MAGNOLIACEAE (H.P. Nooteboom, Leiden)

Trees or shrubs, glabrous or with an indumentum of single hairs. *Leaves* spirally arranged, simple, entire or 2–10-lobed, penninerved, evergreen or deciduous; stipules present, at first enclosing and protecting the innovations, later caducous and leaving an annular scar around the node. *Flowers* terminal or pseudo-axillary on a short shoot in the axils of the leaves, bisexual, rarely unisexual, pedunculate. Peduncle bearing 1 or more caducous spathaceous bracts which leave annular scars. *Perianth* spiral or spirocyclic, simple or differentiated in calyx and corolla, perianth members 6 or more, free, imbricate. *Stamens* numerous, free, spirally arranged; filaments short or more or less elongated; anthers linear, 2-locular, dehiscing introrsely, latrorsely or rarely extrorsely; connective usually more or less produced into an appendage. *Gynoecium* sessile or stipitate (a gynophore present); carpels numerous to few (rarely one), spirally arranged (except in *Pachylarnax*), free or sometimes concrescent; ovules 2 or more, biseriate on the ventral suture. *Fruit* apocarpous, sometimes syncarpous; fruiting carpels opening along the dorsal and/or ventral suture, or circumscissile, rarely indehiscent. *Seed(s)* 1 or more in each fruiting carpel, large, in dehiscent carpels hanging from the elongated spiral vessels of the funiculus, with arilloid testa, rarely, when fruit indehiscent adherent to the endocarp; endosperm copious, oily; embryo minute.

Distribution. Seven genera in temperate and tropical SE. and E. Asia and from North America southward through the West Indies and Central America to S. Brazil.

Ecology. Several of the tropical species are found at low altitudes, many grow at medium and high altitudes, in Malesia up to *c.* 3500 m.

Pollination. — THIEN (1974) studied the floral morphology of North American *Magnoliaceae*. They are all protogynous. The flowers are pollinated by beetles which enter at all stages from large bud to open flower and feed on stigmas, pollen, nectar, and the secretions of the petals. They become covered with pollen when feeding. Because the pollen is shed after the stigmas cease to be receptive, the first flowers that open often are not pollinated. There are indications that if all the flowers blossom in one flush, as rarely happens after a severe winter, no seed is set (TRESEDER, 1978). The timing of the flowers, including opening and closing of petals, the appression of stigmas to the gynoecium (in some species), large quantities of food, and protogyny all suggest that the flowers are highly specialised for exclusive pollination by beetles. Despite the sharing of pollinators few hybrids have been found in nature. Not enough is known about isolating mechanisms in *Magnolia* to explain fully the lack of natural hybrids. Between several species artificial hybrids easily can be obtained (THIEN, 1974).

References: THIEN, Amer. J. Bot. 61 (1974) 1037–1045; TRESEDER, Magnolias (1978).

Morphology. — *Vegetative morphology.* All *Magnoliaceae* are trees or shrubs with deciduous or persistent stipulate leaves. The stipules are first connate, thus forming a cap for the terminal bud and then rupture longitudinally and fall, leaving a circular scar round the twig. They can be free from the petiole or (partly) adnate to it. Growth of the twigs often is faster in the beginning of the season, thus first producing longer internodes than later. In tropical species, however, there may be no conspicuous difference in length of internodes throughout the twig. In *Liriodendroideae* and in tribe *Magnolieae* of *Magnolioideae* growth is sympodial, and when a flower terminates a twig, the axillary bud of the uppermost leaf or a lower leaf gives rise to the next vegetative shoot which in turn eventually will be terminated by a flower. In tribe *Michelieae* growth is monopodial, the flowers grow from the axil of a leaf and are mostly borne on a brachyblast that consists of two or several internodes.

Flower structure and floral anatomy. — The flowers are borne on a pedicel which mostly is the ultimate internode of a brachyblast (axillary in *Elmerrillia* and *Michelia*; terminal in the other genera). The flower bud is often protected by the stipules of the uppermost leaf, especially in the genera with terminal flowers. In temperate species these stipules often are leathery and/or hairy. The brachyblast, if present, bears one to several spathaceous bracts which also surround and protect the flower bud. Essentially these bracts consist of a petiole (reduced lamina) with its stipules adnate to it, together forming a cap like the one surrounding the vegetative buds. The uppermost spathaceous bract, sometimes called bracteole, surrounds the base of the pedicel. This pedicel can be very short or (nearly) absent or long. The perianth is either spiral throughout, such as in *Magnolia stellata*, or consists of some ternate whorls. Ontogenetic studies have shown that the latter are initiated successively, although they form two tiers. Thus there is a clear transition from the spiral phyllotaxy to a whorled phyllotaxy in perianths of the *Magnoliaceae* (TUCKER, 1960; ERBAR & LEINS, 1982, 1983). While there is often no clear differentiation of calyx and corolla such a separation may exist in some cases, *e.g.* in *Liriodendron*, although UEDA (1986) argues for the regular presence of a true calyx.

Vascular system. — Two vascular systems, a stelar and a cortical system of vascular bundles, are present in the floral axis of the *Magnoliaceae* (SKIPWORTH, 1970). The cortical system arises below the flower, either directly from the stele or as branches of leaf and stipule traces. In general it provides the lateral traces of the flower appendages, while the stelar system gives rise to the median traces. This is true of bracts, perianth members, stamens, and carpels. The stamens are spirally arranged and develop either directly after the tepals and in the same 8 (7–10) parastichies like in *Magnolia stellata* (ERBAR & LEINS, 1982), or after a relatively long interval like in *Magnolia denudata* (*l.c.*) and *Michelia fuscata* (TUCKER, 1960). In *Magnolia denudata* the spiral of the stamens is somewhat irregular.

A number of tropical species has broad 3-veined stamens with two pairs of linear sporangia which are deeply embedded in their surface. They are comparable to those of the *Degeneriaceae* and *Himantandraceae*. CANRIGHT (1952) describes several trends of specialisation in the stamens of the *Magnoliaceae* such as: (1) elongation of the apices; (2) differentiation of a filament; (3) reduction in number of veins from three to one; and (4) the transition from a laminal to a marginal position of the sporangia. Teratological stamens often occur, which range from broad petaloid stamens to narrow filamented ones. These different forms were found in the same flower of *Michelia champaca*. Also carpels with varying degrees of fertility were found among the stamens.

The carpels are arranged spirally on the lengthened receptacle. Their phyllotaxy was studied in *Magnolia stellata* (ERBAR & LEINS, 1982) and *Michelia fuscata* (TUCKER, 1961). They arise in the same spirals as stamens and tepals, *i.e.* 8 (sometimes 7, 9) parastichies. In *Michelia* different divergence angles were found to occur in different flowers.

In contrast to the more primitive Ranalean families, the carpels of the *Magnoliaceae* and the related *Himantandraceae* (CANRIGHT, 1960) appear strongly advanced. The most significant specialisations are: (1) the closure of the fertile part of the carpel; (2) the restriction of the external stigmatic surfaces to the margins of the conduplicate style; and (3) conspicuous changes in the vascularisation of the carpels. There is also a tendency towards a reduction in the number of ovules (to two in many *Magnoliaceae*) and to lateral adherence or actual concrescence of crowded carpels. In summary the carpels of *Magnoliaceae* exhibit more or less advanced stages of phylogenetic modification. The carpels, like the stamens, are supplied by three veins. The dorsal traces commonly originate from the stelar system while the two ventral traces originate from the cortical system. CANRIGHT (1960), however, found in cleared material from *Michelia champaca* that 'not uncommonly, the basal carpels of a gynoecium are vascularized entirely by the cortical system, and the apical carpels entirely by the stelar system.'

VAN HEEL (1981, 1983) suggests that the carpels are basically cupuliform. His SEM studies show that carpels arise as cup-shaped (ascidiate) or partly cup-shaped organs lateral or terminal on the flower apex. According to CANRIGHT the margins of the carpels become adnate to the floral

axis. According to VAN HEEL's observations there is no later fusion, but already in an early state there is no abaxial margin present. On the side of the floral axis the cup is deepened secondarily, and the ovules originate in it on the inside margin close to the floral axis when an ovary and a style have not yet differentiated.

Fruits. — The fruits of *Magnolioideae* principally consist of several to many (in *Michelia montana* sometimes one) free carpels spirally arranged around the receptacle. The fruiting carpels are woody and entirely free in some taxa while they are, secondarily, more or less connate in others. The young carpels are always free when initiated, and only relatively late in ontogeny they may become concrescent. Dehiscence of the mature carpels is mostly along the dorsal suture, often also along the ventral suture. Sometimes the carpels become bivalved, the 2 valves only adnate to the central axis, shedding their seeds. Sometimes the carpels form a pseudosyncarp, becoming more or less concrescent. But only the outer layers of the exocarpium are really concrescent, giving the fruit the appearance of a syncarp. In the latter case the dorsal (abaxial) parts of the carpels finally fall away leaving their base, which is inbedded in the receptacle, exposed with the seeds mostly hanging from their placenta on the elongate funicle which in that stage consists of spirally thickened vessels. In some taxa the abaxial parts of the carpels when falling also dehisce along the dorsal suture (*'Tsoongiodendron'*, but also in some *'Talaumas'* and in *'Manglietiastrum'*). In *Magnolia nitida* and *M. kachirachirai* the carpels are essentially connate. When maturing they tear apart and dehisce along the dorsal suture thus giving the appearance of a common *Magnolia* fruit. This condition probably exists in many species with crowded carpels. The concrescence of the carpels has apparently developed independently in different lineages of *Magnoliaceae*. Species with free and concrescent carpels sometimes are very closely allied, judging from the other characters. In *Liriodendron* the fruits are free, indehiscent, samaroid (produced at the apex into a wing-like beak) and, contrary to *Magnolioideae*, caducous.

Seed. — In *Magnolioideae* the seeds are exposed, hanging from the dehiscent carpels. In *Liriodendron* the testa is adherent to the endocarp and the seed falls with the fruit. The seed coat is organised chiefly from the outer integument while the inner integument is represented by a layer of crushed cells. In a ripe seed the testa consists of an outer fleshy region (sarcotesta) comprising the epidermis of the outer integument, 2 or 3 layers of tangentially elongated cells, a 10–12 layered fleshy zone, 2 or 3 layers of tangentially compressed cells, and an inner stony region of 3 or 4 layers of lignified cells. In *Liriodendron* no sarcotesta is formed. The same tissue remains thin-layered and becomes partly sclerotic. The differences in seed coat structure between *Magnolia* and *Liriodendron* are clearly associated with differences in seed dispersal (BOUMAN, 1977).

The seed has such primitive features as the multiplicative sarcotesta, stomata, ligneous sclerotesta (endotesta *sensu* CORNER), massive chalaza, copious endosperm, and minute embryo. It is advanced in the apparently functionless nature of the tegmen, perhaps in loss of rumination, and in the substitution of the aril by the sarcotesta. The specialities of the seed of *Magnolioideae* are the pink pellicle of the sarcotesta, the nature of the cells composing the multiple endotesta, and the tubular lignified sheath around the chalaza. The lignified cells of the sclerotesta are peculiar and need study by electron microscopy. A system of lignified filaments pervades each cell as if the endoreticulum were lignified (CORNER, 1976). TIFFNEY (1977) studied the sclerotesta of many living and fossil species and found that it is possible to recognise morphological distinctions between the genera and in many cases between species within a genus.

Embryology. — The anther wall at the microspore mother cell stage comprises epidermis, endothecium, 2–4 middle layers, and a bilateral glandular tapetum. By the time the cytokinesis is completed in the microspore mother cells, a large number of Ubisch granules line the inner walls of the tapetum. In a fully mature anther the papillate epidermis and endothecium along with 2 or 3 middle layers persist. After meiosis II in the microspore mother cell the cytokinesis takes place by furrowing, resulting in tetrahedral or isobilateral tetrads. The mature pollen is shed at the 2-celled stage. The generative cell is surrounded by a thin sheath of finely granular cytoplasm and a delicate membrane.

The ovules are anatropous, bitegmic, and crassinucellate; the outer integument is vascularised. The hypodermal archesporium is multicellular and of hypodermal origin although ultimately only one cell functions. The primary parietal cell divides repeatedly to form the parietal tissue so that the megaspore mother cell is buried deep in the nucellus. At the end of meiosis II linear or T-shaped megaspore tetrads are formed. The chalazal megaspore functions, giving rise to the *Polygonum* type of embryo sac. The synergids and antipodal cells are ephemeral. The endosperm is cellular from the beginning, and embryogeny conforms to the *Myosurus* variation of the *Onagra* type or is irregular (HAYASHI, 1964, 1966; BHANDARI, 1971; DAVIS, 1966).

References: BHANDARI, J. Arn. Arb. 52 (1971) 1–40, 285–304; BOUMAN, Acta Bot. Neerl. 26 (1977) 213–223; CANRIGHT, Amer. J. Bot. 39 (1952) 484–497; *ibid.* 47 (1960) 145–155; CORNER, Seed of Dicotyledons (1976) 177; DAVIS, Systematic embryology of the Angiosperms (1966) 167; ERBAR & LEINS, Beitr. Biol. Pflanzen 56 (1982) 225–241; Bot. Jahrb. 103 (1983) 433–449; HAYASHI, Sci. Rep. Tohoku Univ. ser. IV Biol., 30 (1964) 89–98; *ibid.* 32 (1966) 111–118; VAN HEEL, Blumea 27 (1981) 499–522; *ibid.* 28 (1983) 231–270; SKIPWORTH, Phytomorphology 20 (1970) 228–235; TIFFNEY, Bot. J. Linn. Soc. 75 (1977) 299–323; TUCKER, Amer. J. Bot. 47 (1960) 266–277; *ibid.* 48 (1961) 60–71; UEDA, Bot. Mag. Tokyo 99 (1986) 333–349.

Anatomy. — *Vegetative anatomy*. The epidermal cells are irregular in form, less often polygonal and with sinuous, curved or nearly straight walls which are often thickened. Many members of the family have a modified subepidermal layer (hypodermis) beneath the upper epidermis, some have such a layer associated with both upper and lower epidermis, and few have it only with the lower epidermis. Many species lack specialised subepidermal cells entirely.

Hairs may be present on both the upper and lower epidermis, or only on the lower. In some species the leaves lack hairs altogether. They are uniseriate, consisting of one to several or many cells. Several types of hair base have been distinguished by BARANOVA (1972), of which the most primitive occurs in *Manglietia* while the most advanced are found in *Elmerrillia*, *Michelia* (*Tsoongiodendron*), and in some scattered species of *Magnolia*.

The stomata are paracytic in *Magnolioideae* (but in rare cases NONG VAN TIEP, 1980: 519, found also anomocytic stomata in *Manglietia*) and paracytic as well as anomocytic in *Liriodendroideae*. They are confined to the lower surface. Significant thickenings on the walls of the epidermal and subsidiary cells, as well as strongly developed cuticular thickenings on the outer wall of the guard cell, occur mainly in the tropical sections of *Magnolia subg. Magnolia* as well as in many Asian species of *Magnolia subg. Talauma*. Foliar sclereids are present in certain taxa. They vary widely in form, size, wall thickness, pitting, and degree of ramification. They may be found in four tissues or cell assemblages: First, as idioblastic sclereids in the petiole and along the midrib, especially in evergreen leaves; less frequently in the mesophyll, in dermal layers and in the vein sheath system including veinlet endings.

Taxonomically the mentioned characters are of different value. Each genus shows a particular range of features, some of which can be used diagnostically to separate taxa above the genus level. The coriaceous texture of tropical leaves is achieved in various ways arising from the variable form and diverse distribution of the sclereids. *Magnolia subg. Talauma* species characteristically have the entire vein system of the leaf encased in sclerenchymatous sheaths, and the veinlets terminate in sclerified elements. *Manglietia* species in contrast have parenchymatous vein sheaths near the terminations and lack sclerified terminal cells, but most of the mesophyll and epidermal cells are sclerified. *Manglietia* leaves are characterized by sclerified epidermal and hypodermal layers, sclerified arm parenchyma in the mesophyll, unlignified lobate vein-sheath cells, and an absence of either sclerified veinlet terminal cells or a sclerified leaf margin. No other genus combines all those features, although some do show one or more. Sterile specimens of *Manglietia* can easily be recognized on the basis of cleared leaf segments.

Magnolia subg. Magnolia and *subg. Talauma* and *Michelia* exhibit in many of their members sclerified terminal veinlet cells, thick sclerified leaf margins, and stellate sclereids along the midrib. Rarely those features may be diagnostic for species, but in most cases they are too common

to be useful. The foliar characteristics of *Magnolia subg. Talauma* include veinlets terminating in thick-walled stellate sclereids and thinner walled tracheary elements. These cell types are typically absent from temperate zone *Magnolia* sections and therefore are possibly an adaptation to climatic conditions. In all the Asian species of *subg. Talauma* examined there is a thick sclerified margin, usually including a vein. In the American species this is absent but in few of them a weak approach to this condition is seen.

The massive marginal ridge helps to identify certain species of *Magnolia subg. Talauma* and *subg. Magnolia, Manglietia* (3 *spp.*), and *Michelia* (3 *spp.*).

In *Alcimandra, Liriodendron, 'Paramichelia'*, and most *Elmerrillia* species foliar sclereids are rare. This may indicate that these taxa have not developed vegetative modifications different from those of the related large genera (mainly after BARANOVA, 1972 and TUCKER, 1977).

Wood anatomy (largely from H. GOTTWALD, a manuscript of a lecture given for the International Association of Wood Anatomists in Amsterdam, which he kindly put at my disposal). Wood anatomy is homogeneous throughout the family. The secondary xylem shows a well developed fibrous ground tissue of thin to medium thick-walled fibres, with diameters from 15 to 25 μm depending on the species. The vessels are mostly evenly distributed, except for the temperate species which show (semi-)ring-porous tendencies. Vessel diameter ranges from 50 to 180 μm on average. The rays are nonstoried, mostly 3 cells wide and 0.5–1 mm high. The axial parenchyma is mainly banded and marginal (bands 1–2(–12) cells wide). CHOWDHURY (1964) established the annual periodicity of these parenchyma bands, even in the tropical *Michelia champaca*. For other tropical species the periodicity of the parenchyma bands remains to be studied, and is probably not annual. Only in *Magnolia subg. Talauma* the bands tend to fork. The paratracheal parenchyma is usually scanty or in some species virtually absent. The parenchyma cells do not contain any kind of crystals, nor are there any phenolic substances found in the vessels. There are some striking anatomical details occurring only in groups of individual taxa. Firstly the primitive vessel pitting varying from purely scalariform to opposite. The vessel perforations are mostly scalariform with only 1 to 15 bars. In the advanced taxa *Liriodendron* and *sect. Yulania* of *Magnolia* also simple vessel perforations occur, always in connection with opposite pits. A rare feature is the occurrence of amorphous silica as a coating on the cell walls including the tyloses, or as solid occlusions completely occluding the lumina. Complete solid plugs of silicium dioxide occur in all species of *sect. Blumiana* of *Magnolia subg. Talauma* and in the monotypic *sect. Lirianthe* of *Magnolia*. The estimated volume percentage of silica is up to 8%, based on air-dried volume; sometimes almost every vessel is filled with silicium dioxide. This means that these taxa belong to the woody species with the highest silica content known in the vascular plants. Spiral thickenings on the vessel walls are a further special feature of limited occurrence in *Magnoliaceae*. They are only weakly pronounced and hard to detect.

Some peculiar idioblastic parenchyma cells are found mainly between the marginal cells of the rays. They are thin-walled, have mostly amorphous brownish contents, and are often referred to as 'oil cells', although their chemical nature is still unknown. These enlarged cells are of irregular distribution so that their taxonomic value is limited. Silica bodies which occur in the ray cells of a few species in *sect. Maingola* of *Magnolia* and in *sect. Blumiana* of *Magnolia subg. Talauma*, point to their close relationship. Crystalline inclusions are found in fine wood-splits of *Magnolia subg. Magnolia* and *subg. Talauma*; they consist of calcium carbonate and are always of traumatic origin. The last special item concerns the occurrence of tyloses in the fibres, besides those in the vessels. This rare feature was observed in 24 species, belonging to 7 genera and subgenera.

The homogeneity of characters enhances a mixture of overlapping structural details which is detrimental to the internal classification of the family. The largest genus, *Magnolia* (without *subg. Talauma*) includes almost all structural traits which are otherwise distributed over the remaining genera.

There are only few taxa which can be distinguished anatomically such as the genus *Liriodendron*, which has neither spirals in the vessels nor tyloses in the fibres. *Magnolia sect. Yulania* is

characterized by simple perforations, and *Magnolia subg. Talauma sect. Blumiana* by its silica-bearing vessels and the pronounced heterogeneity of the rays. *Magnolia subg. Talauma sect. Aromadendron* differs from the rest of *subg. Talauma* in that the pores are almost twice the size of the investigated Asian species of subg. *Talauma*. They are also the largest in the whole family (CANRIGHT, 1955).

Differences are also apparent in the distribution of wood parenchyma and of characteristics of fibre tracheids. In this respect *Elmerrillia* falls within the range of *Michelia* whereas *Kmeria* is indistinguishable from many tropical *Magnolia* species. There is little difference in the wood anatomy of *Manglietia* and many temperate *Magnolia* species. Although neither the primitive nor the advanced wood anatomical characters are confined to any one genus, there are many indications that the woods of the temperate species of *Magnolia* and *Liriodendron* are the most specialized. *Magnolia subg. Talauma* exhibits the largest assemblage of primitive characters. The tropical *Magnolia paenetalauma* from Hainan exhibits a great number of primitive features. Also in the external morphology the species of *sect. Gwillimia*, to which this species belongs, resemble the species of *subg. Talauma* so closely that they cannot be distinguished in absence of fruits.

References: BARANOVA, Taxon 21 (1972) 447–469; CANRIGHT, J. Arn. Arb. 36 (1955) 119–140; CHOWDHURY, J. Indian Bot. Soc. 43 (1964) 334–342; GOTTWALD, Wood Sci. Technol. 6 (1972) 121–127; METCALFE & CHALK, Anatomy of the Dicotyledons ed. 2, 3 (1987) 24–33; NONG VAN TIEP, Feddes Rep. 91 (1980) 497–576; TUCKER, Bot. J. Linn. Soc. 75 (1977) 325–356.

Chromosomes. The basic chromosome number is x = 19. Polyploidy has been demonstrated in *Magnolia*. In wild species diploidy as well as tetraploidy is found. TRESEDER (1978: 208) reports for cultivated *Magnolias* besides diploid, also triploid, tetraploid, pentaploid, hexaploid, heptaploid, and octoploid numbers, while aneuploid numbers also are recorded.

The chromosomes are characteristically small, short rods (WHITAKER, 1933). The chromosome base number of all Angiosperms is 7, the higher numbers are derived from it by palaeopolyploidy (EHRENDORFER *c.s.*, 1968). The same basic chromosome number of 19 is found in *Myristicaceae* (also 21) and *Monimiaceae* (also 22).

References: EHRENDORFER *c.s.* Taxon 17 (1968) 337–468; TRESEDER, Magnolias (1978); WHITAKER, J. Arn. Arb. 14 (1933) 376–385.

Phytochemistry. Chemical characters of the family were summarized and analyzed by HEGNAUER (1969). A general occurrence of essential oils deposited in large idioblasts and of alkaloids of the biosynthetic pathway resulting in the so-called benzyltetrahydroisoquinoline family of alkaloids comprising among others benzylisoquinolines, bisbenzylisoquinolines, aporphines, oxoaporphines, and protoberberines was stressed. Leaf phenolics were represented mainly by kaempferol, quercetin, rhamnetin, procyanidins, and caffeic acid. At the same time a total lack of flavonols with trihydroxylated B-ring, of ordinary flavones and of galli- and ellagitannins had been demonstrated. Other characters mentioned are strongly silicified leaves in many taxa, oil-rich seeds without starch, and a strong tendency to store cyclitols in *Liriodendron* (liriodendritol), *Magnolia subg. Magnolia* (pinitol) and *subg. Talauma* (quercitol). The sporadic occurrence of lignans (lirioresinol), neolignans (magnolol), coumarin glycosides (magnolioside), cyanogenic compounds (not identified), and of the sesquiterpene lactones costunolide and parthenolide was noted. The totality of known chemical characters was interpreted as being highly typical of *Polycarpicae*.

In the meantime much additional phytochemical research was performed with members of the genera *Alcimandra, Elmerrillia, Liriodendron, Magnolia subg. Magnolia* and *Talauma*, and *Michelia*. In each instance alkaloids were isolated, some being new compounds and some already known from other members of *Policarpicae*. All, however, belong to the phenyltetrahydroisoquinoline class. The oxoaporphine liriodendrine and the quaternary aporphine magnoflorine seem to be nearly ubiquitous. New features are the rather general occurrence of biologically active sesquiterpene lactones belonging to the germacranolide, eudesmanolide, elemanolide, and guaianolide groups of these constituents, and of lignans and neolignans (together called ligna-

noids). Hitherto sesquiterpene lactones were isolated from species of *Liriodendron, Magnolia*, and *Michelia*. All species investigated for lignanoids were shown to contain such metabolites. Today many individual compounds are known from members of *Liriodendron, Magnolia subg. Magnolia* and *Talauma*, and *Michelia*; they represent at least 12 different structural types. Cyanogenic compounds were detected in *Liriodendron tulipifera* (taxifolin and triglochinin) and in *Magnolia sprengeri cv. 'Diva'* (taxifolin). They belong to the tyrosine-derived class of cyanogens.

From the taxonomic point of view the secondary metabolism of *Magnoliaceae* can be considered as highly characteristic of *Polycarpicae* and closely related orders such as *Piperales* and *Aristolochiales*. They all have essential oils in idioblasts and comprise members synthesizing benzylisoquinolines. Similar lignanoids are presently known, among others, from *Aristolochiaceae, Eupomatiaceae, Lauraceae, Myristicaceae, Piperaceae*, and *Trimeniaceae*. Sesquiterpene lactones occur also in *Chloranthaceae* and *Lauraceae*. They form one of the arguments for the proposition of an evolutionary line *Polycarpicae — Rutales — Umbelliferales s.str. — Asterales.* — R. HEGNAUER.

Palynology. (After PRAGLOWSKI, 1974). The pollen grains of *Magnoliaceae* are 1-(ana)colpate, bilateral, heteropolar. Aperture simple, with markedly thin, frequently slightly undulated margins. Colpus usually longer, occasionally as long as, or rarely shorter than the longest axis. Colpus invagination usually absent or insignificant. Exine structure in tectate grains (about 95%) consists of a continuous tectum perforatum supported by columellae which have no geometrical connection with the tectum or with the supratectal elements. In rarely occurring semitectate grains the exine structure is microreticulate, without sculpturing. Sculpturing rugulose or absent (tectum smooth). Sexine at the proximal face thicker than nexine, usually twice or more. Columellae minute, usually indistinct.

Elmerrillia pollen grains show partly similarity with pollen grains of *Michelia*, but the microreticulate structure of the grains of *E. tsiampacca ssp. mollis* is rather unique showing no resemblance to *Michelia* pollen. The reticulum is considerably coarser than that of *Pachylarnax* pollen grains.

Michelia, Paramichelia, and *Tsoongiodendron* possess pollen grains that are very similar. *Pachylarnax* possesses pollen with microreticulate exine structure consisting of thin muri encompassing very minute lumina. This rather peculiar exine structure is more delicate than that in other *Magnoliaceae*. Similarly, the rather symmetric ellipsoidal shape of the pollen makes it quite difficult to include them among typical magnoliaceous pollen.

Alcimandra pollen possesses an exine without sculpturing which shows sometimes resemblance with *Talauma* pollen. *Magnolia* pollen grains show a rather large morphological variation; nearly all the pollen types of subfamily *Magnolioideae* are found in *Magnolia*. Pollen grains of *Elmerrillia* and *Michelia* show slight differences to that of *Magnolia*. *Manglietia* pollen grains show a high morphological similarity to those of *Magnolia*. *Talauma* pollen grains show features similar to those encountered in *Magnolia subg. Magnolia*. *Aromadendron* pollen grains show similarity to *Alcimandra* pollen grains, but also with those of *Magnolia sect. Maingola*.

On palynological evidence the joining of *Michelia, Tsoongiodendron*, and *Paramichelia* is strongly supported. The same holds for *Manglietia, Magnolia*, and *Talauma*, while the joining of *Aromadendron* with *Magnolia* is not contradicted.

Reference: PRAGLOWSKI, World Pollen and Spore Flora 3 (1974).

The family can easily be divided into two subfamilies, *Magnolioideae* and *Liriodendroideae*, the latter not in Malesia.

SUBFAMILY MAGNOLIOIDEAE

Leaves entire or occasionally two-lobed at the apex; stipules free from the petiole or adnate to it. Anthers introrse or latrorse. Fruiting carpels longitudinally dehiscent or circumscissile, at least the base remaining adnate to the torus, free or concrescent into a syncarp. Testa free from the endocarp, externally arilloid.

In *Magnolioideae* two tribes can be recognized clearly.

KEY TO THE TRIBES

1. Growth sympodial. Flower buds arising terminal on the twigs ..... **1. Tribus Magnolieae**
1. Growth monopodial. Flower buds arising on brachyblasts in the axils of the leaves **2. Tribus Michelieae**

1. Tribus Magnolieae

Growth sympodial. Flower buds arising terminal on the twigs, the latter growing in length from an axillary bud of one of the upper leaves. Genera: *Magnolia* (incl. *Talauma, Alcimandra, Manglietiastrum* and *Aromadendron*), *Manglietia, Kmeria* (not in Malesia), and *Pachylarnax.*

KEY TO THE GENERA

1. Fruit consisting of few to many separate free or connate carpels along the torus.
 2. Ovules 4 or more in each carpel. The hair base replaces a normal epidermal cell, so that the loss of a hair leaves a pore in the cutical membrane. Leaf anatomical characters: sclerified epidermal and hypodermal layers, sclerified arm parenchyma in the mesophyll, unlignified vein-sheath cells, absence of either sclerified veinlet terminal cells or a sclerified leaf margin ..... **2. Manglietia**
 2. Ovules 2 in each carpel (4 in *Magnolia kachirachirai*), sometimes 4 in the lower carpels. The hair base consists of at least two epidermal cells. The hair does not leave a pore when falling ..... **1. Magnolia**
1. Fruit a woody loculicidal capsule composed of few (2–8) concrescent carpels. Tepals 9–15, subequal. Ovules about 4–8 in each carpel. Stipules free from the petiole ..... **3. Pachylarnax**

1. MAGNOLIA

LINNÉ, Sp. Pl. (1753) 535; Gen. Pl. ed. 5 (1754) 240; DANDY, Kew Bull. (1927) 259; in Hutch. Gen. Fl. Pl. 1 (1964) 55; in Treseder, Magnolias (1978) 29; NOOT. Blumea 31 (1985) 83; *ibid.* 32 (1987) 343. — Type: *M. virginiana* LINNÉ, E. United States.

Talauma JUSS. Gen. Pl. (1789) 281; DANDY, Kew Bull. (1927) 259; in Hutch. Gen. Fl. Pl. 1 (1964) 55. — *Magnolia sect. Talauma* BAILLON, Adansonia 7 (1866) 3, 66; NOOT. Blumea 31 (1985) 83. — *Magnolia subg. Talauma* PIERRE, Fl. For. Cochinch. 1 (1881) *sub* t. 1. — *Violaria* Post & O. K. Lexic. Gen. Pl. (1903) 588, *p.p.* — Type: *T. plumierii* (SCHWARTZ) A.DC. (*Magnolia plumierii* SCHWARTZ).

Aromadendron BLUME, Bijdr. (1825) 10; Fl. Java Magnol. (1829) 25 (*'Aromadendrum'*); DANDY, Kew Bull. (1927) 259; in Hutch. Gen. Fl. Pl. 1 (1964) 55.

— *Violaria* POST & O. K. Lexic. Gen. Pl. (1903) 588, *p.p.* — *Talauma sect. Aromadendron* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70 (*excl. T. vrieseana*). — Type: *A. elegans* BLUME.

Blumia NEES, Flora 8 (1825) 152, *non Blumea* DC., *nom. conserv.* — Type: *Talauma candollei* BLUME.

Alcimandra DANDY, Kew Bull. (1927) 260. — Type: *A. cathcartii* (HOOK.*f.* & THOMS.) DANDY. — **Fig. 1–6.**

Trees or shrubs. Stipules adnate to or free from the petiole. *Flowers* terminal, solitary, bisexual. *Tepals* 9–21, 3–5-merous, subequal or more rarely the outer whorl forming a true calyx. *Anthers* introrse to latrorse, connective produced into a longer or shorter appendage or rarely unappendaged. *Gynoecium* sessile or in some species stipitate; carpels many to few, usually free but connate in *sect. Talauma*, *sect. Gynopodium*, and in some other species. Fruiting carpels free, crowded, dehiscent along the dorsal suture, in *subg. Talauma* the basal parts of the ripe carpels staying adnate to the torus, the apical parts falling and thus exposing the seeds which hang from the lengthened funiculus, sometimes the apical parts during or before falling dorsally dehiscing; in some species of *sect. Gynopodium* the carpels connate but tearing apart when maturing and dehiscing dorsally. *Ovules* generally 2 in each carpel, rarely 3 or 4 in the lower carpels, in few species up to 4 or 5 in all carpels. Ripe *seeds* often hanging from the funicles which lengthen through uncoiling of the spiral vessels.

Distr. About 120 *spp.* of which about one third in the New World from SE. North America to S. Brazil, the remainder in temperate and tropical SE. Asia from the Himalayas to China, Japan, Taiwan and Malesia. In *Malesia* represented by *sect. Maingola* of *subg. Magnolia*, and *sect. Blumiana* and *sect. Aromadendron* of *subg. Talauma*.

Note. Two species of *subg. Magnolia* are commonly cultivated in Malesia, *M. coco* (LOUR.) DC. and *M. grandiflora* L. *Magnolia coco* (of *sect. Gwillimia*) differs from the species in *sect. Maingola* because the stipules are adnate to the petiole. The species can be distinguished from *sect. Blumiana*, especially from *M. candollii*, by the midrib being not prominent on the uppersurface. *Magnolia grandiflora* (of *sect. Theorodon*) has petals of 7 cm long or even longer while those in *sect. Maingola* never exceed 5 cm. The stamens in *M. grandiflora* are 2–3 cm long and the densely appressedly pubescent brachyblast 8 mm diam. or more.

KEY TO THE SECTIONS
(only in Malesia)

1. Stipules free from the petiole. Midrib not prominent above.
 2. Fruits with free carpels ..... **1. *Sect.* Maingola**
 2. Fruits with connate carpels ..... **2. *Sect.* Aromadendron**
1. Stipules adnate to the petiole. Midrib prominent above ..... **3. *Sect.* Blumiana**

To make identification of collections without fruits possible, besides the keys to the species of each section a separate key is given to the sections *Maingola* and *Aromadendron* together.

KEY TO THE SPECIES OF SECTIONS MAINGOLA AND AROMADENDRON

1. Young twigs and underside of leaves hairy. Carpels free in fruit.
 2. Gynoecium hairy.
  3. Young twigs pubescent or pilose. Scars of perianth and stamens along 5–9 mm of the torus under the fruit. Stamens 7.5–12 mm, the 2–3 mm long connective appendage not included .. **1. M. macklottii**

3. Young twigs densely woolly hairy. Scars of perianth and stamens along 10–15 mm of the torus. Stamens 6–9 mm long, the 1.5–2 mm long connective appendage not included ..... **3. M. maingayi**
2. Gynoecium glabrous.
4. Scars of perianth and stamens along 5–9 mm of the torus under the fruit. Stamens 7.5–12 mm, the 2–3 mm long connective appendage not included. Outer tepals 3.5–4 cm long ..... **1. M. macklottii**
4. Scars of perianth and stamens along 10–20 mm of the torus under the fruit. Stamens *c.* 6 mm long, the *c.* 5 mm long connective appendage not included ..... **4. M. uvariifolia**
1. Young twigs mostly and underside of leaves always glabrous. Carpels free or connate in fruit.
5. Tepals *c.* 18 or more. Carpels connate in fruit. Connective appendage 10–15 mm. Petiole 8–25 mm. Pedicle 0–10 mm. Alveoles in general more than 0.5 mm diam. Reticulation on the upper surface quite distinct.
6. Leaves mostly narrowly elliptic; primary nerves in 11–16 pairs. Pedicle 5–10 m. Outer tepals 4, 4.5–7 cm, inner tepals 15–33. Connective appendage 12–15 mm ..... **6. M. elegans**
6. Leaves mostly obovate; primary nerves in 8–12 pairs. Pedicle absent. Outer tepals 3, *c.* 2 cm long, inner tepals *c.* 15, connective appendage 10–12 mm ..... **7. M. bintuluensis**
5. Tepals at most 12. Carpels free or connate in fruit. Connective appendage 0.5–15 mm.
7. Stamens *c.* 10, 4 mm long, the connective appendage *c.* 7 mm. Carpels *c.* 6. Pedicle absent, scars of stamens and perianth at most 1 mm ..... **10. M. pahangensis**
7. Stamens more than 10 and longer than 4 mm. Carpels in general many.
8. Petiole 2.5–5 cm. Pedicle 7–8 mm. Gynophore 5–10 mm. Carpels connate in fruit. **8. M. ashtonii**
8. Petiole 3–17 mm. Pedicle 0–5 mm. Gynophore 0–5 mm. Carpels free or connate in fruit.
9. Outer tepals 4, *c.* 4.5 cm long. Stamens 9–14 mm, the 10–15 mm long connective appendage not included. Scars of tepals and stamens under the fruit along *c.* 5 mm of the torus. Carpels connate in fruit ..... **9. M. borneensis**
9. Outer tepals 3, 1.5–4 cm long. Stamens 5–12 mm, the 0.5–3 mm long connective appendage not included. Scars of tepals and stamens under the fruit along *c.* 1–9 mm of the torus. Carpels free in fruit.
10. Stamens (5–)7.5–12 mm, the 2–3 mm long connective appendage not included. Scars of tepals and stamens along 5–9 mm of the torus. Carpels many (rarely less than 15) ..... **1. M. macklottii**
10. Stamens 5–10 mm, the 0.5–3 mm long connective appendage not included. Scars of tepals and stamens under the fruit along 1–3 mm of the torus. Carpels 1–15.
11. Stamens *c.* 5 mm, 0.5–1 mm long connective appendage not included. Scars of perianth and stamens along 1 mm of the torus ..... **5. M. phaulantha**
11. Stamens 5–10 mm, the 1–1.5 mm long connective appendage not included. Scars of perianth and stamens along 2–3 mm of the torus ..... **2. M. carsonii**

I. Subgenus Magnolia

Ripe fruits consisting of free carpels which dehisce along the dorsal suture. Anthers dehiscing introrsely. Flowers neither precocious nor with a much reduced calyx-like whorl of outer tepals. Leaves in Asia evergreen.

Only one section indigenous:

I. Section Maingola

DANDY, Curtis Bot. Mag. 155 (1948) *sub* t. 16; NOOT. Blumea 31 (1985) 88; *ibid.* 32 (1987) 346.

KEY TO THE SPECIES

1. Carpels many, or at least 15 (rarely in *M. macklottii* fewer). Scars of perianth and stamens in fruit along 5–20 mm of the torus.
2. Twigs (long) yellowish pubescent, pilose, or glabrous. Scars of perianth and stamens in fruit along 5–9 mm of the torus ..... **1. M. macklottii**
2. Twigs woolly hairy when young. Scars of perianth and stamens in fruit along 10–20 mm of the torus.

3. Fruits hairy, 5–8 cm long. Scars of perianth and stamens in fruit along 10(–15) mm of the torus. Brachyblast 1–5 cm ..... **3. M. maingayi**
3. Fruits glabrous, 7–12 cm long. Scars of perianth and stamens in fruit along 10–20 mm of the torus. Brachyblast 4.5–11 cm ..... **4. M. uvariifolia**
1. Carpels at most 15. Scars of perianth and stamens in fruit along 1–3 mm of the torus.
4. Scars of perianth and stamens in fruit along *c.* 1 mm of the torus. Petiole 5–10 mm **5. M. phaulantha**
4. Scars of perianth and stamens in fruit along 2–3 mm of the torus. Petiole 6–18 mm.. **2. M. carsonii**

1. Magnolia macklotti (KORTH.) DANDY, Kew Bull. (1927) 263; BACKER & BAKH.*f.* Fl. Java 1 (1963) 97; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 141; Blumea 32 (1987) 347. — *Manglietia macklottii* KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 97; MIQ. Fl. Ind. Bat. 1, 2 (1858) 15, excl. coll. Haleban; Suppl. (1860) 153; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 71, excl. coll. Haleban. — Type: KORTHALS (L; BO), Sumatra, Mt Singalan.

M. javanica K. & V. Bijdr. 4 (1896) 315; Exk. Fl. Java 2 (1912) 239; KOORD.-SCHUM. Syst. Verz. 1, Fam. 95 (1913) 2; K. & V. Atlas 4 (1918) t. 800; RANT, Nat. Tijd. Ned. Ind. 89 (1929) 446. — *M. pealiana* (*non* KING) K. & V. Bijdr. 4 (1896) 148, 314 (*err.* '*pealii*'). — Lectotype: KOORDERS 4520 (L; BO).

Michelia beccariana AGOSTINI, Atti Com. Accad. Fisiocrit. Siena IX, 7 (1926) sep. 23. — *M. beccariana* (AGOSTINI) NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 141, *nom. inval.* — Type: BECCARI P.S. 116 (FI; BM, K, photo in L), Sumatra, Mt Singalan.

M. aequinoctialis DANDY, Kew Bull. (1928) 185. — Type: Houtvester Sumatra's Oostkust 25 (BO; L), Sumatra, Karolanden.

Shrub or treelet, or tree to 23 m (–50 m, once recorded) high by 43(–50) cm diam. Twigs long yellowish pubescent or pilose, or sometimes glabrous, glabrescent when older; stipules densely yellowish appressedly to patently long soft hairy, rarely nearly glabrous, 3–9 cm. *Leaves* appressedly or patently pubescent, especially on midrib and nerves, often glabrescent, or glabrous below, ± elliptic to narrowly obovate, 12–25 by 3–9 cm; base acute; acumen *c.* 5–15 mm; midrib much prominent below; nerves in 12–22 pairs, much prominent in the undersurface, less so above; intramarginal vein prominent on both surfaces; reticulation densely netted and much prominent on both surfaces. Petiole 5–15 mm. *Brachyblast* appressedly pubescent, rarely (nearly) glabrous, often very slender, 2.5–8 cm long; pedicel absent; spathaceous bracts only one pair. Outer *tepals* three, 2–3 by *c.* 0.7–1.5 cm; inner tepals 6, in two rows, as long as or slightly shorter than outer ones, 5–10 mm broad. *Stamens* 20–many, filament 1.5–2 mm long, anthers 3.5–10 mm, connective appendage triangular, acute, 2–3 mm long; carpels glabrous, glaucous, or yellowish tomentose, 15–*c.* 50, rarely fewer than 15. *Fruits* cylindric, distorted by the abortive carpels, *c.* 2.5 cm broad and up to 5 cm long, torus with scars of perianth and stamens 5–9 mm long.

Distr. *Malesia*: Sumatra, Malay Peninsula (Perak), Java, Borneo (Sabah).

Note. The flowers are creamy, the outer tepals more greenish.

a. *var.* **macklottii.** — *M. javanica* K. & V.

Leaves mostly elliptic. Flower buds and carpels glabrous.

Distr. *Malesia*: Sumatra (W. coast, G. Singgalan, Palembang); W. Java, Borneo (Sabah, Tawau).

Ecol. Rare in primary vegetation; 80–1500 m.

Vern. Java: *tjampacca rimbo, t. gunung.*

b. *var.* **beccariana** (AGOSTINI) NOOT. Blumea 32 (1987) 348. — *Michelia beccariana* AGOSTINI. — *M. aequinoctialis* DANDY.

Leaves mostly narrowly obovate. Flower buds and carpels hairy.

Distr. *Malesia*: Sumatra (Aceh, G. Leuser; Tapanuli; E. coast, Karolanden; W. coast, Padang, G. Singalan, G. Kerinci), Malay Peninsula (Perak, Maxwell's Hill, one coll.).

Ecol. Rare in the mountains; 1000–2600 m; *fl.* Feb.–Aug., *fr.* May–June.

Note. The collection from Perak was identified as *M. maingayi* KING. It rather belongs to *M. macklottii var. beccariana* but demonstrates the close affinity between the two taxa.

2. Magnolia carsonii DANDY *ex* NOOT. Blumea 32 (1987) 348, f. 1. — *Carson's Magnolia* W.MEIJER, The Magnoliaceae of Sabah, Bot. Bull. Sandakan 11 (1968) 7, fig. — *M. 'carsonii'* DANDY *ex* COCKBURN, Sabah For. Rec. 10 (1980) 56, t. 17, *nomen.* — Type: SAN A 1680 (L; SING).

Drymis-leaved Magnolia W.MEIJER *l.c.* 8, fig. — *M. 'drymifolia'* DANDY *ex* COCKBURN, *l.c.* 55, *nomen.* — Type: NOOTEBOOM 4612 (L; BO). — **Fig. 1, 2.**

Shrub or tree to 60 m high and 70 cm diam. Twigs glabrous or hairy in innovations with apical buds glabrous or hairy. *Leaves* glabrous, thin or thick coriaceous, 4.5–16 by 2.5–8 cm. Petiole 6 to 18 mm. *Brachyblast* glabrous or hairy, 2–5 mm long. Outer *tepals* 3(–4), 15–40 mm long; inner tepals 6. *Stamens c.* 15–30, 7–12 mm long with a connective appendage of 1–3 mm long. *Fruit* sessile or gynopo-

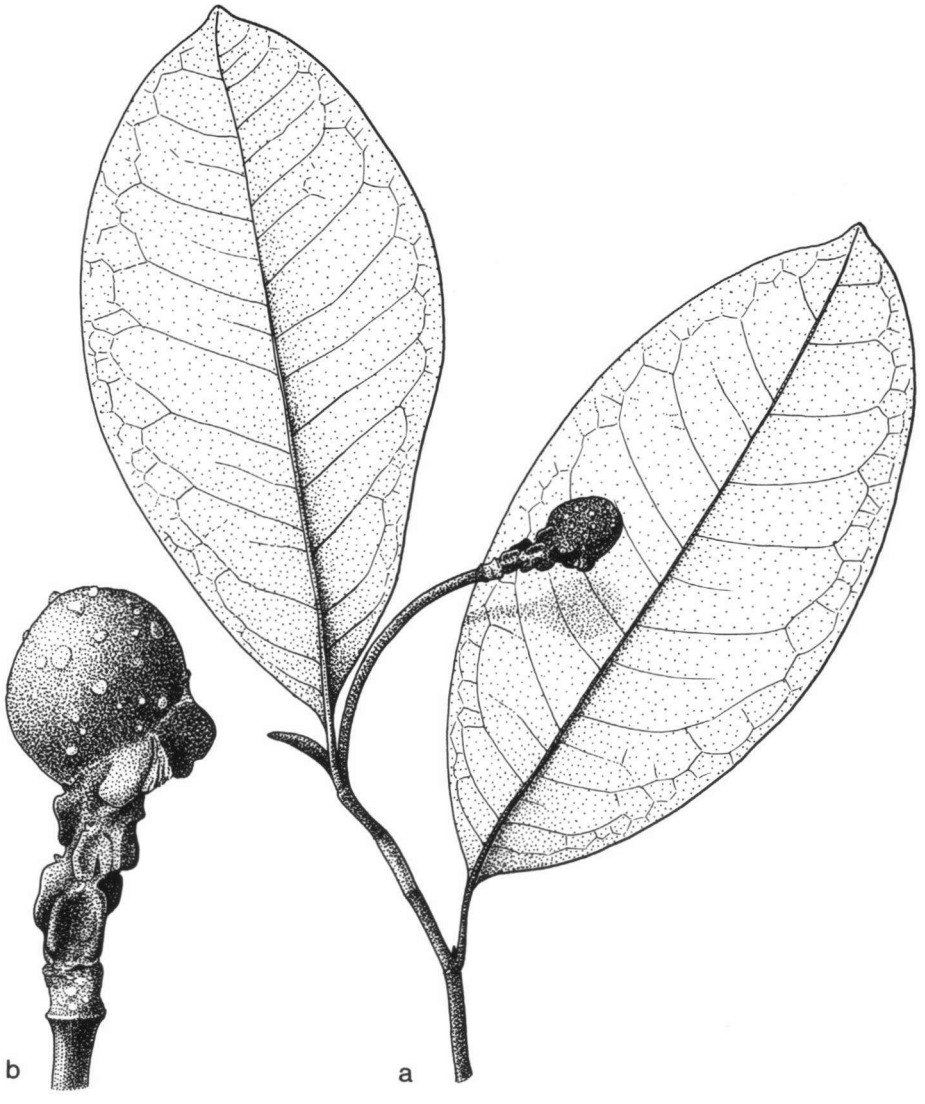

Fig. 1. *Magnolia carsonii* DANDY *ex* NOOT. *var. carsonii. a.* Habit, ×1; *b.* fruit, ×3 (CLEMENS 50271).

dium to 5 mm long, carpels 1–15, glabrous; scar of perianth and stamens 2–3 mm along the torus.

KEY TO THE VARIETIES

1. Tree from 9 to 60 m, glabrous in all its parts except sometimes the inner margins of the terminal stipules. Leaves when dry rather dark reddish brown, darker above than beneath, thin coriaceous, 5–13 by 2.5–6 cm; nerves in 8–15 pairs; the larger alveoles filled with smaller ones from less prominent veins. Petiole 6–13 mm. Gynophore absent **a. *var.* carsonii**

1. Shrub or tree to 25 m; twigs hairy directly under the terminal bud or glabrous; terminal buds hairy or sometimes glabrous. Leaves when dry olive

greyish green or greyish brown on both surfaces, thick coriaceous, 4.5–9 by 2.5–4.5 cm; nerves in 6–12 pairs, all lesser veins forming a dense reticulation and no difference in alveoles, often the reticulation slightly obscured by the coriaceousness of the leaf and the undersurface glaucous. Petiole 10–18 mm. Gynophore 0–5 mm

b. *var.* drymifolia

a. *var.* carsonii. — *Carson's Magnolia* W.MEIJER. — *M. 'carsonii'* DANDY *ex* COCKBURN. — **Fig. 1.**

A big tree to 60 m tall and 60 cm diam.; twigs glabrous; stipules glabrous, up to 4 cm long, sometimes long silky on the inner margin. *Leaves* rather dark reddish brown, darker above than beneath, glabrous, elliptic, thin coriaceous, 5–13 by 2.5–6 cm; acumen 3–10 mm; base cuneate; midrib prominent below; nerves in 8–12(–15) pairs, much prominent below, slightly less so above, meeting in an intramarginal vein; reticulation rather densely and prominently netted on both surfaces, secondary nerves 2–*c.* 4 about parallel with the nerves starting from the midrib and rather obvious from the lesser veins, the alveoles near the midrib oblong, the longest diameter parallel with nerves, the larger alveoles filled with the smaller ones of which the veins are less prominent. Petiole 6–13 mm. *Brachyblast* glabrous, 2.5–4 cm long, very slender; pedicel absent. Only one pair of spathaceous bracts. Outer *tepals* 3, 15–27 mm by *c.* 5 mm; inner tepals 6, about as long by 5–10 mm. *Stamens* 7–10 mm long, the 1–1.5 mm long connective appendage not included; gynophore absent; carpels glabrous, up to *c.* 15. *Fruits* with lenticels on the ripe carpels, often distorted by abortive carpels, mostly less than 10 carpels, sometimes only 1, fertile; scars of perianth and stamens along *c.* 2(–3) mm of the torus.

Distr. *Malesia*: Borneo (Sabah, Kinabalu, Crocker Range).

Ecol. Locally rather common, especially in Sosopodon For. Res.; 1200–1800 m; *fl. fr.* probably Jan.–Dec.

b. *var.* drymifolia NOOT. Blumea 32 (1987) 351, f. 2. — *Drimys-leaved Magnolia* W.MEIJER. — *M. 'drymifolia'* DANDY *ex* COCKBURN. — **Fig. 2.**

Shrub (on exposed ridges) to tree of 25 m high; twigs hairy directly under the hairy terminal bud, soon glabrescent, or rarely entire plant glabrous; stipules hairy (or rarely glabrous) in the terminal bud, glabrous or hairy in lateral buds. *Leaves* olive greyish green or brown on both surfaces or the undersurface bluish, thick coriaceous, glabrous, (broadly) elliptic to sometimes obovate, glossy above, often glaucous underneath, 4.5–9(–16) by 2.5–4.5 (–8) cm; apex not or hardly acuminate or sometimes emarginate to shortly acuminate, acumen up to 10 mm; margin thickened containing a vein; base cuneate, slightly acuminate; midrib much prominent beneath; nerves in 6–12 pairs, curved upwards and meeting in an intramarginal vein; all lesser veins forming together a dense reticulation, prominent above, slightly obscured by the coriaceousness of the leaves below, the alveoles along the midrib mostly ± isodiametric. Petiole 10–18 mm. *Flowers* erect, brachyblast stout, densely appressedly pubescent or pilose to nearly glabrous or more slender and glabrous, (2–)3–5 cm; pedicel 0–1.5 mm, when present densely appressedly pubescent; spathaceous bracts glabrous, only 1 pair. Outer *tepals* 3, greenish, 2–4 by *c.* 1 cm; inner tepals yellow, 6, *c.* 13–35 by 10 mm. *Stamens* up to *c.* 30, filament 1–3 mm, anthers 4–8 mm, connective appendage 1–2 mm; gynophore 2–5 mm or rarely absent; carpels very few (3–5 in my own collections from Bukit Raya), probably never more than 10, glabrous. *Fruits* without or with only few small lenticels, scars of perianth and stamens along 3 mm of the torus; seeds 1 or 2.

Distr. *Malesia*: Borneo (Sarawak; Sabah, Crocker Range, Kinabalu; W., Central and E. Kalimantan, Mt Palimasan).

Ecol. Primary and secondary mountain forest; 1000–2850 m; *fl. fr.* probably Jan.–Dec.

Note. Undersurface of leaves often papillate.

3. Magnolia maingayi KING, J. As. Soc. Beng. 58, ii (1889) 369; Ann. Bot. Gard. Calc. 3 (1891) 208, t. 45 B; C.CURTIS, J. Str. Br. R. As. Soc. *n.* 25 (1894) 71; MERR. Enum. Born. (1921) 251; excl. coll. BECCARI 2661, 3660; RIDLEY, Fl. Mal. Pen. 1 (1922) 13; BURK. Dict. (1935) 1393; W.MEIJER, Bot. Bull. Sabah 11 (1968) 9; COCKBURN, Sabah For. Rec. 10 (1980) 55. — Type: MAINGAY 17 (?; iso L).

Treelet or tree from 1.2 to 18 m, to 50 cm diam.; twigs, terminal buds, and petioles densely woolly hairy. *Leaves* long hairy below, especially on midrib and nerves, glabrescent, glabrous above, obovate to narrowly obovate or rarely elliptic, 9–26 by 3–9(–11) cm; acumen 5–25 mm; base cuneate to more or less rounded; midrib much prominent below; nerves in 14–18 pairs, meeting in an intramarginal vein; reticulation netted, prominent below, slightly so above. Petiole 3–5(–15) mm. *Brachyblast* densely hairy, 1–5 cm; pedicel absent; spathaceous bracts one pair, long hairy. Outer *tepals* 3, 20–40 by 10–12 mm; inner tepals 6, thick coriaceous, 20–25 by 10 mm. *Stamens* many, filament *c.* 1 mm, anthers 5–6(–8) mm, connective appendage triangular, not very acute, tip often blunt, *c.* 1.5–2 mm long; gynophore absent; carpels many, densely (woolly) hairy. *Fruits* hairy, cylindrical, *c.* 5(–8) by 2–3 cm, sometimes much shorter by abortion of the carpels, scars of perianth and stamens along 10(–15) mm of the torus.

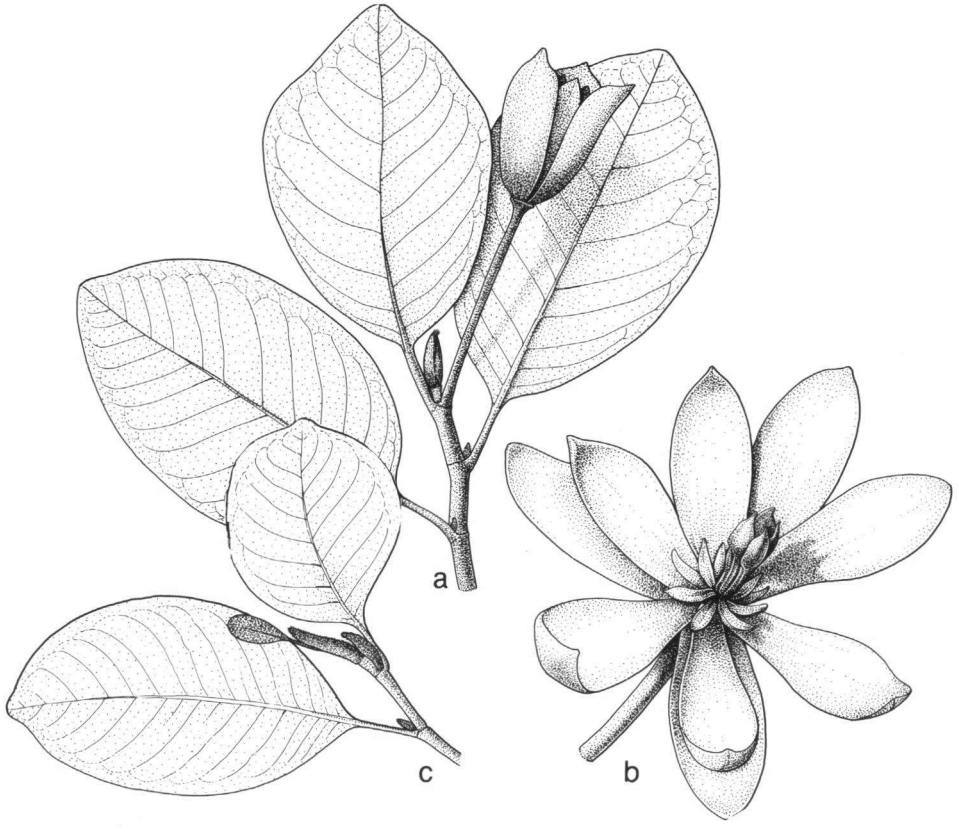

Fig. 2. *Magnolia carsonii* DANDY *ex* NOOT. *var. drymifolia* NOOT. *a.* Habit, ×0.7; *b.* flower, ×1; *c.* reduced leaf from spathaceous bracts, ×0.7 (NOOTEBOOM 4612).

Distr. *Malesia*: Malay Peninsula (Perak; Pahang; Selangor, Kepong; Johore; Singapore), Borneo (Sarawak, Kapit, Ulu Mojong, 3rd Div., Bario, Kelabit plateau; Sabah, Kinabalu).

Ecol. In forest from low altitude to 1500 m; *fl. fr.* Jan.–Dec.

Vern. Borneo: *analwei, leka,* Kelabit.

4. Magnolia uvariifolia DANDY *ex* NOOT. Blumea 32 (1987) 358, f. 6. — *Uvaria-leaved Magnolia* W.MEIJER, Bot. Bull. Sandakan 11 (1968) 9. — *M. 'uvariafolia' (sic!)* DANDY *ex* COCKBURN, Sabah For. Rec. 10 (1980) 55, *nomen.* — Type: CLEMENS 28439 (L; BO, NY). — **Fig. 3.**

Treelet or tree from 6 to 25 m, up to 35 cm diam.; twigs and terminal buds yellowish woolly hairy. *Leaves* pubescent beneath, especially on midrib and nerves, glabrescent, obovate to narrowly obovate, 10–28 by 3.5–9 cm; acumen 3–15 mm; base cuneate to rounded; nerves in 13–19 pairs, prominent below and less so above, meeting in an intramarginal vein; reticulation densely netted, much prominent below, less so above. Petiole 3–13 mm. *Brachyblast* pilose, glabrescent, 4.5–11 cm, pedicel absent; bracts in one pair only, glabrous. Outer *tepals* 3, *c.* 35–40 by 15 mm; inner tepals 6, thick coriaceous, *c.* 30 by 10 mm. *Stamens* very many, filament *c.* 1 mm, anthers *c.* 5 mm, the connective appendage acute, 2.5–3 mm long; gynophore absent; carpels very many, glabrous. *Fruits* cylindrical, *c.* 7–14 by 2–3 cm; scars of perianth and stamens along 10–20 mm of the torus.

Distr. *Malesia*: Borneo (Sarawak, Kapit, 3rd Div.; Sabah, G. Alab, Tambunan, Penampang, Kinabalu; SE. Kalimantan, Berouw).

Ecol. Primary or secondary forest; 180–1800 m; *fl. fr.* Jan.–Dec.

Vern. Borneo: *karampilung,* SE. Kalimantan.

Note. This species is closely related to *Magnolia*

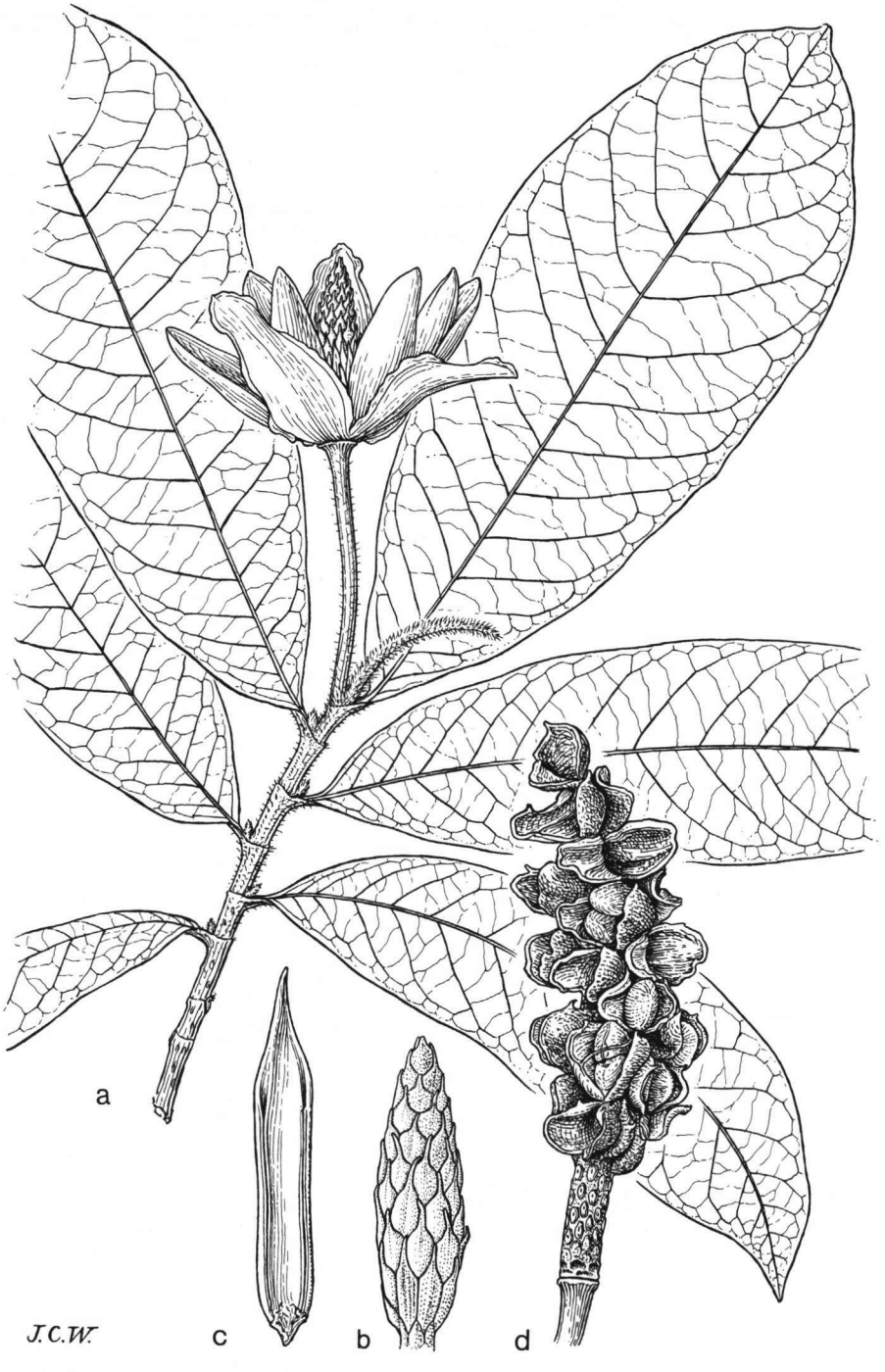

Fig. 3. *Magnolia uvariifolia* DANDY *ex* NOOT. a. Habit, ×0.6; *b.* ovary, ×1.5; *c.* anthers, ×6; *d.* fruit, ×0.8.

maingayi which, however, differs in the mostly longer and denser indumentum and in the flower buds and carpels being hairy.

5. Magnolia phaulantha DANDY *ex* NOOT. Blumea 32 (1987) 359. — Type: FRI bb 29194 (L; A, SING).

Tree to at least 30 m by 50 cm diam., in the young parts entirely glabrous; stipules *c.* 2–4 cm (sometimes the inner margins long hairy); leaves (narrowly) elliptic, to slightly obovate, 6–15 by 2.5–4.5 cm; acumen 3–20 mm; base cuneate, midrib much prominent beneath; nerves in *c.* 10 pairs, hardly distinct from the densely netted reticulation which is prominent on both surfaces. Petiole *c.* 5–10 mm. *Brachyblast* very slender, 2.5–4 cm; pedicel absent; flower buds glabrous. Outer *tepals* 3, *c.* 15 by 2 mm; inner tepals 6–7, slightly longer. *Stamens* many, filament very short, anthers *c.* 5 mm long, connective appendage to *c.* 1 mm long; gynophore absent; carpels less than 10, glabrous. *Fruits* often with only one or two developed carpels, *c.* 1 by 1 cm.

Distr. *Malesia*: Sulawesi (Central, Masamba, Malili, Rantelemo, Rantepao, Palu).

Ecol. Mountain forest; 1250–2200 m; *fl.* Apr.–Dec.

Note. This species resembles *Magnolia carsonii (var. carsonii)* very much and might prove to be conspecific with it.

II. Subgenus Talauma

(JUSS.) PIERRE, Fl. For. Cochinch. 1 (1881) *sub* t.1; NOOT. Blumea 31 (1985) 89; *ibid.* 32 (1987) 360.

Trees or shrubs. Stipules adnate to or free from the petiole. *Tepals* 9–36, subequal. *Anthers* introrse, connective produced into a short to very long (even longer than the anther) appendage. *Gynoecium* sessile or with a gynophore to 10 mm. *Carpels* many to few, concrescent at least at the base; fruiting carpels woody, circumscissile, the upper portions falling away either singly or in irregular masses, the lower portions persistent with the suspended seeds.

2. Section Aromadendron

(BLUME) NOOT. Blumea 31 (1985) 89. — *Aromadendron* BLUME, Bijdr. (1825) 10; Fl. Java Magnol. (1829) 25. — *Talauma sect. Aromadendron* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70.

Stipules free from the petiole. Outer *tepals* 3 or more often 4, inner tepals 8–32. *Stamens* with a connective appendage that is in most species very long, from slightly shorter to longer than the anthers, but in *M. ashtonii* it is triangular and only 2.5 mm long. *Fruit* a fleshy syncarp, often on a gynophore of *c.* 5 to rarely 10 mm long, the carpels falling off when ripe in irregular masses thus exposing the seeds which hang from the torus. *Seeds* 1–2 in each carpel.

Distr. *Malesia*: Sumatra, Malay Peninsula, Java, Borneo, Philippines (Palawan).

KEY TO THE SPECIES

1. Leaves 4.5–7.5 by 1.5–3.5 cm. Petiole 7–10 mm. Carpels *c.* 6 ..... **10. M. pahangensis**
1. Leaves longer than 7.5 cm. Petiole 8–50 mm. Carpels more than 6.
 2. Nerves in 8–12 pairs. Pedicel absent. Fruit ellipsoid, 3–4.5 by 2–3.5 cm. Gynophore absent. Scars of perianth and stamens along up to 3 mm of the torus ..... **7. M. bintuluensis**
 2. Nerves in 11–20 pairs. Pedicel 2–10 mm. Fruit 5–9 by 3–5 cm. Gynophore 0–10 mm. Scars of perianth and stamens along 5 mm of the torus.
  3. Nerves in (12–)15–20 pairs. Petiole 25–50 mm. Fruits ovoid to pear-shaped, 8–9 by 4–5 cm **8. M. ashtonii**
  3. Nerves in 11–16 pairs. Petiole 8–25 mm. Fruit 5–7 by 3–5 mm.
   4. Tepals 18–36 ..... **6. M. elegans**
   4. Tepals 12 ..... **9. M. borneensis**

6. Magnolia elegans (BLUME) H.KENG, Gard. Bull. Sing. 31 (1978) 129; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 141; Blumea 32 (1987) 361. — *Aromadendron elegans* BLUME, Bijdr. (1825) 10; Fl. Java Magnol. (1829) 26, t. 7, 8; MOR. Syst. Verz. (1846) 36; KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 97; MIQ. Fl. Ind. Bat. 1, 2 (1858) 16; RIDLEY, Fl. Mal. Pen. 1 (1922) 17, f. 3; BURK. Gard. Bull. S. S. 6 (1930) 454; Dict. (1935) 241; BACKER & BAKH.*f.* Fl. Java 1 (1963) 98. — *Talauma elegans* (BLUME) MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70; K. & V. Meded. Lands Plantent. 17 (1896) 167; RIDLEY, J. Str. Br. R. As. Soc. *n.* 33 (1900) 38; BACKER, Schoolfl. Java (1911) 13; KOORD. Exk. Fl. Java 2 (1912) 239; KOORD.-SCHUM. Syst. Verz. 1, Fam. 95 (1913) 4; BAKER *f.* J. Bot. 62, Suppl. (1924) 2, *excl. parte*; *ibid.* 64, Suppl. 1 (1926) 142. — Type: BLUME (L; BO).

Aromadendron glaucum KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 98. — *Talauma glaucum* (KORTH.) MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70, excl. syn. *Manglietia oortii.* — *M. glauca* (KORTH.) PIERRE, Fl. For. Cochinch. 1 (1881) *sub* t. 2, *non M. glauca* L. (1759). — *Talauma elegans var. glauca* (KORTH.) P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 277, 336. — *Aromadendron elegans var. glauca* (KORTH.) DANDY, Kew Bull. (1928) 183. — Type: KORTHALS (L; NY).

Manglietia oortii KORTH. Ned. Kruidk. Arch 2, Versl. (1851) 97; MIQ. Fl. Ind. Bat. 1, 2 (1858) 15; *ibid.* Suppl. 1 (1860) 153, excl. coll. TEIJSMANN. — *Manglietia oortii* MIQ. Suppl. (1860) 153, excl. coll. Haleban. — Type: KORTHALS (L; NY), Singalan.

Tree to 40(–53) m high and 80(–115) cm diam.; twigs glabrous, brown or blackish brown provided with many sometimes light coloured annular stipular scars; stipules glabrous but with a tuft of hairs at the apex, the inner margins sometimes beset with long white hairs. *Leaves* glabrous, glossy but rarely the undersurface glaucous (*'var. glauca'*), mostly narrowly elliptic, sometimes elliptic, 7.5–22(–27) by 3–6(–8) cm; acumen 3–20 mm; base cuneate to sometimes rounded; midrib much prominent below; nerves in 11–16 pairs meeting in a looped intramarginal vein which is prominent on both under- and uppersurface but on the uppersurface hardly distinct from the venation; reticulation densely netted, prominent on both surfaces, the marginal vein included in the reticulation. Petiole 8–20(–25) mm. *Brachyblast* glabrous, 3–5(–6) cm long; spathaceous bracts one pair, *c.* 6 cm long, glabrous but with some hairs apically; pedicel glabrous, *c.* 5(–10) mm, often in N. Sumatra and the Malay Peninsula nearly absent. *Tepals c.* 18–36, the 4 outer sepaloid ones light yellowish green *in vivo*, narrowly obovate or mostly elliptic, the longest *c.* 4.5–7 cm long and up to 1.5(–1.8) cm broad, the others white, narrowly elliptic, slightly shorter and much narrower. *Stamens* 60–70, filament *c.* 0.5 mm, anthers 8–9 mm, the connective produced in a long setaceous, 12–15 mm long appendage; a short gynophore present between stamens and carpels. *Fruits* ellipsoid to orbicular, *c.* 5–7 cm long and *c.* 3–5 cm diam., tepal and staminal scars along *c.* 5 mm of the torus, gynophore also *c.* 5 mm long but rarely shorter to nearly absent.

Distr. *Malesia*: Sumatra incl. Banka, Malay Peninsula (Penang, Selangor, Perak, Singapore), W. Java.

Ecol. Common, mostly in lowland rain-forest but in Sumatra also to 1200 and in Aceh (G. Leuser) to 1850 m, in Java up to 1200 m. *Fl. fr.* Jan.–Dec.

Vern. Sumatra: *jelatan bulan, kayu sulung, kedondong tunjuk, medang mempau, m. pauh*, M, *utup-utup*, Batak.

7. Magnolia bintuluensis (AGOSTINI) NOOT. [in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 141, *nom. inval.*] Blumea 32 (1987) 362. — *Talauma bintuluensis* AGOSTINI, Atti Com. Accad. Fisiocrit. Siena IX, 7 (1926) sep. 26; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143. — Type: BECCARI P.S. 2661 (FI; K). Syntype: BECCARI P.S. 3660.

Aromadendron nutans DANDY, Kew Bull. (1928) 183; W.MEIJER, Bot. Bull. Sandakan 11 (1968) 5; COCKBURN, Sabah For. Rec. 10 (1980) 53, t. 16. — *M. maingayi* (*non* KING) RIDLEY, Enum. Born. (1913) 72, *p.p.*; MERR. Enum. Born. (1921) 251, *p.p.* — *M. nutans* (DANDY) H.KENG, Gard. Bull. Sing. 31 (1978) 129. — Type: BECCARI P.S. 3660 (K; FI).

Tree 6–25 m by 15–62 cm; twigs glabrous, wrinkled; terminal buds glabrous, sometimes with a tuft of hairs apically; stipules glabrous but the inner margin provided with long hairs. *Leaves* coriaceous, glabrous, mostly dull, the undersurface sometimes glaucous, obovate or sometimes elliptic, 8.5–18 by 3–7.5 cm; abruptly shortly acuminate with rounded tip, acumen *c.* 5–10 mm; base cuneate; midrib much prominent below; nerves prominent on the undersurface and less so above, in 8–12 pairs, intramarginal vein rather inconspicuous on the uppersurface, often a second less conspicuous intramarginal vein closer to the margin present; reticulation netted and prominent on the undersurface but less so above, the smaller nerves obscured because the leaves are coriaceous and thus the reticulation rather coarse. Petiole 10–25 mm. *Brachyblast* 1–3 cm, mostly curved, often terminating a twig of which the upper leaves are reduced or fallen; pedicel absent; spathaceous bracts glabrous, direct under the flower. Outer *tepals* 3, linear oblong *c.* 2 cm long; inner tepals *c.* 15. *Stamens* 10–12 mm, provided with a connective appendage of hardly the same length; gynophore absent. *Fruits* ellipsoid, *c.* 3–4.5 by 2–3.5 cm, no pedicel or

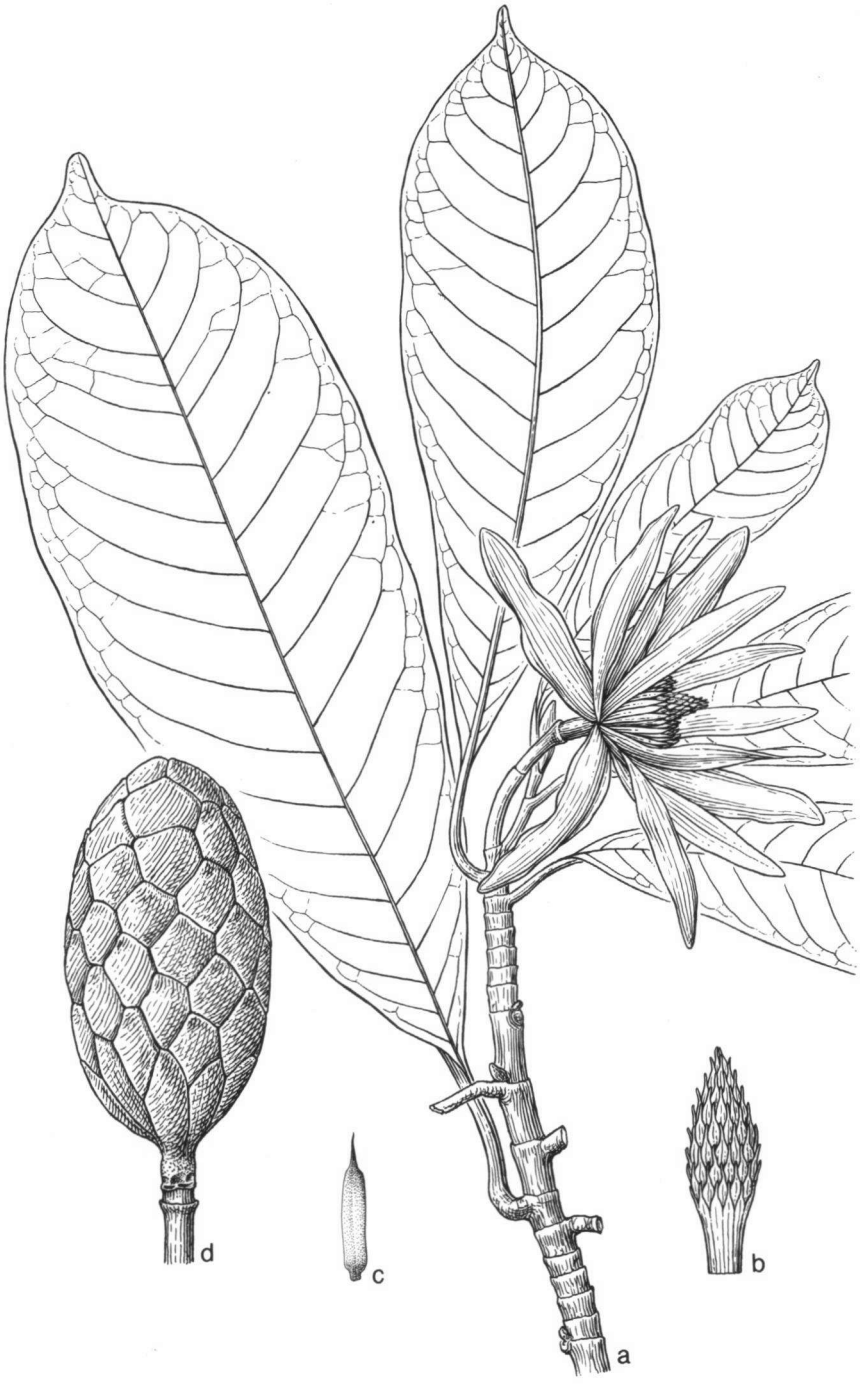

Fig. 4. *Magnolia ashtonii* DANDY *ex* NOOT. *a.* Habit with flower, ×0.6; *b.* ovary, ×1.8; *c.* anthers, ×1.8; *d.* fruit, ×0.6 (*a, c* S 7895 ASHTON, *b* BRUN 5503, *d* S 12449).

gynophore. Scars of perianth and stamens along *c.* 3 mm of the torus.

Distr. *Malesia*: Sumatra (Indragiri, Biliton), Malay Peninsula (Johore), Borneo (Sarawak, Brunei, Sabah, Kalimantan).

Ecol. Rare, 21 collections in total. As far as recorded often in (coastal) swamp, kerangas, in E. Kalimantan in *Agathis* forest on sandy waterlogged soil; 0–1000 m. *Fr.* Feb.-Sept.

Vern. Sumatra: *kedondong kijai*; Borneo: *medang pelam*, W. Kalimantan, *triburus*, Sarawak, Land Dyak.

8. Magnolia ashtonii DANDY *ex* NOOT. Blumea 32 (1987) 363, f. 7. — *Ashton's Aromadendron* W.MEIJER, Bot. Bull. Sandakan 11 (1968) 5, t. — *Aromadendron 'ashtonii'* DANDY *ex* COCKBURN, Sabah For. Rec. 10 (1980) 53, *nomen.* — *M. ashtonii* NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 141, *nomen.* — Type: S 7895 (ASHTON) (L; A, K, SING). — **Fig. 4.**

Tree up to 45 m high and 60 cm diam. Twigs glabrous, rather thick, terminal buds sometimes with a tuft of hairs on the apex; stipules glabrous, *c.* 2 cm. *Leaves* glabrous, the undersurface densely punctulate, often glaucous, obovate, 12–23 by 5–10 cm; acumen 3–7 mm with blunt tip; base acute, decurrent with two ridges into the petiole; midrib much prominent on the undersurface; nerves in 15–20 pairs, distinct on both surfaces, slightly prominent below, hardly or not above; reticulation distinctly fine netted but hardly prominent on both surfaces. Petiole 2.5–5 cm, often thickened towards the base. *Brachyblast* glabrous, 2.5–3 cm (–4 cm in fruit); pedicel glabrous, 7–8 mm. Spathaceous bracts not seen. Outer *tepals* 4, ± linear, 5 by 0.6–0.8 cm; inner tepals 8, linear, 4.5 by 1 (the outermost) to 0.6 (the innermost) cm. *Stamens c.* 50, filament *c.* 1 mm, anthers 9–10 mm, connective appendage ± triangular, *c.* 2.5 mm long; gynophore distinct; carpels many (more than 100). *Fruits* ellipsoid, ovoid or pear-shaped, 8–9 by *c.* 4 cm, pedicel, scars of perianth and stamens, and gynophore all *c.* 5 mm long or gynophore up to 10 mm.

Ditr. *Malesia*: Sumatra (Riouw, Indragiri), Borneo (Sarawak, Brunei, Sabah, W. Kalimantan).

Ecol. Very rare (only 8 collections), on yellow sandy soil (once recorded); low, up to 500 m; *fl.* May–June; *fr.* Aug.–Sept. (both twice recorded).

9. Magnolia borneensis NOOT. Blumea 32 (1987) 366, f. 8. — *Borneo Aromadendron* W.MEIJER, Bot. Bull. Sandakan 11 (1968) 5. — *Aromadendron 'borneensis'* DANDY *ex* COCKBURN, Sabah For. Rec. 10 (1980) 53, *nomen.* — Type: PAYMANS 173 (L; K, SING). — **Fig. 5.**

Tree 23–40 m by 40–112 cm; twigs glabrous; stipules glabrous at both surfaces. *Leaves* glabrous, usually narrowly elliptic, rarely elliptic, 7.5–21 by 3.5–6 cm; acumen 7–10(–15) mm; base acute to sometimes nearly rounded; midrib much prominent on the undersurface; nerves in 11–16 pairs, intramarginal vein rather inconspicuous, slightly prominent on both under- and uppersurface; reticulation very fine (about half as fine as in *M. elegans*), slightly prominent on the otherwise very smooth and somewhat glossy uppersurface, inconspicuous to slightly prominent on the rather dull and mostly darker coloured undersurface, rarely more prominent on both surfaces. Petiole rather slender, 12–17 mm. *Brachyblast* glabrous, often curved at the base, 3–5 cm long; pedicel 2–5 mm; spathaceous bracts glabrous, *c.* 4.5 cm long. Outer *tepals* 4, *c.* 4.5 by 1 cm; inner tepals 8, *c.* 4–4.5 by 1.5 (the outer ones)–1 (the inner ones) cm. *Stamens c.* 55, filament *c.* 1 mm, anthers 8–13 mm, setaceous connective appendage 10–15 mm; gynophore in the observed flowers clearly present. *Fruits* ellipsoid or ovoid, *c.* 5–7 by 4–5 cm, pedicel, scars of perianth and stamens, and gynophore all *c.* 5 mm long or gynophore reduced.

Distr. *Malesia*: Borneo (Sarawak, Sabah, E. Kalimantan), Philippines (Palawan, one coll.).

Ecol. Rare, 14 collections in total. In primary forest, on sandy loam (once recorded) or on ultrabasic in Palawan; from low up to 1800 m; *fl.* Feb.–Aug., *fr.* Feb.–Nov.

Vern. *Asam*, M, *jalat, uwun*, Dyak.

Note. This species resembles vegetatively and in fruit very much *M. elegans* but the flowers are clearly distinct by having only 12 tepals which are also broader than in *M. elegans*. Also the reticulation is more dense. Some Bornean collections, of which the flowers are not known, as well as the collection from Palawan might belong to *M. elegans*.

10. Magnolia pahangensis NOOT. Blumea 32 (1987) 367. — Type: KEP FRI 9030 (L; SING).

Tree, 30 cm diam., glabrous in all its parts. *Leaves* (narrowly) obovate, 4.5–7.5 by 1.5–3.5 cm; acumen less than 4 mm long; base cuneate. Petiole 7–10 mm; midrib much prominent below, hardly so above; nerves in 8–12 pairs prominent on both surfaces, intramarginal vein hardly distinct from the reticulation; reticulation densely netted, much prominent above, less so beneath. *Brachyblast* glabrous, 15 mm long; spathaceous bracts only one pair, directly under the tepals, no pedicel. *Tepals c.* 20 mm long, the 4 outer ones 6–7 mm broad, the 8(!) inner ones 3–4 mm broad. *Stamens c.* 10, filament *c.* 1 mm, anthers *c.* 3 mm, the connective appendage as broad as the anthers, *c.* 7 mm long. Gynophore probably present, carpels *c.* 6. *Fruits* not known.

Distr. *Malesia*: Malay Peninsula (Pahang, Bk. Jeriau), only known from the type.

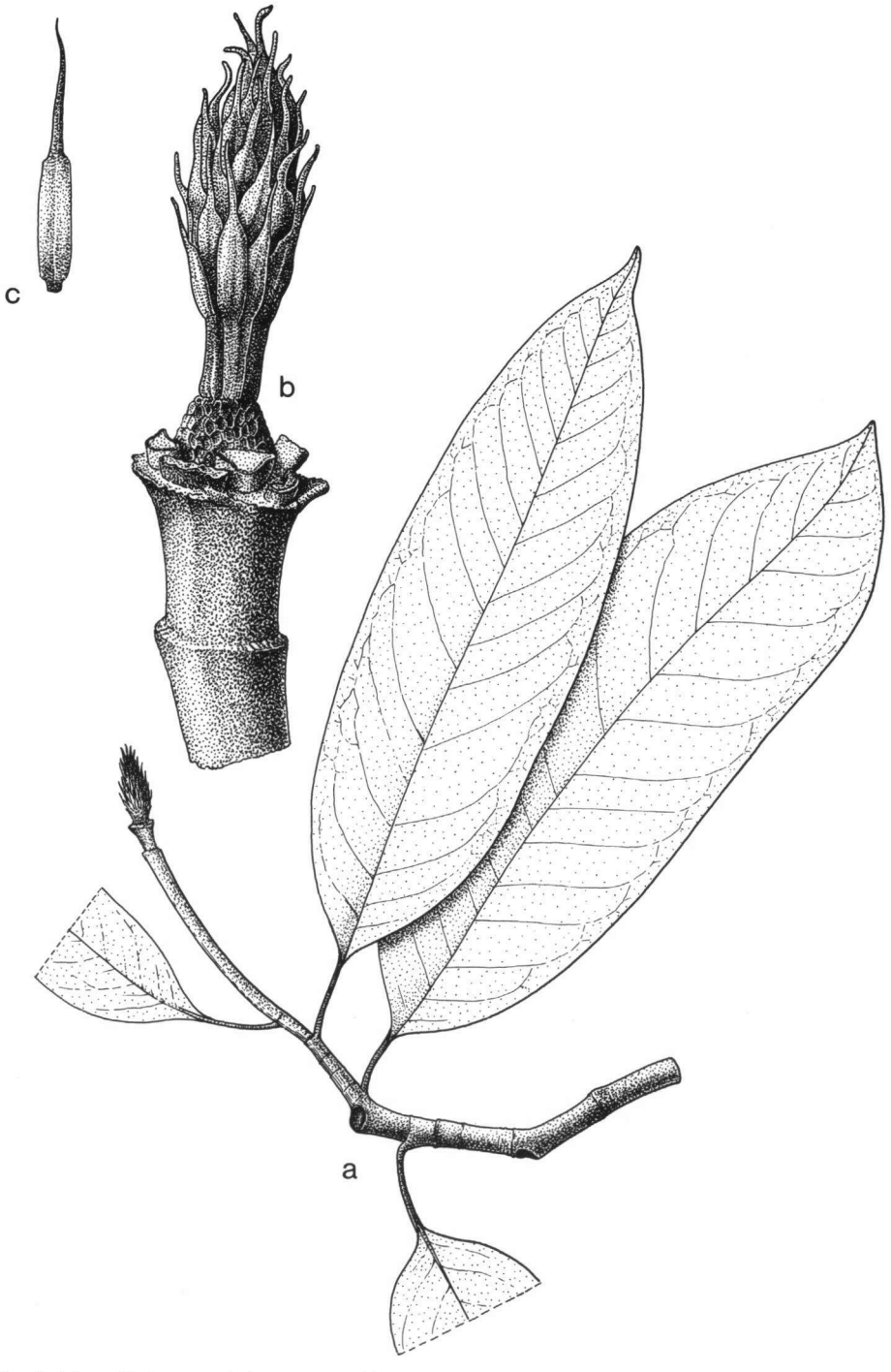

Fig. 5. *Magnolia borneensis* NOOT. *a.* Habit, ×0.9; *b.* ovary, ×5; *c.* stamen, ×1.8 (PAIJMANS 173).

3. Section Blumiana

BLUME, Fl. Java Magnol. (1829) 32; NOOT. Blumea 31 (1985) 89; *ibid.* 32 (1987) 367. — *Blumea* NEES, Flora 8 (1825) 152.

Distr. 6 *spp.*, in tropical and subtropical Southeast Asia from Central Himalaya to Indochina and throughout *Malesia*.

KEY TO THE SPECIES

1. Leaves usually densely appressedly pubescent beneath, 33–more than 85 by 13–32 cm, obovate, the base usually cuneate and the margins straight for the lower half to two third of the blade. Nerves in 24 to more than 50 pairs. Petiole from only a few millimetres to 5 cm. Peduncle with a diam. of 10–20 mm. Stamens 20–25 mm. Fruiting carpels with a stout stylar spine of *c.* 2 cm long..... **12. M. gigantifolia**
1. Plant different. If base cuneate, the margins straight for far less than the lower half of the leaf or leaves glabrous beneath. Fruiting carpels with a smaller spine or twigs very long villous.
2. (Young twigs), peduncle and carpels densely very long (patently) villous. Leaves glabrous, at least when mature.
3. Twigs 8–12 mm diam. Leaves 25–60 by 11–21 cm; nerves nearly straight for the major part of their length. Peduncle diam. at top 10–20 mm. Stamens *c.* 25 mm long. Carpels more than 100 **13. M. lasia**
3. Twigs 5–7 mm diam. Leaves 23–40 by 6–11 cm; nerves leaving the midrib nearly perpendicular and gradually curved upwards. Peduncle diam. probably up to 10 mm. Stamens not known. Carpels probably less than 100 ..... **15. M. sarawakensis**
2. Young twigs glabrous, appressedly hairy, or tomentose, peduncle glabrous, appressedly hairy, or (villous) tomentose. Carpels glabrous or hairy.
4. Young twigs 6–7 mm diam., with young leaves (shortly) tomentose, glabrescent in patches, often part of the indumentum persistent on the leaves, especially on midrib and nerves. Peduncle 10–12 mm diam. at top, villous tomentose. Carpels 18–60, densely villous to tomentose ..... **16. M. villosa**
4. Young twigs glabrous or appressedly hairy, rarely short villous (if tomentose diam. 7–12 mm or less than 5 mm and carpels glabrous).
5. Carpels 20–25(–80), densely villous-pubescent. Leaves elliptic to obovate (rarely broadly elliptic), thick coriaceous with strongly recurved margins, glaucous beneath (or undersurface obscured by the indumentum), glabrous or appressedly (finely) hairy beneath, with strongly recurved margins and rounded to bluntly acute apex. Nerves 10–16 pairs, reticulation rather coarse, alveoles more than 1 mm diam., often obscured below. Twigs diam. 6–10 mm, peduncle diam. at top 6–15 mm. Only on Mt Kinabalu **14. M. persuaveolens**
5. Plant different.
6. Plant glabrous. Leaves thick coriaceous with strongly recurved margins, broadly elliptic, less than two times as long as broad, 11–18 by 6–14 cm, apex rounded to blunt acute. Nerves in 14–15 pairs, forked towards the apex. Twigs 8–10 mm diam., peduncles 9–15 mm diam. at apex **14. M. persuaveolens**
6. Leaves more than twice as long as broad and plant also otherwise different.
7. Plant glabrous. Leaves nearly ten times as long as broad. Petiole not longer than 2 cm **17. M. mariusjacobsia**
7. Plant usually not glabrous. If glabrous then leaves far less than 10 times as long as broad **11. M. candollii**

11. Magnolia candollii (BLUME) H.KENG, Gard. Bull. Sing. 31 (1978) 129 (*'decandollii'*); NOOT. Blumea 32 (1987) 369. — *Talauma candollii* BLUME, Verh. Bat. Gen. K. W. 9 (1823) 147. — Lectotype: BLUME *s.n.* (L), Salak. — **Fig. 6.**

For further synonymy see under the varieties.

KEY TO THE VARIETIES

1. Plant entirely glabrous, except sometimes long caducous silky hairs between the bracts.
2. Leaves mostly obovate, 17–50 by 8–22 cm. Petiole 2.5–7 cm. Twigs diam. 5–12 mm. Peduncle

diam. at top 5–13 mm. Stamens 12–30 mm. Carpels 10–*c.* 100, with an up to 15 mm long woody stylar spine ..... **b. *var.* obovata**

2. Plant different. Twigs and peduncle usually thinner. Petiole 1–4.5 cm. Stamens 8–13(–15) mm. Spines on carpels, if present, shorter **a. *var.* candollii**

1. Young twigs and peduncles hairy (often glabrescent in fruit!).
3. Twigs diam. 3–7 mm. Peduncle diam. at top 2–9 mm. Carpels *c.* 5–100..... **a. *var.* candollii**
3. Twigs diam. 5–12 mm. Peduncle diam. at top 8–20 mm. Carpels *c.* 40–200.
4. Carpels *c.* 200. Stamens *c.* 10 mm. Petiole 2–4 cm ..... **d. *var.* beccarii**
4. Carpels *c.* 40–150. Stamens 12–30 mm. Petiole 1.5–11 cm.
5. Leaves (at least when young) hairy beneath. Carpels *c.* 50–100. Stamens 13–30 mm. Petiole 2.5–11 cm .... **e. *var.* singapurensis**
5. Leaves glabrous beneath. Carpels *c.* 40–150. Stamens 12–20 mm. Petiole 1.5–6.5 cm **c. *var.* angatensis**

a. *var.* candollii. — *M. candollii* (BLUME) H.KENG, Gard. Bull. Sing. 31 (1978) 129 (*'decandollii'*). — *Talauma candollii* BLUME, Verh. Bat. Gen. K. W. 9 (1823) 147; Bijdr. (1825) 9; Fl. Java Magnol. (1829) 32, t. 9, 12A; HOOK. Curtis Bot. Mag. 72 (1846) t. 4251; MIQ. Fl. Ind. Bat. 1, 2 (1858) 14; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 68, *excl. parte*; KURZ, J. As. Soc. Beng. 43, ii (1874) 47; For. Fl. Burma 1 (1877) 24; K. & V. Bijdr. 4 (1896) 166; BACKER, Fl. Batavia 1 (1907) 8; KOORD. Exk. Fl. Java 2 (1912) 240, t. 48; KOORD.-SCHUM. Syst. Verz. 1, Fam. 95 (1913) 3; RIDLEY, Contr. Fl. Born. (1913) 72, *p.p.*; MERR. Enum. Born. (1921) 251, *p.p.*; BURK. Dict. 2 (1935) 2120; GAGNEP. Fl. Gén. I.-C. Suppl. 1 (1938) 31; H.KENG, Tree Fl. Malaya 2 (1973) 293; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143; Blumea 32 (1987) 369, f. 9. — *Blumia candollii* (BLUME) NEES, Flora 8 (1825) 152. — *Manglietia candollii* (BLUME) WALL. Cat. (1832) 6497. — Lectotype: BLUME *s.n.* (L), Salak.

Talauma candollii BLUME *var. latifolia* BLUME, Bijdr. (1825) 9. — Lectotype: BLUME *s.n.* (L), Noesa Kambangan.

M. rumphii SPRENG. Syst. Veget. 4, 2 (1827) 217. — [*Sampacca montana* RUMPH. Herb. Amb. 2 (1741) 204, t. 69.] — *Liriodendron liliiferum* LINNÉ, Sp. Pl. ed. 2, 1 (1762) 755. — *M. pumila auct. non* ANDR.: DC. Syst. 1 (1817) 458, *p.p.*; Prod. 1 (1824) 81, *p.p.* — *Talauma rumphii* BLUME, Bijdr. (1825) 10; Fl. Java Magnol. (1829) 39; MIQ. Fl. Ind. Bat. 1, 2 (1858) 14; MERR. Interpr. Rumph. (1917) 224. — *Talauma pumila* BLUME, Fl. Java Magnol. (1829) 38, *pro syn.* LINNÉ. — *M. liliifera* (LINNÉ) BAILLON, Hist. Pl. 1 (1868) 141, *excl. parte*; DRUCE, Bot. Exch. Club Soc. Br. Is. 3 (1914) 421. — *Talauma liliifera* (LINNÉ) O. K. Rev. Gen. Pl. 1 (1891) 6, *excl. var., non T. liliifera* KURZ (1874). — Type: RUMPHIUS t. 69.

Talauma mutabilis BLUME, Fl. Jav. Magnol. (1829) 35, t. 10, 11, 12B; KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 98; MIQ. Fl. Ind. Bat. 1, 2 (1858) 14; Suppl. 1 (1860) 152; (1861) 366; HOOK.*f.* & THOMS. Fl. Br. India 1 (1872) 40; F.-VILL. Nov. App. (1880) 3; KING, J. As. Soc. Beng. 58, ii (1889) 373; Ann. Bot. Gard. Calc. 3 (1891) 203, t. 44; CRAIB, Fl. Siam. Enum. 1 (1925) 25. — Lectotype: BLUME *s.n.* (L), Bantam.

Talauma mutabilis BLUME *var. acuminata* BLUME, Fl. Java Magnol. (1829) 36, t. 11, *excl. sciagr.* — Lectotype: BLUME *s.n.* (L), Parang.

Talauma mutabilis BLUME *var. longifolia* BLUME, Fl. Java Magnol. (1829) 37; FINET & GAGNEP. Fl. Gén. I.-C. 1 (1907) 33. — *Talauma longifolia* (BLUME) RIDLEY, J. Fed. Mal. St. Mus. 17 (1916) 38; Fl. Mal. Pen. 1 (1922) 16; CRAIB, Fl. Siam. Enum. 1 (1925) 25, *excl. parte.* — Lectotype: BLUME *s.n.* (L).

Talauma mutabilis BLUME *var. splendens* BLUME, Fl. Java Magnol. (1829) 38, t. 11 (*'sciagraphia'*). — *M. splendens* REINW. *ex* BLUME, Fl. Jav. Magnol. (1829) 38 *nom. syn., non M. splendens* URB. (1899). — Type: REINWARDT (L.).

Talauma rubra MIQ. Fl. Ind. Bat. 1, 2 (1858) 14; Suppl. 1 (1860) 153; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 69; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143. — Type: TEIJSMANN HB 470 (U; BO, L), Sumatra, Lolong.

Manglietia celebica MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 72. — *Talauma miqueliana* DANDY, Kew Bull. (1927) 262. — Type: TEIJSMANN & DE VRIESE (L; BO), Celebes.

Manglietia sebassa KING, J. As. Soc. Beng. 58, ii (1889) 370; Ann. Bot. Gard. Calc. 3 (1891) 211, t. 54; RIDLEY, Fl. Mal. Pen. 1 (1922) 14. — *Talauma sebassa* MIQ. [Fl. Ind. Bat. Suppl. 1 (1860) 153, *nomen*] *ex* DANDY, Kew Bull. (1928) 192; H.KENG, Tree Fl. Malaya 2 (1973) 294; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143. — Type: TEIJSMANN 3983 (U; BO, L), Sumatra, Moeara Enim.

Talauma forbesii KING, J. As. Soc. Beng. 58, ii (1889) 373; Ann. Bot. Gard. Calc. 3 (1891) 206, t. 45A. — *M. forbesii* KING, Ann. Bot. Gard. Calc. 3 (1891) 206, *nom. syn.* — Type: FORBES 8153 (CAL, *n.v.*; BM, K, GH), Sumatra.

Talauma kunstleri KING, J. As. Soc. Beng. 58, ii (1889) 373; RIDLEY, Fl. Mal. Pen. 1 (1922) 16. — *M. kunstleri* KING, Ann. Bot. Gard. Calc. 3 (1891) 204, *nom. syn.* — Type: KING's coll. 6383 (BM, K).

Talauma inflata P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 208, 273, t. 8, f. 10. — *Talauma undulatifolia*

AGOSTINI, Atti Com. Accad. Fisiocrit. Siena ser. IX, 7 (1926) sep. 26. — Type: BECCARI PS 76 (MEL; BM, BO, L).

Talauma javanica P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 208, 274. — Type: ZOLLINGER 2809 (MEL, *n.v.*; A, BM, BO).

Talauma gitingensis ELMER, Leafl. Philip. Bot. 4 (1912) 1497; DANDY, Kew Bull. (1927) 420. — Type: ELMER 12443 (*n.v.*).

Talauma oreadum DIELS, Bot. Jahrb. 54 (1916) 240; A.C.SMITH, J. Arn. Arb. 23 (1942) 441; CROFT in Womersley, Handb. Fl. Papua New Guinea (1978) 129, t. 66. — *Aromadendron oreadum* (DIELS) KANEH. & HATUS. Bot. Mag. Tokyo 57 (1943) 147. — Type: LEDERMANN 9114 (K), Sepik Gebiet: Etappenberg, 850 m.

Talauma reticulata MERR. Philip. J. Sc. 17 (1920) 249. — Type: BS 35187 (K), Dinagat I.

Talauma borneensis MERR. J. Str. Br. R. As. Soc. *n.* 85 (1922) 173. — Type: RAMOS 1533 (L, BO), Sandakan and vicinity.

Talauma sumatrana AGOSTINI, Atti Com. Accad. Fisiocrit. Siena ser. IX, 7 (1926) sep. 28. — Type: BECCARI PS 918 (FI; L), Sumatra, Padang; Sgei Balu.

M. pachyphylla DANDY, Kew Bull. (1928) 186. — Type: FB 3864 CURRAN (K; NY, US).

Talauma athliantha DANDY, *l.c.* 189. — Type: RIDLEY (K), Sumatra, Berastagi.

Talauma gitingensis var. glabra DANDY, *l.c.* 189. — Type: BS 39436 RAMOS (BM; BO, US).

Talauma gitingensis var. rotundata DANDY, *l.c.* 190. — Type: VIDAL 2554 (*n.v.*).

Talauma gracilior DANDY, *l.c.* 190. — Type: ROBINSON & KLOSS 6040 (K).

Talauma peninsularis DANDY, *l.c.* 192; H.KENG, Tree Fl. Malaya 2 (1973) 294. — Type: BURKILL & HANIFF 16053 (K; BO, SING).

Talauma soembensis DANDY, Kew Bull. (1928) 193. — Type: IBOET 311 (BO; L), Soemba, Boendohero.

Champaca turbinata NOR. Verh. Bat. Gen. K. W 5, 4 (1791) 12, *nomen.*

M. fragrans REINW. *ex* BLUME, Cat. Gewassen Lands Plantent. Btzg (1823) 79, *nomen.*

M. odoratissima REINW. *ex* BLUME, *l.c.*, *nomen.*

M. pumila auct. non ANDR.: BLUME, Bijdr. (1825) 9, *p.p.* — *Talauma pumila auct. non* ANDR.: BLUME, Fl. Jav. Magnol. (1829) 38, *p.p.*; MIQ. Fl. Ind. Bat. 1, 2 (1858) 14, *p.p.*; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 69; RIDLEY, J. Mal. Br. R. As. Soc. 1 (1923) 51.

Talauma mutabilis var. acuminatissima T. & B. Cat. Hort. Bogor. (1866) 177, *nomen.*

Talauma mutabilis var. brevifolia T. & B. *l.c.*, *nomen.*

Talauma mutabilis var. latifolia T. & B. *l.c.*, *nomen.*

Talauma mutabilis var. leiocarpa T. & B. *l.c.*, *nomen.*

Talauma macrophylla BLUME *ex* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 68, *nom. syn.*

Talauma villariana ROLFE, J. Linn. Soc. Bot. 21 (1884) 307, *pro syn.* F.-VILL. *excl. typus;* MERR. Philip. J. Sc. 1 (1906) Suppl. 52; Philip. J. Sc. 5 (1910) C 348; Sp. Blanc. (1918) 12 (*'villarii'*); Enum. Philip. 2 (1923) 152, *p.p.*

Talauma elegans auct. non MIQ.: BAKER *f.* J. Bot. 62 (1924) Suppl. 2. — **Fig. 6.**

Mostly a shrub or small tree, rarely a medium-sized tree to 25 m high and 50 cm diam.; twigs appressedly long pilose (rarely woolly or villous when young), glabrescent, 3–5(–7) mm diam. Sometimes entire plant glabrous. Stipules adnate to petiole for its whole length, but sometimes up to halfway to up to its whole length. *Leaves* glabrous or (finely) appressedly hairy beneath, hairs straight or sometimes circular-curved at base, in some specimens both types of hairs occur, elliptic to narrowly elliptic, sometimes somewhat ovate or obovate, (6–)13–35 (–46) by (3–)3.5–15(–20) cm; acumen 10–25(–35, *'var. acuminata'*) mm, rarely apex rounded to obtuse; base cuneate to attenuate, rarely rounded but somewhat attenuate; margins nearly meeting at their base at the upperside of the midrib; lateral nerves in (7–)10–20 pairs; intramarginal vein prominent on both surfaces; reticulation prominent on both surfaces, from rather coarse to very fine. In some collections at both sides of the midrib a furrow-like line of depression caused by the leaves being folded in bud. Petiole often conspicuously thickened towards its base, with same indumentum as twigs, 10–45 mm, stipular scars up to halfway the top. Peduncle densely long brown pubescent, rarely glabrous, with 1 to 10 nodes, 0.7–0.8 cm long, at the top 2–6(–9) mm thick, the uppermost leaf sometimes reduced. Rarely peduncle from the axil of a leaf, up to 8 cm long, with up to 10 nodes from reduced leaves; spathaceous bracts long, brown pubescent without, rarely one of them fertile and the inflorescence bearing two flowers; pedicel 0–5 mm, with same indumentum. Outer *tepals* 3, sometimes pubescent towards the base *c.* 1.5–5(–6.5) by 1–2 cm; inner tepals 6–9, in two to three whorls, shorter than to as long as outer tepals. *Stamens* 8–13(–15) mm long, incl. the 1.5–2 mm long triangular connective appendage; carpels 5–more than 100, glabrous, rarely hairy and soon glabrescent. *Fruits* ± elliptic, 4–7.5(–15) by 2.5–6 cm, the carpels terminating in a protruding, outwards curved to 5 mm long stylar beak which often is caducous. *Seed(s)* 1 or 2 from each carpel, 6–20 mm long. When the beaks of the carpels are caducous, the fruits are quite smooth when ripe (especially in the Moluccas and New Guinea).

Distr. Sikkim, Assam (Khasi Hills), Thailand,

Fig. 6. *Magnolia candollii* (BLUME) H.KENG *var. candolli a. Habit; b.* fruit; *c.* carpel; all ×0.6; *d.* ovaries, ×0.9; *e.* anther, ×2.7 (*a, b* VAN STEENIS 9417, *c* KOSTERMANS 7337, *d, e* Herb. Bog. 124717).

Cambodia, Andaman Is.; in *Malesia*: throughout.

Ecol. In all kinds of forest, on different types of soil (ultrabasic, sandy, limestone, clay, in kerangas, on volcanic tuff, sometimes on waterlogged soil); 0–1700 m, in Sumatra up to 2500 m, in Borneo (Kinabalu) and in Sulawesi to 2000 m, in New Guinea up to 2700 m. *Fl. fr.* Jan.–Dec.

Uses. Rarely recorded (Lesser Sunda Islands and Sulawesi) as very hard, durable construction wood.

Vern. Sumatra: *djato*, Karo, *medang abu*, Kerinci, *si tekwok*, Pahang; Java: *kembang tundjung, ketundjung, tjempaka gonda, t. gondoh, t. gondok, t. gunung, t. putih*; Lesser Sunda Islands: *longkor*, Flores; Borneo: *tjempaka telur*, Pontianak, *talahuma*, Iban; Philippines: *anobling*, Luzon; Sulawesi: *danoan, wasian-batu, wasian-watu*, Minahasa; New Guinea: *adjai dia diwarmom*, Kebar Valley.

Field notes. Flowers sweet-scented, white to cream coloured, often red tinged or violet at base, sometimes light red or purplish. Outer tepals often greenish.

b. *var.* obovata (KORTH.) NOOT. Blumea 32 (1987) 374. — *Talauma obovata* KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 98, *non M. obovata* THUNB.; MIQ. Fl. Ind. Bat. 1, 2 (1858) 14; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 69; RIDLEY, Contr. Fl. Borneo (1913) 72, *excl. spec. Bangka*; MERR. Enum. Born. (1921) 251, *excl. parte.* — Lectotype: KORTHALS *s.n.* (L; BO; syntype: L), G. Pamatton.

Talauma betongensis CRAIB, [Fl. Siam. Enum. 1 (1924) 24, *nomen*] Kew Bull. (1925) 7; DANDY, Kew Bull. (1928) 189. — *M. betongensis* (CRAIB) H.KENG, Gard. Bull. Sing. 31 (1978) 129. — Type: KERR 7449 (K; BM).

Talauma oblanceolata RIDLEY, Fl. Mal. Pen. 5 (1925) 286, *excl. pl. e Borneo et Bangka*; DANDY, Kew Bull. (1928) 192; H. KENG, Tree Fl. Malaya 2 (1973) 294. — Type: RIDLEY 15590 (SING, K).

Talauma levissima DANDY, Kew Bull. (1928) 191. — Type: RIDLEY 9047 (K; SING).

Talauma sclerophylla DANDY, J. Bot. 66 (1928) 47. — Type: HAVILAND 3148 (BM; K).

Talauma candollei auct. non BLUME: RIDLEY, Contr. Fl. Born. (1913) 72, *p.p.*; MERR. Enum. Born. (1921) 251, *p.p.*

Manglietia glauca auct. non BLUME: RIDLEY, Fl. Mal. Pen. 1 (1922) 14, *pro coll. Bell & Haniff.*

Treelet, rarely a medium-sized tree 3–20 m, up to 25 cm diam. (50 cm once recorded); twigs glabrous, diam. 5–12 mm. *Leaves* glabrous, (broadly to narrowly) obovate or sometimes elliptic, 17–50 by 8–22 cm; apex rounded to slightly acuminate; base mostly cuneate, often attenuate; nerves in 9–25 pairs, intramarginal vein present; reticulation rather coarse, sometimes obscure ('*T. levissima* DANDY'). Petiole 2.5–7 cm, scar of stipules up to about (nearly) half to the apex. Peduncle glabrous, 3–12 cm, diam. at top 5–13 mm, with 2–18 nodes, pedicel absent or very short; between the (upper) bracts often tufts of (very) long woolly soon caducous hairs. *Tepals* 3–10 cm, the 3 outer ones sometimes recurved in mature flowers (but evidently many flowers were not yet mature when collected); the 6 inner ones erect, in big flowers quite narrow, in small flowers often broader and fleshy. *Stamens* from *c.* 1.2 to *c.* 3 cm, the appendage (narrowly) triangular to subulate, *c.* 3 mm long, filament *c.* 3 mm; carpels *c.* 10–100, the styles long, becoming woody spines up to 15 mm in fruit but sometimes caducous. *Fruits* 5–15 by 4–7.5 cm, ± ellipsoid.

Distr. Sikkim, Assam (Khasia), Thailand; in *Malesia*: Malay Peninsula, Borneo (Sarawak, 3rd and 4th Div.; Sabah; E. Kalimantan).

Ecol. Primary and secondary forest; 0–1700 m; *fl. fr.* Jan.–Dec.

Vern. Borneo: *tala umah*, Iban.

Field notes. Peduncles blue-green, often recorded as glaucous. Tepals cream, often recorded with purple base, sometimes (yolk-)yellow with white base. Outer tepals sometimes recorded as green. Bracts purple.

c. *var.* angatensis (BLANCO) NOOT. Blumea 32 (1987) 375. — *M. angatensis* BLANCO, Fl. Filip. (1837) 859; ed. 3, 2 (1878) 243. — *Talauma angatensis* (BLANCO) VIDAL, Cat. Pl. Prov. Manila (Nov. 1880) 17; F.-VILL. Nov. App. (Dec. 1880) 3; VIDAL, Sin. Philip. Atl. (1883) t. 3; Rev. Pl. Vasc. Filip. (1886) 38; CERON, Cat. Pl. Herb. (1892) 9; MERR. Bur. Gov. Lab. Philip. Publ. 35 (1906) 7; Sp. Blanc. (1918) 146; Enum. Philip. 2 (1923) 151. — Type: BLANCO (*n.v.*).

Talauma villariana ROLFE, J. Linn. Soc. Bot. 21 (1884) 307, *excl. syn.*; VIDAL, Rev. Pl. Vasc. Filip. (1886) 38; CERON, Cat. Pl. Herb. (1892) 9; MERR. Enum. Philip. 2 (1923) 152, *excl. maj. parte.* — *Talauma mutabilis auct. non* BLUME: F.-VILL. Nov. App. (1880) 3, *excl. parte et tab. 148.* — Type: VIDAL 5 (K, L), Bulacan. VIDAL 5 in A is different and belongs to *var. candollii*.

Talauma luzoniensis WARB. *ex* PERKINS, Fragm. Fl. Philip. (1904) 171; MERR. Bur. Gov. Lab. Philip. Publ. 35 (1906) 8; Philip. J. Sc. 3 (1909) C 406. — Type: WARBURG 11767 (?B, *n.v.*).

Talauma grandiflora MERR. Bur. Gov. Lab. Philip. Publ. 29 (1905) 13; *ibid.* 35 (1906) 7. — Type: FB 314 (*n.v.*, photo BM).

Talauma oblongata MERR. Bur. Gov. Lab. Philip. Publ. 35 (1906) 8. — Type: MERRILL 1003 (*n.v.*).

Talauma gigantifolia auct. non MIQ.: F.-VILL. Nov. App. (1880) 4.

Tree to 18 m by 45 cm diam.; twigs appressedly pubescent to glabrous, diam. 5–12 mm. *Leaves* glabrous, (narrowly to broadly) elliptic, 22–45 by 8–22

cm; acumen between 0 and 20 mm; base cuneate, acuminate; midrib much prominent at both sides; nerves in 12 to 26 pairs, with an angle of 50–70° to midrib. Petiole 1.5–6.5 cm, often much thickened at base, scars of stipules from up to halfway, and then the leaf margins decurrent into two ridges, to up to the top. Peduncle (sparsely) appressedly pubescent, often glabrescent under fruit, at the top 8–15 mm diam., 2–5 cm long, nodes 2–11; bracts glabrous but appressedly puberulous at base, to 8 cm, but often much shorter. Outer *tepals* 3, to 7 cm; inner tepals 6, 2.5–4.5 cm long. *Stamens* introrse, 12–20 mm long, including the 1–3 mm long filament and the short triangular appendage; carpels pubescent, sometimes only at base of ovary, to glabrous, *c.* 40 to more than 150. *Fruit* 6–15 by 5–7 cm, base of torus under fruit 10 to 17 mm diam., the carpels provided with persistent stylar spines to *c.* 7 mm long.

Distr. *Malesia*: Philippines (Luzon, Mindanao, Busuanga I., Camiguin I., Dalupiri I., Negros, Palawan, Panay, Capiz prov., Samar), Sulu Archipelago, Tawi I., Moluccas (Talaud; 1 coll.).

Ecol. Primary forest; 0–200 m, but rarely recorded.

Uses. Used for construction and canoe building.

Field notes. Flowers white.

d. *var.* **beccarii** (RIDLEY) NOOT. Blumea 32 (1987) 375. — *Talauma beccarii* RIDLEY, Kew Bull. (1912) 381; Contr. Fl. Born. (1913) 72; MERR. Enum. Born. (1921) 251. — Type: BECCARI 3959 (K; FI), Sarawak, colline del Sadong.

Tree (7–)15–30 m by 20–50 cm; twigs and buds glabrous or appressedly pubescent, diameter of twigs under peduncle 5–9 mm. *Leaves* glabrous, coriaceous with recurved margins, elliptic to obovate, 16–36 by 6–17 cm; apex slightly acuminate, base cuneate in the lower part; nerves in 16–26 pairs, slightly curved upwards but nearly straight, meeting in an intramarginal vein close to the margin. Petiole 20–40(–55) mm, stipular scar (nearly) to the apex. Peduncle densely appressedly pubescent, 3–11 cm long, nodes 6–13, diam. at top 9–18 mm; bracts pubescent. *Tepals* 4.5–9 cm long. *Stamens c.* 10 mm; carpels many (*c.* 200) sparsely pubescent to glabrous in flower, glabrescent. *Fruit* with small stylar spines on the mature carpels, *c.* 12 by 6 cm.

Distr. *Malesia*: Borneo (Sarawak, 1st & 3rd Div., Kapit Distr., 4th Div., Marudi; Sabah, Lahad Datu; E. Kalimantan, Berouw, Sangkuliran I., W. Kalimantan, Amai Ambit).

Ecol. Forest; to 800 m.

Vern. Borneo: *talauma*, Iban.

Field notes. Flowers yellow or cream coloured.

e. *var.* **singapurensis** (RIDLEY) NOOT. Blumea 32 (1987) 376. — *Talauma singapurensis* RIDLEY, Kew Bull. (1914) 323; Fl. Mal. Pen. 1 (1922) 16; DANDY, Kew Bull. (1928) 192; H.KENG, Tree Fl. Malaya 2 (1973) 293; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143. — *M. singapurensis* (RIDLEY) H.KENG, Gard. Bull. Sing. 31 (1978) 129. — Lectotype: RIDLEY 5091 (SING; BM), Singapore, Chan Chukang.

Talauma kuteinensis AGOSTINI, Atti. Com. Accad. Fisiocrit. Siena ser. IX, 7 (1926) sep. 30. — Type: BECCARI PB 2102 (FI).

Talauma lanigera auct. non HOOK *f.* & THOMS.: RIDLEY, J. Str. Br. R. As. Soc. *n.* 33 (1900) 38.

Talauma obovata auct. non KORTH.: RIDLEY, Contr. Fl. Born. (1913) 72, *pro spec. Bangka*; MERR. Enum. Born. (1921) 251, *pro coll. Low.*

Talauma oblanceolata RIDLEY, Fl. Mal. Pen. 5 (1925) 286, *quoad pl. Borneo et Banca.*

Tree 6–40 m, 20–60 cm diam.; twigs appressedly long pubescent to shortly tomentose, glabrescent, diam. 7–12 mm. *Leaves* with basally curled hairs beneath, glabrescent (in fruiting specimens often already glabrous), (narrowly) elliptic to obovate, 30–70 by 8–25 cm; apex slightly acuminate; base cuneate; nerves in 17–29 pairs prominent at both surfaces; reticulation *idem*, rather coarse. Petiole 2.5–11 cm long, stipular scar from up to 1/3 to up to 2/3 of its length. Peduncle densely appressedly long-pubescent, 5–12 cm, diam. at top 10–20 mm, nodes 5–11; bracts with same indumentum. Outer *tepals* glabrous, 5–8 cm long, the inner ones *c.* 2 cm shorter. *Stamens* (13–)25–30 mm; carpels glabrous or nearly so, 50–150. In fruit the stylar spine present, recurved, but top often incurved, (5–)12–17 mm long. *Fruits* 10–15 by 6–7 cm.

Distr. *Malesia*: Sumatra, Simalur I., Banka, Malay Peninsula (incl. Singapore), Borneo (Sarawak, Kuching, Semengoh Arb., 3rd Div., Kapit Distr., Kutein; Sabah, Sandakan, Sgei Labuk, Sipiting, Ulu Mendalong; E. Kalimantan, 3 coll.).

Ecol. Primary rain-forest; 0–600 m.

12. Magnolia gigantifolia (MIQ.) NOOT. Blumea 32 (1987) 377. — *Talauma gigantifolia* MIQ. Fl. Ind. Bat. 1, 2 (1858) 15; Suppl. (1860) 153; (1861) 366; T. & B. Cat. Hort. Bogor. (1866) 177; MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70; BOERL. Cat. Hort. Bogor. (1899) 7; RIDLEY, Contr. Fl. Born. (1913) 72; MERR. Enum. Born. (1921) 251; Pl. Elm. Born. (1929) 60; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 143. — Type: TEIJSMANN HB 463 (U; BO, L), West coast Sumatra, Sungei Pagoe.

Talauma megalophylla MERR. J. Str. Br. R. As. Soc. *n.* 85 (1922) 172. — Type: RAMOS 1509 (A; K), Sandakan and vicinity.

Talauma magna AGOSTINI, Atti Com. Accad. Fisiocrit. Siena ser. IX, 7 (1926) sep. 31. — Type: BEC-

CARI PS 498 (FI; L), ad Ayer mancior, Provincia di Padang in Sumatra occid.

Talauma elmeri MERR. *ex* SODERBERG, Svensk Bot. Tidskr. 30 (1936) 538, *nomen*.

Tree 6–25 m high by 7–40 cm diam.; twigs often thick, more than 10 mm diam., densely appressedly, sometimes very long-pubescent, glabrescent. *Leaves* often crowded towards the end of the twigs, densely appressedly pubescent, glabrescent, rarely glabrous beneath, in innovations often also above, mostly narrowly obovate, 33–85 by 13–32 cm; acumen rounded to shortly abruptly acuminate, to 2.5 cm; base cuneate, usually for the lower half to 2/3 of the blade; nerves in 24–more than 50 pairs, intramarginal vein present; reticulation prominent on both surfaces. Petiole from only a few millimetres to 5 cm, the flat stipular scar nearly up to the top. Peduncle 2.5–15 cm, diam. 10–20 mm, nodes 5–11, densely appressedly (sometimes very long-)pubescent; bracts densely appressedly pubescent. Outer *tepals* 3, at least towards the base densely appressedly pubescent, 7–9 cm long; inner tepals 6, glabrous, 6–7 cm long. *Stamens c.* 20–25 mm, the triangular connective appendage 2–3 mm; carpels from *c.* 40 to *c.* 200, densely appressedly pubescent, the stigma glabrous, styles long, persistent in fruit as *c.* 2 cm long stout spines. *Fruit* 13–18 by *c.* 8 cm.

Distr. *Malesia*: Sumatra (Padang, Palembang, Lampong, Banka), Borneo (Sarawak; Sabah, Sandakan, Tawao; E. Kalimantan, Blu-u, Nunukan, Berouw).

Ecol. Primary forest, on sandy (loam) soil; below 300 m.

Vern. Sumatra: *kayu klappoh, k. tangiheh*.

Field notes. The flowers are reported to be from pale white via light red to dark brown, the fruits pale yellowish.

13. Magnolia lasia NOOT. Blumea 32 (1987) 377. — Type: KATO *c.s.* 7830 (L; KYO).

Tree 9–20 m by *c.* 20 cm; twigs densely very long villous when young, the indumentum falling in patches, diameter 8–12 mm. *Leaves* glabrous, elliptic to obovate, 25–60 by 11–21 cm; apex hardly acuminate; base cuneate; nerves in 16–22 pairs, prominent at both surfaces, reticulation *idem*, rather fine. Petiole glabrous or slightly long villous, 4–10 cm long, stipular scar from halfway to up to the apex. Peduncle densely very long villous, 3–more than 20 cm long, diameter at top 10–20 mm; bracts not seen. *Tepals* glabrous, 6–10 cm long. *Stamens* 25–30 mm long; carpels more than 100, densely long villous with very long styles. In fruit the carpels oblong, with a slender stylar spine of *c.* 3 cm. Probably in ripe *fruits* (not seen, but certainly longer than 10 cm) still vestiges of the indumentum.

Distr. *Malesia*: Borneo (Sarawak, 5th Div., Lawas; Sabah, Tenom & Mostyn; E. Kalimantan, near Long Bawan.

Ecol. Primary, secondary, and riparian forest, also kerangas; 950–1100 m. *Fl.* July (twice recorded), *fr.* March, Aug.

Vern. Borneo: *talal umar*, Iban.

14. Magnolia persuaveolens DANDY, Kew Bull. (1928) 186. — *Talauma persuaveolens* DANDY, Taxon 21 (1972) 468. — *Michelia ?spec.* STAPF, Trans. Linn. Soc. Lond. II, Bot. 4 (1894) 128. — Type: Low (K), Kinabalu.

KEY TO THE INFRASPECIFIC TAXA

1. Leaves elliptic to broadly elliptic, at least twice as long as broad. Twigs appressedly pubescent **a.** *ssp.* **persuaveolens**
1. Leaves broadly elliptic, less than twice as long as broad ..... **(b.** *ssp.* **rigida)**
2. Plant glabrous ..... **b1.** *var.* **rigida**
2. Twigs, leaves beneath, and carpels densely pubescent..... **b2.** *var.* **pubescens**

a. *ssp.* **persuaveolens**

Shrub 1.5–2.5 m (once recorded); twigs appressedly pubescent at least towards the apex, diam. 6–10 mm, terminal buds appressedly hairy. *Leaves* brown when dry, coriaceous, very finely (short) appressedly hairy at least when young, glaucous beneath, ± elliptic to somewhat obovate, 9–22 by 4–8 cm; apex rounded to bluntly acute, margin rather strongly recurved, base cuneate; nerves in 10–14 pairs, slightly curved upwards and meeting in a looped intramarginal vein; reticulation prominent at both sides but often more or less obscured below, rather coarse, diameter of the alveoles much more than 1 mm. Petiole when young with same indumentum as twigs, glabrescent, 1.5–3 cm long, stipular scar up to *c.* 3/4 of its length. Peduncle appressedly pubescent, 4.5–10 cm, with 5–8 nodes, diam. at apex 6–7 mm. *Tepals* 22–45 mm, the outer three somewhat longer than the inner 6. *Stamens* 8–12 mm; carpels *c.* 20–25, pubescent, with rather long styles. *Fruit* glabrous, *c.* 5 by 3 cm, the stylar spines persistent.

Distr. *Malesia*: Borneo (Sabah, Kinabalu, 5 coll.).

Ecol. Mossy forest and open places; 1200–1650 m. *Fl.* Feb.–Aug.

Field notes. Flowers cream.

b. *ssp.* **rigida** NOOT. Blumea 32 (1987) 379. — Type: RSNB 845 (L; SING).

b1. *var.* **rigida**.

Shrub to big tree, 3 to 25 m, diam. to 60 cm but

usually much less. Twigs glabrous, thick, blackish, diam. 8–10 mm. *Leaves* glabrous, thick coriaceous with strongly recurved margins, the undersurface glaucous, broadly elliptic, always less than twice as long as broad, 11–18 by 6–14 cm; apex rounded to blunt cuneate; base attenuate; nerves in 15–16 pairs, straight, forked towards the end and meeting in a less conspicuous intramarginal vein. Petiole 23–35 mm, stipular scar from up to half to up to 3/4. Peduncle glabrous, thick, diam. 9–15 mm, with 2–12 nodes; bracts glabrous, *c.* 6 cm long. *Tepals* 5–6 cm when flower fully open, outer 3, inner 6. *Stamens* 18–20 mm, about as long as the ovary; carpels *c.* 20–80, with long styles. *Fruit* 6–9 by *c.* 5 cm, reported to become *c.* 12.5 cm long. Spines probably persistent, but in the herbarium often caducous.

Distr. *Malesia*: Borneo (Sabah, Kinabalu, 12 coll.), recorded as a common tree.

Ecol. Frequent in gullies as a big tree without buttresses, as shrub probably on ridges; 2700–3400 m; *fl. fr.* Jan., July, Nov.

Field notes. Petals recorded to be white or creamy, slightly purplish at base.

b2. *var.* pubescens NOOT. Blumea 32 (1987) 379. — Type: BEAMAN 9131 (L; MSC, UKMG).

As *var. rigida*, but twigs, leaves, and carpels densely appressedly pubescent. Nerves in *c.* 10 pairs. Flowers not known.

Distr. *Malesia*: Borneo (Sabah, Kinabalu), only the type.

Ecol. Altitude 1950–2000 m.

15. Magnolia sarawakensis (AGOSTINI) NOOT. Blumea 32 (1987) 380. — *Talauma sarawakensis* AGOSTINI, Atti Com. Accad. Fisiocrit. Siena ser. IX, 17 (1925) sep. 29. — *Talauma intonsa* DANDY, Kew Bull. (1928) 191. — Type: BECCARI PB 3331 (FI; K). The isotype in K is the holotype of *Talauma intonsa* DANDY.

Twigs densely long villous, glabrescent in patches, diam. 5–7 mm. *Leaves* in innovations with same indumentum, soon glabrous, glaucous beneath, narrowly elliptic to obovate, 23–40 by 6–11 cm; apex acuminate; base attenuate-cuneate; nerves in 12–18 pairs, leaving the midrib nearly perpendicular and then gradually curved upwards; reticulation rather coarse, prominent at both surfaces. Petiole 15–60 mm with a stipular scar from about half to 2/3 of its length. Peduncle long villous, diam. 12 mm at the top. *Flowers* probably as in *M. lasia*, but length of stamens not known; carpels densely long villous, not many (acc. to DANDY). *Fruits* not known.

Distr. *Malesia*: Borneo (Sarawak, Batang Lupar; Sabah, SE. Kinabalu, Bt Kulung; W. Kalimantan, Singkadjan; E. Kalimantan, Lilit Buan, Teputse).

Ecol. Dipterocarp forest on ultramafic soil; 750 m (once recorded, Bt Kulung).

16. Magnolia villosa (MIQ.) H.KENG, Gard. Bull. Sing. 31 (1978) 129. — *Talauma villosa* MIQ. [Fl. Ind. Bat. Suppl. (1860) 153, *nomen*] Fl. Ind. Bat. Suppl. (1861) 366; H.KENG, Tree Fl. Malaya 2 (1973) 293; NOOT. in Whitmore & Tantra, Tree Fl. Indonesia, Sumatra Checklist (1986) 144. — *Talauma rabiana* CRAIB *var. villosa* (MIQ.) P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 271. — Type: TEIJSMANN HB 3690 (L; BO), Sumatra, Moeara Enim.

Talauma lanigera HOOK.*f.* & THOMS. Fl. Br. India 1 (1872) 40; KING, J. As. Soc. Beng. 58, ii (1889) 372; Ann. Bot. Gard. Calc. 3 (1891) 202, t. 42; RIDLEY, Fl. Mal. Pen. 1 (1922) 15. — Type: GRIFFITH 65 (K).

Tree 9–18 m by 30 cm (once recorded); twigs (shortly) tomentose, glabrescent in patches, diam. 6–7 mm. *Leaves* tomentose when young at both surfaces, glabrescent but often the tomentum persistent on midrib and nerves, elliptic, 19–40(–50) by 7.5–20 cm; apex (abruptly) acuminate; base cuneate-attenuate; nerves in 13–20(–25) pairs; reticulation rather fine, prominent on both surfaces. Petiole with same indumentum as twigs, 1.5–4.5(–6) cm, stipular scar from up to 1/4 to up to 3/4 of its length. Peduncle densely (villous) tomentose, 2.5–?6 cm, diam. at top 10–12 mm; bracts densely villous tomentose. *Tepals* villous without or only at the base, 4–5 cm long. *Stamens* probably *c.* 15 mm; carpels 18–60, densely villous-tomentose, when ripe with a rather stout stylar spine of up to 1 cm. *Fruit* 10 by 6 cm (once seen).

Distr. *Malesia*: Sumatra (West, Taram, E. of Pajakumbuh), Malay Peninsula (Penang; Perak; Genting highlands; Malacca; Lingga Arch.), Borneo (Sabah, Lamag distr.).

Ecol. Primary forest (once recorded); 450–1000 m.

17. Magnolia mariusjacobsia NOOT. Blumea 32 (1987) 381, f. 10.

Treelet *c.* 6 m high by *c.* 6 cm, entirely glabrous. Twigs with many obvious scars of fallen leaves. *Leaves* narrowly elliptic to obovate, 27–55 by 3–7 cm, the blade long decurrent into the short, thickened, 1–2 cm long petiole which bears a stipular scar for its entire length; apex not acuminate, nearly rounded; nerves in *c.* 20–30 pairs, much prominent below and meeting in a prominent intramarginal vein; reticulation rather coarse, prominent beneath. Peduncle 1.5–2.5 cm, thickened towards the apex and there about 8 mm broad, with 2–3 scars; pedicel short to absent. Outer *tepals* 3, *c.* 5 by 3 cm, thin; inner tepals in two whorls of three each (or the inner whorl with 4–5 tepals), fleshy, the outer whorl *c.* 4.5, the inner 2.5–3 cm long. *Stamens* up to 3 (at base 4)

mm broad, 10–12 mm long including the broadly triangular connective appendage; carpels *c.* 25 with long styles protruding above the stamens. Only young *fruits* known yet, like those of *M. candollii var. candollii*.

Distr. *Malesia*: Borneo (Sarawak, 3rd Div., Kapit Distr.).

Ecol. Primary forest on sandstone, on low hills.

Field notes. Outer perianth leaves green, inner ones cream coloured.

2. MANGLIETIA

BLUME, Verh. Bat. Gen. K. W. 9 (1823) 149; Bijdr. (1825) 8; Fl. Java Magnol. (1829) 22; DANDY, Kew Bull. (1927) 259; in Hutch. Gen. Fl. Pl. 1 (1964) 54; NOOT. Blumea 31 (1985) 91. — *Magnolia sect. Manglietia* (BLUME) BAILLON, Adansonia 7 (1866) 66. — Type: *M. glauca* BLUME.

Paramanglietia HU & CHENG, Acta Phytotax. Sin. 1 (1951) 255. — Type: *P. aromatica* (DANDY) HU & CHENG. — **Fig. 7, 8.**

Trees. Stipules adnate to or free from petiole. *Flowers* terminal, solitary, bisexual. *Tepals* 9–13, 3-merous, subequal. Anthers introrse, connective produced into a short or long appendage. Gynoecium sessile. *Carpels* many, free, or often connate when young; ovules 4 or more in each carpel. Fruiting carpels free, crowded, dehiscent along the dorsal and sometimes also the ventral suture.

Distr. About 25 species in tropical and subtropical Asia from the E. Himalayas eastwards to S. China and *Malesia* (5 *spp.*, not in the Moluccas and New Guinea).

KEY TO THE SPECIES

1. Stipules only adnate to the very base of the petiole. Stipular scar hardly or not present. Innovations, stipules, young petioles and underside of leaves never woolly pubescent.
 2. Peduncles appressedly hairy ..... **1b. M. glauca *var.* sumatrana**
 2. Peduncles glabrous.
  3. Underside of leaves densely minutely reddish-brown appressedly hairy. Nerves in 10–15 pairs **3. M. calophylla**
  3. Underside of leaves glabrous. Nerves in 14–20 pairs ..... **4. M. sabahensis**
1. Stipules higher adnate to petiole, stipular scar clearly present.
 4. Innovations, peduncles, stipules and underside of leaves rufous woolly pubescent .. **2. M. lanuginosa**
 4. Twigs and stipules glabrous or nearly so. Hairs if present minute and appressed.
  5. Fruits cylindrical, 2–3 times as long as wide; carpels mostly opening along the dorsal suture first. Ovary conical or cylindrical ..... **5. M. dolichogyna**
  5. Fruits ellipsoid or ovoid, only slightly longer than wide ..... **1. M. glauca (*var.* glauca)**

1. Manglietia glauca BLUME, Verh. Bat. Gen. K. W. 9 (1823) 150; Bijdr. (1825) 8; Fl. Java Magnol. (1829) 22, t. 6; KORTH. Ned. Kruidk. Arch. 2, Versl. (1851) 97; MIQ. Fl. Ind. Bat. 1, 2 (1858) 15; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 71; K. & V. Meded. Lands Plantent. 17 (1896) 150; BACKER, Schoolfl. Java (1911) 14; KOORD. Exk. Fl. Java 2 (1912) 238, f. 47; KOORD.-SCHUM. Syst. Verz. 1, Fam. 95 (1913) 1; BACKER & BAKH.*f.* Fl. Java 1 (1963) 97; NOOT. Blumea 31 (1985) 92. — *Michelia doltsopa auct. non* BUCH.-HAM. *ex* DC.: SPRENG. Syst. Verz. 4, 2 (1827) 217; HASSK. Cat. Hort. Bog. (1844) 178. — *Magnolia blumei* PRANTL in E. & P. Nat. Pfl. Fam. 3, 2 (1888) 16. — Type: BLUME, Salak (*n.v.*)

M. macklottii auct. non KORTH.: MIQ. Fl. Ind. Bat. 1, 2 (1858) 15, *p.p.* — *M. oortii auct. non* KORTH.: MIQ. Suppl. (1860) 153. — Type: TEIJSMANN HB 466, Haleban.

M. sumatrana MIQ. Suppl. (1860) 153, *nomen; ibid.* (1861) 367; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 71. — *M. oortii* (*non* KORTH.) MIQ. Fl. Ind. Bat. 1, 2 (1858) 15, *p.p.* — *M. glauca var. sumatrana* DANDY, Kew Bull. (1928) 188. — Type: TEIJSMANN HB 468, Bukit Silit (L; BO).

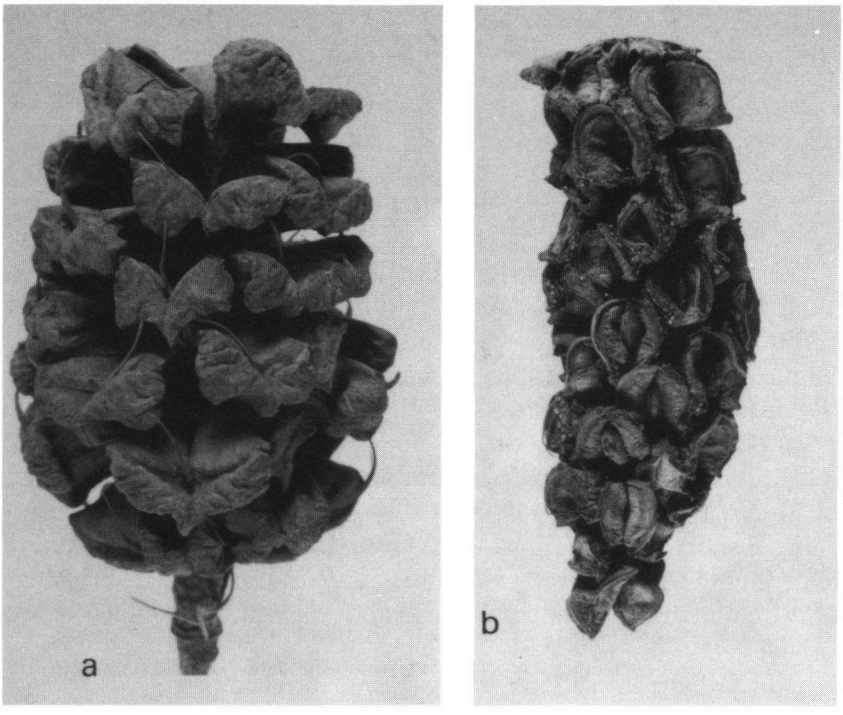

Fig. 7. Fruits of *a. Manglietia glauca* BLUME and *b. M. dolichogyna* DANDY *ex* NOOT., both ×1 (*a* KOORDERS 4449, *b* CLEMENS 26279).

M. pilosa P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 217, 292. — *M. singalanensis* AGOSTINI, Atti Com. Accad. Fisiocrit. Siena, ser. IX, 7 (1926) sep. 22. — Type: BECCARI PS 334 (L, FI), Sumatra, Mt Singalan. — **Fig. 7a**.

Tree up to 35 m by 122 cm diam. Twigs warted, with many ring-formed scars of the fallen stipules, glabrous or with some hairs at the apex, in *var. sumatrana* appressedly hairy in innovations. Stipules glabrous or with some hairs on the apex, adnate to the petiole, *c.* 15–60(–90) mm. *Leaves* glabrous above, minutely appressedly hairy beneath, sometimes the hairs microscopically small and the leaves seemingly glabrous, glaucous, (long-)elliptic to slightly obovate, 10–35 by 5–12 cm; acumen 3–15 mm; base acute to slightly acuminate; midrib much prominent; nerves in (9–)11–16(–18) pairs, decurrent along the midrib, prominent on both sides, straight, anastomosing at some distance from the margin and merging into the venation, sometimes an intramarginal vein distinct; reticulation fine, prominent on both surfaces. Petiole glabrous, 1.5–3(–4.5) cm, stipular scar *c.* 3–10(–15) mm, less than one third of its length, rarely slightly longer, sometimes even up to above halfway its length. Peduncle glabrous, or appressedly hairy in *var. sumatrana*, without scars or with one scar 15–40 mm, pedicel glabrous, or appressedly hairy in *var. sumatrana*, 2–8 mm; spathaceous bracts at least one towards the base of pedicel and one at base of peduncle or higher, sometimes a third at the middle of peduncle or lower. Outer *tepals* 3, *c.* 5–6.2 by 2 cm, inner tepals 6, smaller than the outer tepals. *Stamens* many, filament *c.* 3 mm, anthers *c.* 6 mm, connective appendage very acute, *c.* 4 mm; gynoecium ovoid to orbicular, *c.* 15 by 7 mm. *Carpels* 20–*c.* 50, nearly entirely connate when young, *c.* 3 mm long along the dorsal suture, dorsal face polygonous; style free, 1.5–2 mm long. *Fruits* ellipsoidal or ovoid, 3.5–8(–9.5) by 2.5–5.5(–6.5) cm. *Seeds* flat-orbicular to ellipsoidal, often irregularly shaped, 5–8 by 4–5 mm.

a. *var.* glauca

Peduncle and pedicel glabrous. Fruits at most 8 by 5.5 cm. Dorsal face of carpels from 1–1.5 cm in the upper to at most 2.5 cm in the lower carpels. Twigs in innovations glabrous.

Distr. *Malesia*: Sumatra (Aceh, G. Ketambe;

Sumatera Utara, E. Coast and Tapanuli; W. coast; Lampung, G. Tanggamus), Java (common in the mountains of W. Java, less so in Central and E. Java), Lesser Sunda Is. (Bali, Sumba, Flores), Sulawesi (Central, near Malili; North, Mt Nokilalaki).

Ecol. In forest; 500–2400 m; *fl. fr.* Jan.–Dec.

Uses. Good timber, used for building houses.

Vern. Sumatra: *antuang, bungo, madang bustak, m. kaladi, m. tjampago, tjampago*; Java: *baros, tempoko baros, tjepoko kantil*; Bali: *tjimpaka*; Sulawesi: *manglid.*

Field notes. Flowers cream, rarely white or yellowish green. Fruit (reddish) green to red brown.

b.*var.* sumatrana DANDY, Kew Bull. (1928) 188; NOOT. Blumea 31 (1985) 93. — *M. sumatrana* MIQ. — *M. pilosa* P.PARMENT.

Peduncle and pedicel appressedly hairy. Fruits *c.* 9.5 by 6.5 cm. Dorsal face of carpels from 2 cm in upper to 3.5 cm in lower carpels. Twigs in innovations appressedly hairy. Stipules often adnate to the very base of the petiole only.

Distr. *Malesia*: W. Sumatra (G. Singalan, G. Talang, G. Merapi, G. Silit and Padang Panjang).

Ecol. In forests; 600–1300 m; *fl.* Sept.–Oct., *fr.* June.

Vern. *Sikibus.*

Field notes. Flowers yellow or white, fruit black.

2. Manglietia lanuginosa (DANDY) NOOT. Blumea 31 (1985) 94. — *M. glauca var. lanuginosa* DANDY, Kew Bull. (1928) 187. — Type: FRI bb 8531 (BO).

Tree up to 40 m high and 1 m diam. Innovations and peduncles, stipules, young petioles and undersides of leaves rufous woolly pubescent. *Leaves* (narrowly) elliptic, sometimes slightly obovate, 15–26 by 7–11 cm; nerves in 14–20 pairs. Petiole 2.5–4 cm, with stipular scar only towards the base. Further as *M. glauca.*

Distr. *Malesia*: Sumatra (around lake Toba: Deli, Simelungun & Karolands, Tapanuli).

Ecol. Primary forest; 1000–1500 m; *fl.* Feb., *fr.* Feb.–Nov.

Vern. *Aduwang, antuang, modang sanggar.*

Field notes. Flowers cream or green, sweet scented; fruit grey-green becoming brown.

3. Manglietia calophylla DANDY, J. Bot. 66 (1928) 46; NOOT. Blumea 31 (1985) 94. — *M. glauca* (*non* BLUME) RIDLEY, J. Fed. Mal. St. Mus. 8, 4 (1917) 14. — Type: ROBINSON & KLOSS 200 (BM; SING), Sumatra, Korinchi Peak.

Tree to at least 30 m by 1 m. Stipules appressedly hairy to nearly glabrous, only adnate to the very base of the petiole. *Leaves* ovate, covered by a dense indumentum of very small glistening reddish brown hairs beneath (often only to be seen with a magnification of more than ×50), 10–20 by 4–8 cm with faintly acuminate apex, recurved, bony margin and acute to nearly rounded base; midrib much prominent beneath, grooved; nerves prominent on both sides, in 10–15 pairs, anastomosing and meeting in an intramarginal vein which is hardly distinct from the finely netted reticulation on both surfaces. Petiole 2–2.5 cm. Peduncle glabrous. *Flowers* as in *M. glauca* but smaller, the tepals as far as known not longer than *c.* 2.5 cm. *Fruits* as the smaller fruits in *M. glauca c.* 4–5.5 by 3.5–5 cm, number of carpels *c.* 20. *Seeds c.* 4 from each carpel, flat ovoid, *c.* 7 by 4 mm.

Distr. *Malesia*: Sumatra (W. Coast, G. Kerinci).

Ecol. Primary mountain forest; 2000–2200 m; *fl.* Oct., *fr.* May–Aug.

Field notes. Flowers white or yellow.

4. Manglietia sabahensis DANDY *ex* NOOT. Blumea 31 (1985) 95. — *'Sabah Manglietia'* DANDY *ex* MEIJER, Bot. Bull. Herb. Sabah 11 (1968) 11, *nomen.* — *M. 'sabahensis'* DANDY *ex* COCKBURN, Trees of Sabah 2 (1980) 56, *nomen.* — Type: CLEMENS 34192 (L; A, BO), Kinabalu, Colombon basin, 4500 ft. — **Fig. 8.**

Tree. Stipules glabrous, *c.* 7 cm long, adnate to the very base of the petiole only. *Leaves* glabrous, the undersurface in young leaves with an occasional very small hair, elliptic to obovate, 12–22 by 6–9 cm; base cuneate, apex acute to rounded, usually not or only very shortly acuminate; midrib sulcate above, very prominent and grooved below; nerves in 14–*c.* 20 pairs, meeting in an intramarginal vein which is slightly more prominent than the densely netted reticulation. Petiole 23–30 mm, stipular scar hardly visible. Outer *tepals* 3, *c.* 3 by 1–1.5 cm; inner tepals 6, narrower. *Stamens c.* 1 cm long; ovary ellipsoid, *c.* 15 by 10 mm. *Fruits* ellipsoid to ovoid, *c.* 6 by 4 cm, the carpels opening along the dorsal suture only or both along dorsal and ventral suture. Peduncle slender, *c.* 3 cm long, pedicel slender, *c.* 2 cm long. *Seeds c.* 4 in each carpel, 5–8 by 3–4 mm.

Distr. *Malesia*: Borneo (Sabah, Kinabalu).

Ecol. In forest; *c.* 1300 m; *fr.* June–Aug.

5. Manglietia dolichogyna DANDY *ex* NOOT. Blumea 31 (1985) 95. — *M. glauca* (*non* BLUME) KING, J. As. Soc. Beng. 58, ii (1889) 370; Ann. Bot. Gard. Calc. 3 (1891) 213, t. 56, *excl. fr.*; RIDLEY, Fl. Mal. Pen. 1 (1922) 14, *p.p.*; BURK. Dict. (1935) 1407. — *'Long-pistillate Manglietia'* MEIJER, Bot. Bull. Herb. Sabah 11 (1968) 10. — *M. 'dolichogyna'* DANDY *ex* COCKBURN, Trees of Sabah 2 (1980) 56, *nomen.* — Type: SAN 41051 (L; SAN). — **Fig. 7b.**

Tree up to 21 m and 60 cm diam. Stipular scar on petiole to *c.* halfway. *Flowers*: peduncle *c.* 2–3 cm, pedicel 4–7 mm, spathaceous bract glabrous, outer *tepals* 3, *c.* 3.5 by 14 mm, inner tepals 6, smaller.

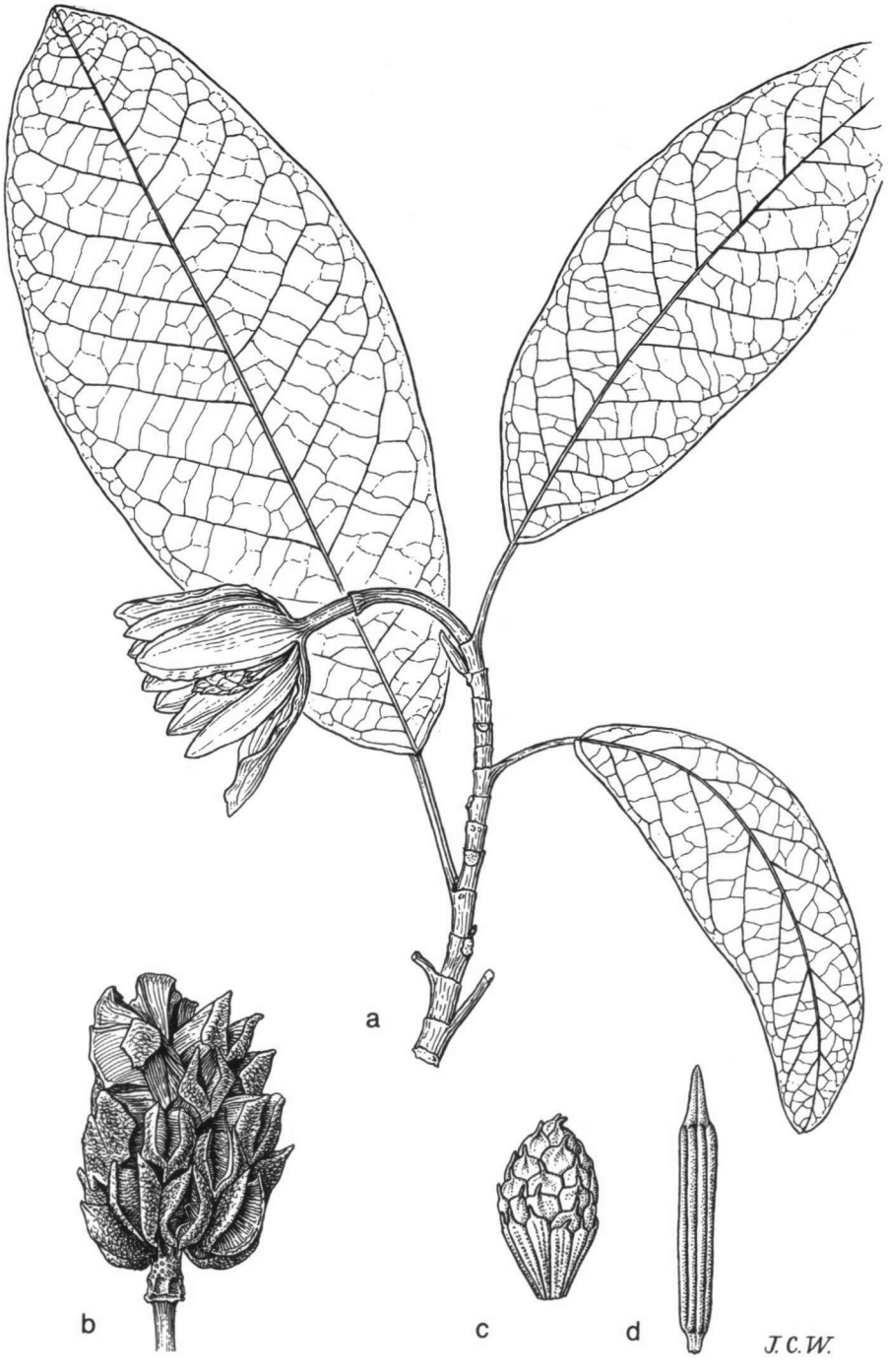

Fig. 8. *Manglietia sabahensis* DANDY *ex* NOOT. *a.* Habit, ×0.6; *b.* fruit, ×0.6; *c.* ovary, ×0.9; *d.* anther, ×3.8 (*a, b* CLEMENS 40979, *c, d* CLEMENS 40769).

Stamens many, *c.* 10 mm, incl. the *c.* 3 mm long acute connective appendage. *Ovary* conical or cylindrical, dorsal face of carpels 2–3 mm along suture, style *c.* 2 mm long. Ripe *fruits* cylindrical 4–7.5 by 2–*c.* 2.5 cm, 2 to 3 times as long as wide, carpels *c.* 60, *c.* 1 cm along the dorsal suture, opening along the dorsal suture first and sometimes later also along the ventral suture. *Seeds* flat ellipsoidal, *c.* 6 by 4 mm. Otherwise as *M. glauca*.

Distr. *Malesia*: Malay Peninsula (Perak, Taiping, road to Fraser's Hill, near Gap Valley), Borneo (Sabah, Tenom, Tambunan, Kinabalu).

Ecol. Primary forest; 450–1500 m; *fl.* March–May, *fr.* June–Feb.

Field notes. Outer tepals dark purple on green, inner tepals lemon with purple tinge; flowers pale yellow.

Excluded species

Manglietia ? minahassae K. & V. Meded. Lands Plantent. 19 (1898) 328, *nomen*; KOORD.-SCHUM. Syst. Verz. 3, 1 (1914) 41, *nomen* = *Madhuca burckiana* (KOORD.) LAMK (*Sapotaceae*).

3. PACHYLARNAX

DANDY, Kew Bull. (1927) 260; in Hutch. Gen. Fl. Pl. 1 (1964) 55; NOOT. Blumea 31 (1985) 97. — Type: *P. praecalva* DANDY. — **Fig. 9.**

Trees. Stipules free from the petiole. *Flowers* terminal, solitary, bisexual. *Tepals* 9–15, 3–5-merous, subequal. *Anthers* introrse; connective produced into a short appendage. *Gynoecium* sessile; carpels few (2–8), concrescent; ovules about 4–8 in each carpel. *Fruit* a thick-walled woody loculicidal capsule, the carpels dehiscent along the dorsal suture and sometimes separating towards the apex.

Distr. There are 2 *spp.*, of which one in Assam and one in Indochina and in *Malesia* (Sumatra and the Malay Peninsula).

1. Pachylarnax praecalva DANDY, Kew Bull. (1927) 260, *excl. plantae ex Annam*; H.KENG, Tree Fl. Malaya 2 (1973) 289, t. 4; NOOT. Blumea 31 (1985) 97, f. 4, 5. — Type: HANIFF 4067 (K; SING), Penang. — **Fig. 9.**

Tree 10–60 m by 30–100 cm, glabrous in all its parts. Stipules free from the petiole. *Leaves* glossy above, less so beneath, (narrowly) elliptic to obovate, 7–16 by 3–6.5 cm; apex obtuse or rounded; base cuneate or attenuate; margin recurved; midrib prominent beneath, slightly so above; nerves in 12–15 pairs, prominent on both surfaces, curved upwards and meeting in a looped intramarginal vein which is rather indistinct from the coarsely netted venation. Petiole without stipular scar, slender, 1.5–3 cm long. *Flowers* terminal on an incrassate peduncle of 0.5–20 mm (sometimes the peduncle becoming much longer); 1–3 (rarely many) spathaceous bracts under each flower, pedicel very short. *Tepals* 9(–10), ± similar, the outermost oblanceolate to oblong, 2.5–3.5 cm long. *Stamens c.* 17–20 mm long with an acute connective appendage; gynoecium elongate-obovoid; carpels 2–4; ovules 4–8. *Fruit* 3.5–6 cm long, ± orbicular before opening, loculicidal, splitting into 2–4 valves, the carpels more or less separating from each other later, in the centre a columella with the attached fruits persistent. *Seeds* black with enveloping pink aril.

Distr. Annam (Bana near Tourane); *Malesia*: Sumatra (W. coast), Malay Peninsula (Kedah, Penang, Selangor).

Ecol. In primary forest; 360–1800 m; *fl. fr.* probably the whole year round.

2. Tribus Michelieae

LAW YUH-WU, Acta Phytotax. Sin. 22 (1984) 89.

Growth monopodial. Flower buds arising on brachyblasts in the axils of the leaves. Genera: *Michelia* (incl. *Paramichelia* and *Tsoongiodendron*) and *Elmerrillia*.

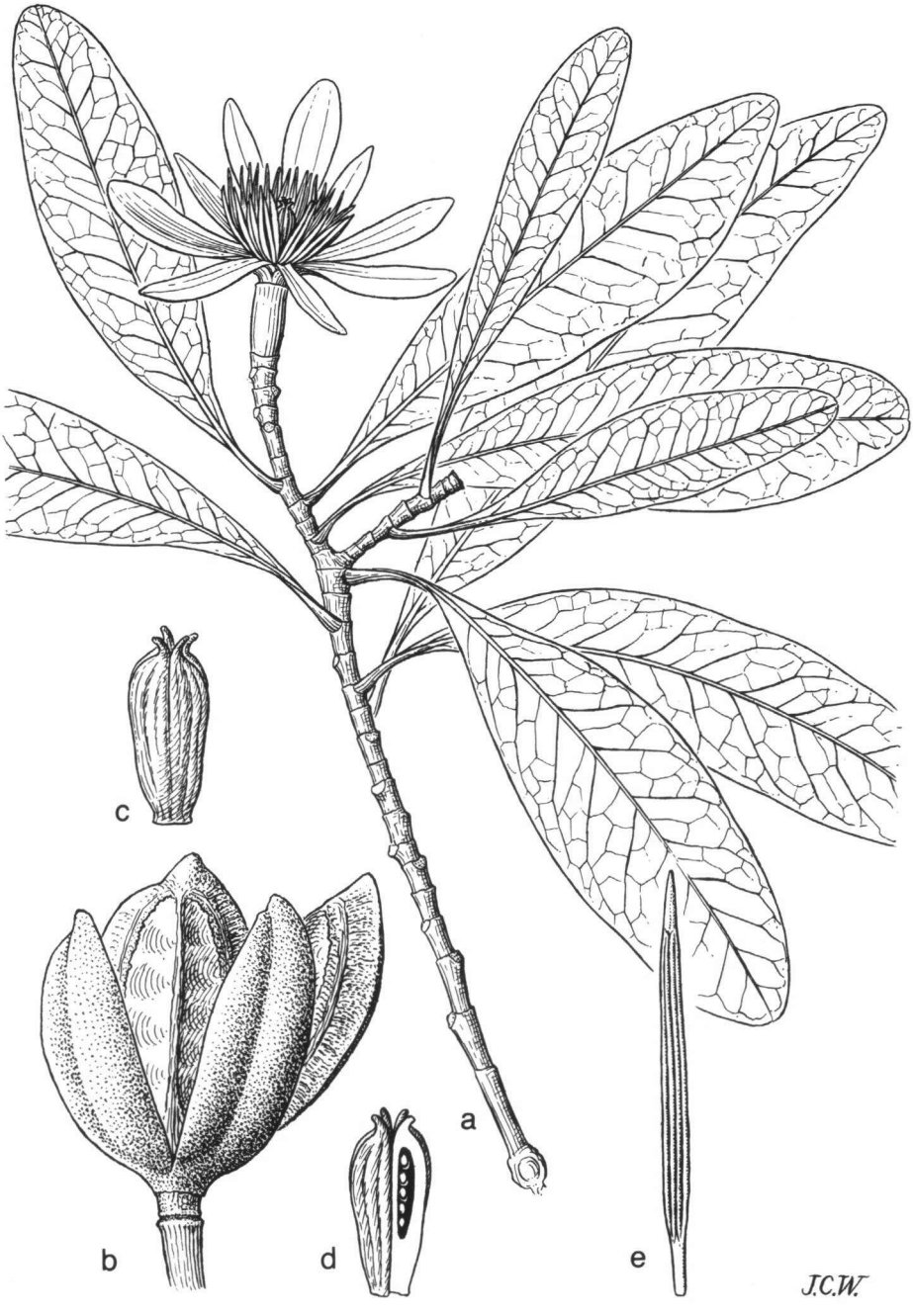

Fig. 9. *Pachylarnax praecalva* DANDY. *a.* Habit, ×0.7; *b.* fruit, ×0.7; *c.* ovary, ×2.2; *d.* anther, ×3 (CURTIS 3012).

KEY TO THE GENERA

1. Gynoecium sessile ..... **4. Elmerrillia**
1. Gynoecium distinctly stipitate ..... **5. Michelia**

4. ELMERRILLIA

DANDY, Kew Bull. (1927) 261; in Hutch. Gen. Fl. Pl. 1 (1964) 56; NOOT. Blumea 31 (1985) 100. — Type: *E. papuana* (SCHLTR) DANDY.

Elmerrillia sect. Pseudoaromadendron DANDY in Praglowski, World Pollen & Spore Flora 3 (1974) 5. — Type: *E. ovalis* (MIQ.) DANDY. — **Fig. 10, 11.**

Trees. Stipules free from petiole. *Flowers* terminal on axillary brachyblasts, solitary or sometimes 2–3-nate, bisexual, growth monopodial. *Sepals* 4 (or 5); petals 5–*c.* 10, 3–5-merous, subequal. *Anthers* introrse; connective produced into a short appendage. *Gynoecium* sessile; carpels many, with the base sunken in the torus, free or concrescent; ovules 2–6 in each carpel. *Fruiting* carpels basally sunken in the torus, free, crowded, and dehiscent along the dorsal suture, finally 2-valved, or concrescent to form a fleshy syncarp. In the latter case the carpels hexagonal, the apical parts falling away, often in irregular masses, thus shedding the seeds, or carpels tearing apart towards the outside and dehiscing longitudinally.

Distr. There are 4 *spp.*, all in *Malesia.*

KEY TO THE SPECIES
(based on flower and fruit characters)

1. Tepals 12. Carpels free (not seen in *E. platyphylla*).
 2. Twigs and stipules hairy ..... **4. E. tsiampacca**
 2. Twigs and stipules glabrous ..... **2. E. platyphylla**
1. Tepals (12–)17. Carpels free or concrescent. For New Guinea plants with 12 tepals and fruiting carpels free, see under *E. tsiampacca*.
 3. Undersurface of leaves glaucous (sometimes a dense indumentum of appressed hairs obscuring the glaucousness), hairy (in New Guinea sometimes glabrous: *var. glaberrima*). Fruiting carpels free, dorsally dehiscing ..... **4. E. tsiampacca**
 3. Undersurface of leaves not glaucous, glabrous or hairy. Fruiting carpels concrescent.
  4. Twigs glabrous or yellowish villous, soon glabrescent, rarely pubescent. Nerves in (10–)14–21 pairs **1. E. ovalis**
  4. Twigs densely fulvously pubescent or tomentose, later glabrescent. Nerves in 20–24 pairs **3. E. pubescens**

KEY TO THE SPECIES
(based on fruit characters)

1. Fruit a syncarp, ripe carpels shedding their apical parts.
 2. Young twigs and stipules glabrous or yellowish villous, soon glabrescent, rarely pubescent. Nerves in (10–)14–21 pairs ..... **1. E. ovalis**
 2. Twigs densely fulvously pubescent or tomentose, later glabrescent. Nerves in 20–24 pairs **3. E. pubescens**
1. Fruit apocarpous, ripe carpels longitudinally dehiscing.
 3. Twigs and leaves glabrous. Brachyblast glabrous ..... **2. E. platyphylla**
 3. Twigs and leaves glabrous or hairy. Brachyblast hairy (except rarely in New Guinea: *E. tsiampacca var. glaberrima*) ..... **4. E. tsiampacca**

1. Elmerrillia ovalis (MIQ.) DANDY, Kew Bull. (1927) 261; NOOT. Blumea 31 (1985) 101. — *Talauma ovalis* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 69; KOORD. Meded. Lands Plantent. 19 (1898) 331; Suppl. Fl. N.O. Celebes 2 (1922) t. 8. — Type: FORSTEN *s.n.* (L; BO), Celebes near Tondano.

Talauma vrieseana MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70. — *Magnolia vrieseana* (MIQ.) BAILLON *ex* PIERRE, Fl. For. Cochinch. 1 (1881) *sub* t. 2. — *E. vrieseana* (MIQ.) DANDY, Kew Bull. (1927) 262. — Type: DE VRIESE & TEIJSMANN *s.n.* (L), N. Celebes.

Tree to 45 m high and 100(–150) cm diam. Twigs glabrous or yellowish villous, soon glabrescent, rarely pubescent. Stipules glabrous to yellowish villous. *Leaves* glabrous or underside minutely sparsely appressedly hairy, rarely sparsely patently pubescent, elliptic, 7–36 by 4–16 cm; acumen less than 10 mm; base cuneate (to rounded), usually attenuate; nerves in (10–)14–21 pairs, intramarginal vein often rather inconspicuous in the prominent fine reticulation. Petiole glabrous or with same indumentum as twigs, (1–)2.4–4.5(–7) cm. Brachyblast glabrous or yellowish villous; spathaceous bracts (sparsely) pubescent to glabrous. *Flowers* (creamy) white; *tepals c.* 16 in 2 or 3 whorls, more or less coriaceous, the longest 25–35 mm. *Stamens* 8–14 mm long; carpels puberulous, 4(–6)-ovuled, concrescent. *Fruit* ellipsoidal, the ripe carpels disintegrating, losing their apical portions and thus shedding the 1–4 seeds.

Distr. *Malesia*: Sulawesi (incl. Muna), Moluccas (Morotai, Ambon).

Ecol. In forests at low and medium altitudes, up to 1000 m; *fl. fr.* Jan.–Dec.

Uses. The timber is very durable and amongst others used for house-building. The trees are cultivated for timber (see KOORDERS, 1898).

2. Elmerrillia platyphylla (MERR.) NOOT. Blumea 31 (1985) 102. — *Michelia platyphylla* MERR. Philip. J. Sc. 13 (1918) Bot. 11; Enum. Philip. 2 (1923) 153. — Type: FB 26866 (K), Leyte.

Tree. Twigs glabrous. Stipules glabrous. *Leaves* elliptic, glabrous, 23–30 by 9–13 cm; acumen shorter than 10 mm; base cuneate, shortly attenuate; nerves in 18–23 pairs meeting in an intramarginal vein; reticulation rather fine. Petiole 2–3 cm. *Brachyblast* glabrous, 4–5 cm long; spathaceous bracts glabrous. *Flowers* white; *tepals c.* 12, the outer ones *c.* 25–35 mm long. *Stamens c.* 12 mm; ovary glabrous. *Fruits* unknown as yet.

Distr. *Malesia*: Philippines (Leyte, Agusan; Mindanao, Zamboanga).

Ecol. Secondary forest at low altitudes.

3. Elmerrillia pubescens (MERR.) DANDY, Kew Bull. (1927) 261; NOOT. Blumea 31 (1985) 102. — *Talauma pubescens* MERR. Philip. J. Sc. 3 (1908) Bot. 133; Enum. Philip. 2 (1923) 152. — Type: CLEMENS 686 (iso BO), Mindanao.

Tree *c.* 15–40 m high and up to 80 cm diam. Twigs densely fulvously pubescent or tomentose, glabrescent. Stipules densely fulvously long tomentose or pubescent. *Leaves* pubescent beneath, elliptic to ovate, 15–30 by 8–14 cm; acumen less than 1 cm; base nearly rounded, slightly acuminate; nerves in 20–24 pairs, meeting in a looped intramarginal vein; reticulation fine. Petiole with same indumentum as twigs, 20–25 mm. *Brachyblast* densely fulvously tomentose or pubescent, 3–5 cm; spathaceous bracts densely pubescent. *Flowers* white; *tepals c.* 15, glabrous, the outer ones 27–35 mm, the inner ones gradually shorter and narrower. *Stamens c.* 10 mm; carpels many, 3–4 ovuled, pubescent. *Fruit* 3–6 by *c.* 2 cm; carpels *c.* 8 mm long, concrescent, tearing apart towards the outside when mature, longitudinally dehiscing, 1–4-seeded.

Distr. *Malesia*: Philippines (Mindanao, Lanao lake, Mt Katanglad, Mt Apo).

Ecol. Altitude *c.* 2000 m; *fl. fr.* Jan.–Dec.

Vern. *Hangilon*, Bukidnon.

4. Elmerrillia tsiampacca (LINNÉ) DANDY in Praglowski, World Pollen & Spore Flora 3 (1974) 5; NOOT. Blumea 31 (1985) 103, f. 6–8. — *Michelia tsiampacca* LINNÉ, Mant. (1767) 78; MIQ. Fl. Ind. Bat. 1, 2 (1858) 18, *p.p.*; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 73; MERR. Interpr. Rumphius (1917) 224. — *Michelia champacca auct. non* LINNÉ: LINNÉ, Syst. ed. 10, 2 (1759) 1082, *p.p.* — *Michelia celebica* KOORD. Meded. Lands Plantent. 19 (1898) 328, 631, *nom. ill.*; Suppl. Fl. N.O. Celebes 2 (1922) t. 9. — *E. celebica* (KOORD.) DANDY, Kew Bull. (1927) 261. — Type: *Sampacca sylvestris* RUMPH. Herb. Amb. 2 (1741) 202, t. 68.

Talauma papuana SCHLTR, Bot. Jahrb. 50 (1913) 70. — *E. papuana* (SCHLTR) DANDY, Kew Bull. (1927) 261; CROFT in Womersley, Handb. Papua New Guinea (1978) 130, t. 65. — Type: SCHLECHTER 19001 (not seen).

Michelia forbesii Baker *f.* J. Bot. 61 (1923) Suppl 2. — Type: FORBES 442a (K; P), Sogeri.

Michelia arfakiana AGOSTINI, Atti Com. Accad. Fisiocrit. Siena, ser. IX, 7 (1926) sep. 25. — Type: BECCARI PP 890 (FI), Mt Arfak.

E. mollis DANDY, Kew Bull. (1928) 184. — *Michelia mollis* (DANDY) MCLAUGHLIN, Trop. Woods 34 (1933) 36. — Type: ENDERT 5252 (K; BO, L), Borneo, W. Kutei.

E. papuana var. adpressa DANDY, Kew Bull. (1928) 185. — Type: LEDERMANN 13089 (K; L), Sepik region.

E. papuana var. glaberrima DANDY, *l.c.* — Type: LEDERMANN 9505 (K), Sepik.

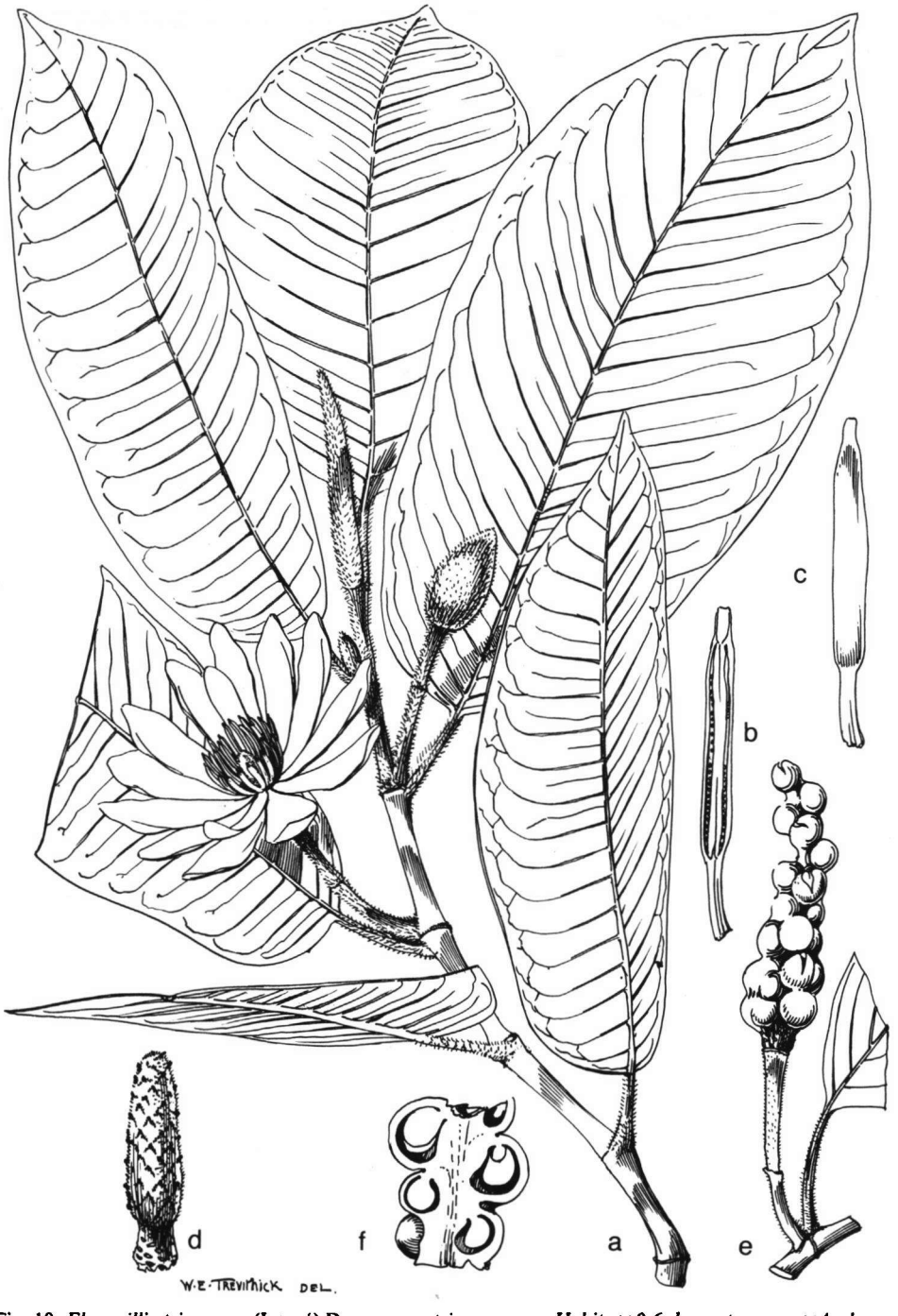

Fig. 10. *Elmerrillia tsiampaca* (LINNÉ) DANDY *var. tsiampaca. a. Habit,* ×*0.6; b–c.* stamens, ×4; *d.* ovary, ×2; *e.* young fruit, ×2; *f. ditto*, longitudinal section, ×4.

E. sericea C.T.WHITE, J. Arn. Arb. 10 (1929) 212. — Type: BRASS 661 (A; K), Sogeri. — **Fig. 10, 11.**

Tree to 60 m high and 150(–200) cm diam. Twigs (densely) ferrugineously or fulvously (woolly) pubescent or tomentose when young, rarely glabrous. Stipules with same indumentum. *Leaves* often appressedly pubescent above in innovations, soon glabrescent, hairy beneath but glabrous in *var. glaberrima*, sometimes glaucous, (narrowly) elliptic, rarely ovate (often so in Sulawesi), 10–46 by 4–15 cm; acumen 5–17 mm; base cuneate to rounded, rarely subcordate; nerves in 11–28 pairs, meeting in an often hardly distinct intramarginal vein; reticulation rather fine to very fine. Petiole 7–35 mm. *Brachyblast* densely pubescent (glabrous in *var. glaberrima*), 15–40(–60) mm. *Flowers* white to yellow; *tepals* (10–)12–*c.* 15, glabrous or the outer ones pubescent, 20–35 mm long. *Stamens* 10–14 mm; carpels many (*c.* 50), pubescent or puberulous, glabrous in *var. glaberrima*. *Fruit* cylindrical, 4–9 by 1.5–2 cm.

Distr. *Malesia*: Sumatra (Mentawai I., Siberut), Borneo, Central & N. Sulawesi, Moluccas (Ambon, Buru), New Guinea (incl. Biak & Japen), New Britain.

Ecol. On fertile soil in forest; 0–1800 m; *fl. fr.* Jan.–Dec.

KEY TO THE INFRASPECIFIC TAXA

1. Leaves 10–30 cm; nerves in (11–)14–22(–24) pairs. Hairs underneath the leaf blade not curved towards their base. Tepals (12–)*c.* 15. *Sulawesi, Moluccas, New Guinea* **a.** *ssp.* **tsiampacca**
2. Young twigs and stipules hairy; ovary puberulous ..... **a1.** *var.* **tsiampacca**
2. Entire plant glabrous ..... **a2.** *var.* **glaberrima**
1. Leaves 16–46 cm; nerves (14–)17–18 pairs. Hairs underneath the leaf blade usually (uncinately) curved towards the base. Tepals (10–)12. *Sumatra, Borneo* ..... **b.** *ssp.* **mollis**

a. *ssp.* **tsiampacca.** — All synonyms except *E. mollis* DANDY.

Tree to 60 m high and 150(–200) cm diam. *Leaves* beneath very densely, often minutely appressedly or patently hairy, 10–30 by 3–15 cm. Petiole 12–35 mm.

Distr. *Malesia*: Central & N. Sulawesi, Moluccas (Ambon, Buru), New Guinea (incl. Biak & Japen), New Britain.

a1. *var.* **tsiampacca.** — All synonyms except *E. papuana var. glaberrima* DANDY. — **Fig. 10.**

Distr. As the subspecies.

Ecol. On fertile soil in forest; to 1400 m; *fl. fr.* Jan.–Dec.

Uses. The most valuable and most demanded timber in N. Sulawesi. Already becoming scarce in 1898 (KOORDERS). Very durable.

Vern. Sulawesi: *tjempaka utan, t. u. aloes, uru tanduk, wasian, w. rintek, w. sela*; New Guinea: *balamtalogo*, Mooi lang., *boska*, Manikiong lang., *arimot, pui*, Biak, *hui*, Sogeri, *wasau, wuka*, Morobe, *kaule*, Kainantu, *bibau*, Hattam lang., *warmei*, Waskuk lang., *pubitza*, Garaina lang., *rap*, Sepik, *biendjung*.

a2. *var.* **glaberrima** (DANDY) NOOT. Blumea 31 (1985) 107, f. 6c. — *E. papuana var. glaberrima* DANDY.

Distr. *Malesia*: New Guinea (Kebar Valley, Idenburg R., Sepik R., Morobe Distr.).

Ecol. Primary forest; up to 1200 m.

Vern. *Mamer, mamier*, Kebar lang.

b. *ssp.* **mollis** (DANDY) NOOT. Blumea 31 (1985) 108, f. 6d, 8. — *E. mollis* DANDY. — **Fig. 11.**

Tree to 40 m high and 80 cm diam. *Leaves* beneath villous, pubescent, or puberulous. Petiole 7–25 mm. Carpels with 2 ovules.

Distr. *Malesia*: Sumatra (Mentawei I., Siberut), Borneo.

Ecol. In forest at low and medium altitude. In Sabah 1500–1800 m. *Fl. fr.* Jan.–Dec.

Vern. Sumatra: *minjaran*; M; Borneo: *arau, miharo*, Dyak.

5. MICHELIA

LINNÉ, Sp. Pl. (1753) 536; Gen. Pl. ed. 5 (1754) 240; DANDY in Hutch. Gen. Fl. Pl. 1 (1964) 56. — *Champaca* ADANS. Fam. Pl. 2 (1763) 365, 537. — *Sampacca* O. K. Rev. Gen. Pl. 1 (1891) 6. — Type: *M. champaca* LINNÉ.

Liriopsis SPACH, Hist. Natur. Veget., Phanerog. 7 (1839) 460, *non Liriopsis* REICHB. (1828). — *Magnolia sect. Liriopsis* BAILLON, Hist. Pl. (1868) 142, note 4. — Type: *L. fuscata* (ANDR.) SPACH.

Fig. 11. *Elmerrillia tsiampaca* (LINNÉ) DANDY *var. mollis* (DANDY) NOOT. Twig with flower, deflorated flow er, and bud showing the stipular nature of the spathaceous bract; ± natural size (NOOTEBOOM 4518A).

Paramichelia H.H.HU, Sunyatsenia 4 (1940) 142. — Type: *P. baillonii* (PIERRE) HU. — **Fig. 12, 13.**

For further synonymy see NOOT. Blumea 31 (1985) 108.

Trees or shrubs. Stipules adnate to or free from petiole. *Flowers* bisexual. *Tepals* 6–21, 3–6-merous, subequal or rarely the outer whorl different. Anthers latrorse or sublatrorse (to introrse). *Gynoecium* stipitate, carpels many to few (rarely 1), free or connate; ovules 2 to many; fruiting carpels free or concrescent.

Distr. About 30 *spp.*, in Southeast Asia from India and Sri Lanka eastwards to S. Japan and Taiwan and southeastwards into Indonesia (not in Sulawesi and New Guinea). In *Malesia* 6 *spp.*, 2 other *spp.* commonly cultivated.

KEY TO THE SPECIES

1. Petiole 3–5 mm long, stipular scar present for nearly its whole length. Leaves glabrous, 4.5–6.5 by 2–3 cm. Tepals 6 ..... **8. M. figo**

Fig. 12. *Michelia scortechinii* (KING) DANDY. *a.* Habit, ×0.7; *b.* young fruit, ×2; *c.* anther, ×4; *d–e.* ovary, ×4 (*a, c–e* SF HOLTTUM 31244; *b* GRASHOFF 335).

1. Petiole longer than 5 mm. The other characters different or the tepals more than 6.
2. Young twigs glabrous. Terminal buds hairy at the apex only. Carpels 1–4. Stipules free from the 15–35 mm long petiole. Leaves glabrous, 9–35 cm long ..... **4. M. montana**
2. Young twigs hairy, at least directly under the terminal bud. Carpels 8 or more.
3. Stipules adnate to the petiole for one third or more than one third of its length.
4. Leaves 8–12 by 2.5–3.5 cm. Petiole 6–16 mm ..... **1. M. scortechinii**
4. Leaves 10–35 by 4–11 cm. Petiole 14–50 mm.
5. Tepals 15, from light yellow to orange, 20–45 mm long. Carpels *c.* 30, fertile. Leaves 10–30 cm **3. M. champaca**
5. Tepals *c.* 12, white, 30–55 mm long. Carpels *c.* 10, sterile. Leaves 15–35 cm ..... **7. M. alba**
3. Stipules free from petiole or adnate to its base only (in *M. salicifolia* sometimes up to one third).
6. Leaves 15–35 by 5.5–11 cm. Petiole 15–50 mm. Tepals *c.* 12, white, 30–55 mm. Carpels sterile, *c.* 10 **7. M. alba**
6. Leaves 4–16 by 2.3–6 cm. Petiole 5–20 mm. Tepals white to yellow, 10–40 mm. Carpels fertile.
7. Brachyblast 10–17 mm. Outer tepals 3, membranous, inner tepals 6, coriaceous. Twigs and stipules puberulous to nearly glabrous. Leaves glabrous beneath, 6–16 by 3–6 cm. Carpels *c.* 10 **2. M. koordersiana**
7. Brachyblast 3–7 mm. All the tepals the same, 9–17. Twigs and stipules pubescent or puberulous. Leaves glabrous or hairy beneath, 4–13 by 1.5–4 cm. Carpels 8–16 or *c.* 30.
8. Tepals 20–40 mm. Leaves 9–13 by 2.3–4 cm, often glaucous beneath. Carpels *c.* 30 **5. M. salicifolia**
8. Tepals 10–15 mm. Leaves 4–12 by 1.5–3.5 cm, not glaucous beneath. Carpels 8–*c.* 16 **6. M. philippinensis**

1. Michelia scortechinii (KING) DANDY, Kew Bull. (1927) 262; H.KENG, Tree Fl. Malaya 2 (1973) 288; NOOT. Blumea 31 (1985) 111, f. 9. — *Manglietia scortechinii* KING, J. As. Soc. Beng. 58, ii (1889) 370; RIDLEY, Fl. Mal. Pen. 1 (1922) 14. — *Paramichelia scortechinii* (KING) DANDY in Praglowski, Pollen & Spore Flora 3 (1974) 21. — Type: SCORTECHINI 764 (BM, K, SING). — **Fig. 12.**

Tree to 37 m high and *c.* 50 cm diam. Twigs zigzag, ferrugineously pubescent to tomentose when young. Stipules adnate to the petiole for at least half its length, to 30 mm long. *Leaves* (densely) ferrugineously pubescent or puberulous beneath, distichously arranged, elliptic, 8–12 by 2.5–3.5 cm; apex shortly acuminate; base cuneate; nerves in 12–18 pairs, with the very fine reticulation prominent on both sides. Petiole 6–16 mm. *Brachyblast* 6–8 mm; spathaceous bracts densely ferrugineously pubescent. *Flowers* white; *tepals c.* 12, more or less the same, 12–18 mm long. *Stamens c.* 8 mm, incl. the *c.* 1 mm long connective appendage; carpels *c.* 20, densely ferrugineously pubescent. Fruiting carpels concrescent.

Distr. *Malesia*: Sumatra (W. Coast, Bengkulu, Palembang), Malay Peninsula (Perak, Pahang, Cameron Highlands).

Ecol. Primary forest; 650–1300 m; *fl. fr.* April–May.

2. Michelia koordersiana NOOT. Blumea 31 (1985) 111, f. 10. — **Fig. 13.**

Tree to 32 m high and 62 cm diam. Twigs finely appressedly puberulous when young, or only so directly under the terminal bud, soon glabrescent, often zigzag. Stipules with same indumentum to nearly glabrous, not adnate to petiole, 10–15 mm. *Leaves* glabrous, more or less elliptic, distichously arranged, 6–16 by 3–6 cm; apex shortly acuminate, acumen (0–)3–8 mm; base cuneate; nerves in 7–13 pairs, with the fine reticulation prominent on both sides. Petiole 10–20 mm. *Brachyblast* appressedly pubescent, 10–17 mm. *Flowers* (orange) yellow; outer *tepals* 3, membranous, 12–22 mm; inner tepals 6, coriaceous. *Stamens* incl. the 0.5 mm long appendage 5–7 mm; carpels *c.* 10, with the *c.* 5 mm long gynophore minutely tomentellous or puberulous. Fruiting carpels 2–10.

Distr. *Malesia*: Sumatra (W. coast, Padang; E. coast, Palembang), Malay Peninsula (Selangor).

Ecol. Primary forest; 0–1000 m; *fl. fr.* probably Jan.–Dec.

3. Michelia champaca LINNÉ, Sp. Pl. (1753) 536; BLUME, Bijdr. (1825) 7; Fl. Java Magnol. (1829) 9, t. 1; BLANCO, Fl. Filip. (1837) 462; KORTH. Ned. Kruidk. Arch. 2 (1851) 96; MIQ. Fl. Ind. Bat. 1, 2 (1860) 101, 153; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 72, *excl. var.*; K. & V. Bijdr. 4 (1869) 159; Atlas 4 (1918) t. 799; KOORD. Exk. Fl. Java 2 (1912) 241; MERR. Enum. Born. (1921) 251; Enum. Philip. 2 (1923) 152; BACKER, Schoolfl. Java (1911) 16; RIDLEY, Fl. Mal. Pen. 1 (1922) 15; BURK. Dict. (1935) 1465; CORNER, Wayside Trees (1940) 434; BACKER & BAKH.*f.* Fl. Java 1 (1963) 98; NOOT. Blumea 31 (1985) 113. — Type: HERMANN Fl. Zeyl. 144 (BM).

M. suaveolens PERS. Syn. 2 (1806) 94, *p.p. excl. syn.* RHEEDE *et* RUMPH. — *M. blumei* STEUD.

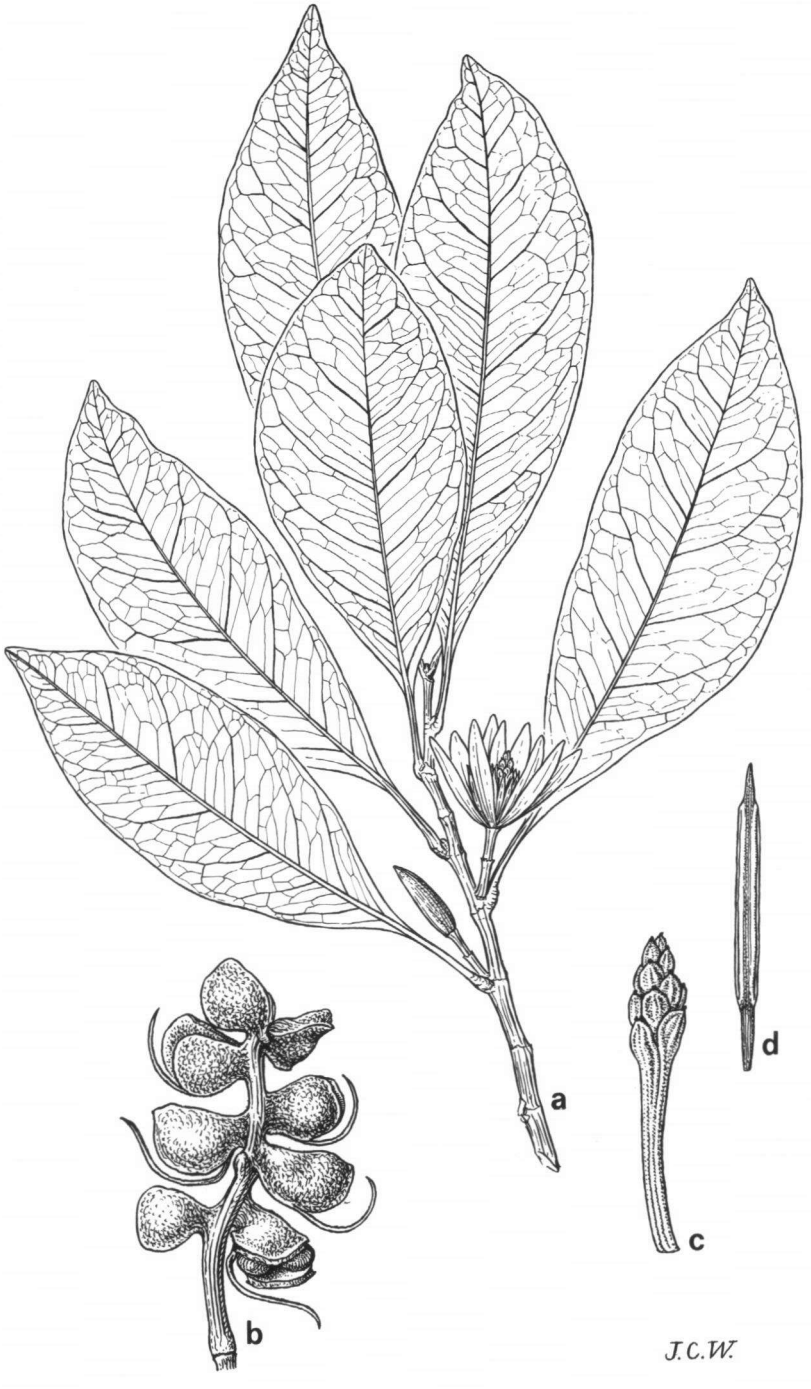

Fig. 13. *Michelia koordersiana* NOOT. *a.* Habit, ×0.6; *b.* fruit, ×0.6; *c.* ovary, ×4; *d.* anther, ×6 (VAN DER ZWAAN for THORENAAR T345).

Nomencl. ed. 2, 2 (1841) 139. — *M. tsiampacca* L. *var. blumei* MORITZI in Zoll. Syst. Verz. (1846) 36. — Type: RUMPH. Herb. Amb. 2 (1741) t. 67.

M. tsiampacca BLUME, Bijdr. (1825) 7, *non M. tsiampacca* LINNÉ (1767). — *M. velutina* BLUME, Fl. Java Magnol. (1829) 17, *non M. velutina* DC. (1824); MIQ. Fl. Ind. Bat. 1, 2 (1858) 17; K. & V. Bijdr. 4 (1896) 162; BACKER, Schoolfl. Java (1911) 16; KOORD. Exk. Fl. Java 2 (1912) 241; H.KENG, Tree Fl. Malaya 2 (1973) 288 *pro coll.* KEP/FRI 6943. — *Champacca velutina* O. K. Rev. Gen. Pl. 1 (1891) 6. — *M. pilifera* BAKH.*f.* Blumea 12 (1963) 61; BACKER & BAKH.*f.* Fl. Java 1 (1963) 98. — Type: BLUME *s.n.* (L).

M. pubinervia BLUME, Fl. Java Magnol. (1829) 14, t. 4. — *M. rufinervis* BLUME, Bijdr. (1825) 8, *non M. rufinervis* DC. (1817). — *M. champaca* MIQ. Fl. Ind. Bat. 1, 2 (1858) 16, *p.p.*, *non M. champaca* LINNÉ (1753); BISSCHOP GREVELINK, Pl. Ned. Ind. (1882) 277, *p.p.* — *M. champaca* LINNÉ *var. pubinervia* (BLUME) MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 72. — Type: BLUME 670 (L; BO).

Talauma villosa MIQ. *forma celebica* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 70. — Type: DE VRIESE & TEIJSMANN *s.n.* (L; BO).

M. montana auct. non BLUME: BAKER *f.* J. Bot. 62 (1924) Suppl. 2.

Huge forest tree to 50 m high and 183 cm diam. Twigs (appressedly) pubescent, glabrescent. Stipules pubescent, adnate to petiole at least for one third of its length. *Leaves* spirally arranged, (long) elliptic or ovate, pubescent below especially on midrib and nerves, often glabrescent, 10–30 by 4–10 cm; acumen 7–13(–25) mm; base cuneate to more often rounded; nerves in 14–23 pairs, intramarginal vein often hardly more prominent than fine reticulation. Petiole 14–36(–40) mm. *Brachyblast* densely pubescent, (5–)10–18(–25) mm long; spathaceous bracts pubescent. *Flowers* light yellow becoming dark orange; *tepals* 15, 20–45 mm long. *Stamens* 6–8 mm, incl. the up to 1 mm connective appendage; carpels *c.* 30, the *c.* 3 mm long gynophore densely pubescent.

Distr. From India to SW. China and Indochina; in *Malesia*: Sumatra, Malay Peninsula, Java, Lesser Sunda Islands.

KEY TO THE VARIETIES

1. Leaves ovate with cuneate-attenuate base; the acumen often quite long. Petiole with a stipular scar up to shortly below its middle to up to its apex. Tree to *c.* 30 m high and 50 cm diam. **a. *var.* champaca**

1. Leaves more or less elliptic with cuneate to rounded base, the acumen often rather short, oblique. Petiole with a stipular scar from 0.3 up to 0.7 of its length. Tree to 50 m high and 180 cm diam. **b. *var.* pubinervia**

a. *var.* champaca. — All synonyms except those under *var. pubinervia.*

Distr. Commonly cultivated throughout the tropics. Probably originally from India, where it is cultivated on the temple ground of Jains and Hindus.

Uses. See BURKILL, Dict. ed. 2 (1966) 148.

Vern. *Tjampacca* ((India: *cempaka*) or *t. kuning* is the common name in most of its area. Further: *djeumpa*, Aceh, *djempa*, Gajo, *kantil, lotjari, petjari*, J, *kembang konèng, tjampacca mera*, Mad., *t. barak, t. warangan*, Bali, *hépaka, képaka*, Sawu, *sampacca, s. modarag, t. mariri*, Ald., Cel., *bunga edja*, Mak., *bunga matjela*, Bug., *kupa haja*, Ceram, *kupa pokur, papokur, pupukuljo, walatol*, Ulis, *hapaka, tjapaka*, N. Halmaheira, *t. goratji*, Ternate, Tidore.

b. *var.* pubinervia (BLUME) MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 72; NOOT. Blumea 31 (1985) 115. — *M. pubinervia* BLUME. — *M. tsiampacca* BLUME. — *M. montana auct. non* BLUME: BAKER *f.*

Distr. *Malesia*: Sumatra (Aceh; Bengkulu, Lake Ranau), Malay Peninsula (Kedah, Langkawi Is.; Bt. Kaju Hitam; Kelantan, Cameron Highlands), Java (common in the mountains), Lesser Sunda Is. (Sumbawa).

Ecol. Evergreen primary forest on fertile soil; 250–1500 m, in Java mostly between 1000 and 1200 m. *Fl. fr.* Jan.–Dec.

Uses. The wood is highly esteemed for building and furniture. The properties are at least the same as of *Tectona grandis*. Because of its nice structure the value for furniture is higher than that of the wood of *M. montana*. In the beginning of this century its extinction was already feared by KOORDERS because of the use made of it. The trees can easily be cultivated and reach a height of *c.* 27 m and a diameter of *c.* 55 cm in 27 years (K. & V., 1896).

Vern. Sumatra: *kemait*, M; Java: *baros, manglis*, S, *kadjeng sekar*, J, *kadju kempheug*, Md, *lungjung*, J; Sumbawa: *tengkel.*

4. Michelia montana BLUME, Verh. Bat. Gen. K. W. 9 (1823) 153; Bijdr. (1825) 7; Fl. Java Magnol. (1829) 15, t. 5; MIQ. Fl. Ind. Bat. 1, 2 (1858) 17; Suppl. 1 (1860) 153; Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 73; BACKER, Schoolfl. Java (1911) 15; KOORD. Exk. Fl. Java 2 (1912) 241; RIDLEY, Fl. Mal. Pen. 1 (1922) 15; BURK. Dict. (1935) 1491; CORNER, Wayside Trees (1940) 434; BACKER & BAKH.*f.* Fl. Java 1 (1963) 98; NOOT. Blumea 31 (1985) 116, f. 11. — *Sampacca montana* O. K. Rev. Gen. Pl. 1 (1891) 6. — Lectotype: BLUME 575 (L, NY).

M. ecicatrisata MIQ. Fl. Ind. Bat. Suppl. [(1860)

153, *nomen*] (1861) 368. — *M. montana* BLUME *var. subvelutina* MIQ. Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 73. — Lectotype: TEIJSMANN HB 4457 (L; BO).

Tree becoming over 40 m tall and over 2 m diam. Twigs glabrous. Stipules pubescent at the apex only, exceptionally entirely pubescent, free from petiole. *Leaves* glabrous, spirally arranged, more or less elliptic, 9–30(–35) by 4–13(–20) cm; acumen 2–20 mm; base attenuate; nerves in 9–15 pairs, conspicuous, intramarginal vein rather conspicuous; reticulation dense, prominent on both surfaces. Petiole often thickened towards its base, 15–35 mm. *Brachyblast* 5–20 mm, glabrous to (rarely) densely pubescent; spathaceous bracts glabrous except the margins towards the apex. Outer *tepals* 3, rather thin, 15–30 mm, greenish or greenish white; inner tepals creamy or white, 6, thick, coriaceous, 14–40 mm. *Stamens* incl. the *c.* 2 mm long connective appendage 10–13 mm; carpels 1–4, with the 4–8 mm long gynophore reddish puberulous when dry, green *in vivo*. Fruiting carpels free.

Distr. *Malesia*: Sumatra (Aceh; W. coast; Lampong; Palembang; Banka), Malay Peninsula (Perak; Pahang; Cameron Highlands), Borneo (Sabah; E. Kalimantan), Java (common), Bali. Fig. 14.

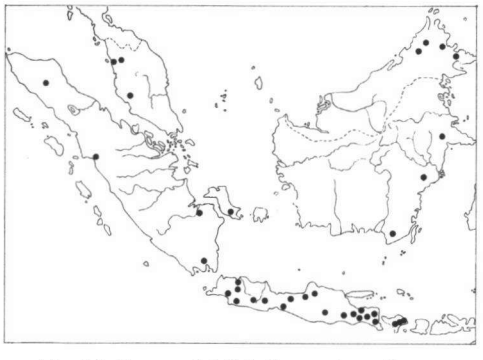

Fig. 14. Range of *Michelia montana* BLUME.

Ecol. Primary forest, on different soils, from low altitude up to 1700 m. *Fl. fr.* Jan.–Dec.

Uses. Very good timber (often used instead of *Tectona grandis*).

Vern. Sumatra: *cempaka utan, medang plàm, m. tanah*; Borneo: *tjempaka wilis*; Java: *kembang marsèhe, k. marsiki, kitaleus, sekar, cempaka baros, c. jahé, t. putih, tjoko rekitje*, M; *mangkl, manglit*, Sund., J., *kembang mondhung*, Mad., *basé*, Bali.

Note. The sapwood reportedly has a ginger smell.

5. Michelia salicifolia AGOSTINI, Atti Com. Accad. Fisiocrit. Siena IX, 7 (1926) sep. 23; NOOT. Blumea 31 (1985) 118. — *M. sumatrae* DANDY, Kew Bull. (1928) 188. — Type: BECCARI PS 118 (FI; BM = holotype *M. sumatrae*, K, L).

Tree 25 m high and 50 cm diam. Twigs appressedly ferrugineously pubescent. Stipules with same indumentum, adnate to base of petiole only. *Leaves* spirally arranged, appressedly finely ferrugineously pubescent, glaucous beneath (often seemingly glabrous because the hairs are very small), narrowly elliptic (to obovate), 9–13 by 2.3–4 cm; acumen 8–13 mm; base cuneate or attenuate; nerves in 9–16 pairs, intramarginal vein rather inconspicuous in the much prominent reticulation on both surfaces. Petiole 10–15 mm. *Brachyblast* appressedly ferrugineously pubescent, 5–7 mm; spathaceous bracts rufous tomentose. *Tepals c.* 12, 20–40 mm long. *Stamens* incl. the 2 mm long connective appendage *c.* 15 mm long; carpels *c.* 30, with the gynophore appressedly ferrugineously tomentellous. Fruiting carpels free.

Distr. *Malesia*: Sumatra (W. Coast, G. Singalan; Aceh, G. Leuser).

Ecol. Altitude 1500–2000 m. Apparently rare. *Fl. fr.* March, July.

6. Michelia philippinensis (P.PARMENT.) DANDY, Kew Bull. (1927) 263; NOOT. Blumea 31 (1985) 118. — *Magnolia philippinensis* P.PARMENT. Bull. Sc. Fr. Belg. 27 (1896) 206, 270. — *M. parviflora* MERR. Bur. Gov. Lab. Publ. 35 (1906) 70, *non M. parviflora* DC. (1817). — *M. cumingii* MERR. & ROLFE, Philip J. Sc. 3 (1908) Bot. 100; MERR. Enum. Philip. 2 (1923) 153. — Type: CUMING 783 (MEL; A, BM, K, L, NY).

Tree to 18 m high and 80 cm diam. Twigs often zigzag, young parts appressedly pubescent, rarely patently pubescent and nearly tomentose. Stipules with same indumentum, free from petiole. *Leaves* often distichously arranged (narrowly) elliptic to slightly obovate, glabrous to finely appressedly puberulous beneath (or patently pubescent when the twigs are so), 4–12 by 1.5–3.5 cm; acumen (0–)15 mm, with rounded tip; base cuneate; nerves in 8–14 pairs. Petiole 5–20 mm. *Brachyblast* 3–7 mm, with same indumentum as twigs; spathaceous bracts *idem*. *Flowers* creamy yellow to white; outer *tepals* 3, inner tepals 6–14, all 10–12 mm (once 15 mm). *Stamens* 3–5 mm; carpels 8–*c.* 16, with the 3–4 mm long gynophore appressedly pubescent. Fruiting carpels free.

Distr. *Malesia*: Philippines (Luzon: Benguet; Zambales; Ilocos Norte; Bataan; Rizal; Laguna; Tayabas; Batangas; Abra; Negros: Dumagueta; Mindanao: Misamis; Lanao; Todaya; Bukidnon).

Ecol. In forests at medium altitude, on some mountains up to 2100 m. *Fl. fr.* Jan.–Feb.

7. Michelia × alba DC. Syst. (1817) 449; MERR. Interpr. Rumph. (1917) 223; Enum. Philip. 2 (1923) 152; BURK. Dict. (1935) 1464; CORNER, Wayside Trees (1940) 433, t. 142, pl. 129, 130; BACKER & BAKH.*f.* Fl. Java 1 (1963) 98. — Type: this species is based on *Sampaca domestica IV alba* RUMPH. Herb. Amb. 2 (1741) 200.

M. longifolia BLUME, Verh. Bat. Gen. K. W. 9 (1823) 155; Bijdr. (1825) 7; Fl. Java Magnol. (1829) 12, t. 2; K. & V. Meded. Lands Plantent. 17 (1896) 157; BACKER, Schoolfl. Java (1911) 15; KOORD. Exk. Fl. Java 2 (1912) 205; MERR. Fl. Manila (1912) 205 (*'longiflora'*); RIDLEY, Fl. Mal. Pen. 1 (1922) 15. — *Sampaca longifolia* O. K. Rev. Gen. Pl. 1 (1891) 6. — Type: BLUME *s.n.* (L).

M. longifolia var. racemosa BLUME, Fl. Java Magnol. (1829) 13, t. 3. — Type: BLUME *s.n.* (L).

Tree to *c.* 30 m. Twigs appressedly greyish pubescent, glabrescent. Stipules with same indumentum, adnate to the base of the petiole. *Leaves* sparsely appressedly puberulous or glabrous, spirally arranged, mostly ovate, 15–35 by 5.5–11 cm; acumen 0.7–30 mm; base attenuate; nerves in 12–18 pairs; reticulation fine, prominent on both sides. Petiole 15–50 mm. *Brachyblast* densely greyish pubescent. *Flowers* often many, nicely scented, white; *tepals c.* 12, all nearly the same, 30–55 mm. *Stamens c.* 10 mm long, carpels *c.* 10, with the *c.* 5 mm long gynophore greyish puberulous. *Fruits* not known (plant sterile).

Distr. Commonly cultivated in tropical and subtropical countries.

Ecol. Up to 1200 m altitude. *Fl.* Jan.–Dec.

Uses. The beautiful and nicely scented flowers are sold on the market. The tree is grown as an ornamental.

Vern. *Djeumpa gadèng*, Aceh, *tjempaka putih*, M., *t. bodas*, Sund., *petjari putih, t. putih*, Jav., *sampaka kulo, s. mopoesi, t. momero, t. mawuro*, Alf. Cel., *bunga èdga kébo, paténé*, Mak., *bunga èdja maputè*, Bug., *t. bobudo*, Ternate, *t. bubolo*, Tidore.

Note. FRI bb 11996 from Bali has the characters of this species but produced fruits. The Head of the Forest Office in Bali, Dr. Ir. I.G.M. TANTRA, told me that *M. alba* in Bali is fertile.

8. Michelia figo (LOUR.) SPRENG. Syst. 2 (1825) 643; NOOT. Blumea 31 (1985) 120. — Type: LOUREIRO. — For further synonymy see NOOT. (1985).

Shrub. Twigs pubescent to tomentose, often zigzag. Stipules adnate to the petiole for nearly its whole length, long ferrugineously pubescent. *Leaves* glabrous, elliptic, 4.5–6.5 by 2–3 cm; acumen 0–5 mm; base cuneate; nerves in 9–12 pairs. Petiole 3–5 mm. *Brachyblast* woolly pubescent, in Malesia *c.* 5 mm; spathaceous bracts long pubescent to tomentose. *Tepals* ± the same, 6 in total, *c.* 18–20 mm. *Stamens c.* 10 mm; carpels *c.* 20–30, gynophore 2 mm, both glabrous or only the gynophore pubescent.

Distr. China; in *Malesia*: frequently and widely cultivated as an ornamental shrub, not known to be naturalized.

Vern. *Cempaka muleng*, Jav.

Excluded genera

Phelima NOR. in Verh. Bat. Gen. 5, Art. 4 (1790) 3, *nomen*; *ibid.* ed. 2 (1827) 66, *nomen*. Based on a Javan plant, the vernacular name being given as *champaca ceylon*.

This was referred to *Michelia* LINNÉ by JACKSON, Index Kew. 2 (1894) 492, and to *Liriodendron* LINNÉ by DALLA TORRE & HARMS, Gen. Siphonog. (1901) 171. According to the vernacular name, however, it was based on the species now known as *Horsfieldia iryaghedi* (GAERTN.) WARB. (*Myristicaceae*). HASSKARL, Cat. Pl. Hort. Bot. Bogor. Cult. Alt. (1844) 174 referred *Phelima* to *Pyrrhosa horsfieldii* (BLUME) HASSK., which is a synonym of *H. iryaghedi*.

Spermabolus TEIJSM. & BINN. Cat. Hort. Bog. (1866) 178, *nomen*, with one species, *S. fruticosus* TEIJSM. & BINN., *nomen*, is *Anaxagorea* A.ST.HIL. (*Annonaceae*).