

## ARALIACEAE—I (W. R. Philipson, Christchurch)<sup>1</sup>

Trees, shrubs, lianas, woody epiphytes or (*extra-Mal.*) more rarely herbs. Branches usually stout with leaves clustered at their ends; armed or unarmed; glabrous or with a tomentum of stellate or simple hairs; buds either covered by the stipular sheaths of leaves or by cataphylls. *Leaves* spiral or rarely opposite or in whorls; petiole usually clasping the stem; stipules either distinct or united into a ligule or absent (in *Osmoxylon* the petiole bears  $\pm$  elaborate crests around its base); lamina digitately compound or pinnate, sometimes to the second or third degree, or simple, when either entire or pinnately or palmately lobed, margin entire or dentate. *Inflorescence* terminal or more rarely lateral; either simple or compound racemes or spikes, or more commonly of umbels or capitula, either solitary or arranged in compound umbels or panicles; bracts usually small and caducous; pedicel either articulated with the flower or continuous with it. *Flowers* hermaphrodite or hetero-sexual, sometimes dioecious; actinomorphic. *Calyx* lobes small, or reduced to a rim, or rarely absent. *Petals* 3 to numerous, often 5, sometimes fused into a calyptra, or forming a tube with spreading lobes (*Osmoxylon*), valvate or imbricate in bud, usually with a broad base but rarely narrowed below. *Stamens* usually as many as the petals and alternating with them, or twice as many, or indefinite; filaments inserted at the edge of the disk; anthers dorsifixed, introrse, pollen sacs 4 or rarely 8. *Ovary* inferior, half inferior, or very rarely (*extra-Mal.*) superior, 1- to many-celled, the top of the ovary usually a fleshy disk; styles and stigmas as many as the cells, either connate or wholly or partially free. *Ovules* solitary, pendulous, anatropous, with the raphe ventral. *Fruit* baccate or drupaceous, exocarp usually fleshy, endocarp forming cartilaginous or membranaceous pyrenes around the seeds. *Seeds* one per pyrene, with a small embryo within smooth or ruminant endosperm.

**Distribution.** About 50 genera with a roughly estimated 1150 species, ranging mainly in the warmer parts of both hemispheres (especially in montane zones), a small number in or extending to cool-temperate regions. With the exception of SE. Asia, the family and its centres of distribution are largely found within the land masses derived from ancient Gondwanaland. In Malesia 17 genera with a total (excluding *Schefflera*) of 117 species in 16 genera. (The largest genus, *Schefflera*, with an estimated 250 species for the region, is omitted from this account.)

Three genera are endemic to Malesia (or nearly so). One of these, *Anakasia* (related to *Polyscias*) is of very local distribution in West New Guinea; the two others, *Harmsioplanax* (Java, Lesser Sunda Is., Celebes, to New Guinea) and *Aralidium* (Malay Peninsula, Sumatra and Borneo, with an extension to Thailand) are more widely distributed.

Five other genera have their main centres of distribution within Malesia. Two of these extend further eastwards: *Mackinlaya* ranges from the Philippines and Celebes through New Guinea to the Solomon Is. and NE. Australia; *Osmoxylon* occurs from Botel Tobago (Taiwan) and the Marianas to Borneo, the Philippines, Celebes, the Moluccas, New Guinea to the Solomon Is. and the New Hebrides. A third, *Trevesia*, is confined to western Malesia (Lesser Sunda Is., Java, Borneo, Sumatra, and Malaya), with an extension into the Asian mainland. Wider ranges are recorded for *Gastonia* (widespread in Malesia to the Solomon Is.) with an additional range in the Seychelles, Mascarenes, and Madagascar (but not East Africa as previously reported) and *Arthrophyllum* (all over Malesia with extensions to Thailand, Laos, the Nicobar Islands, and New Caledonia).

A significant element in the Malesian representation of the family consists of six genera which occur mainly in SE.-E. Asia, two of which further extending to the Americas, *viz* *Aralia* (in

(1) The genus *Schefflera* is omitted and will be treated separately by Dr D. G. Frodin (University of Papua New Guinea). I enjoyed his assistance in drawing the general chapters.

America south to Mexico) throughout Malesia, and *Dendropanax* (tropical America) in West Malesia (Sumatra, Malay Peninsula, Borneo). The remaining four genera range in Malesia as follows: *Macropanax* and *Brassaiopsis* in Malay Peninsula, Sumatra and Java, *Acanthopanax* in Malay Peninsula, Sumatra and the Philippines, and *Pentapanax* only in East Java.

Only one genus, *Delarbrea*, has its main centre of distribution to the east of Malesia (Melanesia, mostly New Caledonia) and Queensland, and extends through New Guinea to the Moluccas and Lesser Sunda Is. as far west as Timor.

Two other genera have wider distributions. *Schefflera*, including several segregate genera, is pantropical although with but few representatives (13) on the African mainland. However, the several sections of *Schefflera* as redefined by FRODIN (1970, 1975) often show distinctive regional distributions paralleling those of several of the other genera. The type section ranges from the New Hebrides to Samoa and New Zealand, including Fiji and New Caledonia.

*Polyscias* is widely dispersed in the Old World tropics from the African mainland eastwards to the Society Is. and Australia, but with only a few species in SE. Asia and western Malesia. As in *Schefflera*, the diverse series of species comprising the genus show distinctive regional distribution patterns, with the type series being mainly Melanesian and East Malesian (in West Malesia it is only cultivated or adventive).

As said above several Malesian genera extend into, or have their main centres in, mainland Asia, but only *Polyscias* (in Sri Lanka) and *Schefflera* are shared with Africa and the same genera (with *Gastonia*) with Madagascar. Only *Polyscias* and *Gastonia* occur in the Mascarene Islands and *Gastonia* and *Schefflera* in the Seychelles. Two other genera are restricted to mainland Africa. *Hedera* of temperate Eurasia extends to the Canary Islands. The Americas have two (or three) distinctive endemic genera with recognizable affinities, as well as disjunct groups of the Australasian *Pseudopanax*, the Asiatic *Pentapanax* and *Dendropanax* and (in North America) *Oplopanax*, *Aralia* and *Panax*, all very closely related to those in East Asia; there are also distinctive sections of *Schefflera* in the neotropics which are nearer those in Africa than in Asia. Many distinctive endemic genera (or parts of the larger genera) occur in Oceania, the New Zealand region and Australia, some of them taxonomically very isolated.

The ratio of species : genus is here estimated as 23 : 1, but if the very large genus *Schefflera* is not accounted for this reduces to 13 : 1. Some 30 genera have five or fewer species; in view of the considerable insular endemism at generic or infrageneric level, weak intercontinental links, and great distinctiveness of many genera (even though small), the family is surely of great antiquity, although much of the available palaeobotanical evidence requires re-evaluation (cf. DILCHER & DOLPH, 1970). Many fossils previously referred to *Oreopanax* must now be placed in *Platanaceae* (DOYLE, pers. comm.). *Dendropanax* has reliably been reported from Tertiary deposits in both Europe and North America where it is now absent (DILCHER & DOLPH, *l.c.*).

*References:* DILCHER & DOLPH, *Amer. J. Bot.* 57 (1970) 153–160; FRODIN, The complex of *Cephaloschefflera* in *Schefflera* (*Araliaceae*), Thesis, Cambridge, U.K. (1970); *J. Arn. Arb.* 56 (1975) 427–448.

*Ecology.* Malesian *Araliaceae* are usually small trees, shrubs, or lianas, with a number being sometimes or always epiphytic (especially in *Schefflera*), and where terrestrial usually in the undergrowth or lower stories of rain-forest, seldom reaching over 20 m. A remarkable exception is provided by the two species of *Gastonia*; of these *G. spectabilis* (HARMS) PHILIPSON of Papuaia can attain the great height of 40 m with a stem of 1.75 m  $\varnothing$ ; it is the largest araliad known and is of very striking appearance. Fig. 27.

Araliads are almost always found scattered in forest and other vegetation, at least in Malesia. However, a notable exception is provided by the tree *Schefflera rugosa* (BL.) HARMS in Java; LAM (1924) recorded its gregarious occurrence on the volcanic cone of Mt Slamet in Central Java where it is co-dominant with the pyrophilous *Albizia lophantha* BTH. in elfin forest between 2500–3050 m, above which it gives way to the open, rocky, treeless slopes below the summit (3428 m). It is also gregarious on Mt Tjeremai in West Java, where LAM (1925) noted that above some 2650 m a low forest dominated by this species replaces the high forest of *Dacrycarpus imbricatus*; this low forest extends to c. 3000 m. On the Gedeh-Pangrango complex above Puntjak Pass in West Java *Schefflera rugosa* is frequent in forest borders. On Mt Ulu Kali in Malaya, east of Kuala Lumpur, *S. nervosa* (KING) VIG. is common in young regrowth along the main road

below the Genting Highlands hotel/casino complex from 1300–1600 m. This pioneering tendency is shared by a number of other species in the genus, especially in montane parts of Papuaia. Many of these species are terrestrial as pioneers or in secondary formations, but epiphytic in closed forest (and then often much more scattered).

Gregarious occurrence, usually in pioneering situations or in forest borders, has also been observed in the various species of *Harmsioplanax*; STEUP (1938) observed *H. aculeatus* (BL.) WARB. ex BOERL. as a characteristic pioneer in grass thickets on hills in SW. Celebes. *H. harmsii* K. SCH. behaves similarly around Wau, Bulolo, and Sogeri (Rouna) in Papua New Guinea, especially in narrow intermontane valleys, while *H. ingens* PHILIPSON can be locally abundant in open situations in the highlands of New Guinea. *Gastonia spectabilis* (HARMS) PHILIPSON can be locally frequent as a pioneer in hill areas, e.g. around Bulolo and on the Madang-Ramu Divide; while *Polyscias elegans* (C. MOORE & F.v.M.) HARMS is frequently seen in stable monsoon scrub and forest borders in the Port Moresby region and *P. ledermannii* HARMS can be an exceedingly common regrowth tree in cut-over montane forest subject to frequent cloudiness and rain.

In the subalpine zone of New Guinea BRASS (1941) found two species of *Schefflera* conspicuous in the stunted forest of *Xanthomyrtus-Vaccinium-Papuacedrus-Phyllocladus* between 3200–3800 m on Mt Wilhelmina. From Lake Habbema upwards, the characteristic overtopping tree is *S. altigena* FRODIN (sect. *Brassaia*), with its large foliage contrasting sharply with the surrounding microphyllous vegetation; at higher altitudes it gives way to *S. pagiophylla* HARMS (*S. falcata* PHILIPSON), a species of uncertain affinities. *Schefflera chimbuensis* FRODIN and *S. straminea* FRODIN are likewise often seen in forest borders on Mt Wilhelm and Mt Giluwe respectively in Papua New Guinea.

In contrast to the large and conspicuous species of *Schefflera*, many others are more or less shade-loving epiphytes or vines of lower storeys within the forest, although they may occur in sunnier situations where clouding is frequent (*S. singularis* B. C. STONE on Mt Ulu Kali). One group of species in New Guinea is almost limited to perhumid moist or wet rain-forests and usually are small epiphytic shrubs or even herbs (*S. gemma* FRODIN). A few species are conspicuous rosette-trees of the forest understorey (*S. stahlia* (WARB.) FRODIN).

*Climate.* In Malesia *Araliaceae* for the most part shun regions subject to a seasonal climate; all species are evergreen. A few exceptions include *Schefflera thaumasiantha* HARMS from open savanna in the hill zone in SE. New Guinea and *S. actinophylla* (ENDL.) HARMS as a gallery tree in seasonal parts of southern New Guinea, but especially *Harmsioplanax aculeatus* whose range is for the greater part subject to an annual drought period; in addition to SW. Celebes, it is also frequent on old lava-streams on Mt Idjen in East Java together with *Wightia*, *Casuarina junghuhniana*, *Dodonaea*, and *Wendlandia*, and is one of the few araliads in the Lesser Sunda Islands.

With respect to altitude, most *Araliaceae* occur in the lowland, hill and montane zone below 2300 m. The only genera of which all Malesian representatives occur in the hills and mountains above 1000 m are *Pentapanax* and *Dendropanax*, but even these do not exceed 3000 m. Only certain species of *Schefflera* and *Harmsioplanax* continue upwards much higher, especially in New Guinea where the highest known record belongs to *S. pagiophylla* HARMS on the Carstenz complex, where F. J. WISSEL found it in 1936 at 3900 m.

*Flower biology.* Little has been recorded about the floral biology of the family in Malesia, but BECCARI's account (1878) of the 'false fruits' of *Osmoxylon* (including *Boerlagiodendron*) serving to attract doves which are assumed to effect pollination has become a classic description and example of ornithophily.

Heterosexual flowers, usually involving combinations of perfect and male flowers, occur frequently but understanding will require intensive study in the living state.

Though flowers are not generally showy and often veritably inconspicuous, the disk produces abundant nectar. They also may spread a rather disagreeable scent, somewhat spermiatic, that in *Schefflera rugosa* resembling that of *Ligustrum*. For this species DOCTERS VAN LEEUWEN (1933) observed on Mt Gedeh, West Java, only rare visits (notably by *Diptera*), but assumed that cross-pollination will be the rule. Flowers (at least those of *Fatsia*) will also be visited by *Hymenoptera*. In *Schefflera stahlia* (WARB.) FRODIN, the thick fleshy flowers, numerous stamens, and position of the inflorescence below the rosette of leaves all point to bat pollination.

*Dispersal* in the family takes place generally by fruit-fall; but as fruits are baccate or (more

usually) drupaceous, they will also be eaten by birds (for the most part) and bats, as recorded by RIDLEY (1930) for *Aralia*, *Hedera*, and *Schefflera*. The black fruits of *Schefflera sect. Brassaiia* in New Guinea and Australia are especially popular with birds. The hooked mericarps of *Harmsioplanax* are exceptional.

Seed germination is most likely after the seed having passed the gut of a bird or after mastication of the fruit by a bat.

*References:* BECCARI, Malesia 1 (1878) 193–198; BRASS, J. Arn. Arb. 22 (1941) 271–342, esp. 318, 320, 323, 327; DOCTERS VAN LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. 2, 31 (1933) 195; H. J. LAM, Trop. Natuur 13 (1924) 20; *ibid.* 14 (1925) 6; RIDLEY, Disp. (1930); STEUP, Trop. Natuur 27 (1938) 142.

**Morphology.** Most erect *Araliaceae* are sparingly branched or even unbranched; their limbs are upright and the often massive, easily broken twigs generally bear rosettes of big, long-stalked leaves which leave large scars when they fall. Few form a true crown (*Arthrophyllum*, *Gastonia*, some species of *Schefflera* and *Polyscias*), while the others often look like elongated and grotesque shrubs with a candelabrum-like framework. Branches in most *Araliaceae* are entirely orthotropic; generally speaking, the plants would fit into the so-called Holttum, Corner, Tomlinson, Chamberlain and Leeuwenberg models of HALLÉ *c.s.* (1970, 1978), or their intermediates.

*Aralia scandens* (MERR.) HA is a true climber. Epiphytic species only occur in the genus *Schefflera*; it is not yet recorded that any of them may appear to turn into a hemi-epiphytic habit.

*Hedera* (not native in Malesia) is almost the only genus with differentiated shoots and marked vegetative dimorphism.

A preliminary account of shoot-morphology in the family has been given by PHILIPSON (1978), but much further field work is required in this area. Vegetative buds may be either proleptic or sylleptic; in the resting phase such buds may be covered by the clasping bases of foliage leaves (*Osmoxylon*, *Schefflera*) or (more rarely) specialized cataphylls (*Acanthopanax*). In both types of bud the primordia and young leaves may be covered by exudations of resinous slime.

There is so far little recorded evidence of the changes in leaf shape and configuration during the somatic phase of the life cycle known in many araliads in other parts of the world; however, recent observations in New Guinea made by FRODIN suggest that heteroblastism does occur, although its manifestation is not constant for a given species. Distinctive juvenile and intermediate foliage has been found in *Schefflera eriocephala* HARMS and (to a lesser extent) in *S. stolleana* HARMS. Other examples are seen in *Brassaiopsis*, *Trevesia* and *Schefflera subg. Agalma* (*S. aromatica* (BL.) HARMS; *S. nervosa* (KING) VIG.); juvenile leaves of some of these are preserved in Herbarium Bogoriense. In *Harmsioplanax*, the configuration of the leaves changes abruptly just below the inflorescence, a phenomenon paralleled in some other genera although less dramatically. In *Mackinlaya celebica* (HARMS) PHILIPSON and *M. schlechteri* (HARMS) PHILIPSON, leaf polymorphism is very marked with the result that in the past several 'paper species' have been described on too limited a range of material; in this revision many reductions have been made.

*References:* HALLÉ & OLDEMAN, Essai sur l'architecture et la dynamique de croissance des arbres tropicaux, Paris (1970); HALLÉ, OLDEMAN & TOMLINSON, Tropical trees and forests: an architectural analysis, Berlin (1978); PHILIPSON in Tomlinson & Zimmermann (eds.), Tropical trees as living systems (1978) 269–284.

**Anatomy.** General accounts of the vegetative anatomy of the ivy family are given by GÜSSOW (1900), VIGUIER (1906, 1909) and METCALFE & CHALK (1950). Secretory canals are characteristic of the stems and leaves, but are absent from *Aralidium*. A comparison of the wood anatomy of *Araliaceae* and *Cornaceae* is made by PHILIPSON (1967), and an extensive account of vegetative anatomy in the context of woody *Umbellales* was provided by RODRIGUEZ (1957, 1971). The xylem of the former family is characterized by fibres with small, simple pits, and the presence of scalariform and reticulate perforation plates in the vessel elements (as opposed to simple perforations) is thought to be a less advanced feature. Recent special reports bearing on taxonomy include: on stomatal development (INAMDAR *c.s.*, 1969); on sievetube plastids (BEHNKE, 1972), and on epidermal papillae (BUI, 1974).

*Floral anatomy* is discussed by BAUMANN-BODENHEIM (1955), PHILIPSON (1967, 1970) and especially by EYDE & TSENG (1971). Embryological characteristics of the family have been re-

viewed by DAVIS (1966) as well as by RAO (1972). The single pendulous anatropous ovule has the funiculus and ovular vascular bundle axial (PHILIPSON, 1970). The embryo is small in a mass of endosperm (MARTIN, 1946; GRUSHVITZKY, 1967).

*References:* BAUMANN-BODENHEIM, Bull. Soc. Bot. Suisse 65 (1955) 481–510; BEHNKE, Bot. Rev. 38 (1972) 155–197; BUI NGOC-SANH, Bull. Mus. Hist. Nat. Paris III, Bot. 18 (1974) 85–91 (whole no 271); DAVIS, Systematic embryology of the angiosperms, New York (1966); EYDE & TSENG, J. Arn. Arb. 52 (1971) 205–239; GRUSHVITZKY, Proc. Int. Symp. Physiol. Ecol. & Biochem. of Germination (ed. H. Borris) (1967); GÜSSOW, Beiträge zur vergleichende Anatomie der *Araliaceae*, Thesis, Breslau (Wrocław) (1900) 67 pp., illus.; INAMDAR, GOPAL & CHOHAN, Ann. Bot. n.s. 33 (1969) 67–73; MARTIN, Amer. Midl. Nat. 36 (1946) 513–660; METCALFE & CHALK, Anatomy of the dicotyledons II, Oxford (1950); PHILIPSON, New Zeal. J. Bot. 5 (1967) 134–165; in Robson, Cutler & Gregory (eds.), New research in plant anatomy, London (1970) 87–100; RAO, Phytomorphology 22 (1972) 75–87; RODRIGUEZ, Univ. Calif. Publ. Bot. 29 (1957) 145–318; in Heywood (ed.), The biology and chemistry of the *Umbelliferae*, London (1971) 63–91; VIGUIER, Ann. Sci. Nat. Bot. IX, 4 (1906) 1–209; *ibid.* IX, 9 (1909) 305–405.

*Palynology.* Palynological studies of Malesian *Araliaceae* include: on *Gastonia* (TSENG, 1971); on *Tupidanthus* and *Plerandra* (= *Schefflera*) (TSENG, 1973); on *Osmoxylon* (as *Boerlagiodendron*) (TSENG, 1974) and on *Schefflera* (TSENG & SHOUP, 1978). A detailed consideration of the relations of Araliaceous pollen to those in other orders is given by HIDEAUX & FERGUSON (1976), and of the affinities of *Klotzschia* (*Umbelliferae*/Hydrocotyloideae) to *Araliaceae* by SHOUP & TSENG (1977). To date, much useful new evidence has been made available, but better correlation with other classes of attributes is required.

*References:* HIDEAUX & FERGUSON in Ferguson & Muller (eds.), The evolutionary significance of the exine, London (1976); SHOUP & TSENG, Amer. J. Bot. 64 (1977) 461–463; TSENG, Amer. J. Bot. 58 (1971) 505–516; Grana 13 (1973) 51–56; Amer. J. Bot. 61 (1974) 717–721; TSENG & SHOUP, Amer. J. Bot. 65 (1978) 384–394.

*Chromosome numbers.* Lists of chromosome numbers for members of *Araliaceae* are given by DARLINGTON & WYLIE (1955), SHARMA & CHATTERJI (1964) and BOLKOVSKIKH *c.s.* (1969). The family shows considerable constancy of the basic number of  $x = 12$ , although  $x = 11$  has been recorded for one non-Malesian group of *Schefflera*. The implications of chromosome data on the wider relationships of the *Araliaceae* are discussed by MOORE (1971).

*References:* BOLKOVSKIKH *c.s.*, Chromosome numbers of flowering plants, Leningrad (1969); DARLINGTON & WYLIE, Chromosome atlas of flowering plants, ed. 2, London (1955); MOORE in Heywood (ed.), The biology and chemistry of the *Umbelliferae*, London (1971) 233–255; SHARMA & CHATTERJI, Cytologia 29 (1964) 1–12.

*Phytochemistry.* Information on the chemistry of the *Araliaceae* should be sought in HEGNAUER (1964, 1978) where references to original sources are given. The family is characterized by the occurrence of essential oils and resins in canals and by the presence of polyacetylenic compounds (especially falcarinone-type), triterpenic sapogenins of the oleanene-, ursene- and dammarene-types, seed oils with petroselinic acid, and by the absence of true tannins. The chemistry of the family fully confirms its close relationship with the *Umbelliferae* and also more distantly with the *Pittosporaceae* and the *Compositae* (HEGNAUER, 1969, 1971; BOHLMANN, 1971). The rareness of flavones and the predominance of flavonols in *Araliaceae* suggests closer relationship with two of the three subfamilies of the *Umbelliferae*, flavones having not yet been found in *Hydrocotyloideae* and *Saniculoideae* (HARBORNE, 1971). The absence of iridoid substances and true tannins and the presence of polyenes, petroselinic acid and isoprenylated coumarins in the *Umbellales* contrasts with the *Cornales* (HEGNAUER, 1969; JENSEN *c.s.*, 1975), and this led to a suggestion that the *Umbellales* and *Cornales* had to be separated (BATE-SMITH *c.s.*, 1975), an argument with increasing support from other lines of inquiry. However, insufficient evidence appears to be yet available for the detection of possible lines of relationship within the *Araliaceae*.

*References:* BATE-SMITH *c.s.* Biochem. Syst. Ecol. 3 (1975) 79–89; BOHLMANN in Heywood (ed.), The biology and chemistry of the *Umbelliferae* (1971) 279–291; HARBORNE, *l.c.* 293–314; HEGNAUER, Chemotaxonomie der Pflanzen 3 (1964); in Harborne & Swain (eds.), Perspectives in phytochemistry (1969) 121–138; in Heywood (ed.), The biology and chemistry of the *Umbelli-*

*ferae* (1971) 267–277; in Cauwet-Marc & Carbonnier (eds.), *Les Umbellifères. Contributions pluridisciplinaires à la systématique*. Perpignan (1978) 335–363; JENSEN, NIELSEN & DAHLGREN, *Bot. Notis.* 128 (1975) 148–180.

**Taxonomy.** The *Araliaceae* are on all grounds closely connected with the *Umbelliferae*, a very large but mainly temperate and tropical-montane group comprising mostly aromatic herbs with a restricted floral scheme. It seems likely that the ancestors of the ivy family were the woody tropical stock from which the herbaceous *Umbelliferae* evolved under the rigours of cooler climates (CORNER, 1940) with the arborescent *Heteromorpha* of upland Africa and *Myrrhidendron* in Central and South America, both in the subfamily *Apioideae*, perhaps representing relics of the transition on account of the presence of a number of attributes primitive for the family (RODRIGUEZ, 1957); on the other hand, the umbellifers may have originated as megaherbs on tropical mountains (PHILIPSON, 1978). A few *Araliaceae* genera exhibit some features characteristic of *Umbelliferae*, such as *Harmsioplanax*, *Mackinlaya*, and especially *Myodocarpus* (from New Caledonia) and *Stilbocarpa* (from southern New Zealand and associated 'subantarctic' islands).

This led HARMS (1898) to show three different lines leading from *Araliaceae* to *Umbelliferae*, suggesting that considerable overlap between the families existed; more recently RODRIGUEZ (1971) again called attention to this phenomenon and THORNE (1968, 1973) has gone further by merging *Umbelliferae* into *Araliaceae* (a step also advocated by HALLIER *f.* in 1905) and assuming the three subfamilies of the former to have arisen separately, perhaps in different parts of the world at different times, from proto-*Araliaceae* ancestors. However both he and RODRIGUEZ have concluded in agreement with CORNER (*l.c.*) and BAUMANN-BODENHEIM (1946) that the *Araliaceae sensu stricto*, "because of their greater evolutionary breadth and their retention of many more primitive features, would seem closest to the proto-araliad stock" (THORNE, 1973).

Nevertheless, the concept of *Araliaceae* as a separate natural family appears to serve a useful purpose and has been retained for this Flora. An isolated, doubtfully included genus is the West Malesian *Aralidium*; it is the only genus lacking resin ducts but it would be equally anomalous in the *Cornaceae* to which it has also been referred. It shows some resemblance with the New Zealand genus *Griselinia*, usually relegated to the *Cornaceae*, be it as a marginal member (PHILIPSON, 1967).

**Subdivision.** Since the first significant family monograph by SEEMANN (1868), several systems have been proposed which, taken together, are notable for their lack of consistency. This results from a lack of agreement on the relative importance of the comparatively minor structural and gross anatomical features of reproductive parts traditionally used and by conflicting claims on the relative 'antiquity' of polymery *versus* pentamery. Until recently, there has been for *a priori* reasons (*cf.* EYDE, 1975) little recognition of the potential value of vegetative features and their acceptance as valid evidence for a system; and information from wood anatomy, floral histology, palynology, karyology, phytochemistry, and other areas is only beginning to be utilized. While woodiness is generally accepted as a primitive feature in *Araliaceae*, the impact of the work of CORNER and others on tree structure and growth rhythms (summarized in HALLÉ, OLDEMAN & TOMLINSON, 1978; see also BORCHERT, 1969; HLADIK, 1970; PHILIPSON, 1978) has still to be fully assimilated. Much more work is also required on inflorescences, although FRODIN (1970), PHILIPSON (1970b) and others have made a beginning. The monothetic interpretation of most attribute states usual in systems of the family was first challenged by BAUMANN-BODENHEIM (*l.c.*) who considered that phyletic changes could have taken place in parallel; and EYDE & TSENG (1969) showed that at least some supposedly unidirectional sequences were reversible. This has tended to reduce the supposed importance of many of the traditional attributes, with a consequent reduction in the number of genera.

Sufficient evidence is not yet available, however, for the construction of a more balanced, polythetically based system of the family, and the long-standing subdivision proposed by HARMS (1898) into three tribes, *Schefflereae*, *Aralieae*, and *Mackinlayeae*, based monothetically on the structure and aestivation of the perianth, is retained. In spite of its now recognized imperfections, it is more valid than the systems of VIGUIER (1906) and HUTCHINSON (1967) and remains the most widely accepted. Some steps towards the formulation of a new system on polythetic principles have been taken by EYDE & TSENG (1971: 221) who make a fundamental distinction based on

basic leaf-organization (either pinnate or palmate) and recognize the heterogeneity of HARMS' *Aralieae*; however, this system was deliberately not completely developed.

*Generic delimitation.* Generic limits within the *Araliaceae* have long been unstable. As in the *Umbelliferae*, the flower conforms to a simple and relatively uniform pattern throughout most of the family and systematists have resorted to small technical differences to delimit genera. HARMS recognized 51 genera, while VIGUIER, little more than a decade later, recognized 80; HUTCHINSON distinguished 84 genera but with criteria very differently weighted as compared with VIGUIER. Nevertheless, in Malesia as elsewhere there are several distinctive and very natural genera, including *Harmsioplanax*, *Aralidium*, *Osmoxylon*, *Anakasia*, *Mackinlaya*, *Arthrophyllum*, *Delarbrea*, and *Trevesia*. Many other genera in the family, including those Malesian ones not noted above, are mutually less distinctive and delimitation is based on various combinations of a number of attributes which have been subject to many different standards of weighting and interpretation. These include: petals valvate or imbricate; pedicel articulated or not; leaves digitately compound, pinnate, or simple; stamen and locule number and the relationship of these numbers; style free or connate; endosperm ruminant or not; and thorns present or not.

The present treatment is characterized by a number of generic reductions or exclusions; only one genus described since 1900 has been retained (*Anakasia*). *Hederopsis* is united with *Macropanax*, a genus with a very similar facies and (in part) overlapping range and which was separated merely on the number of cells in the ovary and variations in inflorescence structure. *Wardenia* has been united with *Brassaiopsis* because apart from its simple palmately veined leaves there are no differences; better material collected in recent years has provided evidence that the ovary is in fact 2-locular, but that one ovule aborts and the fruit is as a result 1-seeded. *Acanthophora* differs from *Aralia* only in habit (VAN STEENIS, 1948). PHILIPSON (1951) already regarded *Anomopanax* as insufficiently distinct from the older *Mackinlaya*, a union retained here. The same author (1973) combined *Boerlagiodendron* with the earlier described *Osmoxylon* as a number of species intermediate between the two genera had come to light. The Malesian species formerly included in *Tetraplasandra* as well as *Peekelioplanax* were likewise by PHILIPSON (1970a) reduced to two species of *Gastonia*; but it should be noted that in Malesia as on the SW. Indian Ocean islands this genus is very close to *Polyscias*, particularly the very similarly ranging *sect. Eupteron* (*P. nodosa*, *P. ledermannii*, etc.).

The two largest Malesian genera are herein both treated in a wider sense. *Polyscias* includes as its type section a distinctive Melanesian/Micronesian group of species which in the wild state extends into eastern Malesia and the Philippines, and in cultivation further west. The remainder of the genus as represented in Malesia comprises some rather distinctive species, several of which have been given generic rank (*Eupteron*, *Kissodendron*, and *Palmervandenbroekia*). If the name *Polyscias* were to be confined to the type-section of the genus it would be necessary to recognize a considerable number of small genera. Retention of a wide concept for the genus therefore appears to be preferable.

*Schefflera*, by far the largest genus of the family in Malesia, is likewise more broadly conceived than in the past, although in our region only a small number of species from segregate genera are involved (i.e. those formerly in *Brassaia*, *Plerandra*, *Scheffleropsis*, and *Tupidanthus*). On a world-wide basis, FRODIN (1975) recommended the reduction of 12 segregate genera; improved knowledge of the genus required that, as in *Polyscias*, this step be taken or have the genus split into a number of differently organized smaller genera with more serious nomenclatural consequences. A broad concept of *Schefflera* has therefore been adopted. It may be noted here that the flowers in both the former genera *Plerandra* and *Tupidanthus*, characterized by numerous stamens, are thought by FRODIN to represent a secondary development related to bat pollination, and the large fruits for dispersal by bats or larger birds; this is supported by the position of the inflorescences, which are beneath the leafy rosettes as a result of retarded development although the axes remain sympodial and the shoot units mostly orthotropic. As divisions of the larger genus *Schefflera*, they are not at all closely related, conforming to the views of TSENG (1974) on the pollen morphology and contrasting with the views of HARMS (1898) and EYDE & TSENG (1971), who regarded them (as genera) as of close affinity and relatively primitive within the family. In fact, rather different levels of specialization are represented overall by the two taxa, not just in the pollen morphology (TSENG, *l.c.*).

*Specific delimitation.* This has offered many problems, but fortunately the very abundant material now available from many areas has revealed that many of the species described up to 1951 are in fact conspecific. Especially was the great plasticity in vegetative and inflorescence development not sufficiently appreciated in the past, partly due to imperfect field knowledge of the plants. This has led to considerable reductions in *Arthropphyllum*, *Aralia*, *Osmoxylon*, *Gastonia*, and parts of *Schefflera* and *Polyscias*. Other species have been reduced through a regional approach to the genera. However, in *Osmoxylon* and *Schefflera*, many species from the Philippines, Celebes, western New Guinea, and to a lesser extent Borneo and Sumatra are still known only from very few or even only a single collection; this has meant a rather tentative treatment in many cases. The same applies in a more limited way in some of the other genera. Certain species are rather polymorphic, and at least in *Schefflera* several 'species-complexes' have been discerned.

*References:* BAUMANN-BODENHEIM, Bull. Soc. Bot. Suisse 56 (1946) 13–112; BORCHERT, Amer. J. Bot. 56 (1969) 1033–1041; CORNER, Ways. Trees Malaya (1940) 153; EYDE, Amer. Sci. 63 (1975) 430–437; EYDE & TSENG, Science 166 (1969) 506–508; J. Arn. Arb. 52 (1971) 205–239; FRODIN, The complex of *Cephaloschefflera* in *Schefflera* (*Araliaceae*), Thesis, Cambridge, U.K. (1970); J. Arn. Arb. 56 (1975) 427–448; HALLÉ, OLDEMAN & TOMLINSON, Tropical trees and forests: an architectural analysis, Berlin (1978); HALLIER f. New Phytol. 4 (1905) 151–162; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1898) 1–62; HLADIK, Adansonia 10 (1970) 383–407; HUTCHINSON, Gen. Fl. Pl. 2 (1967) 52–81; PHILIPSON, Bull. Brit. Mus. Nat. Hist. Bot. 1 (1951) 3–20; New Zeal. J. Bot. 5 (1967) 134–165; Blumea 18 (1970a) 490–495; *ibid.* 18 (1970b) 497–505; *ibid.* 21 (1973) 81–89; in Tomlinson & Zimmermann (eds.), Tropical trees as living systems (1978) 269–284; RODRIGUEZ, Univ. Calif. Publ. Bot. 29 (1957) 145–318; in Heywood (ed.), The biology and chemistry of the *Umbelliferae* (1971) 63–91; SEEMANN, Revision of the natural order of *Hederaceae*, repr. from J. Bot. London (1868); VAN STEENIS, Bull. Bot. Gard. Btzg III, 17 (1948) 390–391; THORNE, Aliso 6 (1968) 57–66; Notes R. Bot. Gard. Edinb. 32 (1973) 161–165; TSENG, Amer. J. Bot. 61 (1974) 717–721; VIGUIER, Ann. Sci. Nat. Bot. IX, 4 (1906) 1–209.

*Uses.* A variety of minor local uses are reported by BURKILL (1966), HEYNE (1927), and OCHSE & BAKHUIZEN VAN DEN BRINK (1931) as well as in the notes under individual species in this Flora. The only species that form articles of trade are the taxa of *Polyscias* sect. *Polyscias* popularly grown as foliage and hedge plants; however, many other species in a variety of genera are of actual or potential ornamental worth, with *Schefflera actinophylla* (ENDL.) HARMS and *S. longifolia* (BL.) VIG. being particularly widely used. In Papua New Guinea, *Gastonia spectabilis* is cut for timber and the wood used for light carpentry, boxes, etc.

Monkeys are fond of the flush of some aromatic species of *Schefflera*, as observed in West Java and North Sumatra.

*References:* BURKILL, Dict. rev. ed. (1966); HEYNE, Nutt. Pl. (1927); OCHSE & BAKHUIZEN VAN DEN BRINK, Veget. D.E.I. (1931).

*Notes.* *Nomina nuda* and invalidly published names have only been quoted if they have been cited in Index Kewensis.

*Notes for collectors.* Many araliads present problems to collectors because of the size of their leaves and inflorescences. It is often advisable to select leaves of medium size, but the maximum size of leaves should be recorded on the label. It is important to preserve the junction of leaf and stem and also sufficient of the leaf to allow reconstruction of the whole. Likewise, with inflorescences the base, main axis and some primary branches should be preserved so that the whole can be visualized — ultimate branches alone are insufficient. Fruiting material is as useful as a flowering specimen. Collectors should be alert to note the existence of vegetative heteroblasty and floral dimorphism and document these with specimens and notes; the form in immature plants is important. Rapid drying is essential or all parts will disarticulate and very fragmentary specimens result.

#### KEY TO THE GENERA

1. Petals imbricate. Tribe ARALIEAE.
2. Leaves simple, palmately or pinnately lobed, or entire.
3. Leaves palmately lobed, tomentose . . . . . 1. *Harmsioplanax*
3. Leaves pinnately lobed or entire, glabrous . . . . . 2. *Aralidium*



2. Leaves pinnately compound (or bi- or tripinnate).  
 4. Leaves twice (or more) pinnate . . . . . 3. *Aralia*  
 4. Leaves once pinnate.  
 5. Leaflets many . . . . . 4. *Delaribrea*  
 5. Leaflets 5 or fewer . . . . . 5. *Pentapanax*
1. Petals valvate.  
 6. Petals with a narrow base, or claw. Tribe MACKINLAYEAE . . . . . 6. *Mackinlaya*  
 6. Petals with a broad base. Tribe SCHEFFLEREAE.  
 7. Inflorescence rays trifid: central branch shorter with 'false fruits', the two lateral longer with normal flowers . . . . . 7. *Osmoxylon*  
 7. Inflorescence branches not as above.  
 8. Ovary with one cell . . . . . 8. *Arthrophyllum*  
 8. Ovary with more than one cell.  
 9. Leaves pinnate.  
 10. Pedicel not articulated below the flower. . . . . 9. *Gastonia*  
 10. Pedicel articulated below the flower . . . . . 10. *Polyscias*  
 9. Leaves not pinnate.  
 11. Pedicel articulated below the flower.  
 12. Leaves digitately compound (or rarely unifoliolate) (Malay Peninsula, Sumatra, Java) . . . . . 11. *Macropanax*  
 12. Leaves simple, not articulated with the petiole (West New Guinea) . . . . . 12. *Anakasia*  
 11. Pedicel not articulated below the flower.  
 13. Leaf simple (or unifoliolate) or palmately lobed.  
 14. Leaf palmately lobed.  
 15. Ovary 2-celled . . . . . 13. *Brassalopsis*  
 15. Ovary 10- or more-celled . . . . . 14. *Trevesia*  
 14. Leaf simple (or unifoliolate).  
 16. Articulation present between petiole and blade . . . . . *Schefflera*  
 16. No articulation between petiole and blade.  
 17. Ovary 2-celled . . . . . 13. *Brassalopsis*  
 17. Ovary 4- or more-celled . . . . . 15. *Dendropanax*  
 13. Leaf digitately compound.  
 18. Petiolules joined together by a web of tissue. . . . . 14. *Trevesia*  
 18. No such web of tissue present.  
 19. Styles or stigmas 2.  
 20. Style bifid . . . . . 16. *Acanthopanax*  
 20. Styles united into a column . . . . . 13. *Brassalopsis*  
 19. Styles or stigmas more than 2 . . . . . *Schefflera*

### 1. HARMSIOPANAX

WARB. in E. & P. Nat. Pfl. Fam. Nachtr. 1 (1897) 166; HARMS, Bot. Jahrb. 56 (1921) 413; HUTCH. Gen. Fl. Pl. 2 (1967) 62; PHILIPSON, Blumea 21 (1973) 81. — *Schubertia* BL. Bijdr. (1826) 884, *nom. illeg., non* MIRB. 1812. — *Horsfieldia* BL. ex DC. Prod. 4 (1830) 87, *non* WILLD. 1805; BTH. in B. & H. Gen. Pl. 1 (1865) 937; BOERL. Handl. 1 (1890) 633; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 60. — Fig. 1-3.

Sparingly branched or single-trunked often monocarpic trees, up to 18 m. *Stems* stout, bearing terminal clusters of large, palmately lobed, often peltate, exstipulate leaves. Trunk, petioles, and sometimes the blades spiny. *Flowers* in very large, repeatedly branched, terminal panicles which develop after the leaves have fallen. *Umbellules* arranged racemously on the ultimate branchlets, sessile or peduncled, each consisting of a few to many pedicelled flowers. Pedicels not jointed, subtended by a bract and bearing two subulate bracteoles. Flowers hermaphrodite or with hermaphrodite flowers on terminal and male flowers on basal branches. *Calyx* a

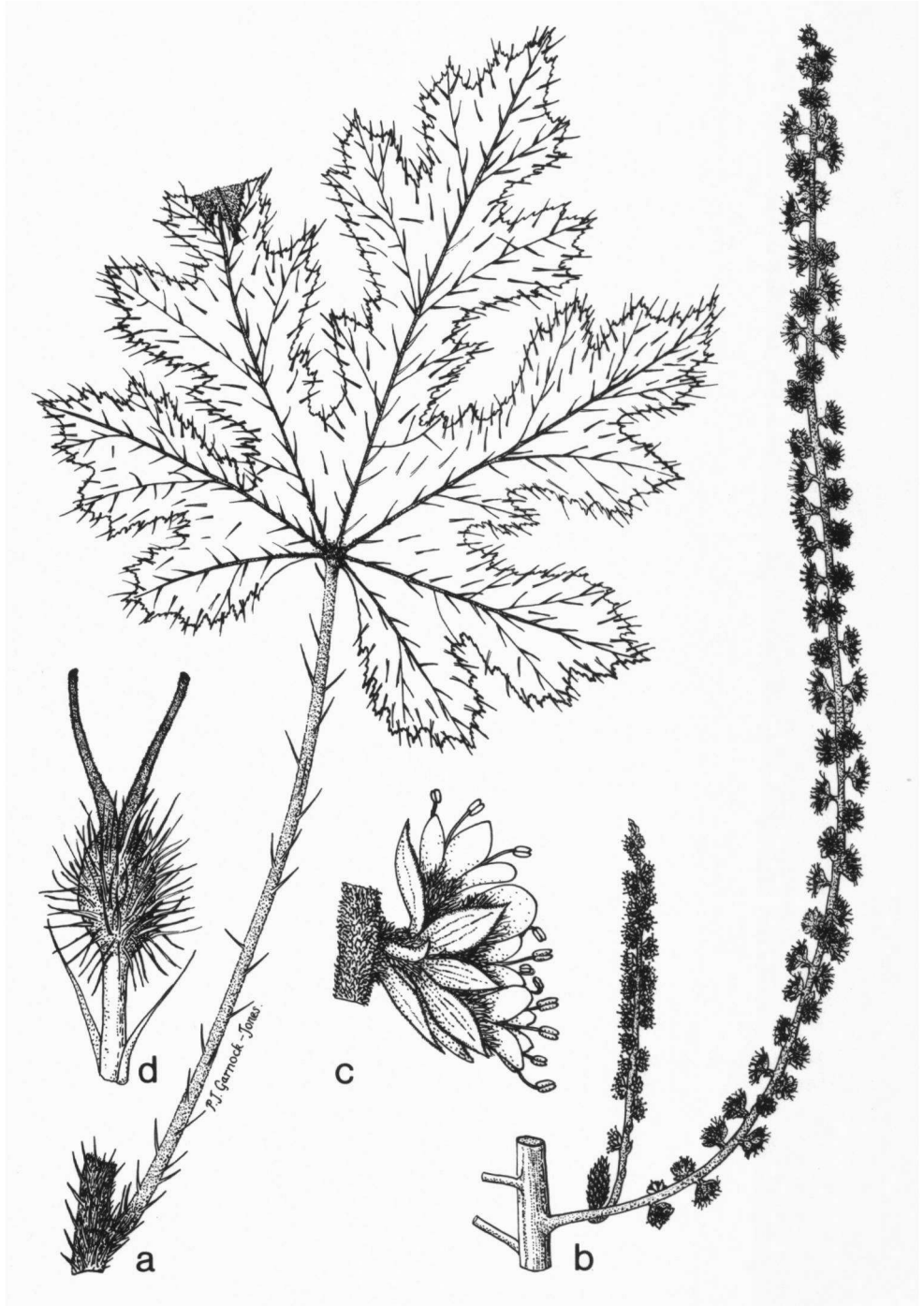


Fig. 1. *Hamsioplanax ingens* PHILIPSON *ssp. ingens*. a. Leaf,  $\times \frac{4}{5}$ , b. part of inflorescence,  $\times \frac{1}{3}$ , c. umbelule,  $\times 4$ , d. developing fruit,  $\times 12$  (a NGF 36901, b-d PHILIPSON 3483).

minute rim. *Petals* 5, free, valvate with a broad base. *Stamens* 5, dorsifixed, versatile, introrse. *Ovary* inferior, narrowly obconic, densely bristly; cells 2; disk conical, deeply cleft between the two subulate styles. *Fruit* consisting of 2 dry mericarps, each 3-ribbed and bearing a persistent slightly hooked style.

*Distr. Malesia*: 3 spp. from Java, the Lesser Sunda Is., Celebes, and New Guinea.

*Ecol.* Montane and mossy forest and in regrowth on grassy hillsides.

*Notes.* *Harmsioplanax* is a small structurally isolated genus confined to Malesia. The three species are uniform both in their vegetative and their reproductive features. It has long been recognized that some of the characters of this genus are anomalous within *Araliaceae* and a return to its earlier position within *Umbelliferae* would have something in its favour. The monocarpic habit is unknown elsewhere in *Araliaceae*, but is not uncommon in *Umbelliferae*. The character of the fruit, which splits into two dry mericarps, closely approaches the fruit structure of *Umbelliferae*, and the vascularization of the gynoeceum is also characteristic of that family. However, the structure of the leaf-base, the woody habit, and the shape of the petals all incline towards *Araliaceae*.

#### KEY TO THE SPECIES

1. Upper surface of leaves uniformly setulose.  
 2. Umbellules sessile. . . . . 1. *H. aculeatus*  
 2. Umbellules peduncled . . . . . 2. *H. harmsii*  
 1. Upper surface of leaves with many (or rarely few) larger spines among the setulose hairs 3. *H. ingens*

1. *Harmsioplanax aculeatus* (BL.) WARB. ex BOERL. *Handl.* 3 (1900) 88; KOORD. *Exk. Fl. Java* 2 (1912) 719; *Atlas* 4 (1916) f. 668 & 669; BAKH. *f. & OOSTSTR.* in *Back. Bekn. Fl. Java* (em. ed.) 7 (1946) fam. 159, p. 19; BACK. & BAKH. *f. Fl. Java* 2 (1965) 171; STEEN. *Mt. Fl. Java* (1972) pl. 3-2; PHILIPSON, *Blumea* 21 (1973) 82. — *Schubertia aculeata* BL. *Bijdr.* (1826) 885. — *Horsfieldia aculeata* (BL.) DC. *Prod.* 4 (1830) 87; BENN. *Pl. Jav. Rar.* (1840) 123, t. 26; K. & V. *Bijdr.* 7 (1900) 57; BOERL. *Handl.* 1 (1890) 647. — *Horsfieldia peltata* BTH. in B. & H. *Gen. Pl.* 1 (1862) 937. — *Fig. 2.*

Tree up to 4 m, with a slender spiny trunk. Young stems covered more or less densely with woolly hairs, bristles, and spines with bulbous bases, the spines enlarging on older stems. *Leaves* rounded, variable in size, often 60 cm or more in  $\varnothing$ , deeply palmately lobed, usually peltate in mature leaves, sinuses between the lobes broad or narrow, lobes 7-10, usually sharply and irregularly incised and toothed, apex acute, upper surface rather sparsely covered with evenly-spaced, appressed, sometimes branched hairs (denser on the main veins), underside densely clothed with a soft, woolly tomentum, often with some bristles on the main veins; petiole c. 60 cm, 1 cm  $\varnothing$  at base, terete with clasping base, densely covered with woolley hairs, bristles, and some spines. *Inflorescence* up to c. 70 cm long, main branches rather sparsely covered with a short tomentum and, when young, bearing numerous bracts similar to the leaves but smaller, not peltate, and often 3-lobed or entire; ultimate branchlets slender and often woolly-tomentose, bearing minute linear bracts which subtend the sessile umbellules. Umbellules

about 4 mm  $\varnothing$  in flower, the broadly ovate outer bracts forming a more or less distinct involucre. *Flowers* hermaphrodite or male, either mixed in an inflorescence, or separate, c. 10-15 per umbellule, each subtended by a lanceolate receptacular bract c. 2 mm long. Pedicel c.  $\frac{1}{2}$  mm long. Calyx rim fringed. Petals strap-shaped, c.  $1\frac{1}{2}$  mm long at anthesis. Filaments c. 2 mm; anthers c. 0.3 mm long, orbicular. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* long-ciliate, crowned with the divergent styles.

*Distr. Malesia*: Java, Lesser Sunda Is. (Bali, Lombok, Sumbawa, Flores, Timor), southern half of Celebes. There is a single KORTHALS sheet in L, ticketed from Central Sumatra, but this is presumably wrongly localized.

*Ecol.* Usually in rather dry, open localities, but also in forest, in secondary forest, also pioneering on rocks, in grasslands and on lava-streams, 300-1800 m. *Fl. fr.* April-Nov. SCHMUTZ found it in Flores flowering in October, but leaves had fallen.

*Vern. Java*: *djankurang*, *d. tjutjuk*, *djoglorangrang*, *S, gabus*, *garang*, *g. lanang*, *gungrang*, *udulan laki*, *J.*

*Note.* In this species lateral shoots usually appear below the infructescences so that the trees are not normally monocarpic.

2. *Harmsioplanax harmsii* K. SCH. in K. Sch. & Laut. *Nachtr.* (1905) 329; HARMS, *Bot. Jahrb.* 56 (1921) 413.

Tree up to 7 m, with a slender trunk. Young stem covered with bristles, hairs, and spines, older stems with smooth bark with small rounded lentils and numerous spines. Monocarpic. *Leaves*



Fig. 2. Habit of *Harmsioplanax aculeatus* (BL.) WARB. ex BOERL. Coarse shrub on old lava-streams in E. Java (Mt Idjen) at c. 900 m altitude (Photogr. VAN STEENIS).

rounded, up to 30 by 40 cm, deeply palmately lobed, cordate at base, lobes 5-9 with broad sinuses between them, margin unevenly and sharply dentate, apex acute, upper surface densely covered with evenly spaced bristles of varying size (larger on the main veins), appressed and directed towards the leaf margin, often with woolly hairs inserted on their enlarged bases, the underside very densely woolly and with many bristles, usually bearing crisped hairs on their enlarged bases; petiole

50 cm,  $\frac{1}{2}$  cm  $\varnothing$  at base, terete with clasping base, densely covered with bristles, woolly hairs, and spines. *Panicle* at first with numerous leaf-like bracts, the principal branches with some spines, rather sparsely covered with bristles and hairs, ultimate branches slender and tomentose, bearing linear bracts c. 4 mm long subtending peduncled umbellules; peduncles up to 5 mm, slender, tomentose, bearing 2 minute bracts. Umbellules spherical, c. 4-5 mm  $\varnothing$  in flower, outer bracts not form-

ing a distinct involucre. *Flowers* hermaphrodite, maturing in basipetal succession, the lower bracts of a branch either with sterile umbellules or lacking flowers; up to 60 in an umbellule, each subtended by a lanceolate ciliate bract *c.* 1 mm long, and borne on a glabrous pedicel *c.* 1 $\frac{1}{4}$  mm long. Calyx rim fringed with many lacerate filaments. Petals ovate, *c.* 1 mm long. Filaments *c.* 1 mm; anthers *c.*  $\frac{1}{2}$  mm long. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* with rounded ribs, long-ciliate, crowned by the divergent styles.

*Distr. Malesia:* Papua New Guinea (Madang Distr., Western Highlands, Morobe Distr. & Central Distr.).

*Ecol.* Forested hills, grassy slopes, and roadsides, 100–1800 m.

*Vern. Opme,* Ganja, Mt Hagen, *mafiong,* Sattelberg, Morobe Distr.

*Note.* Information about the habit is inadequate. The stalked spherical umbellules are very distinctive.

3. *Harmsioplanax ingens* PHILIPSON, *Blumea* 21 (1973) 84.

*ssp. ingens.* — Fig. 1, 3.

Unbranched tree up to 18 m with a thick or sometimes slender trunk densely covered, except towards the base of mature specimens, with long, sharp, upwardly directed spines and marked with leaf-scars. Monocarpic. *Leaves* usually peltate, rounded, up to 1 m  $\varnothing$ , deeply palmately lobed, lobes usually with minor lobes and coarsely dentate, apex acute, upper surface bearing few to many long spines, especially on the midrib and principal veins between which the surface is often rugose and glabrous except for the remains of a tomentum of branched hairs, or with many bristles often with woolly hairs on their bases, the under-surface also with few to many long spines and usually clothed with a fawn or greyish woolly tomentum of branched hairs, or densely furnished with bristles usually with woolly hairs on their bases, or occasionally glabrous between the spines

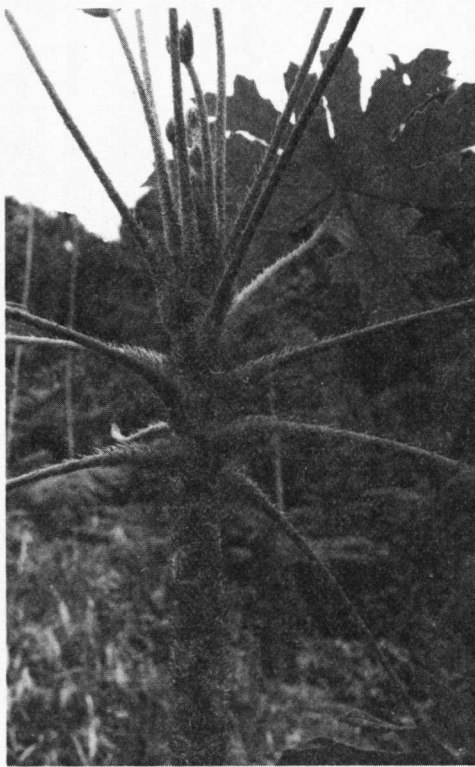


Fig. 3. *Harmsioplanax ingens* PHILIPSON. Left: apex of leafy stem; right: the large inflorescence (Photogr. FRODIN, Murrumbidgee Pass, 1971).

except for a few bristles; petiole up to 1 m and 3 cm  $\varnothing$ , terete with clasping base, covered with woolly hairs and bearing many spines. *Panicle* up to 5 m long and 5 m wide, leafless or with lobed bracts c. 10–20 cm long, principal branches spiny especially below, ultimate branches slender, tomentose, bearing linear bracts c. 1 cm long subtending peduncled or sessile umbellules; peduncles elongating as the fruit ripens, up to 4 mm, rather stout, tomentose, bearing 1 or 2 minute bracts. Umbellules bowl-shaped, c. 6–10 mm  $\varnothing$  in flower, enlarging slightly in fruit, with an involucre of about 8 ovate bracts, 2–4 mm long and ciliolate distally. *Flowers* hermaphrodite, maturing in basipetal succession, terminal branches bearing maturing fruit while lower branches bear flowers or unopened buds; usually c. 12–16 (8–20) in an umbellule each subtended by an involucre bract or a narrower receptacular bract and borne on a glabrous pedicel 1–2 mm long. Calyx rim fringed with many lacerate filaments. Petals ovate, 1–2 mm long. Filaments 2–3 $\frac{1}{2}$  mm; anthers  $\frac{1}{2}$ – $\frac{3}{4}$  mm long. Ovary covered with cilia which lengthen as the fruit ripens. *Mericarps* with rounded ribs, long-ciliate, crowned by the divergent styles.

Distr. *Malesia*: New Guinea (NW. Irian and extending along the central mountains from the Orion Mts to the Owen Stanley Range, Murray Pass).

Ecol. Montane and mossy forest and second-growth forest, 2000–3600 m, occasionally rather lower.

Vern. Papua: *mauku*, Huli; Mandated Terr.: Sepik Distr., *kamul*, Hindenburg Ra.; Western Highlands: *murri*, Hagen, *tolsan*, Minj, *mauri*, Melpa, *mai*, Mendi, *kinogore*, *makua*, *makw*, Enga; Eastern Highlands: *kimu*, Ka, *ollu*, Chimbu.

Notes. A striking, single-trunked, monocarpic tree bearing immense inflorescences. The bark is described as grey brown and the wood white with a wide pith. The inflorescence has the appearance of bearing female flowers above and male flowers below, but this is evidently due to a basipetal sequence of anthesis. The terminal flowers have

stamens when freshly opened and all those on lower branches bear styles. Apparently, the female organs of the lower branches are functional because branches from mature inflorescences bear fruit uniformly. Nevertheless, herbarium specimens cannot adequately represent such a large inflorescence so that the possibility remains that some female-sterile flowers occur in this species.

Variation occurs in both tomentum and inflorescence characters. For example, most specimens from West Irian have small umbellules and fewer leaf-spines. In the eastern part of the Eastern Highlands District a number of gatherings display a series of variations: the under-leaves give the appearance of being glabrous between bristles, the inflorescence branches bear small leafy bracts, the umbellules are sessile, with rather numerous (c. 18–21) small flowers subtended by rather broad bracts. Specimens from Mt Otto show all these features combined, but other specimens from this region diverge from the typical state in only some of these characters. No specimens of this subspecies are known from the Finisterre Range and only one from the Owen Stanley Range.

*ssp. moniliformis* PHILIPSON, *Blumea* 21 (1973) 86.

Umbellules disposed irregularly along the branches, singly or in small groups, with bare spaces intervening, sessile; flowers usually c. 20–30 per umbellule, floral parts smaller than in *ssp. ingens*; fruiting heads rather small (c. 5 mm  $\varnothing$ ).

Distr. *Malesia*: Papua New Guinea (districts bordering on the Huon Gulf).

Vern. Morobe Distr.: *mobian*, Finschhafen.

Note. This subspecies occurs at lower altitudes than is usual for *ssp. ingens* (1500–2000 m). No specimens of either subspecies have been collected from higher altitudes in the mountains north of the Markham River and the Huon Gulf. At higher altitudes in the Owen Stanley Range *ssp. ingens* is known from one gathering. The most south-easterly gathering at present known (CARR 13603) has a distinctive appearance due to the straight rigid inflorescence branches with small sessile umbellules.

## 2. ARALIDIUM

MIQ. Pl. Jungh. 3 (1855) 423; Fl. Ind. Bat. 1, 1 (1856) 762, t. 13; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 25; BTH. in B. & H. Gen. Pl. 1 (1865) 936; HEMSL. in Hook. Ic. Pl. 16 (1886) t. 1549; BOERL. Handl. 1 (1890) 631; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 60; HUTCH. Gen. Fl. Pl. 2 (1967) 59. — Fig. 4.

Unarmed tree or shrub with simple, exstipulate pinnately lobed, irregularly incised, or entire leaves. *Inflorescence* a large panicle, with cymules of small flowers arranged racemosely on the branches. Pedicels articulated below the ovary. Dioecious. *Male flowers*: calyx 5; petals 5, imbricate; stamens 5, anthers dorsifixed. *Female flowers*: calyx and corolla similar to male; staminodes 5; ovary with 3

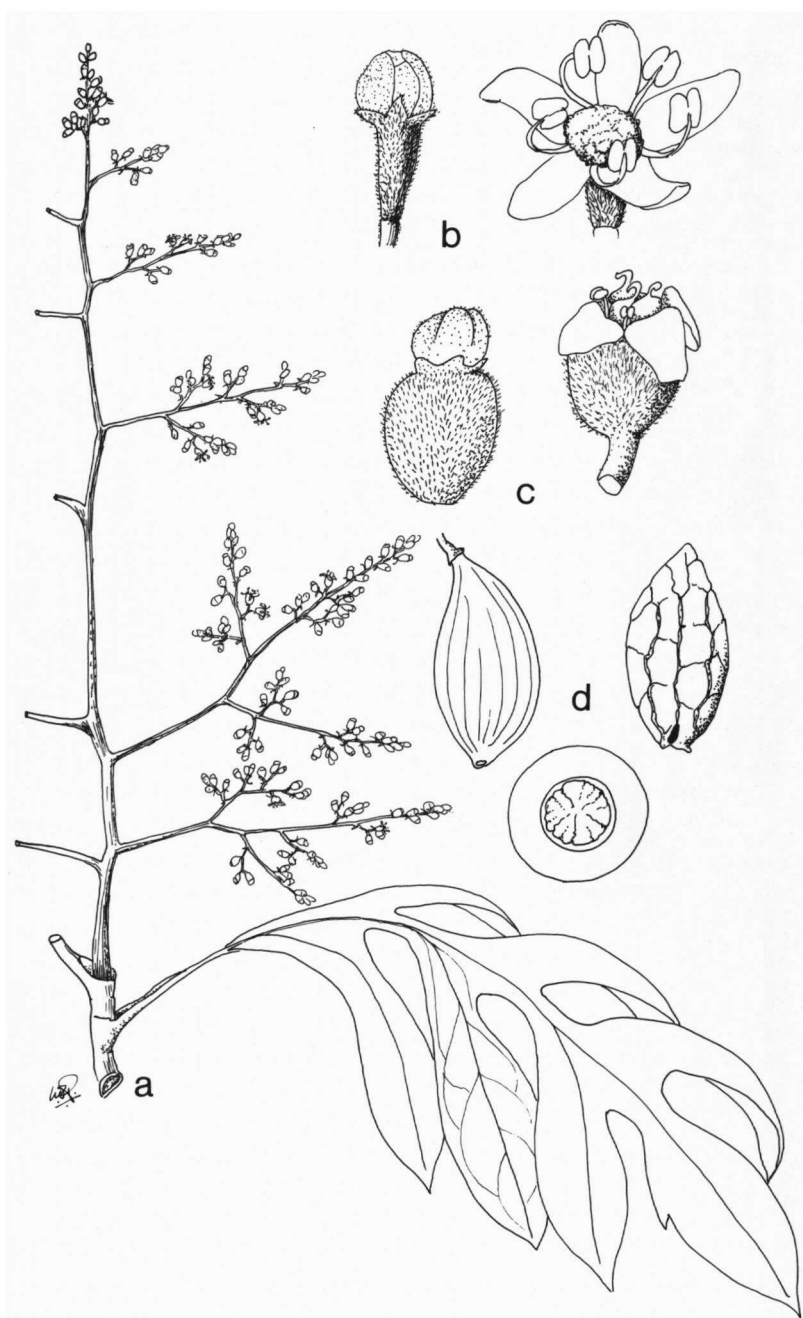


Fig. 4. *Aralidium pinnatifidum* (JUNGH. & DE VRIESE) MIQ. a. Habit,  $\times \frac{2}{5}$ , b. ♂ flower and bud, c. ♀ flower and bud, both  $\times 8$ , d. fruit, seed, and CS, slightly enlarged (a VAN BALGOOY 2185, b COCKBURN FRI 8376, c SINCLAIR 9884, d fresh material). Drawn by W. R. PHILIPSON.

locules (2 abortive) and 1 ovule, styles 3–4, tapering from broad bases, stigmas terminal. *Fruit* drupe-like. *Seed* solitary, pendulous from a thickened funicle, 4–5-grooved; endosperm deeply ruminant.

**Distr.** Monotypic. Peninsular Thailand and *Malesia*: Malay Peninsula, Sumatra, and Borneo.

The record from Java by MIQUEL (Ann. Mus. Bot. Lugd.-Bat. 1, 1863, 25) is erroneous (see K. & V. Bijdr. 7, 1900, 2).

**Ecol.** Primary and secondary forest, from sea-level to c. 1250 m.

**Notes.** The single species forms a genus with several unique features, namely the large, simple, characteristically pinnately lobed leaves, the absence of resin ducts, the diffuse panicles of male or female flowers, the 3-carpellate ovary with a single surviving locus resulting in a single-seeded fruit, the dorsal raphe, the deeply ruminant endosperm, and the enlarged funicle.

The genus is treated here as a member of the *Araliaceae* mainly as a matter of convenience. Sometimes it has been placed in the *Cornaceae* (e.g. RIDL. Fl. Mal. Pen. 1, 1922, 894, and VIGUIER, Ann. Sc. Nat. Bot. 4, 1906, 171), and on full investigation it may well prove to be better placed in that family. The absence of resin ducts and the dorsal raphe strongly support a relationship with the *Cornaceae* and its immediate allies, though the absence of borders to the pits of the xylary fibres is characteristic of *Araliaceae*.

Several genera formerly placed in the *Cornaceae* have now been elevated to the rank of family. If this course is followed then *Aralidium* should also be segregated. Many of the features of *Aralidium* approach those of *Griselinia* (segregated as *Griselinaceae*) and possibly these two genera should be united as a single family.

**1. *Aralidium pinnatifidum* (JUNGH. & DE VRIESE) MIQ.** Fl. Ind. Bat. 1, 1 (1856) 763; HEMSLEY in Hook. Ic. Pl. 16 (1886) t. 1549; BOERL. Handl. 1 (1890) 631; RIDL. Fl. Mal. Pen. 1 (1922) 895; PHILIPSON, J. Bot. 78 (1940) 118. — *Aralia pinnatifida* JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 15; Ann. Sc. Nat. III, 6 (1846) 115. — *A. dentatum* MIQ. Sum. (1861) 340. — *A. integrifolium* HEINE in Fedde, Rep. 54 (1951) 245. — Fig. 4.

Shrub or small tree up to c. 10 m, rarely reaching 20 m and 25 cm  $\varnothing$ , glabrous in its vegetative parts; buds enclosed in long sheathing leaf-bases. *Leaves* spaced with distinct internodes, usually c. 30 by 22 cm or more,  $\pm$  regularly pinnately incised, frequently as deep as the midrib, lobes oblong-acuminate and decurrent on the midrib, c. 2½ cm wide or more, the lobing sometimes irregular, and occasionally the blade entire and broadly ovate (up to 25 by 20 cm) or rarely lanceolate, leaf margin either entire or coarsely dentate, especially on the terminal lobe; petioles 5–12 cm, broadly channelled above, clasping the stem with a slightly dilated base, exstipulate. *Panicles* terminal, or occasionally in the upper axils, to 50 cm long, pendulous, puberulous; main bracts caducous, but the minute bracteoles often persisting until anthesis. *Flowers* numerous, small (buds c. 2½ mm long), fragrant, creamy or red-tinged, ovary, calyx lobes and petals densely covered in a minute but coarse puberulence. *Male flowers* with the corolla persistent during anthesis, petals c. 1½ mm long, strap-shaped, spreading, stamens c. 1 mm with flattened filaments and round anthers; stylopodium a succulent disk with a concave centre; styles absent, the ovary 1½ mm long, narrowly turbinate,

without a locus. *Female flowers* with the corolla caducous at anthesis together with the staminodes, styles divergent from their gibbous bases, ovary ovate with a single locus (two abort early); ovule pendulous. *Fruit* usually obliquely ellipsoid, tapering to the apex and c. 3–4½ cm long, but rarely subspherical, white when immature, ripening to purplish or black, juicy; exocarp fleshy, endocarp chartaceous. *Seed* broadly ellipsoid, 2–2½ cm long, with the surface patterned with deep ruminations.

**Distr.** Peninsular Thailand; in *Malesia*: Malay Peninsula (from Kedah southwards common; Singapore), throughout Sumatra (also in Simalur I.), Anambas Is. (Siantan) and throughout Borneo.

**Ecol.** Frequent in evergreen primary rain-forest, also in open bamboo forest and secondary growths, from sea-level to c. 1250 m, in Borneo up to 1500–1800 m. *Fl. fr.* Jan.–Dec.

**Uses.** The only use, once mentioned, is from Brunei, as “leaves make good ghost medicine”.

**Vern.** Malay Peninsula: *lëmpëdu buaya*, (*poko*) *balai*, *pungar*, *sahalat*, *sëbalai tingal*, *sibilai*, *tëbalai*, M; Sumatra: (*kayu*) *attarodan*, Asahan, Batak lang., *sëgëntut*, Gajo, *mëdung*, M, *manël silai*, *mannel dotan*, *sukun dotan*, M, Simalur; Anambas Is.: *ballok*, M, Siantan; Borneo: *dawn tutchol antu*, Brunei, Iban lang.

**Note.** Entire leaves are not infrequent throughout the range of the species, so that the recognition of a second species using this character is not justified. Coarsely dentate leaf-margins were also employed as a specific character but are merely a minor variation. Some specimens from Mt Kinabalu have rather small globose fruits, but the typical form of fruit also occurs on that mountain.



## 3. ARALIA

LINNÉ, Gen. Pl. ed. 5 (1754) 134; Sp. Pl. (1753) 273; DC. Prod. 4 (1830) 257; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 6; BTH. in B. & H. Gen. Pl. 1 (1865) 936; BOERL. Handl. 1 (1890) 629; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 56; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; HUTCH. Gen. Fl. Pl. 2 (1967) 63; STONE, Gard. Bull. Sing. 30 (1977) 134; PHILIPSON, *l.c.* 97. — *Acanthophora* MERR. Philip. J. Sc. 13 (1918) Bot. 316, *non* LAMOUREUX, 1813 (*Algae*); STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 390. — Fig. 5, 6.

Sparingly branched shrubs or small trees, or climbing, rarely (*extra-Mal.*) herbaceous, glabrous or hairy, often prickly. *Leaves* pinnate to tripinnate, usually with leaflets at the insertion of the lateral pinnae; leaflets serrate; petiole with a sheathing base. *Inflorescence* a terminal panicle; flowers sessile or pedicelled, with an articulation below the flower; calyx with 5–6 teeth; petals 5–6, imbricate; ovary 2–6-celled; styles 2–6 free or shortly connate below. *Fruit* a fleshy drupe; pyrenes cartilaginous, compressed; endosperm uniform.

**Distr.** More than 30 *spp.* in North America (S. to Mexico) and East Asia, 6 *spp.* in *Malesia*: Sumatra, Malay Peninsula, Java, Lesser Sunda Is. (Sumba), Borneo, Celebes, Philippines, and West New Guinea.

**Ecol.** Usually on scrubby hillsides and in secondary growth, often in ravines or near streams, or in thickets near or above the limit of tree-growth, at low altitude (100 m), but usually in the montane zone, up to 3000 m.

**Note.** For a discussion of specific distinctions see VAN STEENIS, *l.c.* 391. HUI-LIN LI in *Sargentia* 2 (1942) 101, treated some species that extend into Malesia. MERRILL considered that the climbing habit and recurved spines of *Acanthophora* justified its separation as a distinct genus, but more recent authors have not agreed.

## KEY TO THE SPECIES

1. Flowers sessile (capitate) or very shortly pedicelled.
2. Flowers sessile, underside of leaf  $\pm$  densely tomentose, hairs of the branches and inflorescence  $\pm$  appressed and felted, bracts around the capitula enveloped in hairs . . . . . 1. *A. dasyphylla*
2. Flowers short-pedicelled, underside of leaf sparsely tomentose, hairs of the branches and inflorescence  $\pm$  patent, bracts around the capitula less densely tomentose . . . . . 2. *A. javanica*
1. Flowers  $\frac{1}{2}$ – $1\frac{1}{2}$  cm pedicelled (umbellate).
3. Climbing or scrambling liana, spines curved . . . . . 3. *A. scandens*
3. Erect shrubs or small trees, spines straight.
4. Leaflets glaucous beneath, margins with few crenations. Fruit small (c. 3 mm long) . . . . . 4. *A. bipinnata*
4. Leaflets green (or with fawn pubescence) beneath, margins serrate. Fruit rather larger (4–6 mm long).
5. Young parts and undersurface of leaves glabrous (but with small spines) . . . . . 5. *A. ferox*
5. Young parts and undersurface of leaves pubescent . . . . . 6. *A. montana*

1. *Aralia dasyphylla* MIQ. Fl. Ind. Bat. 1, 1 (1856) 751; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9, *incl. var. strigosa* MIQ. *et var. latifolia* MIQ.; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 53; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 673 A–K; HUI-LIN LI, *Sargentia* 2 (1942) 20; BAKH. f. *Blumea* 6 (1947) 367, *incl. var. urticifolia* (BL. *ex* MIQ.) BAKH. f.; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159,

p. 18; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; NGOC-SANH BUI, *Adansonia* 4 (1964) 464; BACK. & BAKH. f. Fl. Java 2 (1965) 170; STEEN. Mt. Fl. Java (1972) pl. 3–1; PHILIPSON, Gard. Bull. Sing. 30 (1977) 98; Y.-R. LING, *Acta Phytotax. Sin.* 15 (1977) 86. — *A. chinensis* (*non* L.) BL. Bijdr. (1826) 870. — *A. urticifolia* BL. *ex* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 55; KOORD. Atlas 4

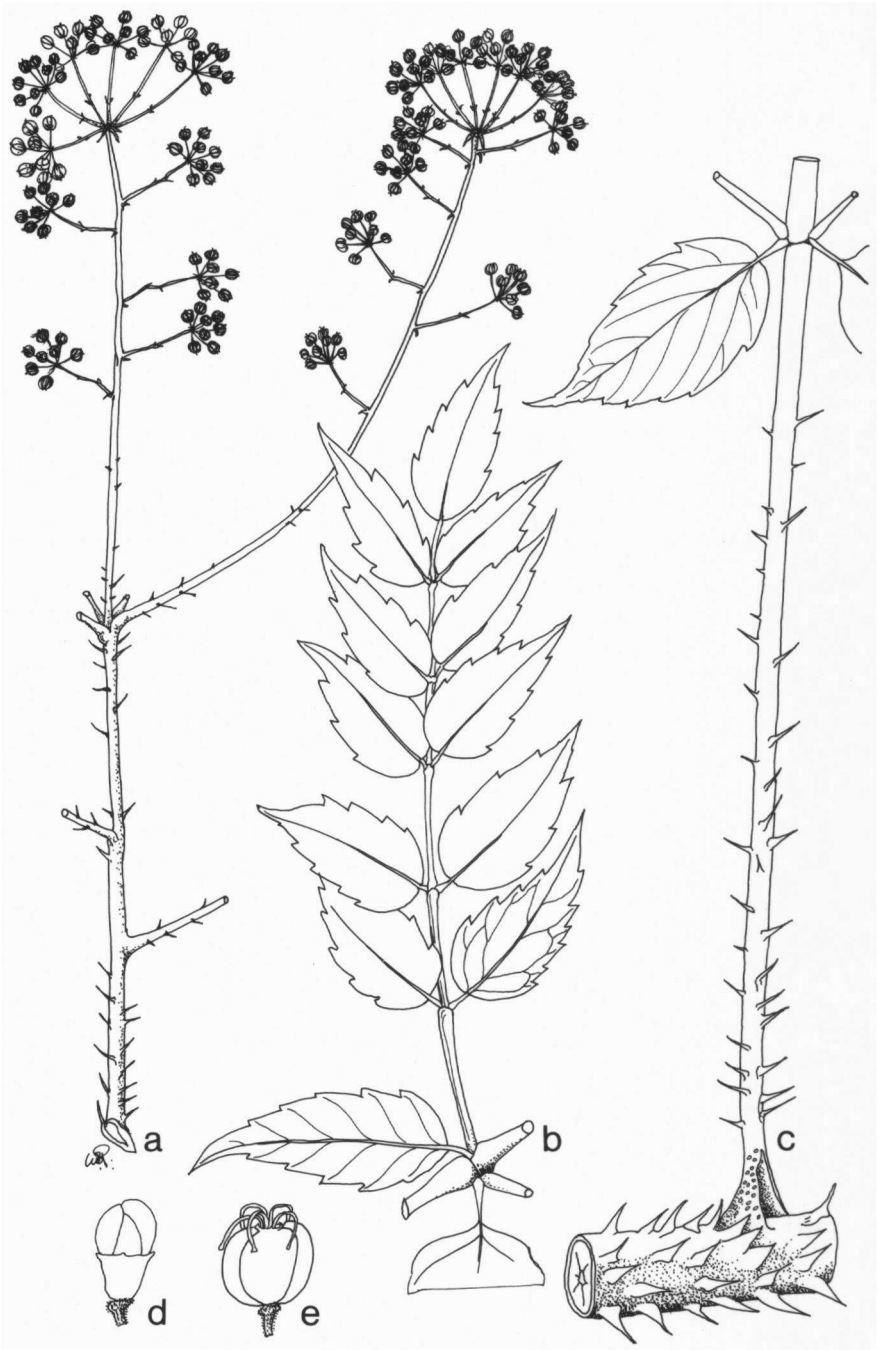


Fig. 5. *Aralia bipinnata* BLANCO. *a*. Upper branches of inflorescence, *b*. pinna, *c*. base of petiole, all  $\times \frac{2}{3}$ , *d*. flower bud, *e*. fruit, both  $\times 3$  (JACOBS 7017). Drawn by W. R. PHILIPSON.

(1916) f. 673 L-N. — *A. beccarii* RIDL. J. Mal. Br. R. As. Soc. 1 (1923) 64. — Fig. 6.

Prickly shrub or small tree, often unbranched, to c. 5 m; young parts densely brown pubescent. *Leaves* forming large rosettes at the summit of the stems, c. 1 m long (or more), bi- or tripinnate, with a pair of leaflets (occasionally pinnate) at each division of the rachis, the petiole, rachis and lateral rachides prickly or unarmed, densely pubescent; leaflets subsessile or petiolule c. 5 mm long (or longer), usually densely pubescent on the lower surface, less dense above, ovate to oblong-ovate, c. 5-14(-18) by 3-5(-10) cm, base rounded to subcordate, apex acuminate, margin finely or sometimes coarsely serrulate; petiole c. 40 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal panicle, 70 cm or more long, densely brown pubescent, rachis bearing several secondary branches c. 30-40 cm long, with ultimate branches arranged racemously, bracts ligulate, ending in heads of several sessile flowers, surrounded by an involucre of small usually densely pubescent bracts. *Calyx* with 5 usually obtuse teeth; petals 5, c. 1½ mm long, glabrous; stamens 5; ovary c. 2 mm long, glabrous, 5-celled; styles 5, slightly connate below. *Fruit* globose, c. 3½ mm  $\varnothing$ , ribbed when dry.

Distr. Northwards to southern China; in *Malesia*: Sumatra, Malay Peninsula, West and Central Java.

Ecol. Primary forest and secondary growths in deep ravines or open hillsides, from low altitude (c. 100 m) to 2500 m.

Vern. Sumatra: *kaju burle lasët, k. sèpak-sipang, k. si marsuga-suga, k. sipang-sipang, samimpadan, M*; Java: *gorang, osangsing, J, pangang tjutjuk, S*.

Note. The capitulate flowers are characteristic (see also under *A. javanica*). The presence of this species in the Malay Peninsula has often been overlooked, though it extends into southern China. Its variability was discussed by VAN STEENIS (1948, l.c.).

2. *Aralia javanica* MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 749; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 55; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 670; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BACK. & BAKH. f. Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 98.

A shrub or small tree, often unbranched, young parts covered with brown pubescence which persists on the stems and rachides of the inflorescence as  $\pm$  patent hairs. *Leaves* tufted at the ends of the branches, bipinnate with a pair of leaflets at the divisions of the rachis; leaflets variable in size, subsessile or the petiolules up to c. 2 cm, blade ovate to elliptic, up to 18 by 8 cm (usually smaller),

both surfaces with sparse, short, appressed, bristly hairs, base cuneate to truncate, apex acuminate, margin finely and unevenly serrulate; petiole 20-30 cm. *Inflorescence* a large terminal panicle, rachis bearing several secondary branches c. 30-40 cm long, with the ultimate branches bearing heads (or subumbellules) of c. 10 flowers, surrounded by an involucre of small linear bracts. *Calyx* with 5 small teeth; petals 5; stamens 5; ovary c. 2 mm long, glabrous, 5-celled; styles erect at anthesis. *Fruit* ovoid, c. 5 mm long, ribbed when dry, with the persistent styles recurved.

Distr. *Malesia*: West and Central Java (Mts Papandayan, Malabar, Diëng, Surakarta).

Ecol. Mountain forests, 2000-3000 m.

Note. This imperfectly known species may prove to be a form of the widespread *A. dasyphylla*, from which it appears to differ in the shortly pedicelled flowers, the sparser leaf-tomentum, the more patent hairs on the inflorescence branches and the bracts of the umbellules less thickly enveloped in hairs.

3. *Aralia scandens* (MERR.) HA, Nov. Sist. Vyssh. Rast. 11 (1974) 229; STONE, Gard. Bull. Sing. 30 (1977) 276, f. 1; PHILIPSON, l.c. 99. — *Acanthopora scandens* MERR. Philip. J. Sc. 13 (1918) Bot. 316; En. Philip. 3 (1923) 236; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 390. — *A. ferox* (MIQ.) KING, J. As. Soc. Beng. 67, ii (1898) 45; KOORD. Minah. (1898) 498; MERR. En. Born. (1921) 458; RIDL. Fl. Mal. Pen. 1 (1922) 872; MASAM. En. Phan. Born. (1942) 564.

Prickly scandent shrub, glabrous, reaching a height of 10 m or more, stems c. 2½ cm  $\varnothing$ . *Leaves* dispersed (c. 30 cm apart), up to 1½ m long, tri- or quadripinnate with a pair of leaflets at each division of the rachis, prickly on the petiole, rachides, and sometimes on the leaf veins; leaflets ovate to elliptic-ovate or ovate-lanceolate, petiolules 3-10 mm, blade 5-14 by 2½-5 cm, base rounded or subcordate, apex acuminate, margins finely spinulose-denticulate; petiole to 35 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal spiny panicle, the main rachis to c. 60 cm, bearing secondary branches singly or in whorls, up to 50 cm; ultimate branches 1-4 cm, subtended by lanceolate bracts, racemously arranged, ending in umbellules; umbellules c. 10-20-flowered, pedicels slender, 10-12 mm, with lanceolate bracts 2-3 mm long, articulated below the flower. *Calyx* with 5-6 short acute teeth; petals 5-6, with a broad base, imbricate; stamens 5-6, filaments c. 4 mm long, anthers c. 1 mm long; ovary turbinate c. 2½ mm long, 5-6-celled, styles 5-6, free or only slightly connate below, at first erect. *Fruit* ellipsoidal, c. 5 mm long, purple to blue-black, deeply furrowed when dry, crowned by the persistent radiating styles.

Distr. *Malesia*: Malay Peninsula (Perak, Selangor, Pahang), Sabah (Mt Kinabalu), Philippines

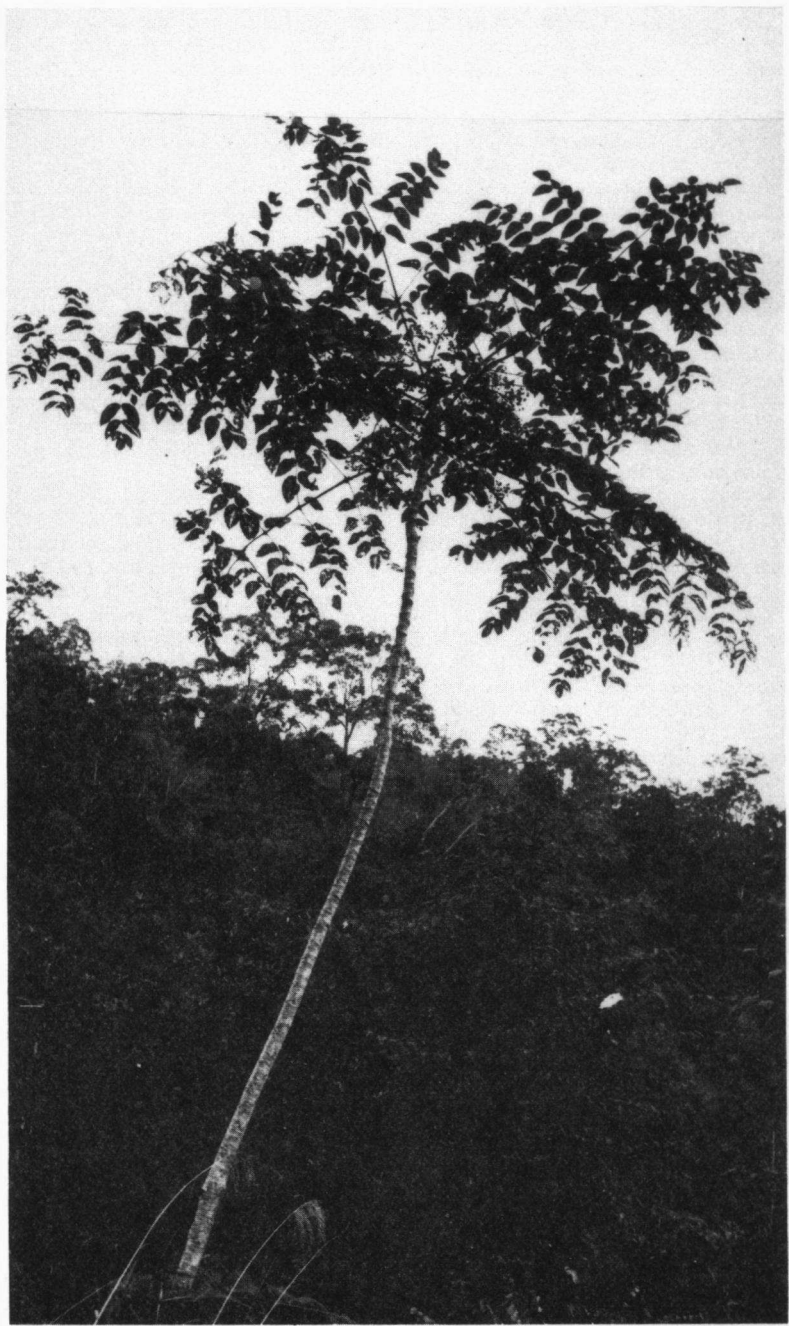


Fig. 6. *Aralia dasyphylla* MIQ. Habit, Tjibodas, on slope of Mt Gedeh, W. Java, c. 1400 m altitude (Photogr. PHILIPSON, 1973).

(Luzon, Panay, Catanduanes, Mindanao), Celebes (Menado, Buton I., S. Celebes).

Ecol. Thickets on slopes and mountainsides, often near streams, or among secondary growths, 180–1550 m.

Uses. In Mindanao is reported that scrapings of the bark are applied to wounds and a decoction of the boiled bark is drunk to relieve internal pain.

Vern. Philippines: *awangyan*, Mindanao, *simbar*, Bag.

Note. The only species with the habit of a liana, with spaced leaves, and recurved spines. The flowers are whitish or yellowish, and slightly fragrant and are visited by numerous small bees. The fruit is purple and fleshy.

4. *Aralia bipinnata* BLANCO, Fl. Filip. (1837) 222; MERR. Sp. Blanc. (1918) 294; En. Philip. 3 (1923) 235; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 392, *incl. f. inermis* STEEN.; PHILIPSON, Gard. Bull. Sing. 30 (1977) 99. — *A. hypoleuca* PRESL, Epim. (1851) 250; MIQ. Fl. Ind. Bat. 1, 1 (1856) 751; F.-VILL. Nov. App. (1880) 101; VIDAL, Phan. Cuming. Philip. (1885) 117; Rev. Pl. Vasc. Filip. (1886) 144; HARMS, Bot. Jahrb. 23 (1896) 18; MERR. Philip. J. Sc. 5 (1910) Bot. 369; En. Philip. 3 (1923) 235. — *A. javanica* (non MIQ.) F.-VILL. Nov. App. (1880) 101. — *A. glauca* MERR. Philip. J. Sc. 2 (1907) Bot. 291; En. Philip. 3 (1923) 236. — *A. apoensis* ELMER, Leaf. Philip. Bot. 7 (1914) 2325; MERR. En Philip. 3 (1923) 235. — Fig. 5.

A shrub or small, sparsely branched tree to 7 m, with prickly stems. *Leaves* to 1½ m or more long, forming large crowns at the ends of the branches, bipinnate, with a pair of pinnae at each division of the rachis, with some prickles, especially on the petiole or unarmed, the rachis swollen and articulated at the nodes; leaflets sessile or with a short petiolule, ovate to lanceolate, usually 4–5 by 2–2½ cm, but variable in size, apex acute or acuminate, base rounded to cordate, usually markedly oblique in lateral leaflets, margin conspicuously crenate, upper surface green, glabrous, lower surface glaucous, pubescent along the veins and sometimes sparingly on the mesophyll, sometimes only in the angles of the lower veins, or almost glabrous throughout, primary and secondary veins conspicuous; petiole to 30 cm, base long sheathing and slightly ligulate. *Inflorescence* a large terminal panicle 30–70 cm long (or more), peduncle and also usually the main branches prickly, the whole either almost glabrous or pubescent; peduncle 5–18 cm long, stout; main rays c. 5–10, mostly clustered at the apex of the rachis, 25–65 cm long, bearing many short tertiary branches along their length; tertiary branches usually 5–10 cm long, ending in umbellules, and bearing a small number of lateral umbellules, or branches, minute lanceolate bracts subtending the branches of the third or higher orders; umbellules with c. 20–30 radiating

pedicels; pedicels 5–10 mm. *Calyx* lobes 5, rounded, ½ mm long; petals 5, 1½ mm long; stamens 5; ovary 5-celled, styles subulate, free. *Fruit* spheroidal, c. 3 by 4 mm, strongly 5-ribbed when dry, persistent styles spreading.

Distr. Taiwan; in *Malesia*: Philippines (Luzon, Leyte, Negros, Mindoro, Mindanao) and West New Guinea (Vogelkop Peninsula, possibly also in Swart Valley).

Ecol. In rather open forests, ravines, and in thickets and secondary growths, (700–)1000–2450 m.

Vern. Philippines: *badbaranai*, C.Bis., *dasanat*, Neg., *karugi*, Buk., *magkasau*, Bis., *mara-bauya*, Bag., *papang*, Bon., *sugsuga*, Ig.

Note. VAN STEENIS *l.c.* discussed the variability in pubescence and the development of spines.

5. *Aralia ferox* MIQ. Fl. Ind. Bat. 1, 1 (1856) 750; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9; BOERL. Handl. 1 (1890) 629; K. & V. Bijdr. 7 (1900) 49; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 671; Fl. Tjib. 2 (1923) 229; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 18; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 394; BACK. & BAKH. f. Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 99. — *A. filicifolia* RIDL. J. Fed. Mal. St. Mus. 8 (1917) 42, *non* C. MOORE, 1876.

Spiny shrub or small tree, usually unbranched, to c. 10 m. *Leaves* forming a large rosette at the summit of the stem, up to c. 1 m long, or shorter below the inflorescence, bi- or tripinnate, with a pair of leaflets (often pinnate) at each division of the rachis, prickly on the petiole, main rachis, and often on the lateral rachides; leaflets sessile or petiolules to c. 5 mm, ovate or ovate-oblong, usually c. 3 by 1¾ cm, but variable in size, base truncate to rounded or cuneate, apex acute acuminate, margin sharply serrate, both surfaces with small bristle-like spines, especially on the veins, sometimes with small spines on the underside of the midrib; petiole to c. 25 cm, with an elongated sheathing base and a small ligule. *Inflorescence* a large terminal panicle, 25–50 cm long, glabrous, the main rachis rather short, bearing a few lateral or a terminal cluster of branches c. 15–25 cm long; tertiary branches disposed singly or in subverticils, ending in umbellules and bearing a variable number of lateral umbellules. *Flowers* c. 10–12 per umbellule; pedicels c. 5–6 mm, articulated below the ovary; calyx a rim bearing 5 narrow or triangular teeth; petals and stamens 5; ovary turbinate c. 2 mm long; styles 5, erect at first, soon spreading, scarcely united at the base. *Fruit* spheroidal, c. 6 by 5 mm, deeply furrowed when dry, the persistent styles radiating.

Distr. *Malesia*: Central W. Sumatra (Mt Kerintji), W. Java (Mts Gedeh, Patuha and Tangkuban Prah).

Ecol. In montane scrub and among scattered trees, 1900–2900 m.

Vern. *Pabong, pangang njirvan, panggang-tjèrmé, S.*

*forma nana* STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 394, f. 1.

Smaller, probably  $\frac{1}{2}$ –1 m, leaves tripinnate, 30 cm long, spiny all over; leaflets 4–13 by 2–7 mm, rachides of the ultimate pinnae winged.

Distr. *Malesia*: Central W. Sumatra (Mt Talang).

Ecol. Growing about 2500 m.

Note. VAN STEENIS considered this interesting dwarf form to represent the extreme of a series in size variability.

6. *Aralia montana* BL. Bijdr. (1826) 870; MIQ. Fl. Ind. Bat. 1, 1 (1856) 750; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 9, incl. var. *acutata* MIQ.; BOERL. Handl. 1 (1890) 646; K. & V. Bijdr. 7 (1900) 51; KOORD. Exk. Fl. Java 2 (1912) 718; Atlas 4 (1916) f. 672; STEEN. Bull. Bot. Gard. Btzg III, 17 (1948) 391; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BAKH. f. Blumea 6 (1950) 367, incl. var. *crassifolia* BAKH. f.; BACK. & BAKH. f. Fl. Java 2 (1965) 170; PHILIPSON, Gard. Bull. Sing. 30 (1977) 100. — *A. bipinnata* REINW. ex BL. Cat. (1823) 43, nomen; ex DE VRIESE, Pl. Ind. Bat. Or. (1857) 84, nomen in synonym. — *Panax armatus* WALL. [Cat. (1832) n. 4933, nomen] ex G. DON, Gen. Syst. 3 (1834) 386. — *A. decomposita* REINW. ex DE VRIESE, Pl. Ind. Bat. Or. (1857) 84, nom. illeg. altern. — *A. armata* (WALL.) SEEM. J. Bot. 6 (1868) 134; CLARKE, Fl. Br. Ind. 2 (1879) 723; KING, J. As. Soc. Beng. 67, ii (1898) 44; RIDL. Fl. Mal. Pen. 1 (1922) 873; HUI-LIN LI, Sargentia 2 (1942) 106. — *A. thomsonii* SEEM. J. Bot. 6 (1868) 134; CLARKE, Fl. Br. Ind. 2 (1879) 723; KING, J. As. Soc. Beng. 67, ii (1898) 44; RIDL. Fl. Mal. Pen. 1 (1922) 873; HUI-LIN LI, Sargentia 2 (1942) 112.

Shrub or small tree, frequently unbranched, with prickly stems, occasionally attaining a height of 12 m. Leaves to 1 m or more long, forming large crowns at the ends of the branches, bipinnate, with a pair of simple or occasionally pinnate leaflets at each division of the rachis, usually with some prickles, especially on the petiole, or unarmed, the rachis constricted at the joints; leaflets sessile or with a short petiolule, ovate, up to 14 by 7 cm, apex acute to acuminate, base truncate or rounded, oblique in lateral leaflets, margin sharply serrate, upper surface with the remains of a strigose tomentum, often  $\pm$  rugose, lower surface often with a  $\pm$  velvety tomentum, or with more harsh hairs  $\pm$  confined to the veins; petiole to 30 cm, its base sheathing and ligulate. Inflorescence a large terminal panicle, peduncle and branches tomentose, prickles, if any, confined to the peduncle and main

rachis, small usually persistent linear or ovate bracts c.  $1\frac{1}{2}$  cm long subtending the branches and also spaced along the peduncle; bracts of tertiary branches similar but smaller; secondary branches at intervals along the main rachis, c. 35 cm long, bearing numerous tertiary branches along their length; tertiary branches usually c. 6 cm long, ending in umbellules, and often bearing a number of lateral umbellules; umbellules with c. 20–30 radiating pedicels; pedicels usually 12–15 mm, occasionally shorter, pubescent. Flowers hermaphrodite; calyx lobes 5, triangular or rounded; petals 5, c. 2 mm long; stamens 5; ovary 5-celled, glabrous; styles subulate, connate below, free and spreading above. Fruit spheroidal, up to c. 4 by 4 mm, strongly 5-ribbed when dry, surmounted by the reflexed styles.

Distr. *Malesia*: Malay Peninsula, Sumatra, Java, Borneo (Sarawak, Sabah), Celebes, Lesser Sunda Is. (Sumba).

Ecol. Primary and secondary forest, bamboo forest and low-lying moist ground, from near sea-level to 2600 m.

Vern. *Goarang, panggang tjutjuk, S*; Malay Peninsula: *poko dulang-dulang*; Sarawak: *tepa paluk*.

Notes. This species is considered to include all West Malesian examples with pedicelled flowers and pubescent leaves. This broad concept is contrary to former treatments which have recognized several species (*A. thomsonii*, *A. armata*). The alliance with *A. chinensis* L. and *A. decaisneana* HANCE is also very close. The application of names to this and other Javanese species has been very confused. The position is ably discussed by VALETON (in K. & V. Bijdr.) and by VAN STEENIS (*l.c.*). In most specimens the lower leaf surface and the pedicels are densely tomentose, but there are specimens in which the leaf is only sparsely hairy and the pedicels may be glabrous. *A. armata* appears to be within the range of variation of the complex although this plant is very spiny, its leaves and inflorescences always being provided with numerous short spines. The leaflets also are thinner and smoother and, like the pedicels, are less densely pubescent (see NGOC-SANH BUI, Adansonia 9, 1969, 461). However, *A. armata* (if distinct) has been collected only very rarely in the Malay Peninsula and only in the extreme north. The most aberrant specimens are those with glabrous umbellules which are mostly from Sumatra but also from Java: they may indicate that *A. foliolosa* SEEM. should also be included in this complex.

#### Excluded

*Aralia capitulata* JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 17; Ann. Sc. Nat. III, 7 (1846) 116 is, cf. SLEUMER, Fl. Males. I, 7 (1971) 24 = *Gomphandra capitulata* (JUNGH. & DE VRIESE) BECC. ( *Icacinaceae*).

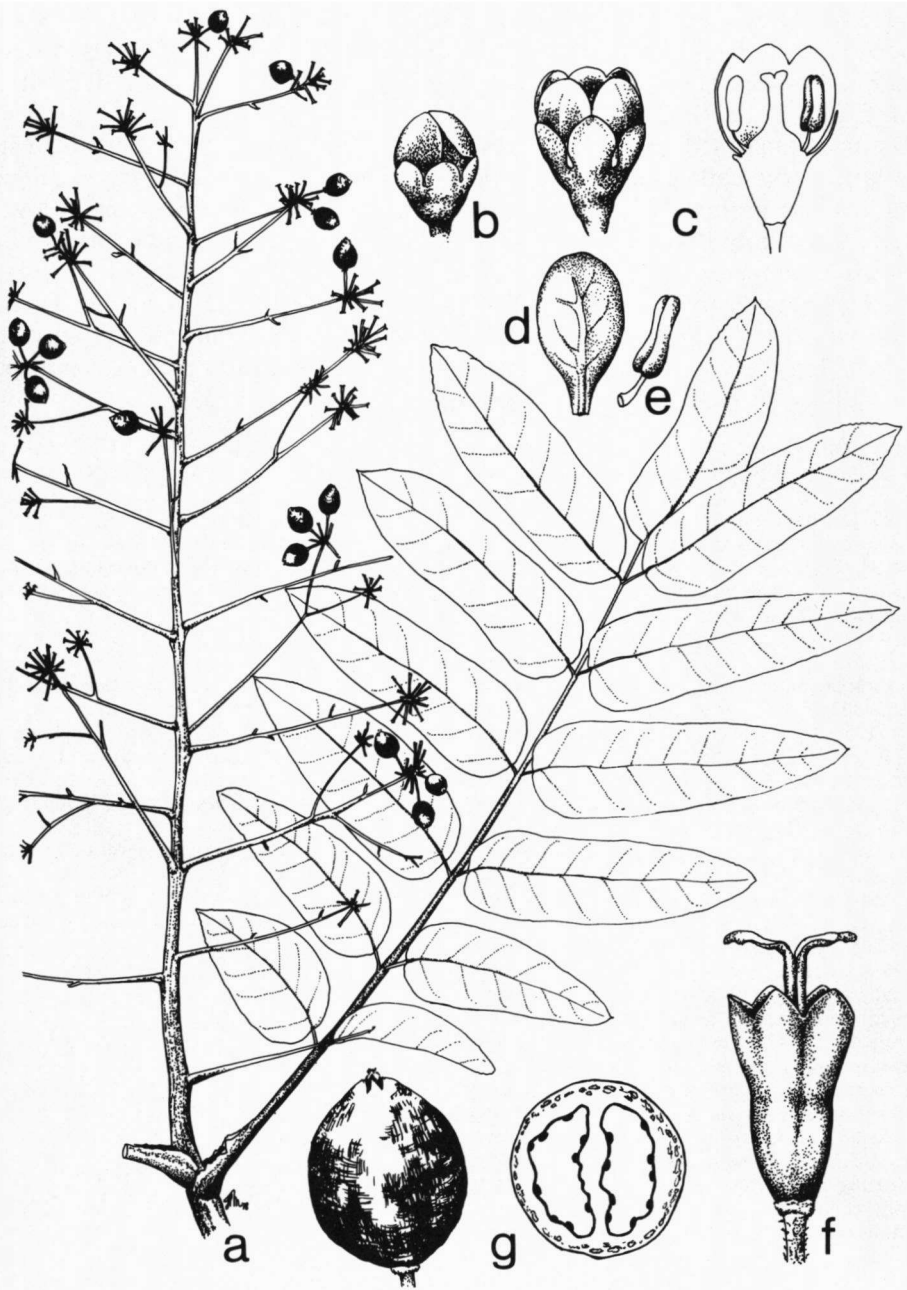


Fig. 7. *Delarbrea collina* VIEILL. a. Habit,  $\times 2/5$ , b. flower bud, c. flower and ditto in LS, d. petal, e. stamen, f. flower after anthesis,  $\times 13$ , g. fruit and ditto in CS,  $\times 3$  (a-e, g RIDSDALE NGF 36736, f SOEKMA s.n.).  
 Drawn by HELENE MULDER.

## 4. DELARBREA

VIELL. Bull. Soc. Linn. Norm. 9 (1865) 342, 393; BTH. in B. & H. Gen. Pl. 1 (1865) 935; BRITTEN in Forbes, Nat. Wand. (1885) 506 (see also p. 354); HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 61; in K. Sch. & Laut. Fl. Schutzgeb. (1900) 485; HUTCH. Gen. Fl. Pl. 2 (1967) 63. — Fig. 7.

Glabrous unarmed shrubs or small trees. *Leaves* large, imparipinnate, with a stipular sheath; leaflets alternate or opposite, entire or indistinctly dentate. *Flowers* in umbellules grouped in large terminal panicles; pedicels articulated below the flower. Calyx lobes 5. Petals 5, imbricate, obovate, narrowed towards the base. *Stamens* 5, filaments stout, anthers dorsifixed. Ovary inferior, 2-celled, disk fleshy, obconic, crowned by two erect styles with clavate stigmas. *Fruit* ovoid, crowned by the small calyx lobes and the recurved style arms (which eventually fall); exocarp thin, fleshy, with peripheral oil vesicles; endocarp papery; endosperm with shallow longitudinal grooves not ruminant.

Distr. Queensland, Melanesia and East Malesia, 3 or 4  *spp.*, from the Lesser Sunda Is. eastwards to New Guinea (also New Britain), Queensland, Solomons, New Caledonia, and New Hebrides. In *Malesia* 1  *sp.*

Ecol. Lowland to montane forest.

Note. The corolla is distinctive, the petals being strongly imbricate and narrowed towards their insertion. The fruit also has a characteristic appearance, since the calyx and stylopodium, although persistent, do not enlarge as in most other araliads. The fruit, therefore, is a smooth ellipsoid berry without a prominent rim around the apex.

1. *Delarbrea collina* VIELL. Bull. Soc. Bot. Norm. 9 (1865) 342; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18. — *D. sp.* HEMSLEY, Rep. Challenger, Bot. 1, pt 3 (1885) 155. — *D. paradoxa* (non VIELL.) BRITTEN in Forbes, Nat. Wand. (1885) 506. — *D. lauterbachii* HARMS in K. Sch. & Laut. Fl. Schutzgeb. (1900) 485.

Sparsely branched shrub to 5 m high, with the multijugate leaves clustered at the ends of the branches. *Leaves* c. 70–100 by 30–40 cm; rachis not articulated; leaflets alternate or in pairs, c. 7 on each side; petiolules c. 1 cm long; lamina c. 17–20 by 4–6½ cm, lanceolate, ovate, oblong or elliptic, gradually tapered to an acute apex, base truncate, rounded or cuneate, usually oblique, margin entire; petiole c. 17–20 cm, terete, lenticellate, with a heavily lenticellate clasping base with membranous margins. *Inflorescence* a terminal panicle of umbellules, rachis up to 60 cm long, bearing well-spaced secondary branches 6–25 cm long, bracts caducous; tertiary branches c. 2–8 cm long, terminating in a cirlet of broadly ovate bracts (mostly caducous) surrounding the umbellules, sometimes with smaller (male) lateral umbellules; umbellules c. 2 cm  $\varnothing$  at anthesis, with c. 30–40 flowers. Pedicels c. 5 mm (elongating to 10–15 mm in fruit), pustulate. *Calyx* lobes 5, obtuse, united below into a tube. Petals 5, c. 1½ by ¾ mm, keeled within. Stamens 5, 1 mm long. Ovary sometimes prominently ribbed when dry, c. 2 mm long; disk

and styles c. 1 mm high at anthesis. *Fruit* 16 by 10 mm, purplish black when mature.

Distr. Solomon Is. to New Caledonia and Queensland; in *Malesia*: Lesser Sunda Is. (Timor, Wetar, Babar), Moluccas (Tenimber Is., Banda), New Guinea (Aru Is., Kar Kar Is., Madang, New Britain). Fig. 8.

Ecol. Rain-forest, from sea-level to 1000 m.

Vern. *Don*, Madang.

Notes. The most wide-ranging of any Malesian araliad. It was collected in Malesia by FORBES in

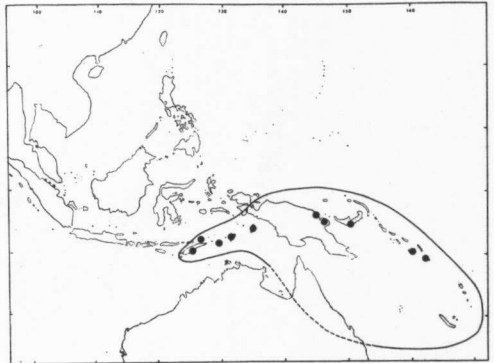


Fig. 8. Range of *Delarbrea collina* VIELL., localities in Malesia dotted.



Timor in 1882, when it was incorrectly identified as the New Caledonian species *D. paradoxa* VIEILL. Eight years earlier it had been collected in the Aru Is. during the Challenger Expedition (HEMSLEY, *l.c.*) and also been referred as close to *D. paradoxa*. Nearly twenty years later LAUTERBACH collected it in the Moluccas, when HARMS described it as a new species. The statement by HARMS that the genus was known previously only from New Caledonia cannot be reconciled with his note in the Pflanzenfamilien in which he recorded

BRITTEN's report of it in Timor. Solomon Islands collections were identified as *D. collina* VIEILL. by PHILIPSON in 1951. The arrangement of the umbellules differs in the panicles of *D. collina* and *D. paradoxa*. All the material from Malesia conforms to the characters of *D. collina*. The plant is evidently rare, few collections having been made in spite of its wide distribution.

It was formerly cultivated in the Botanic Garden at Bogor until about 1958, having been introduced from Banda.

### 5. PENTAPANAX

SEEM. J. Bot. 2 (1868) 294; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 55; KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 181; HUTCH. Gen. Fl. Pl. 2 (1967) 63; NGOC-SANH BUI, Adansonia 9 (1969) 389; PHILIPSON, Austrobaileya 1 (1977) 23. — Fig. 9.

Trees or shrubs, often scandent, unarmed. *Leaves* imparipinnate, exstipulate, glabrous. *Flowers* in racemes or umbels, which are arranged in panicles or compound umbels, pedicels articulated below the ovary. *Calyx* 5. Petals 5, imbricate in the bud. *Stamens* 5. Ovary inferior, 5-celled, disk  $\pm$  conical, surmounted by the styles which are united their whole length or become free down to half their length. *Fruit* globose; exocarp leathery, enclosing crustaceous pyrenes. Seeds compressed, endosperm smooth.

Distr. About 14  *spp.* in India, Thailand, Vietnam, Ceylon, Burma, southern China, Taiwan, in *Malesia*: 1  *sp.* locally in E. Java.

South American species formerly included are best excluded, and the 2 Queensland  *spp.* are now referred to *Polyscias*.

Ecol. Forest and scrub.

1. *Pentapanax elegans* KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 182, pl. 16 & 17; BAKH. *f.* & OOSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 17; BACK. & BAKH. *f.* Fl. Java 2 (1965) 169. — Fig. 9.

*var. elegans.*

Epiphytic scrambler or terrestrial shrub up to 10 m, with unarmed branches, leaf and flower buds separate, enclosed in  $\pm$  persistent imbricated cataphylls. *Leaves* disposed along the branches; petiole c. 6–10 cm, flattened above, base scarcely dilated, and sometimes minutely fimbriated, articulated with the rachis, and the rachis articulated with the petiolules, articulations minutely fimbriate, rachis to 5 cm, petiolules of lateral leaflets up to 5 mm, of terminal leaflet to 20 mm, leaflets 5 or fewer, ovate to oblong-elliptic, the lateral sometimes oblique, up to 10 by 7 cm, usually c. 5 by 2½ cm, apex acute, base rounded or cuneate, margin entire or with subulate teeth, glaucous beneath. *Inflorescence* terminal with persistent cataphylls at the base of the main axis, umbels solitary or 1–4 smaller (apparently male) lateral

umbels arising from the axils of minute bracts on the rachis; rachis 8–16 cm, slender, glabrous; terminal umbel 3–6 cm  $\varnothing$ , many-flowered; pedicels 1½–3 cm, filiform, glabrous, with minute bracteoles surrounding the articulation below the flower. *Calyx* lobes ligulate, obtuse, c. 1 mm long; petals triangular to ligulate c. 2 mm long; filaments yellow, 3 mm, anthers purple, ½ mm long. Ovary broadly obconic, surmounted by a stylar column, 2 mm long. *Fruit* globose, 3–4 mm  $\varnothing$ , disk broadly conical, crowned by the persistent calyx lobes and an awl-shaped stylar column which may divide at apex.

Distr. *Malesia*: E. Java (Mts Ardjuno and Tengger), the variety in Thailand.

Ecol. Uncommon, in light forest or scrub, including *Casuarina junghuhniana* forest, 1700–2600 m.

Note. A remarkably isolated species of a genus otherwise unrepresented in *Malesia*.

*var. pubescens* KOORD. Bull. Jard. Bot. Btzg III, 1 (1919) 183 (as *var. puberula* in *f.* 17); NGOC-SANH BUI, Adansonia 9 (1969) 389.

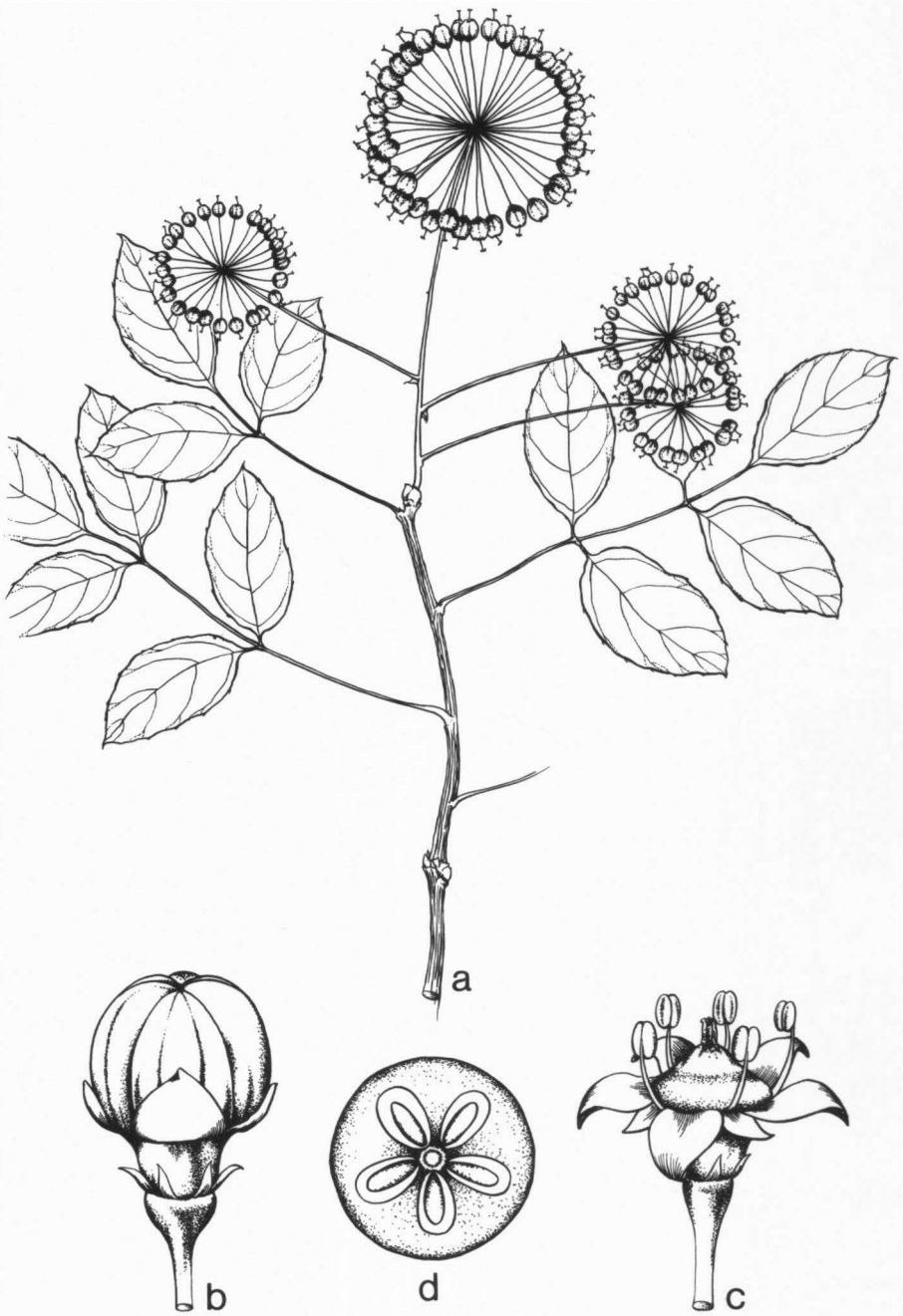


Fig. 9. *Pentapanax elegans* KOORD. a. Habit,  $\times \frac{1}{2}$ , b. flower bud, c. flower in anthesis, d. ovary in CS, enlarged (VAN STEENIS 10879). Drawn by P. PRENDERGAST.

Peduncle and pedicels tomentose.

Distr. Thailand; in *Malesia*: E. Java (Mt Jang).

Ecol. In *Casuarina junghuhniana* forest, scattered, 1900–2300 m.

Note. Since all specimens from Mts Tengger and Ardjuno lack pubescence, the retention of the variety appears justified. However, more collections are required from all localities.

## 6. MACKINLAYA

F.v.M. Fragm. 4 (1864) 119; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 62; Bot. Jahrb. 56 (1921) 413; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 3; HUTCH. Gen. Fl. Pl. 2 (1967) 65. — *Anomopanax* HARMS [in Dalla Torre & Harms, Gen. Siph. (1903) 364, *nomen*.] Ann. Jard. Bot. Btzg 19 (1904) 13; in K. Sch. & Laut. Nachtr. (1905) 332; in E. & P. Nat. Pfl. Fam. Nachtr. 3 (1908) 255; Bot. Jahrb. 56 (1921) 414; HUTCH. Gen. Fl. Pl. 2 (1967) 59. — Fig. 10.

Glabrous unarmed shrubs, often unbranched (sympodial). *Leaves* with a petiole having a dilated sheath encircling the stem and (in dried material) a constriction at the apex, and with a leaf-blade either unifoliolate or digitately compound, the central leaflet, or the three central leaflets, sometimes digitately lobed or compound. *Inflorescence* terminal (but sympodium often continued by axillary branching), the peduncle bearing umbellately arranged branches which terminate either in umbellules or in cymes. *Flowers* male or hermaphrodite, the male flowers either in distinct inflorescences or towards the periphery of mixed inflorescences. Pedicel articulated below the flower. *Calyx* lobes 5–6, triangular or lanceolate. Petals 5–6, narrowed below into a distinct claw, and above into a long incurved process. *Stamens* 5–6; anthers subglobose. Ovary inferior, with two uni-ovulate cells. Disk prominent, with a crenulate margin. Styles 2, subulate, free, recurved in fruit. *Fruit* strongly compressed, 2-seeded (or one aborted), with a longitudinal furrow between the seeds; exocarp leathery, endocarp cartilaginous. Endosperm smooth.

Distr. 5 spp., Solomon Is., Queensland, and in *Malesia* (3 spp.): Philippines, Celebes and throughout New Guinea.

Ecol. Understorey of rain-forest and montane forest, or epiphytic. Also in secondary growth.

Notes. The leaves are palmately divided or they may be reduced to a single leaflet, especially on the upper branches of *M. schlechteri*. The central leaflet, or the three central leaflets, are either lobed or compound, a character rarely found in other genera of this family. Another foliar character rare in the family is the insertion of the leaf-sheath round the whole circumference of the stem. This character occurs also in a section of *Polyscias*, but is more typical of *Umbelliferae*. The narrow base of the petal is also very rare in the family, but is characteristic of *Umbelliferae*. The constantly 2-celled ovary is also typical of *Umbelliferae*, but other characters of the fruit appear to justify the retention of these plants in the *Araliaceae*. Reasons for regarding *Anomopanax* as congeneric with *Mackinlaya* are given by PHILIPSON (*l.c.*).

### KEY TO THE SPECIES

1. Ultimate branches of the inflorescence in irregular cymes . . . . . 1. *M. celebica*
1. Ultimate branches of the inflorescence in umbellules.
2. Primary rays of the inflorescence many (30–50) . . . . . 2. *M. radiata*
2. Primary rays of the inflorescence c. 15 or fewer . . . . . 3. *M. schlechteri*

1. *Mackinlaya celebica* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 8. — *Anomopanax celebicus* HARMS, Ann. Jard. Bot. Btzg 19 (1904) 14; Ic. Bog. 2 (1906) t. 176 & 177. — *Anomopanax philippinensis* HARMS, Ann. Jard. Bot. Btzg 19

(1904) 15. — *Anomopanax warburgii* HARMS, *l.c.* 15. — *M. amplifolia* HEMSL. Kew Bull. (1909) 260; HARMS, Bot. Jahrb. 56 (1920) 413. — *Anomopanax arfakensis* GIBBS, Arfak (1917) 163. — *Anomopanax digitata* MERR. Philip. J. Sc. 17

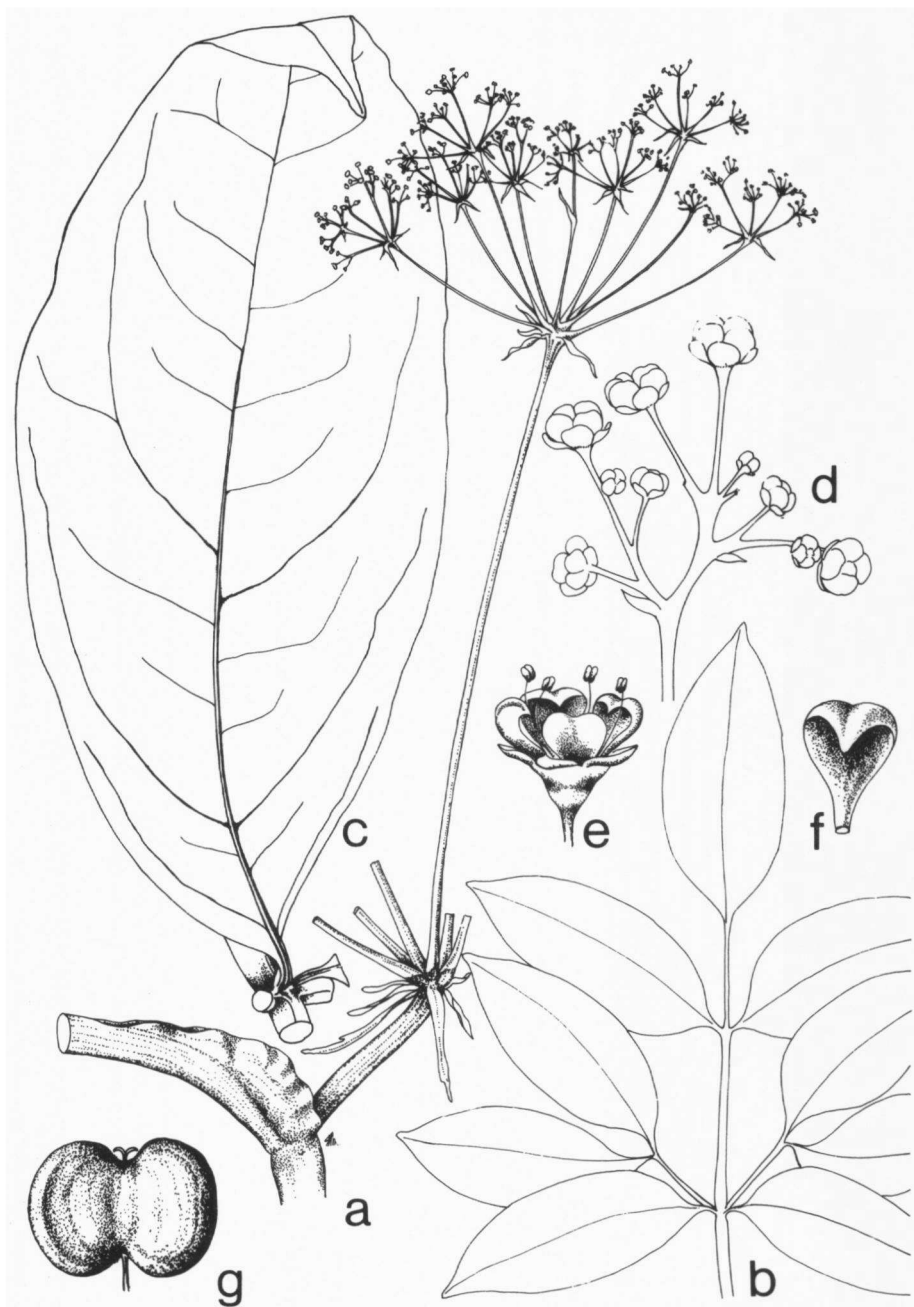


Fig. 10. *Mackinlaya celebica* (HARMS) PHILIPSON. a. Part of inflorescence,  $\times \frac{2}{3}$ , b. leaf, c. leaflet,  $\times \frac{2}{3}$ , d. flower cluster, e. flower,  $\times 7$ , f. petal,  $\times 13$ , g. fruit,  $\times \frac{5}{6}$  (BRASS 28056). Drawn by HELENE MULDER.

(1920) 301. — *Polyscias cibaria* WHITE & FRANCIS ex LANE-POOLE, For. Res. (1925) 129, descr. angl. *minim.* — *Anomopanax varifolius* C. T. WHITE, J. Arn. Arb. 10 (1929) 256. — *M. digitata* (MERR.) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *M. warburgii* (HARMS) PHILIPSON, l.c. 8. — Fig. 10.

Shrub or small sparsely branched tree to 6 m. *Leaves* very variable in size and complexity; petiole up to 52 cm, 1¼ cm wide, terete, striate, with a membranous base ensheathing the stem; leaflets 5 (rarely 3) or the central petiolule (or the central 3 petiolules) frequently dividing to bear three, or more rarely 5 leaflets; lateral petioles short (c. 1–2 cm), the three central longer (up to 12 cm); lamina elliptic or ovate, up to 48 by 22 cm, base abruptly attenuated into the petiolule or subcordate, apex acuminate or gradually narrowed, acute, margin entire, denticulate or coarsely serrate, especially towards the apex, membranous, lamina of the terminal leaflet (and less frequently of the central three leaflets) sometimes deeply 3-lobed or with 3–5 separate leaflets, of which the lateral are markedly oblique at the base. *Inflorescence* a terminal compound umbel, very variable in size, either entirely of male flowers or with male and hermaphrodite flowers, often overtopped by sympodial growth; peduncle terete, striate, stout, up to 30(–45) cm, ¾ cm Ø, bearing lanceolate bracts below the rays; primary rays c. 9–18, 10–20 cm, striate, with distal small linear bracts; secondary rays about 5–10, 3–6 cm, dividing again (often repeatedly) either umbellately or in an irregular cymose manner, the central ray frequently more strongly developed. *Calyx* lobes 5, triangular, c. 1 mm long. *Petals* 5, obovate c. 1½ mm long. *Filaments* c. 1½ mm, anthers small. *Ovary* obconic, 1–2 mm long, narrowly turbinate in male flowers, ovoid and quickly swelling in female flowers. *Fruit* up to 2½ by 3 cm, compressed, rotund, constricted in the mid-axis, the two halves frequently unevenly developed.

Distr. Solomon Is.; in *Malesia*: New Guinea (incl. New Britain and Aru Is.), Celebes, and Central & S. Philippines.

Ecol. Rain-forest, open hill forest, and montane forest, also in secondary growths, from sea-level to 1450 m.

Uses. LANE-POOLE (*l.c.*) recorded that at Mt Obree leaves and flowers are cooked with coconut oil and put in armlets in dances.

Vern. Philippines: *binlaon*, C.Bis., *pararau*, Bag., *tagima*, Sub., *lumot-lumot*, Mindanao; New Guinea: *bugini*, *wale*, *yam bonga*, Sepik Distr., *lak-lak*, W. Highlands, *po'undo*, S. Highlands, Papua, *nere*, Central Distr., Papua, *narona*, New Britain.

Notes. The leaves have a strong parsley-like odour. The flowers are creamy white, and the fruits blue to purple with a glaucous bloom. Salt is said to be obtained from the ashes of the leaves.

Although collected frequently in the Philippines and New Guinea, this species is unrecorded for the Moluccas. There is considerable variation in the size of the leaves and of the inflorescence. A few New Guinea specimens are intermediate in character between this and the equally common *M. schlechteri*, and are interpreted as hybrids.

## 2. *Mackinlaya radiata* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 6.

Slender shrub to 5 m. Petiole c. 20 cm, terete and finely striate, base ensheathing the stem, membranous. *Leaflets* 5, or the central petiolule bearing three leaflets, the two lateral petiolules short (1–1½ cm), the three central longer (6–8 cm, or the midpetiolule to 11 cm); lamina of the lateral leaflets elliptic or ovate, up to 20 by 12 cm, base abruptly attenuated into the petiolule, apex gradually narrowed, acute, margin entire or minutely denticulate towards the apex, membranous; lamina of the central leaflet similar or deeply 3-lobed or with 3 separate leaflets of which the lateral are strongly oblique at the base. *Inflorescence* a terminal compound umbel; peduncle terete, stout, from 20 cm to considerably longer, 4–6 mm Ø, bearing lanceolate bracts below the rays; primary rays numerous (c. 30–50), 9–18 cm, slender, striate, with distal minute, linear, caducous bracts; secondary rays (pedicels) numerous (35–130), filiform, 1–2 cm; outer flowers male, central hermaphrodite. *Calyx* lobes 5, narrowly triangular, c. ½ mm long. *Petals* 5, obovate, c. 1 mm long. *Ovary* narrowly obconic in male flowers, ovoid in hermaphrodite flowers, c. 0.7 mm long. *Fruit* (immature) ovate, compressed.

Distr. *Malesia*: New Guinea (NW. Irian; Sepik Distr.).

Ecol. Montane rain-forest and mossy forest, 900–1200 m.

Vern. *Apiyetimber*, Sepik Distr.

Note. Flowers creamy white.

## 3. *Mackinlaya schlechteri* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *Anomopanax schlechteri* HARMS in K. Sch. & Laut. Nachtr. (1905) 332, t. 13. — *Anomopanax versteegii* HARMS, Nova Guinea 8 (1910) 276. — *M. versteegii* (HARMS) PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 7. — *M. brassii* PHILIPSON, l.c. 6. — *M. klossii* PHILIPSON, l.c. 6. — *M. subulata* PHILIPSON, l.c. 7.

Slender shrub to 6 m. *Leaves* 1–3 (rarely 4)-foliolate. Petiole usually less than 10 cm, but occasionally longer (to 20 cm), especially in compound leaves, terete and finely striate, base ensheathing the stem, membranous. *Lamina* elliptic obovate, or oblong, occasionally irregularly lobed, up to 28 by 12 cm but usually considerably smaller, base cuneate or truncate (of lateral leaflets often

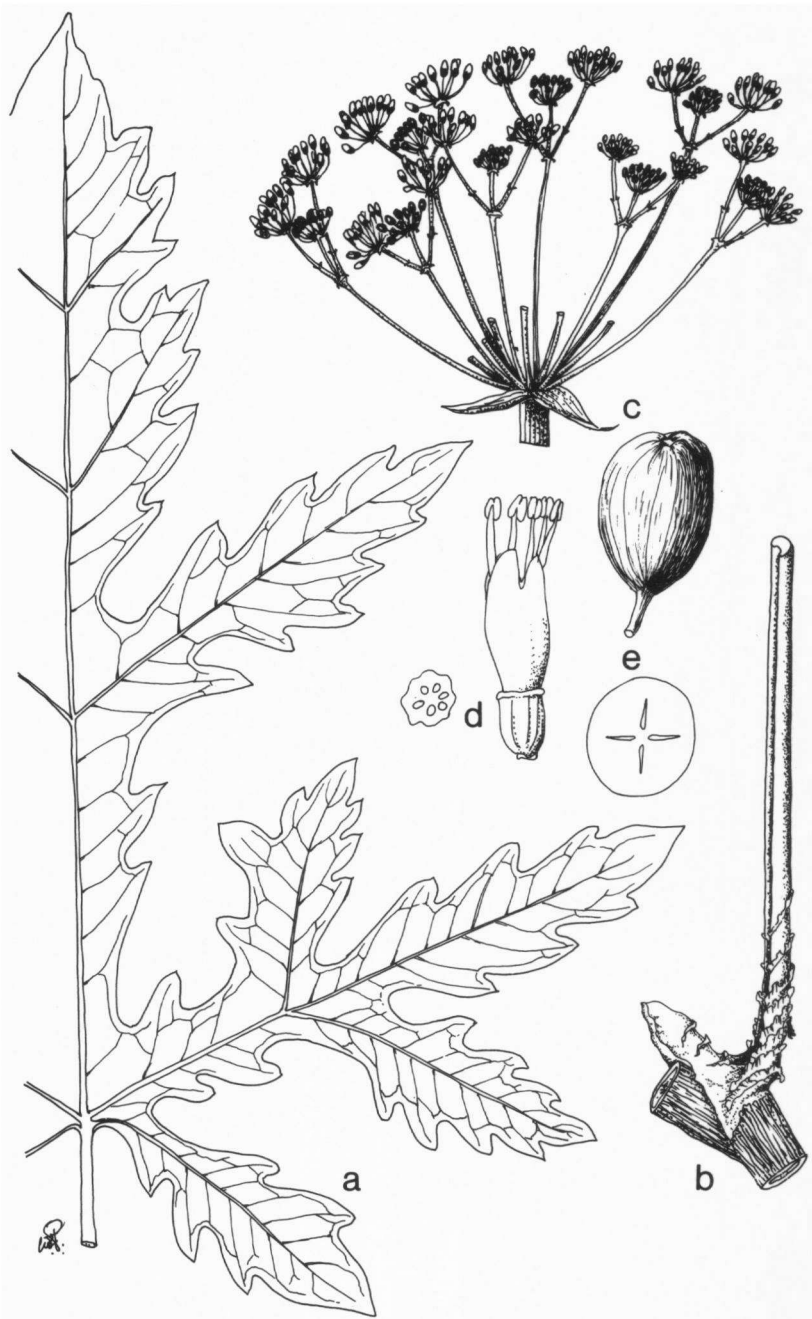


Fig. 11. *Osmoxylon novoguineense* (SCHEFF.) BECC. a. Leaf half, b. base of petiole, both  $\times \frac{2}{5}$ , c. inflorescence,  $\times \frac{1}{5}$ , d. flower and CS of ovary,  $\times 4$ , e. false fruit and ditto in CS (CRAVEN & SCHODDE 789).  
 Drawn by W. R. PHILIPSON.

oblique), apex shortly acuminate, acute, margin entire or dentate towards the apex, membranous or chartaceous. *Inflorescence* a terminal compound umbel, often overtopped by a lateral branch at its base; peduncle terete, striate, c. 10–20 cm, bearing small lanceolate bracts below the rays; primary rays 6–15, c. 4–7 cm, striate, with minute distal caducous bracts; secondary rays (pedicels) c. 10–20, filiform or rather rigid, usually 5–12 mm; male flowers towards the outside of the umbellules. *Calyx* lobes 5, triangular to subulate,  $\frac{1}{2}$ –1 mm long. Petals 5, obovate. Ovary narrowly turbinate, in male flowers obconic or ovoid, c.  $\frac{3}{4}$  mm long in hermaphrodite. *Fruit* large, 15 by 22 mm, compressed, rotund, constricted above and below on the central axis; styles persistent, recurved.

Distr. *Malesia*: New Guinea (along the Central Ranges, from the Star Mts east to Meyamya), also in New Britain.

Ecol. Rain-forest and montane forest, 600–2300 m.

Uses. The cut stem exudes a viscous sap which is an irritant. The leaves are aromatic. The plant is reported to be poisonous and to have a number of medicinal uses. The boiled leaves are eaten to

reduce fever and to relieve 'korima'. Pieces of leaf placed in a cavity relieve toothache. The leaves are wrapped around taro at planting to encourage growth.

Vern. *Dako*, Wissel Lakes, *kolobang*, *kulbang*, Sepik Distr., *auke*, *kenata*, *muklofo*, E. Highlands, *narona*, New Britain.

Notes. The flowers are white and the ripe fruit mauve to purple with a glaucous bloom.

A large number of collections made in recent years throughout New Guinea all have regularly compound umbels with the flowers borne on branches of the third degree in the form of strict umbels. In two of the earliest gatherings (SCHLECHTER 14365 and VERSTEEG 1419) the third degree branches frequently divide again either umbellately or cymosely. These two specimens were described as species by HARMS. PHILIPSON later (1951) kept the forms with regular umbellules separate (describing three species). All these five entities are now considered conspecific, the SCHLECHTER and VERSTEEG specimens being regarded as rare anomalies in a widespread and abundant species. It is possible that the VERSTEEG plant is a hybrid with *M. celebica*.

## 7. OSMOXYLON

MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; BTH. in B. & H. Gen. Pl. 1 (1865) 944; BECC. Malesia 1 (1878) 193; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 123; O. K. Rev. Gen. Pl. 1 (1891) 645; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; Bot. Jahrb. 56 (1920) 384; HUTCH. Gen. Fl. Pl. 2 (1967) 73; PHILIPSON, Blumea 23 (1976) 99. — *Eschweilera* ZIPP. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 112, non *Eschweilera* MART. 1828; Handl. 1 (1890) 640. — *Pseudosandalum* O. K. Rev. Gen. Pl. 1 (1891) 271 ('*Pseudosantalum*'), nom. illeg. — *Boerlagiodendron* HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31; in K. Sch. & Laut. Fl. Schutzgeb. (1900) 484; Bot. Jahrb. 56 (1920) 377; HUTCH. Gen. Fl. Pl. 2 (1967) 72. — Fig. 11, 13–16.

Unarmed, glabrous or tomentose shrubs or trees. *Leaves* palmately lobed or simple, rarely digitately compound; stipules forming a ligule, and the base of the petiole furnished with one to several spiral or transversal crests or collars (very rarely absent). *Inflorescence* a terminal compound umbel; peduncle short; primary rays each terminating into three branches; the central branch bearing a head or umbellule of almost always sterile bacciform flowers ('pseudo-fruits'); the two lateral branches each bearing a head or umbellule of hermaphrodite flowers. *Calyx* an obsolete rim or 0. Corolla with few to many lobes above, tubular below. *Stamens* 4–30, filaments thick, anthers oblong, exserted. Ovary inferior, not articulated with the pedicel, cells 1–many; disk flat with a central raised boss bearing the pustulate stigmas. *Fruit* subglobose (ribbed when dry); exocarp fleshy, endocarp crustaceous. *Seeds* compressed, endosperm smooth or wrinkled.

Distr. About 50 spp., of which 40 occur in *Malesia*, extending from Borneo and the Philippines eastwards through Celebes and Moluccas to New Guinea, the remainder lying further north and east in Taiwan, Micronesia, Melanesia and the New Hebrides. Fig. 12.

Ecol. Mainly understorey trees in primary rain-forest, also in second growth forest, usually at low altitudes, especially in shaded situations and near rivers, 15. *O. borneense* a characteristic rheophyte.

Notes. The foliage, inflorescence and flowers of this genus are all unique within the family. The base of the petiole often bears a spiral crest, or this may form a simple collar; the blade varies from simple to elaborately compound; the inflorescence is composed of trifid rays, the central branch bearing sterile bacciform flowers; the corolla is tubular.

The central bacciform flowers (pseudo-fruits) are sterile, except in 12. *O. yatesii*, in which apparently mature seed was once found.

By exception a specimen of 40. *O. luzoniense* had apparently fertile flowers on the central branches of the inflorescence.

#### KEY TO THE SPECIES

1. Leaves simple, without lobes.
2. Petiole base without crests (New Guinea) . . . . . 1. *O. miquellii*
2. Petiole base with 1 or more crests.
3. Petiole base with several crests (Philippines) . . . . . 8. *O. oblongifolium*
3. Petiole base with a single collar-like crest.
4. Fertile flowers pedicelled (Philippines).
5. Leaf obovate to oblanceolate, petiole 3 cm or less . . . . . 2. *O. dinagatense*
5. Leaf elliptic, petiole 5 cm or more . . . . . 3. *O. simplicifolium*
4. Fertile flowers sessile (or subsessile).
6. Leaf broadly obovate (Solomons) . . . . . 4. *O. spathipedunculatum*
6. Leaf lanceolate or narrowly obovate.
7. Pseudo-fruits pedicelled (Moluccas) . . . . . 5. *O. articulatum*
7. Pseudo-fruits sessile.
8. Inflorescence c. 60 cm  $\varnothing$  (Moluccas) . . . . . 6. *O. umbelliferum*
8. Inflorescence c. 30 cm  $\varnothing$  (New Ireland) . . . . . 7. *O. lanceolatum*
1. Leaves lobed or digitately compound.
9. Leaves digitately compound.
10. Ovary 10-16-celled (New Guinea) . . . . . 13. *O. geelvinkianum*
10. Ovary 4-5-celled.
11. Leaflets lobed (Philippines).
12. Primary rays of inflorescence c. 10 or fewer . . . . . 9. *O. catanduanense*
12. Primary rays of inflorescence more than 20.
13. Inflorescence c. 16-20 cm  $\varnothing$  . . . . . 10. *O. caudatum*
13. Inflorescence c. 5-6 cm  $\varnothing$  . . . . . 11. *O. heterophyllum*
11. Leaflets entire.
14. Leaflets elliptic-oblong to ovate (Philippines) . . . . . 12. *O. yatesii*
14. Leaflets linear-lanceolate.
15. Leaflets 4-7, petiole 4-6 cm (Philippines) . . . . . 14. *O. lineare*
15. Leaflets 9 or more, petiole longer than 10 cm (Borneo) . . . . . 15. *O. borneense*
9. Leaves lobed (sometimes smaller simple leaves below inflorescence).
16. Pseudo-fruits sessile.
17. Petiolar crests long-pectinate. Bracts of the peduncle heavily setose (Philippines) . . . . . 16. *O. pulcherrimum*
17. Petiolar crests fimbriate or undulate. Bracts of the peduncle not setose (Moluccas).
18. Lateral inflorescence branches with opposite, persistent bracts close to the base 17. *O. soelaense*
18. Lateral inflorescence branches with scars of opposite caducous bracts near the middle . . . . . 18. *O. globulare*
16. Pseudo-fruits pedicelled.
19. Lateral inflorescence branches without an articulation.
20. Petiolar base with a single collar-like crest (Borneo) . . . . . 19. *O. kostermansii*
20. Petiolar base with several crests.
21. Petiolar crests long-pectinate.
22. Fertile flowers pedicelled. Stamens at least 7 (Key Is.) . . . . . 20. *O. barbatum*
22. Fertile flowers sessile (or subsessile). Stamens 5 (Bismarck Arch.) . . . . . 21. *O. pfeilli*
21. Petiolar crests fimbriate or undulate.
23. Stamens and ovary cells more than 5. Flowers usually pedicelled (Moluccas) 22. *O. palmatum*
23. Stamens and ovary cells 4. Flowers sessile or subsessile (Philippines). . . . . 23. *O. ramosii*
19. Lateral inflorescence branches with an articulation (2 bracts or bract-scars).



24. Fertile flowers pedicelled.  
 25. Pedicels of fertile flowers longer than 7 mm (New Guinea) . . . . . 24. *O. novoguineense*  
 25. Pedicels of fertile flowers 5 mm or shorter.  
 26. Ovary cells 7 or more.  
 27. Leaf lobes elliptic (Celebes) . . . . . 25. *O. teysmannii*  
 27. Leaf lobes pinnatilobed (Batjan) . . . . . 41. *O. insigne*  
 26. Ovary cells 4-5.  
 28. Petiolar crests ± entire (Philippines) . . . . . 26. *O. humile*  
 28. Petiolar crests with long setae.  
 29. Leaves coriaceous, margin thickened, teeth obtuse (Philippines) . . . . . 27. *O. pectinatum*  
 29. Leaves membranaceous, margin not thickened, teeth setulose (Celebes)  
 28. *O. masarangense*
24. Fertile flowers sessile (or if subsessile bracteoles longer than the very short pedicels).  
 30. Ovary cells 10 or more (New Guinea).  
 31. Flower buds large (c. 9-12 mm long). Primary rays of inflorescence very strong  
 29. *O. insidiator*  
 31. Flower buds smaller (c. 4-6 mm long). Primary rays of inflorescence more tenuous.  
 32. Heads of fertile flowers ± discoid at anthesis . . . . . 30. *O. boerlagei*  
 32. Heads of fertile flowers globose . . . . . 31. *O. sessiliflorum*  
 30. Ovary cells 6 or fewer.  
 33. Leaf lobes lanceolate.  
 34. Leaf lobes 4-7; petiole 4-6 cm (Philippines) . . . . . 14. *O. lineare*  
 34. Leaf lobes 9 or more; petiole longer than 10 cm (Borneo) . . . . . 15. *O. borneense*  
 33. Leaf lobes broader.  
 35. Leaf surfaces retaining some trace of setulose tomentum. Umbellules of pseudo-fruits small (8 mm Ø or less; New Guinea) . . . . . 38. *O. micranthum*  
 35. Leaf surfaces glabrous at maturity. Umbellules of pseudo-fruits larger (1 cm Ø or more).  
 36. Ovary cells 3 (Philippines).  
 37. Petiolar crests ± entire . . . . . 32. *O. camiguinense*  
 37. Petiolar crests long-pectinate . . . . . 33. *O. fenicis*  
 36. Ovary cells 4 or more.  
 38. Umbellules of pseudo-fruits large (3-5 cm Ø) (Philippines).  
 39. Primary rays of the inflorescence 9-12 cm long. Leaves with strong radiating veins, usually more than 11. . . . . 34. *O. eminens*  
 39. Primary rays of the inflorescence 4-5 cm long. Leaf-veins less strongly developed, usually fewer than 11 . . . . . 35. *O. serratifolium*  
 38. Umbellules of pseudo-fruits smaller (2½ cm Ø or less).  
 40. Leaf with a small triangular lobe below the middle of each side of the blade (not strictly palmately lobed) (Philippines) . . . . . 8. *O. oblongifolium*  
 40. Leaf palmately lobed.  
 41. Petiolar crests long-pectinate (Celebes) . . . . . 36. *O. celebicum*  
 41. Petiolar crests fimbriate, entire, or undulate.  
 42. Articulation of lateral branches of umbels close to the base (Talaud Is.)  
 37. *O. talaudense*  
 42. Articulation of lateral branches of umbels near the middle.  
 43. Inflorescence over 20 cm Ø (New Guinea) . . . . . 31. *O. sessiliflorum*  
 43. Inflorescence under 20 cm Ø (Philippines).  
 44. Leaf usually 3-lobed. Inflorescence rays delicate, indistinctly setose to glabrous  
 39. *O. trilobatum*  
 44. Leaf usually 5-7-lobed. Inflorescence rays sturdy, markedly setose 40. *O. luzoniense*

1. *Osmoxylon miquelii* BOERL. Ann. Jard. Bot. Botz 6 (1887) 125, t. 16; HARMS, Bot. Jahrb. 56 (1920) 384; PHILIPSON, Blumea 23 (1976) 103. — *O. amboinense* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 6, p.p.; BECC. Malesia 1 (1878) 194, p.p. — *Gastonia simplicifolia* ZIPP. ex SEEM. J. Bot. 3 (1865) 75, nomen in synon.; ex BOERL. Ann. Jard. Bot. Botz 6 (1887) 125, nom. inval. in synon. — *Pseudosandalum miquelii* (BOERL.) O. K. Rev. Gen. Pl. 1 (1891) 271.

Sparsely branched tree, 15 m. *Leaves* glabrous, simple, subcoriaceous; stipules small forming a bicuspid ligule; petioles long (to 19 cm), swollen distally; blade oblong-elliptic, 22-36 by 9-12 cm, subrounded at base and apex or mucronulate, midrib prominent below, secondary veins arched-ascending and uniting, c. 1-2 cm apart, margin entire to undulate. *Umbel* terminal, sessile, with many (28-32) radiating rigid, angular, trifid branches c. 7 cm long to first joint. Central

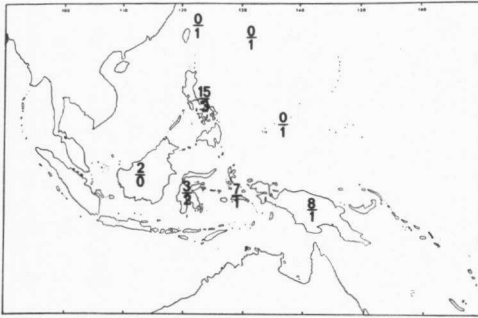


Fig. 12. Species density of *Osmoxylon* MIQ. in Malesia; above the hyphen the number of endemic species, below it the non-endemics.

branches unknown. Lateral branches c. 5 cm long, articulate near the base. Flowers 20–30, sessile on the expanded ends of the inflorescence branches. Corolla and stamens unknown. Drupes crowded, subrotund, c. 4 mm  $\varnothing$  (dry), c. 8–10 ribbed when dry, crowned by a semiglobose entire stigma, 8–10-celled. Seeds with slightly ruminant endosperm.

Distr. *Malesia*: West New Guinea. Only known from the type (coll. ZIPPELIUS).

**2. *Osmoxylon dinagatense* (MERR.) PHILIPSON**, *Blumea* 23 (1976) 103. — *Boerlagiodendron dinagatense* MERR. *Philip. J. Sc.* 17 (1920) 301; MERR. *En. Philip.* 3 (1923) 222.

Glabrous shrub, c. 2 m. Leaves crowded at the ends of the branches; petiole 2–3 cm, channelled above, with a small triangular base, bearing a short stipular ligule (2–3 mm long) and extending around the base of the petiole as a single narrow collar; blade obovate to oblanceolate, to 23 by 8½ cm; base narrowed into the petiole, apex rounded with a very short apiculum, margin slightly revolute, entire to obscurely undulate with minute teeth, coriaceous. Inflorescence a terminal compound umbel; peduncle c. 1½ cm, with 1–few bracts (reduced leaf-bases) with small triangular bracts (3 mm long) among the primary rays; primary rays about 15, 8–10 mm long, flattened, bearing opposite bracts (2 mm long) at the apex, each bearing three branches; central branch c. 4 mm long, bearing a head of sessile, bacciform flowers c. 2½ mm  $\varnothing$ ; lateral branches 1½–2 cm long with two opposite small bracts about the middle and ending in an involucre of minute rounded bracts around a terminal umbellule of c. 7–10 flowers; pedicels 1½–2½ mm long. Calyx a minute rim. Corolla and stamens unknown. Ovary 3–4-celled. Ripe fruit unknown.

Distr. *Malesia*: Philippines (Dinagat I.).

Note. A species clearly demonstrating the congenerity of *Osmoxylon* and *Boerlagiodendron*.

**3. *Osmoxylon simplicifolium* (ELMER) PHILIPSON**, *Blumea* 23 (1976) 103. — *Boerlagiodendron simplicifolia* ELMER, *Leaf. Philip. Bot.* 7 (1914) 2329; MERR. *En. Philip.* 3 (1923) 224.

Glabrous shrub, to 5 m, with numerous leaves clustered near the ends of the branches; petiole 5–7 cm, 2 mm wide, terete, with a small clasping base, an inconspicuous stipular ligule, and a single broad disk-like crest around the lower part of the petiole; blade simple, elliptic, base broadly cuneate, apex acute to apiculate, to 20 by 6½ cm, coriaceous, margin thickened, coarsely dentate, midrib prominent, principal nerves c. 8–10 mm apart. Inflorescence a terminal compound umbel, spherical, c. 7 cm  $\varnothing$ ; peduncle 1½–2 cm; primary rays c. 25–30, c. 1 cm long with two small obtuse bracts at the apex, ending in three branches; the central branch c. 6 mm long, bearing a subglobose umbel of c. 10–12 sterile bacciform flowers (2 mm  $\varnothing$ ), 3–4 mm pedicelled; lateral branches c. 2–2½ cm long, articulated about the middle, terminating in an umbel of c. 10–20 flowers; pedicels c. 2½ mm. Calyx rim obsolete. Corolla 3–4-lobed, tubular below, 2 mm long. Stamens 3–4, exerted, 3 mm long. Ovary subcylindric, 2–4-celled, 1 mm long. Drupe spherical, c. 5 mm  $\varnothing$  (dry), 2–4-ribbed when dry; surface of endosperm shallowly wrinkled.

Distr. *Malesia*: Philippines (Mindanao: Agusan Prov., Cabadbaran).

Ecol. On wind-swept ridge at 1750 m, on moss-covered soil with stones.

Vern. *Bolauanon*, Mbo.

Note. A wide-spreading shrub. Bark thick, yellowish, becoming grey. Wood soft, yellowish. Twigs repeatedly branched, the leafy portion suberect, leaves mostly ascending, rigidly coriaceous. Inflorescence branches green. Flowers orange, odourless. Berries becoming purple-black.

**4. *Osmoxylon spathipedunculatum* (PHILIPSON) PHILIPSON**, *Blumea* 23 (1976) 103. — *Meryta spathipedunculata* PHILIPSON, *Bull. Br. Mus. Nat. Hist. Bot.* 1 (1951) 12.

Glabrous tree, to 20 m, with spreading branches. Leaves crowded at the ends of the branches; petiole to 14 cm with a small clasping base bearing a stipular ligule and a rim-like collar around the base of the petiole; blade obovate 17–30 by 10–15 cm, attenuate at the base, apex obtuse, margin entire, midrib prominent, secondary veins arched and uniting, 1½–2 cm apart. Inflorescence a terminal compound umbel; primary rays c. 12, stout, compressed 9–17 cm long, bearing three branches at the apex; central branches and sterile flowers unknown; the two lateral branches 9–14 cm long with an articulation c. 1–2 cm from base, bearing helmet-shaped bracts which fall to reveal the terminal head of c. 12 flowers sessile on an expanded receptacle with an involucre rim c. 1 cm  $\varnothing$ . Calyx rim 0. Corolla split into 5 lobes above, tubular below. Stamens 5. Ovary subcylindric,  $\pm$

9-celled; disk raised in the centre to the pustulate stigmas. Drupes in a spherical head, globose, c. 12 mm  $\varnothing$ , c. 9-ribbed when dry, crowned by the prominent, persistent, confluent stigmas.

Distr. Solomon Islands (Bougainville and Guadalcanal).

Ecol. Rain-forest, 800–1200 m.

**5. *Osmoxylon articulatum* PHILIPSON, Blumea 23 (1976) 103.**

Tree with stout branches, glabrous. *Leaves* well spaced towards the ends of the branches; petiole 10–13 cm, 2 mm broad, narrowly channelled above, with a small triangular base, bearing a short stipular ligule (c. 2 mm long) and extending around the base of the petiole as a collar; blade obovate, to 27 by 9 cm, base narrowly cuneate, apex rounded or acute and shortly apiculate, margin thickened, remotely dentate towards the apex, midrib prominent, principal lateral veins c.  $1\frac{1}{4}$ – $1\frac{1}{2}$  cm apart. *Inflorescence* a terminal compound umbel, almost sessile, saucer-shaped bracts caducous; primary rays c. 24, 8–11 cm long, flattened, c. 4 mm broad, bearing three branches at the apex; central branch 4– $6\frac{1}{2}$  cm long, the apex expanded and bearing an umbel of c. 10 sterile bacciform flowers c. 6 by 6 mm (when dry) apparently 1-celled, c. 9–14 mm pedicelled; the two lateral branches c. 7 cm long at anthesis with an articulation c. 8–10 mm above the base, bearing helmet-shaped bracts which fall to reveal the terminal head of c. 15–18 flowers, sessile on an expanded receptacle with an involucre rim c. 6 mm  $\varnothing$ . *Calyx* rim 0. *Corolla* split into c. 4 lobes above, tubular below, c.  $2\frac{1}{2}$  mm long. *Stamens* 5, exerted. *Ovary* subcylindric, c.  $1\frac{1}{2}$  mm long, 7–8-celled, disk with a pustulate central stigmatic boss. *Drupes* in a spherical head c. 2 cm  $\varnothing$  (when dry), strongly 7–8-ribbed (when dry), c. 8 mm  $\varnothing$ ; stigmas persistent, prominent.

Distr. *Malesia*: Moluccas (Halmaheira: Ake Mumar to upper reaches of the Kakatua-matawe). *Fr.* Sept.

Note. This plant is evidently similar to 6. *O. umbelliferum* described by RUMPHIUS. However, a number of differences make it unlikely that it is the same species. The diameter of the inflorescence of the Halmaheira plant is only about half that given by RUMPHIUS; the lateral rays of the inflorescence are distinctly articulated near the base, a feature now shown in RUMPHIUS' figure; and the sterile bacciform flowers are long-pedicelled, whereas RUMPHIUS described and figured his as borne in capitula.

**6. *Osmoxylon umbelliferum* (LAMK) MERR.** *Int. Rumph.* (1917) 406; PHILIPSON, *Blumea* 23 (1976) 104. — *Pseudo-Sandalum amboinense* RUMPH. *Herb. Amb.* 2: 54, t. 12. — *Aralia umbellifera* LAMK, *Encycl.* 1 (1783) 225. — *Hedera umbelliferum* (LAMK) DC. *Prod.* 4 (1830) 262. — *Gilibertia saururoides* DC. *l.c.* 256. — *Gastonia saururoides*

ROXB. [*Hort. Beng.* (1814) 90, *nomen*;] *Fl. Ind. ed. Carey* 2 (1832) 408 ('*sasuroides*'). — *O. amboinense* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 6, *p.p.* — *Pseudosandalum umbelliferum* (LAMK) O. K. *Rev. Gen. Pl.* 1 (1891) 271.

According to RUMPHIUS: Tree with stout trunk, the branches marked with prominent round leaf-scars. *Leaves* clustered at the ends of the branches, glabrous; petioles long; blades simple, lanceolate (30–36 by 10–12 cm), base rounded, apex acute, margin dentate. *Flowers* in large spreading umbels, the radiating branches tripartite, c. 30 cm long, each ending in a capitulum.

Distr. *Malesia*: Moluccas. Infrequent on Ambon, but said to be more numerous in Ceram and the Sula Islands. Only known from RUMPHIUS' excellent plate and description; not yet re-collected in Ambon.

Ecol. Evidently in forest in the hills of Ambon, and also planted at the time of RUMPHIUS.

Vern. *Sasuru*, Leytimor, *tomokuku*, Hitu.

Notes. Valued for the perfume of its wood and foliage.

Since this plant is known only from a description and a figure, some uncertainties remain as to its specific characters. In the description it is stated that the young leaves possess a few small teeth of which some signs remain on the older leaves. It is not clear whether the teeth are best developed on distinctive juvenile foliage, or whether the newly expanded normal foliage is intended. The leaves in the figure have prominent teeth, but as they are not shown associated with the inflorescence, they may be from a juvenile shoot. The description of the size of the flower buds is confusing, and it seems likely that sterile pseudo-fruits were mistaken for flower buds. Nevertheless, most characters of the plant are adequately portrayed and there can be no doubt that this species is distinct from the other simple-leaved species with a single, collar-like, petiolar crest.

**7. *Osmoxylon lanceolatum* PHILIPSON, Blumea 23 (1976) 104. — Fig. 13.**

Small tree with few branches, up to 16 m, glabrous. Many *leaves* clustered towards the ends of the branches; petiole 8–15 cm, terete, with a small triangular base, bearing a short stipular ligule (c. 2 mm long) and extending around the base of the petiole as a collar; blade oblanceolate, to 33 by  $7\frac{1}{2}$  cm, base narrowly cuneate, apex acute or slightly apiculate, margin entire, midrib prominent, lateral veins arched ascending, c. 2–3 cm apart. *Inflorescence* a terminal compound umbel, almost sessile, saucer-shaped; bracts caducous; primary rays c. 15, c. 10 cm long, flattened, c. 4–5 mm broad, bearing three branches at the apex; central branch 5–6 cm long, the apex expanded and bearing a spherical head of c. 8–12 sessile, sterile, bacciform flowers c. 5 by 5 mm (when dry), 1–2-celled; the two lateral branches

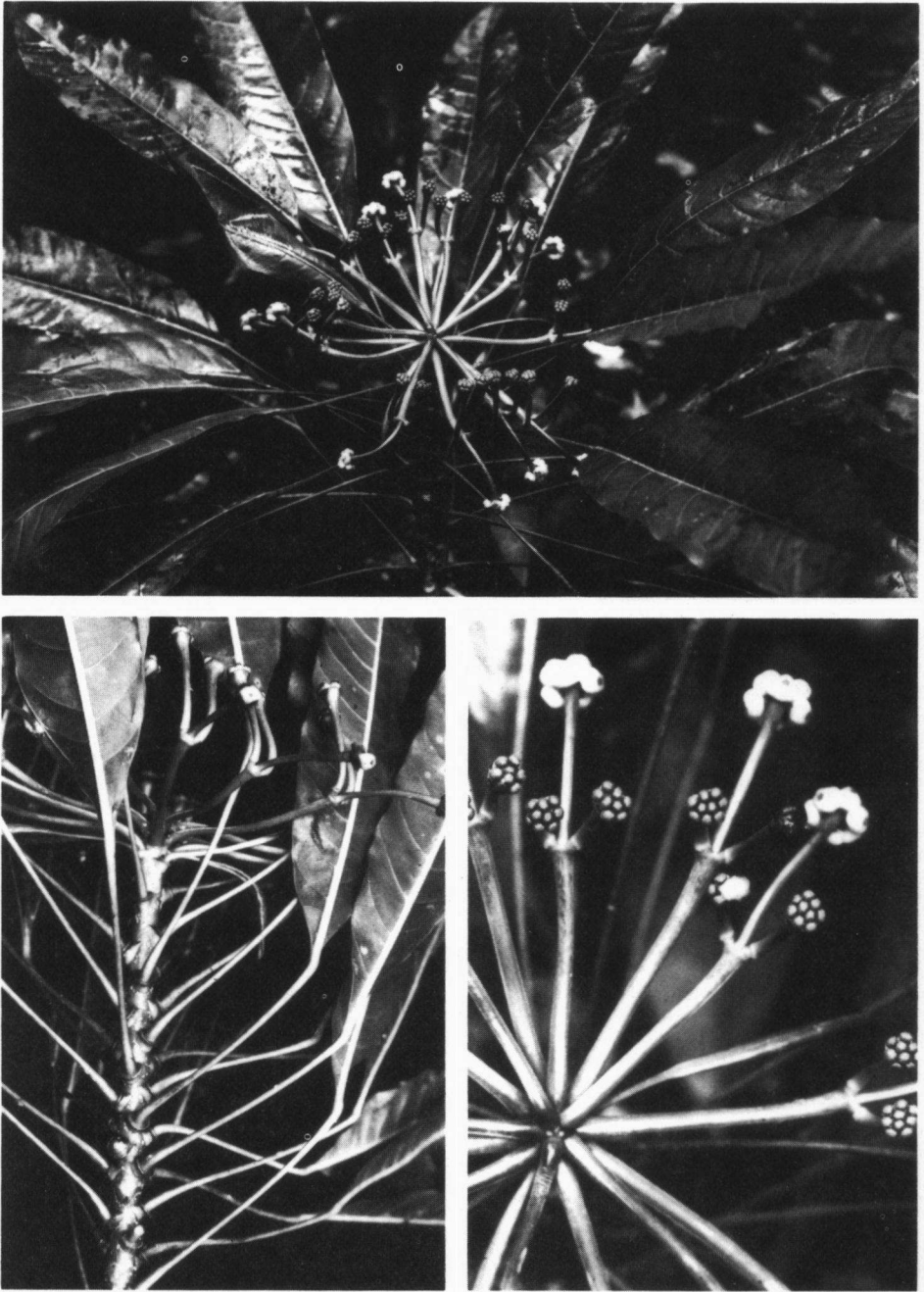


Fig. 13. *Osmoxylon lanceolatum* PHILIPSON. Above: habit of inflorescence and leaves; below, left: twig showing collar-like crests at the base of the petioles; below, right: the trifold branches of the inflorescence (New Ireland, SANDS 795).

c. 5 cm long at anthesis, with an articulation immediately above the base, bearing two helmet-shaped bracts which fall to reveal the terminal head of c. 8–10 flowers, sessile on an expanded receptacle with an involucre rim c. 7 mm  $\varnothing$ . *Calyx* rim 0. Corolla known only in bud, c. 2½ mm long. Stamens c. 5. Ovary gibbous, c. 1½ mm high, 4-celled. Fruit unknown.

Distr. *Malesia*: New Ireland (Namatanai Subdistr., Danfu R. area, inland from Manga).

Ecol. Understorey tree in ridge top forest on limestone, 750–850 m.

Note. The bark is pale grey,  $\pm$  smooth with fine cracks. The twigs and cut branches are strongly aromatic. The wood is soft and dark straw-coloured. The central branches of the inflorescence rays are held  $\pm$  horizontally or depressed and come to maturity before the lateral branches which are held erect.

8. *Osmoxylon oblongifolium* PHILIPSON, *Blumea* 23 (1976) 105.

Shrub c. 2 m, glabrous when mature, setulose on young parts. *Leaves* clustered at the ends of the branches; petiole to 16 cm, channelled above, 4 mm broad, with a clasping base prolonged upwards as a stipular ligule 1½–2 cm long, and with entire or fimbriate crests encircling the lower part of the petiole; blade simple, oblong-ovate, occasionally with a small triangular lobe on each side below the middle, to 46 by 17(–24) cm, base rounded to truncate, apex shortly acuminate, margin serrate, midrib prominent, principal lateral veins c. 3–4 cm apart (at broadest part of leaf). *Inflorescence* a terminal compound umbel, hemispherical, c. 13 cm  $\varnothing$ ; peduncle 3–4 cm, c. 6 mm wide, bearing fimbriate, lanceolate bracts (to 2 cm long) along its length and around and among the primary rays; primary rays c. 20, rather short and stout (16–20 by 3–4 mm) with small opposite caducous bracts at apex, each ray ending in three branches; the central branch c. 4 mm long; sterile flowers unknown; the two lateral branches 3½–4 cm long, articulated below the middle, terminating in a head of c. 20–30 sessile or subsessile flowers. Flowers unknown. *Fruits* crowded in a spherical head, drupes c. 5 mm  $\varnothing$  (when dry) on pedicels c. 1 mm, 4-ribbed, pyrenes 4, cartilaginous; endosperm with faint reticulate ridging.

Distr. *Malesia*: Philippines (Samar).

Ecol. In dipterocarp forest, along creek bank, at 200 m.

9. *Osmoxylon catanduanense* (MERR.) PHILIPSON, *Blumea* 23 (1976) 105. — *Boerlagiodendron catanduanense* MERR. Philip. J. Sc. 13 (1918) Bot. 318; En. Philip. 3 (1923) 222.

Shrub c. 1 m, glabrous except for parts of the inflorescence. *Leaves* clustered at the ends of the branches; petiole c. 30 cm, terete, 3 mm wide, base with a short ligule, and inconspicuous

recurved crests; blade digitately compound, leaflets 7, chartaceous to subcoriaceous; petiolules 4–5 cm, the lateral shorter; leaflets lanceolate, mid-leaflet to 26 cm long, base cuneate, apex  $\pm$  caudate; irregularly lyrate lobed, the sinuses reaching to within c. 8 mm of the midrib, lobes 2–4 cm long, patent, margin slightly thickened, entire or obscurely dentate. *Inflorescence* a terminal compound umbel, c. 10 cm  $\varnothing$ , peduncle stout, bearing ovate bracts c. 1 mm long; primary rays c. 7–10, 2–2½ cm long, to 2 mm wide, minutely pubescent, with 2 broadly ovate bracts 4–5 mm long at apex; central branch 3 mm or less, bearing a head of sterile flowers; lateral branches 2½ cm long, bearing 2 broad bracts near the middle, and ending in a spherical head of c. 15 sessile flowers. *Calyx* an obsolete rim. Petals and stamens unknown. Ovary 4-celled. *Fruit* ovoid, 4-ridged when dry, 7 by 5 mm.

Distr. *Malesia*: Philippines (Catanduanes).

Ecol. On forested slopes, at c. 350 m.

Note. Together with 10. *O. caudatum* and 11. *O. heterophyllum* this species forms a small group with leaves composed of lyrate leaflets. Although the foliage is similar (though not identical), the inflorescences are distinctive. In *O. heterophyllum* the rays are short, resulting in a compact compound umbel; in *O. caudatum* there are few rays (10 or fewer); in *O. catanduanense* there are many, relatively long rays, resulting in a large, diffuse compound umbel. Since *O. catanduanense* and *O. caudatum* are known only from the type collections, the range of variation of these species is not known, but the inflorescence differences justify the retention of all three species.

10. *Osmoxylon caudatum* (MERR.) PHILIPSON, *Blumea* 23 (1976) 105. — *Boerlagiodendron caudatum* MERR. Philip. J. Sc. 14 (1919) 440; En. Philip. 3 (1923) 222.

Erect shrub, c. 2 m, becoming glabrous. *Leaves* clustered towards the ends of the branches; petiole c. 45 cm, terete, striate, 4–5 mm wide, base with a stipular ligule c. 1½ cm long, and 2–3 fimbriate or pectinate crests; blade digitately compound, leaflets 5–9, subcoriaceous; petiolules of the central leaflets to 5 cm long, lateral leaflets  $\pm$  sessile; leaflets elliptic-lanceolate, mid-leaflet to c. 25 cm long, base decurrent on the slightly winged petiole, apex caudate-acuminate, the larger leaflets with 1–3 pairs of lyrate lobes reaching almost to the midrib, lobes ascending, margin slightly revolute with often prominent usually incurved teeth. *Inflorescence* a terminal compound umbel, c. 18 cm  $\varnothing$ ; peduncle stout, c. 2 cm, bearing few ligulate bracts c. 1½–2 cm long, rough, with short setae on the back; primary rays c. 25, c. 4–5 cm long, glabrous and striate, subtended by ligulate bracts, similar opposite bracts at the apex, c. 1 cm long; central branch 1–1½ cm long, glabrous, ending in a whorl of obtuse rough coriaceous bracts

c. 3 mm long and a head (c. 1 cm  $\varnothing$ ) of sterile bacciform flowers c. 3 mm  $\varnothing$ , on pedicels 3–8 mm; lateral branches 4–5 cm long, with opposite fimbriate bracts near the middle, bearing an ellipsoid head of c. 20 sessile flowers, each flower subtended and  $\pm$  enclosed by an ovate fimbriate bract 3–4 mm long. *Calyx* an obsolete rim. Petals and stamens unknown. Ovary 2–2½ mm long, turbinate, obscurely angled, 4-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Luzon: Ilocos Norte Prov., Mt Palimlin).

Ecol. On forested slopes near the summit, at c. 1000 m.

Note. Apparently never re-collected. For a discussion of distinctive features see under 9. *O. catanduanense*.

11. *Osmoxylon heterophyllum* (MERR.) PHILIPSON, *Blumea* 23 (1976) 106. — *Boerlagiodendron heterophyllum* MERR. Philip. J. Sc. 9 (1914) Bot. 329; En. Philip. 3 (1923) 223.

Erect tree, c. 5 m, glabrous. *Leaves* clustered at the ends of the branches; petiole to 25 cm, base clasping, prolonged as a stipular ligule to 2½ cm long, and bearing several pectinate crests (becoming recurved when the bristles may be obscured or shed); blade to 35 cm long, digitately compound (or some leaflets imperfectly separated); leaflets 3–7, unequal in size, oblong-ovate to broadly oblong-oblancoolate, acuminate, lyrate-lybed and irregularly dentate, the base gradually narrowed to the petiolule; petiolule up to 7 cm. *Inflorescence* a dense terminal compound umbel; peduncle stout, c. 2 cm, bearing many lanceolate bracts 2–3 cm long; primary rays c. 30, 10–15 mm long, subtended by lanceolate c. 2½ cm long bracts, sometimes with bristles on the back, and bearing similar opposite terminal bracts 8–10 mm long, each ending in three branches; central branch short (not seen fully developed) terminating in an umbellule of c. 15 sterile bacciform flowers (c. 3 mm long), pedicels 3–4 mm; lateral branches 8–10 mm long (? fully developed), articulation present ending in heads (c. 1 cm  $\varnothing$ ) of numerous flowers. *Calyx* rim obsolete. Corolla lobes 4, 2 mm long. Stamens 4. Ovary 4-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Samar, Biliran and Mindanao).

Ecol. Primary forest, under shade near creek, 100–550 m.

Vern. *Arañas*, Bis., *kayuang*, *Mbo*, *magusayag*, C.Bis.

Note. The description is partially based on the original publication as I have seen only immature inflorescences. For a discussion of distinctive features, see under 9. *O. catanduanense*.

12. *Osmoxylon yatesii* (MERR.) PHILIPSON, *Blumea* 23 (1976) 106. — *Boerlagiodendron yatesii* MERR.

Philip. J. Sc. 13 (1918) Bot. 44; En. Philip. 3 (1923) 225.

Shrub, 1 m, glabrous, except for the inflorescence. *Leaves* clustered towards the ends of the stout branches; petiole to 38 cm, channelled above, 5 mm  $\varnothing$ , base with a stipular ligule 1 cm long, and 1–2 inconspicuous non-fimbriate crests around the back of the petiole; blade digitately compound, leaflets 5–7; petiolule 2–7 cm (the lateral shorter); blade elliptic-oblong to ovate, mid-leaflet to 23 by 8 cm, base gradually tapered, apex acuminate-caudate, margin dentate or somewhat undulate. *Inflorescence* a terminal compound umbel, sessile or peduncle stout 1–3 cm, bearing few ovate bracts 1 cm long; primary rays 5–10, tomentose, c. 3 cm long and 3 mm wide, subtended by ovate bracts 6 mm long, similar opposite bracts at apex; central branch 2–3 mm long, pubescent, ending in a whorl of blunt bracts (3 mm long) and an umbellule of c. 10 sterile flowers 4 mm  $\varnothing$ , 2–4-celled, pedicels 3–8 mm; lateral branches 2–2½ cm long, pubescent, with small opposite bracts about the middle, bearing a head of 10–15 sessile flowers, subtended by ovate ciliate bracts. *Calyx* rim obsolete, sometimes fimbriate. Corolla 4–5-lobed, tubular below, 1½ mm long in bud. Stamens 4–5. Ovary 4-celled. Young fruit (MERRILL, l.c.) shortly pedicelled (2–3 mm).

Distr. *Malesia*: Philippines (Luzon and Catanduanes).

Ecol. In rain-forest and mossy forest, from low altitude to 1250 m.

Vern. *Magalayag*, Dinagat.

Note. The leaves are unlike any other *Osmoxylon*, resembling those of *Macropanax* or *Schefflera*. The flowers are described as yellow, and the fruit black. The only instance of a pseudo-fruit containing apparently normal seeds occurred in this species.

13. *Osmoxylon geelvinkianum* BECC. *Malesia* 1 (1878) 196; PHILIPSON, *Blumea* 23 (1976) 106. — *Eschweilera geelvinkiana* (BECC.) BOERL. Ann. Jard. Bot. Btzg 6 (1886) 120. — *Trevesia geelvinkiana* (BECC.) O. K. Rev. Gen. Pl. 1 (1891) 272. — *Boerlagiodendron geelvinkianum* (BECC.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32. — *Eschweilera (i)a elegans* RIDL. Trans. Linn. Soc. II, 9 (1916) 63. — *Boerlagiodendron elegans* (RIDL.) HARMS, Bot. Jahrb. 56 (1920) 380. — *Boerlagiodendron stenolobum* HARMS, l.c. 382, f. 1 k-t.

Glabrous shrub with few slender branches, up to 3 m high. *Leaves* clustered near the ends of the branches; petiole up to 22 cm, usually shorter, 2–3½ mm wide, narrowly channelled above, with a sheathing base prolonged as a membranous stipular ligule up to 4 cm or longer and with fimbriate or  $\pm$  entire crests encircling the lower part of the petiole; blade up to 30 cm  $\varnothing$  (usually 20 cm or less) very deeply 5–11-lobed, or with distinct digitately arranged leaflets, the lobes or

leaflets linear-lanceolate to lanceolate-obovate, entire or irregularly pinnatifid with narrow finely-tapering lobes, base gradually narrowed, apex narrowly caudate, margin serrate; leaves below the inflorescence sometimes reduced to a single leaflet. *Inflorescence* terminal hemispherical, c. 12–20 cm  $\varnothing$ ; peduncle 1 cm or less, with caducous lanceolate bracts mostly clustered below the primary rays, 1–2 cm long; primary rays rather few, spaced,  $2\frac{1}{2}$ –6 cm long, slender, bearing two caducous lanceolate bracts at the apex, up to  $1\frac{1}{2}$  cm long, each ray ending in three branches; the central branch c. 4–6 mm long bearing a whorl of lanceolate caducous bracts and an umbel of c. 7–12 sterile, globose or ovoid bacciform flowers (c. 7 mm  $\varnothing$  when dry) with pedicels c. 5 mm long and 6–9-celled; the two lateral branches c. 3–4 cm long at anthesis, articulated about the middle, terminating in a small head of 10–20 sessile or subsessile flowers. *Calyx* rim obsolete; corolla splitting into c. 4 irregular lobes above, tubular below, c.  $2\frac{1}{2}$  mm long. Stamens 10–14, exserted, 3 mm long, anthers small. Ovary cylindrical, c. 2 mm long, 10–16-celled; disk with a central raised boss formed by the pustulate stigmas. *Fruit* globose, fleshy (ribbed when dry), c. 10 mm  $\varnothing$ .

Distr. *Malesia*: New Guinea (Irian Jaya, to Sepik and Fly R. areas).

Ecol. Primary forest, along creeks and river banks, flood-resistant, from near sea-level to 850 m.

Vern. *Amamutapu*, Kamora, *korinki*, Orne, *ida'pforporsami*, Kutubu.

Note. The narrow leaf segments, almost or quite separated at their bases, are characteristic, even though variable in outline. The flowers are described as orange or reddish, and the soft fleshy fruits as dark purple, dark blue, or black.

14. *Osmoxylon lineare* (MERR.) PHILIPSON, *Blumea* 23 (1976) 106. — *Boerlagiodendron lineare* MERR. *Philip. J. Sc.* 3 (1908) Bot. 253; *En. Philip.* 3 (1923) 223.

Glabrous, erect shrub, c. 3 m. *Leaves* crowded near the ends of the branches; petiole 4–6 cm, the base with a small stipular ligule (5 mm long) and a few fimbriate crests; blade to 20 cm  $\varnothing$ , digitately compound with 4–7 leaflets (or very deeply divided into as many lobes); leaflets linear-lanceolate, c. 1– $1\frac{1}{2}$  cm wide, the base decurrent on the winged petiolule, apex attenuated, margin thickened, denticulate especially above. *Inflorescence* a terminal compound umbel; peduncle short (c. 1 cm), bracteate; primary rays c. 10, 2– $2\frac{3}{4}$  cm long, each ending in three branches; the central branch 4–5 mm long bearing a spherical head of numerous fimbriate bracts (sterile flowers fallen); the lateral branches 3– $3\frac{1}{2}$  cm long with a pair of minute fimbriate bracts about the middle, ending in a capitulum of c. 20 sessile flowers subtended by small fimbriate bracts, c. 7 mm  $\varnothing$ . *Calyx* rim minute. Corolla and stamens unknown. Ovary

5-celled. Fruit ovoid c. 3 mm long, 5-ridged (when dry).

Distr. *Malesia*: Philippines (Luzon).

Note. Apparently never re-collected. The original specimen is without field information. The foliage is similar to that of 15. *O. borneense* but with shorter petioles and fewer leaflets.

15. *Osmoxylon borneense* SEEM. *J. Bot.* 6 (1868) 141; PHILIPSON, *Blumea* 23 (1976) 107. — *O. helleborinum* BECC. *Malesia* 1 (1878) 198. — *Eschweilera helleborina* (BECC.) BOERL. *Ann. Jard. Bot. Btzig* 6 (1887) t. 13. — *Trevesia helleborina* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron helleborinum* (BECC.) HARMS in *E. & P. Nat. Pfl. Fam.* 3, 8 (1894) 31. — *Boerlagiodendron borneense* (SEEM.) MERR. *En. Born.* (1921) 456.

Glabrous, spreading shrub, up to 3 m. *Leaves* clustered near the ends of the branches; petiole up to 24 cm, narrowly channelled above, 2–3 (or 5) mm wide, with a sheathing base prolonged as a membranous stipular ligule up to  $2\frac{1}{2}$  cm long, and usually with fimbriate,  $\pm$  entire, or more rarely long-setose crests encircling the lower part of the petiole; blade up to 20 cm  $\varnothing$  digitately compound (or the bases of the leaflets joined by a very short web of tissue); leaflets 9–13, linear-lanceolate to lanceolate, gradually narrowed to the base and apex, up to 20 by 3 cm, usually much narrower, margin serrate, principle veins numerous, c. 5–10 mm apart. *Inflorescence* terminal, hemispherical, c. 6–13 cm  $\varnothing$ ; peduncle 1–2 cm or shorter, with caducous lanceolate-ovate entire or fimbriate bracts mostly clustered below the primary rays, 1– $1\frac{1}{2}$  cm long; primary rays rather few (5–12),  $2\frac{1}{2}$ –4 cm long, with 2 ovate bracts at the apex, c. 8 mm long, each ray ending in three branches; central branch c. 5–12 mm, bearing an umbel of c. 6–16 sterile, globose, bacciform flowers, c. 3–5 mm  $\varnothing$  (when dry) with pedicels 4–5 mm long and 5-celled; the two lateral branches  $1\frac{1}{2}$ –3 cm long at anthesis, articulated about the middle, terminating in a small head of c. 20–25 sessile flowers with minute rounded bracts. *Calyx* rim obsolete; corolla splitting into few irregular lobes above, tubular below, c.  $1\frac{1}{2}$ –2 mm long; stamens 5–6, slightly exserted; ovary turbinate, angled, c. 1 mm long, 5-celled, disk with a central raised boss formed by the pustulate stigmas. *Fruit* globose, fleshy (ribbed when dry) c. 5 mm  $\varnothing$ .

Distr. *Malesia*: Borneo (Sarawak, Sabah and Kalimantan).

Ecol. Characteristic of rocky river banks, not beyond flood-level, often in deep shade, from near sea-level to 950 m.

Vern. *Medong*, Kayan, *empasia abor*, Iban, *kayan*, Tamang, *koung*, Kinabalu, *bungor*, Murut Bokan, *salimpangaya*, Murut Kalabakai.

Notes. The leaves of some specimens of 13. *O. geelvinkianum* (New Guinea) resemble this

species closely. This species can be distinguished by the more compact and smaller fertile flowers, and by its leaflets being uniformly unlobed.

Both species are characteristic of river banks, and *O. borneense* has a low spreading habit, with the branches often rooting, resulting in extensive patches of this low shrub. It is a characteristic rheophyte confined to below flood-level.

The flowers are described as greenish white or cream and the inflorescence branches are frequently dark purple.

16. *Osmoxylon pulcherrimum* VIDAL *ex* F.-VILL. Nov. App. (1880) 102; Sinopsis Atlas (1883) 28, t. 55, f. B; PHILIPSON, *Blumea* 23 (1976) 107. — *Eschweilera pulcherrima* (VIDAL) BOERL. Ann. Jard. Bot. Btzg 6 (1887) 123. — *Trevesia pulcherrima* (VIDAL) O. K. Rev. Gen. Pl. 1 (1891) 272. — *Boerlagiodendron pulcherrimum* (VIDAL) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; MERR. Philip. J. Sc. 3 (1908) Bot. 254; En. Philip. 3 (1923) 224. — *Boerlagiodendron sibuyanense* ELMER, Leaf. Philip. Bot. 7 (1914) 2328; MERR. En. Philip. 3 (1923) 224.

Erect, sparsely branched tree, up to 10 m, glabrous when mature, except for the inflorescence. Leaves crowded at the ends of the branches; petiole to 1 m, channelled above, clasping base heavily lenticellate, prolonged as a broad stipular ligule c. 2 cm long, usually with strong bristles on the back, and with strong long-pectinate crests encircling the base of the petiole; blade coriaceous, fan-shaped, c. 40 cm long, base broadly cuneate to truncate, palmately 7–11-lobed, lobes extending to within c. 12 cm from the base, lanceolate, coarsely serrate, sometimes irregularly lobulate, slightly narrowed towards the base, apex acute, sinuses rounded. Inflorescence a terminal compound umbel, c. 18 cm  $\varnothing$ ; peduncle very short, bearing heavily setose bracts; primary rays 15–20, c. 3–4 cm long, 3–4 mm broad, setulose, at the apex bearing opposite, ovate-lanceolate bracts 10–15 mm long, each ending in three branches; central branch c. 15–20 mm long, terminating in a globular head (c. 12 mm  $\varnothing$ ) of c. 20–30, sessile, sterile, bacciform flowers (3–4 mm  $\varnothing$ ) 3-celled, subtended by small ovate-lanceolate bracts; lateral branches c. 5 $\frac{1}{2}$  cm long (7 $\frac{1}{2}$  cm in fruit), with opposite bracts (c. 3–4 mm long) near the middle, terminating in a globose head of c. 40–50 sessile flowers, bracts between the flowers very small, setulose. Calyx rim obsolete. Corolla 4-lobed, tubular below, 2 mm long in bud. Stamens 4. Ovary 4-celled. Fruit globose c. 6–8 mm long, 4-ribbed (dry).

Distr. *Malesia*: Philippines (Luzon, Mindoro and Sibuyan), recorded also from Formosa and Micronesia (Palau), *cf.* KANEHIRA, En. Micron. Pl. (1935) 384.

Ecol. Damp primary forests, 225–800 m.

Vern. *Cf.* MERRILL: *paladukai*, Bik., *salapak*, Neg.; *cf.* ELMER: *palad-amok*, Vis.

Notes. The fan-shaped leaves with several narrow lobes and prominent main veins resemble those of 34. *O. eminens* but are less strikingly developed. The inflorescence is considerably smaller with the pseudo-fruits forming a compact head borne on a comparatively long peduncle. The heads of true flowers, and of the fruits, are considerably smaller than those of *O. eminens*.

Although VIDAL's material is no longer available, the figure and description relate well to later collections.

The specimens on which ELMER based his *Boerlagiodendron sibuyanense* have the lobes of the leaf rather simpler in outline than is usual, but the fragments of young inflorescence are quite typical of the taxon and the name is reduced to synonymy.

17. *Osmoxylon soelaense* PHILIPSON, *Blumea* 23 (1976) 108.

A glabrous shrub or small tree. Petiole c. 32 cm, broadly channelled above, clasping base prolonged as a stipular ligule 1 $\frac{1}{2}$  cm long, and bearing c. 3 fimbriate crests; blade c. 40 cm long, broadly cuneate at the base, palmately 7-lobed to within c. 12 cm from the base, lobes narrowly ovate to oblong-elliptic, slightly narrowed towards the rounded sinuses, apiculate, margin denticulate. Inflorescence a terminal compound umbel; peduncle c. 2 cm, bearing lanceolate bracts c. 2 cm long (similar smaller bracts subtend the primary rays); primary rays c. 1 $\frac{1}{2}$  cm long, 5 mm wide, flattened, bearing opposite, terminal, persistent bracts 10–12 mm long, with lenticels and branched bristles on the back, ending in three branches; central branch c. 10 mm long terminating in a head 1 cm  $\varnothing$  of 10–15 sessile sterile bacciform flowers (4 by 3 mm when dry; 3-celled) surrounded by an involucre of ovate bracts (3 mm long) and with minute bracts interspersed; lateral branches 4 $\frac{1}{2}$ –5 cm long, bearing opposite ovate bracts (4 mm long) c. 8 mm above the base, terminating in a dense head c. 1 cm  $\varnothing$  of 25–30 sessile flowers interspersed with inconspicuous obtuse fimbriate bracts. Calyx rim obsolete. Corolla 5-lobed above, tubular below. Stamens 5. Ovary 4–5-celled. Fruit unknown.

Distr. *Malesia*: Moluccas (Sula Is.: Taliabu and Sulabesi).

Note. For a discussion of the distinctive features, see under 31. *O. sessiliflorum*.

18. *Osmoxylon globulare* PHILIPSON, *Blumea* 23 (1976) 108.

Shrub to 4 m, furfuraceous on the young parts. Petiole to 55 cm long, broadly channelled above, c. 1 cm wide, clasping base heavily lenticellate, prolonged as a stipular ligule 4 cm long sometimes scaly on the back, and bearing numerous irregular undulate crests on the base of the petiole often continued up the petiole, as rough fascicles of bristles as far as the blade; blade 45 cm long, base



cordate or emarginate, with some bristles underneath, palmately 7-lobed to within *c.* 10–15 cm from the base, lobes narrowly ovate to oblong-elliptic, slightly narrowed towards the broadly rounded sinuses, apex acute, margin serrate. *Inflorescence* a terminal compound umbel, spherical, *c.* 15 cm  $\emptyset$ ; peduncle stout, 2–3 cm, bracts together with those among the primary rays caducous; primary rays 30–40, rigid only slightly flattened (subterete), 2–4 cm long, 2–2½ mm wide, bearing opposite bract-scars at the apex, ending in three branches; central branch 8–10 mm long, terminating in a head *c.* 13 mm  $\emptyset$  of *c.* 20 sessile sterile bacciform flowers (5 by 4 mm when dry, 2–3-celled); pedicels to 2 mm interspersed with minute bracts; lateral branches 3–4½ cm long, with the scars of opposite bracts near the middle, terminating in a dense head 1–1½ cm  $\emptyset$  (in bud) of 20–30 sessile flowers interspersed with inconspicuous bracts. *Calyx* rim obsolete. Corolla 6–8-lobed above, tubular below, 2½ mm long (in bud). Stamens 6–8. Ovary turbinate, obscurely ribbed, 5–8-celled (varying on the same plant). Fruit unknown.

Distr. *Malesia*: Moluccas (Halmaheira, Morotai).

Ecol. In forest from sea-level to 800 m. Said to be rare in Halmaheira but common in Morotai.

Vern. *Bungan-gutu, saha-sasate*, Djailola.

Note. For a discussion of the distinctive features see under 31. *O. sessiliflorum*.

19. *Osmoxylon kostermansii* PHILIPSON, *Blumea* 23 (1976) 108.

Glabrous, small tree, 8 m. *Leaves* clustered near the ends of the branches; petiole up to 35 cm, narrowly channelled above, *c.* 3 mm broad, with a sheathing base prolonged as a stipular ligule *c.* 2 cm long, continued around the back of the leaf-base as a single wide crest with an entire recurved margin; blade up to 30 cm  $\emptyset$ , base cordate, deeply 5–7-lobed, lobes elliptic, slightly narrowed towards the sinuses and with a short acute apiculum, margin minutely serrate and sometimes with small sub-lobes, sinuses rounded. *Inflorescence* a terminal compound umbel, hemispherical, *c.* 14 cm  $\emptyset$  at anthesis; peduncle *c.* 1 cm long, bearing small lanceolate bracts (*c.* 3 mm long) below and among the numerous (*c.* 20–24) primary rays; primary rays 4–5 cm long and 1 mm broad, with opposite bracts (2 mm long) at the apex, each ending in three branches; the central branch 5–6 mm long, bearing a spherical umbel of *c.* 20 small, sterile, bacciform flowers (2 mm  $\emptyset$ ) on pedicels *c.* 5–7 mm long, 2-celled; the two lateral branches *c.* 3½–4 cm long, with no articulation or bracts except for a minute involucre around the terminal umbellule of *c.* 10–14 flowers; pedicels *c.* 2–3 mm. *Calyx* rim obsolete; corolla 4-lobed, 2 mm long in bud; stamens 4; ovary subcylindric, angled, *c.* 1 mm long, 5–7-celled, disk with a central stylar boss.

*Fruit* spherical, *c.* 6 mm long, strongly ribbed when dry.

Distr. *Malesia*: Borneo (Kalimantan: Sangkulirang Distr., Mt Medadam).

Ecol. On limestone at 450 m.

Note. The foliage is similar to that of 22. *O. palmatum*, except for the distinctive petiolar crest. The inflorescence is also similar to *O. palmatum*, especially in the lack of an articulation on the rays below the umbellules.

20. *Osmoxylon barbatum* BECC. *Malesia* 1 (1878) 197; PHILIPSON, *Blumea* 23 (1976) 109. — *Eschweilera barbata* (BECC.) BOERL. *Ann. Jard. Bot. Btzg* 6 (1886) 117. — *Trevesia barbata* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron barbatum* (BECC.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31.

Small, glabrous tree. *Leaves* clustered near the ends of the branches; petiole to 32 cm, channelled above, 4–5 mm broad, with a sheathing base prolonged as a stipular ligule 2–3 cm long, and with several long setose crests encircling the lower part of the petiole; blade up to 43 cm  $\emptyset$ , base cordate to truncate; deeply 5–7-lobed; lobes elliptic-lanceolate, narrowed towards the sinuses and tapered to an acuminate apex, margin minutely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, hemispherical, to 12 cm  $\emptyset$ ; peduncle 1–2 cm; primary rays *c.* 20, 3–5 cm long, with three branches at the apex; the central branch *c.* 1 cm long, bearing a subglobose umbel of *c.* 15–20, sterile, bacciform flowers (3–4 mm  $\emptyset$ ) on pedicels 5–7 mm long, 2–4-celled; the two lateral branches about 4 cm long with no clear articulation but 1 or 2 obsolescent bracts, terminating in an umbellule of *c.* 15–20 flowers; pedicels *c.* 3–4 mm. *Calyx* rim obsolete; corolla 4-lobed above, tubular below, *c.* 4 mm long; stamens 7 or more, rarely fewer, exserted; ovary subcylindric *c.* 3 mm long, angled, 7-celled; disk with a central stigmatic boss. Fruit unknown.

Distr. *Malesia*: SE. Moluccas (Key Is.).

Note. Distinguished from the closely related 22. *O. palmatum* by the long-setose petiolar crests. For discrimination from 21. *O. pfeilii* see that species.

21. *Osmoxylon pfeilii* (WARB.) PHILIPSON, *Blumea* 23 (1976) 109. — *Eschweilera pfeilii* WARB. *Bot. Jahrb.* 13 (1891) 396. — *Boerlagiodendron pfeilii* (WARB.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 32.

A tree developing a crown when mature, up to 16 m, glabrous when mature, young parts slightly setulose. *Leaves* in terminal clusters; petiole up to 60 cm, channelled above, *c.* 6 mm broad, with a sheathing base prolonged as a membranous stipular ligule 2–4 cm long, and with many pronounced, long-setose crests encircling the lower part of the petiole; blade up to 75 cm  $\emptyset$ , deeply

7–11-lobed, base cordate or emarginate; lobes lanceolate to narrowly elliptic-oblong, narrowed towards the sinuses and tapered to an attenuate apex, margin sharply and remotely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, hemispherical, to 20 cm  $\varnothing$ ; peduncle short (2–3 cm); primary rays numerous (c. 30–40), 4–5 cm long, glabrous, with obsolete bracts at the apex, each ending in three branches; central branch c. 10 mm long, bearing a subglobose umbel of c. 20, small, sterile, bacciform flowers (1–1½ mm  $\varnothing$ ) on pedicels c. 3–4 mm long, 2–5-celled; the two lateral branches c. 3–4 cm long, with no clear articulation but 1 or 2 obsolescent bracts, terminating in a head of c. 12–16 subsessile flowers (pedicel c. 1 mm, becoming longer in fruit) surrounded by an inconspicuous involucre rim. *Calyx* rim obsolete; corolla 5-lobed, 1½ mm long in bud; stamens 5; ovary subcylindric, angled, 1½ mm long at anthesis, 5–16-celled, disk with a central boss formed by the united pustulate stigmas. *Fruit* spherical, fleshy, c. 8 mm  $\varnothing$ , ribbed when dry, the stigmatic boss persistent and prominent; pyrenes cartilaginous.

Distr. *Malesia*: Bismarck Archipelago (New Britain, Duke of York Group and New Ireland).

Ecol. Primary rain-forest, from near sea-level to 600 m.

Vern. *Sare, sasare, sare a lauvolau*, New Britain, Pomio; *a ibalur*, New Ireland.

Notes. The bark is grey-brown and pustular, the wood straw-coloured and soft. The flowers are orange, and the ripe fruit dark red-violet.

In the original description the ovary is recorded to possess 10–14 cells. However, some other specimens have as few as 5 cells in the ovary, but in other respects agree with specimens with the large number of seeds. Since the inflorescence, leaf-shape, and especially the nature of the petiolar crests, as well as the distribution, are all highly distinctive within the genus, all the specimens can be accepted as examples of one species with a highly variable number of carpels.

This species is very close to 20. *O. barbatum* of the Key Islands. The original diagnostic character of the number of cells in the ovary has been found to be unreliable. However, since the primary rays in the inflorescence are more numerous and the pedicels of the fertile and sterile flowers are shorter this geographically distinct species is maintained.

22. *Osmoxylon palmatum* (LAMK) PHILIPSON, *comb. nov.* — *Folium polypi mas (et femina?)* RUMPH. Herb. Amb. 4: 101, t. 43. — *Aralia palmata* LAMK, Encycl. 1 (1783) 224, type, non LOUR. 1790, nec R. & S. 1820. — *Trevesia moluccana* MIQ. Fl. Ind. Bat. 1, 1 (1856) 748; Bonplandia 4 (1856) 137. — *Trevesia zippeliana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11. — *Unjala bifida* REINW. ex DE VRIESE, Pl. Ind. Or. (1867) 83, *nomen in synon.*; ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 166, *in*

*synon.* — *O. moluccanum* (MIQ.) BECC. Malesia 1 (1878) 195; PHILIPSON, Blumea 23 (1976) 109. — *O. zippeliana* (MIQ.) BECC. Malesia 1 (1878) 195. — *Eschweilera palmata* ZIPP. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 116, t. 14. — *Boerlagiodendron palmatum* (ZIPP. ex BOERL.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31; MERR. Int. Rumph. (1917) 407. — *Boerlagiodendron moluccanum* (MIQ.) BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 3; Blumea 6 (1950) 367; BACK. & BAKH. f. Fl. Java 2 (1965) 163.

Small, glabrous tree to 15 m. *Leaves* clustered near the ends of the branches; petiole up to 40 cm, channelled above, 4–5 mm broad, with a sheathing base prolonged as a stipular ligule up to 5 cm long, and with several fimbriate crests encircling the lower part of the petiole; blade up to 45 cm  $\varnothing$ , base cordate, deeply 5–9-lobed, lobes elliptic, slightly narrower towards the sinuses, acuminate, margin serrate and sometimes with small sub-lobes, sinuses rounded. *Inflorescence* a terminal, compound umbel, subspherical, to c. 20 cm  $\varnothing$  at anthesis; peduncle c. 1–2 cm, with small caducous bracts below and among the numerous (20–60) primary rays; primary rays 3–5 cm long, 2–3 mm broad, with two opposite caducous bracts at the apex, each ending in three branches; central branch 6–10 mm long, bearing a spherical umbel of c. 20–30 small, sterile, bacciform, flowers (2–4 mm  $\varnothing$ ) on pedicels 4–6 mm long, 4–7-celled; two lateral branches c. 2½–5 cm long, rigid and straight, with no articulation (indistinct scars of bracts may occur below the involucre), bearing a minute involucre around the terminal umbellule of c. 12–20 flowers; pedicels to c. 5 mm (occasionally flowers subsessile). *Calyx* rim obsolete. Corolla irregularly 4–5-lobed above, tubular below, c. 5 mm long. Stamens 6–9, exerted, filaments stout. Ovary subcylindric, angled, c. 2 mm long, 6–9-celled, disk with a raised central stigmatic boss. *Fruit* globose, fleshy, c. 10 mm  $\varnothing$ , strongly ribbed when dry.

Distr. *Malesia*: Celebes (once, not localized) and Moluccas (Buru, Ceram, Ambon, Banda, Tenimber Is.).

Also cultivated in the Bogor Botanic Garden.

Ecol. An understorey tree in primary rain-forest.

Uses. The leaves are used for culinary and medicinal purposes (against gonorrhoea).

Vern. *Daun gurita, pelenda darat, saha-saha*, Moluccas, *fumala-alas*, Tenimber Is.

Note. The spherical inflorescence is characteristic, having straight rigid rays with no articulation on the secondary branches, and the pseudo-fruits are well separated from the true flowers. MIQUEL distinguished *Trevesia zippeliana* because the collector noted that its ovary was 4-celled. Possibly this number related to the sterile flowers. In two gatherings from Ambon (Waii, TEYSMANN; G. Salhutu, BOERLAGE 179) the fertile flowers are

subsessile in heads, but otherwise conform to the characters of this species. The only record of this genus from the Tenimber Is. consists of leaves only, but their characters conform to this species.

23. *Osmoxylon ramosii* (MERR.) PHILIPSON, *Blumea* 23 (1976) 110. — *Boerlagiodendron ramosii* MERR. *Philip. J. Sc.* 11 (1916) Bot. 27; MERR. *En. Philip.* 3 (1923) 224.

Erect, unbranched, or sparingly branched, 4 m high shrub, becoming glabrous. *Petiole* to 40 cm, the clasping base prolonged as a stipular ligule c. 2 cm long, and with few to several prominent recurved, obscurely fimbriate, crests surrounding the lower part of the petiole; blade to 30 cm long, base emarginate, palmately 3-7-lobed, lobes extending to within 3-8 cm from the base, oblong-ovate, margin serrate, sometimes lyrate lobulate, apex acuminate, sinuses broadly rounded. *Inflorescence* a terminal compound umbel, 10-15 cm  $\varnothing$ ; peduncle stout, with lanceolate bristle-bearing bracts; primary rays c. 15, 2-3 cm long, 2-3 mm wide, flattened, subtended by lanceolate bracts c. 2 cm long, with bristles on the back and bearing similar opposite terminal bracts c. 1 cm long, each terminating in three branches; central branch c. 4 mm long, slightly pubescent, terminating in an umbellule (c. 1½ cm  $\varnothing$ ) of c. 10-15 sterile, bacciform flowers 4-5 mm  $\varnothing$ , 2-celled, pedicels 5-8 mm long, subtended by caducous bracts; lateral branches 2½ cm long (slightly longer as fruits

form), without any articulation or bracts except for a caducous small involucre around the terminal head of c. 25-35 sessile or very short-pedicelled flowers, c. 1 cm  $\varnothing$ , bracts among the flowers obscure. *Calyx* rim obsolete. *Corolla* 4-lobed above, tubular below. *Stamens* 4, exerted, filaments broad. *Ovary* subcylindric, obscurely angled, 4-celled. *Fruit* spherical 9 mm  $\varnothing$ , 4-ribbed when dry.

*Distr. Malesia*: Philippines (Luzon).

*Ecol.* On low-lying, wet ground, in forest, or on forested slopes, 700-800 m.

*Notes.* The flat-topped inflorescence is c. 15 cm  $\varnothing$  with much-reduced leaves below it. The inflorescence rays are dark purplish and the flowers orange-yellow. The bark is grey and the wood soft.

This is the only species in the Philippines without opposite bracts on the lateral branches of the inflorescence rays. In this respect it resembles 22. *O. palmatum* and a few other species.

24. *Osmoxylon novoguineense* (SCHEFF.) BECC. *Malesia* 1 (1878) 197; PHILIPSON, *Blumea* 23 (1976) 110. — *Trevesia novo-guineensis* SCHEFF. *Ann. Jard. Bot. Btzg* 1 (1876) 26. — *Eschweilera novoguineensis* (SCHEFF.) BOERL. *ibid.* 6 (1886) 118. — *Boerlagiodendron novoguineense* (SCHEFF.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31; BACK. & BAKH. *f. Fl. Java* 2 (1965) 163. — *Boerlagiodendron lauterbachii* HARMS in K. Sch. & Laut. *Fl. Schutzgeb.* (1900) 484. — Fig. 11, 14.



Fig. 14. *Osmoxylon novoguineense* (SCHEFF.) BECC. Petiolar base with ligule and collar-like crests (Photogr. PHILIPSON, Wantoat, 1968).

Tree or shrub, unbranched or sparingly branched, up to 16 m, the young parts rufous-furfuraceous, glabrescent. Large leaves forming terminal crowns; petiole up to 1 m, stout (1–2 cm broad), flattened above, with a sheathing base prolonged as a strong stipular ligule up to 7 cm long, and with fimbriate crests encircling the lower part of the petiole; blade up to 1.20 m  $\varnothing$ , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, the lobes in turn deeply lobed and incised, the central lobes especially being strongly pinnatisect or digitately tripartite, apices acute, margins serrate; upper leaves associated with inflorescences may be smaller, more simply lobed, or entire. *Inflorescence* terminal, a large compound umbel, bowl-shaped, up to 35 cm  $\varnothing$ ; peduncle up to 10 cm, stout, with lanceolate caducous bracts (c. 4 cm long) below and among the numerous (c. 50–70) primary rays; primary rays c. 12–15 cm long at anthesis, c. 3 mm  $\varnothing$ , bearing two caducous bracts (1 cm long) at the apex, each ray ending in three branches; central branch c. 2 cm long, bearing an umbel of c. 20–40, sterile, bacciform flowers (c. 6 mm  $\varnothing$  when dry) on pedicels c. 10 mm, and 2–6-celled; the two lateral branches c. 4–6 cm, with two opposite or sub-opposite bracts about the middle, terminating in a subspherical umbel 2½–3 cm  $\varnothing$  of 30–50 flowers on pedicels c. 8–10 mm long. *Calyx* rim obsolete, undulate. Petals with irregular erect lobes, tubular below. Stamens 6–10 exerted. Ovary turbinate somewhat angled; glabrous, 6–14-celled; disk flat with a central double row of pustulate stigmas. *Fruits* on stiff radiating pedicels, ovoid or spherical, fleshy, ribbed when dry.

Distr. Solomon Is.; in *Malesia*: throughout New Guinea and in the Bismarck Archipelago.

Ecol. Primary and second-growth forest, from sea-level to 1600 m.

Vern. *Lebe*, *Mooi*, *teresakui*, Manikiong, *akriek*, Biak, *hoppung*, Hottam, *uger*, Wagu, *faliifalii*, Tifal, *ap gan dandam*, *aimaini*, Mamig, *ida'pofporsami*, Kutubu, *pulaka*, Gazelle Peninsula.

Notes. The foliage is similar to that of 30. *O. boerlagei*, but the pedicelled flowers of *O. novoguineense* distinguish it readily from that species. The ripe fruits are usually ovoid, but in the Solomon Is. they are characteristically spheroidal, and this feature recurs in some specimens from the Bismarck Archipelago and the adjacent coast of New Guinea.

The fawn bark is pustulate with many lenticels. An orange exudate flows from the cut stems. The wood is soft and straw-coloured. The inflorescence branches are dark purple, the corolla and stamens usually deep red, and the ripe fruit shining purple or blue-black.

25. *Osmoxylon teysmannii* (BOERL.) PHILIPSON, *Blumea* 23 (1976) 111. — *Eschweilera teysmannii* BOERL. *Ann. Jard. Bot. Btzg* 6 (1887) 119. —

*Trevesia teysmannii* (BOERL.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Boerlagiodendron teysmannii* (BOERL.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 31.

A small, glabrous tree, 6 m. *Leaves* clustered at the ends of the branches; petiole to 40 cm, channelled above, 4 mm broad, with a sheathing base prolonged as a stipular ligule 2–2½ cm long, and with several fimbriate or entire crests on the lower part of the petiole; blade c. 30 cm  $\varnothing$ , membranous, cordate at the base, deeply 7-lobed, lobes elliptic, slightly narrowed to the broadly rounded sinuses, narrowed to a fine apiculum at the apex, margin finely serrulate. *Inflorescence* a terminal compound umbel, c. 10 cm  $\varnothing$ ; peduncle c. 1 cm, bearing ovate bracts (ligules of reduced leaves) and terminating in a cluster of bracts (c. 10 mm long) below and among the primary rays; primary rays c. 12–15, c. 3–4 cm long, with a pair of lanceolate bracts at the apex (c. 1 cm long); central branch c. 1 cm long, terminating in an umbellule of c. 5–8 sterile bacciform flowers (c. 4 mm  $\varnothing$  when dry) on pedicels 6–9 mm long interspersed with linear bracts 5 mm long; two lateral branches c. 3½ cm long, articulated about the middle, terminating in an umbellule surrounded by caducous linear bracts (leaving a rim-like involucre); flowers c. 8–12, pedicels c. 2–3 mm. *Calyx* rim obsolete. Corolla 3 mm long, with 7–8 lobes above, tubular below. Stamens 7–8, filaments stout, anthers exerted. Ovary sub-cylindric, angled, c. 1½ mm long, 7–8-celled; disk flat, with a central stigmatic boss. Fruit unknown.

Distr. *Malesia*: SW. Celebes (Tjamba, Kosali-Porema) and NW. Central Celebes (Palu-Parigi and Mt Nokilalaki).

Ecol. In rain-forest, 800–1000 m.

26. *Osmoxylon humile* (ELMER) PHILIPSON, *Blumea* 23 (1976) 111. — *Boerlagiodendron humilis* ELMER, *Leaf. Philip. Bot.* 7 (1914) 2327; MERR. *En. Philip.* 3 (1923) 223.

Erect, small, sparsely branched shrub, up to 1½ m. *Leaves* clustered at the ends of the branches; petiole to 25 cm, terete, base prolonged as a stipular ligule c. 1 cm long, and with c. 3 entire crests at the base; blade palmately 5-lobed, 24 cm long, base truncate or cordate, lobes reaching to within 3–6 cm from the base, elliptic, 4–6 cm wide, narrowed towards the broadly rounded sinuses, tapered to an acute apiculum, margin serrate in the upper part, the outer lobes with a lobule on the lower edge. *Inflorescence* a terminal compound umbel, 9 cm  $\varnothing$ , subtended by a few foliaceous bracts; peduncle stout, 2–3 cm, with furfuraceous, oblong bracts; primary branches crowded, numerous, 2½ cm, furfuraceous, flattened, striate with opposite minute bracts at the apex; central branch c. 3 mm, bearing an umbellule of sterile, bacciform flowers 3½ mm  $\varnothing$ , pedicels 4½ mm; lateral branches 3–3½ cm, articulated about the middle, terminating in an umbellule of c. 15 flowers, bracts

inconspicuous, fimbriate, pedicels  $1\frac{1}{2}$ –2 mm. *Calyx* an obsolete rim. Corolla and stamens not known. Ovary  $1\frac{1}{2}$ –2 mm, 4-celled, with a flat disk and a raised central stigmatic boss, 4-celled. *Fruit* 6 by 4 mm (dry) 4-ribbed; pyrenes crustaceous; endosperm rugose.

Distr. *Malesia*: Philippines (Mindanao).

Ecol. Damp fertile ground in dense forest, on south side of Baruring R., at 1000 m.

Vern. *Sarang-ka-mano*, Bag.

**27. *Osmoxylon pectinatum* (MERR.) PHILIPSON**, *Blumea* 23 (1976) 111. — *Boerlagiodendron pectinatum* MERR. Philip. J. Sc. 3 (1908) Bot. 253, 424; En. Philip. 3 (1923) 224; KANEHIRA, Form. Trees rev. ed. (1936) 520, f. 480; HUI-LIN LI, *Woody Fl. Taiwan* (1963) 666, f. 273.

Shrub or small glabrous tree up to 8 m. *Leaves* clustered at the ends of the branches; petiole to 18 cm, with a clasping base prolonged as a short acute stipular ligule, and with several basal crests fringed with 1–2 cm long bristles; blade to 25 cm  $\varnothing$ , base truncate to broadly cuneate, palmately 5–7-lobed, lobes reaching to about the middle of the lamina, sinuses narrow-rounded, lobes oblong-elliptic, usually slightly narrowed below, obtuse to acute, margin thickened, coarsely dentate, coriaceous. *Inflorescence* a terminal compound umbel; peduncle c. 1 cm, with small bracts (3 mm) below and among the primary rays; primary rays c. 25–35, c. 2–3 cm long, with opposite ovate caducous bracts at the apex, each terminating in three branches; central branch c. 8–11 mm long, ending in an involucre of minute bracts (1 mm) surrounding an umbellule of c. 15–20 ovoid sterile flowers (c. 3 mm long, 3-celled), pedicels 5–6 mm long; lateral branches c.  $2\frac{1}{2}$  cm long at anthesis, with an articulation about the middle, ending in an umbellule c. 1 cm  $\varnothing$  with minute fimbriate bracts; flowers c. 30, pedicels c.  $1\frac{1}{2}$  mm (elongating slightly in fruit). *Calyx* rim obsolete. Corolla lobes 4–5, tubular below, 2 mm long. Stamens 4–5. Ovary turbinate,  $1\frac{1}{2}$  mm long, 4–6-celled. *Fruits* globose, 5 by 5 mm (dry), 4–6-ribbed when dry.

Distr. Taiwan (Botel Tobago and Lutao I., east off Taiwan proper); in *Malesia*: N. Philippines (Batan I.).

Ecol. Forested slopes at 650 m.

Vern. *Narapan*, Iv.

**28. *Osmoxylon masarangense* PHILIPSON**, *Blumea* 23 (1976) 111.

Small tree, 5 m, the young parts setulose, becoming  $\pm$  glabrous. *Leaves* in terminal clusters; petiole c. 17 cm, rather narrow ( $1\frac{1}{2}$ –2 mm  $\varnothing$ ), channelled above, with a small clasping base, prolonged as a stipular ligule, 1– $1\frac{1}{2}$  cm long, setulose on the back, and with a number of long-setulose crests encircling the lower part of the petiole; blade c. 18 by 22 cm, deeply 3–5-lobed (or below the inflorescence sometimes simple), the

base truncate or emarginate, lobes oblong or elliptic, slightly narrowed to the broadly rounded sinuses, apex with a short apiculum, membranous, margin finely setulose-serrate, sinuses c. 6 cm from base of the blade. *Inflorescence* a terminal sum sessile compound umbel; primary rays c. 10, setulose,  $1\frac{3}{4}$ –2 cm long, each ray ending in three branches; central branch 4–5 mm long, ending in an umbellule, pedicels 6 mm, sterile flowers not known; two lateral branches 2– $2\frac{1}{2}$  cm long, 1 mm broad, with two bract scars about the middle but usually not opposite, terminating in an umbellule with c. 10 pedicels 3–5 mm long (in fruit). Flowers unknown. *Fruit* (when dry) ovoid, 6 by 4 mm, 5-seeded.

Distr. *Malesia*: N. Celebes (Minahasa, Tomohon, Mt Masarang).

Ecol. Secondary forest at edge of crater lake, at 1200 m.

Note. This species is similar in aspect to the Philippine 39. *O. trilobatum*, but the petiolar crests are distinctive.

**29. *Osmoxylon insidiator* BECC.** *Malesia* 1 (1878) 195; PHILIPSON, *Blumea* 23 (1976) 112. — *O. carpophagum* BECC. *Malesia* 1 (1878) 196. — *Eschweilera insidiatrix* (BECC.) BOERL. *Ann. Jard. Bot. Btzg* 6 (1886) 120. — *Eschweilera carpophagum* (BECC.) BOERL. *l.c.* 121, t. 15. — *Trevesia insidiator* (BECC.) O. K. *Rev. Gen. Pl.* 1 (1891) 272. — *Trevesia carpophagum* (BECC.) O. K. *l.c.* — *Boerlagiodendron insidiator* (BECC.) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 32. — *Boerlagiodendron carpophagum* (BECC.) HARMS, *l.c.* — *Boerlagiodendron pachycephalum* HARMS, *Nova Guinea* 8 (1910) 271.

Small tree to 12 m, young parts with uniform scurfy tomentum. Large *leaves* forming terminal crowns; petiole up to 80 cm, stout (1–2 cm  $\varnothing$ ), broadly channelled above, with a sheathing base prolonged as a strong stipular ligule c. 9 cm long, and with moderately developed irregular (not fimbriate) crests encircling the lower part of the petiole; blade up to 85 cm  $\varnothing$ , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, lobes in turn deeply lobed and incised, the median often digitately tripartite, apices long acuminate, margin irregularly and remotely serrate, subglabrous when mature or showing remnants of the tomentum. *Inflorescence* a terminal hemispherical compound umbel, c. 15 cm high by 30 cm wide; peduncle short, stout ( $1\frac{1}{2}$ –2 cm  $\varnothing$ ), with lanceolate bracts 4–6 cm long below and among the numerous (15–20) primary rays; primary rays 6–10 cm long, c. 5–12 mm wide, rigid, bearing 2 lanceolate bracts (2–3 cm long) at the apex, each ray ending in three branches; central branch c.  $1\frac{1}{2}$  cm long, bearing an umbel of c. 30 sterile bacciform flowers (c. 5–12 mm  $\varnothing$  when dry), the pseudo-fruits and their pedicels  $\pm$  rufous tomentose, pedicels 10–12 mm,

and 6-celled, surrounded by an involucre of short ovate bracts (3–8 mm long); two lateral branches c. 6 cm at anthesis, rigid, slightly flattened, to 8 mm broad, bearing a pair of bracts (c. 1½ cm long) about the middle, terminating in a subglobose head 3½–4 cm Ø of c. 30–40 sessile flowers, and surrounded by an involucre of ovate bracts c. 10–14 mm long. *Calyx* rim fimbriate. Petals irregularly 4–5-lobed, 7–8 mm long, connate below to form a fleshy tube, pubescent on the outer surface. Stamens c. 15–26, filaments strap-like, projecting beyond the corolla, anthers c. 4 mm long. Ovary shortly turbinate, 2–4 mm long, angled, furfuraceous, c. 13–25-celled; disk flat, with a central boss formed of the pustulate stigmas. *Fruits* in a compact spherical head, the individual drupes angled by mutual pressure, and bearing the persistent stigmas on the exposed face, c. 10–14 mm long, the numerous pyrenes compressed and flat; cartilaginous.

*Distr. Malesia:* throughout New Guinea, but local; also Waigeo I.

*Ecol.* Primary rain-forest and regrowths, frequently beside streams, from sea-level to 350 m.

*Vern. Angit, kangit, Waigeo, pennifogo, Orakawa, Papua.*

*Notes.* The bark is greyish brown, slightly fissured with many lenticels. The wood is soft and

white. The flowers are reddish-brown or purple, with orange-red filaments and the fruit purple.

BECCARI provided a detailed description of the living plant, and noted that the fruits are eaten by various species of pigeon.

*Boerlagiodendron pachycephalum* HARMS has very strongly developed umbels and leaves, but apart from size, it does not differ from this species. Since a range in stature is shown by the several gatherings now available, the whole is best regarded as a single species.

Similarly, the very short pedicels of *O. carpopagaram*, which BECCARI used to distinguish it from *O. insidiator*, can in fact be matched on several specimens of that species.

30. *Osmoxylon boerlagei* (WARB.) PHILIPSON, *Blumea* 23 (1976) 112. — *Eschweilera boerlagei* WARB. *Bot. Jahrb.* 13 (1891) 395. — *Boerlagiodendron warburgii* HARMS in *E. & P. Nat. Pfl. Fam.* 3, 8 (1894) 32, *nom. illeg. superfl.*; in *K. Sch. & Laut. Fl. Schutzgeb.* (1900) 484. — *Boerlagiodendron boerlagei* (WARB.) HARMS, *Bot. Jahrb.* 56 (1920) 382. — Fig. 15.

Small to fairly large tree, unbranched or sparingly branched, up to 24 m, glabrous, at least when mature. Large *leaves* forming terminal crowns; petiole up to 1 m, stout (1–2 cm Ø),



Fig. 15. *Osmoxylon boerlagei* (WARB.) PHILIPSON. Showing that each ray ends into a central umbel of bacciform flowers and two lateral umbels with normal flowers (Photogr. PHILIPSON, Kassam Pass, E. New Guinea, 1968).

broadly channelled above, with a sheathing, heavily lenticellate base prolonged as a strong stipular ligule up to 7 cm long, and with lacerate crests encircling the lower part of the petiole; blade up to 1.15 m  $\varnothing$ , with 5–7 strong ribs radiating from the top of the petiole, deeply lobed almost to the base of these ribs, lobes in turn deeply lobed and incised, the central lobes especially being strongly pinnatisect or digitately tripartite, apices acute, margin undulate or indistinctly serrate. *Inflorescence* terminal (or overtopped by a lateral leafy branch), a large compound umbel, bowl-shaped with a slightly convex top, up to 60 cm  $\varnothing$ ; peduncle c. 10 cm, stout, with lanceolate bracts below and among the very numerous radiating primary rays; outer primary rays c. 20 cm long at anthesis (elongating in fruit), inner rather shorter, woody, bearing two caducous bracts at the apex, each ray ending in three branches; central branch c. 4 cm, bearing an umbel of c. 20 sterile bacciform flowers (c. 8 mm  $\varnothing$  when dry) with rigid pedicels c. 1½ cm long, and 5–6-celled; two lateral branches c. 9 cm long at anthesis, articulated about the middle, terminating in a button-like head of c. 20–30 sessile flowers and surrounded by ovate bracts which soon fall leaving a bowl-shaped involucre, c. 1½ cm  $\varnothing$ . *Calyx* rim obsolete. *Petals* c. 13, bud flat-topped, angled, minutely pubescent, apparently falling as a calyptra. *Stamens* 8–13. *Ovary* shortly turbinate, angled, glabrous, 10–14-celled; disk flat, with a central double row (or ellipse) of pustulate stigmas. *Fruits* spreading to form a  $\pm$  spherical head obscuring the involucre, each c. 9 by 7 mm (when dry) with prominent persistent stigmas.

*Distr. Malesia:* throughout New Guinea.

*Ecol.* Primary forest, and secondary growths on old cultivations, from near sea-level to 1800 m.

*Vern. Eunya*, Gimi, *apiatambay*, Washkuk, *ma-korr-korr*, Jal, *teresahui*, Manikiong.

*Note.* Bark yellow grey with shallow fissures and many pale corky pustules; wood straw-coloured, fibrous. The large terminal inflorescence is shallowly convex on top and is surrounded by several large leaves. Flowers reddish brown. Fruit purplish black and succulent.

**31. *Osmoxylon sessiliflorum* (LAUT.) PHILIPSON**, *Blumea* 23 (1976) 113. — *Boerlagiodendron sessiliflorum* LAUT. *Nova Guinea* 8 (1910) 272.

Small tree, up to 18 m, glabrous when mature, or tomentum persistent on the inflorescence. *Leaves* crowded at the ends of the branches; petiole to 60 cm, with the clasping base prolonged as a stipular ligule up to 6 cm long, and with few to several strong or weak crests around the base of the petiole, margin undulate or fimbriate; blade to 50 cm long, base cordate, palmately 5–9-lobed, lobes extending to near the base, elliptic, coarsely serrate, often irregularly lobulate, apex acute, sinuses rounded. *Inflorescence* a terminal compound umbel;

peduncle to c. 4 cm, bearing lanceolate bracts to 2½ cm long, caducous or persistent, occasionally with some bristles on the back, primary rays c. 20–30, c. 9 cm long,  $\pm$  pubescent, bearing opposite caducous or rarely persistent bracts at the apex; central branch variable in length (2–18 mm), bearing an umbellule or head 1–2½ cm  $\varnothing$  of sterile bacciform flowers (4–5 mm  $\varnothing$ ), 4–8-celled, subtended by minute bracts, pedicels variable in length (5–18 mm); lateral branches 3–7 cm, articulated near the middle, terminating in a globose head of c. 20–30 sessile flowers (or pedicels 1½ mm long), bracts between the flowers very small. *Calyx* rim obsolete. *Corolla* few- to many-lobed, tubular below, 1½–4 mm long in bud. *Stamens* 6–17. *Ovary* 5–18-celled. *Fruit* a globose head of drupes; drupes c. 10 by 6 mm, obovoid, ribbed when dry.

*Distr. Malesia:* throughout New Guinea.

*Ecol.* Rain-forest, especially along the muddy banks of rivers, from sea-level to 100 m.

*Vern. Akriek*, Biak, *korinki*, Orne, *kwita-kwita*, Milne Bay, *sapi-ai*, Jense, *terrasahui*, Manikiong.

*Notes.* Unbranched or sparsely branched with crowns of large leaves. The bark is light brown and the wood cream. The inflorescence branches are purple, the flowers red, and the succulent ripe fruits black.

The variation in the numbers of floral parts is considerable. Most specimens have more than 10 stamens and the same number of cells in the ovary, or more. Three gatherings have from 5–7 stamens and cells. These may possibly require to be segregated as a distinct species, but other evidence to support this course is lacking. An even more distinctive gathering has central branches to 3 cm long with the pseudo-fruits on short pedicels (less than 5 mm) and flowers with 17 stamens and 25 cells in the ovary. These characters have not been included in the specific description as this specimen is only very tentatively referred to this species.

This species forms an eastward extension of a complex of species, represented in the Moluccas by 37. *O. talaudense*, 17. *O. soelaense* and 18. *O. globulare*. Several similar species occur in the Philippines. They are characterized by dense spherical heads of flowers.

*Osmoxylon talaudense* resembles some specimens of *O. sessiliflorum* rather closely, and the difficulty of preserving the characters of these large-leaved plants in an herbarium probably obscures several good diagnostic features. The most reliable character to distinguish these two species is the position of the articulation on the lateral branches of the inflorescence rays. In specimens from the Talaud Is. this is close to the base (below the apex of the central umbellule of pseudo-fruits) and the bracts are persistent, whereas in the New Guinea material it is near (or above) the middle, and is usually marked by two inconspicuous scars which frequently are not opposite. In both species the pseudo-fruits are pedicelled, whereas in the other

two Moluccan species the pseudo-fruits are sessile or subsessile forming spherical heads. In *O. globulare* (from Morotai and Halmahera) the lateral branches are rigid and only slightly flattened with the articulation near the middle and the bracts caducous. In *O. soelaense* the articulation is much nearer the base, the bracts are persistent, and the branches are broader and much flattened.

**32. *Osmoxylon camiguinense* (MERR.) PHILIPSON, Blumea 23 (1976) 113. — *Boerlagiodendron camiguinense* MERR. Philip. J. Sc. 3 (1908) Bot. 252; En. Philip. 3 (1923) 222.**

Shrub to 2 m, glabrous except for the inflorescence. *Leaves* clustered at the ends of the branches; petiole to 18 cm, with a sheathing base prolonged as a stipular ligule 1 cm long, and with several entire crests encircling the lower part of the petiole; blade 20 by 22 cm, base truncate, 3–5-lobed to about the middle, lobes oblong, scarcely narrowed towards the base, apex acuminate, sinuses broad, rounded, margin dentate, coriaceous. *Inflorescence* a terminal compound umbel; primary rays *c.* 2–2½ cm, pubescent with opposite lanceolate bracts (*c.* 12 mm long) at the apex; central branch *c.* 4 mm long, bearing a globose umbellule (*c.* 12 mm  $\varnothing$ ) of sterile bacciform flowers (*c.* 2 mm  $\varnothing$ ), pedicels *c.* 3 mm, subtended by numerous ligulate bracts; lateral branches *c.* 3 cm long, with opposite lanceolate bracts 4 mm long, ending in a head of *c.* 20–30 sessile flowers. Corolla and stamens not seen, described by MERRILL as 3-merous. *Fruit* globose 6 mm  $\varnothing$  (dry), 3-seeded.

Distr. *Malesia*: Philippines (Babuyan Is.: Camiguin I.).

Ecol. On slopes in forest, at 500 m.

**33. *Osmoxylon fenicis* (MERR.) PHILIPSON, Blumea 23 (1976) 114. — *Boerlagiodendron fenicis* MERR. Philip. J. Sc. 13 (1918) Bot. 44; En. Philip. 3 (1923) 223. — *Boerlagiodendron tayabense* MERR. Philip. J. Sc. 13 (1918) Bot. 45; En. Philip. 3 (1923) 224.**

Erect shrub or treelet a few m high, glabrous except for the inflorescence. *Petiole* to 45 cm, clasping base prolonged as a broad stipular ligule, 1½–3 cm long, several prominent long pectinate petiolar crests extending up the petiole as oblique groups of bristles; blade to 30 cm long, base cordate or truncate, deeply palmately 3–7-lobed, lobes extending to within *c.* 7 cm of the base, broadly elliptic to oblong, entire or with subsidiary lobes, somewhat narrowed towards the sinuses, apex abruptly apiculate, margin remotely denticulate or serrate, sinuses very broadly rounded. *Inflorescence* a terminal, compound, furfuraceous umbel, hemispherical, *c.* 10–12 cm  $\varnothing$ ; peduncle 2–3 cm, densely enclosed in broadly ovate bracts *c.* 2 cm long, bearing dense fascicles of strong bristles on their blades; primary rays 15–30, *c.* 2½–3 cm long, 2½ mm wide, pubescent, subtended by large bristly bracts *c.* 1½ cm long,

bearing opposite terminal usually bristly bracts 6–15 mm long, each ending in 3 branches; central branch *c.* 4–10 mm, pubescent, bearing a terminal umbellule of *c.* 10–20 sterile bacciform flowers 2–3 mm  $\varnothing$ , 2-celled, pedicels 3–4 mm tomentose sometimes with a ruff of hairs around the pseudo-fruits, subtended by early-caducous small fimbriate bracts; lateral branches 2½–3 cm long, with two opposite bracts (2–3 mm) about the middle, bearing a terminal head (8 mm  $\varnothing$  without corollas) of *c.* 15–30 sessile flowers, subtended by inconspicuous ovate tomentose bracts. *Calyx* an obsolete rim. Corolla in bud *c.* 1 mm long. Stamens 3. Ovary 3-celled. *Fruiting head* 10–12 mm  $\varnothing$ ; drupes *c.* 6 mm long, crowded, sessile, 3-angled; seeds 3.

Distr. *Malesia*: Philippines (Luzon).

Ecol. In primary dipterocarp forest, on rocky slopes near streams, 300–400 m.

Note. Closely allied to 40. *O. luzoniense* and 27. *O. pectinatum*, but the combination of long-fringed petiolar crests, pubescent inflorescence branches, excessively bristly bracts and 3-merous flowers is distinctive.

**34. *Osmoxylon eminens* (BULL) PHILIPSON, Blumea 23 (1976) 114. — *Trevesia eminens* BULL, Cat. New Plants (1884) 17; Retail List (1885) 64, fig. — *Boerlagiodendron mindanaense* MERR. Philip. J. Sc. 3 (1908) Bot. 154. — *Boerlagiodendron eminens* (BULL) MERR. En. Philip. 3 (1923) 223.**

Small tree, up to 10 m, with few stout branches. *Leaves* large, forming terminal crowns, glabrous when mature, young inflorescence densely furfuraceous; petiole to 1 m, stout (to 2 cm  $\varnothing$ ), flattened above, base clasping the stem, heavily lenticellate, prolonged as a stipular ligule 2 cm long, bicuspid, often with scales or bristles on the back, and bearing few to several entire, fimbriate or occasionally long setose crests; blade to 60 cm long, palmately 10–19-lobed, base cordate, lobes reaching to near the base, lanceolate to oblong, up to 15 cm wide, in outline either strap-shaped or irregularly pinnatisect, or the central lobe occasionally distinctly tripartite, margin coarsely and irregularly dentate, apex acuminate. *Inflorescence* a terminal compound umbel *c.* 40 cm  $\varnothing$ ; peduncle stout *c.* 6 cm, 1½ cm wide, bearing many lanceolate scaly bracts 3–6 cm long; primary rays numerous, rigid, flattened, 9–12 cm long, 6–10 mm broad, bearing opposite oblong scaly bracts (2–3 cm long) at the apex, each ending in three branches; central branch ½–1 cm long, terminating in an umbellule (3–5 cm  $\varnothing$ ) of *c.* 20–40 sterile bacciform flowers, 7 mm  $\varnothing$ , 2–3-celled, pedicels 1–2 cm long, surrounded by an involucre of small bracts (to 8 mm long); lateral branches *c.* 12 cm long, with opposite bracts (6–10 mm long) near the middle, terminating in a head of *c.* 50–60 sessile flowers, 1½–2 cm  $\varnothing$  (with corollas), heads spherical at anthesis, ovoid after corollas absciss;



bracts between the flowers very small. *Calyx* rim obsolete. Corolla 5–6-lobed, tubular below, 4–5 mm long. Stamens 4–6, filaments 7 mm long, anthers  $1\frac{1}{2}$  mm long. Ovary 2–3 mm long (at anthesis), 5–6-celled. *Fruits* crowded in dense ovoid heads 3–4 by  $2\frac{1}{2}$ –3 cm, drupes c. 9 by 5 mm, 5–6-angled by mutual pressure, narrowed to the base, crowned by the persistent stigmatic boss; pyrenes crustaceous; endosperm wrinkled.

Distr. Micronesia: Carolines; in *Malesia*: throughout the Philippines.

Ecol. In primary forest from low altitude (100 m) to ridge forest and mossy forest at 950 m, often in shady ravines.

Vern. Cf. MERRILL: *apalong* or *apulong*, Bis., *bunglui-babde*, *piña-piña*, Sul., *mangunpulun*, Bag., *palad-uloi*, S.L.Bis., *ulo-ulo*, C.Bis.; in addition: *lobongan*, Lan.

Notes. This is the most widespread and most frequently collected species in the Philippines. It is also the most striking. Its large, many-lobed, fan-shaped leaves and the strong inflorescences, with globular flower-heads and large clusters of pseudo-fruits are distinctive. Only 16. *O. pulcherrimum* resembles it somewhat in its leaf characters, but the central branches of the inflorescence rays of that species are much longer and its pseudo-fruits are sessile.

The inflorescence branches are described as dull reddish brown, the flowers as light orange, and the fruits as indigo-black.

35. *Osmoxylon serratifolium* (ELMER) PHILIPSON, *Blumea* 23 (1976) 114. — *Boerlagiodendron serratifolium* ELMER, *Leaf. Philip. Bot.* 2 (1908) 505; MERR. *En. Philip.* 3 (1923) 224.

Sparingly branched shrub to 5 m. *Petiole* to 50 cm long, channelled above, clasping base prolonged as an obtuse stipular ligule, and with few narrow  $\pm$  fimbriate crests around the base of the petiole; blade to 50 cm long, base cordate, palmately lobed (up to 11 lobes), lobes extending to within about  $\frac{1}{3}$  from the base, narrowly elliptic, margin serrate (or slightly lobulate), apex acuminate, sinuses narrowly rounded. *Inflorescence* a terminal compound umbel c. 30 cm  $\varnothing$ ; peduncle stout, bracteate; primary rays 20–30, 4–5 cm long, 5–6 mm wide, flattened, subtended by lanceolate bracts 3–5 cm long, sometimes with bristles on the back, and bearing similar opposite terminal bracts  $2\frac{1}{2}$  cm long, each terminating in three branches; central branch 12–15 mm long, terminating in an umbellule (3–4 cm  $\varnothing$ ) of c. 20–25 sterile bacciform flowers 5–6 mm  $\varnothing$ , 3–4-celled, pedicels to 10 mm, interspersed with persistent small bracts; lateral branches c. 9 cm long, with opposite bracts (c. 6 mm long) 2–3 cm from the base, terminating in a spherical head of c. 30 sessile flowers c.  $1\frac{1}{2}$  cm  $\varnothing$  (in bud), bracts between the flowers very small, obtuse, fimbriate. *Calyx* rim obsolete. Corolla 5–7-lobed above, tubular below, 5 mm long.

Stamens 5–6, exserted, filaments 7 mm long, anthers 2 mm long. Ovary 3 mm long, 5-celled. Fruit unknown.

Distr. *Malesia*: Philippines (Leyte, Camiguin, Panay).

Ecol. ELMER noted that this species was rare in the low hills of Leyte.

Notes. The flowers are orange-yellow (salmon), the fruits dark purple.

The inflorescence is very similar to that of 34. *O. eminens*, but the leaves lack the many strong fan-like ribs of that species.

36. *Osmoxylon celebicum* PHILIPSON, *Blumea* 23 (1976) 115. — *Boerlagiodendron celebicum* HARMS ex KOORD. *Minah.* (1898) 489, *nomen*.

A small, sparsely branched tree, 6 m high. Large leaves forming terminal crowns; petiole 50 cm by 8 mm, flattened above, with a sheathing base prolonged as a strong stipular ligule 3 cm long with branched fibrous setae on the outer surface, and with several crests bearing similar setae on the lower part of the petiole; blade 50 cm  $\varnothing$ , base emarginate, deeply 9-lobed, lobes narrowly elliptic to lanceolate, narrowed towards the sinuses, apex broadly cuneate, margin minutely and remotely serrate, sinuses broadly rounded. *Inflorescence* a terminal compound subspherical umbel c. 20 cm  $\varnothing$ ; peduncle short, stout (15 mm wide) with large setose bracts (c. 4 cm long) below and among the primary rays; primary rays c. 15, c. 6 cm long, 5 mm broad, with a pair of large setose bracts (22 by 10 mm) at the apex, each ending in three branches; central branch c. 6 by 2 mm, terminating in an involucre of setose ovate bracts (c. 4 mm long) and an umbel of c. 20–30 sterile bacciform flowers (c. 3 mm  $\varnothing$  when dry, 2–3-celled, on pedicels 6–10 mm long) interspersed with bracts covered with crisp reddish-brown setulae; the two lateral branches c. 2 cm long, with opposite setulose bracts (c. 1 cm long) below the middle, terminating in a spherical head of c. 30–40 sessile flowers each subtended by a reddish brown setulose cymbiform bract. *Calyx* rim obsolete. Corolla c.  $2\frac{1}{2}$  mm long in bud (not seen in open condition). Stamens 5. Ovary subcylindrical, c. 1 mm long in bud, 5-celled; disk with a central stigmatic boss. Fruit unknown.

Distr. *Malesia*: Celebes (Minahasa, Manado).

Ecol. On rich volcanic sand, at 10 m.

Vern. *Sinomaha*.

Note. The flower buds are orange and the fruits deep purple.

37. *Osmoxylon talaudense* PHILIPSON, *Blumea* 23 (1976) 115.

Shrub or small tree, to 6 m, glabrous. *Leaves* at the ends of the stout branches; petiole to 60 cm, broadly channelled above, clasping base prolonged as a stipular ligule c. 2 cm long, and bearing 2–3 fimbriate crests; blade c. 50 cm long truncate to cordate at the base, palmately 7–11-lobed to within

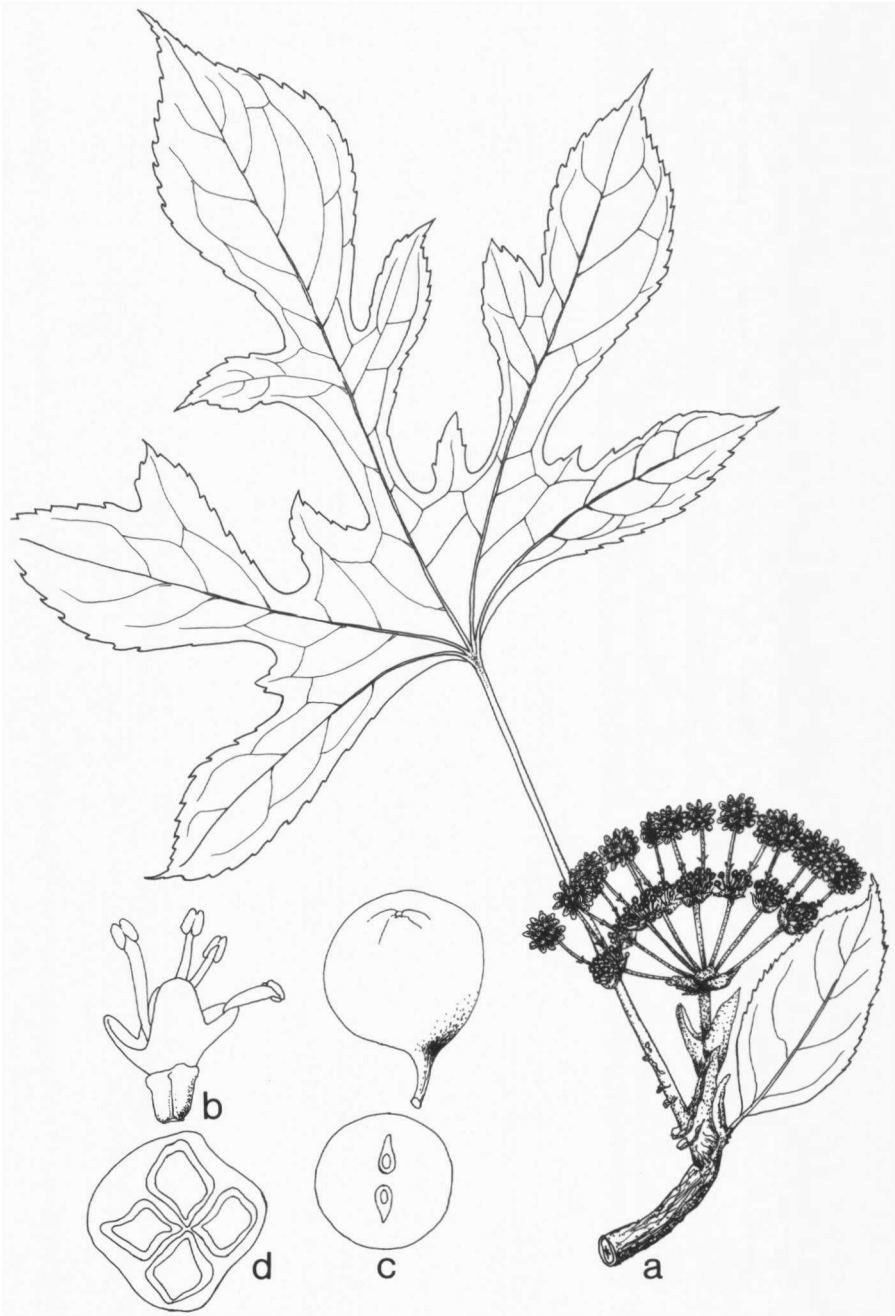


Fig. 16. *Osmoxylon micranthum* (HARMS) PHILIPSON. *a.* Habit,  $\times \frac{1}{2}$ , *b.* flower, *c.* false fruit and *ditto* in CS,  $\times 15$ , *d.* CS of fruit,  $\times 6$  (*a-c* KANIS 1384, *d* PULLEN 428). Drawn by W. R. PHILIPSON.

±  $\frac{1}{4}$  of the base, lobes elliptic oblong slightly narrowed towards the rounded sinuses, apiculate, margin denticulate to undulate. *Inflorescence* a terminal compound umbel, peduncle 1–2 cm, bearing broad ovate bracts 2–3 cm long, with bristles on the back, (similar persistent bracts subtend the primary rays); primary rays c. 15, c. 3–4 cm long, 4 mm wide, flattened, bearing opposite terminal persistent bracts  $1\frac{1}{2}$ –2 cm long, sometimes with a few bristles on the back, ending in three branches; central branch 8–10 mm long, terminating in an umbellule 2 cm  $\varnothing$  of 15–20 sterile bacciform flowers (4 mm  $\varnothing$ , 2-celled) surrounded by an involucre of obtuse bracts 1–2 mm long, pedicels 5–7 mm; lateral branches  $4\frac{1}{2}$ –5 cm long, bearing opposite ovate persistent bracts (3–7 mm long) c. 5–10 mm above the base, terminating in a dense head c. 1 cm  $\varnothing$  of 30–40 sessile flowers interspersed with inconspicuous obtuse bracts. *Calyx* rim obsolete. *Corolla* 5-lobed. *Stamens* 5. *Ovary* turbinate,  $1\frac{1}{4}$  mm long, 5-celled. *Fruit* in spherical heads 2 cm  $\varnothing$  (when dry); drupes c. 9 by 6 mm, obovoid, 5-ribbed.

*Distr. Malasia:* N. Moluccas (Talaud Is.: Kerekelong and Salebabu).

*Ecol.* Common in forest, besides streams, from near sea-level to 100 m.

*Vern. Laripatu,* Talaud.

*Note.* The flower is yellow-orange and the fruit dark purple. For a discussion of the distinctive features, see under 31. *O. sessiliflorum*.

38. *Osmoxylon micranthum* (HARMS) PHILIPSON, *Blumea* 23 (1976) 115. — *Boerlagiodendron micranthum* HARMS, *Bot. Jahrb.* 56 (1920) 379. — *Boerlagiodendron sayeri* HARMS, *l.c.* 379, f. 1 a–j. — *Eschweilera gawadensis* BAKER f. *J. Bot.* 61 (1923) 22. — *Boerlagiodendron tricolor* PHILIPSON, *Bull. Br. Mus. Nat. Hist. Bot.* 1 (1951) 11. — *Fig. 16.*

A sparsely branched shrub to 8 m, sometimes trailing or semi-scandent, young parts uniformly setulose, buds without cataphylls. *Leaves* in terminal clusters; petiole up to 30 cm, rather narrow (2–4 mm  $\varnothing$ ), becoming sparsely setulose, channelled above, with a sheathing base prolonged as a membranous stipular ligule up to 3 cm long, and with a number of lacerate crests encircling the lower part of the petiole; blade deeply 3–5- or more rarely 7-lobed, or below the inflorescence sometimes simple, base cordate or emarginate, the central lobe up to 30 cm long, the lobes oblong, lanceolate or broadly elliptic, entire or irregularly lobed or incised, or with small sub-lobes, apices long cuspidate, acute, margin serrate, sinuses between the lobes broad and rounded, surfaces become sparsely setulose to subglabrous. *Inflorescence* a terminal compound umbel, often appearing subterminal by growth of a leafy branch at the base of the peduncle; peduncle short (1–2 cm), heavily setulose, occasionally with a flowering ray arising from the axils of bracts on or below the

peduncle, bearing distally many lanceolate bracts 5–10 mm long; primary rays 12–18, 10–20 mm long, setulose, with two lanceolate bracts at the apex, each ray ending in three branches; the central branch very short (2–3 mm) bearing a subglobose umbel of many (c. 40) small sterile bacciform flowers (c.  $1\frac{1}{2}$  by 1 mm) with filamentous pedicels c. 2 mm long, and 1–2 cells each with 1 abortive ovule; the two lateral branches c. 2 cm long, with two minute bracts about their middle, setulose, terminating in a head of c. 20 sessile flowers surrounded by an involucre of small rounded bracts. *Calyx* rim obsolete. *Corolla* 4(–5)-lobed, united below, c. 2 mm long. *Stamens* 4(–5), filaments ribbon-like elongating beyond the corolla tube at anthesis, 3–4 mm, anthers small. *Ovary* shortly subcylindric, c. 1 mm high, faintly angled, glabrous, 1–5-, usually 4-celled, disk fleshy, rising slightly to the central stigmas. *Fruit* an ellipsoid drupe with 1–5 cartilaginous pyrenes; seeds with smooth endosperm.

*Distr. Malasia:* New Guinea (Irian Jaya: Idenburg R. to Milne Bay Distr.).

*Ecol.* In primary forest from the foothills to the montane mossy forest, often in swampy or deeply shaded situations, 700–2400 m.

*Vern. Diande,* Chimbu, *kenata,* Okapa.

*Note.* The inflorescence branches are often red or purple, and the flowers either orange or reddish with yellow anthers. The ripe fruits are deep purple or black. The shape and size of the leaf can vary greatly, even on the same plant. The ovary usually has 4 cells, but plants with 3, 2 and 1 occur. Since these are alike in other respects they have been treated as a single species. Although the type of *Boerlagiodendron tricolor* has an ovary with 5 cells and is from much further west than other gatherings, it is not considered to be specifically distinct.

39. *Osmoxylon trilobatum* (MERR.) PHILIPSON, *Blumea* 23 (1976) 116. — *O. cumingii* SEEM. *J. Bot.* 6 (1868) 141, *nomen.* — *Boerlagiodendron trilobatum* MERR. *Philip. J. Sc.* 2 (1907) Bot. 289; *En. Philip.* 3 (1923) 224.

Slender shrub or small tree up to 5 m, becoming glabrous except for slight pubescence on the inflorescence. *Leaves* clustered near the ends of the branches; petioles to 25 cm, c. 3 mm wide, clasping base prolonged as a broad stipular ligule c. 1 cm long, and with 2–3 entire, or obscurely fimbriate, often recurved crests surrounding the base of the petiole; blade 3- or occasionally 5-lobed (leaves below the inflorescence sometimes simple), to 30 by 28 cm, base broadly cuneate, rounded or truncate (emarginate in 5-lobed leaves), lobes about  $\frac{1}{2}$ – $\frac{2}{3}$  of the blade, narrowly or broadly oblong, often slightly narrowed below and sharply acuminate to caudate, margin serrate. *Inflorescence* a terminal compound spherical umbel, 7–15 cm  $\varnothing$ , either rather compact or branches lax; peduncle 2–3 cm with broad ovate bracts; primary rays 8–20

or more, slightly pubescent,  $1\frac{1}{2}$ -4 cm long, subtended by ovate bracts 5-10 mm long, opposite ovate bracts at the apex, 1-3 mm long; central branch  $1\frac{1}{2}$ -6 mm long, pubescent, bearing an umbel ( $1\frac{1}{2}$  cm  $\varnothing$ ) of sterile bacciform flowers up to 5 mm  $\varnothing$ , 1-4-celled, pedicels 2-6 mm long, subtended by ovate bracts 1-3 mm long; lateral branches  $1\frac{1}{2}$ -3 cm with opposite small bracts about the middle, bearing a terminal head, c. 1 cm  $\varnothing$  of c. 8-20 flowers, surrounded by an involucre of small rounded pubescent bracts, pedicels c. 1 mm or less (up to 3 mm in fruit). *Calyx* rim obsolete. Corolla 4-5-lobed above, tubular below, 2-3 mm long. Stamens 4-5, exserted. Ovary subcylindric, 4-5-celled. Fruit a spherical drupe (when dry 4-5-ribbed, 7 by 5 mm).

Distr. *Malesia*: widespread in the Philippines (Luzon to Mindanao).

Ecol. In primary forest, frequently beside streams in damp ravines, from the lowland at 75 m to 750 m.

Vern. *Kamay-kamay*, Tag., *ayum*, C.Bis.

Note. Sparingly branched but wide-spreading slender shrub, with yellowish bark, at first heavily dotted with brown lenticels. The flowers are white and the ripe fruit smooth and purple.

40. *Osmoxylon luzoniense* (MERR.) PHILIPSON, *Blumea* 23 (1976) 116. — *Boerlagiodendron luzoniense* MERR. *Philip. J. Sc.* 3 (1908) Bot. 252; *En. Philip.* 3 (1923) 223. — *Boerlagiodendron clementis* MERR. *Philip. J. Sc.* 3 (1908) Bot. 155; *En. Philip.* 3 (1923) 222. — *Boerlagiodendron agusanense* ELMER, *Leaflet. Philip. Bot.* 7 (1914) 2330; MERR. *En. Philip.* 3 (1923) 222. — *Boerlagiodendron diversifolium* MERR. *Philip. J. Sc.* 10 (1915) Bot. 333; *En. Philip.* 3 (1923) 223.

Erect, unbranched or sparsely branched shrub or tree to 8 m, becoming glabrous except for the inflorescence. *Leaves* clustered at the ends of the branches; petiole to 40 cm, with a clasping base prolonged as a short stipular ligule, and with several basal entire or shortly fimbriate crests; blade to 33 cm  $\varnothing$ , base truncate or cordate, deeply palmately 3-7-lobed, sinuses broad, rounded, lobes elliptic, usually narrowed below, entire or with subsidiary lobes (the central lobe especially often narrow below and strongly pinnately lobed), apex acute, margin coarsely serrate, coriaceous; uppermost leaves often reduced and simple. *Inflorescence* a terminal compound, subsessile umbel 10-15 cm  $\varnothing$ ; primary rays c. 20-30, 2-3 cm long, subtended by lanceolate furfuraceous and  $\pm$  fimbriate bracts, furfuraceous villose or  $\pm$  hirsute, with opposite rounded or lanceolate hirsute bracts at the apex, each ending in three branches; central branch c. 2-8 mm long, hirsute, ending in an involucre of minute bracts (1 mm) surrounding a globose (2 cm  $\varnothing$ ) umbellule of c. 15-20 sterile flowers (c. 6 by 6 mm, 2-3-celled), pedicels 2-3 mm, hirsute; lateral branches c.  $2\frac{1}{2}$ - $3\frac{1}{2}$  cm long at anthesis,

with an articulation about the middle,  $\pm$  hirsute, ending in a globose head, 2 cm  $\varnothing$  (with open corollas), with ovate tomentose obtuse bracts, c. 2 mm long; flowers 30-40,  $\pm$  sessile (rarely pedicels to 2 mm). *Calyx* rim obsolete. Corolla 4-5-lobed above, tubular below,  $3\frac{1}{2}$ -4 mm long. Stamens 4-5, exserted, filament stout, 5 mm, anther 1 mm long. Ovary 4-5-celled. *Fruit* 6 by 5 mm (dry), strongly 4-5-ribbed.

Distr. *Malesia*: widespread in the Philippines (Luzon to Mindanao), also in N. Celebes.

Ecol. In forests, often by streams and on ridge in mossy forest, 280-1650 m.

Vern. Philippines: *bolwang hi inalahan*, If., *iyangnok*, Mbo, *malakapayas*, S.L.Bis., *molonpolon*, Buk., *tañgan-tañgan-batu*, Buk., *tachung*, *vañgang*, Ig.

Notes. Inflorescence yellow to red (salmon), fruits blue-black or purple.

MERRILL did not liken his *Boerlagiodendron diversifolium* (from Mindanao) to this species, no doubt because he gave importance to the occurrence of variable leaves and the 5-merous flowers. However, specimens from Luzon may possess simple leaves below the umbel, and both 4- and 5-merous flowers occur in both Luzon and Mindanao. The greater range of material now available establishes the identity of the two species. Similarly, no features seem to distinguish *Boerlagiodendron clementis*, and *B. agusanense* though a greater range of collections would be desirable.

The species is treated here in a broad sense. The inflorescence characters of most specimens are uniform, being hirsute and with the bracts at the apex of the primary rays obtuse and short. Some specimens (CURRAN 5088, ELMER 16762) have longer lanceolate bracts with some bristles on the back. The northernmost specimen, from Ilocos Norte, has finer and less hairy inflorescence rays (recalling 39. *O. trilobatum*), but the foliage agrees with this species. Leaf-shape is more variable, even on the same specimen. Other species which resemble *O. luzoniense* in some respects are: 32. *O. camiguinense* with broader, shallower lobing, a more delicate inflorescence, and tri-merous flowers; 27. *O. pectinatum* with glabrous inflorescence branches and long-pectinate petiolar crests; and 26. *O. humile* with pedicelled flowers forming less dense heads.

A specimen from Surigao Province (BS 83562) has a most interesting abnormal structure. The central branches of the inflorescence rays bear heads of apparently fertile flowers, with lobed corollas and exserted stamens.

41. *Osmoxylon insigne* (MIQ.) BECC. *Malesia* 1 (1878) 195; PHILIPSON, *Blumea* 23 (1976) 117. — *Trevesia insignis* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 222. — *Trevesia palmata* var. *insignis* CLARKE, *Fl. Br. Ind.* 2 (1879) 732, *pro nomen*. — *Eschweilera insignis* (MIQ.) BOERL. *Ann. Jard. Bot.*

Btzig 6 (1887) 122. — *Boerlagiodendron insigne* (Miq.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 31.

A glabrous tree. *Leaves* large, palmately lobed; petiole to 45 cm, 8–10 mm wide, flattened above, with a sheathing base prolonged as a stipular ligule, numerous fimbriate crests around the base of the petiole, and irregular tufts of bristles along the whole length of the petiole; blade to 55 cm  $\varnothing$ , deeply 5–7-lobed, the sinuses broadly rounded and c. 4–5 cm from the base of the blade, lobes pinnatifid, with a narrow base and an attenuated apex, margins serrate. *Inflorescence* a terminal compound umbel c. 16 cm  $\varnothing$ ; peduncle stout, with lanceolate bracts ( $1\frac{1}{2}$ –2 cm long) subtending the primary rays; primary rays 25–30, c. 4 cm long, bearing 2 caducous lanceolate bracts (c. 1 cm long) at the apex, each ray ending in 3 branches; central branch c. 12–16 mm long, bearing an umbel (c. 2 cm  $\varnothing$ ) of c. 20 sterile ovoid bacciform flowers (c. 4 mm long when dry) with pedicels c. 4–6 mm long, and 3-celled; two lateral branches c.  $3\frac{1}{2}$  cm long, with an articulation about the middle, terminating in an umbellule (c. 2 cm  $\varnothing$ ) of c. 10–15 flowers on short stout pedicels c. 2 mm long, umbellules surrounded by a receptacular rim after caducous bracts have abscised. *Calyx* rim minute. *Petals* c.  $3\frac{1}{4}$  mm long in bud (when dry), with 8–9 lobes above, tubular below. *Stamens* 8–9, with stout filaments. *Ovary* cylindrical, 8–9-celled; disk with a central double row of pustulate stigmas. *Fruit* unknown.

Distr. *Malesia*: Moluccas (Batjan).

Note. Tufts of bristles along the entire length of

the petiole together with the pinnatifid lobes of the leaf are distinctive. SEEMANN (J. Bot. 4, 1866, 353) referred to 5-flowered umbels with 5-angled drupes, but this probably relates to the New Guinea specimen which he included under this name.

#### Insufficiently known

*Boerlagiodendron ledermannii* HARMS, Bot. Jahrb. 56 (1920) 383; PHILIPSON, Blumea 23 (1976) 117. — Type: LEDERMANN 12293.

HARMS compared this species with *Boerlagiodendron geelvinkianum*. The size of the foliage and flowers prevents it from being included within that species. If it represents a local species, it has not been re-collected since the original gathering of LEDERMANN in 1912. The type specimen, which was incomplete, was destroyed during the war.

*Boerlagiodendron monticola* HARMS in K. Sch. & Laut. Fl. Schutzgeb. Nachtr. (1905) 330; PHILIPSON, Blumea 23 (1976) 117. — Type: SCHLECHTER 14471.

The incomplete type specimen, gathered by SCHLECHTER, was destroyed during the war. This species was evidently similar to 38. *Osmoxylon micranthum*, but the ovary was possibly 10-celled. I have tentatively identified ROBBINS 1644 as this species: it is close to *O. micranthum* but its ovary, with 8 cells, is outside the range of variation of that species and the pedicels are longer (in fruit). Its distribution (foothills of Adalbert Range) is not dissimilar to that of *Boerlagiodendron monticola* (Torricelli Mts).

### 8. ARTHROPHYLLUM

BL. Bijdr. (1826) 878; DC. Prod. 4 (1830) 266; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27; BTH. in B. & H. Gen. Pl. 1 (1865) 944; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 54; KOORD. Atlas 4 (1916) f. 675 & 676; HUTCH. Gen. Fl. Pl. 2 (1967) 80; STONE, Gard. Bull. Sing. 30 (1977) 276; PHILIPSON, l.c. 299, f. 1–16; *Adansonia* 17 (1978) 329. — *Mormorphis* JACK ex WALL. Cat. (1831) n. 4931, *nomen*. — *Eremopanax* BALL. *Adansonia* 12 (1878) 158. — Fig. 17, 19–23.

Unarmed, sparingly branched trees or shrubs. *Leaves* on vegetative shoots and lower leaves spirally arranged, imparipinnate, often crowded at the end of the branches, those on flowering branches often opposite, smaller, or reduced to a single leaflet; petiole terete; rachis articulated at the insertion of the pinnae and leaflets; leaflets entire; stipular sheath clasping, small, ligule a mere rim. *Inflorescence* consisting of compound umbels, either solitary and terminal or more commonly borne on a cluster of specialized leafy branches arising from the axils of the uppermost leaves; pedicels not articulated. *Flowers* bisexual. *Calyx* an undulate rim, sometimes with indistinct teeth, persistent. *Petals* 4–6, valvate in bud. *Stamens* 4–6, anthers curved, basifixed. *Ovary* turbinate, 1-celled; disk

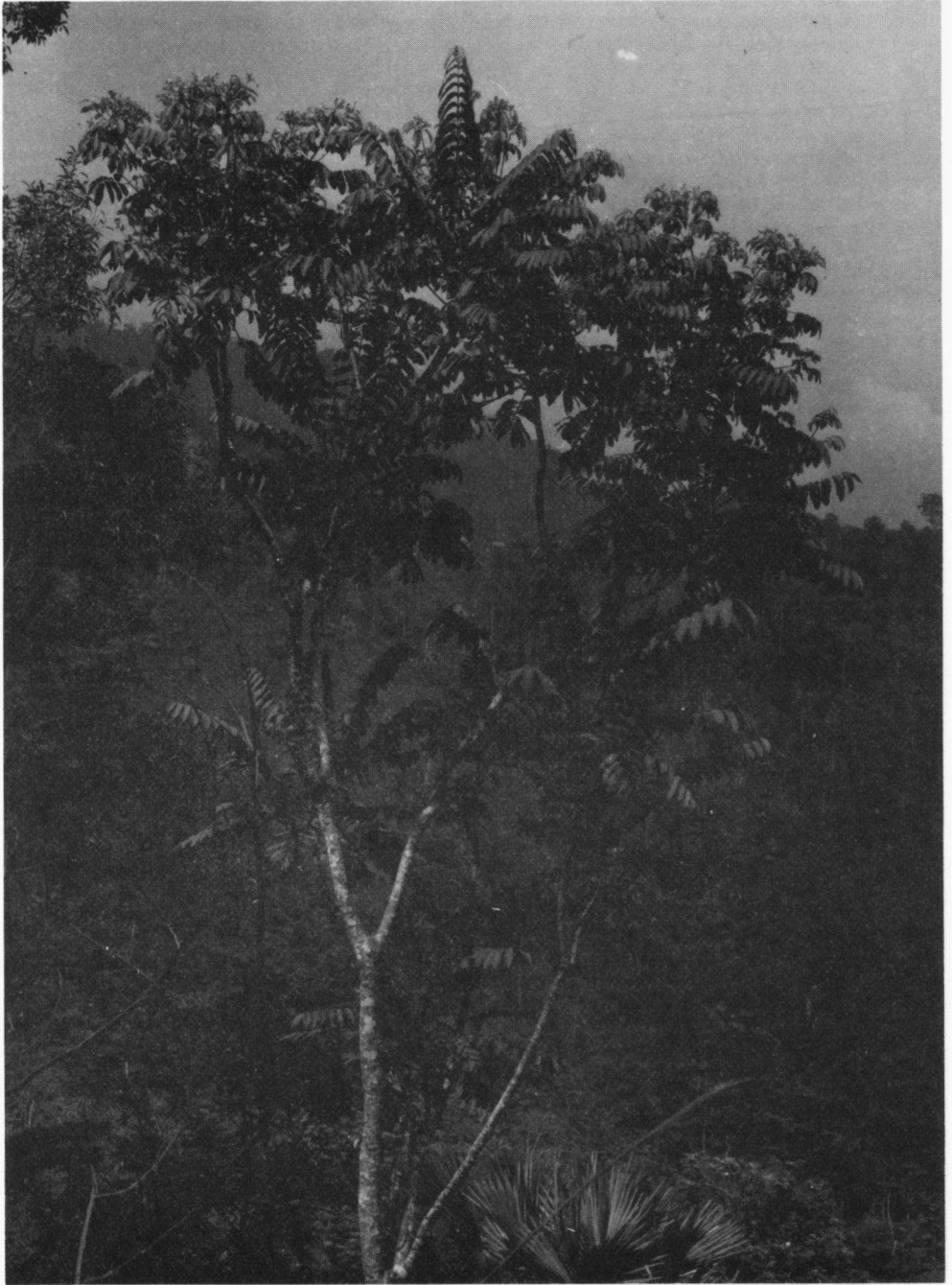


Fig. 17. Habit of *Arthrophyllum diversifolium* BL. (Photogr. HOOGLAND, Bogor).

fleshy, rising in the centre to the  $\pm$  sessile capitate stigma. *Fruit* ovoid or spheroidal, often oblique; exocarp leathery; endocarp cartilaginous. *Seed* solitary, pendulous; endosperm deeply transversely ruminant.

*Distr.* About 31 *spp.* (17 in Malesia) extending from the Nicobar Is. and Indo-China to the Philippines, New Guinea and New Caledonia. Fig. 18.

*Notes.* The principal distinctive characters of this isolated genus are the single-celled ovary and the arrangement of the umbels on specialized lateral branches in the majority of the species.

The present treatment, following that which I gave in 1977, *l.c.*, remains tentative until widespread field studies can be undertaken.

## KEY TO THE SPECIES

1. Inflorescence becoming paniculate by the successive development of branches below the umbellules. Fig. 19a . . . . . 1. *A. proliferum*
1. Inflorescence a compound umbel.
  2. Inflorescence with four orders of branching.
    3. Leaflets lanceolate.
      4. Leaflets *c.* 4–7 cm long. Fig. 20f . . . . . 2. *A. ashtonii*
      4. Leaflets much longer . . . . . 3. *A. angustifolium*
    3. Leaflets broader.
      5. Pedicels (at early anthesis) *c.* 10 mm long.
        6. Peduncles of umbellules with bracts or their scars. Fig. 21a . . . . . 4. *A. ahernianum*
        6. Peduncles of umbellules without bracts or their scars. Fig. 21b. . . . . 5. *A. engganoense*
      5. Pedicels (at early anthesis) *c.* 5 mm long, or shorter.
        7. Leaves associated with the umbels rotund. Fig. 21e. . . . . 6. *A. collinum*
        7. Leaves (or leaflets) associated with the umbels ovate or elliptic.
          8. Leaves associated with the umbels ovate,  $\pm$  fleshy, with the lower surface smooth (lateral veins obscure). Fig. 21f . . . . . 7. *A. crassum*
          8. Leaves (or leaflets) associated with the umbels  $\pm$  elliptic, coriaceous or chartaceous, veins visible.
            9. Young parts glabrous . . . . . 8. *A. pacificum*
            9. Young parts with rufous tomentum.
              10. Umbels at anthesis with numerous filamentous pedicels. Fig. 21c. . . . . 9. *A. diversifolium*
              10. Umbels at anthesis with fewer stout pedicels. Fig. 21d . . . . . 10. *A. macranthum*
    2. Inflorescence with three (or fewer) degrees of branching.
      11. Leaflets membranaceous or chartaceous.
        12. Mid-leaflets *c.* 16 cm long. . . . . 11. *A. papyraceum*
        12. Mid-leaflets *c.* 8 cm long or shorter.
          13. Leaflets usually 5–7 (Fig. 20a). Primary inflorescence branches usually short (*c.* 3–6 cm) and without articulations . . . . . 12. *A. maingayi*
          13. Leaflets more numerous (Fig. 20d). Primary inflorescence branches longer (10–20 cm), with one or more leafy nodes . . . . . 13. *A. kjellbergii*
      11. Leaflets coriaceous.
        14. Leaflets *c.* 5 . . . . . 14. *A. cenabrei*
        14. Leaflets more numerous.
          15. Petals and stamens 6 . . . . . 15. *A. pulgarensis*
          15. Petals and stamens 4 or 5.
            16. Leaflets 6 cm long, or longer. Fig. 20b . . . . . 16. *A. montanum*
            16. Leaflets shorter. Fig. 20c . . . . . 17. *A. alternifolium*

1. *Arthrophyllum proliferum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 302, f. 3–4. — Fig. 19a–b.

Medium-sized, glabrous tree. *Leaves* multijugate, up to 90 by 24 cm, of the flowering branches smaller with fewer pinnae or usually simple; petioles up to 28 cm, 5 mm  $\varnothing$ ; petiolules 1–1½ cm; leaflets obovate-oblong, *c.* 16 by 7 cm, chartaceous, margin slightly revolute, base broadly cuneate to truncate,

sometimes oblique, apex acute. *Inflorescences* terminating specialized plagiotropic shoots, bearing axillary flowering branches and ending in umbellules of a few flowers below which pairs or whorls of branches continue the growth of the inflorescence to produce an elongated panicle of umbellules; pedicels 7–8 mm (slightly longer in fruit). *Calyx* often with 5 indistinct teeth. Petals 5,

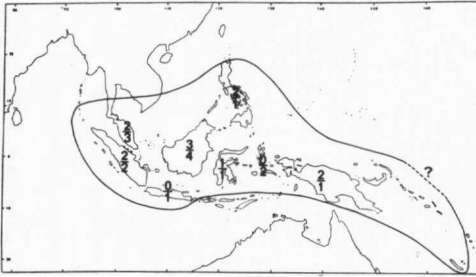


Fig. 18. Species density of *Arthrophyllum* BL. in Malesia; above the hyphen the number of endemic species, below it the non-endemics. Complete range of genus encircled; 17 of the total of 31 *sp.* occur in Malesia.

$3\frac{1}{2}$  mm long, narrowly triangular. Stamens 5, filaments c. 2 mm, anthers reniform, c.  $\frac{1}{2}$  mm long. Ovary obconical, c. 2 mm long; disk fleshy, cushion-like; stigma capitate  $\pm$  sessile. *Fruit* ovoid, fleshy, capped by the calyx and the enlarged beak-like stylopodium, c. 10 by 5 mm when dry.

Distr. *Malesia*: E. New Guinea (Morobe Distr.).

Ecol. Mid-mountain rain-forest, reaching the canopy, on steep slopes, 300–1200 m.

Notes. The thick outer bark is grey-brown, fissured, and peeling in small flakes. Wood straw-coloured. Cut stems exude brown latex. The thick petals are yellow-green.

The flower and fruit are typical of this well-defined genus, but the branching of the inflorescence is unlike that found in all other species.

**2. *Arthrophyllum ashtonii* PHILIPSON, Gard. Bull. Sing. 30 (1977) 303, f. 12. — Fig. 20f.**

Slender small tree, to 5 m, with the leaves dispersed for some distance from the apex of the branches, young parts with brown scurfy tomentum which persists on the umbellules. *Leaves* multijugate, to c. 30 cm long; of the flower-bearing branches smaller with fewer pinnae, or simple; petioles slender, c. 7–9 cm; petiolules c. 4–7 mm; leaflets lanceolate to broadly lanceolate, 3–7 $\frac{1}{2}$  by 1–2 cm, thinly coriaceous, margin revolute, base broadly cuneate, apex tapered to subcaudate, veins channelled above, visible beneath. *Inflorescence* a terminal cluster of specialized leafy branches; main rays variable in length in the same inflorescence, the longest from c. 16–25 cm long with a pair of opposite simple leaves about the middle (with flowering branches in their axils) and ending in a whorl of secondary rays subtended by simple leaves; secondary rays 4–12 cm long, bearing simple leaves, usually in an opposite pair and terminating in compound umbels; umbellules with c. 8–10 flowers; pedicels 4–10 mm, furfuraceous. *Flower buds* c. 2 mm long, calyx a furfuraceous rim. Petals 5, broadly triangular. Stamens 5, anthers

curved, basifixed. Ovary glabrous, obconical, c. 1 mm long; stigma on a raised stylopodium at the centre of a flat disk. *Fruit* spheroidal, with a persistent stylopodium, c. 6 mm long when dry.

Distr. *Malesia*: Borneo (Sarawak and Brunei).

Ecol. Mossy forest on sandstone ridge, and in kerangas forest, 1000–1550 m.

Note. The small narrow leaflets are very distinctive. No other species with small leaflets has inflorescences which branch to the fourth degree.

**3. *Arthrophyllum angustifolium* RIDL, J. Fed. Mal. St. Mus. 10 (1920) 136; Fl. Mal. Pen. 1 (1922) 885; PHILIPSON, Gard. Bull. Sing. 30 (1977) 304.**

Shrub or small tree, up to 5 m, young parts rufous-tomentose, glabrescent. Lower *leaves* multijugate, rachis dilated, c. 70–90 by 30–40 cm; petioles c. 15–22 cm, 3–5 mm wide, ligule a rim c. 2 mm long; petiolules c. 7–10 mm long; leaflets coriaceous, lanceolate, c. 15–22 by 1 $\frac{1}{2}$ –2 $\frac{1}{2}$  cm, tapering to an acute or obtuse apex, base cuneate, margin slightly revolute; upper leaves reduced, mostly unifoliolate, opposite, broader, with petioles 2–4 cm long. *Inflorescence* a terminal cluster of specialized leafy branches; main rays 30 cm (or more) long, bearing simple leaves in opposite pairs with small flowering branches in their axils, ending in a whorl of c. 10–12 secondary rays subtended by simple leaves; secondary rays 8–12 cm long, bearing pairs of simple leaves, and terminating in an umbel of 5–12 tertiary rays c. 2–3 cm long, with bract scars about the middle, and ending in an umbellule of c. 8–12 flowers, pedicels c. 5 mm. Petals 5, 2–3 mm long in bud. Stamens 4. Ovary turbinate, inconspicuous at anthesis; disk fleshy; stigma  $\pm$  sessile. *Fruit* spheroidal, c. 5 by 5 mm when dry, calyx and stylopodium small.

Distr. *Malesia*: Malay Peninsula (Perak) and Borneo (Brunei).

Ecol. Forest and old regenerated forest on peat swamp at low altitude or on ridges.

Note. The lanceolate leaflets are unlike those of any other species. The grey bark is minutely fissured and bears many small orange lenticels. The wood is soft and white. The Malayan and Bornean specimens are similar, except that the flower buds are larger in the Brunei plant.

**4. *Arthrophyllum abernianum* MERR. Philip. J. Sc. 1 (1906) Suppl. 109; En. Philip. 3 (1923) 235; PHILIPSON, Gard. Bull. Sing. 30 (1977) 304, f. 13. — *A. pinnatum* (non CLARKE) F.-VILL. Nov. App. (1880) 103; VIDAL, Synopsis Atlas (1883) 28, t. 55 f. c. — *Macropanax* sp. VIDAL, Rev. Pl. Vasc. Filip. (1886) 145. — *A. sablanense* ELMER, Leaf. Philip. Bot. 1 (1908) 331. — *A. borneense* MERR. Pl. Elm. Born. (1929) 231, non BAKER, 1896. — *A. elmeri* MERR. Webbia 7 (1950) 319. — *A. merrilliana* FURTADO, Gard. Bull. Sing. 19 (1962) 185. — Fig. 21a.**





Fig. 19. *Arthrophyllum proliferum* PHILIPSON. a. Part of inflorescence in fruiting state,  $\times \frac{1}{2}$ , b. ditto, showing detail of ultimate branches in flowering stage, nat. size. — *A. maingayi* PHILIPSON. c. Terminal inflorescence,  $\times \frac{1}{2}$ . — *A. montanum* RIDL. d. Single flowering shoot,  $\times \frac{1}{3}$  (Courtesy Gard. Bull. Sing. 30, 1977).

Tree up to 15 m, young parts with rufous tomentum. *Leaves* clustered at the ends of the branches, multijugate, up to 200 by 60 cm; of the flower-bearing branches smaller with fewer pinnae, or simple; petiole stout, up to 35 cm; petiolules 5–20 mm; leaflets ovate-oblong, occasionally oblong-lanceolate, up to 35 by 12 cm, membranaceous or chartaceous, margin revolute, base cuneate to rounded, usually oblique, apex short acuminate. *Inflorescence* a whorl of specialized leafy branches forming a terminal crown; main rays up to 150 cm (or more), bearing pinnate leaves usually in 1–2 opposite pairs, and with flowering

branches in the upper axils, ending in a whorl of secondary rays subtended by pinnate or more rarely simple leaves; secondary rays up to 30 cm bearing simple or pinnate leaves in opposite pairs, and terminating in compound umbellules; umbellules with c. 10–20 flowers c. 3 cm  $\varnothing$ ; peduncles with 1–2 pairs of small simple, often caducous leaves; pedicels c. 1 cm (at anthesis) subtended by minute caducous bracts. Petals 5, 4 mm long. Stamens 5, anthers curved. Ovary turbinate; disk fleshy; stigma  $\pm$  sessile. *Fruit* c. 10 by 7 mm, ellipsoidal, calyx and stylopodium forming a prominent beak.

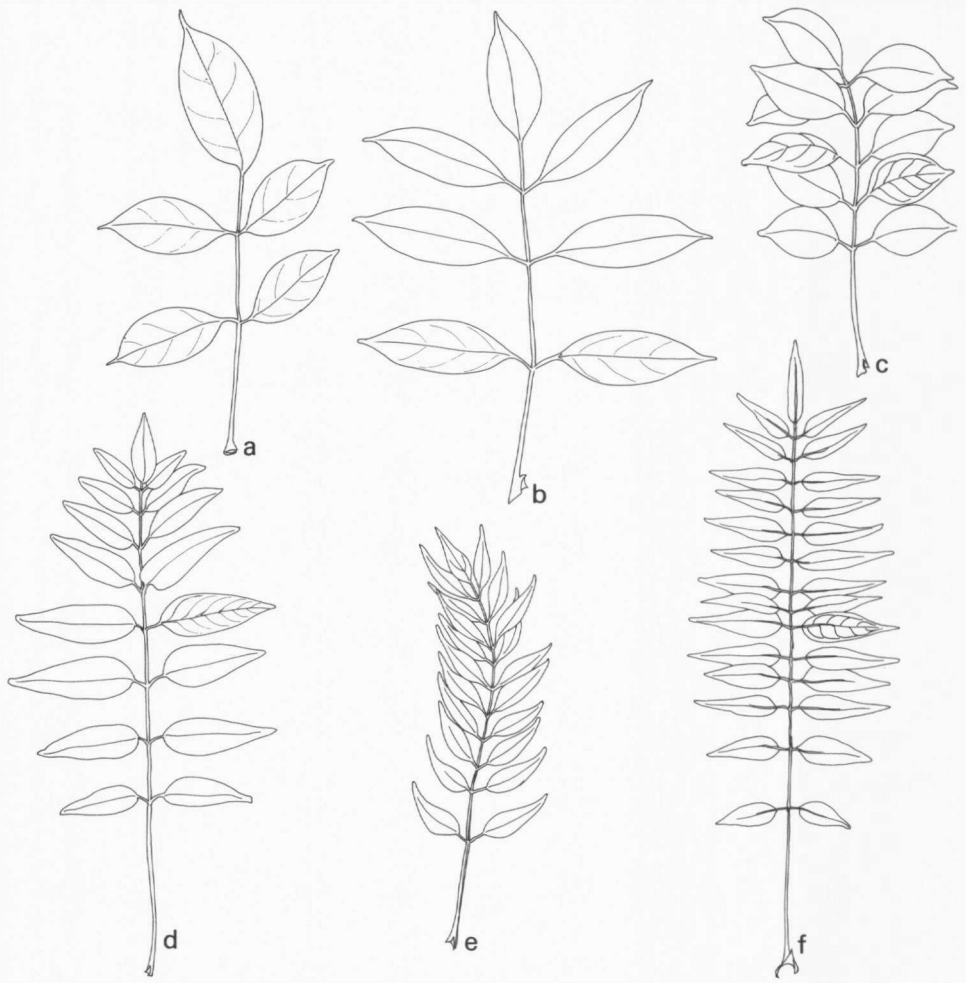


Fig. 20. Foliage leaves of *Arthrophyllum* spp. a. *A. maingayi* PHILIPSON, b. *A. montanum* RIDL., c. *A. pulgarense* ELMER, d. *A. kjellbergii* PHILIPSON, e. *A. alternifolium* MAINGAY ex RIDL., f. *A. ashtonii* PHILIPSON. All  $\times \frac{1}{3}$  (Courtesy Gard. Bull. Sing. 30, 1977).

Distr. *Malesia*: N. Borneo and throughout the Philippines to the northern Moluccas (Talaud, Ternate).

Ecol. Primary and second-growth forest, from the lowlands to 1000 m.

Vern. Philippines, cf. MERRILL: *alabihig*, *dokloi*, P.Bis., *binaláyon*, C.Bis., *danipo*, Ig., *higin*, Mang., *malapapáya*, *puyga-puygáhan*, Tag., *pamalatángen-a-purau*, Ilk. Additional names: Philippines: *lulpo*, Luzon, *mayari*, Mindoro, *bungyo*, Palawan; Moluccas: *langator'a*, Talaud.

Notes. This species replaces the more westerly *A. diversifolium* which it closely resembles. It is

characteristically larger in all its parts, particularly in the size of the individual flowers and the length of their pedicels. There are fewer flowers in an umbellule.

The distinction between these two species is not always easy to make, especially when the material is fragmentary; PHILIPSON, l.c. A few specimens from the Philippines appear very similar to *A. diversifolium*, and it is possible that this species extends beyond Borneo. I have regarded them as part of the range of variation of *A. ahernianum*. Similarly, at least one specimen from S. Borneo approaches *A. ahernianum* in appearance.

5. *Arthrophyllum engganoense* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 14. — Fig. 21b.

Tree to 21 m high, becoming glabrous. Lower leaves imparipinnate, multijugate, 60 cm long or more; petiole 24 cm, 6 mm wide, rachis articulated at the insertion of the leaflets; petiolules 10–18 mm; leaflets broadly elliptic to elliptic-oblong, c. 12–15 by 6–7 cm, base rounded with a short asymmetrical cuneate centre, apex shortly apiculate, margin entire, often undulate chartaceous. Flowering branches c. 40 cm; leaves opposite, simple, or unifoliolate, petiolules c. 5–7 cm, leaflets ovate, c. 13 by 6 cm, with inflorescence branches in their axils; ending in a whorl of simple leaves surrounding a compound umbel to 30 cm  $\varnothing$ ; secondary rays c. 8, c. 10–15 cm long at flowering, slender (2 mm  $\varnothing$ ) and striate, each bearing a pair of small leaves about the middle (sometimes with inflorescences in their axils) and ending in an umbel; tertiary rays c. 8, slender, c. 20–40 mm long, without bracts; tertiary rays pedicels c. 5–10 per umbellule, c. 10–15 mm at anthesis. Calyx an undulate rim. Petals 5, c. 2 mm long in bud. Stamens 5, anthers curved. Ovary turbinate, obscurely ribbed, c. 2½ mm long at anthesis. Fruit ellipsoid, c. 10 by 7 mm, with a rather small persistent calyx and stylopodium.

Distr. *Malesia*: S. Sumatra (Enggano I.), two collections.

Ecol. Forest at low altitude, up to c. 100 m.

Vern. *Langkapu utan kaauh*, Enggano.

Note. The two known collections of this species are very similar and contrast with the widespread 9. *A. diversifolium* because of the few-flowered umbellules with long, spreading pedicels.

6. *Arthrophyllum collinum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 17. — Fig. 21e.

Sparingly branched shrub or small tree up to 12 m, all young parts with dense, rufous tomentum which persists on flowers and inflorescences. Leaves multijugate, up to 60 (or more) by 32 cm; of the flowering branches smaller with fewer pinnae or more frequently unifoliolate, leaflets more rotund and with longer petioles; petiole up to 20 cm; petiolules c. 1 cm; leaflets oblong, broadly elliptic or rotund, up to 16 by 7 cm, coriaceous, margin slightly revolute, base truncate to rounded, unequal, apex rounded, obtuse, or shortly and bluntly apiculate, midrib prominent, lateral veins usually clearly visible below, upper surface frequently rugose. Inflorescence a cluster of specialized leafy branches forming a terminal crown; main rays up to 60 cm long, bearing one or more, rarely two, opposite pairs of usually unifoliolate rotund leaves often with flowering branches in their axils, and ending in a whorl of secondary rays, subtended by usually unifoliolate leaves; secondary rays up to 17 cm, bearing a pair of unifoliolate leaves with flowering branches in their axils, and terminating in compound umbellules; tertiary rays c. 5–10,

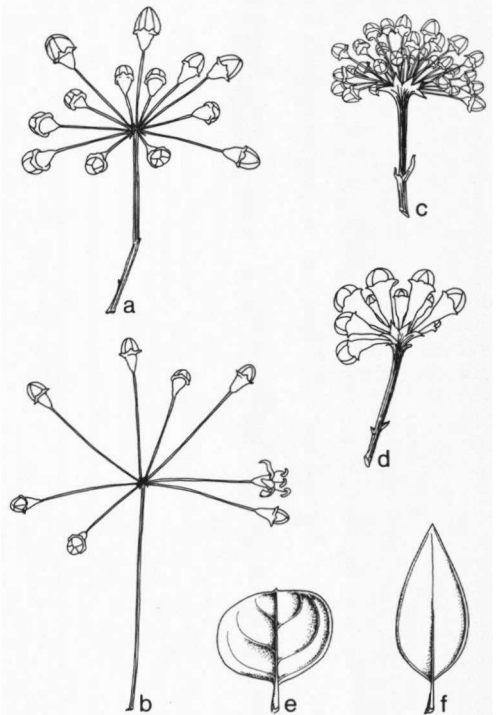


Fig. 21. Umbellules of some *Arthrophyllum* spp. a. *A. ahernianum* MERR., b. *A. engganoense* PHILIPSON, c. *A. diversifolium* BL., d. *A. macranthum* PHILIPSON. All nat. size. — Bracts of two *Arthrophyllum* spp. e. *A. collinum* PHILIPSON, f. *A. crassum* PHILIPSON. Both  $\times \frac{1}{3}$  (Courtesy Gard. Bull. Sing. 30, 1977).

c. 3–6 cm long, articulated near the middle; pedicels c. 10, c. 2–3 mm long, rufous tomentose. Petals 5, broadly triangular, c. 2 mm long. Stamens 5, anthers curved. Ovary turbinate, rufous-tomentose, c. 1½ mm long at anthesis; disk fleshy, stigma sessile. Fruit ellipsoidal, c. 9 by 5 mm (when dry), the calyx and stylopodium prominent.

Distr. *Malesia*: Borneo (Sarawak and Sabah).

Ecol. Forest and scrub, sometimes growing as an epiphyte in the crowns of trees, 600–2700 m.

Notes. The bark is grey and smooth, the wood pale and soft, and the cut stems exude a yellowish or orange latex.

This species is characterized by the rotund, coriaceous leaves on the flowering branches.

7. *Arthrophyllum crassum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 305, f. 18. — Fig. 21f.

Sparingly branched shrub or small tree up to 8 m, occasionally epiphytic, all young parts with dense, rufous tomentum which persists on the

flowers and inflorescence. *Leaves* multijugate, up to 100 (or more) by 50 cm, occasionally with 4 leaflets inserted at some of the lower articulations; of the flowering branches smaller with fewer pinnae or more frequently unifoliate; petiole up to 25 cm; petiolules 10–20 mm; leaflets elliptic, oblong or lanceolate, up to 24 by 7½ cm, coriaceous, margin strongly revolute, base cuneate to rounded, often oblique, apex narrowed to an acute often caudate apiculum, midrib prominent, lateral veins faint to obscure. *Inflorescence* a cluster of specialized leafy branches forming a terminal crown; main rays up to 70 cm, bearing an opposite pair (or rarely more pairs) of unifoliate or (less frequently) pinnate leaves, often with flowering branches in their axils, and ending in a whorl of secondary rays, subtended by usually unifoliate leaves; secondary rays up to 25 cm, bearing a pair of usually unifoliate leaves with flowering branches in their axils, and terminating in compound umbellules; tertiary rays c. 10, c. 2–3 cm long, articulated near the middle; pedicels c. 12–14, c. 3–4 mm long, rufous-tomentose. *Petals* 5, broadly triangular, c. 2 mm long. *Stamens* 5, anthers curved. *Ovary* turbinate, rufous-tomentose, c. 1½ mm long at anthesis; disk fleshy, stigma sessile. *Fruit* spheroidal, c. 6 by 5 mm (when dry), calyx and stylopodium prominent.

*Distr. Malesia:* Borneo (Sarawak and Kalimantan).

*Ecol.* Swampy peat forest and heath woodland, both primary and disturbed, from sea-level to c. 150 m. Some fragmentary collections from higher altitude (1000 m) further inland may belong to this species.

*Note.* The leaves associated with the inflorescence are distinctively fleshy, have a strongly revolute margin and a smooth lower surface with indistinct lateral veins, and are ovate with rather acute apex. The leaflets of the pinnate leaves on the vegetative shoots are also rather leathery with indistinct lateral venation.

**8. *Arthrophyllum pacificum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 306.**

A slender, glabrous tree to 14 m. *Leaves* multijugate, c. 60 by 24 cm; of the flower-bearing branches smaller with fewer pinnae or simple; petioles c. 22 cm, 3–4 mm Ø; petiolules c. 1 cm; leaflets elliptic, oblong or ovate, c. 8–10 by 4–5 cm, rather membranaceous, margin entire, very slightly revolute, base abruptly cuneate, often oblique, apex obtuse, acute, or slightly apiculate (in a specimen from Morotai attenuated). *Inflorescence* a whorl of specialized leafy branches forming a terminal crown to the vegetative shoots; main rays 35 cm, bearing small pinnate leaves in opposite pairs and with flowering branches in the axils, ending in a whorl of secondary rays, subtended by a whorl of simple leaves (bracts); secondary rays 10–24 cm long, bearing simple or trifoliate leaves

usually in opposite pairs, and terminating in umbellules; umbellules c. 7–12-flowered; pedicels c. 5 mm at anthesis, slightly elongating in fruit, minute bracts caducous. *Petals* 5, broadly triangular, 2½–3 mm long. *Stamens* 5, anthers reniform. *Ovary* obconical, 1½ mm long; disk fleshy, furrowed when dry; stigma ± sessile. *Fruit* ellipsoidal, fleshy, somewhat oblique, conical beak with calyx and stigma, c. 9 by 5 mm when dry.

*Distr. E. Malesia:* Moluccas (Morotai) to the Bismarck Archipelago.

*Ecol.* Primary forest on mountain slopes, attaining *Nothofagus* mossy forest, 500–2000 m. Reported as common in most localities.

*Vern. Kainsoka, Ambai, Japen I.*

*Notes.* All specimens from islands to the north of New Guinea are similar, in having more delicate foliage than 10. *A. macranthum* from the mainland of New Guinea. The specimens from Morotai are sterile, and have narrower more tapering leaflets.

The bark is light brown and the cut branches exude a clear latex. The flowers are light green with yellow anthers, and the fruit is black.

**9. *Arthrophyllum diversifolium* Bl. Bijdr. (1826) 879; DC. Prod. 3 (1830) 266; MIQ. Fl. Ind. Bat. 1, 1 (1856) 767; Sum. (1861) 340, incl. var. *lanceolata* MIQ.; CLARKE, Fl. Br. Ind. 2 (1879) 733; K. & V. Bijdr. 7 (1900) 46; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 675 & 676; BACK. & BAKH. f. Fl. Java 2 (1965) 169; STONE, Gard. Bull. Sing. 30 (1977) 135; PHILIPSON, l.c. 306, f. 15. — *A. javanicum* Bl. Bijdr. (1826) 879; DC. Prod. 4 (1830) 266; BACK. & BAKH. f. Fl. Java 2 (1965) 169. — *A. ellipticum* Bl. Bijdr. (1826) 879; DC. Prod. 3 (1830) 266. — *Mormorphis sumatrana* JACK ex WALL. Cat. (1831) n. 4931, nomen. — *A. blumeanum* Z. & M. Syst. Verz. (1846) 41, nom. illeg.; MIQ. Fl. Ind. Bat. 1, 1 (1856) 768; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27, incl. var. *oblongatum* MIQ., var. *ellipticum* (BL.) MIQ. et var. *ovalifolium* (JUNGH. & DE VRIESE) MIQ. — *A. ovatifolium* JUNGH. & DE VRIESE, Ned. Kruidk. Arch. 1 (1846) 19; Ann. Sc. Nat. Paris III, 6 (1846) 117; MIQ. Fl. Ind. Bat. 1, 1 (1856) 768, t. 14 ('*ovalifolium*'); RIDL. Fl. Mal. Pen. 1 (1922) 885; STONE, Gard. Bull. Sing. 30 (1977) 136, f. 2. — *A. dilatatum* MIQ. Fl. Ind. Bat. 1, 1 (1856) 768. — *A. borneense* BAKER, Kew Bull. (1896) 23; MERR. En. Born. (1921) 457. — *A. congestum* RIDL. J. Fed. Mal. St. Mus. 10 (1920) 137; Fl. Mal. Pen. 1 (1922) 887; STONE, Gard. Bull. Sing. 30 (1977) 136. — *A. havilandii* RIDL. Kew Bull. (1933) 494. — *A. rufosepalum* RIDL. Kew Bull. (1946) 40. — *A. rubiginosum* RIDL. l.c. 41. — Fig. 17, 21c, 22, 23.**

Small tree, up to 14 m, young parts with rufous tomentum. *Leaves* clustered at the ends of the branches, imparipinnate or bipinnate (rarely tripinnate) with leaflets at the insertion of the lateral rachides, multijugate, 150 by 45 cm (wider in bipinnate leaves); usually in opposite pairs on



Fig. 22. *Arthrophyllum diversifolium* Bl. Diagrammatic sketch of habit, showing vegetative and flowering branches,  $\times \frac{1}{30}$  (Courtesy Gard. Bull. Sing. 30, 1977).

the inflorescence-bearing branches and smaller with fewer pinnae or unifoliolate; petiole up to 40 cm; petiolules  $\frac{1}{2}$ – $1\frac{1}{2}$  cm; leaflets ovate-oblong or elliptic, up to 24 by 11 cm (leaflets of bipinnate leaves usually c. 10 by 5 cm),  $\pm$  coriaceous or (especially in bipinnate leaves) somewhat membranaceous, margin slightly revolute, base truncate, rounded, or cuneate, often oblique, apex shortly acuminate, veins usually 5–7 pairs. *Inflorescence* a cluster of specialized leafy branches forming a terminal crown which abscises after fruiting; main rays up to 150 cm, bearing pinnate (or more

rarely unifoliolate) leaves mostly in opposite pairs and usually with flowering branches in the axils of the upper leaves, ending in an umbel of secondary rays subtended by a whorl of pinnate or unifoliolate leaves; secondary rays up to c. 30 cm, bearing mainly simple leaves in opposite pairs with flowering branches in their axils and terminating in compound umbellules each subtended by a whorl of often caducous bracts; tertiary rays (peduncles) c. 5 cm, articulated about the middle; umbellules with c. 30–40 flowers, c. 17–20 mm  $\varnothing$ ; pedicels c. 20, c. 5 mm at anthesis (longer in fruit),

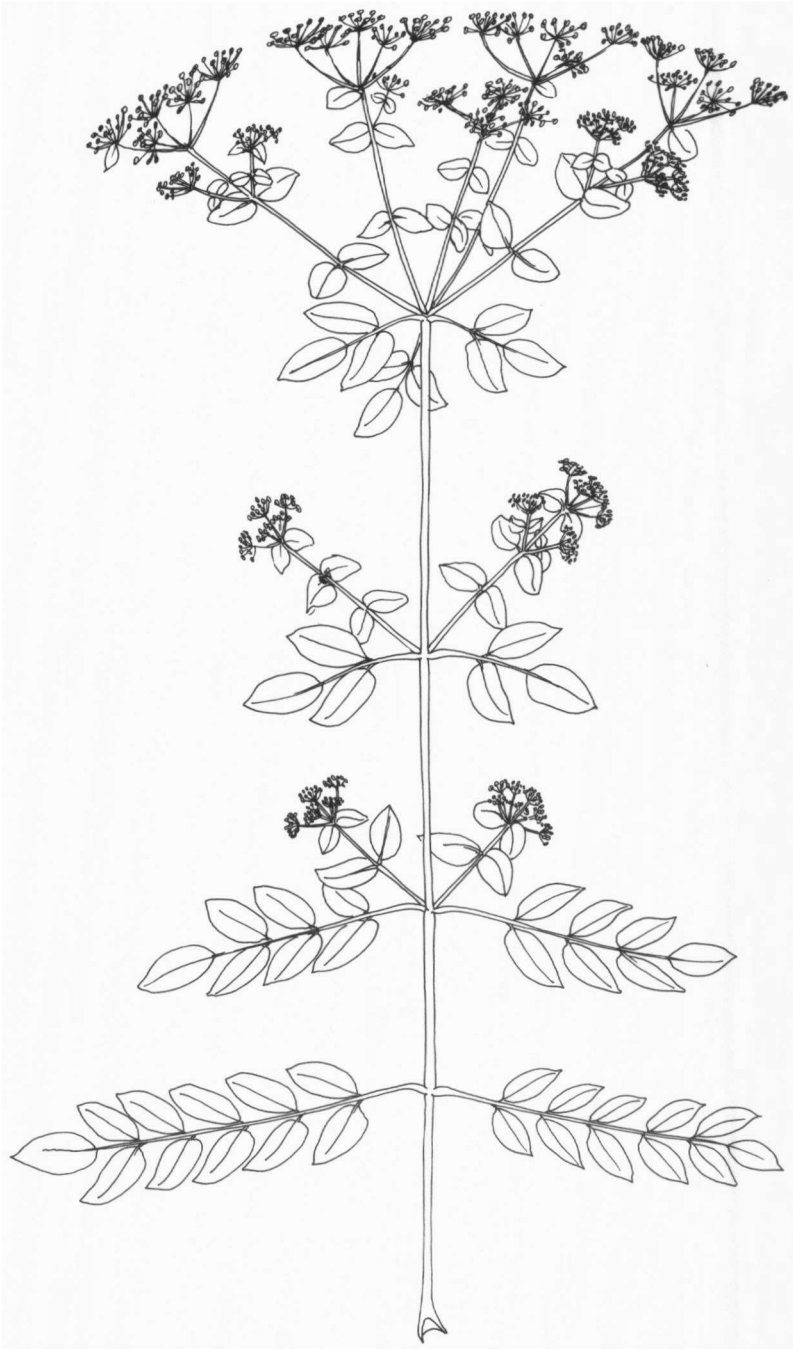


Fig. 23. *Arthrophyllum diversifolium* Bl. Schematic drawing of a single flowering shoot, with four degrees of branching,  $\times \frac{1}{5}$  (Courtesy Gard. Bull. Sing. 30, 1977).

with an involucre of minute caducous bracts. Petals 5, c. 2 mm long. Stamens 5, anthers curved. Ovary turbinate, often inconspicuous at anthesis; disk fleshy, rising in the centre to a sessile stigma. Fruit ellipsoidal, c. 9 by 7 mm; calyx and stylopodium forming a conspicuous beak.

Distr. *Malesia*: Sumatra, Malay Peninsula, Java, Borneo, Celebes.

Ecol. In a wide variety of habitats, on dry sandy soil to swampy humus, in primary lowland and montane rain-forest and also in secondary forest, heath-forest and waste land, from sea-level to 1600 m.

Uses. Concoctions of the root and bark are reported to have medicinal properties, including a remedy for syphilis, and the plant has stupifying and poisonous properties.

Vern. Sumatra: *antjaneudeung uding, bidju, bolu bolu, bulu, (kayu) abang-abang, k. attu turut, lègung*, Rìouw Arch., *mapang, miu, obang, potah, silanta, rěnjam dakan*, Banka, *tochrah*. Malay Peninsula: *chindangan utan, jolok hantu, lupa dahan, (pokok) restong, sėgan budahan, susun kėlapa, tum bong ninyor, tusum perpah*. Java: *dajo, dėlahan, dėleg, dėlek, djangkorrang, gombong, (kayu) gompang, kėdrja, kidjangkurang, kingompang, ki ompong, klėntjang, krėpang, langitj, malas bėrdahan, pongporang, putjangan*. Borneo: *merjemeh*, Sarawak, *karadjungjung*, Kalimantan. Celebes: *kambabah, susangkangan*.

Notes. The very widespread *A. diversifolium* is variable in many characters, and may comprise a number of geographic subspecies, but no basis for this is apparent at present. Most individuals have the lower leaves simply imparipinnate, whereas others have bipinnate, or rarely tripinnate, leaves. The flowers and inflorescences of these forms appear to be identical, though rapid changes in the umbellules after flowering produce a deceptively distinctive appearance in specimens at different stages of development. Field experience over the whole range of the species will be required to understand this interesting leaf-polymorphism. In treating all forms as one species I am partly influenced by the fact that most authors who have been familiar with the plants in Java (where both forms occur) have regarded the complex as a single species (the fact that some authors have recognized the variant from Mt Salak as a distinct species does not affect the problem of leaf-polymorphism).

Apart from the strikingly different leaf forms just discussed, certain local variants may eventually be shown to justify specific rank. A form growing on Mt Salak (near Bogor) has often been regarded as distinct (see, for example, HOCHREUTNER, *Candollea* 2, 1925, 481, and BACKER & BAKHUIZEN VAN DEN BRINK *f. Fl. Java* 2, 1965, 169). Indeed this form is the basis of the name *A. diversifolium*. I retain this name in preference to the other two names published simultaneously by BLUME because it has been most consistently adopted since

it was first used in this comprehensive sense by CLARKE, *l.c.* On the evidence available I do not consider the Salak plants any more distinctive than many other local variants.

It might be considered that 5. *A. engganense* is also no more than another such variant, but its facies is so marked that specific rank appears justified.

It is possible that RIDLEY was correct in distinguishing *A. congestum*, but the material is not good and appears inadequate to confirm specific status.

Five collections from Brunei and a neighbouring district of Sarawak are all very alike and sufficiently distinct from both *A. diversifolium* and 7. *A. crassum* to suggest that they represent a separate taxon, but for the present they are tentatively retained as a form of *A. diversifolium*.

Similarly, the two collections described by RIDLEY as *A. rubiginosum* and *A. rufosepalum* are based on collections which are not altogether typical of *A. diversifolium*, but which come closest to that species. In the absence of more supporting material, it is advisable not to retain them as species. The first of these names (*A. rubiginosum*) has been widely used in identifications of Bornean specimens, but the specimens concerned are either typical *A. diversifolium* or belong to the distinctive 7. *A. crassum*.

Specimens from Mt Kinabalu described by RIDLEY as *A. havilandii* have bipinnate leaves, and appear to conform well with *A. diversifolium*. This form was again collected on Mt Kinabalu by CLEMENS and is also known from Sarawak.

The smooth bark is whitish to greyish brown with pustulate lenticels; the wood is cream, with a colourless aromatic exudate. The flowers are yellowish with a sickly sweet scent. Seedlings have simple and trifoliate leaves.

10. *Arthrophyllum macranthum* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18; Gard. Bull. Sing. 30 (1977) 308, f. 16. — *A. diversifolium* (non BL.) HARMS, Bot. Jahrb. 56 (1920) 413. — Fig. 21d.

Tree up to 25 m, sparsely branched with leaves crowded at the ends of the branches, all young parts with dense rufous tomentum which may persist on the flowers and inflorescence. *Leaves* multijugate, up to 100 by 30 cm; of the flower-bearing branches smaller with fewer pinnae, or simple; petioles stout, up to 40 cm, clasping base heavily lenticellate; petioliules  $\frac{1}{2}$ -2 cm; leaflets ovate to oblong, up to 16 by 8 cm, coriaceous, margin revolute, base rounded, truncate, or cordate, very rarely cuneate, often oblique, apex obtuse or bluntly apiculate, principal veins arched-ascending, reticulations visible especially beneath (pinnae of leaves on the flowering branches usually elliptic with a cuneate base). *Inflorescence* a whorl of specialized leafy branches forming a terminal crown; main rays up to 60 cm, bearing pinnate leaves often in opposite pairs and with flowering

branches in the upper axils, and ending in a whorl of secondary rays subtended by a whorl of usually simple leaves (bracts); the secondary rays c. 10–20 cm, bearing simple leaves, usually in opposite pairs, and terminating in compound umbels; umbellules (c. 2 cm) with c. 10–15 flowers; pedicels stout, 3–5 mm to 10 mm or more in fruit, subtended by minute bracts. *Flower buds* 5 mm or more long; calyx a rim or with 5 indistinct teeth. Petals 5, triangular, c. 4 mm long, fleshy. Stamens 5. Ovary obconical, c. 2½ mm long; disk fleshy (hemispherical in living material, conical and furrowed when dry); stigma capitate, ± sessile. *Fruit* ellipsoid, sometimes slightly oblique, c. 12 by 8 mm, the stylopodium forming a conical beak with the persistent stigma; exocarp fleshy, endocarp cartilaginous.

Distr. *Malesia*: New Guinea (from Irian Jaya to Milne Bay Distr. and the Bismarck Archipelago).

Ecol. Usually a sub-canopy tree of rain-forest ranging from the lower montane zone to mossy subalpine woodland and scrubland, occasionally in second growth, usually above 1000 m (up to 2700 m), but occurring also on the coastal scarps of the Astrolabe Range.

Vern. *Maguva*, W. Sepik, *agagwa*, *agare*, *agugwa*, *alolo*, *angga*, *engga*, *pooli*, *tipilan*, W. Highlands, *arua*, *hagegoa*, *wonkurumeh*, E. Highlands, *kolom*, S. Highlands.

Note. Trees become very different in appearance when in flower or fruit: the spiral pinnate foliage leaves are surmounted by tufts of branches which end in inflorescences and bear much smaller leaves. The foliage leaves are fleshy, leathery and glossy. The ripe fruit is purple and shining. The bark is grey, at first smooth with many leaf-scars and lenticels, but small longitudinal fissures develop. The cut branches exude a brown latex and a scent of celery. The soft wood is white or straw-coloured.

**11. *Arthropphyllum papyraceum* PHILIPSON, Gard. Bull. Sing. 30 (1977) 308.**

Shrub, rufous-tomentose on the young parts. *Leaves* alternate, imparipinnate; petiole 15–20 cm; leaflets c. 7, membranaceous, elliptic, c. 12–24 by 5–10 cm, base broadly cuneate, apex finely acuminate, margin slightly revolute. *Inflorescence* a terminal compound umbel; primary rays few (2), 2–3 cm long, 2 mm wide, without bracts (caducous), secondary rays few (3), c. 13–18 mm long, articulated about the middle, ending in an umbellule of c. 10–12 flowers; pedicels 2–3 mm, slightly furfuraceous. Petals 5, c. 2 mm long in bud. Stamens 5, anthers curved. Ovary turbinate, glabrous, obscurely ribbed. Fruit unknown.

Distr. *Malesia*: E. Sumatra (East Coast Res. near Aek Sordang), one collection.

Ecol. Primary rain-forest.

Note. Known from a single collection (with no duplicates) this species resembles 12. *A. maingayi* in its simple inflorescence, and the few pinnae of its

foliage leaves. However, the large size of the leaflets precludes its inclusion in that species.

**12. *Arthropphyllum maingayi* PHILIPSON, Gard. Bull. Sing. 30 (1977) 309, f. 7. — *A. pinnatum* CLARKE, Fl. Br. Ind. 2 (1879) 734, excluding synonyms [see also SEEM. J. Bot. 4 (1866) 294]; RIDL. Fl. Mal. Pen. 1 (1922) 886. — Fig. 19c, 20a.**

Low shrub or slender tree, rarely as high as 10 m, rufous-tomentose on the very young parts, soon becoming glabrous. *Leaves* tufted at the ends of the branches, usually with 5–7 leaflets (but up to 15), up to 30 by 18 cm; petiole to 12 cm (usually shorter), 2 mm Ø; petiolules c. 0–10 mm; leaflets elliptic or elliptic-lanceolate (occasionally the lowermost pair of leaflets is replaced by pinnate leaf segments), c. 8 by 3½ cm, rather thin, base cuneate or rounded, apex apiculate or caudate, margin slightly revolute, lateral veins faint and obscure; leaves below the flowering branches sometimes reduced to 3 or 1 leaflet(s). *Inflorescence* consisting of a number of primary branches radiating from the end of a leafy shoot (which forms a longer or shorter peduncle); primary branches, often rather few, usually 3–6 cm long and devoid of leaves except for a few terminal simple or trifoliolate leaves around the compound umbels, occasionally the branches bear pairs of opposite leaves when they may be up to 30 cm long; secondary rays c. 2–3 cm long; pedicels 4–10 cm. Petals 5, 1½–2 mm long in bud. Stamens 5. Ovary turbinate, disk fleshy. *Fruit* spheroidal, c. 8 by 6 mm, calyx and stylopodium rather inconspicuous.

Distr. *Malesia*: Central W. Sumatra (Mt Kerintji), throughout the Malay Peninsula (incl. Penang) and Borneo.

Vern. *Poko minta anak*, Kedah, *karon baru*, Sumatra.

Notes. The name '*A. pinnatum*', misapplied by CLARKE, *l.c.*, has been in general use for this species. However, this name was based on *Panax pinnatum* LAMK, which in turn was based on the Rumphian name '*Scutellaria secunda*'; this is quite a distinct plant (see under 6. *Polyscias cumingiana*).

The three species *A. maingayi*, 16. *A. montanum* and 17. *A. alternifolium* are similar in having simpler inflorescences than 9. *A. diversifolium*.

*A. montanum* can be distinguished from *A. maingayi* by its more leathery leaves with more prominent nervation, and by the more woody and leafy flower-bearing primary branches of the inflorescence.

*A. alternifolium* is distinguished from both these species by its small, coriaceous leaflets with inconspicuous nervation.

Most specimens can be readily distinguished, but a few can be assigned to a species only doubtfully, usually because the material is inadequate. This is usually due to the junction between the vegetative (spiral phyllotactic) shoots and the flower-bearing branches being omitted.



13. *Arthropphyllum kjellbergii* PHILIPSON, Gard. Bull. Sing. 30 (1977) 309, f. 10. — Fig. 20d.

Small tree, 10 m, branches c. 1 cm  $\varnothing$ , young parts covered by rufous tomentum. *Leaves* clustered towards the ends of the branches, multijugate, 25–30 by 16 cm; petioles c. 8 cm, 2 mm wide; petiolules c. 3–8 mm; leaflets elliptic or ovate-oblong, up to 8 by 3 $\frac{1}{4}$  cm, chartaceous, margin minutely revolute, base rounded to cuneate often oblique, apex tapered to a blunt apiculum, or rounded and mucronate. *Inflorescence* a terminal cluster of c. 5–10 specialized branches (primary rays); primary rays c. 15–20 cm, 1 $\frac{1}{2}$ –2 mm wide, bearing near the middle an opposite pair of simple leaves or sometimes trifoliolate leaves with short flowering branches in their axils, and sometimes with a second pair higher up, and 2–3 similar leaves below the terminal cluster of secondary rays; secondary rays c. 12, c. 2 $\frac{1}{2}$ –3 $\frac{1}{2}$  cm long, each subtended by a small bract and bearing opposite caducous bracts near the middle, terminating in an umbellule of c. 12 flowers surrounded by an involucre of caducous bracts (1 mm long). *Flowers* known only in young bud. *Fruit* spheroidal, c. 5 by 4 mm, calyx and stylopodium prominent; pedicel 5–6 mm.

Distr. *Malesia*: SE. Celebes (Kendari).

Ecol. Primary rain-forest, 50–150 m.

Note. The small leaves and relatively simple inflorescences are distinctive.

14. *Arthropphyllum cenabrei* MERR. Philip. J. Sc. 20 (1922) 417; En. Philip. 3 (1923) 235; PHILIPSON, Gard. Bull. Sing. 30 (1977) 309.

Glabrous tree, c. 10 m, ultimate branches c. 5 mm  $\varnothing$ . Upper leaves pinnate, up to 10 cm long, leaflets mostly 5, sometimes 3, or the uppermost reduced to simple leaflets, the rachis and petiole c. 4 cm; leaflets mostly elliptic, 4 $\frac{1}{2}$ –6 by 2 $\frac{1}{2}$ –3 $\frac{1}{2}$  cm, chartaceous to subcoriaceous, very shortly and obtusely acuminate, base acute, brownish olivaceous and slightly shining when dry, nerves 3–4 pairs, slender; petiolules 5–10 mm. Peduncles c. 4 cm, umbellately arranged at the tops of the branchlets, usually however with solitary inflorescences in the axils of the uppermost leaves, thus forming a somewhat leafy inflorescence. *Fruits* 5–8 in each umbel, ovoid, c. 7 mm  $\varnothing$ ; pedicels 8–10 mm.

Distr. *Malesia*: Philippines (Cebu; FB 28343, type, not seen).

Ecol. On slopes at 600 m.

Vern. *Bingliu*, C.Bis.

Note. No specimen of this species has been located. The above description is taken from MERRILL's original account. In placing this species in the key, it has been assumed that the inflorescence branching is relatively simple.

15. *Arthropphyllum pulgarensis* ELMER, Leaf. Philip. Bot. 7 (1915) 2551; MERR. En. Philip. 3 (1923) 235;

PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 9. — Fig. 20c.

Small tree, branches c. 1 cm  $\varnothing$ , young parts with red tomentum, becoming glabrous except on the ovaries. *Leaves* clustered towards the ends of the branches, leaflets c. 6 pairs, c. 22 by 8 cm; petioles c. 6 cm, 3 mm  $\varnothing$ ; petiolules 5–6 mm; leaflets elliptic to rotund, c. 4 by 2 $\frac{3}{4}$  cm, coriaceous, margin revolute, rounded to broadly cuneate, apex rounded or abruptly tapered to a short obtuse apiculum. *Inflorescence* a terminal cluster of specialized branches (primary rays); primary rays c. 6–10 cm, 3–4 mm  $\varnothing$ , bearing near the middle an opposite pair of simple rotund leaves, sometimes with flowering branches in their axils, and with a whorl of similar leaves below the terminal cluster of secondary rays; secondary rays c. 6–8, 2–4 cm long, articulated about the middle with scars of bracts or bearing a pair of small simple leaves terminating in an umbellule of c. 8–12 flowers; bracts caducous. *Calyx* with indistinct teeth. Petals 6, 2 $\frac{1}{2}$  mm long (in bud). Stamens 6, anthers curved. Ovary obconical, 2 mm long, furfuraceous. *Fruit* ellipsoid, c. 8 by 5 mm, the stylopodium forming a beak with stigma and calyx; exocarp fleshy.

Distr. *Malesia*: Philippines (Palawan: Mt Pulgar).

Ecol. Common in montane forest on Mt Pulgar.

Note. The coriaceous, small, often rotund leaflets are characteristic.

16. *Arthropphyllum montanum* RIDL. J. Fed. Mal. St. Mus. 4 (1909) 24; Fl. Mal. Pen. 1 (1922) 886; PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 8. — *A. nitidum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42; Fl. Mal. Pen. 1 (1922) 886. — *A. ovatum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42; Fl. Mal. Pen. 1 (1922) 886. — Fig. 19d, 20b.

Shrub or small tree to 6 m, unbranched or sparingly branched, rufous-tomentose on the young parts, becoming glabrous. *Leaves* tufted at the ends of the branches, multijugate, c. 30–55 by 12–22 cm; petiole 9–21 cm, 3 mm  $\varnothing$ ; petiolules c. 10–15 mm; leaflets elliptic or oblong, 6–10 by 2 $\frac{1}{2}$ –4 cm, coriaceous or chartaceous, base cuneate, apex with a short blunt apiculum, margin entire, revolute, the few principal lateral veins usually rather prominent; the leaves associated with the umbels usually unifoliolate, broadly elliptic to rotund, with a petiole to 4 $\frac{1}{2}$  cm. *Inflorescences* on specialized leafy branches either in terminal clusters or axillary in the upper leaves; branches 10–30 cm, leaves mostly simple in opposite pairs, usually without flowering branches in their axils, branches ending in a whorl of simple leaves surrounding a compound umbel; primary rays c. 5–15(–20), 2–6 cm, with scars of caducous bracts; pedicels 4–8 mm. Petals (4–)5, 2 mm long in bud. Stamens (4–)5. Ovary turbinate; disk fleshy, stigma  $\pm$  sessile. *Fruit* spheroidal, c. 8 by

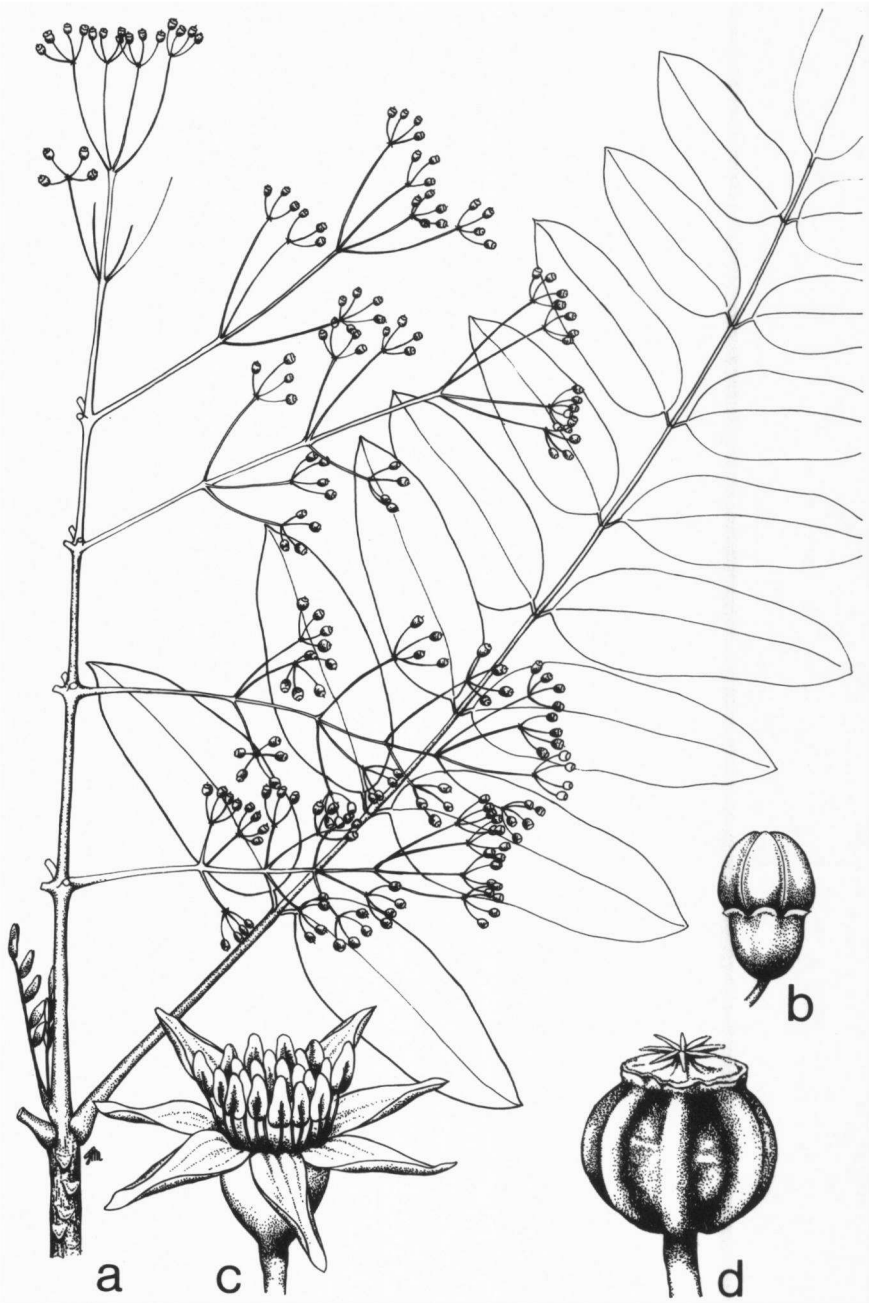


Fig. 24. *Gastonia serratifolia* (MIQ.) PHILIPSON. a. Habit,  $\times \frac{1}{3}$ , b. lower bud, c. flower, d. fruit, both  $\times 5$  (a-c SCHMUTZ 3612, d VAN ROYEN 4090). Drawn by HELENE MULDER.

5 mm, calyx and stylopodium rather prominent.

Distr. *Malesia*: Malay Peninsula (Kedah to Selangor).

Ecol. Primary forest ascending to the montane zone, and in second-growth, 250–1500 m.

Note. Similar to 12. *A. maingayi* but distinguished by the more leathery leaves and by the leafy inflorescence branches which are usually absent in *A. maingayi*.

17. *Arthrophyllum alternifolium* MAINGAY ex RIDL. Fl. Mal. Pen. 1 (1922) 886; PHILIPSON, Gard. Bull. Sing. 30 (1977) 311, f. 11. — *A. pinnatum* CLARKE, Fl. Br. Ind. 2 (1879) 734, p.p., excl. *basionym*; KING, J. As. Soc. Beng. 67, ii (1898) 59, p.p. — *A. alternifolium* MAINGAY ex CLARKE, Fl. Br. Ind. 2 (1879) 734, *nomen in synon.* — Fig. 20e.

Slender, sparingly branched shrub to 2 m, rufous-tomentose on the young parts, becoming glabrous. *Leaves* tufted at the ends of the branches, multijugate, c. 20–25(–30) by 9–12(–15) cm; petiole terete, c. 3–6(–9) cm, 2–3 mm  $\varnothing$ ; petiolules c. 2 mm; leaflets ovate, elliptic or lanceolate,  $3\frac{1}{2}$ –4(–6) by 1–2(–2 $\frac{1}{4}$ ) cm, coriaceous, base cuneate, apex acuminate to caudate, obtuse, margin revolute, veins obscure; leaves associated with the umbels (if any) reduced, with fewer leaflets or unifoliate, sometimes broadly ovate. *Inflorescence* usually a terminal compound umbel, occasionally a whorl of leafy branches (5–14 cm long) (leaves usually simple in opposite pairs), each

ending in a compound umbel; peduncle  $1\frac{1}{2}$ – $4\frac{1}{2}$  cm, with one or more usually caducous simple (or trifoliate) leaves at the apex; primary rays c. 5, 3– $4\frac{1}{2}$  cm, with scars of caducous leaves about the middle, each ending in an umbellule of c. 12–25 flowers, pedicels 5–8 mm. *Calyx* a rim or minutely 4–5-dentate. Petals 4–5, 2 mm long in bud. Stamens 4–5. Ovary turbinate; disk fleshy, stigma  $\pm$  sessile. *Fruit* spheroidal, c. 5 by 5 mm when dry, calyx and stylopodium small.

Distr. *Malesia*: Malay Peninsula (Johore: Mt Ophir; Pahang, Selangor, and Malacca).

Ecol. In shady montane forest, with *Rhododendron* and *Dacrydium*, 900 m and above.

Note. The small, coriaceous, often apiculate leaflets are characteristic. Although collected most frequently on Mt Ophir it occurs on other high ridges in southern Malaya.

#### Excluded

*Arthrophyllum ceylanicum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27 (type in L), is according to VAN STEENIS, Rec. Trav. Bot. Néerl. 24 (1927) 819 = *Oroxylum indicum* (L.) KURZ (*Bignoniaceae*).

*Arthrophyllum reticulatum* BL. ex MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 27 (type in L), is according to MIQUEL (*l.c.* 318) and VAN STEENIS (*vide supra*) = *Oroxylum indicum* (L.) KURZ (*Bignoniaceae*).

### 9. GASTONIA

COMM. ex LAMK, Encycl. 2 (1786) 610; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43; HUTCH. Gen. Fl. Pl. 2 (1967) 68; PHILIPSON, Blumea 18 (1970) 491, 497, f. 1–10. — *Tetraplasandra* (non A. GRAY) MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 4; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 29, p.p.; Nachtr. 2 (1900) 253. — *Indokingia* HEMSL. in Hook. Ic. Pl. (1906) t. 2805. — *Peekeliopanax* HARMS, Notizbl. Berl.-Dahl. 9 (1926) 478, fig. — Fig. 24, 26, 27.

Trees unarmed with thick branches, glabrous or tomentose. *Leaves* large, imparipinnate, exstipulate; rachis articulated; leaflets in pairs entire or crenate; petiole terete, with clasping base. *Flowers* in umbellules which are arranged racemously, or in verticils, on strong inflorescence branches; pedicels not articulated below the ovary. *Calyx* forming a continuous rim with an entire or indistinctly denticulate margin. Corolla of 5–13 free petals or calyprate, fleshy, valvate. *Stamens* either equal in number to the petals or up to several times as many; filaments usually rather short and thick; anthers large, often irregularly lobed, dorsifixed. Ovary inferior, broadly obconic, cells 7–22; disk fleshy with stylar processes equal in number to the cells arising from its centre. *Fruit* a spherical berry (strongly ribbed when dry), with an indistinct calyx rim, a flattened disk, and a

prominent stylopodium bearing a ring of radiating stigmatic arms; exocarp fleshy, endocarp crustaceous. Endosperm with smooth surface.

Distr. About 10  *spp.* in East Africa, Madagascar, the Seychelles and Mascarenes, *Malesia*, and the Solomon Is.

Ecol. Primary and second-growth forest, or in open country, from sea-level to lower montane zone.

Taxon. I have amply analyzed and discussed the affinities of *Gastonia* (Blumea 18, 1970, 497). I have come to the conclusion that within its alliances *Gastonia* is the only genus west of Samoa; in Polynesia there are three other closely allied genera.

#### KEY TO THE SPECIES

1. Corolla with free petals. Ovary cells and style arms 6–9(–12). Whole plant glabrous. Leaflets usually entire or sparsely crenate. Main inflorescence branches borne along an elongated axis with caducous bracts; peduncles of the umbellules mostly aggregated into pseudo-whorls . . . . 1. *G. serratifolia*
1. Corolla calyptrate. Ovary cells and style arms 12–18(–22). Young parts with scurfy tomentum, persisting on the ovary and bracts. Leaflets strongly crenate. Main inflorescence branches borne sub-umbellately on a short axis with persistent bracts; peduncles of the umbellules scattered  
2. *G. spectabilis*

1. *Gastonia serratifolia* (MIQ.) PHILIPSON, *comb. nov.* — *Arthropphyllum serratifolium* MIQ. Sum. (1861) 341, type from Sibolga, leg. TEYSMANN (in U). — *G. papuana* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 5; HARMS, Bot. Jahrb. 56 (1921) 408; PHILIPSON, Blumea 18 (1970) 492, 500 f. 3. — *Tetraplasandra paucidens* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 4; KOORD. Minah. (1898) 488. — *G. eupteronoides* T. & B. Nat. Tijd. N. I. 25 (1863) 416. — *Polyscias papuana* (MIQ.) SEEM. J. Bot. 3 (1865) 181. — *Tetraplasandra koordersii* HARMS, Ann. Jard. Bot. Btzg 19 (1904) 12; Ic. Bog. 2 (1906) t. 178. — *Tetraplasandra philippinensis* MERR. Philip. J. Sc. 1 (1906) Suppl. 219; En. Philip. 3 (1923) 222. — *G. winkleri* HARMS in Fedde, Rep. 15 (1917) 20. — *Tetraplasandra solomonensis* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 11. — Fig. 24.

Shrub or small tree, sometimes epiphytic, up to 27 m, with clear bole to 15 m, dbh 34 cm, crown sparsely branched with leaves crowded at the ends of the branches, glabrous. *Leaves* up to 80 by 20 cm; petiole c. 13 cm; leaflets c. 10 pairs, petiolules up to 1 cm; blade oblong, ovate or lanceolate, middle leaflets 8–14(–18) by 2½–3½(–8) cm, chartaceous, entire and subrevolute, or with a few obscure, more rarely several prominent crenations, apex rounded and bluntly apiculate or tapering and acute, base broadly cuneate, midrib prominent. *Inflorescence* terminal, glabrous, with a stout primary axis 15–25 cm long, bearing scattered or clustered branches along its length and ending in an umbel of c. 10 branches; bracts caducous; secondary branches 30–40 cm, bearing numerous subverticillate peduncles along their length and ending in an umbel; peduncles c. 3 cm, somewhat longer in fruit; pedicels 1–2½ cm, forming umbellules of c. 10 flowers. Flower buds (when dry) c. 7 by 3 mm. *Calyx* rim

undulate. Petals 5–9, slightly fleshy, fully separated. Stamens variable in number, (7–)14–55; filaments short; anthers broad and irregularly lobed, variable in size. Ovary glabrous, smoothly rounded below, slightly constricted below the calyx; cells 6–12, usually c. 9, disk with a prominent rim and, at anthesis, a central boss formed by closely appressed subulate style arms equal in number to the ovary cells. *Fruit* c. 9 by 7 mm (without stylopodium), the flattened stylopodium ending in a ring or double row of radiating subulate stigmatic arms, black when ripe, the fleshy exocarp enclosing compressed crustaceous pyrenes.

Distr. Solomon Is.; in *Malesia*: Central W. Sumatra (Sibolga, Enggano I.), Malay Peninsula (Johore), Sunda Straits (islet Dwars in den Weg), West Java, Lesser Sunda Is. (Sumba, Timor, Wetar, Flores), W. Borneo (east of Pontianak, Karimata), N. Borneo (Sabah), Philippines

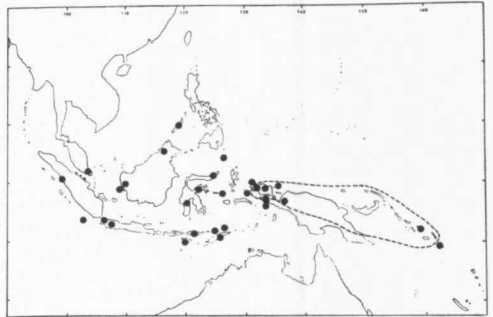


Fig. 25. Distribution of *Gastonia* in Malesia. Known localities of *G. serratifolia* (MIQ.) PHILIPSON: black dots; range of *G. spectabilis* (HARMS) PHILIPSON: broken line.



Fig. 26. *Gastonia spectabilis* (HARMS) PHILIPSON, two inflorescences visible below the leaves (Photogr. PHILIPSON, Kassam Pass, E. New Guinea, 1968).

(Palawan, Balabac), Celebes (Lepo-Lepo, Luwuk, Minahassa), N. Moluccas (Talaud Is.), New Guinea (Vogelkop, NW. & SW. Irian, Schouten I., Waigeu I.). Fig. 25.

Ecol. Primary and secondary forest, or in open country, usually at low altitude and often on the shore or sea-cliffs, but ascending to 1000 m. EYMA noted it to be a characteristic tree on Mt Tambunan, Luwuk, E. Celebes.

Vern. *Bajur talang èkoaho*, M, Enggano, *jarum*, Sabah, *raka*, Sumba, *kre*, *wangka*, Flores, *lampopaä*, *bungku*, Celebes, *buñgio*, Palawan, *lantora*, Talaud Is., *mansngoree*, *mantsenongor*, Schouten I., *raauwrack*, *ara-orach*, Vogelkop, Maibrat.

Note. The entire or serrate nature of the leaf margins, the number of ovary cells, and especially the number of stamens are variable characters but show no discernable geographical segregation. The outer bark is described as light brown, with small oblong brittle scales. Inner bark, leaves and inflorescences with copious sticky juice. Wood soft white. The petals are variously described as purple, light green, and white.

2. *Gastonia spectabilis* (HARMS) PHILIPSON, *Blumea* 18 (1970) 494, pl. 1. — *Peekeliopanax spectabilis* HARMS, *Notizbl. Berl.-Dahl.* 9 (1926) 478, fig.; PHILIPSON, *Blumea* 18 (1970) 500 f. 2. — *G. bori-diana* HARMS, *Bot. Jahrb.* 69 (1938) 282. — Fig. 26, 27.

Tree up to 40 m high, clear bole to 28 m, dbh 1.75 m, crown sparsely branched with the branches whorled or regularly forked and the leaves crowded at the ends of the branches, all young parts with scurfy indumentum more evident in dried material. *Leaves* up to 80 by 30 cm; petiole c. 15 cm, with some tomentum remaining at the joints; leaflets c. 11 pairs on petiolules c. 2–8 mm, oblong or elliptic, middle leaflets 10–15 by 4–6 cm, chartaceous when dry, prominently crenate, apex narrowed to a short blunt apiculus, base rounded or truncate. *Inflorescence* in forks well below the leaves, when in bud covered with large scurfy cataphylls, and when mature with radiating branches forming clusters c. 130 cm Ø. *Primary axis* short (5–10 cm) with persistent bracts; secondary branches numerous, radiating, up to 65 cm, bearing small, persistent, scurfy bracts and peduncles scattered along their length and clustered in a terminal umbel; peduncles c. 1½–5 cm; pedicels ½–1½ cm, forming umbellules of c. 5–12 flowers. Flower buds c. 8 by 5 mm when dry (fresh c. 12 by 8 mm). *Calyx* rim straight. Petals 6–12, very fleshy, incompletely separated (often splitting into c. 5 lobes). Stamens 25–66, often c. 35, filaments short; anthers broad and irregularly lobed, variable in size. Ovary with a short dense indumentum, smoothly rounded below, cells usually c. 16, very rarely fewer than 10, as many as 22; disk at anthesis with a prominent rim and a central boss formed by closely appressed subulate

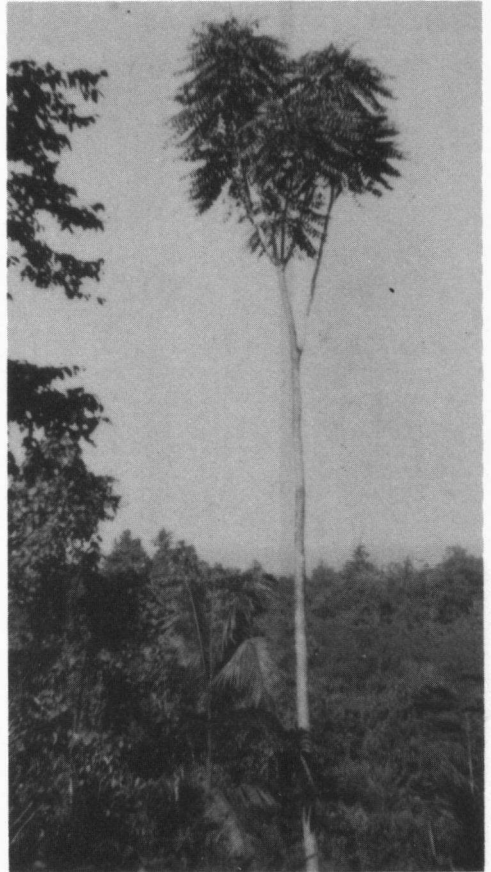


Fig. 27. *Gastonia spectabilis* (HARMS) PHILIPSON. Young tree, free bole 19 m, 47 cm Ø, crown 10 m, longest leaves 2 m, not yet flowering (Photogr. G. PEEKEL, New Ireland, Uganda, 1940).

styles equal in number to the cells. *Fruit* c. 8 by 10 mm (dry and without stylopodium), the flattened disk with a prominent stylopodium ending in an elliptical ring of radiating subulate stigmatic arms; the fleshy exocarp enclosing compressed crustaceous pyrenes.

Distr. Solomon Is.; in *Malesia*: New Guinea (Vogelkop, NW. Irian, Papua New Guinea), Bismarcks, and New Ireland. Fig. 25.

Ecol. Primary and secondary rain-forest, and in cultivated areas, 200–2000 m.

Vern. *Amoriga*, *bekuak*, *djak*, *ntjier*, *tuju*, Vogelkop, *bohko*, *boinga*, *gabiel*, *jamwa*, *mestic*, *sikoto*, *tubat*, *tumbala*, Madang Distr., *waki*, W. Highlands, *aita*, E. Highlands, *kuhuh*, Papua.

Note. Possibly the largest araliad known. The regular habit of branching results from the vegeta-

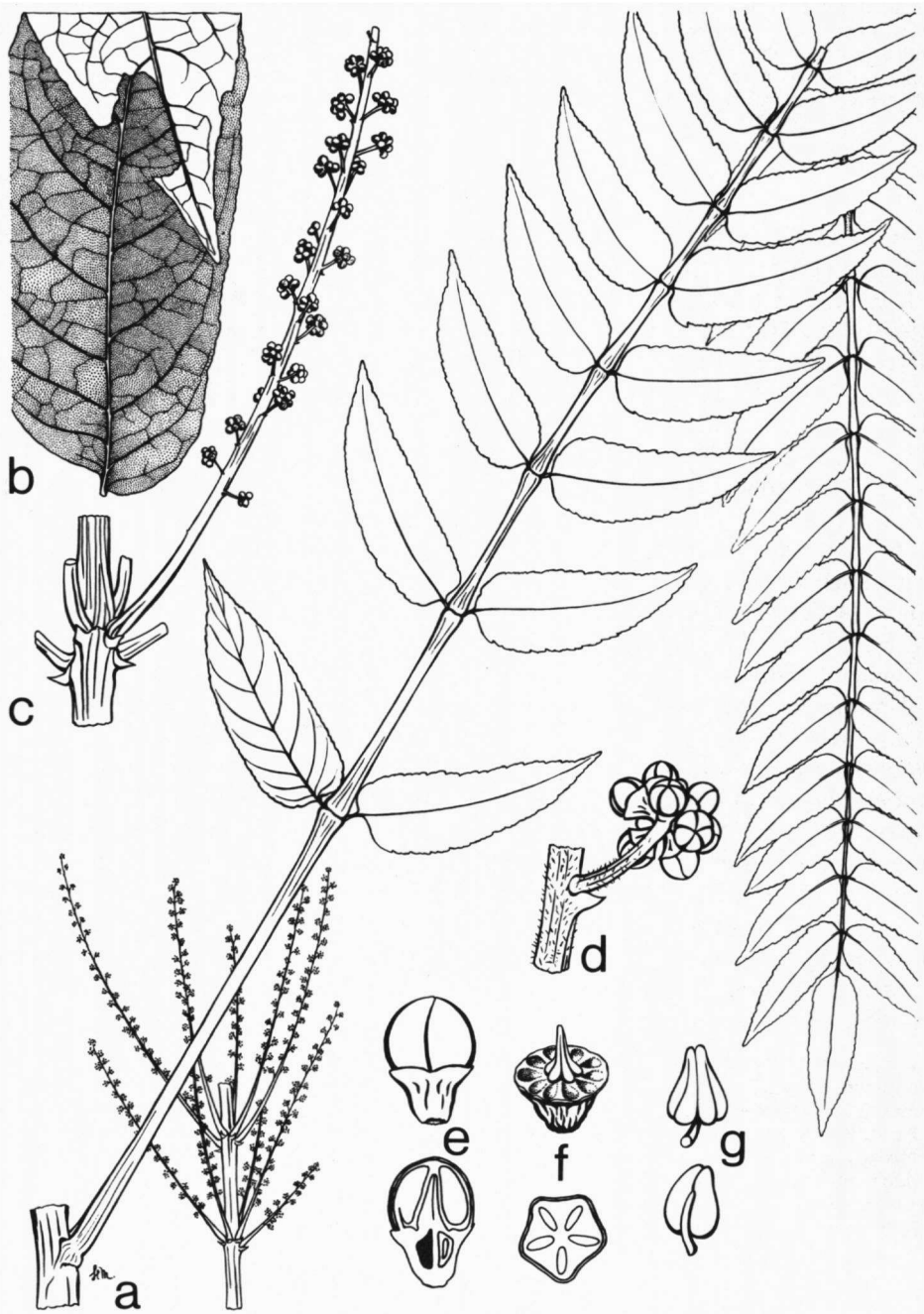


Fig. 28. *Polyscias nodosa* (Bl.) SEEM. *a.* Leaf and part of inflorescence,  $\times \frac{1}{3}$ , *b.* leaflet,  $\times \frac{2}{3}$ , *c.* branch of inflorescence,  $\times \frac{2}{3}$ , *d.* umbellule, *e.* flower bud and ditto in LS,  $\times 8$ , *f.* ovary and ditto in CS,  $\times 8$ , *g.* stamens (VERSTEEGH BW 3868). Drawn by HELÈNE MULDER.

tive shoots springing in pairs or whorls from below terminal inflorescence buds. Several flushes of growth occur as an inflorescence bud matures, so that at anthesis the inflorescences are situated in forks well below the leafy crown, with a succession of younger inflorescence buds in higher forks.

Bole without buttresses or with buttresses 1 m high and 2 m wide. Outer bark brown with prominent pustular lenticels and small shallow fissures. Exudate from cuts abundant, clear and aromatic. Wood soft. Flowers cream, stamens yellow. Ripe fruit dark red-brown.

## 10. POLYSCIAS

J. R. & G. FORSTER, Char. Gen. (1776) 63, t. 32; DC. Prod. 4 (1830) 257; SEEM. J. Bot. 3 (1865) 179; BTH. in B. & H. Gen. Pl. 1 (1876) 941; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43; KOORD. Atlas 4 (1916) f. 677-680; MERR. Int. Rumph. (1917) 408; HARMS, Bot. Jahrb. 56 (1921) 409; MERR. En. Philip. 3 (1923) 233; HUTCH. Gen. Fl. Pl. 2 (1967) 75; BERNARDI, Candollea 26 (1971) 13; PHILIPSON, Blumea 24 (1978) 169. — *Eupteron* MIQ. Pl. Jungh. 3 (1855) 423; Fl. Ind. Bat. 1, 1 (1856) 762; HUTCH. Gen. Fl. Pl. 2 (1967) 68. — *Nothopanax* MIQ. Pl. Jungh. 3 (1855) 425; Bonplandia 4 (1856) 139; Fl. Ind. Bat. 1, 1 (1856) 765; SEEM. Fl. Vit. (1866) 114; MERR. Int. Rumph. (1917) 409; En. Philip. 3 (1923) 233. — *Irvingia* F.v.M. Fragm. 5 (1865) 17, non HOOK. f. 1860. — *Kissodendron* SEEM. J. Bot. 3 (1865) 201; *ibid.* 6 (1868) 129; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; Bot. Jahrb. 56 (1921) 412; HUTCH. Gen. Fl. Pl. 2 (1967) 75. — *Palmervandenbroekia* GIBBS, Arfak (1917) 162; HUTCH. Gen. Fl. Pl. 2 (1967) 75. — *Gelibia* HUTCH. Gen. Fl. Pl. 2 (1967) 57. — Fig. 28, 30.

Unarmed shrubs or trees, glabrous or furfuraceous. *Leaves* imparipinnate or 2-3-pinnate (rarely unifoliolate) with an elongated or short sheathing base; rachis articulated; petiole terete; leaflets in pairs, entire, crenate or dentate. *Inflorescence* terminal, often large, a panicle, corymb, or compound rarely simple umbel. *Flowers* in umbellules, capitula, or racemose; pedicels articulated below the ovary. *Calyx* a rim with an undulate or dentate margin. *Petals* 4-5(-8 or more), valvate. *Stamens* equal in number to the petals; anthers dorsifixed. *Ovary* inferior, 4-5(-8 or more)-celled; disk fleshy; styles either free and recurved (at least in fruit) or joined to form a beak-like stylopodium. *Fruit* a spherical or ovoid drupe, crowned by the persistent calyx rim and the styles or stylopodium; exocarp fleshy, endocarp chartaceous. Endosperm with an uneven surface, fissured, or rarely smooth.

Distr. About 100 *spp.* throughout the tropics of the Old World (incl. Australia), and the Pacific Islands; in *Malesia* 23 *spp.* of which 3 adventive: rare in West (none native in Sumatra and Malaya), more common in East, the majority in New Guinea. Fig. 29.

Ecol. Primary or second-growth forest, from sea-level to 2650 m.

Note. Araliads with pinnate leaves and an articulated pedicel are here regarded as forming one genus, divided into several sections. These sections have formerly been segregated as genera, but I follow BERNARDI, *l.c.*, in uniting them. The most distinctive is *sect. Polyscias*, characterized by an elongated leaf-sheath. Several of the species of this section are cultivated and have a number of cultivars.

### KEY TO THE SECTIONS

1. Leaf-sheath elongated, extending along the petiole for about  $\frac{1}{4}$  of its length (*Spp.* 1-7)
    1. Leaf-sheath short or obsolete, restricted to the base of the petiole.
    2. Style arms spreading, at least in fruit.
1. *Sect. Polyscias*



- 3. Flowers arranged racemously (*Sp.* 8) . . . . . 2. *Sect. Gelibia*
- 3. Flowers arranged in umbellules or capitula (*Spp.* 9–14) . . . . . 3. *Sect. Eupteron*
- 2. Style arms erect, fused, forming a beak in fruit.
- 4. Inflorescence large, ± as long as the leaves (*Spp.* 15–19) . . . . . 4. *Sect. Kissodendron*
- 4. Inflorescence much shorter than the leaves (*Spp.* 20–23). . . . . 5. *Sect. Palmervandenbroekia*

1. Section Polyscias

PHILIPSON, *Blumea* 24 (1978) 169.

Aromatic, glabrous shrubs or small trees, often cultivated. Leaf-sheath elongated along the petiole for  $\frac{1}{3}$ – $\frac{1}{4}$  of its length. Styles spreading, at least in the fruit.

Distr. Polynesia, Queensland, *Malesia*, and SE. Asia.

KEY TO THE SPECIES

- 1. Leaves 2–3-pinnate. . . . . 1. *P. fruticosa*
- 1. Leaves imparipinnate, or unifoliolate.
- 2. Ovary 2-celled (or predominantly so).
- 3. Main inflorescence branches diffusely branched . . . . . 2. *P. macgillivrayi*
- 3. Main inflorescence branches with verticils of short branches . . . . . 3. *P. verticillata*
- 2. Ovary variable, but many flowers with more than 2 cells.
- 4. Leaflets orbicular or reniform. Leaves unifoliolate or trifoliolate . . . . . 4. *P. scutellaria*
- 4. Leaflets ovate, oblong, or elliptic (cultivated forms often lacinate or lanceolate). Leaves with 3 or more pairs of leaflets.
- 5. Leaf margin sharply serrate (blade often rhomboidal and variegated with light yellow) . . . . . 5. *P. guilfoylei*
- 5. Leaf margin entire, or obscurely dentate.
- 6. Peduncles of the ultimate umbellules bearing 1 or more pairs of small bracts (reduced flowering branches sometimes present in their axils) . . . . . 6. *P. cumingiana*
- 6. Peduncles of the ultimate umbellules either without bracts, or with 1 or more small bracts inserted singly . . . . . 7. *P. javanica*

1. *Polyscias fruticosa* (L.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; K. & V. Bijdr. 7 (1900) 2; HARMS in K. Sch. & Laut. Fl. Schutzgeb. (1900) 486; KOORD. Exk. Fl. Java 2 (1912) 716; Atlas 4 (1916) f. 680; BAILEY, *Rhodora* 18 (1916) 153, *incl. var. plumata* (Hort.) BAILEY; BACK. & BAKH. *f. Fl. Java* 2 (1965) 168; PHILIPSON, *Blumea* 24 (1978) 169. — *Scutellaria tertia* RUMPH. Herb. Amb. 4: 78, t. 33. — *Panax fruticosum* LINNÉ, Sp. Pl. ed. 2 (1763) 1513; BL. Bijdr. (1826) 830; DC. Prod. 4 (1830) 254; BLANCO, Fl. Filip. ed. 2 (1845) 156; ed. 3, 1 (1877) 281, t. 78; CLARKE, Fl. Br. Ind. 2 (1879) 725; F.-VILL. Nov. App. (1880) 101; BOERL. Handl. 1 (1890) 647; F.v.M. Descr. Pap. Pl. 9 (1890) 60; WARB. Bot. Jahrb. 13 (1891) 396; KOORD. Minah. (1898) 488; MERR. Philip. J. Sc. 3 (1908) Bot. 84. — *Panax obtusum* BL. Bijdr. (1826) 880; DC. Prod. 4 (1830) 254. — *Aralia tripinnata* BLANCO, Fl. Filip. (1837) 223, *cf.* MERR. Sp. Blanc. (1918) 295. — *Nothopanax fruticosum* (L.) MIQ. Pl. Jungh. 3 (1855) 425; Fl. Ind. Bat. 1, 1 (1856) 765; SEEM. Fl. Vit. (1866) 114, 115; J. Bot. 4 (1866) 363; MERR. Fl. Manila (1912) 358, *incl. var. plumatum* (Hort.) MERR. *et var. victoriae* (Hort.)

MERR.; Int. Rumph. (1917) 410; Sp. Blanc. (1918) 295; HARMS, Bot. Jahrb. 56 (1921) 412; MERR. En. Philip. 3 (1923) 233; HEYNE, Nutt. Pl. (1927) 1209; OCHSE & BAKH. Veg. D.E.I. (1931) 64, f. 37; CORNER, Ways. Trees (1940) 150. — *Nothopanax obtusum* (BL.) MIQ. Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. Fl. Vit. (1866) 114. — *P. obtusa* (BL.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45, *nom. illeg., non* BLANCO, 1837, *quae est Schefflera odorata* (BLANCO) MERR. & ROLFE; KOORD. Exk. Fl. Java 2 (1912) 716; Atlas 4 (1916) t. 679 S; BACK. & BAKH. *f. Fl. Java* 2 (1965) 168.

Glabrous shrub or small tree, up to 5 m, with branches bearing spirally arranged leaves towards their ends. *Leaves* tripinnate, variable in size to c. 75 cm long; petiole up to c. 25 cm, with a sheathing base to 5 cm long; pinnae to c. 25 cm long; leaflets shortly petiolate, very variable in shape and size, oblong or linear-lanceolate, or 1–12 by  $\frac{1}{2}$ –4 cm, more or less deeply serrate or lobed, or irregularly pinnatisect, apex attenuate, acuminate or rounded, base cuneate, truncate or subcordate, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis up to c. 60 cm with

secondary branches mostly in verticils at intervals along its length; secondary branches up to 30 cm bearing umbellules in an irregularly branched system towards their extremities; umbellules with 12–20 flowers on pedicels c. 3 mm long. *Calyx* a minute rim. Petals 5, 2 mm long. Stamens 5. Ovary turbinate, c. 1 mm high, 2–3(–4)-celled; styles at first erect, later spreading. *Fruit* subglobose, fleshy, c. 5 mm  $\varnothing$  when dry.

Distr. Native country not properly known, cultivated throughout the region, and in other parts of the Indo-Pacific tropics.

Ecol. Grown at low and moderate altitudes (c. 1000 m) as an ornamental or hedge shrub and for culinary use.

Vern. (from various sources). Sumatra: *orang aring*, Medan, *kédongdong mekka*, Palembang; Malaya: *daun girang*, *siku kluang*, M; Java: *kédongdong alus*, *k. batur*, *k. laut*, M, *imba*, *kédongdong laki*, *k. tjina*, *randa nunut*, S, *tjakar kutjung*, t. *tjikri*, J, *kadongdung*, *k. laut*, *k. petédhan*, Md; Celebes: *boka ula risé*, *kèndèm rintèk*, Minahasa, Alfur lang., *bombu*, Makassar; Philippines: *papúa*, Tag., Bik., *bani*, *makan*, Bik.; Moluccas: *daun papeda papua*, *pagar pagar*, Ambon, *guarbatí*, *tampusong*, Ternate.

The name *kedongdong* belongs properly to species of the fruit tree genus *Spondias*, but is sometimes also applied to trees of other families with pinnate leaves; *papua* means 'curly'.

Notes. The foliage of this plant is extremely variable in size and form. Typical plants are figured by KOORDERS (1916, *l.c.*) and by OCHSE & BAKHUIZEN VAN DEN BRINK (*l.c.*). These may be readily identified by the intricately compound leaf.

The individual leaflets are characteristically ovate-lanceolate and serrate to deeply pinnatifid. However, broader leaflets with simpler outlines are not uncommon. The more rotund, blunter leaflets of *P. obtusa* are considered here to be an extreme form of this species (the type is bipinnate).

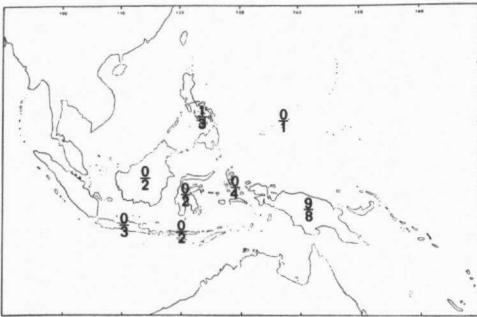


Fig. 29. Species density of *Polyscias* J. R. & G. FORSTER in Malesia; above the hyphen the number of endemic species, below it the non-endemics. Only the native species.

Occasional specimens have leaves so much reduced that they are simply pinnate or unifoliolate when they approach forms of 6. *P. cumingiana*.

A number of names have been applied to horticultural forms belonging to this section of the genus (*cf.* BAILEY, *Rhodora* 18, 1916, 153), but the interrelations of these will be understood only after intensive biosystematic study of the many cultivars.

2. *Polyscias macgillivrayi* (SEEM.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 14; Blumea 24 (1978) 169. — *Nothopanax macgillivrayi* SEEM. Fl. Vit. (1866) 114, *nomen*. — *Panax macgillivrayi* (SEEM.) BTH. Fl. Austr. 3 (1866) 382. — *P. grandifolia* VOLKENS, Bot. Jahrb. 31 (1901) 471; KANEHIRA, En. Micron. Pl. (1935) 385. — *Tieghe-mopanax macgillivrayi* VIGUIER, Bull. Soc. Bot. Fr. 52 (1905) 313. — *Polyscias sp.* C. T. WHITE, J. Arn. Arb. 10 (1929) 255.

Glabrous shrub or small tree, up to 15 m, with few branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 1 m (or more) long, uppermost leaves smaller; petiole c. 15 cm, with a sheathing base extending for 6–10 cm along the petiole; petiolules c. 10–15 mm; lamina oblong often broader near the base (lower and the terminal pinnules more ovate) c. 20–25 by 8–10 cm, slightly succulent when fresh, margin entire, revolute or occasionally minutely dentate, apex rounded and shortly apiculate, base rounded, truncate or subcordate, midrib and widely spaced laterals prominent. *Inflorescence* a large panicle; primary axis stout, rather short (c. 3–10 cm), often bearing reduced leaves or cataphylls basally, and a few lateral inflorescence branches, terminating in an umbel of long diffusely branched rays; lateral branches and rays c. 40–50 cm, with secondary branches c. 6–12 cm borne singly or in subverticils along their length; secondary branches with numerous tertiary branches bearing lateral and terminal umbellules (or the branching may be of a high order); umbellules with c. 6–12 flowers on delicate pedicels c. 3 mm long. *Calyx* a minute rim. Petals 5, 2½ mm long. Stamens 5, anthers oblong 1½ mm long, filaments delicate, 1½ mm long. Ovary turbinate in bud, 1½ mm long, rapidly becoming rotund, compressed with prominent veins, 2-celled; styles 2, divergent. *Fruit* fleshy, black, compressed, c. 5 by 6 mm; styles persistent, recurved.

Distr. Micronesia, Solomon Is., Queensland; in Malesia: New Guinea (Papua, Eastern and Milne Bay Distr.; Territory of New Guinea, Morobe Distr., Musi I.), also in the D'Entrecasteaux and Trobriand Is., New Britain, and Louisiades.

Ecol. Strand vegetation and littoral rain-forest, often behind mangrove.

Vern. *Aikove*, Mimific lang., *ane*, D'Entrecasteaux Is., *gambou*, Musi I., Morobe Distr., *nakaigwo*, Trobriand Is., *raumonas*, Onjob lang.

3. *Polyscias verticillata* STONE, J. Arn. Arb. 47 (1966) 272, f. 1; PHILIPSON, Blumea 24 (1978) 169.

Glabrous, small tree to 7 m with few branches bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, up to 1 m long; petiole c. 24–30 cm, terete with a sheathing base c. 6–7 cm long; petiole 5–20 mm, leaflets oblong often broader near the base, c. 16–27 by 5–13 cm, margin entire, slightly revolute or sparsely denticulate, apex acuminate, base subcordate or truncate, often oblique, midrib and lateral veins evident. *Inflorescence* a large panicle; primary axis stout, rather short, with broad cataphylls, bearing several long radiating secondary branches in a sub-umbel; secondary branches c. 50 cm, with numerous tertiary branches borne in well defined verticils and in a terminal umbel, bracts triangular c. 8 mm long, caducous; tertiary branches c. 4–7 cm with small bracts near the middle; umbellules with c. 10–15 flowers, on pedicels 1–4 mm long. *Calyx* a minute rim. Petals 5, 2<sup>1</sup>/<sub>2</sub> mm long. Stamens 5, anthers oblong, c. 1–1<sup>1</sup>/<sub>2</sub> mm long. Ovary turbinate, c. 1 mm long, 2-celled; styles 2, at first erect, later recurved. *Fruit* globose, fleshy, black, compressed, c. 4 by 7 mm when dry; styles persistent.

Distr. Solomon Is.; in *Malesia*: New Guinea (New Britain, New Ireland, New Hanover, Admiralty Is., and Bagabag I.).

Ecol. Usually near the beach or in lowland forest, to 140 m.

Uses. The young foliage is eaten fresh or boiled.

Vern. *Babagula, valagur*, Kuana dial., *la bara kiku*, Nakanai, *tauwol*, Gasmata, *palu*, Vairamana, *vela vela*, Pomio.

Note. Cut surfaces produce a sweet scented sticky exudate. The petals are violet within, the fruits purple-black.

4. *Polyscias scutellaria* (BURM. f.) FOSB. Un. Hawaii Occ. Pap. 46 (1948) 9; STONE, Taxon 14 (1965) 284; PHILIPSON, Blumea 24 (1978) 169. — *Scutellaria prima* RUMPH. Herb. Amb. 4: 75, t. 31. — *Scutellaria secunda latifolia* RUMPH. l.c. 76. — *Crassula scutellaria* BURM. f. Fl. Ind. (1768) 78. — *Aralia cochleata* LAMK, Encycl. 1 (1783) 224. — *Panax scutellarioides* REINW. ex BL. Bijdr. (1826) 880; SPAN, Linnaea 15 (1841) 208. — *Panax cochleatum* (LAMK) DC. Prod. 4 (1830) 253; BOERL. Handl. 1 (1890) 647. — *Panax conchifolium* ROXB. Fl. Ind. ed. Carey 2 (1832) 77. — *Nothopanax cochleatum* (LAMK) MIQ. Pl. Jungh. 3 (1855) 425; Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. J. Bot. 4 (1866) 296; Fl. Vit. (1866) 116; KOORD. Minah. (1898) 490; Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 697. — *Nothopanax tricochleatum* MIQ. Fl. Ind. Bat. Suppl. (1860) 135, 340; MERR. Int. Rumph. (1917) 409; En. Philip. 3 (1923) 234; OCHSE & BAKH. Veg. D.E.I. (1931) 69, f. 39A. — *Panax rumphii* HASSK. Abh. Naturf. Ges. Halle 9 (1866) 220. — *Nothopanax scutellarium* (BURM. f.) MERR. Int. Rumph. (1917) 409; En. Philip. 3

(1923) 234; HEYNE, Nutt. Pl. (1927) 1209; OCHSE & BAKH. Veg. D.E.I. (1931) 67, f. 39; CORNER, Ways. Trees (1940) 156; BACK. & BAKH. f. Fl. Java 2 (1965) 169. — *P. tricochleata* (MIQ.) FOSB. Phytologia 5 (1955) 290.

Glabrous shrub or small tree, up to 6 m, with branches bearing spirally arranged leaves towards their ends. *Leaves* simple or trifoliolate, variable in size; petiole often c. 6 cm, but as long as 28 cm, with a sheathing base 1–6 cm long; lamina rotund or reniform, often c. 8 cm  $\varnothing$  but as wide as 28 cm, margin usually serrate or becoming sub-lobed towards apex, in larger leaves the serrations often inconspicuous, apex rounded, base  $\pm$  cuneate, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis usually long (up to 1 m) with secondary branches (mostly in verticils, at intervals along its length; secondary branches 15–30 cm, bearing umbellules in an irregularly branched system towards their extremities; umbellules with c. 8–16 flowers, on pedicels c. 3 mm long. *Calyx* a minute rim. Petals 4–5, 2 mm long. Stamens 4–5, anthers oblong, 1 mm long. Ovary turbinate, c. 1 mm high, (2–)3–4-celled, styles at first erect, later recurved. *Fruit* subglobose, fleshy, c. 5 mm  $\varnothing$  when dry.

Distr. Native country not properly known, possibly *East Malesia*; cultivated throughout the region, extending through the tropical Pacific.

Ecol. Grown at low and moderate altitudes (800 m) as an ornamental or hedge shrub.

Uses. The foliage is aromatic and is used to furnish perfume. Forms with variegated foliage are in cultivation. Used medicinally as a diuretic, against breast cancer, and to prevent baldness (HEYNE, l.c.). Also for culinary purpose (OCHSE & BAKH. l.c. 67).

Vern. Cf. HEYNE: *memangkokan*, (*pohon mangkok*, Mal. (after the dish (= *mangkok*)-shaped leaves which are in the Moluccas sometimes used as dishes); Java: *godong mangkokan*, M, *mama-mëkan*, S, *piring mangkok*, Md; Lesser Sunda Is.: *lanido*, *ndalido*, *ndari*, *ramido*, Roti; Celebes: (*daun*) *mangko*, *tuwo mangku*, M, *bobohang*, *boku ula*, *këndem wèwéné*, *woworan*, Manado, *angko mangko*, Bug. & Mak.; Philippines: *salapiin*, Mindanao; Moluccas: *daun koin*, *d. papéda*, M, Ambon, *ai laun niwël*, *ai lohot*, Alf., Ambon, *goma ma tari*, Gal., Halmahera, *sawoko*, Loda, Halmah., *rau paroro*, Ternate.

Note. This species is usually readily distinguished by its simple, orbicular, saucer-shaped leaves, but plants with some or all of their leaves trifoliolate occur. STONE (Micronesica 2, 1965, 51) advanced evidence for uniting these trifoliolate plants with *P. pinnata* (= 6. *P. cumingiana*) while retaining the unifoliolate plants as a distinct species. Possibly all are forms of one polymorphous species complex, but here it is considered convenient to adhere to the view which unites all forms having

orbicular usually bowl-shaped leaves under the concept *P. scutellaria*.

5. *Polyscias guilfoylei* (COGN. & MARCHÉ) L. H. BAILEY, *Rhodora* 18 (1916) 153; STONE, *Micronesica* 2 (1965) 57; PHILIPSON, *Blumea* 24 (1978) 169. — *Aralia guilfoylei* [BULL., Cat. (1873)] COGN. & MARCHÉ, *Pl. Ornam.* 2 (1874) t. 58. — *Nothopanax guilfoylei* (COGN. & MARCHÉ) MERR. Philip. J. Sc. 7 (1912) Bot. 242; Fl. Manila (1912) 357; En. Philip. 3 (1923) 234.

Glabrous shrub to 3 m high, with few branches, bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, with 3–4 pairs of leaflets, c. 60 cm long; petiole c. 18 cm, terete, with a sheathing base 3–4 cm long; petiolules c. 1½–2½ cm; leaflets rotund, oblong or rhomboidal, c. 10–14 by 6–7 cm, rather thin and flaccid, sometimes rugose, margin sharply serrate to broadly cuneate (often decurrent on the petiole), often oblique, midrib and lateral veins evident. *Inflorescence* a diffuse panicle; primary axis short (c. 3–4 cm) with one or few lateral flowering branches, terminating in an umbel of long much-branched rays; lateral branches and rays c. 40–50 cm, with secondary branches (c. 5–8 cm) singly or mainly in subverticils along their length and in a terminal umbel; secondary branches with one or more pairs of small bracts and ending in umbellules with a few lateral tertiary branches also ending in umbellules; umbellules with c. 8–12 flowers on pedicels c. 8–10 mm long. *Calyx* a minute rim. Petals 5, 2½ mm long. Stamens 5, anthers oblong, 1½ mm long; filaments 2 mm. Ovary turbinate, c. 1 mm high, usually 3-celled, styles at first erect, but soon elongating and recurved. *Fruit* fleshy, globose, c. 4 by 5 mm.

*Distr.* Native country unknown, possibly from *East Malesia*. Cultivated throughout the region, but less commonly than other cultivated species of this section. General throughout the tropical Pacific.

*Ecol.* Usually grown as a hedge plant. Flowers only when left untrimmed or when growing as an escape from cultivation.

*Note.* Recognizable by the shape, texture and serrations of the leaflets, which are usually variegated with whitish or yellowish blotches near the margins. The flowers are brown in bud but yellow-green when open.

6. *Polyscias cumingiana* (PRESL) F.-VILL. *Nov. App.* (1880) 102; PHILIPSON, *Blumea* 24 (1978) 169. — *Scutellaria secunda angustifolia* RUMPH. *Herb. Amb.* 4: 76, t. 32. — *Panax pinnatum* LAMK, *Encycl.* 2 (1788) 715, non *P. pinnata* J. R. & G. FORSTER, 1776; DC. *Prod.* 4 (1830) 254; SPAN. *Linnaea* 15 (1841) 208; MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 15; BOERL. *Handl.* 1 (1890) 647; KOORD. *Minah.* (1898) 15. — *Panax secundum* SCHULT. *Syst.* 6 (1820) 215, *nom. superfl. illeg.* —

*Panax bandanense* ZIPP. *ex SPAN.* *Linnaea* 15 (1841) 208, *nom. inval. in synon.* — *Paratropia cumingiana* PRESL, *Epim.* (1851) 250. — *Nothopanax pinnatum* (LAMK) MIQ. *Bonplandia* 4 (1856) 139; MIQ. *Fl. Ind. Bat.* 1, 1 (1856) 766; MERR. *Int. Rumph.* (1917) 409; EN. *Born.* (1921) 458; HEYNE, *Nutt. Pl.* (1927) 1209; OCHSE & BAKH. *Veg. D.E.I.* (1931) 67, f. 38; CORNER, *Ways. Trees* (1940) 156. — *Nothopanax cumingii* (PRESL) SEEM. *Fl. Vit.* (1865) 114. — *Aralia filicifolia* C. MOORE, *Ill. Hortic.* 23 (1876) 72, t. 240. — *Arthrophyllum pinnatum* (LAMK) CLARKE, *Fl. Br. Ind.* 2 (1879) 734, *pro basionym.* — *Panax cumingiana* (PRESL) ROLFE, *J. Linn. Soc. Bot.* 21 (1884) 310; VIDAL, *Phan. Cuming.* (1885) 117. — ? *Aralia naumannii* E. MARCHAL, *Bot. Jahrb.* 7 (1886) 469. — *Panax crispatum* BULL., *Cat.* (1888) 9. — *Panax ornatum* BULL., *l.c.* — *P. cumingii* (PRESL) HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 45. — *P. rumphiana* HARMS, *l.c.* 45; in K. Sch. & Laut. *Fl. Schutzgeb.* (1900) 485; BAKH. *f. & OOSTSTR.* in *Back. Bekn. Fl. Java* (em. ed.) 7 (1948) fam. 159, p. 13; BAKH. & BAKH. *f. Fl. Java* 2 (1965) 167. — *Nothopanax crispatum* (BULL) MERR. Philip. J. Sc. 7 (1912) Bot. 241. — *Nothopanax ornatum* (BULL) MERR. *l.c.* — *P. filicifolia* (C. MOORE) BAILEY, *Rhodora* 18 (1916) 153. — *P. sorongensis* GIBBS, *Arfak* (1917) 216. — *Anomopanax cumingianus* (PRESL) MERR. Philip. J. Sc. 17 (1920) 300; En. Philip. 3 (1923) 236.

Glabrous shrub or small tree, to c. 4 m, unbranched or with few branches bearing spirally arranged leaves towards their ends. *Leaves* imparipinnate, up to 100 cm; petiole to 20 cm, with a sheathing base c. 5–6 cm long; petiolules to 3 cm; leaflets ovate-oblong or elliptic, 10–30 by 2–13 cm, apex attenuated or acuminate, base rotund, truncate or broadly cuneate, often oblique, margin entire or minutely and distantly dentate (sometimes pinnatilobed or almost pinnatipartite); midrib and lateral veins evident. *Inflorescence* a large terminal panicle, or with flowering branches also in the axils of the upper leaves; primary axis up to 140 cm with secondary branches mostly in verticils at intervals along its length; secondary branches up to 120 cm, bearing umbellules in an irregularly branched system towards their extremities, peduncles of the umbellules with one or more pairs of small bracts; umbellules with c. 10–20 flowers; pedicels 4–8 mm. *Calyx* a minute rim with 4–5(–6) teeth. Petals 4–5(–6), 2½–3½ mm long. Stamens 4–5(–6), 2 mm long. Ovary turbinate, c. 2 mm long, 2–5-celled; styles at first erect, later spreading. *Fruit* subglobose, fleshy, 3–5 mm  $\varnothing$  when dry.

*Distr.* Cultivated throughout the region, and also apparently growing as part of the indigenous vegetation.

*Ecol.* Rain-forest and secondary growth, usually at low altitude but ascending to 1700 m, native range not very clear.

*Uses.* A common ornamental shrub, especially

the cultivars with dissected foliage. Also for culinary use.

Vern. (from various sources). Celebes: *daun grisik*, *d. mangko*, *d. papéda pandang*, M, Manado; Philippines: *bani*, Luzon, Albay; Moluccas: *kèndèm*, Ternate, *gurabati*, M; *papua*, Jappen I.; New Britain: *awalagu*, Gazelle Pen.

OCHSE & BAKHUIZEN VAN DEN BRINK record that the vernacular names applied to *P. fruticosum* also include *P. cumingianum*.

Notes. A complex of forms requiring intensive biosystematic study. I adhere to the view that the Indo-Malayan material is specifically distinct from the Polynesian *Polyscias pinnata* J. R. & G. FORSTER; cf. HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 9, but some cultivated forms included here may have been derived from the Pacific rather than the Indo-Malayan species. Existing herbarium material, though voluminous, is inadequate to determine whether the complex includes species with more limited ranges.

As in 1. *P. fruticosa*, cultivated forms with dissected foliage occur.

See also under 4. *P. scutellaria* for a discussion of the relationship with that species.

I have not seen the type of *Aralia naumannii* MARCHAL which, from the description, I assume to be a synonym.

7. *Polyscias javanica* K. & V. Bijdr. 7 (1900) 13; KOORD. Atlas 4 (1916) f. 679 A-R; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 12; BACK. & BAKH. f. Fl. Java 2 (1965) 167; PHILIPSON, Blumea 24 (1978) 169.

## 2. Section Gelibia

(HUTCH.) PHILIPSON, Blumea 24 (1978) 169. — *Gelibia* HUTCH. Gen. Fl. Pl. 2 (1967) 57.

Tree with bipinnate leaves. Flowers arranged racemously; style arms free and divergent after anthesis.

Distr. In New South Wales, Queensland, and *Malesia* (New Guinea) 1 *sp.*

8. *Polyscias elegans* (C. MOORE & F.v.M.) HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45; J. Arn. Arb. 20 (1939) 323; PHILIPSON, Blumea 24 (1978) 169. — *Panax elegans* C. MOORE & F.v.M. Trans. Phil. Inst. Vict. 2 (1858) 68; BTH. Fl. Austr. 3 (1866) 383; C. MOORE, Handb. Fl. N.S.W. (1893) 215. — *Nothopanax elegans* (C. MOORE & F.v.M.) SEEM. Fl. Vit. (1866) 114; J. Bot. 4 (1866) 294. — *Tieghemopanax elegans* (C. MOORE & F.v.M.) VIGUIER, Bull. Soc. Bot. Fr. 52 (1905) 308. — *P. branderhorstii* HARMS, Nova Guinea 8 (1910) 274; Bot. Jahrb. 56 (1920) 42; J. Arn. Arb. 20 (1939) 323. — *Gelibia branderhorstii* (HARMS)

Glabrous shrub or sparsely branched small tree, bearing spirally arranged leaves towards the ends of the branches. *Leaves* imparipinnate, c. 70 cm long; petiole c. 17 cm, with a wide membranous sheathing base (c. 7 cm long); petiolules c. 1 cm; leaflets ovate to elliptic-oblong, up to 22 by 8 cm, membranous, apex attenuated, base rounded to broadly cuneate, often oblique, margin entire or minutely distantly dentate, slightly revolute, midrib and lateral veins prominent. *Inflorescence* a panicle; rachis 40 cm, with caducous bracts (reduced leaves or leaf-sheaths), bearing few secondary branches and terminating in a compound umbel; secondary branches with one or more verticils of tertiary branches; peduncles of the umbellules with one obscure bract or none; umbellule of c. 10–20 flowers, pedicels c. 5 mm. *Calyx* an undulate rim, indistinctly 5-dentate. *Petals* 5, 2½–3 mm long. *Stamens* 5, with very short filaments. *Ovary* turbinate, 1½ mm high, 5-celled, styles at first erect, later recurved. *Fruit* a globose or obovoid fleshy drupe (prominently 5-ribbed when dry) c. 7 by 5 mm; persistent styles united below, strongly reflexed above.

Distr. *Malesia*: East Java, Lesser Sunda Is. (Lombok, Sumbawa, Sumba).

Ecol. In forest up to 1650 m.

Uses. The root is said to be made into a face powder in Sumbawa.

Vern. Lesser Sunda Is.: *pulosari*, Sumbawa, *amdari*, Sumba.

Note. The vegetative parts are rather similar to those of 6. *P. cumingiana*, but the smaller and simpler inflorescence is distinctive.

HUTCH. Gen. Fl. Pl. 2 (1967) 57. — *Gelibia elegans* (C. MOORE & F.v.M.) HUTCH. *l.c.* 58

Tree to 20 m high, with a spreading crown of thick branches bearing terminal clusters of large leaves, young parts with fawn to grey scurfy tomentum. *Leaves* bipinnate, becoming glabrous, up to 110 by 50 cm, or larger; petiole c. 13 cm, with a slightly clasping base; petiolules up to c. ½ cm; leaflets ovate or elliptic, c. 6 by 3 cm, chartaceous to somewhat leathery, margin entire and slightly revolute, apex with an obtuse apiculum, base cuneate, midrib prominent, lateral veins rather obscure. *Inflorescence* a large panicle,

tomentum persistent especially on the pedicels; primary axis stout, c. 30 cm, bearing secondary axes along its length and in a terminal subumbellate cluster, bracts caducous; secondary axes c. 20–30 cm, bearing tertiary axes (c. 10 cm) along their length; flowers borne racemously along the tertiary axes on pedicels 1–2 mm long. *Calyx* a minute rim. Petals 5, oblong, rather fleshy, spreading at anthesis and soon falling. Stamens 5, 2 mm long on short filaments, soon falling. Ovary scurfy, at first turbinate, globose at anthesis, c. 4 mm high, 2-celled, disk rising to the 2 styles; style arms at first short and pressed together, elongating and diverging after the anthers have fallen. *Fruit* leathery, globose, compressed, c. 5 by 5 mm and irregularly ribbed when dry.

Distr. New South Wales and Queensland; in

*Malesia*: New Guinea (West Irian, Southern Distr.; Papua, Western & Central Distr.).

Ecol. Gallery and second growth forest in (seasonal) monsoon regions, at low altitudes, up to 300 m.

Notes. The racemose flower arrangement has sometimes been considered sufficiently distinctive to justify the accommodation of this species in a separate genus.

The bark is described as grey or patched grey-brown; the wood as soft and pale; and the cut surfaces having a clear sticky exudate which has a pleasant fragrance. The inflorescence branches are purplish, the petals maroon, the anthers cream to yellow on reddish filaments, and the fruit purplish and smooth.

### 3. Section *Eupteron*

(MIQ.) PHILIPSON, *Blumea* 24 (1978) 170. — *Eupteron* MIQ. *Pl. Jungh.* 3 (1855) 420; *Fl. Ind. Bat.* 1, 1 (1856) 762.

Trees or shrubs with imparipinnate or bipinnate leaves. Flowers in umbellules or capitula; style arms divergent at least in fruit.

Distr. In *Malesia* 6 spp., but the section probably includes the majority of the genus in other parts of the Old World tropics.

Note. With the exception of 14. *P. philipsonii*, the Malesian spp. of sect. *Eupteron* have umbellules or capitula arranged racemously along the main inflorescence branches. The type species of the section (*P. nodosa*) has its flowers in capitula, but this is not considered a sufficient difference to require a separate section.

#### KEY TO THE SPECIES

- |   |                           |
|---|---------------------------|
| 1. Flowers in capitula . . . . .                            | 9. <i>P. nodosa</i>       |
| 1. Flowers in umbellules.                                   |                           |
| 2. Umbellules arranged racemously along the principal rays. |                           |
| 3. Leaf margins crenate.                                    |                           |
| 4. Leaflets oblong (Luzon) . . . . .                        | 10. <i>P. florosa</i>     |
| 4. Leaflets lanceolate (New Guinea) . . . . .               | 11. <i>P. ledermannii</i> |
| 3. Leaf margins entire (rarely with few minute dentations). |                           |
| 5. Leaflets ovate (Sabah, Palawan) . . . . .                | 12. <i>P. borneensis</i>  |
| 5. Leaflets elliptic (New Guinea) . . . . .                 | 13. <i>P. belensis</i>    |
| 2. Umbellules in a short corymbose compound umbel . . . . . | 14. <i>P. philipsonii</i> |

9. *Polyscias nodosa* (BL.) SEEM. *J. Bot.* 3 (1865) 181; F.-VILL. *Nov. App.* (1880) 102; VIDAL, Phan. Cuming. (1885) 117; *Rev. Pl. Vasc. Filip.* (1886) 145; BOERL. *Handl.* 1 (1890) 647; HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 44; KOORD. *Minah.* (1898) 491; K. & V. *Bijdr.* 7 (1900) 11; MERR. *Philip. J. Sc.* 1 (1906) *Suppl.* 110; KOORD. *Exk. Fl. Java* 2 (1912) 716; *Atlas* 4 (1916) f. 677 & 678; MERR. *Int. Rumph.* (1917) 408; *Sp. Blanc.* (1918) 294; *En. Philip.* 3 (1923) 233; HEYNE, *Nutt. Pl.* (1927) 1208; BAKH. *f. & OOSTSTR.* in *Back. Bekn. Fl. Java* (em. ed.) 7 (1948) *fam.* 159, p. 12;

BACK. & BAKH. *f. Fl. Java* 2 (1965) 167; PHILIPSON, *Blumea* 24 (1978) 170. — *Papaya silvestris* RUMPH. *Herb. Amb.* 1: 149, t. 53 f. 1. — *Aralia nodosa* BL. *Bijdr.* (1826) 872. — *Paratropia nodosa* (BL.) DC. *Prod.* 4 (1830) 265; PRESL, *Epim.* (1851) 250. — *Aralia umbraculifera* ROXB. [*Hort. Beng.* (1814) 22, *nomen*;] *Fl. Ind. ed. Carey* 2 (1832) 108. — *Aralia pendula* BLANCO, *Fl. Filip.* (1837) 223; *ed.* 2 (1845) 157; *ed.* 3, 1 (1877) 283. — *Hedera nodosa* (BL.) HASSK. *Tijd. Nat. Gesch. Phys.* 10 (1843) 131. — *Eupteron nodosa* (BL.) MIQ. *Pl. Jungh.* 3 (1855) 420; *Fl. Ind. Bat.* 1, 1 (1856) 762; *Ann.*

Mus. Bot. Lugd.-Bat. 1 (1864) 220; HUTCH. Gen. Fl. Pl. 2 (1967) 68. — ? *P. acuminata* VIDAL, Sinopsis Atlas (1883) 28, t. 55 f. A, non SEEM. 1865; F.-VILL. Nov. App. (1880) 102. — *P. floribunda* ELMER, Leaf. Philip. Bot. 10 (1939) 3819, *nom. inval. in synonym.* — Fig. 28.

Tree to 25 m, unbranched or with few thick branches, bearing tufts of long leaves at their ends, young parts scurfy-tomentose. *Leaves* imparipinnate, multijugate, becoming glabrous or minutely villose on the nerves beneath, up to 2 m (or even 3 m); petiole c. 30 cm, to 2 cm  $\varnothing$ , with a short sheathing base; leaflets sessile, ovate-oblong commonly 15 by 4 cm, or larger, chartaceous, margin slightly crenate, apex  $\pm$  apiculate, base truncate. *Inflorescence* a large panicle (sometimes with additional flowering branches in the axils of the upper leaves), tomentum  $\pm$  persistent; primary axis stout, c. 1½ m, bearing secondary axes along its length, bracts triangular, c. 5 mm long; secondary axes c. 20–40 cm; capitula borne racemously along the secondary branches on peduncles c. 6–15 mm long. *Flowers* c. 8–12 in a capitulum. *Calyx* a minute rim. *Petals* 5, triangular, 2 mm long. *Stamens* 5, anthers broadly ovate on short filaments. *Ovary* turbinate, c. 2½ mm high, 5-celled; disk flat, rising to the 5 central erect styles. *Fruit* subglobose (5-ribbed when dry), styles spreading and reflexed.

*Distr.* Solomon Is. (Bougainville); in *Malesia*: Sunda Straits (Krakatau), Java, Lesser Sunda Is. (Lombok), Celebes, throughout the Philippines and Moluccas (Talaud, Ternate, Sulu Is., Ceram, Ambon, Banda, Tenimber, Aru Is.), New Guinea (eastwards to Milne Bay Distr.).

Recorded doubtfully, on sterile material, from the Andaman Is. by KURZ (Veg. Andam. Is. 1870, 39) but unlikely as it is absent from Sumatra, Malaya, and Borneo.

*Ecol.* Open thickets and rain-forest, mostly at low altitudes and on small islands, but recorded to 1000 m.

*Uses.* Used medicinally against purpuric fever and to delay pregnancy (Mindanao). The leaves are used to stupify fish and the wood makes durable fence posts and handles for rice-knives.

*Vern.* (from various sources). Java: *ki langit*, *S*, *déleg*, *djaranan*, *manglé*, *puténgan*, *J*, *pénang-pénangan*, *Md*, *kaju djaran*, *k. lanang*, *rangit*, *tjaliru*, *tua kalap*; Philippines: *bias-bias*, *bingliu*, *Tag.*, *Bis.*, *bungloi*, *Bis.*, *bon liu*, *bungliu*, *goyung-góyung*, *Tag.*, *bungdieu*, *Ig.*, *hagdan-anak*, *C.Bis.*, *mano-máno*, *Yak.*, *malapapáya*, *Tag.*, *Bis.*, *Pang.*, *tukod-lángit*, *Tag.*, *Pamp.*; Celebes: *kambowa*, *lalusuhan*, *pasusinggala*, (*pohon*) *mamalapa*, *tamalola*, *tundu*; Sulu Is.: *lua*; Moluccas: *kobo-kobo*, *Morotai*, *batatopus*, *Ceram*, *papaya utan*, *pata tulan*, *p. tulong*, *Ambon*, *matanglolan*, *Tenimber*; West New Guinea: *amorigh*, *lulako*, *sonomdoro*, *totja*.

*Note.* A widespread, common and noticeable

species. The flowers are described as yellow and as having a fragrant scent. The wood is soft and white.

#### 10. *Polyscias florosa* PHILIPSON, *Blumea* 24 (1978) 170.

Small tree, up to 10 m, with thick branches bearing terminal clusters of large leaves, glabrescent. *Leaves* imparipinnate, multijugate, up to 2 m; petiole c. 25 by 1½ cm, with a short sheathing base; leaflets sessile, oblong, c. 22 by 8 cm, chartaceous, margin crenate, apex slightly to long acuminate, base truncate or subcordate. *Inflorescence* a large glabrescent panicle; principal rays over 1 m, up to 3 cm  $\varnothing$ , each bearing secondary branches (20–40 cm) along its length; bracts broadly ovate, 1 cm long, caducous; umbellules borne racemously along the secondary branches on peduncles 1–2 cm long (in fruit to c. 4 cm). *Flowers* c. 6–12 in an umbellule, pedicels 3–5 mm with 2 minute bracts near the middle. *Calyx* an undulate rim. *Petals* 5, oblong, 3 mm long. *Stamens* 5. *Ovary* turbinate, c. 2 mm long, 5-celled, disk flat, rising to the 5 central erect styles. *Fruit* subglobose (5-ribbed when dry), 8 by 6 mm, styles spreading and reflexed.

*Distr. Malesia*: Philippines (Luzon; Mt Bulusan, Sorsogon Prov. and Mt Malinao, Albay Prov.).

*Ecol.* Rarely collected in montane forest, c. 560 m.

*Note.* The leaves are very similar to those of *P. nodosa*, with which this species has often been confused. However the pedicelled flowers are quite distinctive.

#### 11. *Polyscias ledermannii* HARMS, *Bot. Jahrb.* 56 (1921) 409; PHILIPSON, *Blumea* 24 (1978) 170. — *Panax murrayi* (non F.v.M.) F.v.M. *Descr. Pap. Pl.* 7 (1886) 29; BOERL. *Handl.* 1 (1890) 647. — *P. forbesii* BAKER f. *J. Bot.* 56 (1923) *Suppl.* 22. — *P. clemensiana* HARMS, *Bot. Jahrb.* 69 (1938) 283.

Glabrous tree, to 28 m, with few thick branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 1½ m; petiole to c. 16 cm, base slightly dilated; petiolules c. 2–4 mm; leaflets lanceolate or oblong-lanceolate, c. 10–20 by 2–4 cm, papyraceous, margin crenulate, apex acuminate, base truncate or rounded, often oblique, midrib prominent, lateral veins numerous, faint. *Inflorescence* a panicle; primary axis stout, c. 15 cm, bearing crowded secondary axes along its length and in a subumbellate cluster at its apex, bracts triangular, c. 3 mm long, caducous; secondary axes 20–30(–40) cm; umbellules borne racemously along the secondary axes (often in subverticils) on peduncles 2–5 cm long, usually bearing 2 minute bracts. *Flowers* c. 8–12 in an umbellule, pedicels c. 5 mm. *Calyx* a minute rim. *Petals* 2½ mm long. *Stamens* 5. *Ovary* turbinate, 2 mm high, 3–4-celled, disk rising to the central styles. *Fruit*

globose, 4–5 mm high (when dry), 3–4-ribbed, styles 3–4, divergent, persistent.

Distr. *Malesia*: New Guinea (Vogelkop to Milne Bay).

Ecol. In rain-forest, gallery forest and secondary growths, usually above 1500 m (to 3000 m), but occasionally as low as 500 m.

Vern. *Agugwa*, Hagen, *gapin*, Morobe Distr., *gowi*, Efogi lang., *panda panda*, Mendi lang., *puri*, Kepilan.

Notes. A common small tree. CARR estimated the height of one specimen as 28 m, but most are considerably smaller. The flowers are described as green. The wood is soft and pale. The plant has a scent resembling celery.

The species closely resembles *P. murrayi* (F.v.M.) HARMS from Queensland.

12. *Polyscias borneensis* PHILIPSON, J. Bot. 78 (1940) 118; *Blumea* 24 (1978) 170.

Glabrous shrub or small tree with few thick branches bearing terminal clusters of leaves. *Leaves* imparipinnate, c. 50 cm; petiole c. 15 cm, base slightly dilated; petiolules c. 1 cm; leaflets ovate, up to 10 by 4 cm, coriaceous, margin entire or slightly undulate, apex attenuate, base rounded or broadly cuneate, often asymmetrical, midrib prominent, lateral veins rather obscure. *Inflorescence* a large panicle; primary axis stout, up to c. 40 cm, bearing secondary axes along its length and in a subumbellate cluster at its apex, bracts triangular c. 5 mm long; secondary axes c. 35 cm; umbellules borne racemously along the upper part of the secondary branches on peduncles 2–5 cm long. *Flowers* about 10 in an umbellule, pedicels c. 10 mm long. *Calyx* a minute undulate rim. Petals oblong 3 mm long. Stamens 5, oblong c. 2½ mm long, filaments 2 mm. Ovary turbinate, 2 mm high, 5-celled, disk rising to the 5 central erect styles. Fruit unknown.

Distr. *Malesia*: N. Borneo (Mt Kinabalu), Philippines (Palawan, Mt Mantalingahan).

Ecol. Montane forest, c. 1500 m.

Note. Specimens collected on Palawan by EDAÑO were distributed with the specific epithet '*palawanensis*', but this name was never published.

13. *Polyscias belensis* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 13; *Blumea* 24 (1978) 170.

Glabrous tree, to 14 m. Branches bearing terminal clusters of large leaves. *Leaves* imparipinnate, up to 80 cm long; petiole c. 12–16 cm, base slightly dilated; leaflets subsessile or with a petiolule to 1 cm; leaflets elliptic to narrowly elliptic, c. 12 by 3½–6 cm, subcoriaceous, margin entire or sparsely denticulate, slightly revolute, narrowed to an obtuse apex, base cuneate, midrib prominent, lateral veins c. 12. *Inflorescence* a panicle; primary axis stout, c. 18–22 cm, bearing many secondary branches along its length and in a subumbellate cluster at its apex, bracts caducous; secondary

axes c. 22–35 cm, bearing umbellules racemously along their length, bracts triangular c. 3 mm long; peduncles c. 1½–3 cm. *Flowers* c. 10 per umbellule, pedicels 5–6 mm. *Calyx* a minute rim. Petals 4, oblong. Stamens 4, anthers oblong, 2 mm long, filaments very short. Ovary turbinate, 1½–2 mm high (in anthesis), 4–5-celled, disk flat with 4–5 free styles, at first erect, later divergent. Fruit unknown.

Distr. *Malesia*: New Guinea (West Irian, Bele R. near Lake Habbema; Papua, Morobe Distr., Mt Kaindi and Aseki Patrol area).

Ecol. Infrequent tree in montane forest and regrowth, 1450–2650 m.

Note. The inflorescence is similar to that of 11. *P. ledermannii*, but the shape of the leaflets is distinctive. In the type (from West Irian) the leaf margins are entire, but in the three gatherings from Morobe there are some dentations, and it is possible these are not conspecific. The corolla is maroon (Morobe). The plant has an odour like celery.

14. *Polyscias philipsonii* BERNARDI, Ber. Schweiz. Bot. Ges. 74 (1966) 364; PHILIPSON, *Blumea* 24 (1978) 170. — *P. fraxinifolia* PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 13, non HARMS, 1894.

A sympodial, unbranched, glabrous shrub or epiphyte to 2 m high, with leaves spirally arranged towards the apex, new shoots arising below the inflorescence. *Leaves* imparipinnate, or occasionally 3 leaflets inserted together, or the leaves bipinnate, up to 35 cm long; petiole to 10 cm, with a very short sheathing base; petiolules to 7 mm, leaflets variable in size and shape, broadly or narrowly elliptic, up to 9 by 4½ cm, but usually smaller, narrowed to the apex or apiculate, base cuneate or rounded, margin minutely setose-crenulate, midrib prominent, lateral veins few, arched-ascending. *Inflorescence* a corymb; peduncle short, 1–2 cm, sometimes bearing a reduced leaf or cataphyll distally; primary rays c. 5, subequal, c. 3–4½ cm, bearing terminal compound umbels (occasionally with a lateral umbel); ultimate umbellules with 6–12 flowers on pedicels c. 4 mm long. *Calyx* a minute rim with indistinct teeth. Petals 5, triangular, 2 mm long. Stamens 5, anthers oblong, 1 mm long. Ovary turbinate, c. 2 mm high, 5-celled, the fleshy disk rising to the 5 central erect styles. *Fruit* fleshy, globose, 5-ribbed when dry, c. 4 by 6 mm, styles persistent, recurved.

Distr. *Malesia*: West New Guinea (Idenburg R.).

Ecol. In mossy forest at 1800 m, and on an exposed slope at 2150 m.

Notes. The short corymbose inflorescence is similar to that in *sect. Palmervandenbroekia*, but the free recurved style arms exclude it from that section.

The shrub is variable in aspect, and may grow as an epiphyte or as an undershrub. The panicle branches are described as purple and the flowers as green.



4. Section *Kissodendron*

(SEEM.) PHILIPSON, *Blumea* 24 (1978) 170. — *Kissodendron* SEEM. *J. Bot.* 3 (1865) 201.

Trees or shrubs with pinnate or bipinnate leaves. Umbellules arranged in diffuse panicles. Style arms fused, forming a beak-like projection on the fruit.

Distr. In *Malesia* (Moluccas and New Guinea) 5 spp., three of which extend to Queensland.

## KEY TO THE SPECIES

- |  |                           |
|--|---------------------------|
| 1. Leaves bipinnate. . . . .                                   | 15. <i>P. bipinnata</i>   |
| 1. Leaves simply imparipinnate.                                |                           |
| 2. Leaflets in 3-4(-5) pairs . . . . .                         | 16. <i>P. zippeliana</i>  |
| 2. Leaflets in more than 5 pairs.                              |                           |
| 3. Fruits rotund, c. 8 mm broad . . . . .                      | 17. <i>P. royenii</i>     |
| ≠ 3. Fruits ovoid, c. 4-5 mm broad.                            |                           |
| 4. Base of leaflets cuneate . . . . .                          | 18. <i>P. schultzei</i>   |
| 4. Base of leaflets truncate, subcordate, or rounded . . . . . | 19. <i>P. australiana</i> |

15. *Polyscias bipinnata* (GIBBS) PHILIPSON, *Blumea* 24 (1978) 170. — *Kissodendron bipinnatum* GIBBS, *Arfak* (1917) 161; HARMS, *Bot. Jahrb.* 56 (1921) 413.

A small tree; branches with spirally arranged leaves towards their ends; young parts brown furfureous. *Leaves* bipinnate, 70 by 68 cm; petiole 26 cm, with a short sheathing base; rachis with a pair of leaflets at each articulation; petiolules to 1¼ cm; leaflets narrowly oblong or ovate, c. 6-12 by 2½-4(-5) cm, apex attenuated, base broadly cuneate or rounded, margin entire, irregularly undulate slightly revolute, midrib prominent. *Inflorescence* a diffuse panicle (sometimes also with flowering branches in the axils of the upper leaves); peduncle c. 6 cm, terminating in few (3) primary rays; primary rays 40-50 cm, bearing verticils of pairs of secondary branches along their length and ending in a compound umbel; umbellules of c. 10-15 flowers on pedicels c. 10 mm long. *Calyx* an undulate rim. Petals 5, 2½ mm long. Stamens 5, filaments 1 mm, anthers 1¼ mm long. Ovary turbinate 2-3-celled, disk with a central stylopodium 1 mm long. Fruit ovoid, fleshy, 5 by 3 mm (when dry) crowned by the calyx rim and the beak-like stylopodium, stigmas minutely capitate.

Distr. *Malesia*: W. New Guinea (Vogelkop: Angi Lakes).

Ecol. Montane forest, at c. 2000 m.

Vern. *Louklouwko*.

Note. The individual leaflets are similar to those of 18. *P. schultzei*, but their bipinnate arrangement is distinctive. The flowers are white.

16. *Polyscias zippeliana* (MIQ.) VALETON, *Bull. Dép. Agr. Ind. Néerl.* 10 (1907) 42; PHILIPSON, *Blumea* 24 (1978) 170. — *Panax zippelianum* MIQ. *Ann. Mus. Bot. Lugd.-Bat.* 1 (1863) 15; BOERL.

*Handl.* 1 (1890) 645; HARMS in *E. & P. Nat. Pfl. Fam.* 3, 8 (1894) 46. — *Nothopanax zippelianum* (MIQ.) SEEM. *Fl. Vit.* (1866) 115. — *Kissodendron australianum* [non (F.v.M.) SEEM.] BOERL. *Handl.* 1 (1890) 650. — *P. caroli* HARMS, *Bot. Jahrb.* 56 (1920) 411.

Shrub, 1½(-5) m, with few branches, bearing leaves spirally arranged near their ends, glabrous except a slight rufous tomentum on young parts. *Leaves* imparipinnate, with 3-4 pairs of leaflets, up to c. 60 cm; petiole to 17 cm, with a very short sheathing base; petiolules ½-1½ cm; leaflets oblong, ovate or elliptic, 6-13 by 3½-6 cm, papyraceous, apex attenuate or apiculate, base cuneate, often oblique, margin entire, slightly revolute, midrib and few lateral veins evident. *Inflorescence* a panicle, often appearing lateral by rapid growth of a bud at its base; branches rather fine and wiry, rachis often angled at the nodes, up to c. 60 cm; secondary branches borne singly at wide intervals and in a few rayed terminal umbels, c. 20 cm long, bearing umbellules on side branches and terminally; umbellules with c. 10-15 flowers on pedicels ½-1 cm long. *Calyx* a minute rim. Petals 5, broadly oblong, 2 mm long. Stamens 5, anthers oblong, 1 mm long, filaments 1 mm. Ovary turbinate, 2 mm high, 2-celled, the fleshy disk rising to the central fused styler column. *Fruit* ovoid, crowned by the prominent stylopodium with a capitate stigma, c. 7 by 4 mm when dry.

Distr. *E. Malesia*: SE. Moluccas (Aru Is.) and New Guinea (S. Irian and southern part of Western Distr. of Papua; also in the Sepik Distr.).

Ecol. In the Aru Is. and S. New Guinea in obviously seasonal savannah country associated with *Acacia* and *Melaleuca* at low altitudes, in the Sepik Distr. in the mountains at c. 1000 m.

Vern. *Mirmur, uwah, perdi-perdi*, W. Irian.

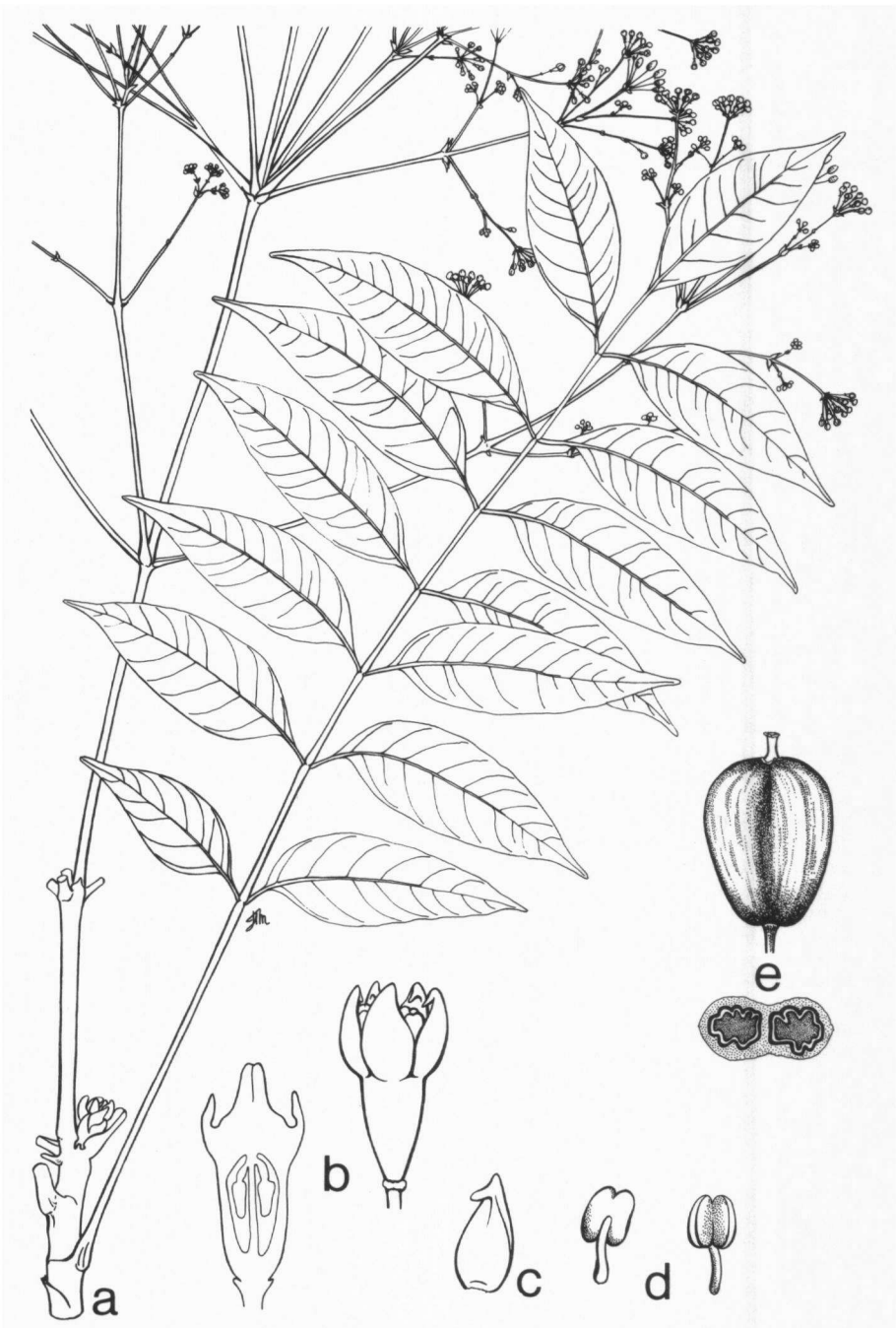


Fig. 30. *Polyscias schultzei* HARMS. a. Habit,  $\times \frac{2}{5}$ , b. flower and ditto in LS,  $\times 10$ , c. petal, d. stamens, e. fruit and ditto in CS,  $\times 5$  (a-d HOOGLAND & PULLEN 5841, e KALKMAN 4200). Drawn by HELÈNE MULDER.

Notes. The identity of *P. zippeliana* has been discussed by BOERLAGE, VALETON, and HARMS, *l.c.* The short leaf-sheath and the connivent styles place it within *sect. Kissodendron*.

A comparison of the type specimen with the species usually known as *P. caroli* HARMS shows them to be conspecific. The type of *P. caroli* is no longer available but specimens collected by BRASS can be considered authentic as they were identified by HARMS. It should be noted, however, that the type of *P. caroli* is from the Sepik Distr. (probably in rain-forest) at 1000 m, while all other specimens are from the south of the island and from seasonal savannahs at much lower altitudes.

The single gathering from the Aru Is. approaches 19. *P. australiana* having larger leaves with more pairs of leaflets than other gatherings of *P. zippeliana*.

17. *Polyscias royenii* PHILIPSON, *Blumea* 24 (1978) 170.

Small tree up to 5(–15) m, monocaulous sympodial, persistently rufous-furfuraceous, with leaves spaced along the upper part of the stem. *Leaves* imparipinnate, with *c.* 9 pairs of leaflets, up to 100 cm long or more; petiole to 30 cm, with a short sheathing base; petiolules of mid-leaflets *c.* 8–20 mm; leaflets normally oblong-ovate, broadest near the base, up to 24 by 11 cm, coriaceous, apex attenuated or apiculate, base truncate to subcordate; often oblique, margin entire, irregularly undulate, slightly revolute; midrib prominent, reticulations depressed above (rugose) raised and furfuraceous below. *Inflorescence* a panicle, flowering branches also often present in the axils of the uppermost leaves; rachis up to 60 cm with verticils of secondary branches subtended by caducous unifoliate bracts and a terminal compound umbel; lower secondary branches up to 50 cm, with verticillate tertiary branches and terminal compound umbels; umbellules with 10–20 flowers on furfuraceous pedicels *c.* 8 mm long. *Calyx* a furfuraceous rim, with 5 small teeth. Petals 5, strap-shaped, *c.* 3 mm long, soon falling. Stamens 5. Ovary subcylindric, furfuraceous, *c.* 3 mm long, 2(–3)-celled, the fleshy disk forming a projecting conical stylopodium 2 mm long; stigmas 2, appressed at anthesis. *Fruit* rotund, compressed, with prominent ribs when dry 7–9 by 8–10 mm, crowned by the prominent persistent calyx and a short stout beak-like stylopodium; stigmas short, divergent.

Distr. *Malesia*: New Guinea (Cyclops Mts to the E. Highlands Distr.).

Ecol. Terrestrial or epiphytic in primary or secondary montane forest, 1200–2400 m.

Vern. Irian: *ato*, Kapauku lang.; Papua New Guinea: *habia*, S. Highlands, *magabin*, W. Sepik, *momin*, Mendi lang.

Note. A species readily characterized by the sympodial monocaual habit with thick leathery

leaflets, a large rigid furfuraceous inflorescence, and large, compressed, black fruits with a glaucous bloom.

18. *Polyscias schultzei* HARMS, *Bot. Jahrb.* 56 (1921) 410; PHILIPSON, *Blumea* 24 (1978) 171. — *P. gjellerupii* HARMS, *Bot. Jahrb.* 56 (1921) 410. — Fig. 30.

Shrub or small tree, often unbranched, 4–20 (–26) m high, young parts densely brown furfuraceous, branches with spirally arranged leaves towards their ends. *Leaves* imparipinnate, to 80 cm long, with *c.* 8–11 pairs of leaflets; petiole up to 35 cm, with a short sheathing base; petiolules *c.* 8 mm; leaflets ovate-lanceolate, oblong or elliptic, up to 14(–17) by 4–5 cm, apex attenuated or acuminate, base broadly cuneate, oblique, margin entire, midrib prominent. *Inflorescence* a diffuse, repeatedly compound umbel, with reduced leaves ± persistent at the nodes; peduncle usually rather short (*c.* 5 cm) ending in a group of several primary rays (and sometimes with one or more lateral rays); primary rays 50–60 cm, with verticils and a terminal umbel of secondary rays which in turn are branched; umbellules with *c.* 5–10 flowers on fine pedicels *c.* 5–8 mm long (elongating in fruit to 12–15 mm). *Calyx* a minute rim with 4–5 small teeth, usually glabrous but occasionally furfuraceous. Petals 4–5, *c.* 3 mm long. Stamens 4–5, 2 mm long. Ovary ± cylindric, glabrous or occasionally furfuraceous, *c.* 2 mm long, 2-celled, the fleshy disk forming a blunt stylopodium. *Fruit* ovoid, fleshy, *c.* 5 mm long, crowned by the inconspicuous calyx and the projecting beak-like stylopodium (*c.* 2 mm long); stigmas slightly divergent or capitate.

Distr. Queensland; in *Malesia*: Moluccas (Morotai) and New Guinea (throughout most of the island, from the Vogelkop Peninsula and Japen I. to the Central and Morobe Distr.).

Ecol. Usually in lower and mid-montane rain-forest (with *Castanopsis*, *Nothofagus*, *Lithocarpus*), also in regrowth, usually above 1200 m, ascending to 2400 m, but also descending to near sea-level.

Vern. New Guinea: *atok*, Wissel Lakes, *funim*, Telefomin, *houklouwkô*, Angi Lakes, *paul*, Wabag, *agugwa*, Hagen.

Notes. A widespread and frequently collected species recognized by the multijugate leaves with rather small, thin, attenuate leaflets with cuneate base. The flowers are white to yellowish and the fruits black. The grey bark exudes a small amount of gummy sap; the wood is white.

HARMS recognized that *P. gjellerupii* was very similar and the abundant material now available indicates the variability of this common species.

19. *Polyscias australiana* (F.v.M.) PHILIPSON, *Blumea* 24 (1978) 171. — *Hedera australiana* F.v.M. *Fragm.* 4 (1864) 120; BTH. *Fl. Austr.* 3 (1866) 384. — *Kissodendron australianum* (F.v.M.)

SEEM. J. Bot. 3 (1865) 201; *ibid.* 6 (1868) 129. — *Irvingia australiana* (F.v.M.) F.v.M. Fragm. 5 (1865) 18.

*var. disperma* (F.v.M.) PHILIPSON, *Blumea* 24 (1978) 171. — *Kissodendron australianum* (F.v.M.) SEEM. *var. disperma* F.v.M. Descr. Not. Pap. Pl. 5 (1877) 88; HARMS, Bot. Jahrb. 56 (1921) 412.

Small tree, often unbranched, branches with leaves arranged spirally towards their ends, young parts brown furfuraceous. *Leaves* imparipinnate, multijugate, to 1 m long; petiole *c.* 25 cm, with a short sheathing base; petiolules to 1½ cm; leaflets broadly ovate or oblong, broadest near the base, up to 14 by 6 cm, ± coriaceous, apex attenuated to an obtuse apex, or with an obtuse apiculum, base rounded, truncate, or subcordate, oblique, margin entire, slightly revolute, midrib and lateral veins prominent. *Inflorescence* a diffuse panicle (sometimes also with flowering branches in the axis

of the upper leaves); peduncle short, terminating in several primary rays, reduced leaves subtending the principal branches; primary rays *c.* 50 cm, bearing verticils of secondary branches along their length and ending in a compound umbel; umbellules of *c.* 10–15 flowers on pedicels *c.* 8–10 mm long. *Calyx* an undulate rim. Petals 5, *c.* 1½ mm long. Stamens 5, *c.* 1 mm long. Ovary turbinate, 2-celled, a fleshy disk rising to a low conical stylopodium. *Fruit* ovoid, fleshy, 6 by 4 mm (when dry), crowned by the persistent calyx and beak-like stylopodium (2 mm long).

Distr. *Malesia*: New Guinea (Vogelkop Peninsula and Southern Distr. in Papua).

Ecol. Primary rain-forest at low altitudes and also in lower montane forest at 1750 m.

Note. Distinguished from 18. *P. schultzei* by the leathery leaflets with a truncate base, and from 17. *P. royenii* by the smaller fruits.

### 5. Section *Palmervandenbroekia*

(GIBBS) PHILIPSON, *Blumea* 24 (1978) 171. — *Palmervandenbroekia* GIBBS, Arfak (1917) 162.

Trees or shrubs with imparipinnate leaves. Umbellules arranged in short corymbose compound umbels. Style arms fused, forming a beak-like projection on the fruit.

Distr. *Malesia*: New Guinea (Vogelkop Peninsula and Cyclops Mts in W. Irian, Western Distr. in Papua).

#### KEY TO THE SPECIES

1. Pedicels tomentose (at anthesis).
  2. Inflorescence a compact regular compound umbel with rigid rufous branches (Vogelkop and Cyclops Mts) . . . . . 20. *P. sleumeri*
  2. Inflorescence more open, less regularly branched, with branches becoming ± glabrous (Mt Bosavi, Papua) . . . . . 21. *P. jacobsii*
1. Pedicels glabrous (at anthesis).
  3. Flower buds lanceolate, stylopodium at anthesis *c.* 2 mm long (Vogelkop, Arfak Mts) . . . . . 22. *P. palmervandenbroekii*
  3. Flower buds ovoid, stylopodium at anthesis *c.* 1 mm long (Vogelkop, Nettoti Range and Aifai R.) . . . . . 23. *P. vogelkopensis*

20. *Polyscias sleumeri* PHILIPSON, *Blumea* 24 (1978) 171.

Monocaulous sympodial shrub, 1–1½ m, with leaves spaced along the upper part of the stem; young parts red-furfuraceous. *Leaves* imparipinnate, with 3–4 pairs of leaflets (leaflets occasionally in threes), *c.* 35 cm long; petiole to 9 cm, with a very short sheathing base; petiolules 8–15 mm; leaflets oblong, ovate or elliptic, up to 16 by 6 cm, chartaceous, apex attenuate or apiculate, base rounded or cuneate, margin entire, irregularly undulate, slightly revolute, midrib prominent. *Inflorescence* a compound umbel, red-furfuraceous

(stem growth renewed by a bud between the inflorescence and the uppermost leaf); peduncle 3–6 cm, bearing scars of caducous reduced leaves, occasionally with a lateral umbellule, and ending in an umbel of *c.* 7 primary rays; primary rays 1–2½ cm, sometimes with a minute bract near the middle; umbellule with 10–20 flowers on pedicels 2–3 mm long, densely furfuraceous. *Calyx* a rim with 5 broad teeth. Petals 5, broadly oblong, 3–4 mm long. Stamens 5, anthers 1 mm long, filaments 2 mm. Ovary turbinate, 2 mm high, 2-celled, the fleshy disk forming a projecting conical stylopodium; stigmas 2 appressed at anthesis.

*Fruit* rotund to ovoid compressed 5–6 by 5 mm crowned by the prominent persistent calyx and the beak-like stylopodium (2–2½ mm long); stigmas not prominent.

*Distr. Malesia:* New Guinea (Vogelkop Peninsula and Cyclops Mts).

*Ecol.* Undergrowth in primary forest, 450–1000 m.

*Note.* The flowers are creamy white, the fruit dark red.

**21. *Polyscias jacobsonii* PHILIPSON, Blumea 24 (1978) 171.**

A monocaulous sympodial shrub to 3 m high, with leaves spaced along the upper part of the stem, young parts furfuraceous. *Leaves* imparipinnate, 4–5 pairs of leaflets (leaves of juveniles smaller with fewer leaflets), c. 45 cm long; petiole to 12 cm, with a short sheathing base; petiolules 1–1½ cm; leaflets oblong or elliptic, c. 12 by 4 cm, chartaceous, apex attenuate or caudate, base truncate or cuneate, margin entire, irregularly undulate, slightly revolute, midrib prominent. *Inflorescence* a compound umbel (stem growth renewed by a bud between the inflorescence and the uppermost leaf); peduncle 1–4 cm (sometimes bearing a unifoliolate leaf about the middle with an axillary flowering branch), ending in an umbel of 2–4 primary rays; primary rays sometimes subtended by 1–2 unifoliolate leaves, c. 4 cm long, ending in 2–3 tertiary rays which may branch again before ending in umbellules; umbellules with 6–10 flowers on furfuraceous pedicels c. 8 mm long. *Flower buds* with an apical umbo. *Calyx* a rim with 5 acute teeth. *Petals* 5, attenuated. *Stamens* 3 mm long, anthers 1½ mm long. *Ovary* subcylindric, furfuraceous, 4 mm high, 2-celled, disk forming a projecting conical stylopodium (1½ mm long at anthesis), stigmas 2. *Fruit* rotund, compressed, 8 by 9 mm, crowned by the small calyx and the persistent stylopodium (2 mm long) with subcapitate stigmas.

*Distr. Malesia:* New Guinea (Papua: Mt Bosavi). Only known from the type.

*Ecol.* On old well-drained volcanic soil in primary mixed forest, mostly on ridges and upper slopes, 1600–2100 m.

*Note.* An aromatic, single-stemmed shrub. The flowers are white and the fruit dark purple.

**22. *Polyscias palmervandenbroekii* BERNARDI, Candollea 26 (1971) 16; PHILIPSON, Blumea 24 (1978) 171. — *Palmervandenbroekia papuana* GIBBS, Arfak (1917) 162, f. 15, non *P. papuana* SEEM. 1865.**

Glabrous shrub, c. 1½ m, sparsely branched, with leaves spaced along the upper parts of the stems. *Leaves* imparipinnate, with 3–5 pairs of leaflets, up to 13 cm long; petiole to 4 cm, slightly channelled above, with a very small sheathing

base; petiolules 0–5 mm; leaflets lanceolate, obovate to elliptic, 1¼–4 by ¾–2 cm, coriaceous or chartaceous, apex attenuated (sometimes emarginate) to apiculate, base cuneate, margin entire, revolute, midrib prominent, lateral veins obscure. *Inflorescence* a simple or compound umbel; peduncle slender, c. 2 cm; primary rays (when present) few, c. 1 cm; umbellules of c. 10 flowers on glabrous pedicels 3–6 mm long. *Flower buds* lanceolate, acute, 3–6 mm. *Calyx* a rim with 5 broad teeth. *Petals* 5, attenuate, 5–8 mm long. *Stamens* 5, filaments c. 3 mm, anthers c. 1 mm. *Ovary* turbinate, striate, 2 mm high, 2-celled, disk projecting as a conical stylopodium (2 mm long). *Fruit* ovoid, compressed, 6 by 5 mm, crowned by the persistent calyx and the beak-like stylopodium; stigmas 2, small, divergent.

*Distr. Malesia:* New Guinea (Vogelkop: Arfak Mts).

*Ecol.* In summit heath vegetation (*Tristania-Dacrydium* scrub) and *Nothofagus* forest, 1900–2400 m.

*Note.* Collections made since the original description show that this interesting plant is quite variable as regards leaf-shape, texture and amount of rolling of the margin, and also in the size of its flowers. The calyx is purplish brown, the petals reddish purple outside and white within. The ripe fruit is purplish black. The thin papery bark is light grey.

**23. *Polyscias vogelkopensis* PHILIPSON, Blumea 24 (1978) 171.**

An often monocaulous sympodial shrublet usually under 1 m high, with leaves spaced along the upper parts of the stem; young parts slightly furfuraceous, but soon becoming glabrous. *Leaves* imparipinnate, with 3–4 pairs of leaflets (leaflets occasionally in threes) variable in size; petiole 2–7 cm, slightly channelled above with a short inconspicuous sheathing base; petiolules 2–8 mm; leaflets elliptic or ovate, 3–12 by 1¼–4 cm, chartaceous, apex attenuated or apiculate, base broadly to narrowly cuneate, margin entire, irregularly undulate (occasionally with isolated dentations) slightly revolute, midrib prominent. *Inflorescence* a small compound umbel; peduncle up to 8 cm, occasionally with a lateral or basal umbellule, ending in c. 2–3 primary rays (sometimes subtended by a reduced leaf); primary rays 1–2 cm; umbellules with c. 10–15 flowers on glabrous pedicels c. 3–6 mm long. *Flower buds* ovoid, obtuse. *Calyx* a rim with 4–5 broad undulations. *Petals* 4–5, broadly oblong, 4 mm long. *Stamens* 4–5, anthers 1 mm, filaments 3 mm. *Ovary* turbinate, 2 mm high, 2-celled, the fleshy disk rising to a conical stylopodium (1 mm long); stigmas 2, appressed at anthesis. *Fruit* ovoid, compressed, 5 by 4 mm, crowned by the persistent calyx and the prominent beak-like stylopodium; stigmas inconspicuous.

Distr. *Malesia*: New Guinea (Vogelkop and Wandammen Peninsula, Nettoti Range and Aifat R.).

Ecol. Primary submontane forest (*Nothofagus*, *Castanopsis*, and conifers), heath vegetation, or in open places, 1200–2000 m.

Note. A delicate shrub, often unbranched. The material from Aifat R. has larger leaves than that from the Nettoti Range. The flowers are cream or light yellow, and the fruits orange with black stylopodium.

#### Insufficiently known

*Polyscias disperma* BLANCO, Fl. Filip. (1837) 226; MERR. Sp. Blanc. (1918) 384; En. Philip. 3 (1923) 233. — Philippines.

MERRILL (1923, *l.c.*) stated that this name was excluded by BLANCO from his 2nd edition, and that it is unrecognizable from the very short and imperfect description. Possibly a *Rubiaceae*.

*Polyscias roemeriana* HARMS, Bot. Jahrb. 56 (1921) 411. — New Guinea.

I have seen no authentic specimens of this species. Evidently it is related to *P. palmervandenbroekii* by reason of its connivent styles, its short inflorescence, and its small leaflets. However, bipinnate leaves are not known in that species.

#### Excluded

*Polyscias joskei* L. S. GIBBS, J. Linn. Soc. Bot. 39 (1909) 149. — This species was by error ascribed by Index Kewensis to the Philippines; it is from Fiji.

## 11. MACROPANAX

MIQ. Fl. Ind. Bat. 1, 1 (1856) 764; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13; BTH. in B. & H. Gen. Pl. 1 (1865) 945; BOERL. Handl. 1 (1890) 643; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 47; HUTCH. Gen. Fl. Pl. 2 (1967) 80. — *Hederopsis* CLARKE, Fl. Br. Ind. 2 (1879) 739; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 56; KING, J. As. Soc. Beng. 67, ii (1898) 62; HUTCH. Gen. Fl. Pl. 2 (1967) 78; STONE, Gard. Bull. Sing. 30 (1977) 141. — Fig. 31.

Small, unarmed trees. *Leaves* digitately compound or unifoliolate; petiole terete, with a sheathing base; stipules inconspicuous; leaflets entire or denticulate. *Inflorescence* a terminal panicle of umbellules. Pedicels articulated below the ovary. *Flowers* bisexual or on lower branches male. *Calyx* 5–6-dentate. Petals 5–6, valvate. *Stamens* 5–6, extrorse. Ovary inferior, 2–6-celled. Disk fleshy with the styles united below. *Fruit* ellipsoid or obovate, surmounted by an awl-shaped or conical stylopodium; exocarp fleshy, endocarp crustaceous. Endosperm ruminant.

Distr. 4 *spp.* from India, Burma and southern China to *West Malesia*: 3 *spp.*, Sumatra, Malaya and Java.

Ecol. Lowland and montane rain-forest.

Notes. *Hederopsis* is united with *Macropanax* because the species are very similar in appearance and in their technical characters. The sole difference is the number of cells in the ovary, 2 (or sometimes 3) in *Macropanax* and 5–6 (sometimes 4) in *Hederopsis*. This distinction does not seem adequate to split a few very similar species into distinct genera.

This genus is distinguished from *Pseudopanax* (China, New Caledonia, Tasmania, New Zealand, Chile) by the ruminant endosperm. Cf. PHILIPSON, New Zeal. J. Bot. 3 (1965) 333.

#### KEY TO THE SPECIES

1. Ovary 2-celled.
2. Ovary broadly campanulate, not ribbed; 'epicalyx' below ovary distinct. Leaf margin usually distinctly serrate. Inflorescence branches usually bearing lateral umbellules. . . . . 1. *M. dispermus*
2. Ovary narrowly turbinate, strongly ribbed; 'epicalyx' below the ovary absent. Leaf margin entire or minutely dentate. Inflorescence branches usually without lateral umbellules . . . . . 2. *M. concinnum*
1. Ovary 5- or 6-celled . . . . . 3. *M. maingayi*

1. *Macropanax dispermus* (BL.) O. K. Rev. Gen. Pl. 1 (1891) 271; KOORD. Exk. Fl. Java 2 (1912) 716, 717; Atlas 4 (1916) f. 681 & 682 F-P; Fl.

Tjib. 2 (1923) 227; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 14; BACK. & BAKH. f. Fl. Java 2 (1965) 168. — *Aralia*

*disperma* BL. Bijdr. (1826) 872. — *Hedera disperma* (BL.) DC. Prod. 4 (1830) 265. — *Aralia calyculata* Z. & M. in Mor. Syst. Verz. (1846) 41. — *M. floribunda* MIQ. Fl. Ind. Bat. 1, 1 (1856) 764. — *M. oreophilus* MIQ. l.c. 764; Suppl. (1860) 135; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13; KURZ, For. Fl. Burma 1 (1877) 541; CLARKE, Fl. Br. Ind. 2 (1879) 738; BOERL. Handl. 1 (1890) 644; K. & V. Bijdr. 7 (1900) 16.

Small tree, up to 18 m. *Leaves* dispersed along the shoots; petiole to 25 cm, striate, with a small basal sheath, the connate stipules forming a small ligule within the petiole; leaflets 5–7, petiolules up to c. 5 cm (the lateral shorter); blade elliptic or oblanceolate, usually c. 10–23 by  $2\frac{1}{2}$ –9 cm, gradually tapered to an acute apex, base cuneate, rounded or oblique, margin coarsely dentate or sometimes only finely serrate, glabrous when mature. *Inflorescence* a panicle of umbellules, often stellate-furfuraceous, with a stout rachis to 40 cm and lateral (secondary) branches which terminate in umbellules, and which commonly bear tertiary branches. Pedicels c. 5–7 mm, with a distinct involucre ("epicalyx") around the base of the flower. *Calyx* rim undulate or indistinctly dentate, puberulous. Petals 2–3 mm long. Ovary subglobose, c.  $2\frac{1}{2}$  mm high. Disk fleshy, surmounted by an awl-shaped stylar column, which bifurcates at apex. *Fruit* ovate, 1 by  $\frac{1}{2}$  cm, crowned by the persistent stylar column.

Distr. India, Burma, and southern China; in *Malesia*: Sumatra, Malay Peninsula, and throughout Java.

Ecol. Mountain rain-forests, 1000–2300 m, in Java especially in Central and East Java.

Vern. Java: *panggung puju*, *p. serem*, *p. siju*, *ramo-gentjel*, *tjerem*, *S, pampung*, *sahang*, *tanganan*, *J, konjingal*, *Md*.

2. *Macropanax concinnus* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 220; BOERL. Handl. 1 (1890) 643; K. & V. Bijdr. 7 (1900) 18; KOORD. Exk. Fl. Java 2 (1912) 717; Atlas 4 (1916) f. 682 Q–W. — *M. undulatus* (WALL. ex G. DON) SEEM. J. Bot. 2 (1864) 294, *pro specim. malac.*; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 14; BACK. & BAKH. f. Fl. Java 2 (1965) 168.

Small tree, up to 15 m. *Leaves* dispersed along the shoots; petiole slender, to 20 cm, with a small basal sheath, the connate stipules forming a small ligule within the petiole; leaflets 5 or 3, petiolules slender, up to c.  $5\frac{1}{2}$  cm (the lateral shorter); blade elliptic, usually c. 7–15 by  $2\frac{1}{2}$ –5 cm, gradually tapered to a caudate-falcate acuminate apex, base narrowly cuneate, or rarely obtuse, often oblique, margin entire or sometimes a few very fine serrations, glabrous, membranous. *Inflorescence* a panicle of umbellules, minutely stellate-pubescent, with a stout rachis to 30 cm, and lateral (secondary) branches which terminate in umbellules; pedicels c. 6–7 mm, only slightly swollen at the articulation.

*Calyx* rim undulate or indistinctly dentate. Petals c. 2 mm long. Ovary narrowly turbinate with distinct longitudinal ribs, c. 2 mm high. Disk fleshy, surmounted by an awl-shaped stylar column. *Fruit* ovate, 8 by 4 mm, crowned by the persistent stylar column.

Distr. *Malesia*: widespread in Java, but local and uncommon.

Ecol. Damp mountain forests, descending to lower altitudes (400 m) than the preceding species.

Vern. *Djampang tjerem*, *panggung puju*, *S, tanganan*, *J*.

Notes. This species has sometimes been identified with *M. undulatus* (WALL. ex G. DON) SEEM. from the Himalayan region, but that species differs in the more verticillate inflorescence branches, the large involucre around the umbellule, the hermaphrodite flowers more confined to the terminal umbellules, and the broader less prominently ribbed fruit. A considerable geographical gap separates the two species.

A specimen collected by GRIFFITH labelled 'Malacca' is perhaps *M. undulatus*, but the locality may be incorrect.

3. *Macropanax maingayi* (CLARKE) PHILIPSON, *comb. nov.* — *Hederopsis maingayi* CLARKE, Fl. Br. Ind. 2 (1879) 739; RIDL. Fl. Mal. Pen. 1 (1922) 888; STONE, Gard. Bull. Sing. 30 (1977) 287, f. 7. — *Arthrophyllum trifoliatum* RIDL. J. Fed. Mal. St. Mus. 7 (1916) 42. — *Hederopsis major* RIDL. Kew Bull. (1929) 124. — Fig. 31.

Small tree, up to 15 m. *Leaves* dispersed along the shoots; petiole to 20 cm, striate, with a small basal sheath; leaflets 5, or (below the inflorescence) 3 or 1, petiolule of the central leaflet to 6 cm, of the lateral leaflets much shorter (c. 1 cm); blade elliptic or ovate, up to 20 by 8 cm, base rounded or broadly cuneate, apex acuminate, margin denticulate or nearly entire, membranous or chartaceous. *Inflorescence* a terminal panicle of umbellules, with a stout rachis to 20 cm, terminating in an umbellule and bearing lateral secondary branches (c. 12 cm) which also terminate in umbellules and bear racemously arranged tertiary branches (c. 4 cm) which terminate in umbellules; umbellules terminating the primary and secondary branches with hermaphrodite flowers, those terminating the tertiary branches smaller and apparently mostly functionally male. *Flowers* of small umbellules usually 5-merous, of larger umbellules usually 6–7-merous, pedicels c. 1 cm at anthesis, slightly elongating in fruit. *Calyx* rim obscurely dentate. Petals of terminal flowers c. 3 mm long, fleshy. Ovary subglobose, c. 2 mm high; disk fleshy surmounted by the style arms which become divergent in their upper part at anthesis. *Fruit* enlarging to a drupe 2 by 1 cm with a persistent calyx rim and a prominent conical stylopodium tapering into the stylar column bearing the recurved distal parts of the styles.

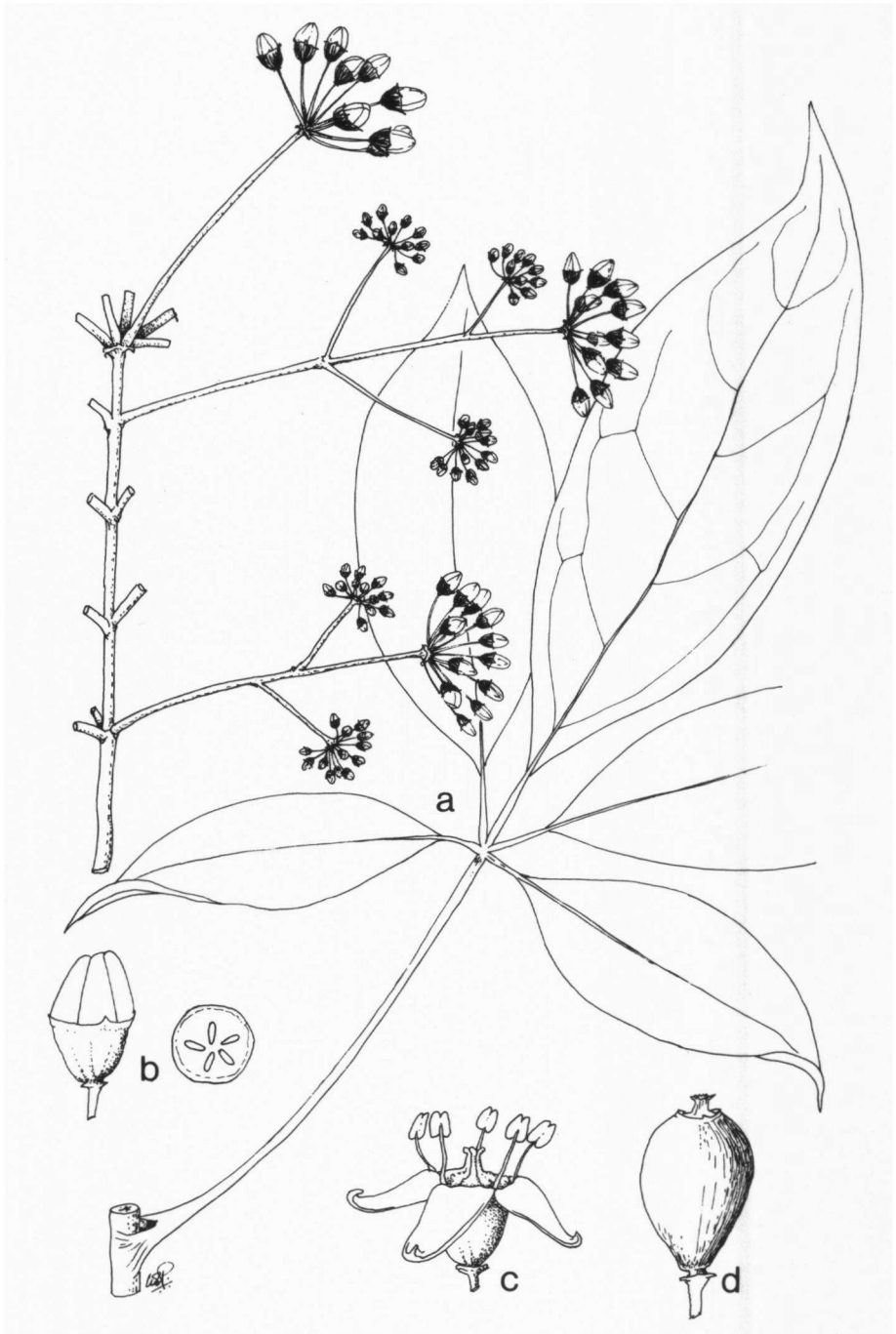


Fig. 31. *Macropanax maingayi* (CLARKE) PHILIPSON. a. Leaf and upper branches of inflorescence,  $\times \frac{2}{3}$ , b. flower bud and CS of ovary,  $\times 2$ , c. flower,  $\times 2$ , d. fruit, slightly enlarged (Phytochem. Surv. Mal. 2519). Drawn by W. R. PHILIPSON.



Distr. Tonkin; in *Malesia*: Malay Peninsula (from Kedah southwards) and Central Sumatra (East Coast Res. and Mt Kerintji).

Ecol. Uncommon, in forest, up to 1050 m.

Note. The trunk may have small buttresses, the bark is rugose with large lenticels, and produces a watery exudate when cut. The flowers are greenish yellow.

## 12. ANAKASIA

W. R. PHILIPSON, *Blumea* 21 (1973) 87, fig. on p. 88. — Fig. 32.

Shrub with large, simple, exstipulate leaves. *Inflorescence* axillary; rachis bearing racemously arranged umbellules. Pedicels very short with an articulation below the flower. *Calyx* a short rim with minute lobes. Petals 5 or 6, valvate, triangular. *Stamens* 5 or 6, filaments thick, anthers large, dorsifixed. Ovary inferior, broadly obconic, (4-)5-6-celled. Disk fleshy with (4-)5-6 styler arms. *Fruit* broadly obovoid, strongly ribbed when dry; exocarp fleshy. Pyrenes compressed, crustaceous; endosperm smooth.

Distr. *Malesia*: West New Guinea. Monotypic.

Note. The large, simple, oblanceolate leaves clustered at the ends of the branches recall *Meryta*, but the flowers do not share the highly distinctive features of that genus. The floral and fruit characters are not unlike those of *Polyscias* (e.g. there is an articulation below the flower, the style arms are free, and the endosperm is smooth), but the general facies is unlike that genus, and this, together with the distinctive inflorescence and leaf, make the plant quite distinct from any species of *Polyscias*.

1. *Anakasia simplicifolia* W. R. PHILIPSON, *Blumea* 21 (1973) 87, fig. on p. 88. — Fig. 32.

Glabrous shrub, 5 m, branches marked with prominent lenticels. *Leaves* crowded at the ends of the branches, sessile or with a very short petiole, lanceolate, up to 135 by 18 cm, narrowed gradually to the base, apex acuminate, margin entire or undulate, midrib prominent, lateral veins arching upwards, reticulation rather indistinct. *Inflorescence* rachis simple or forked, to 70 cm, at maturity 5 mm  $\varnothing$ , bearing small lanceolate bracts. Peduncles arising from the axils of all but the lowest bracts, 3-4 mm long, elongating to c. 15 mm in fruit. Umbellules with c. 11 minute bracts. *Flower buds* when dry c. 3 mm long. *Calyx* rim with 5-6 minute teeth. Petals slightly fleshy, 2 mm long. *Stamens* 5-6, filaments broad; anthers 4-celled,  $\frac{3}{4}$  mm long. Ovary glabrous. Disk with a central boss formed by closely appressed subulate arms which soon

recurve and spread beyond the calyx. *Fruit* with (4-)5-6 prominent ridges when dry, c. 2 by  $1\frac{1}{2}$  cm, with the persistent style arms in a terminal depression.

Distr. *Malesia*: West New Guinea (Vogelkop Peninsula and near Babo).

Ecol. Primary forest near sea-level.

Note. BECCARI described (*in sched.*) the inflorescence branches as erect in flower and reflexed in fruit. He noted that the outer flowers of the umbellules are probably male and those at the centre female, though he could not be certain of this. His observations cannot be confirmed from the material available. Evidently all flowers are structurally hermaphrodite, but all developing fruits seen are attached to central pedicels. The corolla is green and soon falls, the disk yellow, the anthers cream, and the mature fruit blue (azure-violet) and aromatic.

## 13. BRASSAIOPSIS

DECNE & PLANCH. *Rev. Hort.* IV, 3 (1854) 106; BTH. in B. & H. *Gen. Pl.* 1 (1865) 945; CLARKE, *Fl. Br. Ind.* 2 (1879) 735; BOERL. *Handl.* 1 (1890) 643; HARMS in E. & P. *Nat. Pfl. Fam.* 3, 8 (1894) 42; KING, *J. As. Soc. Beng.* 67, ii (1898) 61; NGOC-SANH BUI, *Adansonia* 6 (1966) 437, pl. 1 (map); HUTCH. *Gen. Fl. Pl.* 2 (1967) 79; STONE, *Gard. Bull. Sing.* 30 (1977) 280. — *Araliopsis* KURZ, *Rep. Andam.* (1870) 39, *nom. inval.*, in *synon.*, non ENGLER, 1896. — *Wardenia* KING, *J. As. Soc. Beng.* 67, ii (1898) 60; HARMS in E. & P. *Nat. Pfl. Fam. Nachtr.* 2

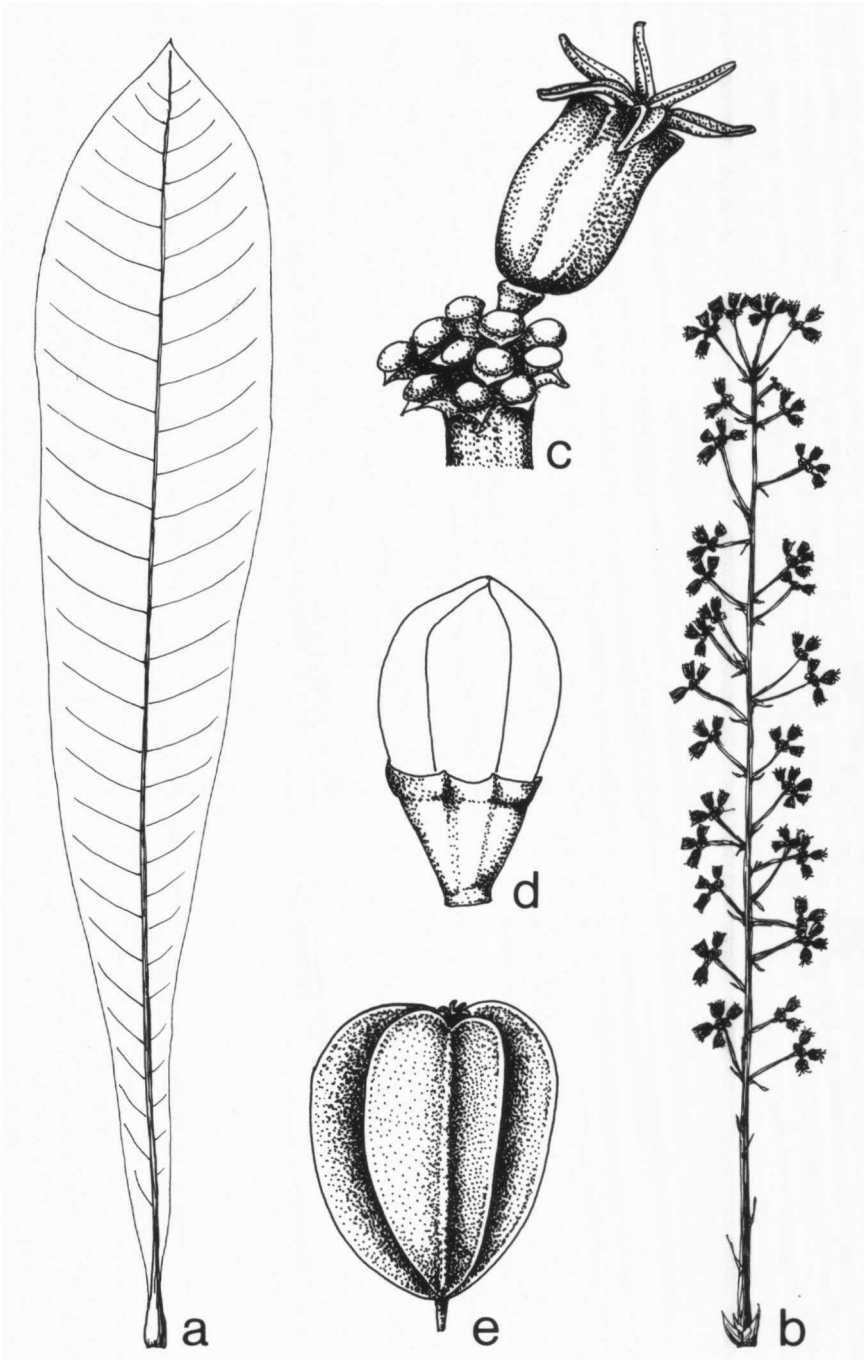


Fig. 32. *Anakasia simplicifolia* PHILIPSON. a. Leaf,  $\times \frac{1}{7}$ , b. inflorescence,  $\times \frac{1}{3}$ , c. single umbellule with an immature fruit, d. flower bud,  $\times 12$ , e. immature fruit,  $\times 2$  (BECCARI PP 282).

(1900) 51; RIDL. Fl. Mal. Pen. 1 (1922) 887; HUTCH. Gen. Fl. Pl. 2 (1967) 81; cf. FRODIN, Misc. Rec. Found. Fl. Males. 3 (1973) 8. — *Euaraliopsis* HUTCH. Gen. Fl. Pl. 2 (1967) 80, 624. — *Pseudobrassaiopsis* BANERJEE, J. Bomb. Nat. Hist. Soc. 72 (1975) 71. — Fig. 33, 34.

Shrubs or trees, usually prickly and tomentose. *Leaves* digitately compound, palmately lobed or simple, with a sheathing base and a usually bicuspid ligule; petiole terete. *Inflorescence* usually a terminal panicle of umbellules, often with persistent small bracts; pedicel not articulated below the ovary. *Calyx* rim 5-dentate. Petals 5, valvate. *Stamens* 5, extrorse. Ovary inferior, 2-celled; disk shallow; styles united into a usually long column. *Fruit* globose, exocarp fleshy, endocarp chartaceous; seed 2, not compressed, endosperm smooth.

Distr. More than 20 spp., extending from India, Tibet and southern China to *West Malesia*: Sumatra, Malay Peninsula and W. Java. In Malesia 6 spp., 1 endemic in Sumatra, 3 endemic in the Malay Peninsula, 2 in Indo-Malaya.

Ecol. Understorey of damp evergreen forest, mostly in mountainous districts, up to 2400 m.

Notes. A genus characterized by the 2-celled ovary, columnar style, and non-articulated pedicel, combined with leaves which may be either entire, palmately lobed, or digitately compound. Possibly close to *Trevesia*, which is similar vegetatively, but which has more massive inflorescences and ovaries with more numerous cells.

In dividing the species into two genera merely on the basis of leaf shape, HUTCHINSON *l.c.* fragmented what appears to be a coherent assemblage.

#### KEY TO THE SPECIES

1. Inflorescence shorter than the petioles (or at most about equal to them). Leaves palmately lobed, but variable in the variety . . . . . 1. *B. sumatrana*
1. Inflorescence much longer than the petioles.
  2. Leaves simple, entire, minutely and remotely dentate.
    3. Leaf base subcordate; blade to 35 cm or more long; petioles c. 15 cm, 5 mm  $\varnothing$  . . . 2. *B. simplex*
    3. Leaf base cuneate or rounded; blade to 25 cm long; petioles c. 7 cm, 2 mm  $\varnothing$  . . . 3. *B. minor*
  2. Leaves palmately lobed or digitately compound (occasionally some simple).
    4. Leaves palmately lobed . . . . . 4. *B. polyacantha*
    4. Leaves digitately compound.
      5. Branches of the inflorescence bearing several umbellules racemously (as well as one at end); umbellules with c. 25–35 flowers . . . . . 5. *B. glomerulata*
      5. Branches of the inflorescence bearing a terminal umbellule only (or occasionally with separate flowers below it); umbellule with c. 10–13 flowers . . . . . 6. *B. elegans*

1. *Brassaiopsis sumatrana* RIDL. J. Fed. Mal. St. Mus. 8, 4 (1917) 43. — *Kalopanax sumatranum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 17, heterotypic; BOERL. Handl. 1 (1890) 647; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 51. — ? *Kalopanax resectum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 18, see note below. — *Euaraliopsis sumatrana* (RIDL.) HUTCH. Gen. Fl. Pl. 2 (1967) 624.

*var. sumatrana.*

Shrub or small tree, to 15 m, with stout prickly branches, rufous-tomentose in its younger parts. *Leaves* palmately lobed, clustered at the ends of the shoots; petiole c. 15–32 cm, striate, sometimes with prickles, with an enlarged basal sheath and a small bicuspid ligule; blade rounded, cordate, c. 14–22 by 20–28 cm, palmately 5–7-lobed,

lobes elliptic acuminate, midrib prominent and lateral veins widely spaced and arched-ascending, margin irregularly spinulose-serrate. *Inflorescence* a short, rufous-tomentose panicle, arising below the leaves (actually terminal but overtopped by sympodial innovations); rachis c. 4–6 cm, lateral branches ascending, c. 2–4 cm, subtended by small linear bracts and sometimes branching to the third degree; umbellules with c. 8–20 flowers; pedicels c. 1 cm long, subtended by numerous minute bracts. *Calyx* a minute rim with 5 indistinct teeth. Petals 5, triangular, 2½ mm long. Stamens 2 mm long, anthers oblong, 1 mm long. Ovary obconic, c. 2 mm high; disk fleshy, cushion-shaped, surmounted by a slender awl-shaped stylar column. *Fruit* subglobose, c. 8 mm high, with a persistent calyx-rim and stylar column.

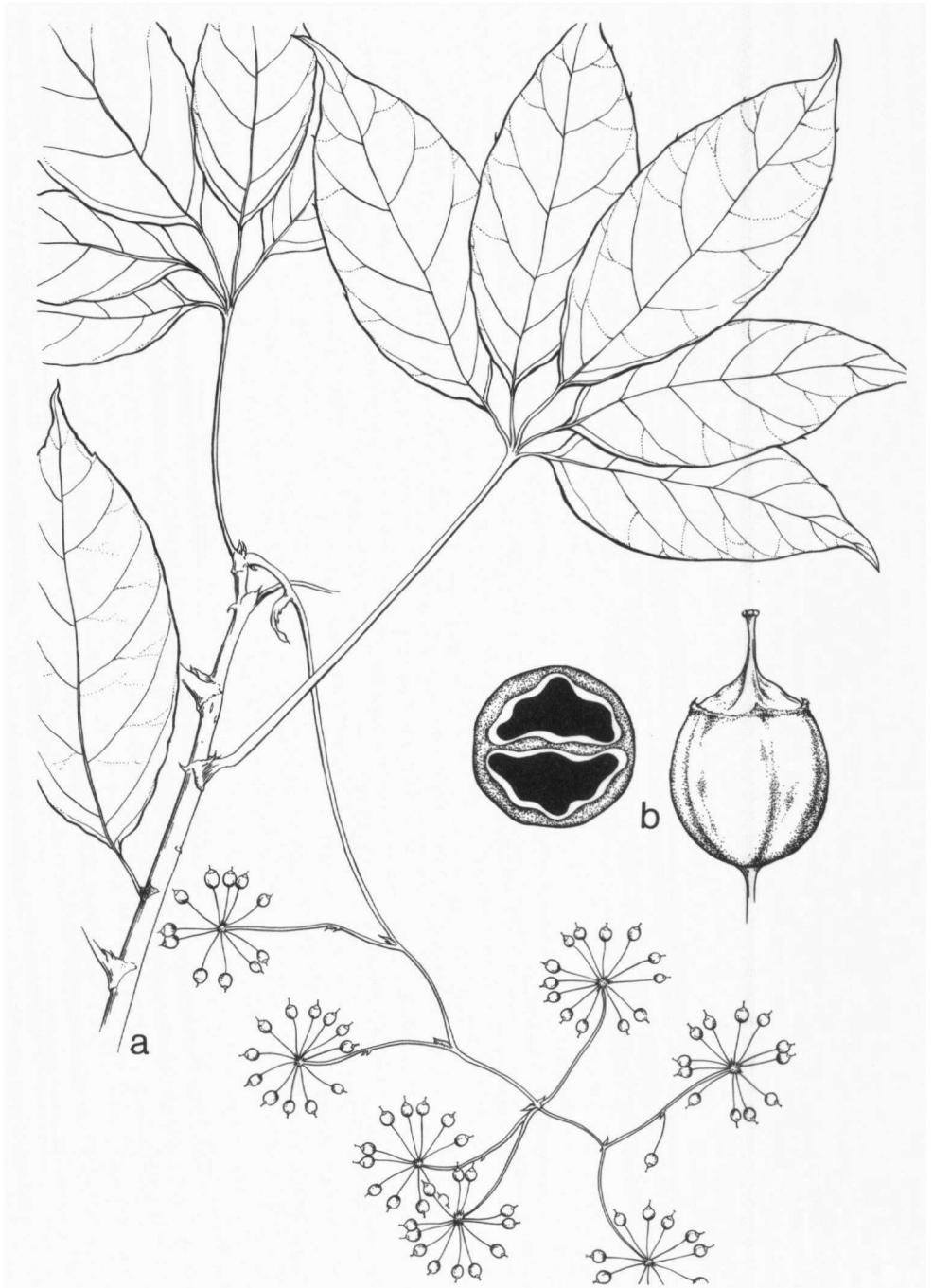


Fig. 33. *Brassaiopsis elegans* RIDL. a. Habit,  $\times \frac{2}{5}$ , b. fruit and ditto in CS,  $\times 4$  (KLOSS 1912). Drawn by P. PRENDERGAST.

Distr. *Malesia*: West Sumatra (Mts Kerintji, Merapi, Singalang).

Ecol. Montane, evergreen forest, 1500–2400 m. Vern. *Semontong*, Karo.

Notes. The foliage is similar to that of 4. *B. polyacantha* and of *Trevesia sundaica*, but the small inflorescence is distinctive. The prickles persist on the older branches and the trunk. The petals and filaments are white, the anthers light purple, and the disk yellow.

*Kalopanax resectum* MIQ. *l.c.*, described on a KORTHALS collection from Sumatra, possibly belongs here, but the inflorescence may be larger and most leaves are decidedly digitately compound. Possibly it represents a hybrid between *B. sumatrana* and 5. *B. glomerulata*.

var. *variaefolia* PHILIPSON, var. *nov.* — *B. ovalifolia* RIDL. J. Fed. Mal. St. Mus. 8, 4 (1917) 43.

*Frutex* var. *sumatrana humilior et tenerior, foliis secus ramis dispersis, inermis. Folia minora (10–20 cm longa) forma variantia etiam in eodem ramo, vel simplicia et ovata, vel profunde bi-vel trilobata, vel digitatim composita.* — *Typus*: W. MEIJER 7200 (L), Mt Sago near Pajakumbuh, W. Sumatra, 1000–1200 m, 8–VIII–1957.

A smaller, more delicate and unarmed shrub than var. *sumatrana*, with the leaves scattered along the branches. Leaves smaller (10–20 cm long) and variable in shape, even on the same branch, being either simple and ovate, or deeply bi- or trilobed, or digitately compound.

Distr. *Malesia*: Central West Sumatra.

Ecol. Montane, evergreen forest, 1000–1200 m.

Note. It is possible that RIDLEY was correct in regarding this as a distinct species, but the size and shape of the inflorescence links it with *B. sumatrana*, and the variable form of the leaf suggests that it may be no more than an extreme form of *B. sumatrana*. Nevertheless, typical forms of that species, with their stout prickly stems and rather coarse palmately lobed leaves, are very distinct. On the evidence available it is not possible to decide whether this variety consists of shade and/or juvenile forms of *B. sumatrana*, or whether it should constitute a distinct species.

2. *Brassaiopsis simplex* (KING) STONE, Gard. Bull. Sing. 30 (1976) 282, f. 3. — *Wardenia simplex* KING, J. As. Soc. Beng. 67, ii (1898) 60; HARMS in E. & P. Nat. Pfl. Fam. Nachtr. 2 (1900) 51; RIDL. Fl. Mal. Pen. 1 (1922) 887; HUTCH. Gen. Fl. Pl. 2 (1967) 81; PHILIPSON, J. Linn. Soc. Bot. 63, Suppl. (1970) 90.

Shrub, to 5 m high, branches prickly, rufous-tomentose in its younger parts. Leaves large, simple, coriaceous, clustered towards the tips of the branches; petiole c. 14–20 cm, stout, striate, with a basal sheath and a short, bicuspid ligule; blade ovate, c. 35–40 by 12–18 cm, apex shortly acuminate, base slightly cordate, rufous-stellate

hairs persistent beneath, midrib prominent, lateral veins very widely spaced, arched ascending, margin minutely dentate. *Inflorescence* a panicle of umbellules; rachis c. 10–20 cm; lateral branches reflexed, 5–12 cm, subtended by small lanceolate bracts and often bearing 1–2 bracts from which tertiary branches arise; umbellules with c. 10–20 flowers; pedicels  $1\frac{1}{4}$ –2 cm, slender, subtended by numerous minute bracts. *Calyx* a narrow rim with 5 indistinct teeth. Petals 5, falling as a calyptra. Stamens 2 mm long, anthers oblong. Ovary obconic, c. 2 mm high, disk cushion-like, surmounted by an awl-shaped stylar column  $1\frac{1}{2}$  mm long. *Fruit* globose, fleshy, c. 5 mm  $\varnothing$ , with a persistent calyx rim and a stylar column c. 2 mm long.

Distr. *Malesia*: Malay Peninsula (Perak, Selangor).

Ecol. In open bamboo forest, 100–800 m.

Note. Originally described as a distinct genus because of its supposedly 1-celled ovary. RIDLEY (1922) did not include this feature in his description. He distinguished *Wardenia* from *Brassaiopsis* because of its simple leaves, but several species of *Brassaiopsis* from further north also have undivided leaves. Both HARMS (1900) and HUTCHINSON (1967) accepted the original statement that the ovary is 1-celled at the time of flowering, but I found the ovary to be 2-celled even in the young state (1970, *l.c.*).

3. *Brassaiopsis minor* STONE, Gard. Bull. Sing. 30 (1976) 282, f. 5.

Small shrub, c. 60 cm, with very few small prickles, rufous tomentose on its young parts. Leaves simple, spaced towards the ends of the branches, subcoriaceous; petiole 5–8 cm, c. 2 mm  $\varnothing$ , with a basal sheath and a small ligule; blade elliptic or ovate 20–26 by 10–12 cm, apex shortly acuminate, base rounded to cuneate, rufous stellate hairs persistent beneath, midrib prominent, lateral veins widely spaced, arched ascending, margin minutely and remotely dentate. *Inflorescence*: peduncle short, bearing lanceolate bracts; umbellules on short lateral branches, with 15–20 flowers on slender pedicels c.  $1\frac{1}{2}$  cm long, subtended by minute puberulent bracts. *Calyx* with 5 indistinct teeth. Ovary rotund, surmounted by a slender stylar column 1 mm long.

Distr. *Malesia*: Malay Peninsula (Trengganu).

Ecol. Humid situations in lowland to montane forest, to 1100 m.

4. *Brassaiopsis polyacantha* (WALL.) BANERJEE, Ind. For. 93 (1967) 341; STONE, Gard. Bull. Sing. 30 (1977) 282. — *Hedera polyacantha* WALL. Pl. As. Rar. 2 (1831) 82, t. 190. — *Panax palmatum* ROXB. [Hort. Beng. (1814) 21, *nomen*;] Fl. Ind. ed. Carey 2 (1832) 74. — *B. palmata* (ROXB.) KURZ, J. As. Soc. Beng. 39, ii (1870) 77; CLARKE, Fl. Br. Ind. 2 (1879) 735; KING, J. As. Soc. Beng. 67, ii (1898) 61; RIDL. Fl. Mal. Pen. 1 (1922) 887. —



Fig. 34. *Brassaiopsis polyacantha* (WALL.) BANERJEE. In flower at Kuala Lumpur (Photogr. PHILIPSON, 1975).

*Euraliopsis palmata* (ROXB.) HUTCH. Gen. Fl. Pl. 2 (1967) 80. — *Pseudobrassaiopsis polyacantha* (WALL.) BANERJEE, J. Bomb. Nat. Hist. Soc. 72 (1975) 72. — Fig. 34.

A small sparsely branched tree with buttresses, to c. 13 m; branches prickly, rufous-tomentose on the younger parts and persisting on the leaves and inflorescence. *Leaves* palmately lobed, clustered at the ends of the shoots; petiole to c. 70 cm, longitudinally grooved, with an enlarged basal sheath and a pair of small stipular processes; blade rounded, cordate, c. 18–30 by 20–40 cm, deeply palmately 5–9-lobed, lobes oblong-elliptic, acuminate, midrib prominent and main lateral veins widely spaced and arched-ascending, margin inconspicuously serrate. *Inflorescence* a large panicle often overtopped by sympodial innovations; rachis c. 40–60 cm, lateral branches c. 8–15 cm, subtended by very small caducous bracts and often bearing a pair of minute bracts near the middle, from which short tertiary branches may arise, branches terminating in spherical umbellules; umbellules with c. 15–25 flowers, subtended by numerous minute bracts; pedicels  $\frac{3}{4}$ – $1\frac{1}{4}$  cm.

*Calyx* of 5 small teeth, rusty tomentose. *Petals* 5, triangular,  $2\frac{1}{2}$  mm long. *Stamens* 2 mm long, anthers oblong, 1 mm. *Ovary* obconic, c. 2 mm high; disk fleshy, cushion-shaped, surmounted by an awl-shaped stylar column  $1\frac{1}{2}$  mm long. *Fruit* globose, 6–8 mm  $\varnothing$ , with a persistent calyx rim and stylar column.

*Distr.* Widespread in SE. Asia (India, Nepal, Burma, Andamans); in *Malesia*: Malay Peninsula (from Kedah to Selangor and Pahang).

*Ecol.* Montane rain-forest, to c. 1800 m.

*Note.* The inflorescence is similar to that of *B. glomerulata* but the leaves of these two species cannot be confused.

5. *Brassaiopsis glomerulata* (BL.) REGEL, Gartenfl. 12 (1863) 275, t. 411; KOORD. Exk. Fl. Java 2 (1912) 715; Atlas 4 (1916) f. 674; Fl. Tjib. 2 (1923) 226; BACK. & BAKH. f. Fl. Java 2 (1965) 167; NGOC-SANH BUI, Adansonia 6 (1966) 437; STONE, Gard. Bull. Sing. 30 (1977) 282. — *Aralia glomerulata* BL. Bijdr. (1826) 872. — *Hedera glomerulata* (BL.) DC. Prod. 4 (1830) 265; HOOK. Bot. Mag. 80 (1854) t. 4804. — *B. speciosa* DECNE & PLANCH.

Rev. Hort. 4, 3 (1854) 106; BOERL. Handl. 1 (1890) 643; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 43, f. 1 B; K. & V. Bijdr. 7 (1900) 8; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 11. — *Macropanax glomerulatum* (BL.) MIQ. Fl. Ind. Bat. 1, 1 (1856) 764. — *Macropanax cyrtostylum* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 13. — *B. cyrtostyla* (MIQ.) SEEM. J. Bot. 2 (1864) 293.

Tree up to 10 m, with stout often sinuous branches prickly in their upper parts, the young parts of the shoots and inflorescences rufous-tomentose. *Leaves* digitately compound, clustered at the ends of the shoots; petiole c. 25–60 cm, with an expanded basal sheath with two aculeate stipules; leaflets 5–9, petiolules c. 8–10 cm (the laterals shorter), blade elliptic-oblong, c. 15–25 by 6–10 cm, apex acuminate, base broadly cuneate to rounded, midrib prominent, lateral veins widely spaced, arched-ascending, margin serrulate. *Inflorescence* a large panicle; rachis 30–60 cm, lateral branches c. 20–30 cm, with umbellules arranged racemously along them on peduncles c. 2–5 cm long, bracts numerous, lanceolate, c. 1/2 cm long, mostly persistent; umbellules with c. 25–35 flowers, pedicels 1–1 1/4 cm, subtended by numerous minute ferruginous bracts. *Calyx* of 5 small teeth. Petals 5, triangular, 3–4 mm long. Filaments 2–2 1/2 mm, anthers oblong, 1 mm. Ovary obconic at anthesis, c. 2 mm high; disk fleshy, cushion-shaped, surmounted by an awl-shaped stylar column. *Fruit* globose, 6–7 mm high, with a persistent calyx rim and a stylar column usually 2 mm long but occasionally much shorter (even in the same inflorescence).

Distr. India to SW. China; in *Malesia*: Malay Peninsula (Pahang, Negri Sembilan), Sumatra, W. Java.

Ecol. Humid, evergreen, montane rain-forest, 1200–2200 m.

Vern. Sumatra: *kayu aro*, M (Kerintji); Java: *panggang*, *p. pujut* (or *puju*), *p. ranti* (or *ranto*), S.

Note. Juvenile plants bear leaves which are simple, irregularly lobed, or with 2, 3 or 5 leaflets. The flowers are pale yellowish cream. The cut stems exude a yellowish sap.

6. *Brassaiopsis elegans* RIDL. J. Linn. Soc. Bot. 41 (1913) 291; Fl. Mal. Pen. 1 (1922) 888; STONE, Gard. Bull. Sing. 30 (1977) 282, f. 4. — Fig. 33.

Shrub, stems with few to many prickles, young parts rufous-tomentose, becoming glabrous. *Leaves* digitately compound, or occasionally simple; petiole c. 14 cm, striate, with a small basal sheath and a short, bicuspid ligule; leaflets 3–5 (or 1), petiolules c. 3 cm (laterals shorter); blade elliptic, c. 12–16 by 4–5 cm, apex long acuminate, base cuneate, midrib prominent, lateral veins widely spaced, arched-ascending, margin minutely denticulate. *Inflorescence* a lax gracefully pendent raceme of umbellules; rachis c. 23 cm, lateral branches c. 5 cm, subtended by small lanceolate bracts and bearing 1–2 minute bracts near the middle, terminating in spherical umbellules and occasionally with separate flowers arising below the apex; umbellules with c. 10–13 flowers, subtended by numerous minute bracts; pedicels at anthesis c. 1/2 cm elongating to c. 1 1/4–1 1/2 cm in fruit. *Calyx* of 5 minute teeth. Petals 5, triangular, 2 1/2 mm long. Stamens 2 mm long, anthers oblong. Ovary obconic, c. 2 mm high; disk fleshy, surmounted by an awl-shaped stylar column. *Fruit* globose, 6 mm high, with a persistent calyx rim and stylar column.

Distr. *Malesia*: Malay Peninsula (Selangor, Pahang), very local.

Ecol. Montane, evergreen rain-forest, 800 m.

#### 14. TREVESIA

VISIANI, Giorn. Tosc. Sc. Med. 1 (1840) 72; Mem. Accad. Torino II, 4 (1842) 262; MIQ. Fl. Ind. Bat. 1, 1 (1856) 747; Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 10; BTH. in B. & H. Gen. Pl. 1 (1865) 942, *p.p.*; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 107; Handl. 1 (1890) 639; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 32; KING, J. As. Soc. Beng. 67, ii (1898) 57; KOORD. Atlas 4 (1916) f. 664–666; HUTCH. Gen. Fl. Pl. 2 (1967) 71. — *Petasula* NORONHA, Verh. Bat. Gen. 5 (1790) ed. 1, art. 4: 3, *p.p.*, *cf.* STEEN. Regn. Veget. 71 (1970) 376. — Fig. 35, 36.

Shrubs or trees, unarmed or prickly, tomentose at least on young parts; buds enclosed in cataphylls. *Leaves* large, palmately lobed or digitately compound, stipules forming a bicuspid ligule within the terete petiole. *Flowers* in umbellules which are arranged racemously along a rachis or in panicles; pedicels not articulated below the ovary. *Calyx* a small rim. Petals 7–12, valvate, often falling at

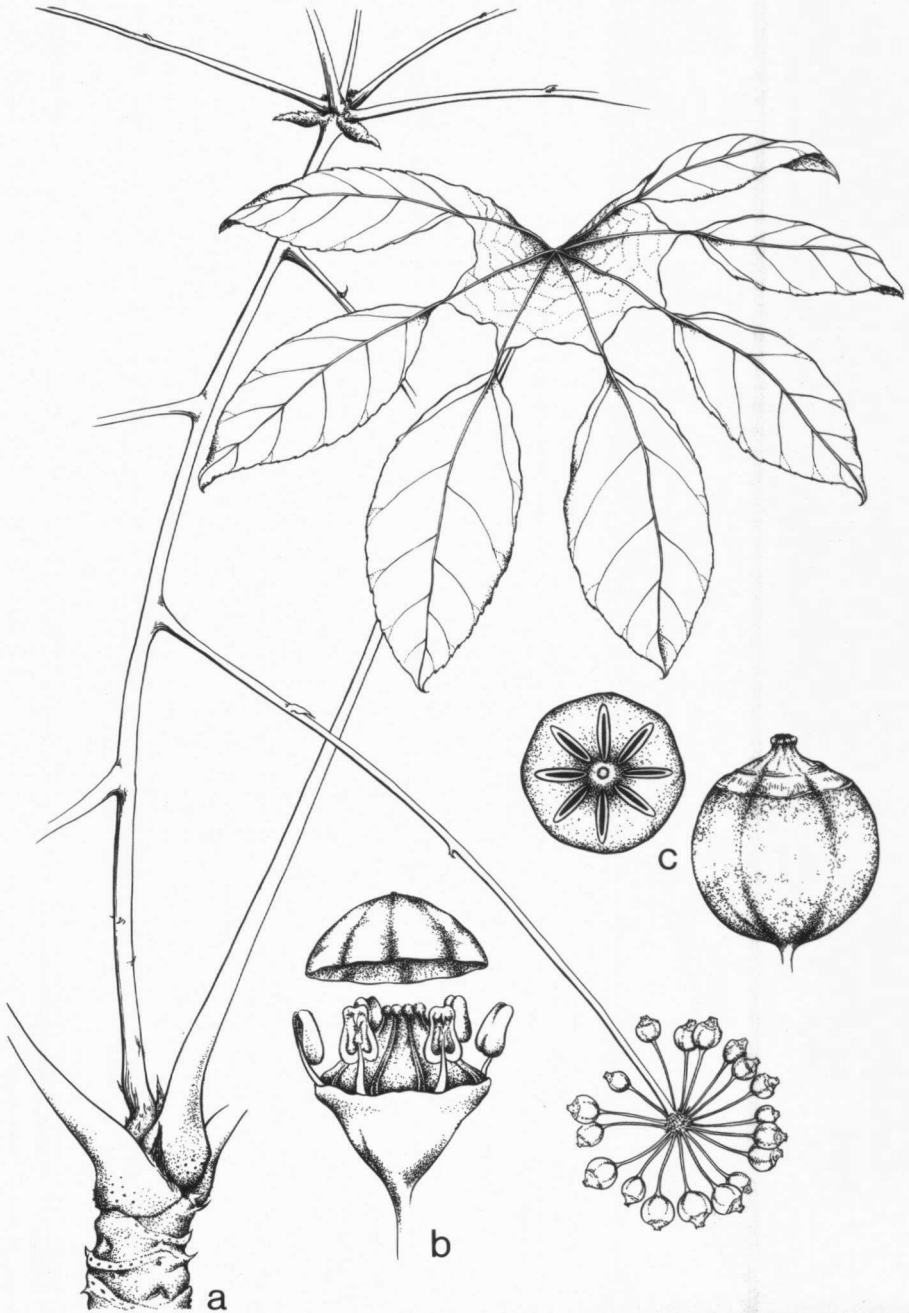


Fig. 35. *Trevesia burckii* BOERL. a. Habit,  $\times \frac{1}{3}$ , b. flower,  $\times 2$ , c. fruit and ditto in CS,  $\times 1\frac{1}{2}$  (a RAHMAT SI TOROES 5048, b YAPP 99, c RAHMAT SI TOROES 5049). Drawn by P. PRENDERGAST.



anthesis as a calyptra. *Stamens* as many as the petals; anthers large ovoid, dorsifixed, introrse, filament strap-like. Ovary inferior, broadly obconic or subglobose, 7–12-celled; disk rising gradually to a central boss formed by the united styles. *Fruit* globose or ovoid, crowned by the disk and prominent styler column; pyrenes coriaceous, compressed, endosperm smooth.

Distr. 6 spp. ranging from eastern India and SW. China to Malesia; 5 of the species occur in *W. Malesia*: Sumatra, Malay Peninsula, Java, Borneo, Lesser Sunda Is. (Lombok).

Formerly erroneously credited to the Philippines, cf. MERRILL, En. Philip. 3 (1923) 237.

Ecol. Primary rain-forest and second growth, especially in humid, shady localities.

Note. The genus comprises three well known species, each occupying distinct areas, except that the ranges of two overlap in Sumatra. In addition there are three very local and imperfectly known species.

#### KEY TO THE SPECIES

1. Leaves digitately compound.
  2. Petiolules connected by a web of tissue for most of their length . . . . . 1. *T. burckii*
  2. Petioles free. Continental SE. Asia. . . . . *T. palmata* (DC.) Vis.
1. Leaves palmately lobed.
  3. Inflorescence branches and petioles densely covered with long red setae . . . . . 2. *T. rufo-setosa*
  3. Inflorescence branches not as above (but sometimes setulose, furfuraceous, pubescent or glabrous).
    4. Flowers sessile or subsessile . . . . . 3. *T. beccarii*
    4. Flowers pedicelled.
      5. Ovary c. 14-celled, pedicels stout, c. 4 mm  $\varnothing$  . . . . . 4. *T. sundalca*
      5. Ovary c. 8–10-celled, pedicels more slender, 1–2 mm  $\varnothing$  . . . . . 5. *T. arborea*

1. *Trevesia burckii* BOERL. Ann. Jard. Bot. Btzg 6 (1887) 110, pl. 12(–14); Handl. 1 (1890) 649; MERR. En. Born. (1921) 456; MASAMUNE, En. Phan. Born. (1942) 566. — *T. palmata* (DC.) VIS. var. *cheirantha* CLARKE, Fl. Br. Ind. 2 (1879) 732; KING, J. As. Soc. Beng. 67, ii (1898) 58. — *T. cheirantha* (CLARKE) O. K. Rev. Gen. Pl. 1 (1891) 272; RIDL. Fl. Mal. Pen. 1 (1922) 882. — Fig. 35.

Shrub or small, sparsely branched tree up to 10 m, branches stout with small prickles, young parts rufous-furfuraceous, cataphylls prickly. *Leaves* crowded at the ends of the shoots, digitately compound; leaflets usually 7–9; petioles c. 60 cm, striate, sometimes with small prickles or bristles, dilated into a clasping base, ligule with two lanceolate lobes; petiolules united for all or most of their length by a foliaceous web; leaflets oblong-lanceolate or elliptic, up to 30 by 10 cm, apex acuminate, base cuneate or rounded, margin finely serrate especially in the upper part, principal veins arched-ascending, prominent. *Inflorescence* a large terminal panicle, often overtopped by lateral shoots; rachis to 60 cm, slightly prickly or not, bearing branches along its length and usually ending an umbel of branches, bracts caducous or persistent; secondary branches (peduncles) c. 10–18 cm, sometimes with 1 or few bracts along their length and terminating in spherical umbellules of 40–50 flowers; pedicels c. 20–35 mm, slender. *Calyx* an irregular obsolete rim. Corolla hemispherical, c. 6 mm high, falling as a calyptra, petals c. 7–10. *Stamens* c. 7–10, filament flattened c. 2½ mm, anthers broadly triangular, c. 3 mm

long. Ovary at anthesis broadly obconic, usually rufous-furfuraceous, c. 7–10-celled; disk broadly conical surmounted by the connate styles, stigmas slightly swollen. *Fruit* subglobose 1½ by 1¼ cm, surmounted by the stylopodium and connate styles.

Distr. *Malesia*: Sumatra, Malay Peninsula (from Kedah southwards), Borneo (Sarawak).

Ecol. Primary rain-forest, mostly below 500 m, rarely up to 1000 m.

Vern. Sumatra: *tapa arimau, tada lada*, M; Malaya: *kakabu, tapak itek, t. rimau*, M.

Note. The stamens are described as cream on an orange disk. Seedling plants have leaves which are palmately lobed or entire.

2. *Trevesia rufo-setosa* RIDL. J. Str. Br. R. As. Soc. n. 86 (1922) 294; Fl. Mal. Pen. 1 (1922) 883.

A shrub with stout prickly stems, young parts, petioles and inflorescence densely covered with red-brown flat setae. *Leaves* palmately lobed, clustered at the ends of the shoots; petioles c. 60 cm, dilated into a clasping base with a bicuspid ligule; blade c. 30 by 30 cm, with 7 lobes; lobes c. 20 by 9 cm, elliptic, shortly cuspidate, midveins and widely spaced arched-ascending laterals prominent, margin with many upwardly directed spinulose teeth. *Inflorescence* terminal; rachis flexuous, c. 20 cm, bearing lateral umbellules, bracts linear c. 12 mm; pedicels short. *Flowers* heterosexual. *Calyx* rim obscure. Petals 5, triangular, 6 mm long, setose on the outside, spreading. *Stamens* 5. Ovary in the fertile flowers obconic,

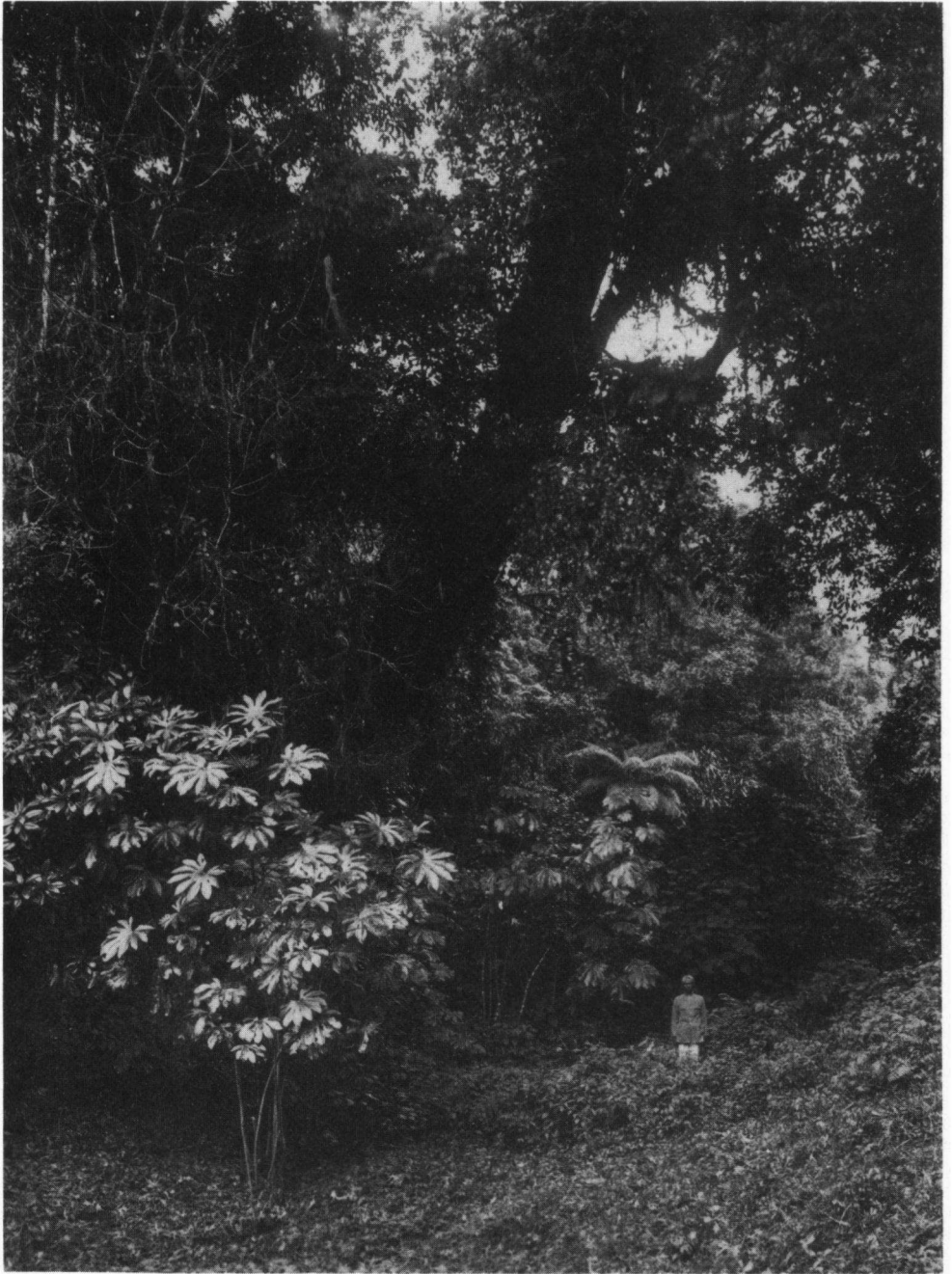


Fig. 36. *Trevesia sundaica* MIQ. in mixed evergreen mountain forest in E. Java at Sarangan, c. 1200 m altitude, with *Quercus* (Photogr. JESWIET, 1925).

setose, 5-celled; disk with cylindrical projecting stylar column. *Fruit* unknown.

*Distr. Malesia:* Malay Peninsula (Selangor: Semangkok Pass).

*Ecol.* Montane forest, at c. 800 m.

3. *Trevesia beccarii* BOERL. Ann. Jard. Bot. Btzg 6 (1887) 110, pl. 11.

Shrub, c. 3 m, with stout prickled stems. *Leaves* palmately lobed, clustered at the ends of the branches; petiole c. 50 cm, hirsute with short patent bristly hairs when young, some persisting, dilated into a clasping spinulose base with a bicuspid ligule; blade c. 30 by 40 cm, with 7-9 lobes, base cordate, lobes c. 15 by 7 cm, broadly elliptic-oblong, apex rather blunt, rusty stellate-pubescent when young, sometimes persisting, mid-veins and rather numerous arched-ascending lateral veins prominent, margin irregularly serrate. *Inflorescence* when young hirsute like the petioles, sometimes persistent; rachis c. 90 cm, bearing many lateral branches (peduncles) along its length, bracts lanceolate, caducous; peduncles c. 5-15 cm with some caducous, linear bracts along their length and around the base of the umbellules (capitula). Capitula of c. 10-20 sessile (or subsessile) flowers. *Calyx* rim short, undulate. Corolla conical in bud, falling as a calyptra. Stamens 10-12, anthers oblong, filaments stout. Ovary obconic, angular from contact with neighbouring flowers, 10-12-celled; disk broadly conical; surmounted by the massive connate styles, stigmas slightly swollen. *Fruit* obconic angular from mutual pressure, c. 10 by 7 mm.

*Distr. Malesia:* West Central Sumatra.

*Ecol.* Forest, ascending to 1200 m.

*Vern. Likabau, M.*

4. *Trevesia sundaica* MIQ. Pl. Jungh. 3 (1855) 420; Fl. Ind. Bat. 1, 1 (1856) 747; DE VRIESE, Pl. Ind. Or. (1857) 81; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 11; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, pl. 12 (16); Handl. 1 (1890) 649; K. & V. Bijdr. 7 (1900) 4, incl. var. *glomerata* K. & V. l.c. 5; KOORD. Exk. Fl. Java 2 (1912) 710; Atlas 4 (1916) f. 664-666; Fl. Tjib. 2 (1923) 222; BAKH. f. & OOSTSTR. in Back. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 159, p. 4; BACK. & BAKH. f. Fl. Java 2 (1965) 163. — *Aralia palmata* REINW. ex BL. Cat. Btzg (1823) 43, *nomen*; ex DE VRIESE, Pl. Ind. Or. (1857) 82, *nomen in synonym*; BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, *in synonym*, non LAMK, 1783, nec LOUR. 1790. — *Sciadophyllum palmatum* BL. Bijdr. (1826) 875, non *T. palmata* (ROXB.) VIS. 1842. — *Aralia reinwardiana* STEUD. Nomencl. 1 (1840) 118, *nomen*. — *Gastonia sundaica* (MIQ.) BAILL. Hist. Pl. 7 (1880) 161, f. 202. — *Actinophyllum palmatum* BL. ex BOERL. Ann. Jard. Bot. Btzg 6 (1887) 111, *in synonym*. — Fig. 36.

Shrub or small, sparsely branched tree, up to

8 m; branches stout, with small prickles, young parts stellate-tomentose, becoming glabrous, buds with cataphylls. *Leaves* palmately lobed, clustered at the ends of the branches; petiole striate, c. 50-60 cm, unarmed or with a few prickles near the base, dilated with a clasping, heavily lenticellate base, ligule bicuspid; blade c. 60 by 60 cm, with 7-11 lobes, base cordate, lobes c. 30 by 40 cm, elliptic-oblong, apex acute to acuminate, separated by wide sinuses, mid-veins and widely spaced arched-ascending lateral veins prominent, margin serrate, occasionally irregularly incised. *Inflorescence* arising among or below the leaves, a raceme of umbellules, at first rusty pubescent, glabrescent; rachis up to 60 cm, often much shorter, bearing branches along its length and ending in an umbel, bracts lanceolate, caducous; secondary branches (peduncles) c. 8-16 cm, bearing small bracts along their length and around the umbellules; umbellules of c. 20-35 flowers, pedicels c. 2-5 cm, lateral umbellules sometimes bearing small sterile (male) flowers. *Calyx* rim very short, undulate. Corolla hemispherical in bud, c. 6 mm high, falling as a calyptra, petals 8-12. Stamens 8-12, filaments stout, anthers ovate, c. 3 mm long. Ovary at anthesis broadly obconic, rufous-furfuraceous, c. 8-10-celled; disk broadly conical passing into the stylar column. *Fruit* semiglobose,  $1\frac{1}{4}$ - $1\frac{1}{2}$  cm  $\varnothing$ , surrounded by the stylopodium and connate styles.

*Distr. Malesia:* Sumatra, Java, Lesser Sunda Is. (Lombok).

*Ecol.* Evergreen rain-forest, especially in ravines, ascending to 1500 m.

*Vern. Sumatra:* *ahab*, *tapa arimau*, M; Java: *borang*, *djemporang*, *dorang*, *gabus*, *gorang*, *lontanglanting*, *panggang*, *p. lembur*, *p. puju*, *p. tjutjuk*, *papangangan*, S.

5. *Trevesia arborea* MERR. Contr. Arn. Arb. 8 (1934) 116.

Tree up to 15 m, young parts shortly reddish stellate-tomentose, prickly. *Leaves* palmately lobed, clustered at the ends of the branches; petioles 17-50 cm, shortly rusty tomentose, glabrescent, unarmed, dilated into a sheathing base, ligule bicuspid; blade rotund, 25-40 cm, base cordate, glabrous above, shortly red-pubescent below, coriaceous, usually 9-lobed, sinuses narrow, lobes oblong-elliptic or oblong-oblancoleate, acuminate, margin distantly serrate distally. *Inflorescence* a raceme of umbellules, at first reddish pubescent, glabrescent, sometimes with a few spines below; rachis stout (c. 1 cm  $\varnothing$ ), c. 35 cm, bearing branches along its length, and ending in an umbel, bracts oblong-ovate, acuminate 1-2 cm long; primary branches (peduncles) few, spreading, stout, without spines, to c. 15 cm; umbellules of c. 8-13 flowers, pedicels  $1\frac{1}{2}$ - $2\frac{1}{2}$  cm, stout (3-4 mm  $\varnothing$ ), reddish tomentose, basal bracts triangular, c. 5 mm long. *Flowers* hermaphrodite. *Calyx* an irregular short

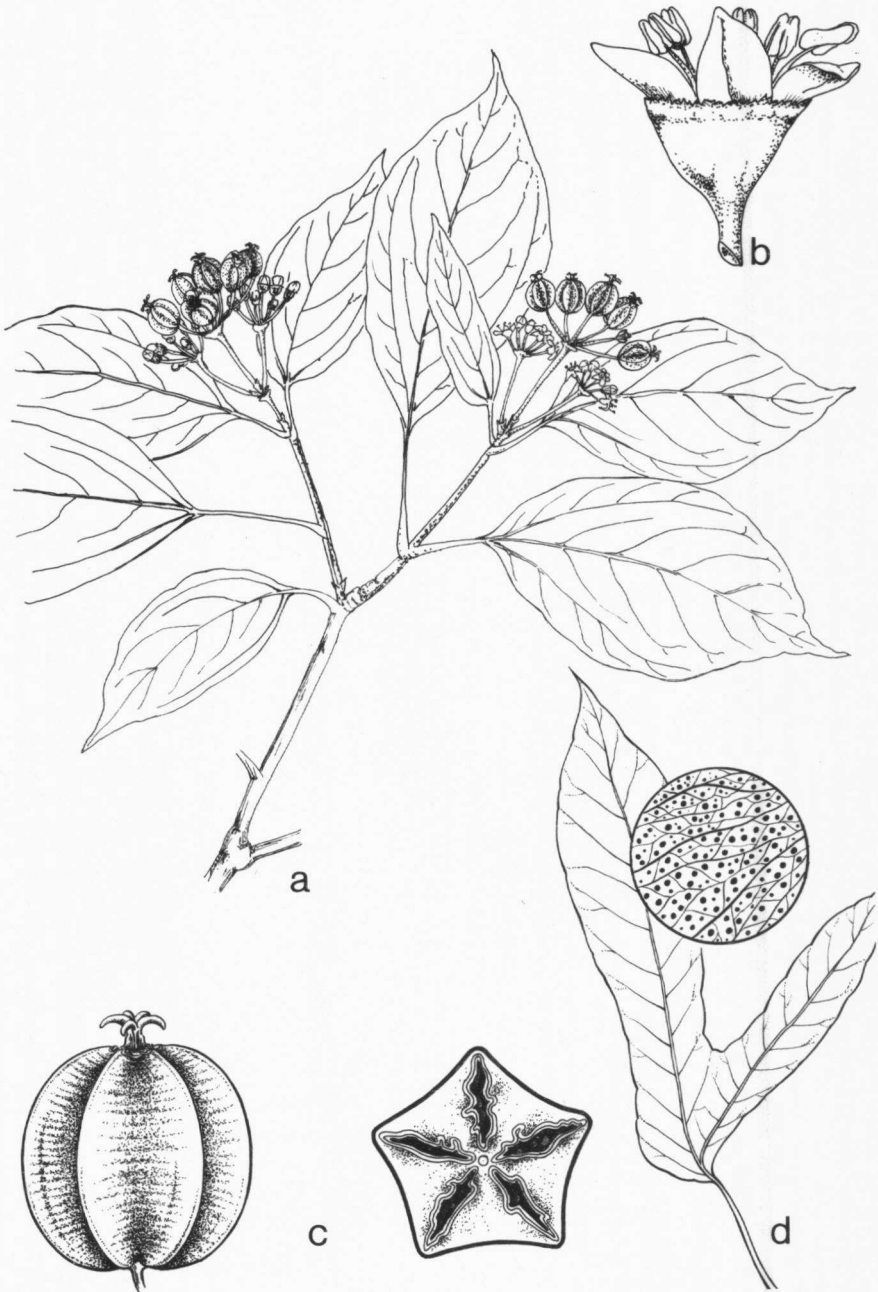


Fig. 37. *Dendropanax borneensis* (PHILIPSON) MERR. a. Habit,  $\times \frac{1}{2}$ , b. flower,  $\times 5$ , c. fruit and ditto in CS,  $\times 5$ , d. bifid leaf with area enlarged to  $\times 100$  to show glands (a-b NOOTEBOOM 2258, c CLEMENS 51039, d CLEMENS 28927). Drawn by P. PRENDERGAST.

rim. Corolla hemispherical in bud, c. 6 mm high, 12 mm diam., densely rusty pubescent outside, falling as a calyptra. Stamens c. 13, filaments stout, 4 mm, anthers ovate, c. 4 mm long. Ovary broadly

hemispherical, shortly furfuraceous, 14-celled. Fruit unknown.  
 Distr. *Malesia*: N. Sumatra (Atjeh).  
 Ecol. Primary, evergreen forest, 1100 m.

15. DENDROPANAX

DECNE & PLANCH. Rev. Hort. IV, 3 (1854) 107; BTH. in B. & H. Gen. Pl. 1 (1865) 943; CLARKE, Fl. Br. Ind. 2 (1879) 733; MERR. Brittonia 4 (1941) 129; HUI-LIN LI, Sargentia 2 (1942) 38; PHILIPSON, Bull. Br. Mus. Nat. Hist. Bot. 1 (1951) 18; HUTCH. Gen. Fl. Pl. 2 (1967) 71; STONE, Gard. Bull. Sing. 30 (1977) 148. — *Gilibertia* RUIZ & PAV. Prod. Fl. Peruv. (1794) 50, non J. F. GMEL. 1791; BTH. in B. & H. Gen. Pl. 1 (1865) 944; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 40 & Nachtr. 2 (1900) 254; PHILIPSON, J. Bot. 78 (1940) 116. — *Textoria* MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 12. — Fig. 37.

Unarmed, usually glabrous small trees, or erect or subscaudent shrubs. *Leaves* simple, entire, or sometimes palmately 3–5-lobed, often with pellucid glands, without articulation between blade and petiole; stipular sheath inconspicuous. *Umbels* solitary or compound, or on racemously arranged branches or paniculate; pedicels not articulated below the ovary. *Flowers* sexually dimorphic. *Calyx* on entire rim or 5-dentate. *Petals* 5, valvate. *Stamens* 5–8, extrorse. *Ovary* inferior, 4–8-celled; styles united throughout all or part of their length, or free. *Disk* fleshy, conical. *Fruit* globose or ellipsoid, usually strongly ribbed when dry; exocarp fleshy; endocarp cartilaginous. Endosperm smooth or rarely weakly ruminant.

Distr. About 30 spp. in tropical America and eastern Asia south to *Malesia* (3 spp.): N. Sumatra, Malay Peninsula, Borneo. Fig. 38.

Ecol. Rain-forest in lowland and montane regions, 300–3100 m.

Note. Distinguished from *Hedera* by the normally erect habit and the smooth (or only weakly ruminant) endosperm.

KEY TO THE SPECIES

- 1. Leaves without pellucid gland-dots . . . . . 1. *D. lancifolius*
- 2. Inflorescence a compound umbel . . . . . 2. *D. maingayi*
- 2. Inflorescence a simple umbel . . . . . 3. *D. borneensis*
- 1. Leaves with pellucid gland-dots . . . . . 3. *D. borneensis*

1. *Dendropanax lancifolius* (RIDL.) RIDL. Fl. Mal. Pen. 1 (1922) 884; STONE, Gard. Bull. Sing. 30 (1977) 148, f. 6 C. — *Arthrophyllum lancifolium* RIDL. J. Str. Br. R. As. Soc. n. 75 (1917) 38.

Tree to c. 14 m. *Leaves* dispersed along the shoots; petiole c. 5 cm, slightly dilated at the base and with an obscure ligular rim; blade to c. 15 by 3<sup>3</sup>/<sub>4</sub> cm, chartaceous, lanceolate, base narrowly cuneate, apex gradually tapered to an acute point, margin entire but undulate, midrib well defined, secondary and tertiary veins delicate. *Umbel* terminal, compound; peduncle c. 2 cm; secondary rays few, 1–2 cm; pedicels 5–10, c. 1–2 cm. *Calyx* a rim with indistinct teeth. *Petals* triangular, falling as a cap or separating. *Ovary* 4–5-celled, styles forming an erect column.

Distr. *Malesia*: Malay Peninsula (Perak) and N. Sumatra (Toba Lands).

Ecol. Montane rain-forest, c. 300–1500 m.

Vern. Sumatra: *modang simarla siak*, Batak lang.

2. *Dendropanax maingayi* KING, J. As. Soc. Beng. 67, ii (1898) 48; RIDL. Fl. Mal. Pen. 1 (1922) 884; STONE, Gard. Bull. Sing. 30 (1977) 48, f. 6 B. — *D. parviflorus* [non (CHAMP.) BTH.] CLARKE, Fl. Br. Ind. 2 (1879) 733. — *Gilibertia maingayi* PHILIPSON, J. Bot. 78 (1940) 117.

Slender shrub to c. 1<sup>1</sup>/<sub>2</sub> m, with few branches. Buds enclosed in small cataphylls. *Leaves* dispersed along the shoots; petiole 1<sup>1</sup>/<sub>2</sub>–5 cm, channelled above, slightly dilated at the base and with

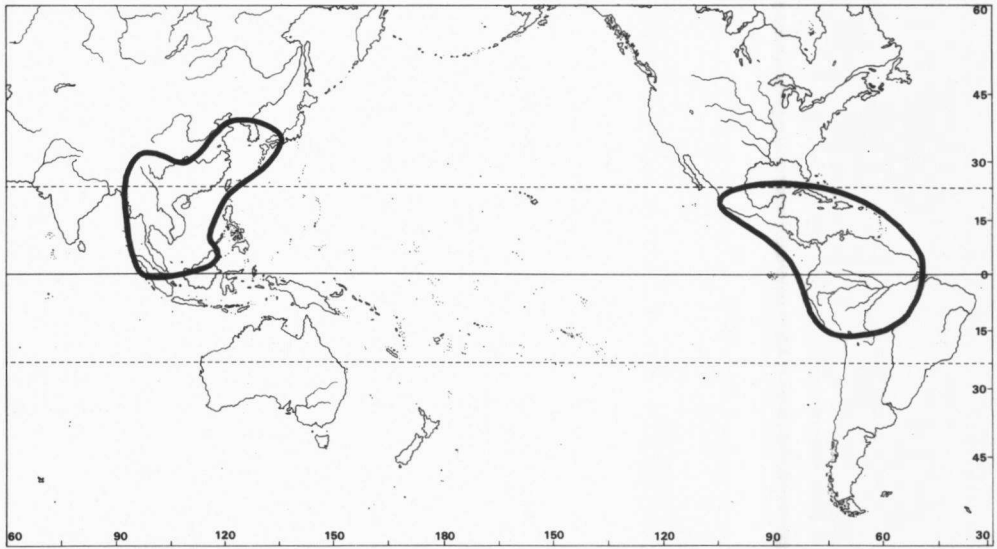


Fig. 38. Range of *Dendropanax* DECNE & PLANCH.

a small to obscure ligule within the petiole; blade 5–15 by 2–5<sup>3</sup>/<sub>4</sub> cm, thinly coriaceous to membranous, ovate, elliptic, oblong or lanceolate, base rounded to narrowly cuneate, apex acute, margin entire, often undulate, midrib prominent, sometimes with three distinct principal veins. *Umbel* terminal, simple, peduncle c. 1–2 cm; pedicels 1–2 cm, slightly elongating in fruit, bracts caducous. *Flowers* sexually dimorphic, males predominate in lateral umbellules. *Calyx* margin minute. Petals triangular, c. 2<sup>1</sup>/<sub>2</sub> mm long. Stamens 5. Ovary 5–6-celled, reduced in male flowers, disk fleshy, conical; styles 5–6, at first erect, but the free upper half spreading in fruit. *Fruit* globose or ellipsoid, succulent, 5–6-ribbed when dry, c. 10 by 8 mm, crowned by the persistent spreading styles.

*Distr. Malesia:* Malay Peninsula (from Kedah southwards).

*Ecol.* Montane rain-forest, 1000–2000 m.

*Note.* Very like the next species in the general appearance of leaf and inflorescence. However, all specimens from the Malay Peninsula lack pellucid glands in the lamina of the leaf, whereas these are present in all specimens from Borneo.

**3. *Dendropanax borneensis* (PHILIPSON) MERR.** *Brittonia* 4 (1941) 132. — *Gilibertia borneensis* PHILIPSON, *J. Bot.* 78 (1940) 116, fig. — Fig. 37.

Slender shrub or small tree, with few or no branches, occasionally prostrate or subscandent, sometimes reaching 5–6 m. Buds enclosed in few broadly ovate cataphylls. *Leaves* dispersed along

the shoots; petiole 4–10 cm, channelled above, slightly dilated at base and with a small to obscure ligule within the petiole; blade 7–15 by 3–7 cm, coriaceous, with pellucid glands, usually ovate, elliptic or oblong, occasionally irregularly lobed, base rounded to broadly cuneate, apex acute, margin entire, often undulate, midrib and lateral veins prominent, frequently with 3 distinct principal veins. *Umbel* terminal, simple, or occasionally compound, single or two borne side by side, with c. 20 flowers; peduncle and secondary rays (if present) usually rather short (1<sup>1</sup>/<sub>2</sub>–3<sup>1</sup>/<sub>2</sub> cm), but occasionally much longer (to 13 cm); pedicels c. 1<sup>1</sup>/<sub>4</sub>–1<sup>1</sup>/<sub>2</sub> cm (occasionally to 3 cm), elongating slightly in fruit, bracts ovate caducous. *Flowers* sexually dimorphic, males predominate in lateral umbellules. *Calyx* margin minute. Petals triangular, c. 2<sup>1</sup>/<sub>2</sub> mm long. Stamens 5. Ovary 4–6-celled, reduced in male flowers; disk fleshy, conical with 4–6 styles, at first erect, but the free upper half spreading in fruit. *Fruit* globose or ellipsoid, succulent, 4–6-ribbed when dry, 5–10 by 6–12 mm, crowned by the persistent spreading styles.

*Distr. Malesia:* N. Sumatra (Mts Goh Lembuh and Pinto) and northern Borneo (Sabah: Mt Kinabalu; Brunei: Pagon Ridge; Sarawak: Mt Murut and Kalabit Highlands).

*Ecol.* Local in montane, mossy forest, and alpine thickets, 1700–3100 m.

*Vern. Borneo:* *merit*, Kalabit Highlands.

*Notes.* Flower greenish or cream, fruit black.

This species exhibits considerable variation in size and shape of leaf, inflorescence and fruit, and

also in venation pattern, but these variations are not correlated with geographical distribution. Specimens from the two Sumatran localities have small fruits and leaves, but similar specimens occur

in Borneo. The presence of pellucid glands between the reticulations of the veins of the lamina distinguishes this species from the other two species in the area.

## 16. ACANTHOPANAX

(DECNE & PLANCH.) H. WITTE, Ann. Hort. Bot. 4 (1861) 89; MIQ. Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 10; BTH. in B. & H. Gen. Pl. 1 (1865) 938; SEEM. J. Bot. 5 (1867) 238; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 49; MERR. Philip. J. Sc. 1 (1906) Suppl. 217; HUTCH. Gen. Fl. Pl. 2 (1967) 69. — *Panax* subg. *Acanthopanax* DECNE & PLANCH. Rev. Hort. IV, 3 (1854) 105. — Fig. 39.

Small trees or scandent shrubs, prickly or unarmed. *Leaves* digitately compound, stipules absent, glabrous or with bristles. *Inflorescence* terminal, with umbels either solitary or more usually umbellately or racemosely arranged; pedicels not articulated below the flower. *Flowers* hermaphrodite or sexually dimorphic. *Calyx* margin minutely dentate. Petals 4 or 5, valvate. *Stamens* as many as the petals, anthers dorsifixed, introrse. Ovary 2–4(–5)-celled; disk fleshy; styles 2, connate to about the middle. *Fruit* a subglobose drupe, crowned by the persistent bifid style, 2–4(–5)-seeded; exocarp fleshy, endocarp chartaceous or cartilaginous. Endosperm smooth or undulate.

Distr. About 30 spp. in eastern Asia and the Himalayan region, south to *Malesia* (2 spp.): Malay Peninsula, N. Sumatra (Gajo Lands), Philippines (N. Luzon).

Ecol. Usually in montane forest or in secondary growth.

Note. A sterile specimen from Gunong Iran, Cameron Highlands (SYMINGTON CF 36300) in the Kepong Herbarium, probably represents an undescribed species.

### KEY TO THE SPECIES

1. Twigs with prickles. Leaf margins without bristles . . . . . 1. *A. trifoliatum*  
1. Twigs without prickles. Leaf margins with bristles . . . . . 2. *A. malayanum*

1. *Acanthopanax trifoliatum* (L.) MERR. Philip. J. Sc. 1 (1906) Suppl. 217. — *Zanthoxylum trifoliatum* LINNÉ, Sp. Pl. (1753) 270. — *Panax aculeatum* AIT. Hort. Kew. ed. 1, 3 (1789) 448. — *A. aculeatum* H. WITTE, Ann. Hort. Bot. 4 (1861) 89, *nom. illeg.*; SEEM. J. Bot. 5 (1867) 238; HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 50.

Scandent shrub, c. 2–8 m, with broadly based recurved prickles sparsely disposed on the branches, usually below the nodes; buds with small brown cataphylls. *Leaves* disposed along the branchlets; petiole up to c. 5 cm, flattened above, with a slightly dilated base, glabrous, usually with a few prickles; leaflets (1–)3(–5); petiolules up to 8 mm, articulated with the petiole, channelled above; blade up to 3½ by 2¼ cm, broadly ovate to subrotund, apex acute, base cuneate, margins serrate, chartaceous, glabrous, lateral veins conspicuous on both surfaces, pinnate, reticulation inconspicuous. *Inflorescence* terminating the main or lateral branches, a sessile compound umbel; primary

rays c. 4–5, or rarely solitary, slender or the central ray stronger (the laterals sometimes apparently male), with minute furfuraceous bracts at their bases, occasionally with a few prickles, glabrous, c. 3–6 cm long; secondary rays (pedicels) numerous, slender, c. 1–1¾ cm. *Calyx* a rim with 5 minute teeth. Petals 5, ligulate, c. 2 mm long. Stamens 5, filaments c. 2 mm. Ovary turbinate, c. 1½ mm high, 2-celled; styles 2, connate to about the middle. *Fruit* a spheroidal drupe, c. 5 mm ø when dry, crowned by the persistent bifid style; endocarp chartaceous. Endosperm surface slightly undulate.

Distr. From the Himalayas through S. China to Japan and Formosa; in *Malesia*: Philippines (N. Luzon: Benguet; Bontoc).

Ecol. In montane forest and thickets, 1100–1400 m.

2. *Acanthopanax malayanum* M. R. HENDERSON, Gard. Bull. S. S. 7 (1933) 105, pl. 22. — Fig. 39.

Unarmed tree to 17 m, trunk to 1 m ø; branch-

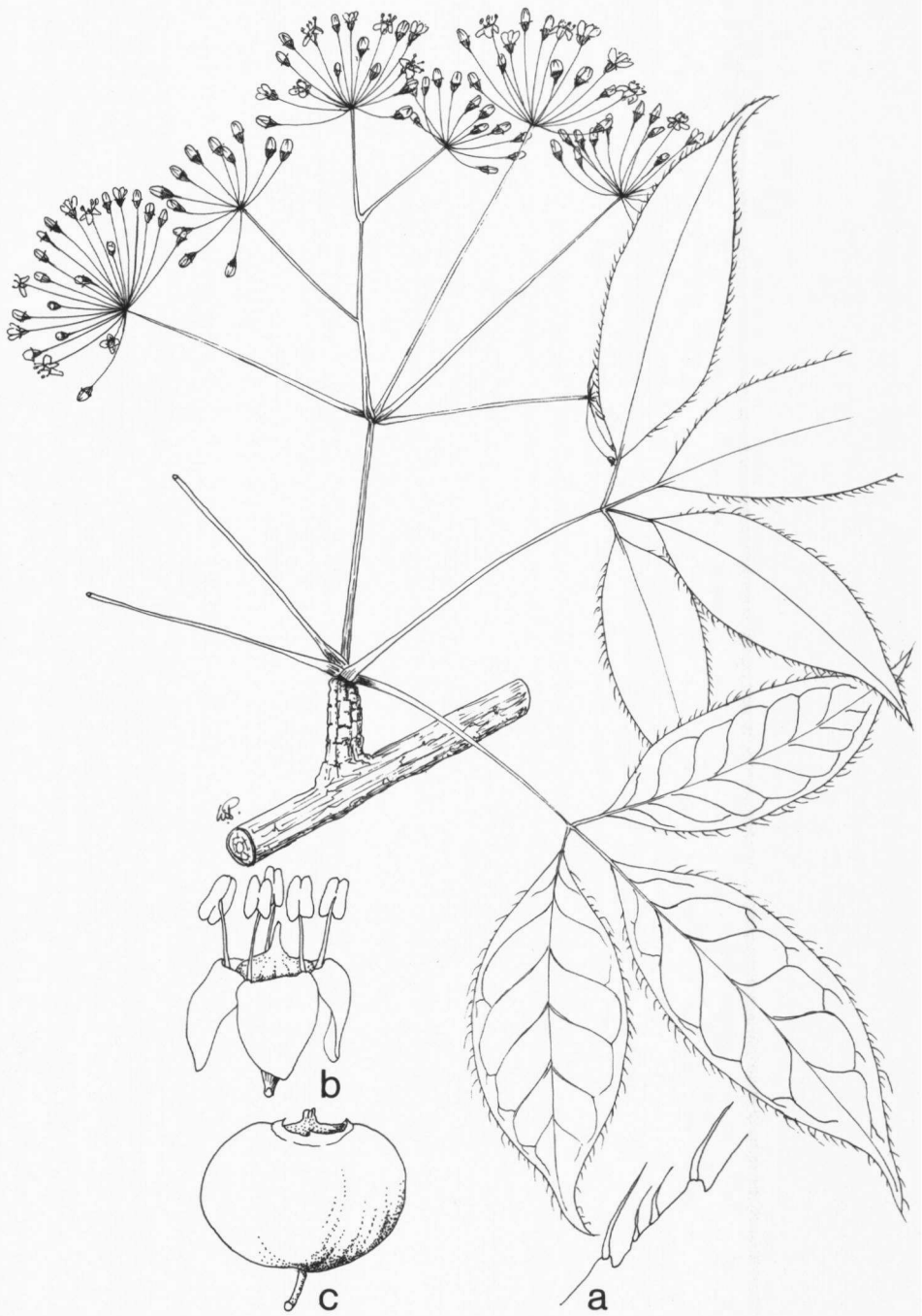


Fig. 39. *Acanthopanax malayanus* HENDERSON. *a.* Habit,  $\times \frac{1}{2}$ , *b.* flower,  $\times 7$ , *c.* fruit,  $\times 4$  (*a, b* DE WILDE c.s. 16725, *c* DE WILDE c.s. 15925). Drawn by W. R. PHILIPSON.



lets rather stout (c. 5 mm  $\varnothing$ ); bark greyish brown, glabrous, smooth; buds with small brown cataphylls. *Leaves* crowded at the ends of the branchlets; petiole terete, striate, glabrous, with a slightly dilated base, up to 12½ cm; leaflets 3–5; petiolules up to 7 mm, articulated with the petiole, channelled above; blade up to 17 by 5½ cm, ovate-lanceolate to narrowly elliptic, apex acute, base cuneate or one side truncate, chartaceous, the principal veins pinnately arranged and conspicuous, the minor veins forming a dense reticulation, margin with numerous spinulose teeth. *Inflorescence* a terminal, sessile, compound umbel, often on short lateral shoots, apparently dioecious; primary rays c. 3–7, slender, terete, glabrous, striate, c. 4–8 cm; secondary rays (pedicels) of male flowers numerous, slender, 1½–2 cm, of female flowers stouter. *Calyx* a rim with 4–5 minute teeth. Petals 4–5, ligulate, c. 2½ by 1½ mm long. Stamens 4–5, filaments c. 2¾ mm long. Ovary turbinate, 3–4-celled; styles 2, at first connate, but becoming free to about the middle. *Fruit* an oblate spheroidal

drupe, c. 10 by 8 mm when dry, with a small stylopodium bearing a persistent bifid style; endocarp cartilaginous. Endosperm surface strongly undulate.

Distr. *Malesia*: Malay Peninsula (Pahang; Cameron Highlands), N. Sumatra (Gajo Lands).

Ecol. Montane rain-forest and mossy forest, 1400–2600 m.

Vern. *Berlaki*, Sakai lang.

Notes. The interpretation of this species as having sexually dimorphic inflorescences cannot be proved with the available material. This appears to consist of twigs bearing either inflorescences of male flowers, or infructescences. Appearances suggest that the putative male flowers have rudimentary ovaries. There is no evidence whether the fruiting flowers had produced pollen.

The tree is said to be conspicuous when flowering by reason of its delicate feathery foliage, which is pale green with a reddish tinge, the petioles and inflorescence also being reddish.

#### Excluded

*Meryta colorata* F. M. BAILEY, Queensl. Agric. J. 3 (1898) 283; HARMS, Bot. Jahrb. 56 (1920) 384.

The type specimen of this species cannot be located, but the original description does not seem to relate to a member of the *Araliaceae*, and certainly not to a *Meryta*.

*Panax ? anisum* DC. Prod. 4 (1830) 254. — *Anisum moluccanum* RUMPH. Herb. Amb. 2: 131, t. 42. — *Nothopanax ? anisum* MIQ. Fl. Ind. Bat. 1, 1 (1856) 766; SEEM. Fl. Vit. (1866) 114. — *Polyscias anisum* HARMS in E. & P. Nat. Pfl. Fam. 3, 8 (1894) 45.

According to MERRILL (Int. Rumph. 1917, 289) these names are all based on the Rumphian description and plate and must refer to some species of *Fagara*, possibly *F. avicennae* LAMK = *Zanthoxylum avicennae* (LAMK) DC. (*Rutaceae*).