LECITHIDACEAE

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


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 circumscissile operculum (Neotropics), then woody; seeds winged or without wings; endosperm lacking or very scanty; embryo undifferentiated or with plano-convex or foliaceous cotyledons.

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 sub-montane 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 calyprata in casowarie dung in Northern Australia and it is probable that some of the New Guinea species are dispersed by these giant birds.


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, Schönénberger 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 Napoleonaceae, 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 Barringtonioidae, which must now be used and is applied here.

The Barringtonioidae 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 Barringtonioidae 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 Barringtonioidae 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.


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 Barringtonioidae 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.


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).


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 Malesean 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 Planchnonia, 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 Malesean 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 Planchnonia; 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).


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

The Napoleoneaceae, 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 calyptrycalyx*), 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: *Napoleonaeae*).

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 duplicolurnellate 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.

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 Barringtonogenic acid both derivatives of β-amyrin in *Barringtonia racemosa* and barringtonoleanols 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* germancol caffeoyl ester and camelliagenone. They also found many other compounds, germancol trans-coumaroyl ester, spinasterol and trinolein from the fruits and spinasterol, squalene, linoleic acid and trinolein from the seeds. Some of these compounds exhibited antifungal activity against *Candida albicans* and caffeoyl ester, camelliagenone and germancol 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, barringtonenol 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.

Cyanogenesis 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 %.

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 chutneys. 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.


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 circinate, 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

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 nervesd, 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 circumsissile, 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 locale, rarely more; the ovules attached at the apex or axially, basal in Chydenanthus; ovules bitemgic, 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)


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


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 the short staminal tube. 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 chutneys. Three species, B. edulis,
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. Abdulmajidia, 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 Madagascan 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

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 .............................................. 5
   b. Calyx in bud completely closed ............................................. 20. *B. gigantostachya*

5a. Fruit distinctly 4-winged, hypanthium tetragonal, winged or sharply angled ...
   b. Fruit circular in section to subtetragonal, not winged; hypanthium at most only slightly angled .................................................. 46. *B. pterita*

6a. Calyx and inflorescence rachis glabrous; fruit ovoid, subtetragonal, lightly winged when young .................................................. 47. *B. racemosa*
   b. Calyx and inflorescence rachis densely short-pubescent; fruit cylindrical–8-sided, not winged .............................................. 45. *B. procera*

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, tetragonal; 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. calyprata*) ................................... 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. calyptra
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 ovate; 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 rami-
floruous 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-ovate, 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 tetragonal 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 tetragonal, 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)tetragonal; 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, tetragonal, 13–14 by 5–5.5 cm; inflorescence rachis yellowish puberulous ................................. 29. B. longisepala

b. Staminal whorls 8–10; fruit subtetragonal, 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 notably tetragonal at base, ovate, 8.5–11 cm long; petioles 0–5 mm long; venation cladomerous; sepals 3–4 by 2–3 cm ........... 4. B. asiatica
b. Fruit not tetragonal 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 infrapetiolate; 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 tetragonal; inflorescence axillary, terminal or ramiflorous .............................................. 55

b. Hypanthium tetragonal, trigonous or angled (terete in **B. confusa**); 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, tetragonal, 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 ferruginous ................. 36. B. niedenzuana

1. Barringtonia acutangula (L.) Gaertn.


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.


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 prominent above, prominent beneath, primary veins 7–20 pairs, brochidodromous, not conspicuously merging, intercostal veins slightly prominent 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-gonal, 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. . . . . . .

| a. subsp. *acutangula* |


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

Shrub or small trees. Flowers sessile. Fruits almost globose, 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.


Uses — Leaves are edible and eaten as a vegetable in Java.
2. *Barringtonia apiculata* Lauterb.


*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


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 pulvulent, 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 whors 3–4, the inner one staminal, 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 (Sabah, Sakhalin, Kalimantan).
Habitat & Ecology — Along rivers in primary mixed dipterocarp forest in lowlands to 200 m.
Vernacular name — Tampalang (Dusun).

4. *Barringtonia asiatica* (L.) Kurz


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 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 tetragonal 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 tetragonal to the emarginated base. Seeds oblong, 4.5–5 cm long. — Fig. 1b; Plate 1d, e; Map 3.


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


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 promonilous 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 tetragonal, 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, tetragonal 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, subtrigonal, 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


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


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, divided 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.


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

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

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 prominently above, prominent beneath, primary veins 8–20 pairs, brochidodromous, merging only through network of intercostal veins, prominent above, prominent beneath, intercostal veins prominent 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; hypan-thium 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.

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, Kootre, Tolamiai (Elena, 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.


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 tetragonal, 3–5 by 3–7 mm, pulvurulent; 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**
a. var. calyptrocalyx


For more nomenclature see under species.

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


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

b. var. mollis Lauterb.


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


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


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 tetragonal; 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 chantaranoi* 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, staminodal 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


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).
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.


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.


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 acuminated.
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

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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).
Prance & Kartawinata — Lecythidaceae 41
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


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, prominent on both surfaces, more so beneath, intercostal veins prominent 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.


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.


— 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


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 prominent on both surfaces, primary veins 8–10 pairs, brochidodromous, arching and merging 2 mm from margin, slightly prominent above, prominent beneath, intercostal veins slightly prominent above, prominent 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


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 prominent on both surfaces; primary veins 16–25 pairs, brochidodromous, merging
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,
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), tetragonal, 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.

**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


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


*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 gēdang, Putat, Tubang palong.

21. *Barringtonia glomerata* Prance


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 tetragonal; splitting into 2 sepals, broadly ovate, c. 1 cm long,

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


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, prominent above, prominent beneath, intercostal veins prominent 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

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### 23. Barringtonia havilandii Ridl.


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. *Calyx* open in bud. *Flowers* with pedicels 0.5–2 cm long; hypanthium tubular, trigonous or subtetragonal, 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 whors 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 subtetragonal, 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.

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### 24. Barringtonia jebbiana W.N.Takeuchi


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 round 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


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, prominent 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 1.16 cm, reddish white, pink or white; stamens white, staminal whors 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).
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: Jam-palang, Jempalang apoi (Dusun); Langkong (Iban); Putat.

Uses — Bark used as a fish poison.

26. Barringtonia latiflora (El-Sherif) Prance


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, mature. *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

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, ob lanceolate, 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. pin nibolia Jebb & Prance (●); B. revoluta Merr. (★); B. rimata Chantar. (▼).
28. **Barringtonia longipes** Gagnep.


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


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, thickcoriaceous, base cuneate, margin entire, revolute, apex acuminate or rarely acute or rounded, the lower surface glabrous; midrib prominent 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, tetragonal, 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-ovate, 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 prominent 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, prominent above, prominent beneath, intercostal veins prominent 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., scarceley 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; circumsessile, 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, staminial 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.


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).


*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].


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


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


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


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 prominent 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 prominent 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 tetragonal, 4–6 mm long, glabrous; petals pinkish red crimson or striped red; stamens pink or deep red, staminal whorls 4–5, the inner one staminodial, 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, tetragonal, 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.
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

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).
si marte ni uwo, Twah dotan; Borneo: Putat; Semuting (Djak); 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


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


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 fit-
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


— 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, brochi-dodromous, 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, circumsessile, 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 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, curving 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 subtetragonal, 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 whors 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, tetragonal, 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.


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


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 stores, 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 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 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, pulverture, 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 subtetragonal 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- wilderness, see there. — Fig. 12g.


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


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.


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

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


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.


Trees. Leaves: petioles 1–6 mm long, slightly winged; lamina oblanceolate or ob-ovate, 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.


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, prominent above, prominent beneath, intercostal veins prominent 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, stamiodia 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.**


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.


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 rami-flororous 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; brac-teoles 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.


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


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 promi-nulous on both surfaces, reticulate. Inflorescences terminal or rami-flororous 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, stami-nodia 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


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 prominent 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, ferruginous 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 *Chydeenanthus 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


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
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.

Fig. 8. *Barringtonia pinnifolia* Jebb & Prance. Leaves and inflorescence (*NGF (Ridsdale) 31563*, LAE).
Cataphylls not seen. Inflorescences cauliflorous and ramiﬁlorous, 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 obvoid, c. 2.3 by 1.5–2.5 cm, red, tapering towards both ends, persistent rim of calyx present. — Fig. 8; Map 13.


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

45. Barringtonia procera (Miers) R.Knuth


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.


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


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.


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 tetragonal, 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 locale; style c. 3.5 cm long. Fruits distinctly 4-winged, tetragonal, 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 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 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 ramiﬂoros 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 circumsissile. 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, subtetragonal, 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, subtetragonal, tapering towards apex. — Fig. 1a, 9; Map 11.


Habitat & Ecology — Primary and secondary rainforest, mostly in inundated ﬂood- plains 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 aam, Putat aying (Brunei), Putat ayer (Sabah). Philippines: Apálang, Kasouai (Manóbo); Kukut-timbalen (Suli); Magebayabat (Agtá); Nuling, Tuba-tuba (Cebu Bisáya). Palings (Ibanág); Potat, Putat (Tagbanua). Sulawesi: Alakang (Bugis); Kambaha, Wumbalango (Gorontalo); Kungkungan, Mahakungkungan, Malegai (Minahasa); Palam (Manado area); Párag’a (Talaud Is.); Puta (Muna). Moluccas: Ai latalr, Djifal, Tuf (Seram Is.); Arari, Butun darat, Kamlarasarsjawe, Kawetianalas; Palangasa sesil, 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.


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).


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, prominently on both surfaces, intercostal veins prominent 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.


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 prominent above, prominent beneath, primary veins 14–16 pairs, brochidodromous, merging through marginal veins 2–5 mm from margin, prominent on both surfaces, intercostal veins prominent 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.

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**50. Barringtonia ridsdalei** Chantar.


**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 tetragonal, 9–10 mm long, minutely pulverulent; sepals oblong-oblanceolate 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.

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**51. Barringtonia rimata** Chantar.


**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.


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 tetragonal, 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 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, prominent 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 sub lanceolate-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 subtetragonal with rounded edges, 9–13 by 9–10 mm, glabrous; sepal sub orbicular, 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 subglobose, 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


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


*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


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 prominent on both surfaces, primary veins 7–10 pairs, brochidodromous, arching but not joined at margin, prominent on both surfaces, intercostal veins prominent 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 tetragonal 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* tetragonal with distinct wings on edges when young, later ovoid with 8 ridges, 10–12 by 3–5 by 3–5 cm. *Seeds* single, ovoid, tetragonal, 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.
55. **Barringtonia sepikensis** Lauterb.


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
Prance & Kartawinata — Lecythidaceae

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 ramiﬁlorous 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, calyprate, 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 staminalod, 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.


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


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 serena Jubb & 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 circum-scissily 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 round-edged, 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


Type: *Jebb 884* (holo K; iso L, LAE), Papua New Guinea, Madang Prov., Balek Wildlife Reserve, S5°19', E145°43.35'.

Upright leptocaual 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 Champanat’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** spatulate, 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,
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.


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, tetragonal, 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

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, tetragonal, 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.


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 tetragonal, 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


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, tetragonal, 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)


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.


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;
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)


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 sub-terminal, 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,
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** inedible, 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


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

Trees, up to 30 m high, c. 50 cm diameter. **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 diameter.; 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.
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
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)


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.


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, acumens 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 nervèd. 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)

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, basifixied, 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*), campylo-tropous, 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*
Planchonia brevistipitata Kuswata


*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, *stipitate*, *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*. *Infuctescences* 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;
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


Deciduous trees, 3–15 m high. Bark up to 1 cm thick, suberose, scaly, densely 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 spatulate, (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, prominent, 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-mentically, 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.
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).


Trees, up to 31 m high, up to 1 m diam. *Bark* brown, vertically grooved. *Branchlets* dark brown, smooth to striate, c. 0.4 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 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.
4. Planchonia papuana R. Knuth


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); Wanaj (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.


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 oblong 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, arcuate 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, semi-ovate, 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.


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, Malatagun, Motonboton (Bikol); Apalang, Bayok, Lamug, Malaputat, Mauban, Uban (Tagalog); Bansalagun, Buhukan (Panay Bisaya); Llamog (Tagalog, 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


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, aracately 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 turbinated, 1.5–2 cm long, smooth (fresh), glabrous, striate when dry; lobes semiobicular 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), obovate 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.


Note — This species differs from *P. valida* in having larger flowers, bigger, sub-globular 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 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 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 *Barteringonia*, 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,
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.

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).
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.


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**


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**


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