jebb & Prance, Blumea 56 (2011) 108; Prance, Allertonia 12 (2013) 66, f. 14. — Type: *Takeuchi & Ama 16438* (holo L; iso A), Papua New Guinea, Morobe Province, Kamiali Wildlife Management Area, ridgeline leading to Bulili Mountain, S7°19', 147°08'.

Small trees, to 7 m tall, branching. *Leaves* clustered at branch ends; petiole 1–3 cm long, with decurrent lamina base; lamina narrowly lanceolate, 19–36 by 2.5–4.5 cm at broadest point near apex, tapering from 4/5 to 5/6 of length to much less towards

Fig. 8. *Barringtonia pinnifolia* Jebb & Prance. Leaves and inflorescence (*NGF (Ridsdale) 31563*, LAE).

base, chartaceous, base cuneate, margin slightly serrate-crenulate, apex acuminate to mucronate, acumen 5–6 mm long, lower surface glabrous; midrib prominulous on both surfaces, more so beneath, primary veins 21–26 pairs, brochidodromous, merging through network of veins 1–3 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, more conspicuous beneath, reticulate.

Cataphylls not seen. *Inflorescences* cauliflorous and ramiflorous, pendulous, emerging below leaves, 50–65 cm long with sparse flowers; rachis thin, 1–1.5 mm diam., glabrous; bracts not seen. *Calyx* closed in bud, with small, c. 1 mm long beak at apex, undivided into lobes and persistent in old flowers, red. *Flowers* with pedicels 3–6 mm long; hypanthium conical, slightly ridged, puberulous on exterior, c. 4 mm broad at apex by 4 mm long; petals and stamens caducous, not seen; disc an annular raised ring, c. 5 mm diam.; style red, c. 2 cm long; ovary 4-locular, with 1–2 ovules per loculus. *Fruits* obovoid, c. 2.3 by 1.5–2.5 cm, red, tapering towards both ends, persistent rim of calyx present. — **Fig. 8; Map 13.**

Distribution — *Malesia*: Papua New Guinea.

Habitat & Ecology — Forest in ultrabasic areas and on rocky slopes facing the sea, 0–100 m

45. Barringtonia procera (Miers) R.Knuth

Barringtonia procera (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 25; Guillaumin, Ann. Mus. Colon. Marseille 55/56 (1948) 38; Payens, Blumea 15 (1967) 223; Prance, Allertonia 12 (2013) 67, f. 16, 17, 40, 41. — *Butonica procera* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 74. — Type: *Hinds s.n.* (holo BM, fragm.; iso CGE, K), Vanuatu, Launa, 1841.

Barringtonia schuchardtiana K.Schum. in K.Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 92; Notizbl. Königl. Bot. Gart. Berlin 1 (1895) 54; Lauterb. & K.Schum., Fl. Schutzgeb. Südsee (1900) 463; Lauterb., Bot. Jahrb. Syst. 57 (1922) 349; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 37. — Lectotype (Prance 2013): *Hollrung 791* (B†; lecto WRSL), Papua New Guinea, Augustafluss; syntype: *Hollrung 473* (B†, CGE, WRSL), Papua New Guinea, Suam, near Finschhafen.

Barringtonia magnifica Lauterb., Bot. Jahrb. Syst. 45 (1911) 363; Bot. Jahrb. Syst. 57 (1922) 350; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 24; Peekel, Ill. Fl. Bism. Arch. (1945) 1287, f. 1286; E.Walker, For. British Solomon Is. Protect. (1948) 131. — Lectotype (Prance 2013): *Peekel 146* (holo B†; lecto WRSL), Papua New Guinea, Namatanai.

Barringtonia guppyana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 25. — Type: *Guppy 59* (holo K), Solomon Is., Treasury I.

Barringtonia excelsa auct. non Blume: Benth., Hooker's J. Bot. Kew Gard. Misc. 2 (1843) 221.

Small trees, 7–15 m tall. *Leaves*: petioles 0–1 cm long, not swollen at base; lamina obovate-oblong, 29–62 by 8–24 cm, chartaceous, base cuneate, decurrent onto petiole, margin serrate-crenulate, apex acuminate with a recurved tip, acumen to 1 cm long, lower surface glabrous; midrib flattened prominulous above, very prominent beneath, primary veins 17–23 pairs, brochidodromous, weakly merging 3–5 mm from margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* lanceolate, 2.5–12 by 1–3 cm. *Inflorescences* terminal spikes, pendulous, 30–80 cm long, densely flowered with up to 120 flowers; rachis c. 5 mm diam., slightly fissured, pulverulent; bracts triangular, c. 10 by 5 mm. *Calyx* closed in bud, the apex round, pulverulent, rupturing into 2–4 lobes, 0.75–1.75 by 0.75–1.75 cm. *Flowers* sessile; hypanthium obpyramidal, tetragonous, fissured, 3–7 by 3–5 mm, greyish yellow pulverulent; petals 4, elliptic, 2.25–3 by 0.5–2 cm, cream or white; stamens red or cream; staminal whorls 5–6, the inner one staminodal, staminal tube 4–5 mm high, staminodia connate up to 1 cm, the free filiform part 1–1.5 cm; disc inconspicuous, c. 0.25 mm high; ovary 4-locular, 1–3 ovules per locule; style 4–5.5 cm long. *Fruits*

cylindrical, 8-sided, hooked near base on alternate ribs, 6–7.5 by 3–4 by 3–3.5 cm. *Seeds* ovoid, slightly fissured, 3–3.5 by 1–2 cm. — **Map 5.**

Distribution — Solomon Is., Vanuatu; in *Malesia*: Papua New Guinea, New Britain, New Ireland.

Habitat & Ecology — Lowland rainforest, swamp forest, secondary forest.

Vernacular names — New Guinea: A pana hutun, Borolong, Vaha, Waha.

Uses — Seeds edible, commonly planted around villages or grown in plantations.

Note — For differences with *B. lumina* see note under latter.

46. Barringtonia pterita Merr.

Barringtonia pterita Merr., Philipp. J. Sci., Bot. 9 (1914) 322; Enum. Philipp. Fl. Pl. 3 (1923) 142; Payens, Blumea 15 (1967) 210; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 117; Prance, Allertonia 12 (2013) 69, f. 2. — Lectotype: *BS (M. Ramos) 15121* (holo PNH†; hololecto K; iso US), Philippines, Luzon, Prov. Laguna, San Antonio.

Small trees, 7–10 m tall. *Leaves* sessile or with petioles 0.5–1 cm long; lamina obovate-lanceolate or linear lanceolate, rarely obovate-oblong, 13–52 by 3–9 cm, chartaceous, base long-cuneate, confluent to base of petiole, margin undulate or serrate-crenulate, apex acuminate or cuspidate, the acumen 5–14 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 15–28 pairs, brochidodromous, prominulous on both surfaces, intercostal veins prominulous on both surfaces. *Cataphylls* lanceolate or triangular, 5–25 by 3–5 mm, chartaceous. *Inflorescences* terminal or ramiflorous racemes or spikes, pendulous, 58–144 cm long, c. 60-flowered; rachis 2.5–3 mm diam., glabrous or pulverulent when young; bracts triangular, 2.5–5 by 1–2 mm, serrate. *Calyx* closed in bud, apex rounded, glabrous, rupturing into 2–3 unequal segments. *Flowers* sessile or with pedicels 5–12 mm long; hypanthium tetragonous, 4-winged or sharply angled, 2.5–5 by 1–3 mm, truncate, tapering to base, glabrous or pulverulent when young; sepals 2–3, unequal, 9–10 by 6–11 mm; petals elliptic, 15–20 by 7–10 mm, convex; staminal whorls 3, the inner one staminodal, staminal tube 1.5–3 mm, staminodia c. 0.75 mm; disc a small ring, c. 0.5 mm high; ovary (3–)4-locular, 3–5 ovules per locule; style c. 3.5 cm long. *Fruits* distinctly 4-winged, tetragonous, truncate, tapering at base, 4–6 by 1–2.5 by 1–2 cm. *Seeds* ovoid, distinctly fissured, 2.5–3.5 by 1–1.25 cm. — **Map 2.**

Distribution — *Malesia*: Borneo and Philippines.

Habitat & Ecology — Beside streams and on ridges in lowland dipterocarp forest, 0–170 m.

Vernacular name — Philippines: Bariyonok (Palanan-Agta).

47. Barringtonia racemosa (L.) Spreng.

Barringtonia racemosa (L.) [Roxb., Hort. Bengal. (1814) 52, nom. nud.] Spreng., Syst. Veg. 3 (1826) 127; DC., Prodr. 3 (1828) 288; Roxb., Fl. Ind. 2 (1832) 634; Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 333; Kostel., Allg. Med.-Pharm. Fl. 4 (1835) 1535; Wight, Icon. Pl. Ind. Orient. 1 (1839) t. 152; Hook., Bot. Mag. 67 (1841) 3831, fig.; Hassk., Flora 27 (1844) 594; Voigt, Hort. Suburb. Calcutt. (1845) 51; Korth., Ned. Kruidk. Arch. 1 (1846) 205; Miq., Anal. Bot. Ind. 1 (1850) 28; Blume in Van Houtte, Fl. Serres 7 (1851) 23, incl. var. *minor* Blume; Griff., Notul. Pl. Asiat. 4

(1854) 659; Icon. Pl. Asiat. 4 (1854) 636, f. II, 1–6; Miq., Pl. Jungh. 4 (1855) 413; Fl. Ind. Bat. 1, 1 (1855) 486; de Vriese, Pl. Ind. Bat. Orient. 1 (1856) 78; Thwaites, Enum. Pl. Zeyl. 2 (1859) 119, incl. var. α and β; Dalzell & A.Gibson, Bombay Fl. (1861) 94; Cleghorn, For. Gard. S. India (1861) 251; Sond. in Harv. & Sond., Fl. Cap. 2 (1862) 523; E.G.Balf., Timber Trees ed. 2 (1862) 44; Vieill., Bull. Soc. Linn. Normandie 10 (1866) 98; Seem., Fl. Vit. 3 (1866) 83, excl. syn. Forster; Bedd., Fl. Sylv. S. India 3 (1869) 112; Lawson in Oliv., Fl. Trop. Afr. 2 (1871) 438; Kurz, Prelim. Rep. Forest Pegu (1875) App. A, 1xvi, App. B, 52; J. Roy. Asiat. Soc. Bengal 45, ii (1876) 131; Forest Fl. Burma 1 (1877) 496; J. Roy. Asiat. Soc. Bengal 46, ii (1877) 70; Baill., Hist. Pl. 6 (1877) 323, f. 315, 316; Blanco, Fl. Filip. ed. 3, 2 (1878) 325, t. 240; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 507; Fern.-Vill., Nov. App. (1880) 86; Grevelink, Pl. Ned.-Indië (1883) 157; Hemsl., Rep. Voy. Challenger, Bot. 3 (1884) 152, 238; S.Vidal, Revis. Pl. Vasc. Filip. (1886) 133; Drake, Ill. Fl. Ins. Pacif. (1890) 171; Warb., Bot. Jahrb. Syst. 13 (1891) 388; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 33; Nairne, Fl. Pl. W. India (1894) 115; Reinecke, Bot. Jahrb. Syst. 25 (1898) 660; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 6; C.W.Andrews, Monogr. Christmas Isl. (1900) 178; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 136; Volkens, Bot. Jahrb. Syst. 31 (1901) 470; Merr., Philipp. Bur. For. Bull. 1 (1903) 42; Saff., Contr. U.S. Natl. Herb. 9 (1905) 195; Merr., Rev. Blancos Fl. Filip. (1905) 46; Matsum. & Hayata, Enum. Pl. Formosa (1906) 144; Brandis, Indian Trees, ed. 1 (1906) 330; A.Usteri, Vierteljahrsschr. Naturf. Ges. Zürich 50 (1906) 440; H.B.Guppy, Observ. Natural. Pacific 2 (1906) 573; Sim, Forest Fl. Port. E. Afr. (1909) 68, t. 68; Merr., Philipp. J. Sci., Bot. 3 (1909) 422; Rech., Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 85 (1910) 320; Guillaumin, Ann. Mus. Colon. Marseille 19 (1911) 155; Backer, Schoolfl. Java (1911) 530; Talbot, For. Fl. Bombay 2 (1911) 47; Koord., Exkurs.-Fl. Java 2 (1912) 665; Lauterb., Nova Guinea 8 (1912) 845; Hayata, Icon. Pl. Formosan. 2 (1912) 21; Merr., Fl. Manila (1912) 345; Interpr. Herb. Amboin. (1917) 385; Kirt. & B.B.Das, Indian Med. Pl. 1 (1918) 557, t. 426; Gamble, Fl. Madras 1 (1919) 487; Engl., Pflanzenw. Afrikas 3, 2 (1921) 658, f. 290; Troup, Silvic. Ind. Trees 2 (1921) 591; Lauterb., Bot. Jahrb. Syst. 56 (1921) 527; Merr., Bibliogr. Enum. Born. Pl. (1921) 419; Enum. Philipp. Fl. Pl. 3 (1923) 142; Gagnep. in M.H.Lecomte, Fl. Indo-Chine 2 (1921) 855; Lauterb., Bot. Jahrb. Syst. 57 (1922) 349, 353; Ridl., Fl. Malay Penins. 1 (1922) 757; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 142; Hochr., Candollea 2 (1925) 445; Marloth, Fl. S. Africa 2 (1925) 218, f. 140; Craib, Fl. Siam. 1 (1931) 672; Guillaumin, J. Arnold Arbor. 12 (1931) 258; Steenis, Arch. Hydrobiol., Suppl. 2 (1932) 310, f. 65, 66, 68; Benthall, Trees Calc. (1933) 251; Booberg, Bot. Jahrb. Syst. 66 (1933) 19; Floyd & Aiken, Bull. Lloyd Libr. Bot. 33 (1934) 78; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 305; Merr., Trans. Amer. Philos. Soc. 24 (1935) 281; Kaneh., J. Dept. Agric. Kyushu Imp. Univ. 4 (1935) 376; Formos. Trees rev. ed. (1936) 491; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 17; Merr. & Chun, Sunyatsenia 5 (1940) 142; Corner, Wayside Trees Malaya 1 (1940) 355, f. 123; Holthuis & H.J.Lam, Blumea 5 (1942) 134, 217; Parham, Bull. Dept. Agric. Fiji 21A (1942) 42, 70; Peekel, Ill. Fl. Bism. Arch. (1945) 1290, f. 1290 (ined.); Guillaumin, Ann. Mus. Colon. Marseille 55/56 (1948) 38; Glassman, Bull. Bernice P. Bishop Mus. 209 (1952) 62; E.Walker, Import. Trees Ryukyu Isl. (1954) 230, f. 143; H.Perrier, Fl. Madagasc. 149 (1954) 4, f. 2; Cufod., Bull. Jard. Bot. État Bruxelles 29, Suppl. (1959) 613; T.S.Liu, Ill. Lign. Pl. Taiwan 1 (1960) 281, t. 233; Hundley & U Chit Ko Ko, List Trees Shrubs Burma, ed. 3 (1961) 107; Dale & Greenway, Kenya Trees & Shrubs (1961) 243, f. 48; Backer & Bakh.f., Fl. Java 1 (1963) 353; Parham, Pl. Fiji Isl. (1964) 143; Balgooy & Payens, Blumea, Suppl. 5 (1966) 27, 292, map 164; Payens, Blumea 15 (1967) 192; Whitmore, Tree Fl. Malaya 2 (1973) 259; A.C.Sm., Fl. Vit. Nova 2 (1981) 597; Macnae & Fosberg in Dassan., Revis. Handb. Fl. Ceylon 3 (1981) 197; R.J.F.Hend. in A.S.George, Fl. Australia 8 (1982) 5; Chantar., Kew Bull. 50 (1995) 689; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 117; H.N.Qin & Prance, Fl. China 13 (2007) 293; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 203; Allertonia 12 (2013) 70, f. 5, 11, 32. — *Eugenia racemosa* L., Sp. Pl. 1 (1753) 471; Lam., Encycl. 3 (1789) 197. — *Stravadium racemosum* (L.) Sweet, Hort. Brit. (1826) 159. — *Butonica racemosa* (L.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 66, t. 13, f. 11–17. — *Michelia racemosa* (L.) Kuntze, Revis. Gen. Pl. 1

(1891) 240. — *Huttum racemosum* (L.) Britten, J. Bot. 39 (1901) 67. — Lectotype (Prance 2013): *Herb. Hermann figs 212* (lecto BM; para f. 213, 339: BM).

Menichea rosata Sonn., Voy. Nouv. Guinée 1 (1776) 133, t. 92–93. — *Butonica rosata* (Sonn.) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 71, t. 14, f. 16–18. — *Michelia rosata* (Sonn.) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — *Barringtonia rosata* (Sonn.) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19. — Type: Sonnerat, Voy. Nouv. Guinée 1 (1776) t. 92–93.

Stravadium album Pers., Syn. 2 (1807) 30, pro descr. Rumphius, excl. t. 116, nom. illeg. — Type: Rumphius, Herb. Amboin. 3 (1743) text with Pl. 115 (see DC., Prodr. 3, 1828: 289).

Barringtonia stravadium Blanco, Fl. Filip., ed. 1 (1837) 533. — Type: Blanco description (see Merr., Rev. Blancos Fl. Filip., 1905: 46).

Barringtonia rosaria Oken, Allg. Naturgesch. 3, 3 (1841) 1926. — Type: Rheede & Rumphius description in Rumphius, Herb. Amboin 3 (1743) text with Pl. 116 (see Merr., J. Arnold Arbor. 31, 1950: 272).

Barringtonia elongata Korth., Ned. Kruidk. Arch. 1 (1846) 206; Walp., Ann. Bot. Syst. 2 (1852) 641. — *Barringtonia racemosa* (L.) Spreng. var. *elongata* (Korth.) Blume in Van Houtte, Fl. Serres 7 (1851) 23. — Type: *Korthals s.n.* (holo L, sheet 898.204.202), Indonesia, Kalimantan, Poeloe (Pulau) Lampei.

Barringtonia racemosa (L.) Spreng. var. *minor* Blume in Van Houtte, Fl. Serres 7 (1851) 23. — Type: *Forsten 318* (holo L, sheet 925.250.552), Indonesia, Sulawesi.

Barringtonia racemosa (L.) Spreng. var. *procera* Blume in Van Houtte, Fl. Serres 7 (1851) 23. — Type: *Hasskarl 532* (holo L, sheet 898.204.199), Indonesia, W Java.

Barringtonia timorensis Blume in Van Houtte, Fl. Serres 7 (1851) 23; Miq., Fl. Ned. Ind. 1, 1 (1855) 486; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 850; Britten in H.O.Forbes, Naturalist's Wanderings E. Archipel. (1885) 505; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19. — ?*Megadendron ambiguum* Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 110, nom. superfl. — *Michelia timorensis* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Type: *Zippelius s.n.* (holo L, sheet 898.204.236; iso L, sheets 898.204.237–238, U), Indonesia, Timor.

Stravadium obtusangulum Blume in Van Houtte, Fl. Serres 7 (1851) 24, excl. syn.; Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 81. — *Barringtonia obtusangulum* (Blume) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 46. — Type: *A. van Royen s.n.* (holo L, sheet 898.204.144), Sri Lanka.

Barringtonia racemosa (L.) Spreng. var. *subcuneata* Miq., Fl. Ned. Ind. 1, 1 (1855) 486. — Type: *Horsfield 21* (holo K), Indonesia, Java, Patjitan.

Butonica rumphiana Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 68, t. 13, f. 18–24. — *Barringtonia rumphiana* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19. — Type: *R. Schomburgk s.n.* (holo BM, iso K), Thailand.

Butonica terrestris Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 69, t. 14, f. 4–9. — *Barringtonia terrestris* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19, excl. synonyms Rumph. & Miq. — Type: *T. Horsfield s.n.* (holo BM; iso K), Indonesia, Sumatra, Ban(g)ka Is.

Butonica inclyta Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 71, t. 14, f. 19. — *Barringtonia inclyta* (Miers) B.D.Jacks., Index Kew. 1 (1895) 276, in syn. — Type: *W. Griffith s.n.* (holo K), Malaysia, Malacca.

Butonica apiculata Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 75. — *Michelia apiculata* (Miers) Kuntze, Revis. Gen. Pl. 1 (1891) 240. — *Barringtonia apiculata* (Miers) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 18, nom. illeg., non *apiculata* Lauterb. (1922). — Type: *Pervillé 517* (holo P; iso BM, fragm.), Madagascar, Nosbé.

Butonica caffra Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 78. — *Barringtonia caffra* (Miers) E.Mey. ex R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 19. — Lectotype (Prance 2013): *Drège 5369* (holo B†; hololecto K; isolecto BM, fragm., CGE, L, U), South Africa.

Megadendron pallidum Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 110, p.p. quoad flores. — *Barringtonia pallida* (Miers) Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 17 (1900) 12. — Type: *Horsfield s.n.* (holo BM, flowers only; iso CGE, K, U), Indonesia, Java, Patjitan.

Barringtonia salomonensis Rech., Feddes Repert. Spec. Nov. Regni Veg. 11 (1912) 183. — Type: *Rechinger 4787* (holo W), Papua New Guinea, Bougainville Is., near Sinai.
Barringtonia longiracemosa C.T.White, Proc. Linn. Soc. New South Wales 44 (1919) 823, t. 44. — Type: *Bancroft s.n.* (holo BRI, sheet no. 38832), Australia, Queensland, Johnstone River.
Barringtonia celebesensis R.Knuth in Engl., Pflanzenr, VI. 219, Heft 105 (1939) 17. — Type: *Warburg 15129* (holo B†; iso WRSL, flower fragment only), Indonesia, Sulawesi, Amurang.
Barringtonia lageniformis Merr. & L.M.Perry, J. Arnold Arbor. 21 (1940) 294, t. 1A. — Type: *Brass 5776* (holo A; iso BO, BRI, NY), Papua New Guinea, W Division, Oriomo River., Wuroi.
Barringtonia excelsa auct. non Blume: A.Gray, U.S. Expl. Exped., Atlas Phan. 1 (1854) 508.
Barringtonia costata auct. non (Blume) Miq.: Lauterb., Nova Guinea 8 (1910) 315.

Shrubs or small to medium sized trees, 2–20 m tall. *Leaves* clustered at apex of branches; petiole 0.25–1.5 cm, slightly winged, not swollen at base; lamina obovate-oblong or obovate-lanceolate, 14–42 by 4–16 cm, papyraceous, base cuneate, margin serrate-crenulate, flat, apex acute to acuminate at apex, the acumen 5–20 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 10–20 pairs, brochidodromous, merging by network of veins 2–5 mm from margin, impressed above, prominent beneath, intercostal veins prominulous on both surfaces, finely reticulate. *Cataphylls* triangular, 5–11 by 2–8 mm. *Inflorescences* terminal or ramiflorous racemes or spikes, pendulous, 20–100 cm long; rachis to 3 mm diam., glabrous or pulverulent; bracts triangular, 5–6 by 1.5–2 mm; bracteoles triangular, 1.5–2 by c. 0.5 mm, acute. *Calyx* closed in bud, apex rounded, rupturing into 2–5 unequal lobes, not circumscissile. *Flowers* sessile or with pedicels 3–16 mm long, latter not articulate; hypanthium funnel-shaped, not grooved or winged, 4–12 mm long, glabrous; petals white, sometimes tinged pink; stamens white, pink, purple or red, staminal whorls 5–6, the inner one staminodal, staminal tube 3.5–6 mm high, staminodia 1–2 cm; disc a thick grooved ring; ovary (2–)3–4-locular, 2–3 ovules per locule; style 3–5.5 cm long. *Fruits* ovoid, subtetragonous, truncate, tapering at base, slightly winged when young, 5–9 by 2–5.5 by 2–5.5 cm. *Seeds* ovoid, 2–4 by 1–2.5 cm, subtetragonous, tapering towards apex. — **Fig. 1a, 9; Map 11.**

Distribution — The most widespread species of *Barringtonia*: E and S Africa, Comores, Madagascar, Seychelles, India (incl. Andamans and Nicobars), Sri Lanka, Myanmar, Thailand, China, to Marianas, Carolines, N Australia, Solomons, Vanuatu, New Caledonia, Fiji, Samoa and many other Pacific islands; in *Malesia*: throughout.

Habitat & Ecology — Primary and secondary rainforest, mostly in inundated floodplains and tidal riverbanks and swampy places, along lake and seashores.

Vernacular names — Peninsular Malaysia: Putat ayam, Putat darat, Putat kampong, Putat kedol, Putat talang, Common putat. Sumatra: Putat, Putat sungai (Island Bangka); puntu. Java: Penggung (Java); Songgom, Songgom laut (Sunda). Borneo: Putat aanem, Putat aying (Brunei), Putat ayer (Sabah). Philippines: Apálang, Kasouai (Manóbo); Kutkut-timbalen (Suli); Magebayabat (Agta); Nuling, Tuba-tuba (Cebu Bisáya). Paling (Ibanág); Potat, Putat (Tagbanua). Sulawesi: Alakang (Bugis); Kambaha, Wumbalango (Gorontalo); Kungkungan, Mahakungkungan, Malegai (Minahasa); Palam (Manado area); Párang'a (Talaud Is.); Puta (Muna). Moluccas: Ai latalr, Djifal, Tuf (Seram Is.); Arari, Butun darat, Kamlarasarsjawe, Kawetianalas; Palangasa sesiil, Pangaha (Halmahera Is.); Puta puta (Ambon Is.). New Guinea: Papua: Aikaru, Dadang (Amju); Putay; Papua New Guinea: Ai ai chiram (Bougainville Is.); Aua aua, Bam, Koem. Solomon Is.:

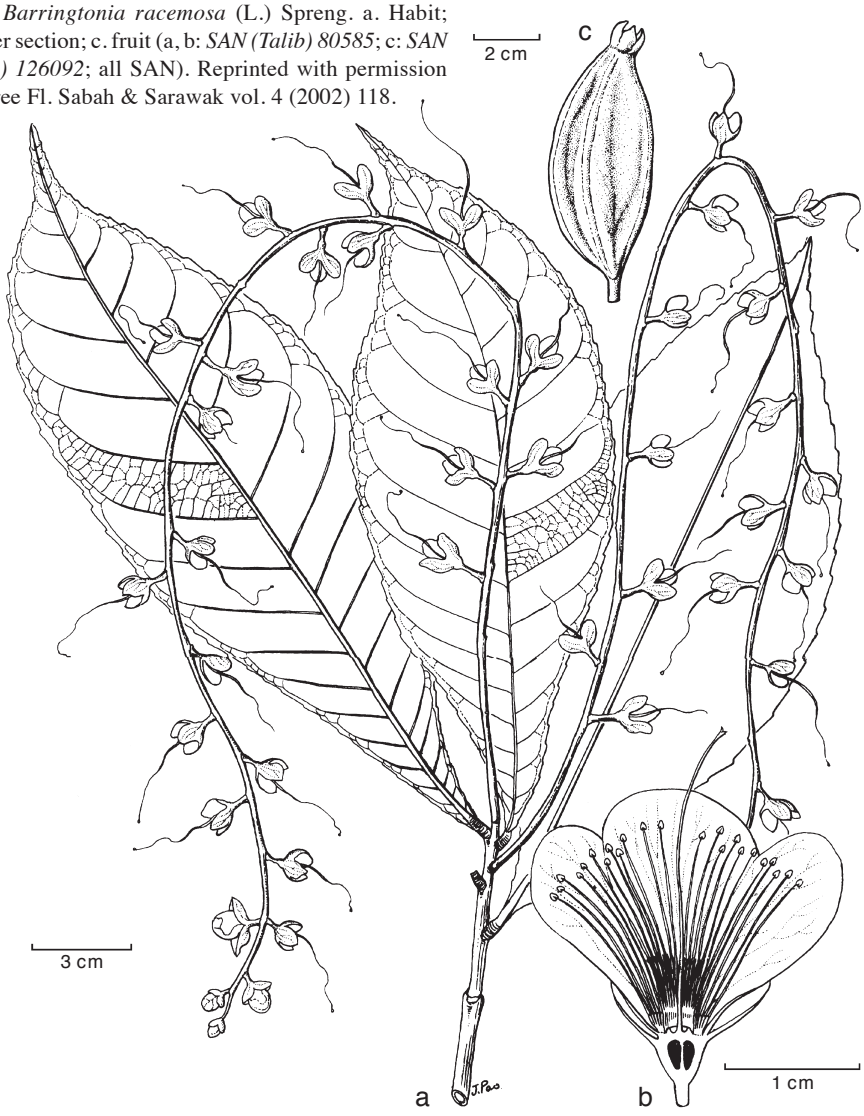


Fig. 9. *Barringtonia racemosa* (L.) Spreng. a. Habit; b. flower section; c. fruit (a, b: *SAN (Talib) 80585*; c: *SAN (Awang) 126092*; all SAN). Reprinted with permission from Tree Fl. Sabah & Sarawak vol. 4 (2002) 118.

Cut nut (Pidgin); Falananda (Kwara'ae); Falangada, Harangada, Nganvwewa (Nangu); Futu, Hutu.

Note — For differences with *B. norshamiae* see note under latter.

48. **Barringtonia reticulata** (Blume) Miq.

Barringtonia reticulata (Blume) Miq., Fl. Ned. Ind. 1, 1 (1855) 490; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; Kurz, Natuurk. Tijdschr. Ned.-Indië 27 (1864) 164; Merr., Philipp. J. Sci. 1, Suppl. (1906) 102; Bibliogr. Enum. Born. Pl. (1921) 419; Pl. Elmer. Born. (1929) 213; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 47; Hundley & U Chit Ko Ko, List Trees Shrubs Burma,

ed. 3 (1961) 107; Payens, Blumea 15 (1967) 252; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 205; Allertonia 12 (2013) 116, f. 20, 33. — *Barringtonia acutangula* auct. non (L.): Gaertn.: Korth., Ned. Kruidk. Arch. 1 (1846) 206. — *Stravadium reticulatum* Blume in Van Houtte, Fl. Serres 7 (1851) 24. — *Michelia reticulata* (Blume) Kuntze, Revis. Gen. Pl. 1 (1891) 241. — Lectotype (Prance 2013): *Korthals s.n.* (hololecto L, sheet 898.204.205-20; isolecto U), Borneo.

Barringtonia sumatrana Miq., Fl. Ned. Ind., Eerste Bijv. (1862) 315; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 139; Merr., Bibliogr. Enum. Born. Pl. (1921) 420; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 35; Corner, Wayside Trees Malaya 1 (1940) 356. — Type: *Teysmann HB 4536* (holo U; iso BO, K, L), Indonesia, Sumatra, Lampongs (Lampung Prov.), Mangala.

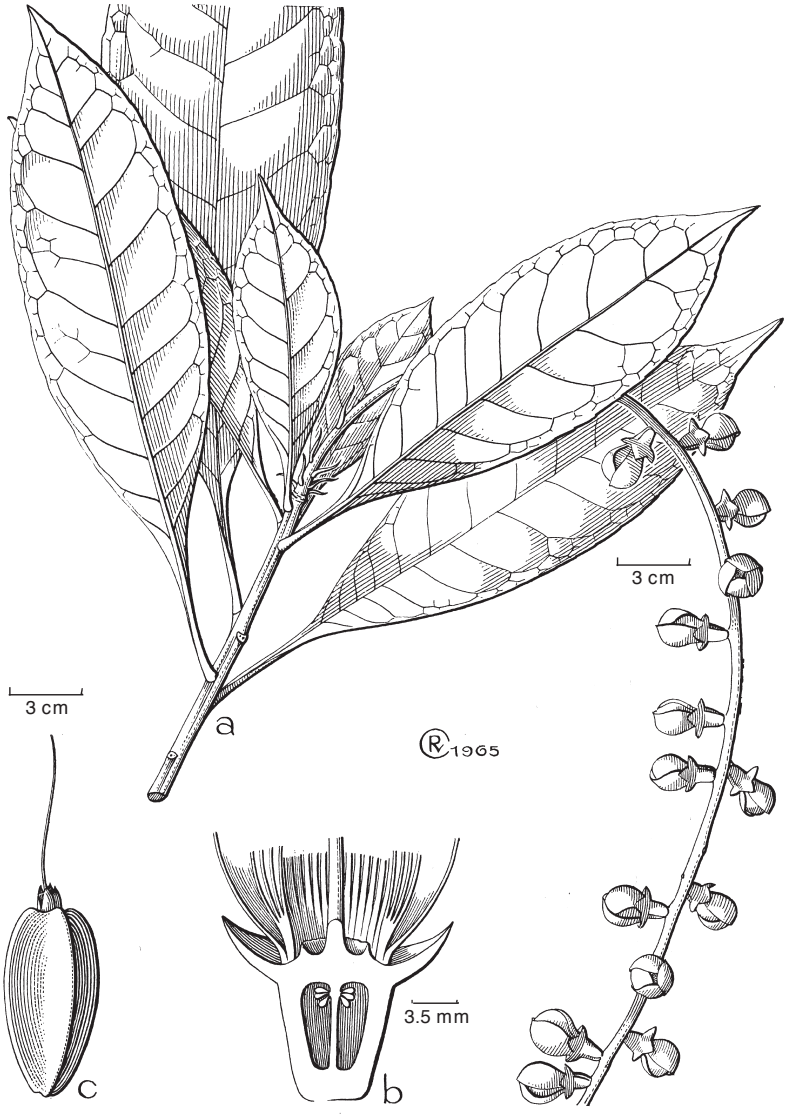


Fig. 10. *Barringtonia reticulata* (Blume) Miq. a. Habit; b. flower section; c. fruit (a: *Bogor Botanical Garden V-A-4*; inflorescence and b: *PNH (Canicosa) 9764*; c: *S (Brunig) 12051*).

Barringtonia gitingensis Elmer, Leafl. Philipp. Bot. 8 (1915) 2730; Merr., Enum. Philipp. Fl. Pl. 3 (1923) 142; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 36. — Lectotype (Prance 2013): *Elmer 12238* (not *12236*) (holo PNH†; hololecto BM; isolecto BISH, BO, E, HBG, K, L, P, US, W), Philippines, Sibuyan, Prov. Capiz, Magallanes, Mt Giting-Giting.

Barringtonia linggaensis R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 23. — Type: *H.A.B. Bünnemeijer 7316* (holo L), Indonesia, Lingga I., Dabok Pulau Singkep.

Shrubs or small trees, 2–10 m tall. *Leaves*: petiole 2.5–6 cm long, slightly winged by decurrent leaf base, slightly swollen at base; lamina elliptic, 11–22 by 3–8 cm, coriaceous, base cuneate, margin slightly serrate-crenulate, revolute, apex acuminate, acumen 5–14 mm long, lower surface glabrous; midrib prominent on both surfaces, primary veins 9–18 pairs, brochidodromous, arching and scarcely joining at margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, conspicuously reticulate. *Cataphylls* triangular, 3–6 by 1–2.5 mm. *Inflorescences* terminal spikes, pendulous, 30–65 cm long, up to 30-flowered; rachis c. 2 mm diam., accrescent to 6 mm, glabrous; bracts lanceolate, 3–6(–15) by 1–1.5 mm; bracteoles triangular, c. 1 by 0.5 mm. *Calyx* open in bud. *Flowers* sessile; hypanthium funnel-shaped, tetragonous with acute winged edges, 4–6 by 4–5 mm, glabrous; petals white to reddish white or pink; stamens white, staminal whorls 4–5, the inner one staminodal, staminal tube 2–3 mm high, staminodia c. 7 mm; disc annular, 0.5 mm high; ovary 4-locular, tetragonous with acute winged edges, glabrous, 2–4 ovules per locule; style 4–6 cm long. *Fruits* ovoid or almost fusiform, truncate at apex, 6–10.5 by 2.5–7 by 2.5–6 cm, 4-angled, slightly winged when young, tapering towards base, smooth, shiny, sides flat or depressed. *Seeds* single, ovoid, trigonous, c. 2 cm long, deeply fissured. — **Fig. 10; Map 4.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo (Brunei, Sarawak, Sabah, E Kalimantan), Philippines.

Habitat & Ecology — Primary hillside forest and mixed dipterocarp forest, 0–1700 m.

Vernacular names — Peninsular Malaysia: Putat. Sumatra: Beliman (Rejang); Semilang (Bangka); Peranap, Putat halang, Putat rawa. Borneo: Rengas (Iban); Paya, Putat, Putat darat, Putat hitam. Philippines: Mago, Paho (Sibuyan).

Uses — Bark used as a fish poison.

49. Barringtonia revoluta Merr.

Barringtonia revoluta Merr., Philipp. J. Sci. 1, Suppl. (1906) 211; Enum. Philipp. Fl. Pl. 3 (1923); R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 36; Payens, Blumea 15 (1967) 199; Whitmore, Tree Fl. Malaya 2 (1973) 259; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 120; Prance, Allertonia 12 (2013) 75, f. 14. — Lectotype (Prance 2013): *FB (Curran) 3507* (holo PNH†, hololecto K, isolecto L), Philippines, Palawan.

Trees, 5–33 m tall. *Leaves*: petiole 1–11 cm long, slightly winged towards lamina, not swollen at base; lamina obovate-lanceolate, 11–34 by 3–13 cm, coriaceous, base cuneate, margins entire or slightly serrate-crenulate, strongly revolute, apex acute or acuminate, the acumen 0–12 mm long, lower surface glabrous; midrib prominulous above, prominent beneath, primary veins 14–16 pairs, brochidodromous, merging through marginal veins 2–5 mm from margin, prominulous on both surfaces, intercostal veins prominulous and conspicuously reticulate on both surfaces. *Cataphylls* triangular, 4–6 by 2–3 mm. *Inflorescences* terminal or ramiflorous racemes, pendulous, 70–80 cm

long, up to 90-flowered; rachis glabrous; bracts triangular, c. 1 by 0.5 mm. *Calyx* closed in bud, with a small beak of c. 1 mm, rupturing into 2–4 segments, 9–12 by 6–10 mm, without apical pore. *Flowers* with pedicels 0.5–2 cm long; hypanthium obpyramidal with acute edges, trigonous, 3–5 by 2.5–4 mm, glabrous, without appendages;

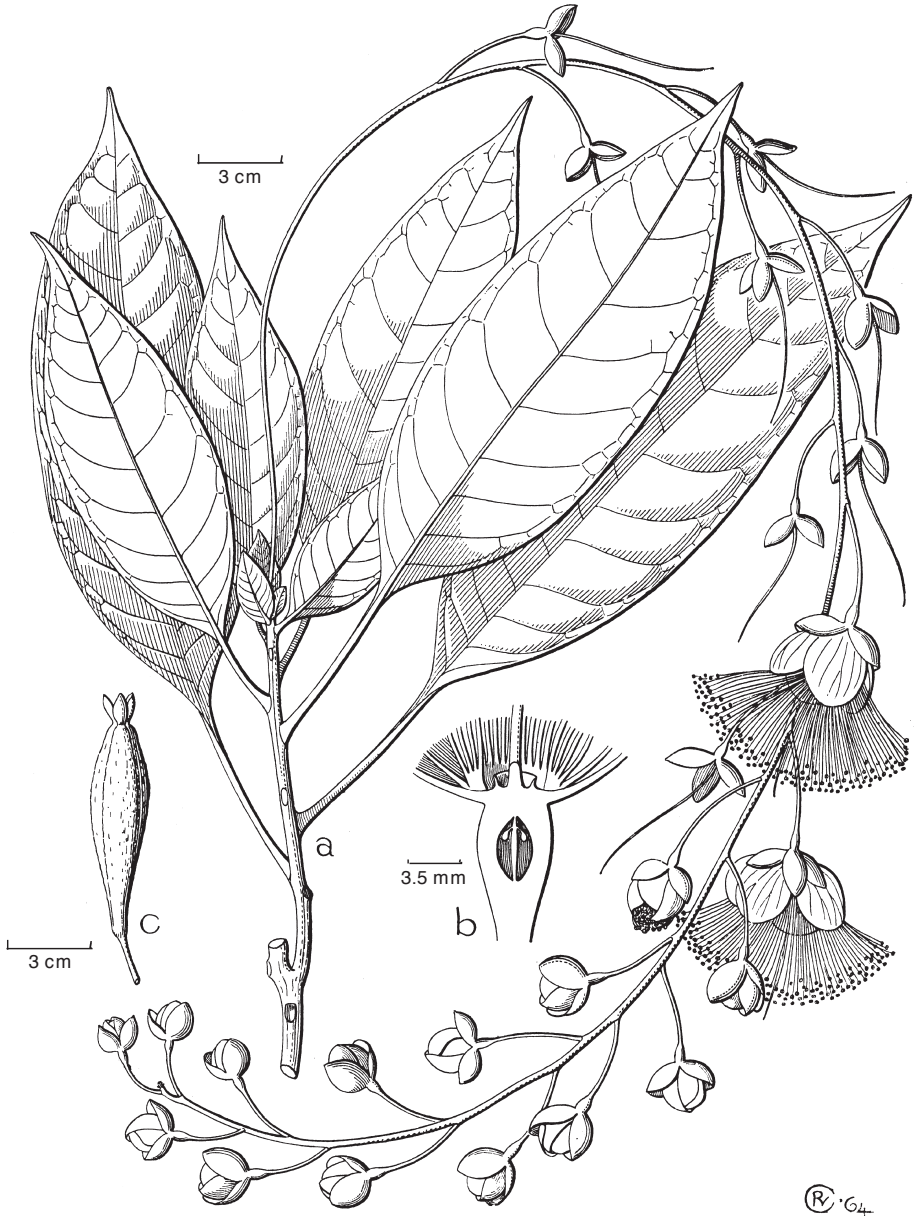


Fig. 11. *Barringtonia revoluta* Merr. a. Habit; b. flower section; c. fruit (a, b: *BRUN (Ashton) 5162*, L; c: *S (Hassan) 4852*).

sepals 2–4, oblong, c. 10 mm long, glabrous; petals 3–4, elliptic, 1.75–2 by 1–1.25 cm, red or pink; stamens yellow or pink to deep pink, staminal whorls 4, the inner one staminodal, staminal tube c. 1.5 mm high, staminodia c. 1.25 mm; disc thin, outside grooved, 0.25–0.5 mm high; ovary 3(–4)-locular, 3–4 ovules per locule; style 3.5–4.5 cm long. *Fruits* distinctly pedicelled, sharply 3–4-gonous, truncate, fusiform when young, later ovoid, cuneate at base, 4.5–6 by 1.25–1.75 by 1–1.5 cm, not winged. *Seeds* ovoid, trigonous, c. 3 cm by 9 mm. — **Fig. 11; Map 13.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo (Sarawak, Brunei, Sabah), Philippines (Palawan).

Habitat & Ecology — Primary forest in hilly areas and along riverbanks or inundated plains, 0–200 m.

Vernacular names — Sumatra: Peranap, Putat. Borneo: Buah carrot (Dusun); Karut, Rengas (Iban); Putat samba (Brunei). Philippines: Pusak (Tagbanua, Palawan).

Note — For differences with *B. norshamiae* see note under latter.

50. Barringtonia ridsdalei Chantar.

Barringtonia ridsdalei Chantar., Kew Bull. 50 (1995) 700; Prance, Allertonia 12 (2013) 76, f. 17. — Type: *Ridsdale 1019* (holo L), Philippines, Palawan, Pulot, Massin River, 12 km N of Brook's Point.

Trees. *Leaves*: petiole 4–5 cm long, winged with decurrent leaf bases; lamina oblanceolate or ovate, 17.5–21.5 by 5–6 cm, coriaceous, margin entire, revolute, apex acute, lower surface glabrous; primary veins 11–12 pairs. *Cataphylls* triangular, c. 10 by 0.3–0.5 mm. *Inflorescences* terminal racemes, pendulous, c. 75 cm long, flowers 60–70, dense near proximal end of inflorescence; bracteoles triangular, c. 1.5 by 0.7 mm, caducous. *Calyx* closed in bud, without an apical pore, tip mucronate, rupturing into 2–3 segments, minutely pulverulent. *Flowers* with pedicels 1.5–1.8 cm long; hypanthium funnel-shaped, slightly tetragonous, 9–10 mm long, minutely pulverulent; sepals oblong-lanceolate to orbicular, 4–7 by 4–6 mm, pubescent; petals red; staminal whorls unknown; ovary 4-locular, 4–7 ovules per locule. *Fruits* unknown. — **Map 5.**

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — Lowland forest along river.

Note — The winged petioles distinguish this species.

51. Barringtonia rimata Chantar.

Barringtonia rimata Chantar., Kew Bull. 50 (1995) 4; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 207; Allertonia 12 (2013) 117, f. 14. — *Abdulmajidia rimata* (Chantar.) El-Sherif & Latiff, Folia Malaysiana 7 (2006) 50. — Type: *Maxwell 84-37* (holo A; iso PSU, UKMB), Thailand, Songkhla, Hat Yai, Ko Hong Hill.

Small trees, 2–15 m tall. *Leaves*: petiole 4–12 cm long, slightly swollen at base, not winged; lamina ovate to oblanceolate, 20–60 by 5–14 cm, coriaceous, base cuneate, margin serrate-crenulate, apex acute, the acumen 5–10 mm long, both surfaces yellowish green to pale green; midrib prominent on both surfaces, primary veins 14–30 pairs, brochidodromous, merging 2–4 mm from margin, prominulous above, prominent beneath, intercostal veins prominulous on both surfaces, finely reticulate. *Inflorescence* a

terminal spike, pendulous; rachis to 80 cm long, c. 6 mm diam. at base, c. 1.5 mm near apex, glabrous. *Calyx* open in bud. *Flowers* sessile; hypanthium c. 4 mm long, broadly conoid, glabrous; sepals 4, elliptic, 4–15 by 3–10 mm; petals 4, elliptic, 1.5–2 by 1–1.5 cm, margins fimbriate, apex obtuse, red, pink or white tinged pink; staminal whorls 5, filaments to 3 cm long; disc annular, raised, c. 2 mm; ovary 3-locular, rounded, pubescent, 4 ovules per locule; style to 4 cm long, pink. *Fruits* ovoid, 3–5 by 1–2 cm, turning reddish, exocarp smooth. *Seeds* 3–5 or rarely single, 2–4 by 1–2 cm. — **Map 13.**

Distribution — Thailand; in *Malesia*: Peninsular Malaysia (Kedah, Kelantan, Perak, Selangor, Terengganu).

Habitat & Ecology — Lowland dipterocarp forest, also on limestone hills, to 800 m.

Note — This species is very similar to *B. macrostachya* and hard to distinguish vegetatively without the fruit that is very different. The smaller ovoid fruit of this species usually has more than one seed, but not consistently.

52. Barringtonia sarawakensis Chantar.

Barringtonia sarawakensis Chantar., Kew Bull. 50 (1995) 700; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 121; Prance, Allertonia 12 (2013) 78, f. 17. — Type: *S (Soepadmo & Chai) 28183* (holo L; iso A, K, KLU), Malaysia, Sarawak, 3rd Division, Kapit Distr., Bukit Raya.

Trees, 10–25 m tall. *Leaves*: petiole 6–12 mm long, not or scarcely winged, not swollen at base; lamina oblanceolate to elliptic, 7.5–12.5 by 3–5 cm, chartaceous, base cuneate, margin entire, apex acute or acuminate, acumen 2–10 mm long, beneath glabrous; midrib prominulous on both surfaces more so beneath, primary veins 9–11 pairs, brochidodromous, not merging, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Inflorescences* terminal racemes or in upper leaf axils, erect, 1.7–4 cm long, sparsely-flowered with 7–10 flowers; rachis 1–1.5 mm diam., glabrous, not striate; bracteoles triangular, c. 0.2 by 0.2 mm, caducous. *Calyx* closed in bud, rupturing into 2–3 segments, glabrous, in bud with a fine beaked point at apex, without apical pore. *Flowers* with pedicels 4.5–6 cm long; hypanthium funnel-shaped, terete or slightly triangular, c. 8–10 mm long, glabrous; sepals 2–3, oblong to lanceolate or ovate, 12–14 by 9–11 mm; petals 4, margins with ciliate teeth; stamens in 4–5 whorls; ovary 2-locular, 4–7 ovules per locule; style 4–4.5 cm long. Young *fruits* ovate-oblong, tapering towards base, base not tetragonous, to 4 cm long. *Seeds* unknown. — **Map 5.**

Distribution — *Malesia*: Borneo (Sarawak).

Habitat & Ecology — Hill slopes in mixed deciduous forest, 400–900 m.

Vernacular names — Karut putat, Putat (Iban); Pelenuim (Kenjah).

53. Barringtonia sarcostachys (Blume) Miq.

Barringtonia sarcostachys (Blume) Miq., Fl. Ned. Ind. 1, 1 (1855) 490; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 851; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1959) 34; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 122; Prance, Allertonia 12 (2013) 79, f. 11. — *Stravadium sarcostachys* Blume in Van Houtte, Fl. Serres 7 (1851) 24. — *Doxomma sarcostachys* (Blume) Miers, Trans. Linn. Soc. London, Bot. 1 (1875) 102. — Type: *Praetorius s.n.* (holo L, sheet 898.204.176-181; iso BO), Indonesia, Sumatra.

Barringtonia dolichobotrys Merr., J. Malayan Branch Roy. Asiat. Soc. 77 (1917) 204. — Type: *Villamil 278* (holo K; iso US), Malaysia, Sabah.

Barringtonia anacardiifolia Ridl., Kew Bull. (1938) 284. — Type: *Haviland 2934* (holo K; iso BM, BO, L, SAR, SING), Malaysia, Sarawak, Garai, near Kuching.

Small to large trees, 7–40 m tall, twigs 7–20 mm diam. *Leaves*: petiole 1–9 cm long, slightly winged by decurrent lamina; lamina obovate to elliptic to linear-lanceolate, 15–100 by 4.5–15 cm, coriaceous, base cuneate, not to strongly decurrent, margin entire, revolute, apex usually acute or rounded, rarely acuminate, the acumen 0–15 mm long, beneath glabrous; midrib plane to prominent above, prominent beneath, primary veins 12–50 pairs, brochidodromous, merging c. 3 mm from margin, prominulous on both surfaces, swollen at base, intercostal veins slightly prominulous above, prominulous beneath, reticulate to parallel and at right angles to the primary veins. *Cataphylls* triangular, 6–14 by 2–5 mm. *Inflorescences* terminal spikes, pendulous, 24–180 cm long, sparsely flowered, flowers spaced along rachis; latter c. 4 mm diam., accrescent to 10 mm, glabrous; bracts sublanceolate-triangular, 4–11 by 2–4 mm. *Calyx* closed in bud, the apex rounded, rupturing into 2–5 unequal segments, 14–18 by 12–16 mm. *Flowers* sessile; hypanthium subtetragonous with rounded edges, 9–13 by 9–10 mm, glabrous; sepals suborbicular, 14–18 by 12–16 mm, coriaceous, apex acute; petals 4, elliptic, 3.5–4.5 by 2–3 cm, white; stamens white, staminal whorls 4–6, the inner one staminodal, staminal tube 4–5 mm high, staminodia 1.5–2.5 cm high; disc annular, 1.5–2 mm high; ovary 4-locular, 4–6 ovules per locule; style 4–7.5 cm long. *Fruits* ovoid to subglobular, 5–11 by 3.5–7.5 by 3–7.5 cm, smooth. *Seeds* ovoid-subglobular, 3.5–6.5 by 2.5–4.5 cm, with about 14 deep fissures. — **Fig. 12a–e.**

Distribution — *Malesia*: Sumatra, Borneo.

KEY TO THE SUBSPECIES

1a. Leaf laminas obovate to elliptic, 15–45 by 4.5–15 cm, not strongly decurrent, primary veins 12–20; petiole 1–9 cm long . . . . . **a.** subsp. **sarcostachys**

b. Leaf laminas linear-lanceolate, 30–100 by 5–10.5 cm, with a strongly decurrent base, primary veins 19–50; petiole 1–1.5 cm long . . . . . **b.** subsp. **dolichophylla**

a. subsp. **sarcostachys**

Barringtonia sarcostachys (Blume) Miq. subsp. *sarcostachys*: Prance, Allertonia 12 (2013) 79. — *Barringtonia sarcostachys* (Blume) Miq. forma *sarcostachys*: Payens, Blumea 15 (1967) 21. — Type: as species.

For nomenclature see also under species.

Leaves: petiole 1–9 cm long; lamina obovate to elliptic, 15–45 by 4.5–15 cm, base not strongly decurrent; midrib plane above, primary veins 12–20, intercostal veins reticulate. — **Map 11.**

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — Primary forest in hilly areas, 0–300 m.

Vernacular names — Sumatra*:* Putat-talang. Borneo: Sabah: Tampalang, Tempalang (Dusun); Putat. Sarawak: Keroot, Langkong (Iban); Putat tangkong.

Uses — Bark used as a fish poison.

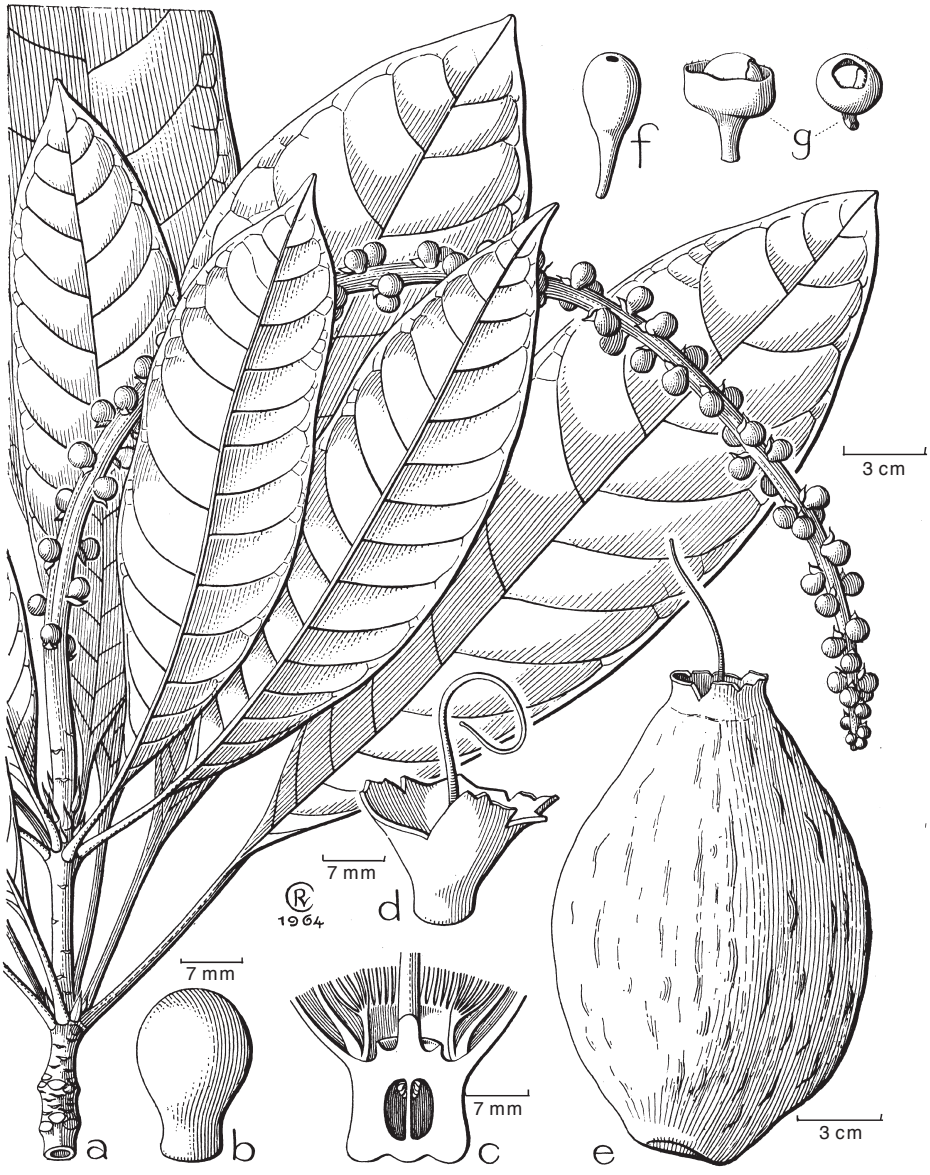


Fig. 12. a–e: *Barringtonia sarcostachys* (Blume) Miq. a. Habit; b. bud; c. flower section; d. flower after anthesis; e. fruit. — f: *Barringtonia sepikensis* Lauterb. Young bud. — g: *Barringtonia novae-hiberniae* Lauterb. Young bud (a–d: *SAN (Chai) 23737*; e: *SAN (Zen) 13040*; f: *Hartley 10561*; g: *BSIP (Cowmeadow's collectors) 4820*; all L).

b. subsp. **dolichophylla** (Merr.) Prance

Barringtonia sarcostachys (Blume) Miq. subsp. *dolichophylla* (Merr.) Prance, Allertonia 12 (2013) 80. — *Barringtonia dolichophylla* Merr., J. Malayan Branch Roy. Asiat. Soc. 77 (1917) 205; Bibliogr. Enum. Born. Pl. (1921) 410; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 21. — *Barringtonia sarcostachys* (Blume) Miq. forma *dolichophylla* (Merr.) Payens, Blumea 15 (1967) 218. — Type: *Hose 610* (holo K; iso BM, L), Malaysia, Sarawak, Baram Distr., Miri.

Leaves: petiole 1–1.5 cm long; lamina linear-lanceolate, 30–100 by 5–10.5 cm, base strongly decurrent; midrib prominent above, primary veins 25–50, intercostal veins parallel, at right angles to the primary veins. — **Map 11.**

Distribution — *Malesia*: Borneo (Sarawak, Sabah, Brunei).

Habitat & Ecology — In primary mixed dipterocarp forest on hillsides, 0–50 m.

Vernacular names — Borneo: Langkong, Tampalong (Iban).

54. Barringtonia scortechinii King

Barringtonia scortechinii King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 138; Ridl., Fl. Malay Penins. 1 (1922) 757; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 30; Burkill, Dict. Econ. Prod. Malay Penins. 1 (1935) 306; Corner, Wayside Trees Malaya 1 (1940) 355; Payens, Blumea 15 (1967) 233; Whitmore, Tree Fl. Malaya 2 (1973) 262; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 208; Allertonia 12 (2013) 118, f. 18. — Lectotype (Payens 1967): *King's Collector 3854* (hololecto BM; isolecto K, P), Malaysia, Perak, Larut.

Barringtonia scortechinii King var. *globosa* Craib, Fl. Siam. 1 (1931) 673; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 30. — Type: *Kerr 15222* (holo K; iso BM, SING), Thailand, Trang, Kao Sung.

Small to large trees, 2–40 m tall. *Leaves*: petiole 0.5–5 cm long, swollen at base, slightly winged; lamina obovate to elliptic, 8–21 by 5–7.5 cm, subcoriaceous, base cuneate, slightly confluent onto petiole, margins serrate-crenulate, revolute, apex acuminate, the acumen 4–12 mm long, beneath glabrous; midrib prominulous on both surfaces, primary veins 7–10 pairs, brochidodromous, arching but not joined at margin, prominulous on both surfaces, intercostal veins prominulous on both surfaces, finely reticulate. *Inflorescences* ramiflorous or rarely terminal spikes, pendulous, 13–70 cm long, with up to 65 flowers, rachis 3–7 mm diam., accrescent, often fissured, slightly pubescent; bracts triangular, c. 4 by 2 mm; bracteoles triangular, c. 0.5 by 0.5 mm. *Calyx* open in bud. *Flowers* sessile; hypanthium tetragonous with distinctly winged edges, 3–9 by 2.5–6 mm, often pulverulent; petals white or pink; stamens white or pink; staminal whorls 4–5, the inner one staminodal, staminal tube 3–4 mm high, staminodia c. 1.25 cm long; disc a thin distinct ring, 1–2 mm high; ovary 3–4-locular, 3–4(–5) ovules per locule; style c. 4 cm long. *Fruits* tetragonous with distinct wings on edges when young, later ovoid with 8 ridges, 10–12 by 3–5 by 3–5 cm. *Seeds* single, ovoid, tetragonous, 3–6 cm long. — **Fig. 13; Map 1.**

Distribution — Thailand; in *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — Swampy forest near rivers, or hillside forest and mixed dipterocarp forest, 0–1400 m.

Vernacular names — Peninsular Malaysia: Putat gajah, Putat tuba. Borneo: Langsat burung, Putat, Tempalang

Uses — Fruit and bark used as a fish poison. Wood used for timber.

Fig. 13. *Barringtonia scortechinii* King. a. Habit; b. mature bud; c. bud section; d. fruit (a: *SAN (Bakar) 24981*, L; b, f: *SFN (Corner) 30704*, d: *Allen SA 7650/170*).

55. Barringtonia sepikensis Lauterb.

Barringtonia sepikensis Lauterb., Bot. Jahrb. Syst. 57 (1922) 351, f. 4; Prance, Allertonia 12 (2013) 81, f. 9 — Type: *Ledermann 8042* (holo WRSL), Papua New Guinea: Sepik R. region.

Trees, 10–31 m tall. *Leaves*: petiole 0.5–3 cm long, not swollen at base; lamina oblong or obovate-oblong, 10–26 by 3.5–9 cm, papyraceous, base cuneate, slightly

decurrent almost to base of petioles, margin entire, flat, apex rounded, acute or caudate, the acumen 0–10 mm long, blade drying grey-green, glabrous beneath; midrib prominulous above, prominent beneath, primary veins 11–20 pairs, brochidodromous, merging through network of veins 1–10 mm from margin, weakly prominulous above, prominulous beneath, intercostal veins weakly prominulous above, prominulous beneath, reticulate. *Inflorescences* terminal or ramiflorous racemes, pendulous, 12–25 cm long, the rachis 0.5–2 mm diam., accrescent to 4 mm, grey-pulverulent; bracts caducous. *Calyx* closed in bud, not beaked, without apical pore, calyptrate, rupturing circumscissile into a persistent ring 5–7 mm high and a caducous cap, 3–4 by c. 8 mm, pink. *Flowers* with pedicels 0.75–3 cm long, not articulate; hypanthium obpyramidal, 3–6 by 3–5 mm, grey-pulverulent; petals 4–5, elliptic, 2–2.5 by 1–1.5 cm, white, cream or pink; stamens yellow or rose red, staminal whorls 6–7, the inner one staminodal, staminal tube c. 3 mm high, staminodia connate for 8–20 mm, free filiform part 1–2 mm long; disc annular, c. 1.5 mm high; ovary 3–4-locular, 1–3 ovules per locule; style 1.5–2.5 cm long. *Fruits* ovoid to cylindrical, not ribbed, truncate at both ends, 4.5–6.5 by 1.5–4.5 by 1.5–3.5 cm; exocarp puberulous; remains of calyx persistent. *Seeds* ovoid, 3.5–5 by 1.5–2 cm, deeply grooved. — **Fig. 12f; Map 10.**

Distribution — *Malesia*: New Guinea (Adi, Japen and Rossel I.).

Habitat & Ecology — Primary rainforest in sandy clay soil up to 750 m and moist oak forest at 1550 m.

Vernacular names — New Guinea: Bottegaib, Oedaub (Manokwari region); Eosin, Kati-ili, Salajie, Swilliwinni (Mooi); Oesem (Biak); Temakkofoes (Tehid).

Uses — Bark used as a fish poison.

Note — For difference with *B. lauterbachii* see note under latter.

56. Barringtonia serenae Jebb & Prance

Barringtonia serenae Jebb & Prance, Blumea 56 (2011) 108; Prance, Allertonia 12 (2013) 82, f. 29. — Type: *Jebb 905* (holo K; iso L), Papua New Guinea, Madang Province, river gorge 0.8 km W of Sein village, near Madang, by path to Og Cave, S5°18', E145°42.3'.

Trees, leptocaul, c. 20 m tall, upright, c. 25 cm diam. *Branches* pendulous, upcurved at ends, sparsely branched; internodes 8–40 cm long, ultimate twigs 8–16 mm. *Leaves* in whorls of 8–11(–16) at branch apices only, in upper half of internodes; petioles 2–7 cm, rounded below, flattened above with 2 abrupt ridges along the top margin contiguous with the lamina, to 0.8 cm thick; pulvinate in lower 1/3 to 1/2 and there to 12 mm thick, scabrous, grey-brown, glabrous, green; lamina flat, obovate, 13–39(–60) by 5.5–16.5(–24) cm, coriaceous, base tapering, slightly confluent, abruptly cuneate, margin flat, asymmetrically crenulate, and minutely apiculate between crenulations, these becoming worn, ± entire towards base, apex acuminate; midrib rounded and prominent beneath, prominulous with a narrow abrupt ridge above, veins 10–14 pairs, prominulous above, prominent beneath, arising obliquely, arched and united at margin, intercostal veins prominulous on both surfaces, parallel and arranged at right angles to veins. *Cataphylls* leaf-like, below whorls obovate, apetiolate; at stem apices broad-ovate, smallest c. 0.9 by 0.6 cm, base truncate, margin serrate, apex acute. *Inflorescences* lateral, from old leaf axils of branches, to 4 cm diam., rarely terminal on

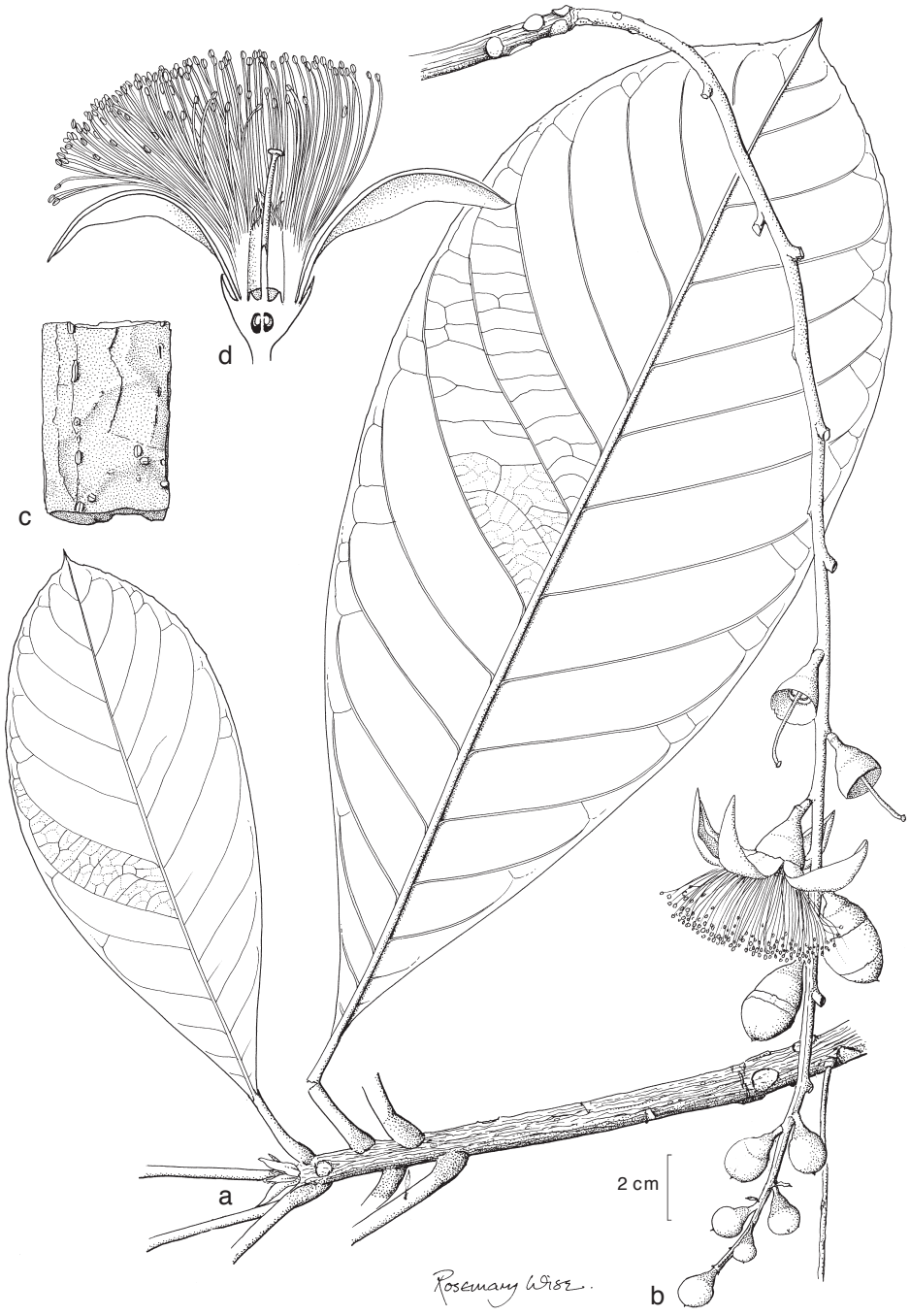


Fig. 14. *Barringtonia serenae* Jebb & Prance. a. Leaves and branch; b. inflorescence; c. bark; d. flower section (*Jebb 905*, K, L; *Jebb 909*, K).

leafless shoots, pendulous, solitary to clusters of 3–5, each arising in old leaf axils; 30–35 by c. 0.5 cm; striate; bracts to 5 by 1 mm, minutely serrulate, caducous. *Flowers* 20–28, opening 1–3 at a time; pedicels to 3 mm long and 2 mm diam., thickened at their apices, articulate; buds spherical, apiculate, closed, to 14 mm diam., splitting circumscissily at their widest point, glabrous, pale green flushed with pink; calyx cupuliform, developing a red margin after flower has fallen; hypanthium triangular, c. 6 by 9 mm, without appendages; petals 4, obovate, to 38 by 22 mm, apex rounded, fleshy at centre, membranaceous to margin, gently recurved along their length, but strongly recurved in open flower, giving the appearance of triangular tapering petals, c. 10 mm wide, apex acute, blade puberulous, white, flushed with pink along the lower margins; stamens 200–250, in numerous whorls, 30–40 by c. 0.5 mm, including the connate base, shortest towards centre of flower, arising in numerous whorls from the thick-walled (c. 2.5 mm) staminiferous tube, latter c. 8 mm long by 6 mm wide internally, innermost whorl staminoidal, to 20 mm long, flattened, unbranched, tapering, anthers elliptic, 4-celled, c. 1.5 by 1 mm; disc c. 8 mm across, with an annular scar from the staminiferous tube, within this scar a prominent, narrow, sharp-edged, cupuliform rim to 1 mm tall and 5 mm diam., sloping inwards to base of style, yellow; ovary 4-locular, each locule with 2 ovules, style 20–23 by c. 1 mm, tapering, stigma flattened, capitate, to 2 mm across, ± 4-lobed; white below, deep red in upper half, stigma yellow. *Fruits* unknown. — **Fig. 14; Map 9.**

Distribution — *Malesia*: Papua New Guinea, only known from two collections from Madang Province.

Habitat & Ecology — Growing on coral rock by river edge at 100 m.

Note — The short style of this species, almost half the length of the stamens, and covered by the staminodes is a rare character in the genus.

57. **Barringtonia tagala** Jebb & Prance

Barringtonia tagala Jebb & Prance, Blumea 56 (2011) 112; Prance, Allertonia 12 (2013) 83, f. 29. — Type: *Jebb 884* (holo K; iso L, LAE), Papua New Guinea, Madang Prov., Balek Wildlife Reserve, S5°19', E145°43.35'.

Upright leptocaul trees, to 20 m; bole to 8 m; richly branched. *Branches* horizontal to down curved; internodes 6–24 by c. 1.2 cm, architecturally conforming to Champagnat's Model. *Leaves* in loose whorls of 5–14, in upper half of internode; petioles to 1 cm, rounded below, flat above, slightly winged, not swollen at base; lamina flat, obovate-lanceolate, 16–33 by 5–12 cm, broadest at c. 2/3 of the length, chartaceous, base cuneate, margin asymmetrically crenulate, entire towards base, flat, apex shortly round-acuminate, above glossy green; midrib rounded, prominulous above, prominent beneath, primary veins 12–17 pairs, brochidodromous, prominulous but sunken above, prominent beneath, arising obliquely, curving, arched and united near margin, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* spathulate, 5–11 by 1–2.5 cm, base tapering, apex blunt and mucronate, rounded in larger cataphylls, abruptly transforming to leaves, caducous. *Inflorescences* lateral, arising from old leaf axils, often someway behind apex, sometimes solitary, usually in clusters of 2–3(–4), pendulous, rachis to 90 by 0.3 cm, thickening in fruit to 0.5 cm, glabrous, round,

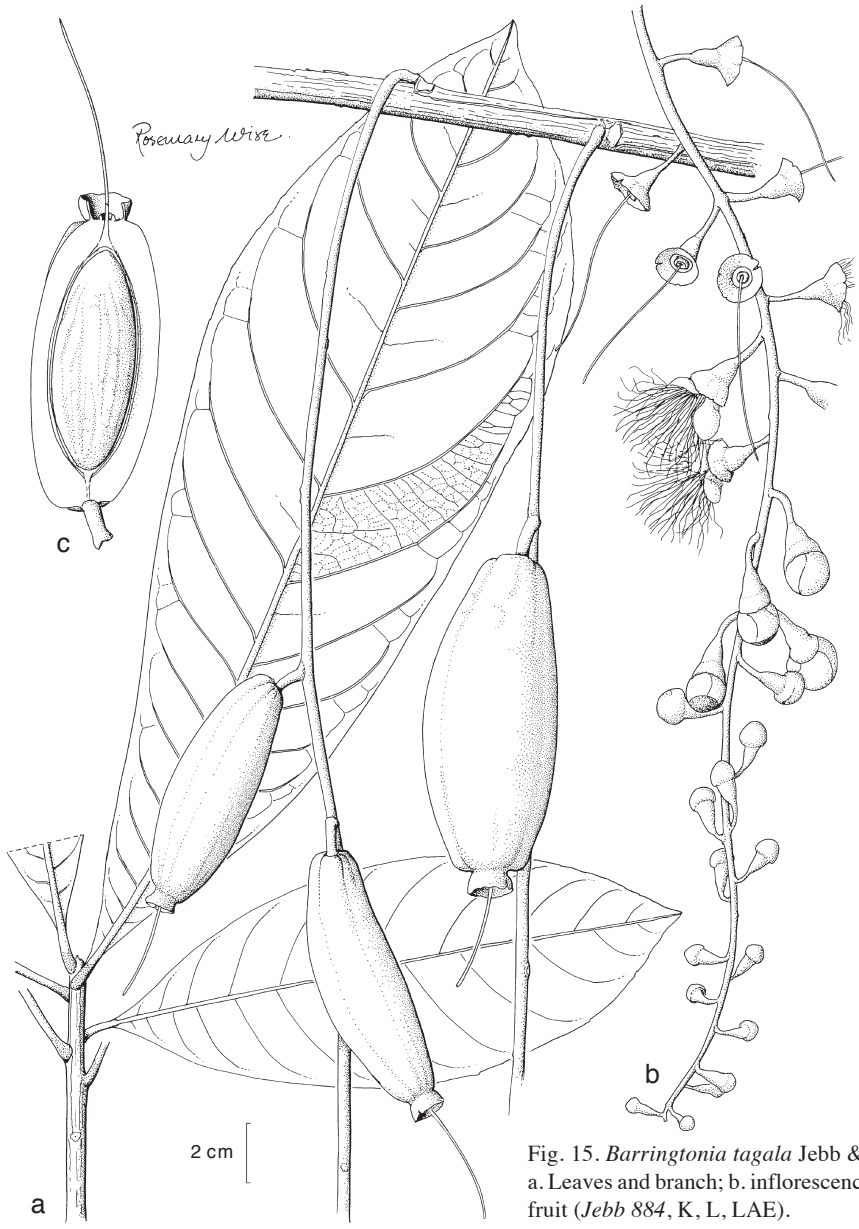


Fig. 15. *Barringtonia tagala* Jebb & Prance. a. Leaves and branch; b. inflorescence; c. half fruit (*Jebb 884*, K, L, LAE).

smooth to striate; bracts lanceolate, to 0.5 cm long, caducous. *Flowers* 25–40, pedicels characteristically upcurved when in bud, nodding when flowering, and ± lateral after flower has fallen, c. 1.5 by 0.6 cm, not articulate; buds spherical, apiculate to 1.2 cm diam., splitting circumscissily at their widest point, flower swelling to 16 mm, and often retaining caducous cap before finally opening; hypanthium conical, glabrous, c. 0.7 by 0.8 cm, arising abruptly from pedicels, without appendages; calyx papery,

closed in bud, margin ± entire, flattened, but becoming cupuliform in fruit, to 1.5 cm diam., c. 0.5 cm high; petals 4, obovate, c. 22 by 15 cm, apex rounded, strongly dished, white; stamens 200–250, 40–50 by c. 0.5 mm, in c. 7 whorls, connate in the lower 2–3 mm, the innermost whorl fused to form a tube of c. 10 by 4 mm, at its apex fimbriate with staminodes to 20 mm overall, anthers round-ovate, c. 1 by 1 mm, 4-celled; disc to 8 mm diam., the raised annulus acute-topped, to 1.5 mm high, yellow; ovary 2–3-locular, but then with 3–4 septae basally, each locule with 2–4 ovules; style 55–58 by c. 1 mm, tapered; white, pink towards apex. *Fruits* narrow-cylindric when young, c. 8.5 by 2 cm, becoming thicker and oblong with age, to 9.5 by 4.5 cm, apex and base blunt; surface irregularly and thickly ribbed, apex puckered, with prominent and persistent calyx and style remains; dark green when young, becoming yellow when fully ripe and then falling. *Embryo* cylindric, to 7 by 2.5 cm, tapering to each end. — **Fig. 15; Map 1.**

Distribution — *Malesia*: Papua New Guinea, so far only known from the Gogol valley, Madang Province.

Habitat & Ecology — In forest.

Vernacular name — Tagal'pa.

58. Barringtonia terengganuensis Chantar.

Barringtonia terengganuensis Chantar., Gard. Bull. Singapore 48 (1996) 201; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 209; Allertonia 12 (2013) 119, f. 23. — Type: *KEP FRI (Cockburn) 8363* (holo K; iso A, KEP, L), Malaysia, Terengganu, Ulu Sungai Terengganu, near Jaram Galong.

Small trees, to 6 m tall. *Leaves* subsessile, petiole 4–5 mm long; lamina elliptic, 26–28.5 by 7–7.5 cm, chartaceous, base rounded to slightly cordate, margin slightly serrate-crenulate, apex acuminate, the acumen 20–25 mm long, curved, glabrous beneath; midrib prominent on both surfaces, more so beneath; primary veins 22–23 pairs, brochidodromous, merging by network of veins, prominulous on both surfaces, intercostal veins prominulous on both surfaces, reticulate. *Cataphylls* triangular, 10–12 by 3–5 mm. *Inflorescence* terminal spikes, pendulous, c. 25 cm long, densely flowered with c. 50 flowers; bracteoles triangular, 0.4–1 by c. 0.2 mm, caducous. *Calyx* open in bud. *Flowers* sessile; hypanthium funnel-shaped, tetragonous, 4-grooved at corners, sparsely pulverulent; sepals 4, orbicular, sparsely pulverulent; petals 4, orbicular; staminal tube in bud c. 0.25 mm long; ovary 2-locular, 3–6 ovules per locule. *Fruits* and *seeds* unknown. — **Map 12.**

Distribution — *Malesia*: Peninsular Malaysia (Terengganu).

Habitat & Ecology — Primary hillside forest, 600 m.

Note — This species is close to *B. fusiformis* and perhaps further collections will show it to be synonymous.

59. Barringtonia zainudiniana (El-Sherif & Latiff) Prance

Barringtonia zainudiniana (El-Sherif & Latiff) Prance, Blumea 55 (2010) 14; in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 210; Allertonia 12 (2013) 119, f. 21. — *Abdulmajidia zainudiniana* El-Sherif & Latiff, Folia Malaysiana 7 (2006) 46. — Type: *Y.N. Lo & Mahmud 111* (holo KLU), Malaysia, Kedah, Yan, Gunung Jerai.

Small trees, to 8 m tall. *Leaves*: petiole 10–12 cm long; lamina linear-lanceolate, 10–14 by 2–3 cm, coriaceous, base cuneate, margin serrate-crenulate, apex acute to acuminate, glabrous; primary veins 11–12 pairs, brochidodromous. *Inflorescences* terminal spikes, pendulous, the rachis to 80 cm long, glabrous. *Calyx* open in bud. *Flowers* sessile; hypanthium to 5 mm long, tetragonous, glabrous; sepals 4, ovate, 5–6 by 4–5 mm, margins fimbriate, apex obtuse; petals 4, ovate, 5–6 by 4–5 mm, margin fimbriate, apex obtuse, reddish green; staminal whorls 5, filaments to 1.5 cm long; disc raised to 0.5 mm high; ovary 4-locular; style to 2 cm long, pink. *Fruits* ovoid, 3–5 by 2–4 cm. *Seeds* 5, c. 3 by 1 cm. — **Map 8.**

Distribution — *Malesia*: Endemic to Peninsular Malaysia (Kedah).

Habitat & Ecology — Lower montane forest at 1100 m.

Note — I have only seen a photo of the type of this poorly known species.

INCOMPLETELY KNOWN SPECIES

60. Barringtonia flagellata Lütjeh. & Ooststr.

Barringtonia flagellata Lütjeh. & Ooststr., Blumea 3 (1938) 95; Prance, Allertonia 12 (2013) 120, f. 21, 28. — Type: *Lütjeharms 4189* (holo L; iso BO), Indonesia. Enggano I., Benkoelen, near Boea Boea.

Large trees. *Leaves*: petiole 6–11 cm long; lamina oblong-elliptic to oblong, 22–35 by (6–)10–12.5 cm, chartaceous, base cuneate and slightly unequal, not decurrent, margin entire, apex acuminate, the acumen 10–15 mm long, glabrous beneath; primary veins 14–16 pairs, prominulous on both surfaces, arching and merging c. 2 mm from margin. *Inflorescences* terminal, pendulous, to 85 cm long, the rachis thin, c. 2 mm thick, sparsely short-puberulous, longitudinally striate when dry. *Flowers* unknown. *Fruits* obpyriform, distinctly tetragonous, c. 5 cm long, 1.7–2 cm wide, calyx persistent; pedicel 1–1.5 cm long; exocarp glabrous. *Seed* 1, elongate-ellipsoid, c. 3 by 1.2 cm. — **Map 8.**

Distribution — *Malesia*: Sumatra (Enggano Island).

Habitat & Ecology — Forest to 200 m.

Vernacular name — Putat.

Note — Payens (Blumea 15, 1967: 199) placed this species in synonymy under *B. revoluta*. It differs in the thinner chartaceous leaves, the long inflorescence and seems to be distinct from any other species. It is probably close to *B. chantaranoi* from Borneo, the material of which was also identified as *B. revoluta* by Payens. There are enough differences in the leaves and fruit to keep these two taxa apart. Since *B. flagellata* is based on a single collection with young fruit only I prefer to keep it as a poorly known species for the moment until further material is collected.

61. Barringtonia payensiana Whitmore

Barringtonia payensiana Whitmore, Gard. Bull. Singapore 26 (1973) 284; Tree Fl. Malaya 2 (1973) 259; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 201; Allertonia 12 (2013) 120. — Type: *KEP FRI (Whitmore) 4550* (holo KEP; iso K), Malaysia, Selangor, Ulu Batang Kali.

Small trees. *Leaves*: petiole c. 15 mm long; lamina obovate, 21–50 by 6.5–14.5 cm, chartaceous, base cuneate, margin serrate towards apex, apex acuminate, the acumen

3–4 cm long, glabrous beneath; midrib prominent on both surfaces, primary veins 25–32 pairs, brochidodromous, plane above, prominulous beneath, intercostal veins slightly prominulous on both surfaces. *Inflorescences* and *flowers* unknown. *Fruits* rounded to slightly pyramidal, not ribbed, tetragonous, deeply grooved, c. 4.5 by 4.5 cm. *Seeds* unknown. — **Map 7.**

Distribution — *Malesia*: Peninsular Malaysia (Selangor and Perak).

Habitat & Ecology — Forest on steep hillside.

2. CAREYA

(G.T. Prance)

Careya Roxb., Pl. Coromandel 3 (1811) 13, nom. cons.; Miers, Trans. Linn. Soc. London, Bot. 2 (1875) 95; Nied. in Engl. & Prantl, Nat. Planzenfam. 3, 7 (1892) 31; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 50; Whitmore, Tree Fl. Malaya 2 (1973) 264; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 211. — Type: *Careya herbacea* Roxb. (type cons.)

Large trees. *Leaves* spirally arranged, clustered at end of branches, glabrous, broadly obovate, margins serrate-crenulate, decurrent onto petiole. *Inflorescences* terminal or lateral racemes to 20 cm long, erect, few-flowered. *Flowers* sessile. *Calyx tube* obpyramidal, not winged or angled; calyx lobes imbricate, ciliate at apex. *Petals* 4, alternate with sepals. *Stamens* numerous, inserted in 5–8 whorls, fused at base into a short tube, the innermost whorl staminodal; anthers basifixed, latrorse. *Disc* annular, well defined, c. 1.5 mm high. *Ovary* inferior, 4(–5)-locular; ovary surface concave inside disc to form a nectar reservoir c. 5 mm deep by 7 mm diam.; ovules many per locule, longitudinally aligned along axis, campylotropous; style filiform. *Fruits* ovoid-globose, to 6 cm long. *Seeds* numerous, embedded in a pulp; embryo undifferentiated, undivided, without cotyledons. — **Map 14.**

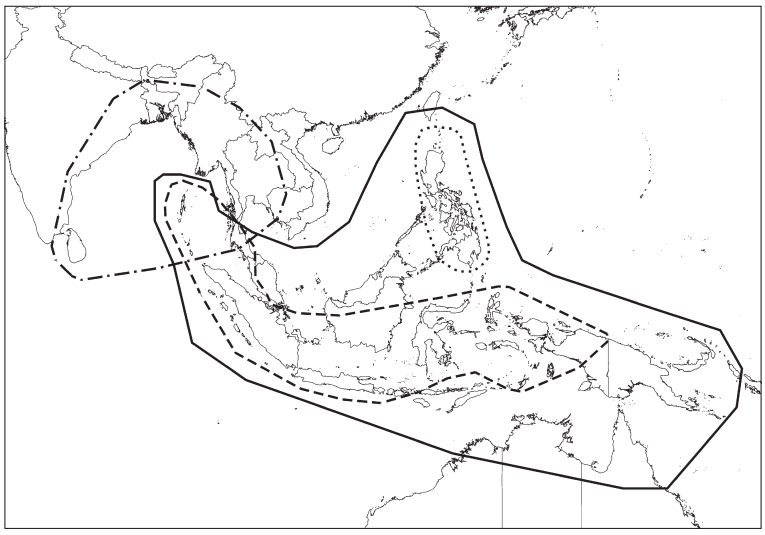
Distribution — Four species in Afghanistan, India and Andaman Islands to Thailand and one species reaching the extreme north of Peninsular Malaysia.

Taxonomy — Closely related to *Planchonia* and differs only in the undifferentiated embryo without cotyledons.

1. Careya arborea Roxb.

Careya arborea Roxb., Pl. Coromandel 3 (1811) 14; Hort. Bengal. (1814) 52; Buch.-Ham., Trans. Linn. Soc. London 15 (1827) 97; DC., Prodr. 3 (1834) 295; Wight & Arn., Prodr. Fl. Ind. Orient. 1 (1834) 334; Wight, Ill. Ind. Bot. 2 (1841) 20, pl. 99–100; Thwaites, Enum. Pl. Zeyl. (1849) 119; Miq., Fl. Ned. Ind. 1, 1 (1855) 494; Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 97; Kurz, J. Asiat. Soc. Bengal 46 (1877) 71; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 511; Ridl., Fl. Malay Penins. (1922) 760; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 51; Whitmore, Tree Fl. Malaya 2 (1973) 264; Leti et al., Fl. Photogr. Cambodge (2013) 325. — Type: Rheede, Hortus Indicus Malabaricus 3 (1682) 35, pl. 36.

Small trees, to 12 m high; twigs 6–9 mm thick, brownish grey. *Leaves*: petiole to 4 cm long, narrowly winged; lamina ovate to obovate, 15–23 by 10–14 cm, chartaceous, tapering to a long narrow base and decrescent onto petiole, margin finely serrate-crenulate, apex rounded or obtusely acuminate. *Inflorescences* terminal spikes, 8–15 cm long; the rachis 5–8 mm thick, glabrous; bracts 3, small. *Flowers* sessile or subsessile;



Map 14. Distribution of the genera *Careya* Roxb. (hyphen-dotted line); *Chydenanthus* Miers (hyphened line); *Petersianthus* Merr. (dotted line); *Planchonia* Blume (continuous line).

calyx tube glabrous, c. 2 cm long, the lobes ovate, c. 7 by 8 mm; petals 2.5–3.5 cm long, obtuse; stamens 3–4 mm long united into a tube for 4–5 mm at base; style to 4 cm long. *Fruits* ovoid-globose, to 5–6 cm long by c. 5 cm wide, crowned by persistent adpressed sepals, c. 1 cm long. *Seeds* numerous. — **Fig. 16; Plate 2.**

Distribution — Afghanistan, Andaman Islands, through India, Myanmar, Thailand, Laos; in *Malesia*: Peninsular Malaysia, where generally cultivated.

Habitat & Ecology — Lowland forest to 600 m, mainly in deciduous forest outside Malaysian region.

Vernacular names — Malaysia: Putat kedun, Putat kundang.

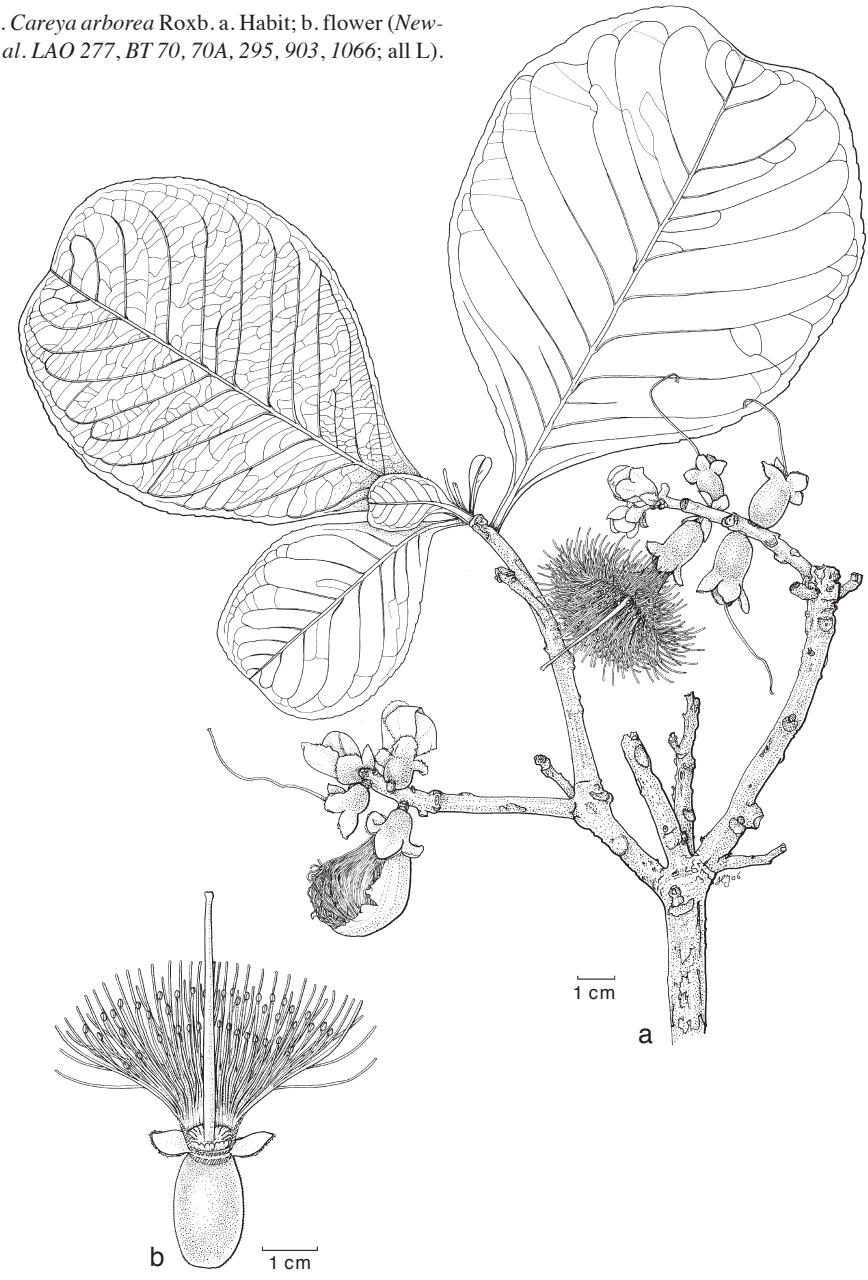
3. CHYDENANTHUS

(E. Kuswata Kartawinata)

Chydenanthus Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 112, Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1898) 33; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 40 (1900) 20; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 56, f. 12; Backer & Bakh.f., Fl. Java 1 (1965) 353. — Type: *Chydenanthus excelsus* (Blume) Miers.

Trees, bole fluted, modular. *Stipules* caducous, minute, subulate or reduced to dots. *Leaves* simple, alternate, penninerved, glabrous; petiole not winged; blade generally elliptic to elliptic oblong, papyraceous to coriaceous, margin entire or faintly serrulate, apex acuminate, venation prominent below. *Inflorescences* panicles, terminal or subterminal, many flowered, pulverulent to pubescent; bracts and bracteoles velutinous outside, caducous. *Pedicel* not articulate. *Calyx* lobes 3–4, small, triangular, connate at the base forming a funnel-shaped or slender urn-shaped tube. *Petals* 4, longer than calyx lobes, loosely attached to the staminal tube. *Stamens* numerous, inflexed in bud,

Fig. 16. *Careya arborea* Roxb. a. Habit; b. flower (*Newman et al. LAO 277*, *BT 70, 70A, 295, 903*, *1066*; all L).



multiseriate, the inner ones shorter and sterile, the basal part connate into a tube, the entire tube caducous, glabrous; anthers small, versatile, basifixed, ovoid to ellipsoid, bilocular, longitudinally dehiscent. *Disc* intrastaminal, consists of the vertex of the ovary and a ring-like rim. *Ovary* inferior, biloculate, ovules ascendent, 2 in each cell, placentation central. *Styles* slender, as long as stamens; stigma simple or pin-head

shaped. *Fruits* indehiscent, not winged, generally inserted at the terminal end of the peduncle, crowned by the persistent calyx; pericarp fibrous to woody. *Seeds* single, hard and stone-like when dry; embryo large; cotyledons absent. — **Map 14.**

Distribution — One species distributed from Andaman and Nicobar Islands, Lower Burma to *Malesia*: Sumatra, Java, Celebes, Lesser Sunda Islands (Bali, Sumbawa), Moluccas and New Guinea.

1. **Chydenanthus excelsus** (Blume) Miers

Chydenanthus excelsus (Blume) Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 112, t. 17, f. 5, 20; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1898) 33; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 40 (1900) 20; Boorsma, Bull. Dépt. Agric. Indes Néerl. 16 (1908) 10; Koord., Exkurs.-Fl. Java 2 (1912) 666; Greshoff, Meded. Lands Plantentuin 25 (1898) 82; Meded. Dept. Landb. Ned.-Indië 17, 3, Suppl. (1913) 118; Van Dongen, Pharm. Weekbl. Ned. 50 (1913) 446; Commun. Dept. Agric. Res. Roy. Trop. Inst. (1913) 123; Janssonius, Mikrogr. Holzer Java 3 (1914) 502; Anat. Bestimm. Java Holzer (1940) 81; K.Heyne, Nutt. Pl. Ned.-Ind., ed. 3, 1 (1950) 1161; Janssonius, Key Java Woods (1952) 84; Duyster, Pharm. Weekbl. Ned. 60 (1923) 777; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 56, f. 12; Airy Shaw, Kew Bull. 4 (1949) 152 (excl. syn. *B. cymosa* C.E.C.Fisch.); Backer & Bakh.f., Fl. Java 1 (1965) 353; Kuswata, Reinwardtia 10 (1982) 27, f. 1–3. — *Barringtonia excelsa* Blume, Bijdr. (1826) 1097; Miq., Fl. Ned. Ind. 1, 1 (1855) 491; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 852. — *Stravadium excelsus* (Blume) DC., Prodr. 3 (1828) 289; Blume in Van Houtte, Fl. Serres 7 (1851) 24; Greshoff, Meded. Lands Plantentuin 25 (1898) 117. — Type: *Blume 1733* (holo L), Indonesia, Java.

Barringtonia vriesei Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 2 (1851) 308; Ned. Kruidk. Arch. 3 (1855) 411; Miq., Fl. Ned. Ind. 1, 1 (1855) 491; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 854; Grevelink, Pl. Ned.-Indië (1883) 159; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1898) 3; Treub, Ann. Jard. Bot. Buitenzorg 4 (1884) 101, t. 8. — *Doxomma vriesei* (Teijsm. & Binn.) Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 106 ('*vriesii*'). — Type: *Blume 1733* (holo L), Java.

Careya valida auct. non (Blume) Kurz: C.E.Parkinson, Forest Fl. Andaman Isl. (1923) 175.

Trees, up to 30 m high, c. 50 cm diam. *Bark* smooth, greyish brown. *Branchlets* up to 5 mm thick, greyish brown or brown, striate, lenticellate. *Axillary buds* 3–4 mm long, pubescent. *Leaves*: petiole flat with sharp margin above, convex below, 10–20 mm long, c. 2 mm thick, very dark brown when dry, greyish brown when fresh; blade elliptic to elliptic oblong, rarely elliptic-obovate or obovate, (4–)7–26(–130) by (1.2–)3–8(–11.5) cm, papyraceous to coriaceous, membranaceous when young, base generally cuneate, sometimes rounded, margin slightly plicate below, apex acuminate, acumen up to 15 mm long, tip blunt; midrib strongly prominent beneath, prominulous or flat above; lateral nerves 7–15 pairs, angles with the midrib about 50°, prominent beneath, prominulous or sometimes obscure above, arcuate and anastomosing near margin, often branched, tertiary nerves distinct, reticulation visible or sometimes obscure above. *Inflorescences* up to 18 cm long; rachis greyish brown, striate, often lenticellate, c. 5 mm diam.; pedicel up to 5 mm long, c. 3 mm thick, velutinous; bracts triangular, c. 5 by 3 mm; bracteoles 2, opposite, c. 3 by 2.5 mm. *Calyx* tube up to 2 cm long after anthesis; lobes ciliate, velutinous outside, glabrous inside. *Petals* obovate, c. 3 by 1.5 cm, apex rounded, veined, thinly papyraceous, membranaceous at the margin, greenish white when fresh, dark brown when dry, pulverulent to pubescent outside (in bud). *Stamens*: filaments yellow (fresh), very slender, up to 45 cm long, tube c. 0.5 cm long.

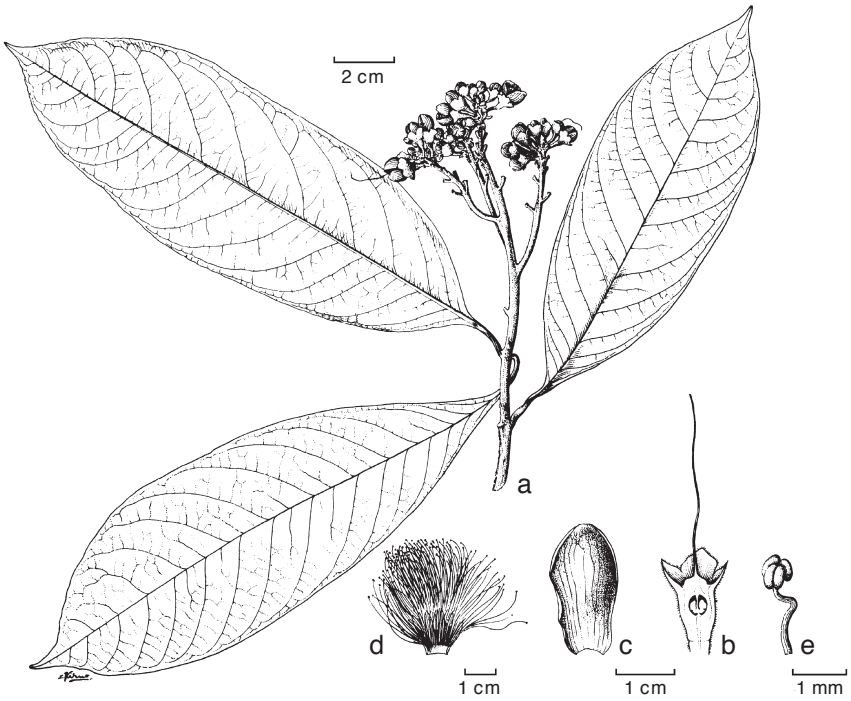


Fig. 17. *Chydenanthus excelsus* (Blume) Miers. a. Habit; b. longitudinal section of calyx and ovary; c. petal; d. stamens; e. anther (a: *Koorders 25249*; b–e: *Bogor Botanical Garden V-A-5*; all BO).

Fruits bluntly quadrangular, elongate ellipsoid or obovoid, c. 12 by 6 cm, lenticellate or warty, puberulous; pericarp up to 1 cm thick; pedicel thickened, c. 5 cm long, c. 8 mm thick. *Seeds* ellipsoid. — **Fig. 17, 18.**

Distribution — See under genus.

Habitat & Ecology — Moist areas but more common in drier areas where the dry period has monthly rainfall of less than 60 mm and does not last more than 6 months. In dry areas it grows on moist soils in valleys or along rivers. Found in primary and secondary forests as well as in planted teak forests on a variety of soils including those on limestone and peat swamp, from sea level to 600 m. It flowers and fruits throughout the year, but flowering seems to be more common from June to September and fruiting from September to January. Flowers open at night and drop early in the morning.

Uses — The wood of this species is of little economic value. It is strong but not very durable; the specific gravity is 0.66. The bark is fatally poisonous (Greshoff 1893). Seeds contain chydenantine, a glycoside (Duyster 1923), and according to Van Dongen (1913) they can be used as a fish poison and a medicine against diarrhoea. The phytochemical and pharmacological properties of this species are amply given by Boorsma (1908) and Duyster (1923).

Vernacular names — Java: Besole, Leprak; Persole (Sunda).

Notes — 1. *Chydenanthus* is characterized by its panicled inflorescence, ascendent ovules, and pubescent flowers, differing from *Barringtonia* in these characters. Another

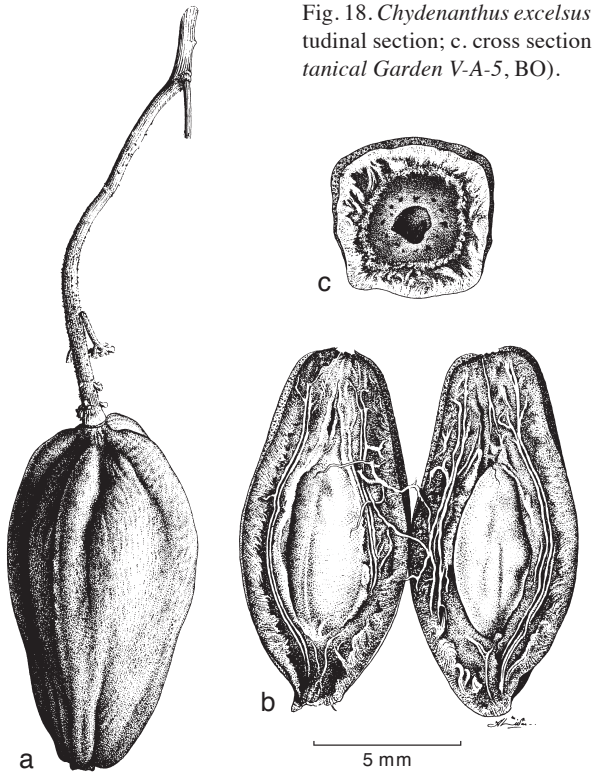


Fig. 18. *Chydenanthus excelsus* (Blume) Miers. a. Ripe fruit; b. longitudinal section; c. cross section showing fibrous pericarp (*Bogor Botanical Garden V-A-5*, BO).

feature is the presence of minute, subulate and caducous stipules (or sometimes reduced to dots) at the base of the petioles, which are usually discernable in very young leaves. The genus, like most *Barringtonia* species, has 1-seeded fruit. The entire seed is an embryo, consisting of the inner and outer parts, which on cross section are separated by a concentric woody ring. The seed has no cotyledons, and when germinating the plumule emerges from one end and the radicle from the other, i.e. the *Barringtonia* type germination (e.g., De Vogel, Seedl. Dicotyled., 1980). The development of the embryo was amply described by Treub (Ann. Jard. Bot. Buitenzorg 4, 1884: 101).

2. The monotypic genus *Chydenanthus* was established by Miers in 1875. A second species, *C. dentato-serratus* appeared to be a synonym of *Barringtonia acutangula* subsp. *spicata* (see there).

4. PETERSIANTHUS

(E. Kuswata Kartawinata)

Petersianthus Merr., Philipp. J. Sci., Bot. 11 (1916) 200; Enum. Philipp. Fl. Pl. 3 (1923) 141; Liben, Bull. Jard. Bot. Natl. Belg. 38 (1968) 207; Kuswata, Kalikasan 11 (1982) 388. — Type: *Petersianthus quadrialatus* (Merr.) Merr.

Tall trees with tall buttresses. *Leaves* coriaceous, glabrous, lamina extends to petiole making leaves sessile, margin finely crenulate, venation pinnate. *Inflorescences*

paniculate corymbose, terminal, glabrous, sometimes subtended by dwarfed leaves; bracts early caducous, leaving conspicuous scars. *Flowers* white; pedicels articulate at the base. *Calyx* tube distinctly 4-winged, gradually enlarging upwards, lobes 4, thick, alternate with the wings, imbricate. *Petals* 4. *Stamens* multiseriate, subequal, forming tube at the base; filaments slender; anthers basifixed, versatile, 2-celled, longitudinally dehiscent. *Ovary* inferior, 4-celled, ovules multiseriate, axillary; style slender, stigma funnel-shaped. *Fruits* 4-winged, the seed-bearing portion very narrow, thin-walled; wings equal, thinly coriaceous or submembranaceous. — **Map 14.**

Distribution — Africa (two species, see Merrill 1916), Malesia (one species in the Philippines).

1. Petersianthus quadrialatus (Merr.) Merr.

Petersianthus quadrialatus (Merr.) Merr., Philipp. J. Sci., Bot. 11 (1916) 200; Enum. Philipp. Fl. Pl. 3 (1923) 141; Kuswata, Kalikasan 11 (1982) 388, f. 1. — *Terminalia quadrialata* Merr., Philipp. J. Sci., Bot. 4, 3 (1909) 301. — *Combretodendron quadrialatum* (Merr.) Merr., Philipp. J. Sci. 15 (1936) 32. — Type: *BS (Rosenbluth) 12558* (holo PNH†?; iso K), Philippines, Masbate.

Trees, more than 35 m tall with diam. up to 186 cm; buttresses up to 2 m tall. *Twigs* terete, striate, leaf scars triangular, conspicuous. *Leaves* sessile; lamina obovate to elliptic, 20–32 by 7–9 cm, coriaceous, papyraceous when young, base attenuate, apex acuminate, acumen up to 1 cm long; midrib raised above, very prominent beneath, lateral nerves c. 8 pairs, angle with midrib c. 60°, slightly flattened above, prominent beneath, arcuate and anastomosing near margin, tertiary nerves irregularly transverse, faint above, conspicuous beneath, veins ending in a minute, sharp, black notch at sinus of crenulation. *Inflorescences* up to 15 cm long. *Flowers* white, c. 2.5 cm long, c. 1.5 cm wide when open, pedicels 0–3 mm long, articulate at the base. *Calyx* tube obconical, c. 6 mm long; lobes 4, orbicular, 4–5 mm diam., apex rounded. *Petals* orbicular-ovate, c. 1 by 1 cm, papyraceous, apex round. *Stamens*: tube c. 2 mm high; filaments c. 1 cm long; anthers ellipsoid, c. 1 mm long. *Style* up to 2.5 cm long. *Fruits* ellipsoid or suborbicular (including wings), 2–3 cm long, nearly as wide, base rounded, apex retuse; seed-bearing portion very narrow, thin-walled, usually about 5 mm thick; wings 1–1.3 cm wide, transversely nerved. *Seeds* oblong, 6–7 mm long. — **Fig. 19.**

Distribution — *Malesia*: Philippines (central and southern parts of the country: Masbate, Samar, Agusan, Luzon, Surigao and Mindanao).

Uses — The timber is used for bridges, piling and other constructions. Leaves are used also to treat rash.

Vernacular name — Toog (Bisaya).

5. PLANCHONIA

(E. Kuswata Kartawinata)

Planchonia Blume in Van Houtte, Fl. Serres 7 (1851) 24 (non *Planchonia* J.Gay ex Benth. & Hook.); Miq., Fl. Ind. Bat. 1, 1 (1855) 492; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 852; Benth. & Hook.f., Gen. P1. 1 (1865) 721; Miers, Trans. Linn. Soc. London, Bot. 2 (1875) 90; Baill., Hist. P1. 6 (1877) 371; Kurz, Forest Fl. Burma 1 (1877) 500; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 511; Boerl., Handl. Fl. Ned. Ind. 1 (1890) 49; Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1898) 30; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 40 (1900) 22; King, J. Roy. Asiat.

Soc. Bengal 70, 2 (1901) 141; Ridl., Fl. Malay Penins. 1 (1922) 759; Lemée, Dict. Gen. Pl. Phan. 5 (1934) 375; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 52; Backer & Bakh.f., Fl. Java 1 (1963) 352; Kuswata, Bull. Bot. Surv. India 9 (1965) 162; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 124. — *Pirigara* Blume (non Aubl.), Bijdr. 17 (1926) 1095. — *Butonicoides* R.Br. ex Miers, Trans. Linn. Soc. London, Bot. 2 (1875) 90. — Type: *Planchonia timorensis* Blume.

Trees or rarely shrubs. *Leaves* simple, spirally arranged, crowded at the end of the branchlets, penninerved, glabrous, membranaceous to coriaceous, base slightly decurrent or decurrent petioles narrowly winged, margin crenulate to denticulate or sub-entire to entire, without pellucid dots, caducous. *Inflorescences* terminal, racemes, spikes

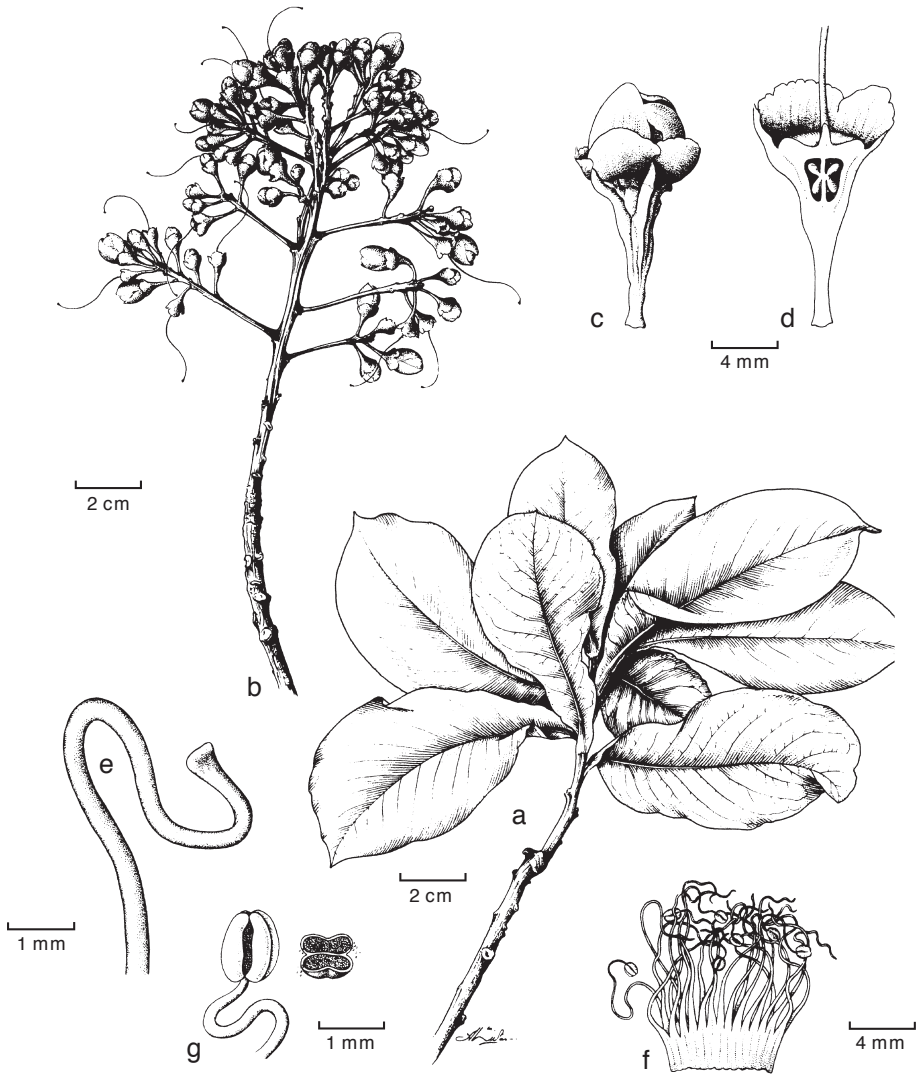


Fig. 19. *Petersianthus quadrialatus* (Merr.) Merr. a. Habit; b. inflorescence; c. flower bud with winged calyx tube; d. longitudinal section of ovary; e. style and stigma; f. stamen; g. anther (*PNH 14416*, L).

or sometimes flowers solitary. *Flowers* 5-merous, tribracteate, bracts and bracteoles subpersistent; bracteoles opposite. *Sepals* 4, connate at the base into a turbinate or campanulate tube with a gibbose margin in between the lobes; lobes imbricate. *Petals* 4, free, veined, attached at the base to the staminal tube, imbricate. *Stamens* numerous, multiseriate, unequal, contortoduplicate, in whorls, the inner whorl sterile, shorter than the outer whorl, the basal part connate into a tube; filaments filiform, longer than the petals; anthers small, 2-celled, basifixed, ovate-oblong to oblong, base and apex emarginate, longitudinally dehiscent; staminal tube and corolla caducous as a whole. *Disc* intrastaminal, epigynous, consisting of a vortex of the ovary and a rim. *Ovary* turbinate, adnate to the calyx tube, inferior, 3–4-locular; ovules horizontal, numerous, on whole length of central part of carpel, biseriate (irregular in *P. grandis*), campylotropous, funicle long, suspended; locule empty at the base; style slender, longer than the stamens; stigma small, cruciately capitate to capitate, lobed. *Fruits* fibrous, without pulp, indehiscent, obovoid to ovoid to ellipsoid or globular, 1–4-locular, crowned by the persistent calyx; pericarp fibrous; endocarp coriaceous. *Seeds* one to many in each locule, ovoid, smooth or angular, without endosperm; radicle very long, clavate, spirally convolute around the cotyledons or curved (in *P. careya*); cotyledons small, foliaceous, plicate (straight and attached to the radicle in *P. careya*). — **Map 14.**

Distribution — The genus contains 8 species distributed from the Andaman Is. throughout *Malesia* to NE Australia (Queensland) and the Solomon Is.

Note — Knuth (1939) incorporated *Planchonia* together with *Careya*, *Barringtonia* and *Chydenanthus* in the tribus Barringtonieae of the Barringtoniaceae, whereas Niedenzu (1898) placed them together with *Petersia* in the subfamily Planchonioideae of the Lecythidaceae. The generic status of *Planchonia* was accepted by all subsequent authors, with exception of Kurz (1877) who originally incorporated it in *Careya* as a subgenus, but later reinstated it. The genus is closely related to *Careya* in having horizontal ovules, by the presence of a narrowly winged petiole and in general habit. The embryo consists of a terete, spirally coiled radicle (curved in *P. careya*) with foliaceous, plicate cotyledons. *Barringtonia*, *Careya* and *Chydenanthus* have an embryo without visible radicle and cotyledons. The genus differs from *Barringtonia* and *Chydenanthus* also in having horizontal ovules. *Planchonia*, a few species of *Barringtonia* formerly in *Abdumajidia* and *Careya*, have as character in common a multi-seeded fruit. The flowers are very uniform. Those of *P. papuana* and *P. timorensis* are the largest in the genus. Miers (1875) and Niedenzu (1898) described the cotyledons as being straight. It is most probable that they saw only the seeds of *P. careya*, as the straight cotyledons occur only in that species.

KEY TO THE SPECIES

1a. Leaf laminas coriaceous, tertiary nerves and reticulation obscure; flowers in spikes . . . . . **3. P. grandis**

b. Leaf laminas papyraceous, tertiary nerves and reticulation distinct; flowers solitary or in racemes 2

2a. Leaf laminas elliptic to oblanceolate; fruit globular to ovoid with basal neck . . . . . **1. P. brevistipitata**

b. Leaf laminas elliptic to obovate, obovate-elliptic to broadly oval; fruit subglobular to ovoid to obovoid to ellipsoid, without basal neck 3
3a. Leaf venation slightly areolate, apex short (< 5 mm) acuminate to emarginate; calyx-lobes distinctly or obscurely ciliate, radicle curved . . . . . **2. P. careya**
b. Leaf venation reticulate, apex long (5–16 mm) acuminate; calyx-lobes entire; radicle spirally convolute 4
4a. Flowers many in racemes 5
b. Flower solitary or in 2–5-flowered racemes 6
5a. Peduncle, pedicel and calyx tube glabrous, pedicel 1–2.5 cm long . . . . . **6. P. timorensis**
b. Peduncle, pedicel and calyx-tube puberulous to glabrous, pedicel up to 1 cm long . . . . . **7. P. valida**
6a. Calyx tube c. 1 cm long, slightly ribbed, staminal tube c. 0.5 cm long, free part of the stamens c. 5 cm long . . . . . **5. P. spectabilis**
b. Calyx tube 1.5–2.5 cm long, smooth; staminal tube 1–1.5 cm long, free part of the stamens c. 3.5 cm long . . . . . **4. P. papuana**

1. Planchonia brevistipitata Kuswata

Planchonia brevistipitata Kuswata, Bull. Bot. Surv. India 7 (1965) 179; Reinwardtia 11 (1998) 192; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 125. — Type: *Amdjah 256* (holo BO; iso L), Indonesia, East Kalimantan, Berau, Sedalier.

Barringtonia belagaensis Chantar., Kew Bull. 50 (1995) 695. — Type: *S (Othman et al.) 43541* (holo K; iso A, KEP, L, SAN), Malaysia, Sarawak, Ulu Sg. Belaga, 7th Division.

Low-spreading, small trees, up to 20 m tall, up to 8 cm diam., crown up to about 8 m diam. Outer *bark* smooth to flaky, brownish grey; inner bark up to 2.5 cm thick, pinkish to smooth brown, laminated; sapwood soft, whitish, yellow to yellowish pink. *Branchlets* greyish brown, c. 5 mm diam., finely grooved, leaf-scars conspicuous. *Leaves*: petiole 5–10 mm long; blade obovate, elliptic to oblanceolate, (4–)8–25 by (2–)6 cm, papyraceous, withering red, base decurrent, margin serrulate, apex acuminate, acumen up to 2 cm long, slender, tip sharp; midrib strongly prominent beneath, prominulous above, lateral nerves (8–)14–18 pairs, making an angle of c. 60° with the midrib, prominent on the lower surface, prominulous above, arcuately and faintly anastomosing near the margin, reticulation dense, distinct beneath, faint above. *Inflorescences* terminal racemes, (1–)2–5 cm long, 2–3 mm thick, few to 7–9 flowered; bracts distinct. *Flowers* white to pale green (fresh); pedicel 2–10 mm long, 1–3 mm thick. *Calyx* an obconical tube, 8–10 mm long, base stipitate; lobes ovate, 3–6 by 3–8 mm, apex rounded. *Petals* obovate to oblong, 2.5–3.5 by 1–1.7 cm, papyraceous, apex rounded. *Staminal* tube 5–10 mm long; filaments 5–8 cm long; anthers oblong, c. 0.5 by 0.8 mm. *Disc* a rim, c. 2 mm high. *Ovary* 4-locular, up to 20 ovules per loculus; style up to 7 cm long, stigma capitate. *Infructescences* persistent, terminal, rachis up to 5 cm long, sometimes angular; pedicels 3–10 mm long, 1–3 mm thick. *Fruits* globular to ovoid, 2–3 by 1.5–2 cm, crowned with persistent calyx and style (up to 7 cm long), base with 2–3 mm long neck, slightly ribbed, 4-celled; septa thin. *Seeds* 4–11 in each loculus, ovoid to pyramidal, slightly curved, tetragonous, sides concave, 7–9 by 3–5 mm;

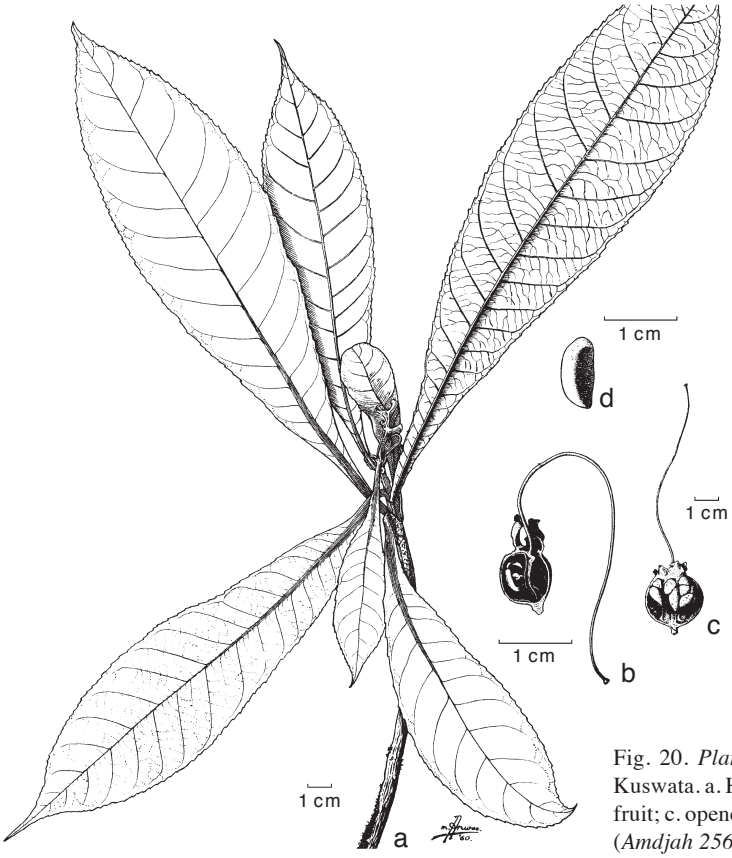


Fig. 20. *Planchonia brevistipitata* Kuswata. a. Habit; b. opened young fruit; c. opened mature fruit; d. seed (*Amdjah 256*, BO).

seedcoat coriaceous, silvery brown, c. 0.5 mm thick; embryo coiled, covered by very thin membrane. — **Fig. 20.**

Distribution — *Malesia*: Only known from Borneo.

Habitat & Ecology — Common in riverine forest and rheophytic zone as well as primary forests on sandy and rocky soils on low undulating terrain and in valleys; frequently growing together with *Dipterocarpus oblongifolius* Blume. Flowering at night from May to June and fruiting from July to November, and occasionally in February.

Taxonomy — *Barringtonia belagaensis* is reduced to synonymy because its characters, particularly its fruits, agree with those of *P. brevistipitata*. Numerous seeds contained in each fruit distinguish *Planchonia* from most *Barringtonia* species, which generally have 1-seeded fruits.

2. **Planchonia careya** (F.Muell.) R.Knuth

Planchonia careya (F.Muell.) R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 56; S.T.Blake, Austral. J. Bot. 2, 1 (1954) 105; Kuswata, Bull. Bot. Surv. India 9 (1965) 181, f. 10, 12; R.L.Barrett, Austral. Syst. Bot. 19 (2006) 148. — *Barringtonia careya* F.Muell., Fragm. 5 (1866) 183. — *Careya australis* F.Muell., Fragm. 5 (1866) 183, nom. illeg., in synonymy. — *Careya australis* F.Muell.

[Syst. Census Austral. Pl. (1882) 60, nom. nud.] ex F.M.Bailey, Syn. Queensl. Fl. (1883) 192; Compr. Cat. Queensland Pl. (1890) 19; Queensl. Fl. 2 (1900) 667; Compr. Cat. Queensland Pl. (1913) 209, f. 184; Maiden, Usef. Nat. P1. Australia (1889) 161; Greshoff, Meded. Lands P1antentuin 10 (1893) 87; Lauterb., Nova Guinea 8 (1910) 313; Bot. Jahrb. Syst. 57 (1922) 344; Ewart & O.B.Davies, Fl. N. Territory (1917) 198; C.T.White, Proc. Linn. Soc. New South Wales 44 (1920) 824; L.J.Webb, Bulletin (CSIRO) 232 (1948) 72; Bulletin (CSIRO) 241 (1949) 27. — Type: *F. Mueller s.n.* (holo MEL; iso K, barcode 000216990), Australia, between the Victoria R. (Northern Territory) and Keppel Bay (Queensland).

Careya arborea Roxb. var. (?) *australis* Benth., Fl. Australia 3 (1867) 289; Maiden, Usef. Nat. P1. Australia 393 (1889) 619. — Lectotype (Barrett 2006): *F. Mueller s.n.* (hololecto K, barcode 000216990; isolecto BM, barcode 000647741 p.p. as to Mueller 164 only; MEL), Australia, [Northern Territory,] Victoria River.

Planchonia crenata Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 91, t. 18, f. 1–15; Erdtman, Pollen Morph. P1. Taxon. (1952) 222, f. 133. — *Careya crenata* R.Br. ex Kunth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 57, nom. illig, in synonymy. — Lectotype (Barrett 2006): *R. Brown 75* (*Bennett No. 5278*) (hololecto BM, barcode 000647742; isolecto CANB, sheet 278867, K, barcode 000216989), Australia, Queensland, Gulf of Carpintaria.

Cumbia australis Britten in Banks & Sol., Ill. Austral. Pl. Cook's Voy. 2 (1901) 41, t. 124. — Lectotype (Barrett 2006): *J. Banks & D. Solander s.n.* (hololecto BM, barcode 000647737; isolecto B, barcode 000647739, MEL, NSW no. 133500), Australia, [Queensland,] Cape Grafton.

Careya arborea auct. non Roxb.: Leichh., J. Overland Exped. (1847) 466; Ten.-Woods, Proc. Linn. Soc. New South Wales 7 (1882) 81; Maiden, Usef. Nat. P1. Australia (1889) 13.

Deciduous trees, 3–15 m high. *Bark* up to 1 cm thick, suberose, scaly, deeply fissured, greyish brown; living bark red; wood light grey outside, red in the centre, closed grain, tough. *Branchlets* terete, striate, lenticellate, grey or brownish grey (dry), cylindrical, 2–5 mm thick; leaf-scars distinct, leaf-traces sometimes visible. *Leaves*: petiole c. 2 cm, rarely up to 3 cm; blade obovate to broadly oval, the smallest leaves spathulate, (1–) 2.3–8.2 by (1.5–)3–6 cm, papyraceous, slightly areolate, base slightly decurrent, margin finely crenulate, apex emarginate to bluntly acuminate, in the latter case acumen very short (< 5 mm), tip obtuse, upper surface somewhat glossy, lower surface dull; midrib strongly prominent on the lower surface, flat above, lateral nerves 9–12 pairs, making an angle of c. 60° with the midrib, arcuately and faintly anastomosing near the margin, often branched, prominulous, veinlets ending in a mucro at the sinus. *Inflorescences* racemes, few-flowered; rachis 0.5–7 cm long, pulverulent to puberulous; bracts sometimes absent and pedicels subtended by small leaves; bracteoles cordate-ovate, 4–6 mm long, ciliate-denticulate, especially at the apex. *Pedicels* puberulous, (2–)8–15 mm long, c. 2 mm thick. *Calyx* tube and lobes puberulous outside, tube c. 1 cm long, campanulate, attenuate at the base, smooth, green; lobes ovate to semi-orbicular, unequal, the largest one c. 6 by 6 mm, the smallest one c. 3 by 5 mm, coriaceous, margin distinctly or obscurely ciliate. *Petals* obovate-oblong, 20(–30) by c. 17 mm, papyraceous, base tapering, not ciliate, apex obtuse, white, pink at the base, greenish on the back. *Stamens* 3–5 cm long; tube pink, 1–5 mm high; lower part of the free stamens pink, upper part white; anthers c. 1 mm long, 0.5 mm wide. *Disc* rim c. 1 mm high. *Style* c. 4 cm long. *Fruits* obovoid to ellipsoid, smooth, up to 7.5 cm (including calyx lobes) by 3 cm, with thick, fibrous pericarp. *Seeds* many, compressed-oval, c. 5 mm long, seedcoat brown to silvery brown, c. 0.3 mm thick; radicle curved. — **Fig. 21.**

Distribution — Australia (Northern Territories and Queensland); in *Malesia*: New Guinea.

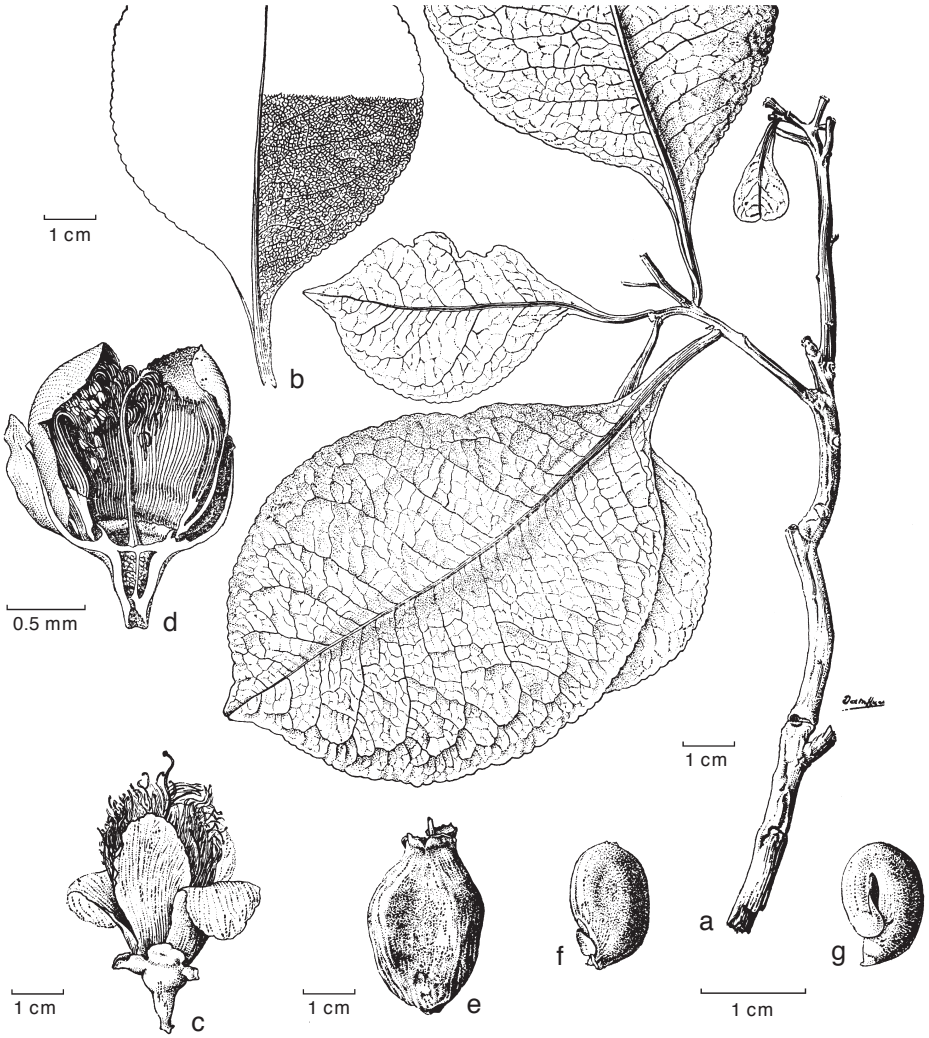


Fig. 21. *Planchonia careya* (F.Muell.) R.Knuth. a. Habit; b. detail of reticulation of upper surface of leaf; c. flower; d. opened flower bud; e. fruit; f. seed; g. embryo (a, b, e–g: *Hair s.n.*, BRI; c: *Branderhorst 174*, BO; d. *Specht 1037*, L).

Habitat & Ecology — This species has been recorded to occur in grasslands, monsoon forests on lateritic podsol, mixed open forest on sandy outwash plains and savannah ridges, edge of monsoon forest on truncated lateritic podsol. Irrigation has little effect on leaf fall, leaf-flush, stem water status and phenological behaviour (Myers et al., Austral. J. Ecol. 23, 2009: 329–339).

Uses — The wood is easy to work but liable to crack unless very carefully seasoned. The fruits and seeds are eaten by the natives. The bark is used by the aborigines for stupefying fish. The pulped leaves are considered a sure and safe cure for ulcers. Pulverized leaves are supplied as fermentations. The plant is suspected of causing

death in cattle characterised by posterior paralysis and death in several days. Leaves of *P. careya* have been traditionally used in the treatment of wounds by the indigenous people of northern Australia, although the compounds responsible for the medicinal properties have not been identified. The isolation of six antibacterial compounds from the leaves of *P. careya* validates the use of this species as a topical wound-healing remedy (McRae et al., J. Ethno-pharmacol., 2008: 554–560).

Vernacular names — New Guinea: Unga ungge (Gelieb).

3. Planchonia grandis Ridl.

Planchonia grandis Ridl., J. Straits Branch Roy. Asiat. Soc. 61 (1912) 9; Fl. Malay Penins. 1 (1922) 760; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1766; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 53; Kuswata, Bull. Bot. Surv. India 9 (1965) 185, f. 11, 12; Whitmore, Tree Fl. Malaya 2 (1973) 264; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 127; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 214. — Type: *Ridley 6423* (holo K), Singapore, Botanical Gardens, Garden Jungle.

Trees, up to 31 m high, up to 1 m diam. *Bark* brown, vertically grooved. *Branchlets* dark brown, smooth to striate, c. 4 mm thick, leaf-scars distinct, leaf-traces sometimes visible. *Leaves*: petiole c. 1 cm long, wing much narrower on the lower part, almost invisible; blade obovate to elliptic, 5–14 by 4–6 cm, coriaceous, base slightly decurrent, margin entire to subentire, apex acuminate, acumen short, tip blunt, both surfaces dark green, upper somewhat glossy, lower dull; midrib strongly prominent beneath, prominulous or flat above, lateral nerves 9–10 pairs, making an angle of 45–80° with the midrib, arcuately anastomosing near the margin, prominent on the lower surface, flat above, tertiary nerves and reticulation obscure; veinlets not ending in a mucro. *Inflorescences* spikes, many-flowered, up to 8 cm long; rachis 5–8 mm thick; bracts attached to the rachis, ovate, up to 15 by 7 mm; bracteoles at the base of the calyx tube, oblong, c. 7 by 2 mm. *Calyx* green, tube turbinate, not ribbed, c. 1 cm long; lobes coriaceous, semiorbicular, c. 4 by 7 mm. *Petals* obovate, tapering towards the base, up to 3 by 1.5 cm, papyraceous, greenish white. *Stamens* numerous, tube c. 5 mm long, red, free part c. 30 mm long, white; anthers c. 0.4 by 0.3 mm. *Disc* a rim, c. 1 mm high. *Style* up to 4.5 cm long, white. *Fruits* fleshy, globose, c. 4 cm diam., astringent, bitter, green, white inside, smell of turpentine. *Seeds* 3 or more, obliquely ovoid, longitudinally compressed, not angular, c. 1.5 cm long; coat coriaceous, brown, c. 0.2 mm thick. — **Fig. 22.**

Distribution — *Malesia*: Sumatra, Singapore, Borneo.

Habitat & Ecology — Lowland primary forests; flowering and fruiting from October to January.

Vernacular names — Sumatra: Putat, Putat talang. Borneo: Jonger, Lihai, Putat, Telikai.

Uses — Phytochemical studies by Crublet et al. (Phytochemistry 64, 2003: 589–594) show that leaves of *P. grandis* contain three acylated flavonol glycosides. They have potential medicinal application.

Note — The species is characterised by its terminal spikes and especially by its coriaceous leaves with obscure secondary nerves and reticulation. Although Knuth (1939) gives the inflorescence length as up to 15 cm, in the material at hand, the longest spike was only 8 cm, with the flowers only less than 1 cm, whereas the tube in the material conserved in alcohol is smooth.

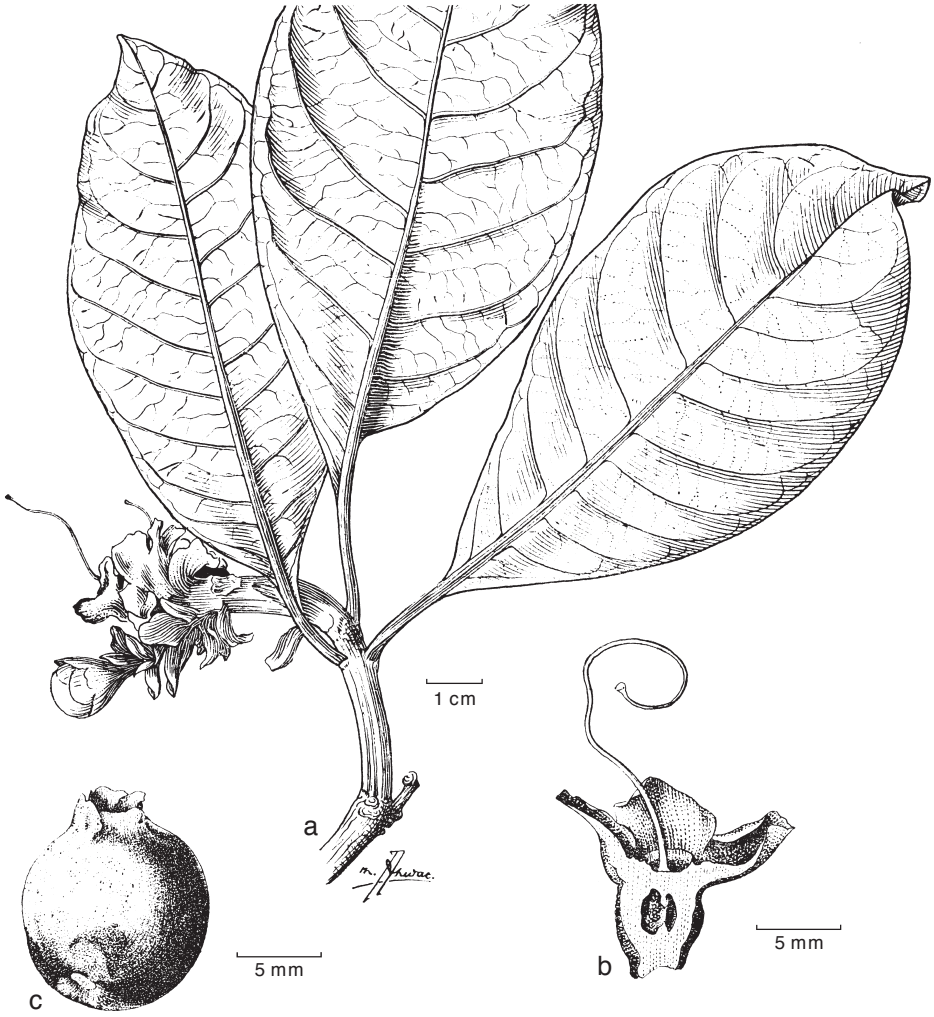


Fig. 22. *Planchonia grandis* Ridl. a. Habit; b. opened flower, corolla and stamens removed; c. fruit (a: *SFN VI*, b, c: *Dorst T.3.P.862*; all BO).

4. **Planchonia papuana** R.Knuth

Planchonia papuana R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 56, f. 11; Merr. & L.M.Perry, J. Arnold Arbor. 21 (1940) 295; J. Arnold Arbor. 29 (1948) 161; Kuswata, Bull. Bot. Surv. India 9 (1965) 176, f. 6, 7, 12. — Type: *Ledermann 7202* (holo B†), Papua New Guinea, Sepik River.

Planchonia timorensis auct. non Blume: Lauterb., Nova Guinea 8 (1912) 845; Bot. Jahrb. Syst. 57 (1922) 342, f. 1.

Trees, up to 40 m high, with large buttresses, deciduous. *Bark* flaky or scaly, deeply grooved, fibrous, hard to cut, red-brown to black; living bark pinkish, fibrous, blaze red fading to pink in fibrous section; sapwood clearly defined, straw; heartwood red-brown to dark red, dense, moderately soft to hard to cut across the grain, soft tissue finely

reticulate, tyloses common. *Branchlets* smooth to striate, greyish brown, lenticels scattered, leaf-scars, distinct, leaf-traces sometimes visible. *Leaves*: petiole 1–2 cm long; blade obovate to obovate-elliptic to elliptic, (3.5–)5.5–19(–22) by (1.5–)3.5–8(–10) cm, papyraceous, glossy, turning red before falling, base slightly decurrent, margin crenulate, serrulate or rarely denticulate, apex acuminate, acumen 5–10 mm long, tip blunt; midrib very prominent on the lower surface, flat above, nerves 9–13(–17) pairs, making an angle of c. 60° with the midrib, prominent on the lower surface, prominulous above, arcuately anastomosing near the margin, tertiary nerves distinct, irregular, reticulation dense, veinlets ending in a mucro near the sinus. *Inflorescences*: flowers solitary or in 2–3(–5)-flowered racemes; rachis 2(–4) mm thick; bracts at the base of the pedicels or median, sometimes absent, pedicels subtended by small leaves; bracteoles ovate, c. 6 by 6 mm. *Flowers* white, glabrous; pedicel (5–)7–18(–22) mm long, 2–3 mm thick. *Calyx* tube turbinate, 1.5–2.5 cm long, smooth; lobes ovate, (7–)9–10(–12) by 7–10 mm, coriaceous, entire, tip obtuse. *Petals* obovate, up to 5.4 by 2.4 cm, green, membranaceous to papyraceous, reflexed, apex obtuse. *Stamens* forming tube of 1–1.5

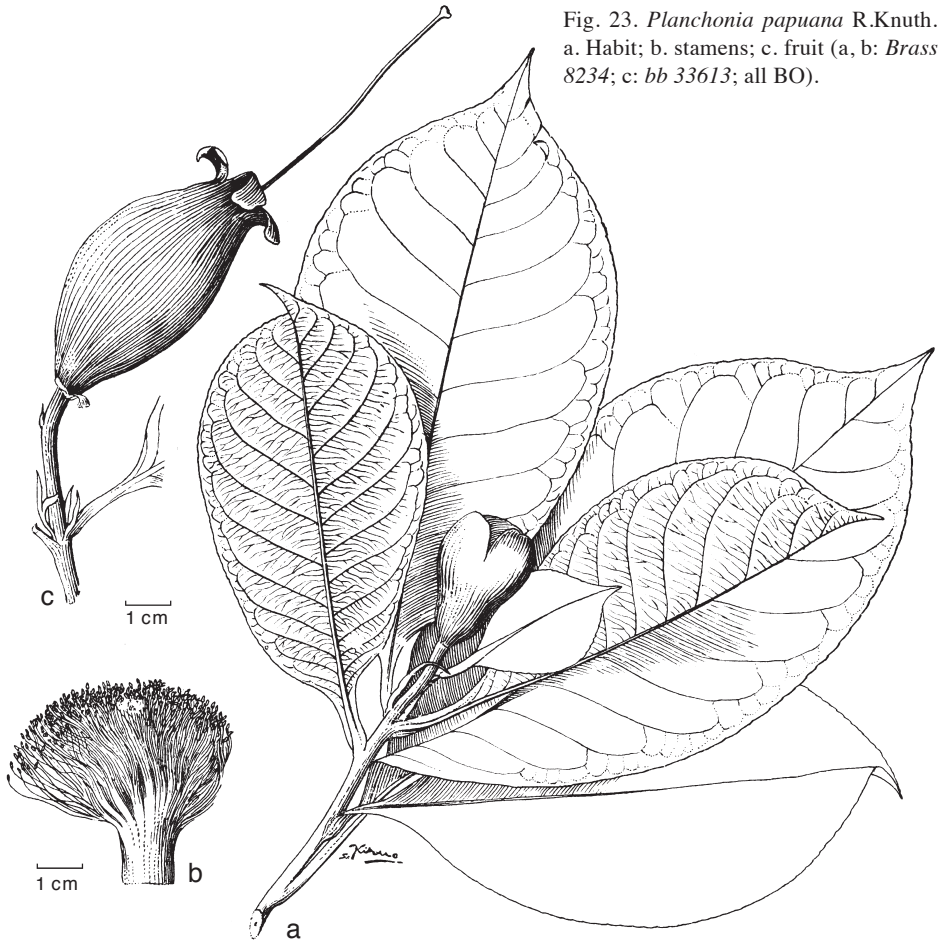


Fig. 23. *Planchonia papuana* R.Knuth. a. Habit; b. stamens; c. fruit (a, b: *Brass 8234*; c: *bb 33613*; all BO).

cm long, white; free part c. 3.5 cm long, pink at base, white above; anthers c. 1.5 by 0.75 mm. *Disc* a rim of c. 1 mm high. *Style* c. 6.5 cm long, c. 1 mm thick. *Fruits* obovoid to elongate-obovoid, without basal neck, up to 7 cm (including calyx lobes) by 3 cm, green; pericarp fibrous, 2–3 mm thick. *Seeds* ovoid, oblique, 3-angular; seedcoat silvery brown to chocolate, coriaceous, 0.3 mm thick; radicle spirally convolute. — **Fig. 23.**

Distribution — Solomon Islands; in *Malesia*: Moluccas (Aru Islands), New Guinea.

Habitat & Ecology — One of the largest and most common trees of the swamp forest on the Augusta River, and at the Lower Fly River; it is common on the drier flood plains. Growing in dense lowland primary rainforests with clayey soil on hills and coastal plains, also common in secondary forest on the inner edge of the mangrove. In the Solomon Islands, the species is planted in native villages. It flowers and fruits throughout the year, but there is an indication that flowering and fruiting are more frequent in March and from August to November.

Vernacular names — Aru Is.: Inara, Iniaa, Makakai (Aru language). New Guinea: Behbeh'o (Onjob, Koreaf dialect); Kuwot (Kaintuk); Kwaw (Kaowerawetj); Nandara (Inanwattan, Papua language); Narie, Terbe (Skou and Njau language); Tengkwo (Atanu); Tipaka (Tarie); Wanasj (Jense); Yale (Papua language). Solomon Is.: Bobohi (Suwa).

Uses — A decoction of the macerated bark can cure headache.

Notes — 1. This species differs from *P. timorensis* by its few-flowered racemes or even solitary flowers instead of the many-flowered racemes in *P. timorensis*.

2. See notes under *P. valida* and *P. spectabilis* for differences.

5. Planchonia spectabilis Merr.

Planchonia spectabilis Merr., Philipp. Gov. Lab. Bur. Bull. 17 (1904) 30; Philipp. J. Sci. 1, Suppl. (1906) 102; Enum. Philipp. Fl. P1. 3, 2 (1923) 143; Whitford, Bull. Bur. Forest. Philipp. Islands 10 (1911) 81; Schneider, Bull. Bur. Forest. Philipp. Islands 14 (1916) 179; Anon., Philipp. J. Forest. 1, 3 (1938) 330; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 55; Quisumb., Bull. Dept. Agric. Philipp. 16 (1951) 1043; Erdtman, Pollen Morph. P1. Taxon. (1952) 223; Kuswata, Bull. Bot. Surv. India 9 (1965) 174, f. 5, 12. — Type: *BS (Barnes) 58* (holo PNH†; iso BO, SING), Philippines, Luzon, Bataan, Lamao River.

Trees, up to 30 m or more, up to 1 m diam.; trunk straight, columnar. *Bark* brown, scaly. *Branchlets* slender, smooth to striate, lenticellate, greyish brown, darker at apex, leaf-scars distinct, leaf-traces often visible. *Leaves*: petiole 1.5–2.5 cm long; blade obovate or rarely elliptic, (3.5–)5–16(–21) by (2.2–)3–9 cm (according to Merrill 1904, up to 10 cm), thinly papyraceous, glossy, base slightly decurrent, margin finely serrate or crenulate, apex acuminate, acumen up to 16 mm long, narrow, tip blunt; midrib strongly prominent beneath, flat or sometimes prominulous above, primary veins 9–12 pairs, making an angle of c. 60° with the midrib, prominent to prominulous beneath, prominulous above, arcuately and faintly anastomosing near the margin, tertiary nerves regular, reticulation distinct, veinlets ending in a mucro at the sinus. *Inflorescences*: flowers solitary or in 2–5-flowered racemes (c. 1 cm long); bracts at the base of the pedicel, occasionally median, oblong, 2–7 by 1.5–3 mm; bracteoles ovate, 3–5 by 2–3 mm. *Flowers* c. 7 cm long, glabrous, slightly fragrant; pedicel 2–5(–15) mm long, c. 3 mm thick. *Calyx* tube turbinate, c. 1 cm long, slightly ribbed; lobes coriaceous, semiorbicular, 5–7 by 6–10 mm. *Petals* oblong, 38–48 by 10–15 mm, thinly papyraceous, base

tapering, apex acute. *Stamens* white at the apex shading to deep red at the base; tube c. 0.5 cm high, free part c. 5 cm long; anthers c. 1 by 0.6 mm. *Disc* a rim of c. 1 mm high. *Style* green, 6.8 cm long; stigma green. *Fruits* ovoid, without basal neck, not compressed or angular, c. 4.5 by 3 cm, green. *Seeds* 4–6, irregularly compressed, 1–5 cm long. — **Fig. 24.**

Distribution — *Malesia:* Philippines (Luzon and Mindanao). Very common in Luzon and Bisaya Islands.

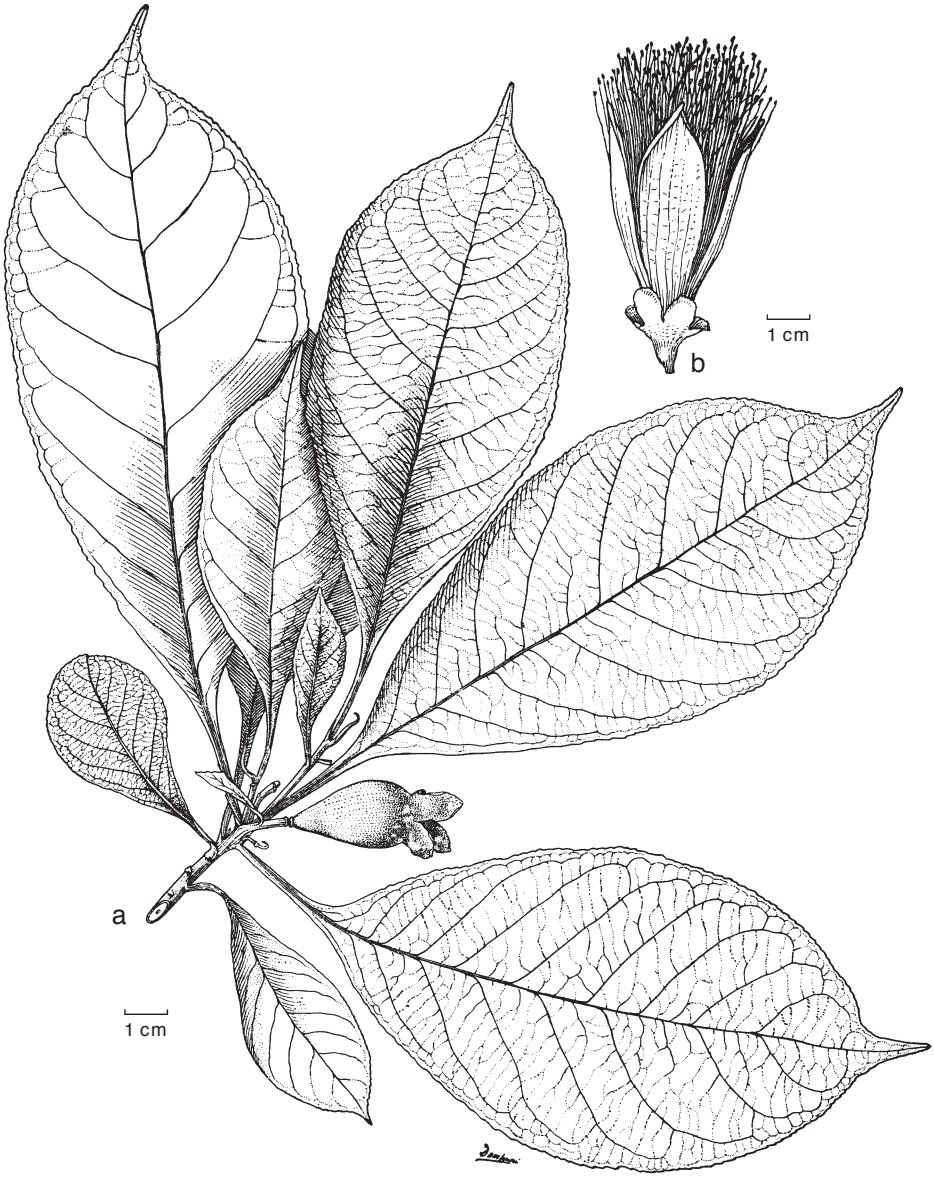


Fig. 24. *Planchonia spectabilis* Merr. a. Habit; b. flower (a: *BS 49247*; b: *BS 5218*; all BO).

Habitat & Ecology — Occurs in humid lowland forests up to 600 m and flowers between March and November, but more frequent from April to July.

Uses — The wood is used for posts, beams, joints, rafters, flooring, interior finish and cabinet work. The wood rarely comes to the Manila market except in medium-grade miscellaneous lots, but sometimes is ignorantly or fraudulently substituted for *betis* (a Sapotaceae species) or other heavy, dark-red woods (Schneider, Bull. Bur. Forest. Philipp. Islands 14, 1916: 179).

Vernacular names — Philippines: Abobo, Alitaptap, Balatuson, Hilitoson, Malatagum, Motonboton (Bikol); Apalang, Bayok, Lamug, Malaputat, Mauban, Uban (Tagalog); Bansalagun, Buhukan (Panay Bisaya); Llamog (Taggalog, Patup); Malauban (Tagalog, Bikol); Oban-ohan (Bagobo); Poronot (Iloko); Taui (Cebu Bisaya).

Note — This species differs from *P. valida* by its thinner leaves and solitary or few-flowered, short racemes and from *P. papuana* by its smaller calyx and shorter staminal tube.

6. **Planchonia timorensis** Blume

Planchonia timorensis Blume in Van Houtte, Fl. Serres 7 (1851) 25; Miq., Fl. Ned. Ind. 1, 1 (1855) 493 ('*timoriensis*') [excl. vars. *alata* (Blume) Miq. and *bimensis* Miq.]; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 853 [excl. vars. *alata* (Blume) Miq. and *bimensis* Miq.]; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 56; Kuswata, Bull. Bot. Surv. India 9 (1965) 165, f. 2, 3, 3a, 12. — Type: *Spanoghe s.n.* (holo L) [Indonesia, Nusa Tenggara Timur (Lesser Sunda Islands),] Timor.

Trees, up to 35 m high, up to 1 m diam.; buttresses conspicuous. *Bark* greyish brown, scaling off into small pieces. *Branchlets* terete, lenticellate, smooth, sometimes striate, greyish brown, darker towards the apex, up to 6 mm thick; leaf-scars conspicuous, leaf-traces sometimes visible. *Leaves*: narrowed part (petiole) 2–2.5 cm long, but actually leaves sessile; blade obovate to obovate-elliptic, (10–)15–33 by (6–)7.5–15 cm, papyraceous, turning red before falling, glossy, base decurrent, margin crenulate or bluntly denticulate, apex acuminate, acumen up to 1.5 cm long, obtuse; midrib strongly prominent beneath, prominulous above, nerves 12–14 pairs, making an angle of c. 60° with the midrib, prominent beneath, slightly raised above, arcuately anastomosing near the margin, often branched, tertiary nerves distinct; reticulations dense, veinlets ending in a mucro at the sinus. *Inflorescences* racemes, glabrous, generally many-flowered, up to 12 cm long, glabrous; rachis up to 5 mm thick. *Pedicels* glabrous, 1–2.5 cm long, 2–3 mm thick, the lowest pedicels subtended by ordinary leaves; bracteoles ovate to ovate-oblong, 5–6 by 6–7.5 mm, coriaceous. *Calyx*: tube turbinate, 1.5–2 cm long, smooth (fresh), glabrous, striate when dry; lobes semiorbicular to oblong, unequal, 10–15 by 8–10 mm, coriaceous, margin entire, tip obtuse. *Petals* obovate, 4.5–6 by 2–3 cm, membranaceous, pale green. *Stamens*: tube c. 1 cm high, white; free part 4.5–5.5 cm, light red at the base, white higher up; anthers c. 1 by 0.75 mm. *Disc* a rim of c. 1 mm high. *Style* c. 6.5 cm long, in fruit the base slightly swollen; stigma 4-lobed. *Fruits* smooth, subglobular, without basal neck, c. 5.5 cm diam. (fresh), obovoid to ovoid when dry, pericarp fibrous; containing a sticky substance. *Seeds* numerous, obliquely ovoid, angular; testa brown, glossy; radicle spirally convolute. — **Fig. 25.**

Distribution — *Malesia*: Lesser Sunda Islands (in particular Sumbawa, Komodo, Sumba and Timor and in Timor Leste).

Habitat & Ecology — Lowland monsoon forest area as well as in the limestone plateau escarpment and often common trees along ravines and slopes, sometimes solitary.

Vernacular names — Sumbawa: Bentenu, Ketipu, Putat (Bima). Komodo Is.: Kunca. Flores: Menaha (Solor dialect). Sumba: Lengkak. Timor Leste: Kai uaouco.

Note — This species differs from *P. valida* in having larger flowers, bigger, subglobular fruits and longer pedicels; from *P. papuana* by its many-flowered racemes; from *P. andamanica* (absent in Malesia) by its larger flowers with much larger sepals.

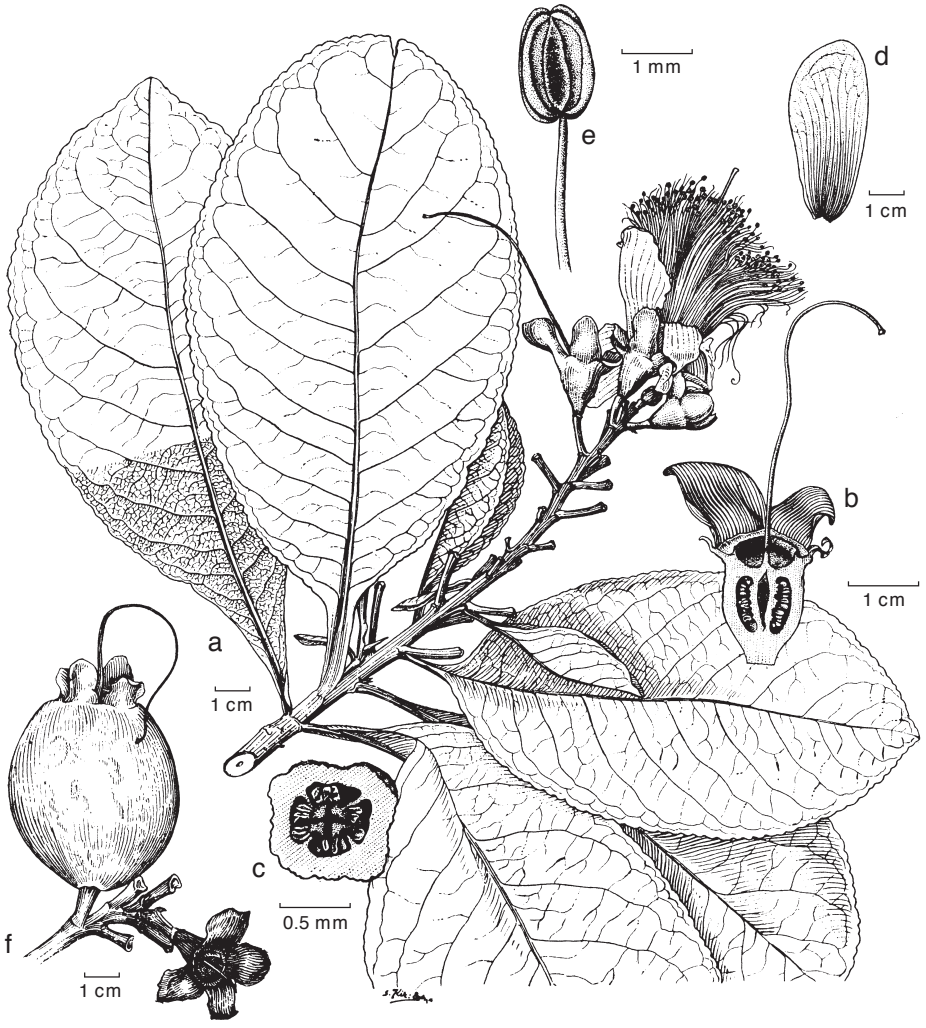


Fig. 25. *Planchonia timorensis* Blume. a. Habit; b. opened flower, corolla and stamens removed; c. cross section of ovary; d. petal; e. anther; f. young and old fruit (*Kostermans 19031*, BO).

7. **Planchonia valida** (Blume) Blume

Planchonia valida (Blume) Blume in Van Houtte, Fl. Serres 7 (1851) 24; Miq., Fl. Ned. Ind. 1, 1 (1855) 493; Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 94; Foxw., Philipp. J. Sci., Bot. 4, 40 (1909) 526; Koord., Exkurs.-Fl. Java 2 (1912) 666 (excl. syn. *P. timorensis* and part of *P. tetraptera*); Koord.-Schum., Syst. Verz. 1, Fam. 219 (1912) 19; Ridl., Fl. Malay Penins. 1 (1922) 760; Endert, Tectona 18 (1925) 50; Den Berger, Meded. Proefstat. Thee 97 (1926) 137; Duyster, Giftige Ind. Pl. (1927) 117; Ochse & Bakh., Veg. Dutch East Indies (1931) 361, f. 228; Burkill, Dict. Econ. Prod. Malay Penins. 2 (1935) 1766; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 55; K.Heyne, Nutt. P1. Ned.-Ind., ed. 3, 1 (1950) 1159; Backer & Bakh.f., Fl. Java 1 (1963) 352; Kuswata, Bull. Bot. Surv. India 9 (1965) 168, f. 4, 12; Whitmore, Tree Fl. Malaya 2 (1973) 264; Kessler & Sidiy., Tropenbos-Kalimantan Ser. 2, 7 (1994) 160; Pinard in Soepadmo et al., Tree Fl. Sabah & Sarawak 4 (2002) 128; Prance in Kiew et al., Fl. Penins. Malaysia, Ser. 2, 3 (2012) 216. — *Pirigara valida* Blume, Bijdr. l7 (1826) 1096; Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 9. — *Gustavia valida* (Blume) DC., Prodr. 3 (1828) 290; G.Don, Gard. Hist. 2 (1832) 870; Hassk., Flora 27 (1844) 595. — *Careya valida* (Blume) Kurz, J. Roy. Asiat. Soc. Bengal 46, 2 (1877) 72. — Type: *Blume 233* (holo L; iso BO), Indonesia, Java.

[*Myrtus alata* Zipp. ex Span., Linnaea 15 (1841) 204, nom. nud.]. — *Planchonia alata* Blume in Van Houtte, Fl. Serres 7 (1851) 25, descr.; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 55. — *Planchonia timorensis* Blume var. *alata* (Blume) Miq., Fl. Ned. Ind. 1, 1 (1855) 493 ('*timoriensis*'); Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 853. — *Planchonia tetraptera* Miers, Trans. Linn. Soc. London, Bot. 2, 11 (1875) 93, nom. superfl. — Type: *Zippelius s.n.* (holo L), Indonesia, Nusa Tenggara Timur (Lesser Sunda Islands), Timor, Kupang.

Planchonia littoralis Blume in Van Houtte, Fl. Serres 7 (1851) 25; Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 94; C.B.Clarke in Hook.f., Fl. Brit. India 2 (1879) 511; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 54. — Lectotype (Kuswata 1965): *Blume 1526* (lecto L), Indonesia, Java.

Planchonia sumatrana Blume in Van Houtte, Fl. Serres 7 (1851) 25; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 54 (excl. syn.). — Type: *Praetorius s.n.* (holo L; iso BO), Indonesia, S Sumatra, Palembang Residency.

Planchonia sundaica Miq., Fl. Ned. Ind. 1, 1(1855) 493, nom. illeg.; Müll.Berol. in Walp., Ann. Bot. Syst. 4 (1857) 852; Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 92; King, J. Roy. Asiat. Soc. Bengal 70, 2 (1901) 142; Koord. & Valeton, Meded. Dept. Landb. Ned.-Indië 40 (1900) 24, 26; Koord.-Schum., Syst. Verz. 2, Fam. 219 (1911) 42; Janssonius, Mikrogr. Holzer Java 3 (1914) 508; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 55. — Type: *Junghuhn s.n.* (holo L?), Java, Central Java, Nusakambangan Island.

Planchonia undulata Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 29 (1866) 256; Hassk., Flora 49 (1866) 438. — Type: *Binnendijk HB 7348* (holo BO; iso CAL), Indonesia, Bogor, Botanic Gardens.

Planchonia elliptica Miers, Trans. Linn. Soc. London, Bot. 2, 1 (1875) 93; Merr., J. Straits Branch Roy. Asiat. Soc., Spec. No. (1921) 420; R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 55. — Type: *J. Motley 750* (holo K), Indonesia, S Kalimantan, Banjarmasin.

Planchonia forbesii R.Knuth in Engl., Pflanzenr. IV.219, Heft 105 (1939) 54. — Type: *Forbes 3254* (holo B?†; iso CAL, FE, L), Indonesia, S Sumatra, Rawas River.

Planchonia spectabilis auct. non Merr.: H.G.Keith, North Borneo Forest Rec. 3 (1947) 113, 119.

Trees, up to 50 m high, up to 2 m diam.; bole straight, almost cylindrical; buttresses up to 4 m high, 5 m outwards. *Bark* greyish brown, 2–6 mm thick, scaling off in small, irregular pieces; living bark 10–15 mm thick, beefy red outside, odourless, slightly bitter and astringent, dirty white inside; sapwood dirty white. *Branchlets* angular (young); leaf-scars distinct, leaf-traces of ten visible; bark smooth (fresh), striate when dry, with scattered lenticels, greyish brown, dark brown towards the apex. *Stipules* early caducous, inserted at the base of the petioles of very young leaves, subulate, c. 0.4 by 0.1 mm, tip very sharp. *Leaves*: blade elliptic to obovate, (3–)6–25(–35) by (2.5–)4.5–13

cm, papyraceous, turning red before falling, glossy, base slightly decurrent, petiole 1–2 cm, margin serrulate to bluntly denticulate, apex acuminate, acumen up to 1.5 cm long, obtuse; midrib strongly prominent on the lower surface, prominulous or flat above, nerves 12–22 pairs, making an angle of 60–70° with the midrib, prominent on the lower surface, flat above, arcuately anastomosing near the margin, usually branched, tertiary nerves distinct, irregular, reticulation dense, veinlets ending in a mucro near or at the tip of the tooth of the crenulation. *Inflorescences* racemes, generally many-flowered, up to 13.5 cm long, puberulous to glabrous; rachis 2–5(–7) mm thick; bracts oblong to semi-orbicular, 7.5–10(–15) by c. 5 mm. *Pedicels* 0.2–1 cm long, 2–5 mm thick, puberulous to glabrous; the two lowest pedicels often not subtended by bracts but by ordinary leaves. *Calyx*: tube campanulate, ribbed, puberulous to glabrous; lobes ovate, 7–10 by 4–8 mm, entire, coriaceous, pale green. *Petals* obovate-oblong, 15–35 by 7–10 mm, membranaceous, greenish, reflexed, base tapering, apex obtuse. *Staminal tube* c. 1 cm high, free part 25–45 mm, pink to red at the base, yellowish white higher up, the inner whorl yellowish white; anthers c. 1 by 0.75 mm. *Disc* a rim of c. 1 mm high. *Style* slender, 3–6 cm long. *Fruits* ovoid to ellipsoid, without basal neck, 3–4 by 1.5–2.5 cm, pale green; pericarp up to 7 mm thick, fibrous. *Seeds* 1–15, ovoid, 3–4-angular; seedcoat pale chocolate brown (dry), coriaceous, c. 0.5 mm thick; radicle spirally convolute. — **Fig. 26.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Sulawesi, the Lesser Sunda Islands (Bali, Lombok, Timor).

Habitat & Ecology — The species occurs up to 1000 m alt., but is more common below 500 m. In very humid forest, occasionally on swampy sites, also in monsoon forest, such as teak forest, near water and is deciduous for a short period of time. The largest tree with diam. of up to 2 m and well-developed buttresses of up to ± 4 m high and ± 5 m out was observed on the Peucang Island (SW Java). It flowers and fruits throughout the year but the peak of flowering and fruiting season tends to occur between October and December.

Uses — The wood is useful and, therefore, it is recommended as replacement of teak in regions where it is too wet for teak, but not near stagnant water or marshes. The wood is easy to work and does not warp much (according to Keith 1947, warps a great deal if not carefully seasoned). It is a good to very good firewood; not very durable. It is used for house building, heavy constructions, poles, furniture and cabinet work, beams, joints, rafters, flooring, sheathing, panelling, bentwood work, ship-framing and vehicle shafts. Young leaves and red shoots are eaten as *lalab* (raw vegetables) or the steamed ones are mixed with fish and other spices. The plant is probably a fish poison as *Barringtonia*, but which part of the plant should be poisonous is not indicated (Gresshoff, Meded. Lands Plantentuin 10, 1893: 87). The species is devoid of saponins (Boorsma, Bull. Dépt. Agric. Indes Néerl. 16, 1908: 10).

Vernacular names — Peninsular Malaysia: Putat, Putat paya. Sumatra: Darah, Dukut dasih, Kulit dasih (Batak Karo); kelusi (Lampung). Java: Butat (Madura); Putat (Sundanese, Javanese); Putat kebo, Maesa (maesa = kebo = water buffalo), Putat penggung (penggung = tree), Putat resek (resek = cracking when crashed) (Javanese). Borneo: Sabah: Kasui (Murut); Telisai (Kinabatangan); Kalimantan: Dut (Kutei, Pasir, Benuak); Kandihei (Kapuas); Kelempilung (Bulungan, Tidung: Batajan dialect); Pintai (Berau,

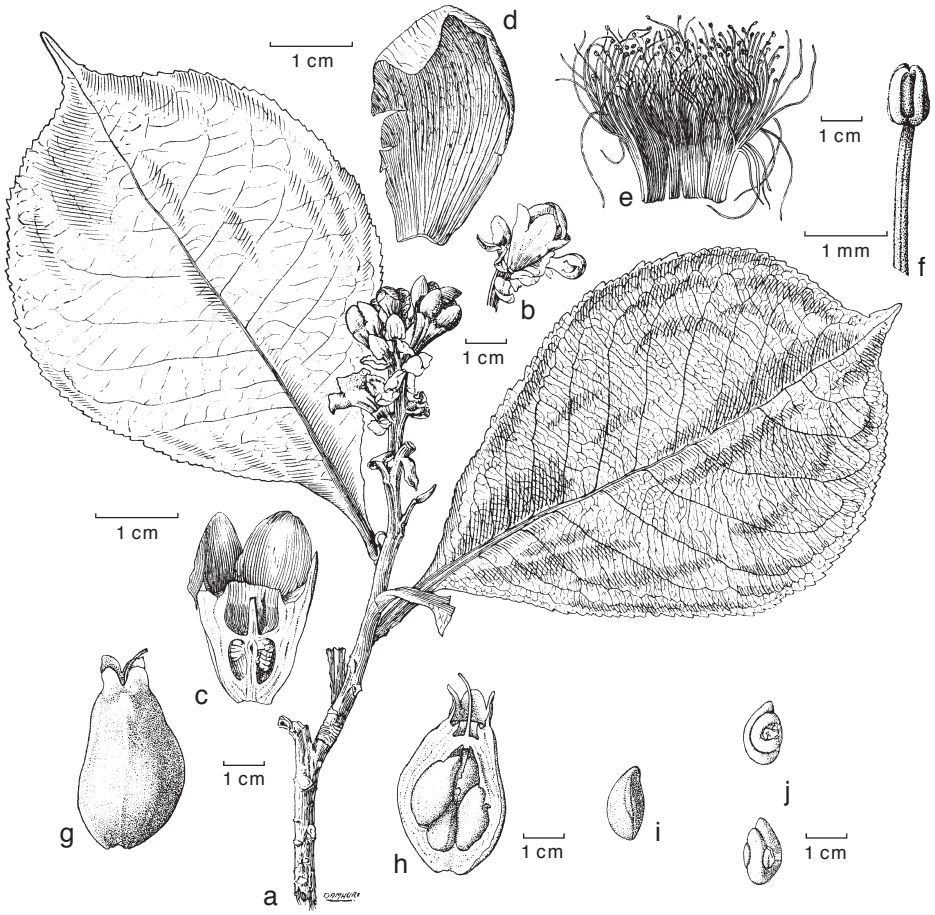


Fig. 26. *Planchonia valida* (Blume) Blume. a. Habit; b. flower bud with bracts and bracteoles; c. opened flower, corolla and style removed; d. petal; e. stamens; f. anther; g. fruit; h. opened fruit; i. seed; j. embryo (a–f: *Koorders 5440*, BO; g–i: fresh specimen).

Dayak Bassap); Putat (Banjar); Telisai (Dayak Tunjung, Berau, Kutei). Sulawesi: Achiem (N Celebes: Tonsawang); Dingkaeleng (Sangir); Inarintek, Mumariit sela (Bolaang Mongondow); Intjalen, Wuwuringan (Totembuan); Lotooe hintalahe, Tapalu (Gorontalo); Meu (Makassar language); Palentuna (Kaili: Ledo dialect); Puca sasa (Bugis); Saru nianggane (Muna); Wewu (Buton Moronene, Muna, Kendari Tolalaki); Wewu niongkuni (Tobela).

Notes — 1. As the type specimen of *P. littoralis* the sheets marked *Blume 1526* in the Leiden Herbarium were selected, which have ribbed fruit as indicated in Blume's description.

2. Several names were considered to be synonyms, because of the small differences between them. Blume distinguishes *P. littoralis* from *P. valida* by having elongate-ellipsoid and costate-subangular fruit, while those of *P. valida* are ellipsoid and smooth.

3. The only difference mentioned between *P. valida* and *P. sumatrana* is the crenulate or unequally bluntly denticulate leaf margin in the former and the appressed serrulate to denticulate in the latter.

4. The type specimen of *P. alata* (*Zippel s.n.* in Leiden) might represent a sapling of *P. valida*, which has longer leaves than usual.

5. Miquel combined *P. valida*, *P. littoralis* and *P. sumatrana* and called this species *P. sundaica*, which is not allowed under the present rules.

6. Knuth distinguishes *P. forbesii* from *P. sumatrana* by having reddish brown, obovate leaves in *P. forbesii* and slightly black, lanceolate-oblong leaves in *P. sumatrana*. In the specimens of *P. sumatrana*, identified by him, no lanceolate-oblong leaves can be found; the leaves are obovate to elliptic-oblong. The colour of the dry leaves is not reliable for distinguishing species.

7. Kostermans, who studied the type specimens, is of the opinion that *P. elliptica* is conspecific with *P. valida*.

8. The name *P. tetraptera* was incorrectly introduced by Miers to prevent confusion between *P. alata* and *Barringtonia alata*.

9. For differences with *P. timorensis* see note under latter, and note under *P. spectabilis* for differences with that species.

INTRODUCED GENERA

Subfamily **Lecythidoideae** Nied.

Subfamily *Lecythidoideae* Nied. in Engl. & Prantl, Nat. Pflanzenfam. 3, 7 (1892) 34. — Type: *Lecythis ollaria* Loefl.

Large trees. *Leaves* alternate, exstipulate or with minute stipules, pinnately nerved, brochidodromous, the margins usually entire. *Inflorescences* terminal or axillary panicles or racemes or cauliflorous and ramiflorous racemes. *Flowers* actinomorphic or zygomorphic, calyx-tube campanulate, not winged. *Sepals* 2–6; petals 4, 6 or 8, rarely 12 or 18 in *Gustavia*. *Stamens* arising from a connate staminal ring, the ring slightly expanded to one side or markedly expanded into a strap-like ligule with an enlarged hood at the apex, the hood appendages with or without anthers. *Ovary* 2-, 4-, or 6-locular, inferior or semi-inferior, with 2–many anatropous ovules in each loculus, the axile placentae at the apex, base or throughout the length of the locule. *Fruits* indehiscent fleshy and indehiscent or woody and indehiscent in *Couroupita*, dehiscent via circumscissile operculum, large and woody with a small operculum falling inwards in *Bertholletia*.

Distribution — Ten genera endemic to the Neotropics and a few of the 235 species are cultivated elsewhere.

6. BERTHOLLETIA

Bertholletia Humb. & Bonpl., Pl. Aequinoct. 1 (1808) 122; Prance in S.A.Mori & Prance, Fl. Neotrop. Monogr. 21, 2 (1990) 114. — Type: *Bertholletia excelsa* Humb. & Bonpl.

Large trees. *Inflorescences* terminal panicles. *Flowers* zygomorphic. *Sepals* 2. *Androecium* expanded on one side to form a large ligule and hood covering the ring

stamens, the hood appendages sterile. *Fruits* a large round woody pyxidium, 10–15 cm diam., with a small inwardly falling peg-like operculum. *Seeds* 10–25, triangular in cross section, the testa hard and woody, embryo undifferentiated.

Distribution — One species in rainforests of Amazonian Brazil, Peru and Bolivia.

Uses — The monotypic species *Bertholletia excelsa* is cultivated in various places such as in the grounds of the Forest Research Institute in Kepong, Malaysia, and in the Bogor Botanic Garden. This species is easily recognized by the hard woody fruit with hard woody seeds inside (Brazil nuts of commerce). Other notable features are the zygomorphic androecium with a hood of sterile appendages that covers the ring of fertile stamens beneath and the calyx which has only two lobes.

7. COUROUPITA

Couroupita Aubl., Hist. Pl. Guiane 2 (1775) 708; Prance in S.A.Mori & Prance, Fl. Neotrop. Monogr. 21, 2 (1990) 88; Leti et al., Fl. Photogr. Cambodge (2013) 326. — Type: *Couroupita guianensis* Aubl.

Large trees. *Inflorescences* cauliflorous and ramiflorous racemes. *Flowers* zygomorphic. *Sepals* 6. *Androecium* expanded on one side to form a large, open, not hood-like ligule, the ligule appendages bearing anthers. *Fruits* large, round, indehiscent, 12–20 cm diam.; seeds embedded in a spongy pulp. *Seeds* ovate, not angled; cotyledons foliaceous. — **Plate 3.**

Uses & Note — This genus has three Neotropical species, one of which, *Couroupita guianensis*, the Cannon ball tree, has been widely distributed in botanic gardens and parks for its ornamental flowers and curious cauliflorous fruits. This species is easily recognized by the large round fruits of 10–15 cm diam. borne on the branches and trunk. The androecium, bearing numerous sterile stamens, has a more open hood than that of *Bertholletia* and it is also over the ring of fertile stamens. The leaves of this species are grouped at the ends of the branches in a similar way to many species of *Barringtonia*.

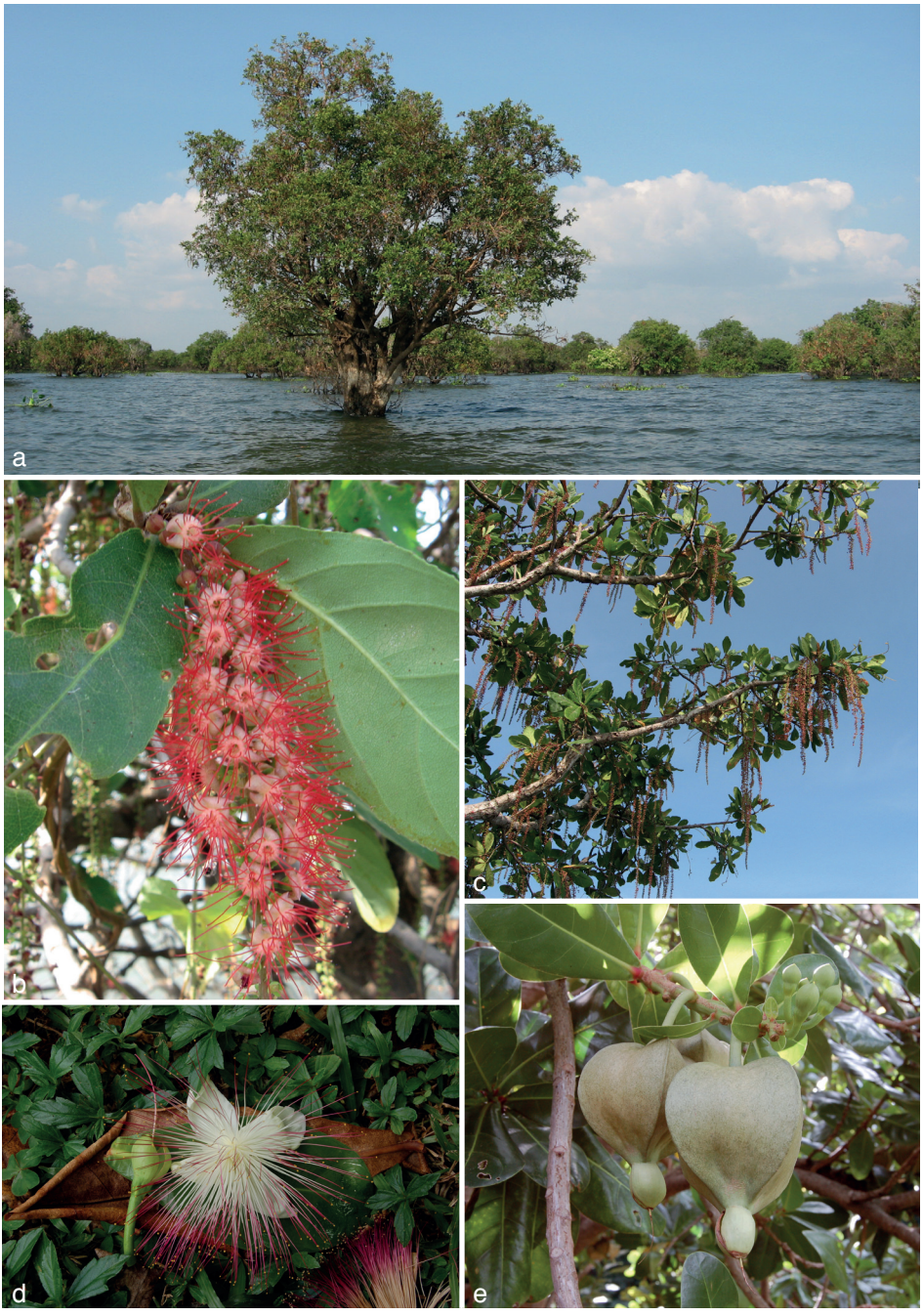


Plate 1. a–c: *Barringtonia acutangula* (L.) Gaertn. subsp. *acutangula* a. Habit in typical surrounding; b. inflorescence; c. branches with inflorescences. — d, e: *Barringtonia asiatica* (L.) Kurz. d. Flower; e. fruit. a–c: © Bruno David (reprinted with permission from Leti et al., Fl. Photogr. Cambodge (2013) 324); d, e: Photos by G.T. Prance..

Plate 2. *Careya arborea* Roxb. a. Habit; b, c. flower; d. fruit. © Mathieu Leti (reprinted with permission from Leti et al., Fl. Photogr. Cambodge (2013) 325).

Plate 3. *Couroupita guianensis* Aubl. a. Habit with inflorescences; b. flower; c, d. inflorescences; e. fruits. © Mathieu Leti (reprented with permission from Leti et al., Fl. Photogr. Cambodge (2013) 326).