

LORANTHACEAE

(B.A. Barlow, Canberra, Australia)¹

Loranthaceae D. Don, Prod. Fl. Nepal (1825) 142; Miq., Fl. Ind. Bat. 1, 1 (1856) 807; Agardh, Theoria Syst. Pl. (1858) 117; Tiegh., Bull. Soc. Bot. France 43 (1896) 247; Barlow, Proc. Linn. Soc. New S Wales 89 (1964) 269; Backer & Bakh. f., Fl. Java 2 (1965) 67; Kuijt, Brittonia 20 (1969) 136–147; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 206; in Fl. Austral. 22 (1984) 68; P. Royen, Alpine Fl. New Guinea 3 (1982) 2257; Wiens in Rev. Handb. Fl. Ceylon 6 (1987) 123; Barlow et al., The Golden Bough 11 (1989) 1–4 (Roy. Bot. Gard., Kew). — *Loranthaceae* subfam. *Loranthoideae* Engl., Nat. Pflanzenfam. 3, 1 (1889) 177; Tiegh., Bull. Soc. Bot. France 41 (1894) 138; Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 291; Verh. Akad. Wet. Amst. Afd. Natuurk. 29 (1933) 1–128. — Type genus: *Loranthus* L.

[For additional synonymy see Barlow, Proc. Linn. Soc. New S Wales 89 (1964) 269].

Perennial evergreen hemiparasites, usually aerial stem-parasitic shrubs, sometimes terrestrial root-parasitic shrubs or trees; attachment to the host (in aerial stem-parasites) by many haustoria produced on epicortical runners (especially in Malesia) or by a single complex woody primary haustorium. *Leaves* mostly opposite, less frequently alternate or verticillate, always simple; stipules absent. *Inflorescences* mostly axillary, less frequently terminal, internodal or borne on the epicortical runners; uniflorescence a simple dichasium (triad) or a single flower, these usually aggregated to racemose, umbellate or capitate compound inflorescences. *Flowers* dichlamydeous, mostly hermaphrodite, when unisexual plants mostly dioecious. *Calyx* a membranous limb at the apex of the ovary, without vascular bundles. *Corolla* choripetalous or gamopetalous, regular or somewhat zygomorphic, normally 4- to 6-merous, valvate. *Stamens* as many as and opposite the petals, epipetalous; anthers mostly basifixed, immobile and continuous with the filament, sometimes dorsifixed and then usually versatile, opening by longitudinal slits; pollen mostly trilobate, rarely triangular or spherical. *Ovary* ('calyx tube' of some authors) inferior; ovarian cavity with or without a central column (mamelon); ovules absent; sporogenous tissue massive, located in lobes of the mamelon or at the base of the ovarian cavity; style and stigma simple. *Fruit* mostly berry-like, with a single seed covered by a sticky layer which develops outside the vascular bundles.

1) With contributions by P. Baas (leaf anatomy), R.W.J.M. van der Ham (palynology), and L. van den Oever (wood anatomy). Drawings were mostly adapted from various earlier publications and redrawn at CSIRO Plant Industry Visual Resources Unit, Canberra, principally by Sandie McIntosh, with contributions by Sue Percival and Carl Davies. Photographs are from different sources as indicated.

DISTRIBUTION

About 65 genera and 950 species, predominantly tropical but well represented also in southern temperate regions; occurrence in the northern temperate zone is limited. In *Malesia* 23 genera and 193 species, distributed throughout the region; major centres of species richness are the Philippines, New Guinea and northern Borneo. For biogeography see below.

HABITAT

Mostly in tropical and warm temperate habitats; rare or absent in seasonally cold temperate situations. In Malesia distributed throughout the range of forest habitats from mangrove associations at sea level to the tropicalpine margins above 3000 m altitude. Common in all major forest types (everwet and seasonal, closed and open, humid and dry, primary and secondary, evergreen and deciduous); many species can flourish in disturbed or cleared areas and on exotic hosts.

An important element of habitat for *Loranthaceae* is the host; see below for discussion of host specificity.

ECOLOGY

Loranthaceae exhibit a suite of remarkable adaptations associated with the hemiparasitic habit, especially in the majority of the species which occur as aerial stem parasitic shrubs; for additional details see under morphology below.

Effective seed dispersal is by fruit-eating birds, and demonstrates close mutualism involving fruit and embryo structure, germination, and bird anatomy and behaviour (Docters van Leeuwen 1954; Reid 1989; Barlow & Schodde 1993). The ovoid seed, 5–12 mm long, is covered by a viscous layer rich in carbohydrates. The seed is removed from the fruit and swallowed whole, and passes through the short alimentary canal of the bird rapidly, commonly in 10–20 minutes. Although nutrients have been absorbed from the viscous layer, it is intact when the seed is voided. The most specialized bird dispersers, for example *Dicaeum* spp., perform specific movements when defecating, such that the voided seed is placed on the branch on which the bird is perched. The viscous layer cements the seed in place, and it germinates spontaneously, probably because it has been removed from an inhibiting environment within the wall of the fruit. These adaptations together greatly increase the likelihood that the seed will be dispersed to a suitable habitat on a tree branch. Instead of normal roots, the embryo radicle produces an haustorium which penetrates to the cambial layer of the host to take up water and nutrients from the xylem. See Fig. 1.

Host preference and specificity vary widely within the family. Most loranth grow on dicotyledonous trees, but some utilize gymnosperms as occasional hosts, and a few species are specialized for growth on gymnosperms. In mixed forests with high tree species diversity the loranth tend to have very low host specificity, occurring on a broad range of host species; this is the common situation in Malesia. In open woodlands with

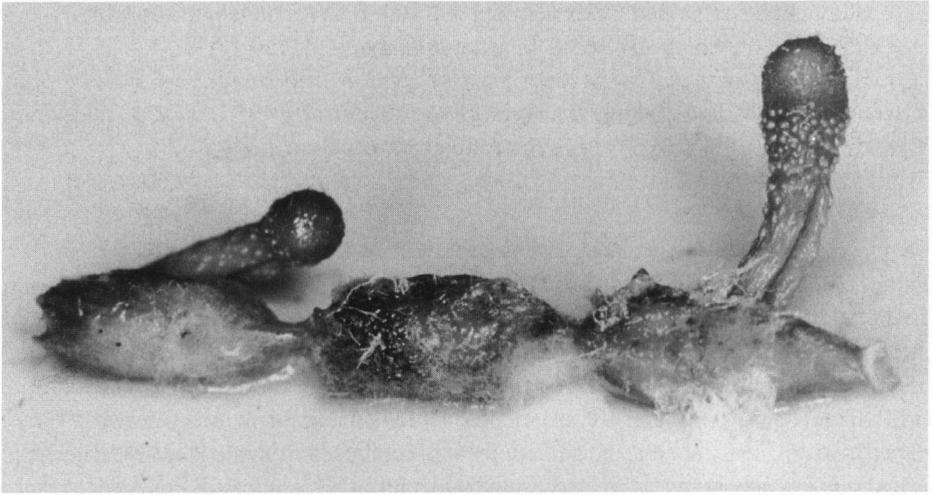


Fig. 1. Seedlings of unidentified loranthaceous seedling. Lombok. Photo E. Schmutz, with permission.

low tree species diversity and one or two dominant tree species, the loranth flora tends to be more closely adapted for growth on the common host, and therefore to show high host specificity. This situation is common in Australian woodlands, and occurs to a limited extent in the Malesian monsoon belt, especially in the Lesser Sunda Islands.

When host specificity is high the loranth species may sometimes show a visual resemblance to the preferred host (Barlow & Wiens 1977). By influencing the birds' search image, this may increase the likelihood of dispersal to the preferred host species. It may also confer some protection from herbivores. Because of the generally low host specificity of Malesian loranth species this phenomenon is almost absent in Malesia, although the parasites of *Eucalyptus*, *Melaleuca* and *Pittosporum* in Timor and adjacent islands tend to resemble the host in leaf form. In rain forests any resemblance between the leaves of loranth species and their hosts is probably convergence in response to habitat conditions rather than a genuine mimicry.

There are several pollination syndromes in the family. Bird pollination is most common and many genera, especially in Malesia, have tubular curved brightly coloured corollas with exerted stamens and nectar chambers at the base. In Malesia the pollinators are commonly sunbirds to the west of Charles's Line and honeyeaters to the east. Beyond Malesia bird pollination may include explosive mechanisms, especially in Africa. Insect pollination also occurs, and is indicated in species with relatively small spreading choripectalous corollas or short bell-like tubular corollas which are often pale-coloured. Insect pollination is probably the primitive state for the family (see below), and in Malesia this may be represented in *Cecarria*. In other genera such as *Amyema* and *Dendrophthoe* insect pollination may be a secondary development. In some Malesian genera, notably *Macrosolen* and *Trithecanthera*, slender tubular corollas may reach 150 mm in

length, and may be pollinated by moths. Beyond Malesia, corolla lengths up to 250 mm occur, notably in the South American genus *Aetanthus*.

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MORPHOLOGY

Haustorial system — The haustorial system in *Loranthaceae* shows considerable diversity. The primitive state, found in a few genera, is terrestrial root-parasitism with no primary haustorium, which is common in the related families *Olacaceae* and *Santalaceae* (Calder & Bernhardt 1983). Among aerial *Loranthaceae* the apparently most primitive haustorial system involves basal epicortical roots (referred to as ‘runners’), which grow in vine-like fashion along the host stems, producing haustoria at regular intervals. They can produce new leafy shoots and sometimes inflorescences along their length. The epicortical runners may represent an early stage in evolution from terrestrial root-parasitism to aerial stem-parasitism, in which root-like structures producing numerous haustoria are still present (Hamilton & Barlow 1963). Species with epicortical runners are most common in humid tropical forests, and in Malesia the great majority of loranthids exhibit this character. The more advanced haustorial systems are those in which epicortical runners are not produced, and only the primary haustorium developed from the embryo is present. This may be very complex, especially in internal structure; some produce long strands which extend for metres inside the host, either in the cambial zone or in the cortex (Hamilton & Barlow 1963). In Malesia such haustoria are rare, generally being found in species with close phyletic links to Australia, where such haustoria are common. Haustoria produced from stem-borne roots, as in the neotropical genus *Struthanthus*, probably also represent a derived state, but do not occur in any Malesian species.

The haustoria in most mistletoe species are xylem-tapping, although some species also tap the phloem and therefore have easier access to host photosynthate. Xylem-tapping mistletoes nevertheless divert and concentrate nutrients such as nitrogen and phosphorus from the host’s sap. On average, about 15% of the total carbon gain of xylem-tapping mistletoes is from photosynthate diverted from the xylem stream of the host (Moore 1994; Marshall et al. 1994).

Inflorescences — There are several parallel trends in inflorescence structure in *Loranthaceae*. The most primitive inflorescences appear to be simple cymes, and a common inflorescence unit widespread in the family is a simple dichasium (triad). The triads are often aggregated into larger compound inflorescences, which are usually racemose or umbellate (Fig. 5, 8, 18). A secondary trend in inflorescence evolution appears to be reduction from this compound state, and simple racemes or umbels, for example, are probably derived through reduction of triads to single flowers. This is clearly evident in *Macrosolen*, where each flower in the raceme is subtended by three bracts (Fig. 36–38). In Malesia reduction in inflorescence structure reaches its extreme in some species of *Amyema* and in *Sogerianthe*, where the inflorescence is a single flower but its articulate pedicel is evidence of its derivation (Fig. 6, 42).

Another trend in inflorescence evolution is the contraction of the flowers into heads, often subtended by enlarged bracts which form an involucre. Such inflorescences are more common in loranthids in Malesia than in any other region, and parallel evolution of capitate inflorescences has occurred in a number of lineages. The basic racemose or umbellate nature of the inflorescence is still usually evident, as well as the presence of triads or single flowers as the basic inflorescence unit. In many capitate inflorescences the young flowers are tightly enclosed during development, possibly for protection (Fig. 31, 32, 40, 44). However, at anthesis the flowers may be exerted from the involucre, which is often brightly coloured and probably contributes to the presentation of the flowers to pollinators. This interpretation of inflorescence evolution agrees in its broadest principles with the conclusions of Kuijt (1981), but differs in many details.

Flowers — Whilst the external form of the flowers does not appear exceptional, there are some very unusual features of ovary structure and embryology (Maheshwari et al. 1957; Johri & Bhatnagar 1960). There are no normal ovules. In many species there is a central mound or column, the mamelon, which occupies most of the ovarian cavity, and which may be homologous with an axile placenta. In some cases the base of the mamelon is lobed, and these lobes may be homologous with ovules. Bands of tissue radiating between the lobes to the ovary wall may form 3 or 4 obscure cells in the ovarian cavity, and are possibly homologous with septa. In other cases the mamelon is simple or completely absent, and the ovarian cavity is hardly more than a small dilation of the base of the stylar canal. The sporogenous tissue is massive, located either in 3 to 4 blocks in the mamelon lobes or in a single block at the base of the ovarian cavity. These structures may represent progressive reduction of a syncarpous ovary, and the extreme of the reduction sequence, for example in *Amyema*, is an almost completely undifferentiated ovary with a single group of sporogenous cells at the base of the stylar canal. There are several embryo sacs which elongate up the stylar canal to various levels, so that fertilization occurs in the style, sometimes close to the base of the stigma (*Helixanthera*, *Dendrophthoe*). Rapid development of a long suspensor pushes the proembryo down into the ovary before the style is shed. Normally only one embryo develops in the seed, and the viscous layer develops from a zone in the ovary wall outside the vascular bundles. These features of embryology are so exceptional in angiosperms that Van Tieghem (1896) treated loranthids and related groups as a subclass of the angiosperms with rank equivalent to the monocotyledons and dicotyledons.

Seeds and seedlings — Seed and seedling features may provide useful diagnostic characters at a tribal or subfamilial level in *Loranthaceae*. The seeds are primarily endospermic, although in the neotropical genus *Psittacanthus* the endosperm appears to be entirely absorbed in mature seeds. The embryo is normally green. In many genera the cotyledons emerge as the first photosynthetic leaves after germination. In others the slender cotyledons remain in the endospermic seed, elongating to push out the plumule, which produces the first leafy shoot. These two basic germination patterns are generally correlated with other characters of taxonomic importance at higher ranks, especially basic chromosome number and ovary structure.

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VEGETATIVE ANATOMY

(P. Baas, leaf anatomy & L. van den Oever, wood anatomy)

Leaf anatomy — Our knowledge of the leaf anatomy of the *Loranthaceae* is mainly based on studies of taxa outside Malesia. Metcalfe & Chalk (1950) recorded an interesting leaf anatomical diversity for the family as a whole. The indumentum, when present, tends to be complex and includes candelabra and stellate hairs (Engler & Krause 1935; Uphof et al. 1962). The lamina is dorsiventral or isobilateral, and amphistomatic in the latter case. Stomata paracytic. Groups of silicified cells (also typical of many genera in the related families of the *Viscaceae* and *Olacaceae*, cf. Baas et al. 1982) occur in the mesophyll of some genera. Sclereids, present in some taxa, including *Dendrophthoe* spp. (Rao & Malaviya 1962), often including crystals. Vascular bundles supported by arcs of sclerenchyma or collenchyma. Crystals solitary and/or clustered. Detailed study will almost certainly yield information of taxonomic interest.

Wood anatomy — The wood anatomy of Malesian *Loranthaceae* is very poorly known. The account below is based on original observations on a few Southeast Asian species (*Dendrophthoe curvata* from Sulawesi, *D. neelgherrensis* from Sri Lanka, *Helixanthera parasitica* from Sulawesi, and *Tolyphanthus gardneri* from Sri Lanka) and some general information from the literature in Metcalfe & Chalk (1950) and Patel (1991). The quantitative data are restricted to the original observations, and may be very different for temperate species or stems and branches of smaller diameter.

Growth rings absent to distinct. Vessels diffuse, 25–48/mm², solitary and in radial multiples or small clusters, tangential diameter up to 60–80 µm, vessel member length 420–780 µm in *Dendrophthoe curvata*, in the other specimens only up to 100 µm. Perforations simple. Intervessel pits small, alternate, vessel-ray and vessel-parenchyma pits alternate, similar in shape and size to intervessel pits, occasionally large and simple. Vessel elements storied structure together with axial parenchyma. Ground tissue composed of relatively thin-walled fibre-tracheids with distinctly bordered pits in radial and tangential walls (in *D. curvata* mainly confined to the radial walls).

Parenchyma predominantly apotracheal, diffuse, partly scanty paratracheal, in strands of 2–5 cells.

Rays mostly multiseriate (up to 12 cells wide) and weakly heterocellular to homocellular; in *D. curvata* distinctly heterocellular and 1–3-seriate.

Crystals solitary, infrequent in non-chambered ray or axial parenchyma cells.

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POLLEN MORPHOLOGY

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

Only the smaller, neotropical part of the family *Lorantheaceae* is palynologically well-known. Feuer & Kuijt (1979, 1980, 1985) described the pollen of all 16 American genera listed by Barlow et al. (1989), nearly every time including scanning as well as transmission electron micrographs. A few relatives from Australia and New Zealand (*Atkinsonia*, *Nuytsia*, *Tupeia*) were treated similarly (Feuer & Kuijt 1978, 1980), but the pollen of most other paleotropical genera is unknown or described on the basis of limited data only. Danser (1933) and Barlow (1966, 1974) used pollen grain shape as a character in their generic keys. More detailed accounts of a few taxa were later published in several regional studies: Africa: Bonnefille & Riollet (1980), El Ghazali (1993); Madagascar: Muller et al. (1989); China: Liu & Qiu (1993); New Zealand: Moar (1993). The Chinese study contains species of several widespread genera occurring also in Malesia (*Dendrophthoe*, *Elytranthe*, *Helixanthera*, *Loranthus*, *Macrosolen*, *Scurrula*, *Taxillus*). Data of the Papuan genera in Malesia are nearly absent.

Pollen grains of most *Lorantheaceae* are relatively flat, triangular with concave (pollen 'trilobate') or sometimes straight to slightly convex sides, and 3-aperturate or rarely almost spheroidal and 4- or 5-aperturate (*Ixocactus*, *Tupeia*). The largest diameter (equatorial plane) is between 20 and 99 μm . The apertures are usually simple (ectoapertures without endoapertures). Compound apertures with more or less distinct endoapertures were observed in a few neotropical genera, and are considered as derived conditions (Feuer & Kuijt 1985). The spheroidal, inaperturate pollen of *Atkinsonia* is unique in the family. The aperture system found in most *Lorantheaceae* is syncolpate, although the colpi are often less distinct or even absent at the poles (pollen more or less colpate) and/or at the equatorial plane (pollen diploemisyncolpate). The germinative parts of the colpi seem to be about halfway between each pole and the equator (6 per grain), and are indicated by a thin, invaginating or teared up colpus membrane. In some genera the germinative function is still more clearly confined, the apertures being reduced to very short colpi or pori enclosed and connected by thick exine zones (*Dendropemon*, *Oryctanthus*, *Phthirusa*). The harmomegathic function in *Lorantheaceae* pollen seems to be transferred from the apertures to the mesocolpia. As far as known parasyncolpate apertures are restricted to a few neotropical genera. Strongly heteropolar (shape, apertures) pollen is known from the African genus *Plicosepalus*. The exine is 3-layered (tectum, infratectum, nexine), at least in the electron microscope. An endexine is usually found only in apertural regions. The infratectum is thin, and granular, columellate or intermediate. Or-

namentation in *Loranthaceae* is psilate, scabrate, verrucate or sometimes echinate, with or without small perforations. Finely rugulate pollen occurs in Brazilian *Struthanthus*. The exine zones along the colpi ('margins') are often distinct by a deviating ornamentation compared with the mesocolpia: psilate to transversely striate vs scabrate to verrucate.

Some genera are palynologically very diverse (see also Castro & Telleria 1995), and pollen morphology has been useful in establishing intra- and intergeneric relationships (Feuer & Kuyt l.c.). However, due to the lack of data from many of the Old World genera a subdivision of the family is unfeasible yet. More or less typical loranthaceous pollen is shared by relatively primitive (*Desmaria*, *Gaidendron*, *Nuytsia*) and advanced (*Ligaria*, *Psittacanthus*, *Tristerix*) genera (sequence according to Barlow et al. 1989). Deviating morphologies seem to dominate in relatively primitive groups: *Atkinsonia*, *Tupeia*, *Ileostylus*, *Ixocactus*, *Dendropemon*, *Phthirusa*, *Oryctanthus*. The pollen characters of *Ixocactus* and *Tupeia* indicate relationships to the *Eremolepidaceae* and/or *Viscaceae* (Feuer & Kuijt 1978, 1985).

Possibly, the differences between trilobate *Loranthaceae* pollen and the spheroidal pollen of the *Viscaceae* and *Eremolepidaceae* are connected with pollination: largely by birds in the former and by insects at least in the *Viscaceae*. Bernhardt & Calder (1981) depict (SEM) a strongly lobate pollen grain of *Amyema* attached to/lodged in the parallel feather barbules of a honey eater.

Fossil pollen that can be attributed to the *Loranthaceae* is known from Europe, America, India, Indian Ocean (Ninetyeast Ridge), Borneo, Australia and New Zealand, and ranges from the early Paleocene onwards (Muller 1981; Taylor 1990). It has been described as *Gothanipollis*, *Aetanthus*, *Amylotheca*, and compared to the pollen of several extant genera (*Amylotheca* type, *Loranthus elegans* type). Taylor (1989) illustrated (LM and SEM) *Gothanipollis cockfieldensis* from the Eocene of Tennessee, which is much like the pollen of *Tripodanthus flagellaris*. Thanikaimoni et al. (1984) compare *Loranthipites elegans* from the Miocene of India with the pollen of *Dendrophthoe falcata*. *Tricolpites simatus* described from the Eocene of southern Australia is probably also a fossil loranth (Macphail et al. 1993). According to Jarzen (1977) isopolar forms of the fossil genus *Aquilapollenites* (Traverse 1988: late Cretaceous to Eocene) bear a close morphological and probably genetic relationship with *Loranthaceae* pollen. However, *Aquilapollenites* is an exclusively Laurasian group, while the present distribution patterns of the more primitive extant *Loranthaceae* suggest a Gondwanan origin. The inception of the undoubtedly loranthaceous *Gothanipollis* is linked with the expansion of *Nothofagus*, attesting to the age of the *Loranthaceae* in the southern lands. The fossil pollen record shows the presence of the family in Tasmania from the early Eocene throughout the Tertiary until the ?late Pleistocene (Macphail et al. 1993), even though mistletoes (and mistletoe birds) are now absent there.

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CHROMOSOMES

Chromosomal characters have made a significant contribution to taxonomic and phylogenetic knowledge of the family (Barlow & Wiens 1971; Martin & Barlow 1984). The primary basic chromosome number is $x = 12$, and the other basic numbers of $x = 11$, 10, 9 and 8 indicate progressive dysploid reduction. Polyploidy is virtually absent, but there is a general trend towards increase in chromosome size, and the largest chromosomes in the family are equal to any in the plant kingdom. There is considerable genomic stability, with particular chromosome numbers and sizes being constant for entire suites of related genera, and cytogeographic data are therefore phylogenetically useful. In Malasia there are lineages with $x = 12$ and $x = 9$, with different geographic histories; see discussion under biogeography below.

References: Barlow, B.A. & D. Wiens, *Taxon* 20 (1971) 291–312 (cytogeography). — Martin, N.G. & B.A. Barlow, in W.F. Grant, *Plant Biosystematics* (1984) 117–140 (chromosome evolution).

PHYTOCHEMISTRY AND CHEMOTAXONOMY²

Much of the phytochemical study of mistletoes has been undertaken at a time when *Loranthaceae* and *Viscaceae* were treated as a single family *Loranthaceae* sens. lat. Furthermore many of the studies have involved comparative work in several genera of both families, identifying similarities and differences between the groups then considered subfamilies. For this reason it is appropriate to consider the phytochemistry of the two families together, to identify the contribution of chemotaxonomy to the current treatment of the two families. Chemical data are not available for a third segregate family, *Eremolepidaceae*, and the status of this family is not considered further.

The chemical data presently available, although limited, allow some general observations on the taxonomic significance of metabolism and storage of primary and secondary plant products in stems, leaves, fruits and seeds of mistletoes, and their two major component groups, *Loranthaceae* and *Viscaceae*.

Apart from the considerable attention given to the traditional European mistletoe, *Viscum album*, phytochemical investigations of mistletoes are relatively few. The phyto-

2) This section has been written almost entirely on the basis of information, analysis and conclusions contributed by R. Hegnauer, Leiden. Without his valuable input, this section could not have been written, and it is most gratefully acknowledged.

chemistry of *Loranthaceae* s.l. and its possible taxonomic implications were treated by Hegnauer (1966, 1989, where many additional phytochemical references are given). Many aspects of the biology of semiparasitic *Santalales*, especially of *Loranthaceae* and *Viscaceae*, were reviewed in a work edited by Calder & Bernhardt (1983). A series of International Symposia on Parasitic Flowering Plants (e.g., Weber & Forstreuter 1987) has also fostered contributions to phytochemical knowledge. Becker and Schmoll (1986) published a valuable ethnobotanical monograph of European *Viscum album*, and Kanner (1939) of mistletoes generally, of relevance for all students of mistletoes.

Phytochemistry of parasites — Because all mistletoes are parasitic (most hemiparasitic, some holoparasitic) it is possible that chemical compounds isolated from a particular mistletoe are not metabolites of the parasite, but were in fact derived from its host plant. Comparative analyses of host plants and their parasites are essential for establishing definitely the site of synthesis, especially of easily transportable hydrophilic mistletoe constituents. It has been shown that a number of secondary metabolites such as tropane alkaloids in *Duboisia*, cardenolides in *Nerium* and tutin and related toxic terpenoid hydroxylactones in *Coriaria* can pass in rather large amounts from hosts into their parasites. Some carbohydrates and carbohydrate-like compounds such as mannitol and certain cyclitols (e.g. quercitol) isolated from mistletoes may have their origin in the host plant (Plouvier 1953). Richter and Popp (1987) showed that whilst pinitol, quebrachitol and *chiro*-inositol are characteristic of *Viscum album*, sorbitol and *scyllo*-inositol are only present when they occur in the host. Studies in *Viscum album* by Urech (1987) also suggest that arginine is taken up from the host. Room (1971) showed that *Tapinanthus bangwensis* can act as a sink for products of photosynthesis manufactured by cocoa, and Kanner (1939) reported that mistletoe growing on coffee may have almost as much caffeine in its leaves as the host. Studies in *Amyema* by Hall et al. (1987a, b) suggest that cytokinins are acquired from the host, although they may be converted in the parasite to other forms. Whilst most mistletoes are xylem-tapping, some are also phloem-tapping (see under morphology and anatomy); this may explain the diversity of substances which appear to be acquired from the hosts.

On the other hand extensive comparative studies of species of *Loranthaceae* and some of their host plants in Africa, eastern Asia, Australia and America, and of *Viscum album* and many of its hosts in Europe (Plouvier 1953), have clearly established that mistletoes are largely independent from their hosts with respect to patterns of most of their low-molecular phenolic constituents, biogenic amines or protoalkaloids and methylated cyclitols. Similarly, mistletoes appear to be characterized by the presence of relatively large amounts of free proline and/or hydroxyproline. In other cases there appear to be consistent phytochemical differences between *Loranthaceae* and *Viscaceae*. By making allowance for the parasitic habit of the plants, it therefore seems possible to reach some preliminary but nevertheless taxonomically meaningful conclusions.

Phytochemical features in common to Loranthaceae and Viscaceae — Several biochemical similarities between *Loranthaceae* and *Viscaceae*, and often other members of *Santal-*

ales, have been reported. In some cases these may relate to particular adaptations, such as the presence of a viscous layer in fruits of *Loranthaceae* and *Viscaceae*. Features shared by *Loranthaceae* and *Viscaceae* include:

a) Presence of much free proline (or) hydroxyproline in fruits, leaves, stems and haustoria.

b) Presence of acetylenic fatty acids in the lipids in vegetative parts.

c) Frequently, presence of large amounts of pentacyclic triterpenes, alkanols, alkanes, fatty acids and esters in the lipids of stems, leaves and fruits. These are probably constituents of cuticular waxes. The following triterpenes are known from mistletoes: lupeol, 7-hydroxylupeol (loranthin), 7,15-dihydroxylupeol, betulin, betulinic acid, β -amyrin and oleanolic acid. Sometimes the 3-hydroxyle of these triterpenoids is acylated by acetic acid or by fatty acids. However saponins (glycosides of triterpenoids) have not yet been isolated.

d) Production and storage of appreciable amounts of tyramine or phenylethylamine or related biogenic amines or betaines.

e) Storage in all parts of these plants of rather large amounts of *myo*-inositol and *chiro*-inositols.

f) An extremely variable flavonoid mechanism. Chalcones, flavanones, flavanonols, flavones, C-glycoflavones, flavonols (including many methyl ethers of quercetin), flavan-3-ols (catechins) and 3-deoxycatechins (the viscutins of *Viscum tuberculatum*) have been isolated from one or several taxa of this alliance. Flavonoid metabolites with a trihydroxylated B-ring seem to be rare in mistletoes, but were shown to be present in many *Arceuthobium* species (Crawford & Hawksworth 1979: glycosides of myricetin; Bate-Smith 1962: prodelphinidins in *A. oxycedri*). Flavonoids are often accompanied by phenolic benzoic and cinnamic acids which generally are present as esters, and by small amounts of glycosides of coniferyl alcohol, syringenin and the bifuranoid lignan syringaresinol.

g) A tendency to deposit large amounts of silica in cell groups of the mesophyll (Solereder 1899, 1908). In numerous studies published between 1895 and 1907, Van Tieghem recorded the occurrence of these deposits, and frequently used it to support his distinction of genera. This rather surprising feature in a group of hemiparasitic plants has subsequently been given little attention by botanists. It was not treated at all in the review by Calder & Bernhardt (1983), and no additional information was presented by Metcalfe & Chalk (1950). Deposition of silica occurs in cells of many members of the *Santalales*, and it seems possible that a careful study of SiO₂-accumulation in leaves and stems of mistletoes may yet contribute to classification in this taxonomically difficult alliance.

Phytochemical differences between Loranthaceae and Viscaceae — A number of metabolic patterns and/or individual constituents appear to be restricted to or occur predominantly in either *Loranthaceae* or *Viscaceae*. These differences have sometimes been used to support distinction of these two taxa at family rank. The status of such chemical markers may be summarized as follows:

a) The viscous layer in fruits of *Loranthus europaeus* and of various South American and African *Loranthaceae* contains large amounts of rubber, which makes such fruits suitable for the preparation of birdlime (Riley 1963; Uphof 1968). Accumulation of rubber seems to be lacking in *Viscaceae*; reports in older literature that birdlime was produced from berries of *Viscum album* were probably the result of confusion with *Loranthus europaeus*. Reliable data suggest that this distinction holds for *Loranthaceae*, which produce rubber-rich fruits, and *Viscaceae*, which have rubber-poor or rubber-lacking fruits.

b) In addition to *chiro*- and *myo*-inositol, *Viscum album* also produces and stores methyl ethers of cyclitols, i.e. pinitol, quebrachitol, 1-O-methyl-*muco*-inositol and viscumitol (1,2-di-O-methyl-*muco*-inositol). These methylated cyclitols seem to be restricted to *Viscaceae*, having been detected so far in *Arceuthobium* and five species of *Viscum*. *Loranthaceae* appear not to possess cyclitol-methylating enzymes and also to lack cyclitol-epimerizing enzymes [(+)-*chiro*-inositol \rightarrow *muco*-inositol, resp. D-pinitol \rightarrow 1-O-methyl-*muco*-inositol]. In particular, methylated cyclitols and *muco*-inositol were not detected in *Dendrophthoe falcata*, *Macrosolen cochinchinensis*, *Loranthus europaeus*, *Scurrula parasitica* or *Taxillus cuneatus* (Richter et al. 1990; Richter 1992).

c) Most *Viscaceae* are tannin-poor plants, whilst many species of *Loranthaceae* have been reported to contain rather large amounts of tannins. For a long time plant anatomists noted the presence of tannin-containing idioblasts in ordinary parenchymatic cells in *Loranthaceae*; according to Metcalfe and Chalk (1950) "tanniferous cells (are) present in parenchymatous tissues, particularly of *Loranthoideae*" (= *Loranthaceae* s. str.). Loranthaceous tannins are mainly of the condensed type, based on catechins and oligomeric proanthocyanidins. Condensed tannins may be accompanied in some taxa by gallo- and ellagitannins. In particular, ellagic acid was detected by Bate-Smith (1962) in leaf-hydrolysates of *Nuytsia floribunda*, and taxillusin of *Taxillus kaempferi* is a monogallate of (+)-taxifolin-3-glucoside. Recently leaves of this taxon, growing on *Pinus thunbergii*, yielded taxillusin and three 3-monoglycosides of quercetin, i.e. avicularin, hyperin and quercitrin and (+)-catechin and the dimorphic procyanidins B-1 and B-3 were isolated from its stems (Konishi et al. 1996). Tilney and Lubke (1974) observed complex patterns of phenolic compounds in leaves and stems of *Erianthemum dregei*, *Tapinanthus minor*, *T. oleaeifolius*, *T. rubromarginatus* and *T. zeyheri* (*Loranthaceae*) and *Viscum capense*, *V. combreticolum*, *V. obovatum*, *V. obscurum*, *V. rotundifolium* and *V. verrucosum* of South Africa. Two constituents were identified positively; catechin, a building stone of condensed tannins, detectable in leaves and stems of all *Loranthaceae* sampled, and chlorogenic acid, an ester of caffeic acid, present in all *Viscum* species sampled. The latter compound seemed to be lacking in all *Loranthaceae* samples. (+)-Catechin was isolated from the South American *Loranthaceae* *Tripodanthus flagellaris* and *Ligaria cuneifolia*.

Other taxa may have a polyphenolic metabolism which is somewhat intermediate between those typical of *Loranthaceae* and those typical of *Viscaceae*. *Arceuthobium* (*Viscaceae*) seems to have its own polyphenolic pattern; it has many flavonoids with a trihydroxylated B-ring (several glycosides of myricetin) in twigs and leaves of all 36 investigated species (Crawford & Hawksworth 1979) and it seems also to be rich in pro-

delphinidins, at least in *Arceuthobium oxycedri* (Bate-Smith 1962). Cambie et al. (1961) screened for alkaloids, saponins and proanthocyanidins in seven New Zealand mistletoes, including one belonging to *Viscaceae* (*Korthalsella salicornioides*) and six belonging to *Lorantheaceae* (*Trilepidea adamsii*, *Peraxilla colensoi*, *P. tetrapetala*, *Alepis flavida*, *Ileostylus micranthus* and *Tupeia antarctica*). Saponins were lacking in all and alkaloids were present only in *Peraxilla tetrapetala*.

Proanthocyanidins were absent from leaves, bark and wood of *Tupeia antarctica* (a dioecious species which has been referred to *Viscaceae* by some authors), but present in all six other species. The proanthocyanidins of *Korthalsella* appear to resemble those of *Arceuthobium*. The differences in phenolic patterns between *Lorantheaceae* and *Viscaceae* are thus not absolute.

d) *Lorantheaceae* and *Viscaceae* differ in their content of toxic glycoproteins (lectins) and polypeptides. Toxic polypeptides (viscotoxins, including phoratoxin) which are highly toxic to mice after intraperitoneal injection, are restricted to *Viscaceae* (five genera and 21 species tested; presence of viscotoxins demonstrated for all five genera and nine of the species). None of the four genera and 26 species of *Lorantheaceae* contained viscotxin-like polypeptides. The viscotoxins and lectins of *Viscum* were clearly arranged by Becker (in Becker & Schmoll 1986), and *Viscum* lectins were comprehensively reviewed by Luther (1982) and by Goldstein & Poretz (1986). Work with viscotxin-like basic polypeptides containing 46 amino acid residues was summarized by Samuelsson (1966, 1969, 1972) and by Ramshaw (1982).

Chemotaxonomy: summary — Several plant substituents common to *Lorantheaceae* and *Viscaceae* occur more generally in *Santalales*, and may thus provide some support for the higher level classification of families within this order. However, there are other phytochemical features which may add support to the distinction of *Lorantheaceae* and *Viscaceae*, already strongly indicated by morphological, anatomical, karyological and other data. In *Lorantheaceae* intensive rubber synthesis in fruits and accumulation of condensed tannins (oligo- to polymeric proanthocyanidins) and of their monomers (catechins) occur frequently, whilst presence of viscotxin-like basic polypeptides and synthesis and accumulation of methylated cyclitols are rather characteristic of *Viscaceae*.

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USES

Mistletoes, including *Loranthaceae*, feature prominently in folk legend and medicine (Kanner 1939; Barlow 1987). Superstitions about mistletoe are widespread in many human cultures, and involve numerous species. In most cases mistletoes were regarded as a good omen, providing protection from misfortune, injury, crop failure or evil spirits, or good luck in finding wealth or fertility. They have been widely used medicinally, to treat a broad range of afflictions, through both internal and external application. In the related family *Viscaceae* some of these uses appear to be based on genuine medicinal properties (antispasmodic, diuretic, antihæmorrhagic, muscle toning, lowering blood pressure), but *Loranthaceae* do not appear to have these properties. The widespread prominence of mistletoe in legend and medicine is probably due to its growth habit. When growing on trees of ritual or utilitarian importance (see Fig. 2), it may have been regarded as the ‘heart’ of the tree, important for its survival.

References: Barlow, B.A., *Biologist* 34 (1987) 261–269. — Kanner, L., *Bull. Hist. Med.* 7 (1939) 875–936.

TAXONOMY

Until relatively recently the family *Loranthaceae* has been treated in a broader sense. It was traditionally divided into two subfamilies, *Loranthoideae* and *Viscoideae*, the latter including genera now placed in *Viscaceae* and *Eremolepidaceae*. There are substantial differences between *Loranthaceae* sens. str. and *Viscaceae* in flower and fruit development and structure, summarized by Barlow (1964). The brief diagnostic key to the two families presented at the end of this section covers all Malesian taxa. *Loranthaceae* and *Viscaceae* may not be directly related; the former is possibly derived from root parasitic *Olacaceae*, whilst the latter is probably close to and derived from aerial stem-parasitic *Santalaceae* (Kuijt 1969).

At generic level, the taxonomic history of *Loranthaceae* sens. str. (= *Loranthoideae*) has been turbulent. Originally hundreds of species were assigned to a single genus *Loranthus*, which was therefore cosmopolitan and very heterogeneous. Many segregate genera had been recognized early in the 19th century (but subsumed in *Loranthus* by other authors), and in this respect the work of Blume was notable for Malesia, as he recognized several genera now widely accepted (*Dendrophthoe*, *Elytranthe*, *Lepeostegeres*, *Loxanthera*, *Macrosolen*). Engler (1889) recognized 10 genera, but still retained a very large and diverse genus *Loranthus*. Between 1894 and 1902 Van Tieghem revised the loranthids,



Fig. 2. *Dendrophthoe pentandra* (L.) Miq. and/or *D. praelonga* (Blume) Miq. on leafless kapok trees *Ceiba pentandra* (L.) Gaertn., cultivated in Java (?). Photo J.C. van der Meer Mohr.

recognizing many new diagnostic characters, and distinguishing about 100 genera. However, Van Tieghem's approach was somewhat mechanical, and he used diagnostic characters of doubtful value as generic determinants repeatedly in different groups. Between 1929 and 1933 Danser reviewed and rationalized Van Tieghem's work, and recognized c. 65 genera, including a few he circumscribed himself. The generic classification of the family now generally accepted is little different from that of Danser (1929, 1933); for summary see the outline by Kuijt in Barlow et al. (1989). It is fortunate that Danser's special interest was in Malesian *Loranthaceae* and *Viscaceae*, as his work has provided a critical and substantial base for the present treatment.

At the species level loranthids have presented much taxonomic difficulty. Many species show considerable variability, and there is evidence of introgression in many taxa. Numerous segregate taxa have been recognized where narrow species concepts have been applied, and have resulted in unsatisfactory treatments from both practical taxonomic and biogeographic viewpoints. For Malesia numerous names have been placed in synonymy, both by Danser (1931, 1935) and Barlow (1974, 1992, 1993). For further discussion see Barlow (1992: 297).

Phylogenetic analysis of *Loranthaceae* is aided by suites of character states in which polarity is clear and correlations strong. These include karyological and embryological

data, morphological data from haustorial, inflorescence and floral structures, pollination syndromes and geographic relationships (see above). For details see Barlow (1983). The phylogeny of the family is strongly reflected in its biogeography (see below).

Subsequent to the recognition of *Loranthaceae* and *Viscaceae* as distinct families, there has been only limited attention to the classification of genera into infrafamilial groups. Kuijt, in Barlow et al. (1989), recognized a number of informal groups of genera in a provisional treatment not yet formalized. In this treatment the Malesian genera are grouped as follows.

Group "21–30": *Amylotheca*, *Cyne*, *Decaisnina*, *Elytranthe*, *Lampas*, *Lepidaria*, *Lepeostegeres*, *Loxanthera*, *Macrosolen*, *Thaumasianthes* (the last transferred from Group "31–39").

Group "31–39": *Amyema*, *Cecarria*, *Dactylophora*, *Distrianthes*, *Papuanthes*, *Sogeri-anthe*.

Group "40–70": *Barathranthus*, *Dendrophthoe*, *Helixanthera*, *Loranthus*, *Scurrula*, *Taxillus*, *Trithecanthera*.

Group "21–30" corresponds with subtribe *Elytranthinae* Engl., recognized by Danser (1933), distinguished by cotyledons emerging from the seeds and expanding during germination, and by a basic chromosome number of $x = 12$. Groups "31–39" and "40–70" together correspond with subtribe *Hypheatinae* Danser as accepted by Danser (1933). This subtribe is distinguished by cotyledons remaining embedded in endosperm in the seeds during germination, and by a basic chromosome number of $x = 9$. Groups "31–39" and "40–70" differ in basic inflorescence structures (although obscured by inflorescence evolution in each Group), and generally in chromosome size. Group "31–39" is Australian/Papuan in origin, whilst Group "40–70" is African/Asian. See also the discussion on plant geography below.

KEY TO THE FAMILIES

- 1a. Perianth monochlamydeous, with tepals mostly less than 2 mm long; flowers unisexual, with male and female flowers usually in the same inflorescence; pollen spherical; fruit with the viscous layer inside the vascular bundles; embryo suspensor very short or absent **Viscaceae** (p. 403)
- b. Perianth dichlamydeous, with the calyx reduced to a limb at the apex of the ovary and the corolla (2.5–)10–150 mm long; flowers mostly bisexual, rarely functionally unisexual and then with vestigial organs of the other sex present and plants mostly dioecious; pollen trilobate; fruit with the viscous layer outside the vascular bundles; embryo suspensor long, multiseriate **Loranthaceae**

References: Barlow, B. A., Austral. J. Bot. 22 (1974) 531–621; in D. M. Calder & P. Bernhardt (eds.), The Biology of Mistletoes (1983) 19–46; Blumea 36 (1992) 293–381; Blumea 38 (1993) 65–126. — Barlow, B. A., F. G. Hawksworth, J. Kuijt, R. M. Polhill & D. Wiens, The Golden Bough 11 (1989) 1–4 (Roy. Bot. Gard., Kew). — Danser, B. H., Bull. Jard. Bot. Buitenzorg III, 11 (1931) 233–519; Verh. Kon. Akad. Wet. Amsterdam, Afd. Natuurk., Sect. 2, 29 (1933) 1–128; Philipp. J. Sc. 58 (1935) 1–128.

PLANT GEOGRAPHY

Because of the nature of the seed dispersal mechanism, dispersability in loranth is normally very low (Barlow & Schodde 1993). The family has a strongly continental distribution, with occurrences on remote islands being exceptional. It is probable that the present distribution of the family has been established primarily through migration over continuous land surfaces, and this allows high confidence in the correlation of phylogeny and migration.

The historical biogeography of the *Loranthaceae* is interpreted from the morphological, systematic and karyological data (for summary see Barlow 1990). The most primitive extant genera are all small, with relatively restricted areas, confined almost exclusively to Gondwanan land surfaces, and mostly in temperate habitats. They appear to be relictual endemics, and their scattered occurrence in the southern lands strongly suggests that the *Loranthaceae* are an old southern family. The loranth presumably originated in the mesic, warm to mild, closed forests of Gondwana, and the parasitic habit presumably did not arise in response to water stress but to competition for nutrients in complex ecosystems. Different phyletic stocks of *Loranthaceae* probably were dispersed with the separation of the Gondwanan fragments.

The Malesian loranth flora is clearly a composite one. Different lineages of *Loranthaceae* were well established on both sides of Charles's Line (Audley-Charles 1981) at the time of the Miocene contact between the Australian and Sunda plates. Phytogeographic patterns in the *Loranthaceae* with respect to Charles's Line range from localized species transgressions to differentiation and diversification of new genera from intrusive stocks which have crossed the Line, indicating prolonged exchange, perhaps continuously since migration first became possible after the Miocene contact. Because loranth are not directly dependent on soil or rainfall, and in Malesia are mostly of low host specificity, their habitat requirement is essentially a susceptible host tree. New habitats may have been readily available and two-way dispersal of loranth may have quickly followed the Miocene contact. *Cecarria* and *Amyema* have crossed from the east, and *Decaisnina*, *Cyne*, *Amylothea*, *Macrosolen*, *Lepeostegeres* and *Dendrophthoe* from the west, along with the progenitors of the Australian genus *Lysiana*.

At generic level, the Malesian loranth flora is also largely an immigrant one. Several genera of western Malesia, including *Macrosolen*, *Helixanthera*, *Dendrophthoe* and *Scurrula*, are widespread on the Asian mainland. They represent the ancestral stocks from which some endemic Malesian genera such as *Lepeostegeres*, *Lepidaria* and *Tri-thecanthera* have been derived. This component of the Malesian loranth flora is therefore Laurasian, probably established there following the original Gondwanan fragmentation (Barlow 1990). Similarly *Amyema* is widespread in Australia, and endemic genera such as *Dactylophora*, *Distrianthes*, *Sogerianthe* and *Papuanthes* are Papuan derivatives. The entire loranth flora of Malesia is therefore derived from two immigrant stocks, one Laurasian and the other Papuan, and both stocks have generated some small endemic genera and numerous endemic species.

References: Audley-Charles, M.G., in T.C. Whitmore (ed.), *Wallace's Line and Plate Tectonics* (1931) 24–35. — Barlow, B.A., in P. Baas et al. (eds.), *The Plant Diversity of Malesia* (1990) 273–292. — Barlow, B.A. & R. Schodde, *Beaufortia* 43 (1993) 124–129.

KEY TO THE GENERA

Owing to the general uniformity of growth habit, leaf morphology and fruit structure in Malesian *Loranthaceae*, it is not possible to generate keys based solely on vegetative and/or fruit characters. Diagnosis and identification of genera depends principally on inflorescence and floral characters, and is usually very difficult if they are not available. Inflorescence structures can sometimes be deduced from fruiting specimens if attention is given to the disposition of bracts and the scars of fallen parts.

- 1a. Inflorescence developing in a shallow depression, under a bubble-like calyptra of one piece formed from the stem periderm and falling or rupturing irregularly as the inflorescence develops beneath it **Cyne** (p. 284)
- b. Inflorescence externally visible from an early stage, not developing under a calyptra 2
- 2a. Inflorescence a head with an involucre of enlarged imbricate or valvate bracts completely or partially enclosing the flowers 3
- b. Inflorescence not a head, or if so, with floral bracts not enlarged and imbricate or valvate, nor forming an involucre around the entire inflorescence 10
- 3a. Involucral bracts 2, connate at the margins 4
- b. Involucral bracts 4 or more, free, usually imbricate 5
- 4a. Flowers in the inflorescence 6 in 2 opposite triads, sessile
..... **Distrianthes** (p. 324)
- b. Flowers in the inflorescence 8–12 in 2 opposite rows, pedicellate and with a bract at the apex of each pedicel **Papuanthes** (p. 379)
- 5a. Flowers in the inflorescence (at least the outer ones) grouped in triads 6
- b. Flowers in the inflorescence not grouped in triads 9
- 6a. Petals free **Amyema** (p. 228)
- b. Petals fused to the middle or higher 7
- 7a. Inflorescence in reality a subumbellate raceme of triads tightly crowded at the apex of the axis, with narrow involucral segments developed from the bracts of the outer flowers and fused to the pedicels and rays **Lampas** (p. 339)
- b. Inflorescence distinctly capitate, the flowers inserted on a flat receptacle, with broad involucral segments developed from nonfertile bracts 8
- 8a. Inflorescence triads in the axils of enlarged bracts, with each flower surrounded by 3 smaller bracts **Thaumasianthes** (p. 394)
- b. Inflorescence triads not in the axils of enlarged bracts (except the outer triads), with each flower subtended by a single small bract **Lepeostegeres** (p. 340)
- 9a. Involucral bracts subtending the individual flowers **Elytranthe** (p. 326)
- b. Involucral bracts tightly enclosing the whole inflorescence ... **Lepidaria** (p. 348)

- 10a. Flowers in simple dichasia (triads or rarely tetrads), these in most species aggregated into larger racemose or umbellate inflorescences 11
- b. Flowers single in the inflorescences (racemes, spikes, umbels, heads or solitary flowers) 17
- 11a. Petals fused to the middle or higher (sometimes with the corolla tube deeply split on one side) 12
- b. Petals free completely or almost to the base (sometimes coherent for some time after anthesis) 15
- 12a. Anthers dorsifixed **Loxanthera** (p. 357)
- b. Anthers basifixed 13
- 13a. Inflorescence a subumbellate raceme of triads tightly crowded at the apex of the axis, with narrow involucre segments developed from the bracts of the outer flowers and fused to the pedicels and rays **Lampas** (p. 339)
- b. Inflorescence umbellate or racemose but lacking an involucre of enlarged bracts 14
- 14a. Inflorescence umbellate **Amyema** (p. 228)
- b. Inflorescence racemose **Amylothea** (p. 276)
- 15a. Inflorescence umbellate, sometimes contracted to a head **Amyema** (p. 228)
- b. Inflorescence racemose 16
- 16a. Inflorescence a raceme with whorls of triads **Dactylophora** (p. 289)
- b. Inflorescence a raceme with decussate triads **Decaisnina** (p. 292)
- 17a. Petals fused to the middle or higher (sometimes with the corolla tube deeply slit on one side) 18
- b. Petals free completely or almost to the base (sometimes coherent for some time after anthesis) 25
- 18a. Corolla 6-merous 19
- b. Corolla 5- or 4-merous 23
- 19a. Bracts 3 under each flower, sometimes partly united 20
- b. Bracts single under each flower 22
- 20a. Inflorescence a solitary flower on a short pedicel which is sometimes articulate **Sogerianthe** (p. 388)
- b. Inflorescence a spike or raceme 21
- 21a. Inflorescence axis decussately flattened, with the flowers borne in hollows **Elytranthe** (p. 326)
- b. Inflorescence axis terete or quadrangular, with the flowers not borne in hollows **Macrosolen** (p. 358)
- 22a. Flowers strongly reflexed upwards from a vertical axis; corolla thick, more than 60 mm long **Trithecanthera** (p. 396)
- b. Flowers not reflexed on the axis; corolla thin, less than 60 mm long **Amylothea** (p. 276)
- 23a. Fruit obovoid, club-like, distinctly stipitate **Scurrula** (p. 381)
- b. Fruit ovoid or ellipsoid, not stipitate 24

- 24a. Inflorescence racemose (sometimes few-flowered and subumbellate); corolla 5- or rarely 4-merous, regular or slightly zygomorphic; leaves mostly alternate **Dendrophthoe** (p. 307)
- b. Inflorescence a few-flowered umbel; corolla (in Malesia) 4-merous, zygomorphic; leaves opposite **Taxillus** (p. 392)
- 25a. Anthers dorsifixed, versatile **Cecarria** (p. 283)
- b. Anthers basifixed, immobile 26
- 26a. Inflorescence a simple umbel or solitary flower **Amyema** (p. 228)
- b. Inflorescence a raceme, spike or contracted to a head 27
- 27a. Inflorescence sessile, capitate, a very condensed spike without involucre **Barathranthus** (p. 279)
- b. Inflorescence a raceme or spike 28
- 28a. Flowers hermaphrodite; anthers linear **Helixanthera** (p. 328)
- b. Flowers mostly unisexual; anthers globose or subglobose . **Loranthus** (p. 354)

AMYEMA

Amyema Tiegh., Bull. Soc. Bot. France 41 (1894) 499. — Type species: *Amyema congener* (Sieber ex Schult. & Schult. f.) Tiegh., lecto.

Rhizomonanthes Danser, Verh. Kon. Ned. Akad. Wet. Amst. Afd. Natuurk., Sect. 2, 29 (1933) 100. — Type species: *Rhizomonanthes curvifolia* (K. Krause) Danser, *R. hastifolia* (Ridl.) Danser, *R. heterochroma* (K. Krause) Danser, syntypes.

[For extensive additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 318; Philipp. J. Sc. 58 (1935) 61; Barlow, Austral. J. Bot 14 (1966) 452; 22 (1974) 561].

Aerial stem-parasitic shrubs, with or without epicortical runners bearing secondary haustoria. *Leaves* opposite or verticillate, sometimes displaced and appearing alternate; venation pinnate or curvined. *Inflorescences* usually axillary, sometimes borne on internodes and/or epicortical runners, basically a pedunculate umbel of dichasia (triads or tetrads), but variously reduced in some species, to a head or simple umbel or solitary flower; rays of the umbel 1–50; bract usually single under each flower, simple or rarely lobed or with a dorsal protuberance. *Corolla* mostly 4- to 6-merous, mostly choripetalous but sometimes with petals coherent into a short tube. *Anthers* basifixed, immobile. *Style* simple, usually with a knob-like stigma. *Fruit* ellipsoid to ovoid or obovoid. — **Fig. 3–9.**

Distribution — Genus of 91 species distributed from the Southeast Asian mainland to Australia and islands of the southwestern Pacific as far as Samoa. In *Malesia* 59 species mostly in the east and south, with centres of diversity in the Philippines and New Guinea.

Habitat — Humid and open forests and disturbed sites, from lowlands to subalpine communities at 3750 m altitude. In some cases related species show altitudinal zonation, and many species accordingly have small areas in upland habitats. Among lowland species, some are widespread across several islands, whilst others are local endemics.

Ecology — Some species are aggressive, often occurring on cultivated trees. Host specificity varies between species, some having broad host ranges and others having a single preferred host genus or species. Most species of humid forests have low host specificity, occurring on a wide range of dicotyledonous hosts. This is the case even in mangrove communities, where the *Amyema* species usually occur on several host genera. In seasonal open forests and woodlands the *Amyema* species may be more closely adapted to parasitize the dominant tree species. In Australia many species show close visual resemblance to common hosts, and mimicry has been suggested.

Biogeography — The genus is a significant representative of the Australian/Papuasian element in the Malesian flora. For discussion see Barlow, *Blumea* 36 (1992) 293.

Taxonomy — For a conspectus of the entire genus, and discussion of species circumscription, relationships and differences, see Barlow, *Blumea* 36 (1992) 293.

KEY TO THE SPECIES

Separate regional keys for Indonesia, the Philippines, New Guinea follow the main key.

- 1a. Leaves with opposite and decussate phyllotaxy, although sometimes displaced 2
- b. Leaves with verticillate phyllotaxy, usually ternate or quaternate, sometimes up to 8-verticillate, sometimes displaced to irregular spirals 49
- 2a. Inflorescence a pedunculate umbel of 2 or more triads or tetrads 3
- b. Inflorescence other than a pedunculate umbel of triads or tetrads (e.g., a head, simple umbel, solitary flower or sessile cluster) 32
- 3a. Flowers in triads 4
- b. Flowers in tetrads 31
- 4a. Triads with all flowers closely sessile 5
- b. Triads with at least the lateral flowers pedicellate, sometimes very shortly so 13
- 5a. Rays in the umbel 2–4 6
- b. Rays in the umbel 5 or more 10
- 6a. Corolla 4-merous **4. A. arthrocaulis**
- b. Corolla 5- or 6-merous 7
- 7a. Leaves sessile, cordate at the base **12. A. cercidioides**
- b. Leaves petiolate (sometimes very shortly), attenuate or contracted at the base 8
- 8a. Corolla in mature bud obtuse, 14–18 mm long; anther equal to the free part of the filament **53. A. tristis**
- b. Corolla in mature bud acute, 20–40 mm long; anther much shorter than the free part of the filament 9
- 9a. Flowers in a linear row in the triad, the bracts not together forming a cupule subtending the triad **3. A. artensis**
- b. Flowers in an equilateral disposition in the triad, the bracts together forming a subtending cupule **9. A. caudiciflora**
- 10a. Rays in the umbel 10–30 **29. A. incarnatiflora**
- b. Rays in the umbel 5–8 11

- 11a. Leaf lamina mostly acute and acuminate at the apex; anther longer than the free part of the filament **22. A. friesiana**
 b. Leaf lamina obtuse or rounded at the apex; anther shorter than the free part of the filament 12
- 12a. Corolla in mature bud 18–20 mm long; anthers c. 1.5 mm long; leaf lamina often folded **52. A. triantha**
 b. Corolla in mature bud 20–40 mm long; anthers 2–3 mm long; leaf lamina flat **9. A. caudiciflora**
- 13a. Leaves curvinerved; haustorial attachment single; epicortical runners lacking . 14
 b. Leaves pinninerved; haustorial attachments numerous, arising from epicortical runners 17
- 14a. Ovary white- or pale brown-tomentose in the lower part, glabrous above **13. A. conspicua**
 b. Ovary glabrous or with a uniformly sparse indumentum 15
- 15a. Corolla in the mature bud ridged or winged longitudinally . . **35. A. miraculosa**
 b. Corolla in the mature bud terete or angular but not ridged or winged longitudinally 16
- 16a. Corolla 4-merous, with a globular inflation at the base in the mature bud; anthers transversely septate **23. A. gravis**
 b. Corolla 5-merous, uniformly slender in the mature bud; anthers not transversely septate **34. A. mackayensis**
- 17a. Rays in the umbel mostly 2 or 3 18
 b. Rays in the umbel mostly 4 or 5 19
 c. Rays in the umbel 6 or more 24
- 18a. Corolla 4-merous; leaf lamina mostly less than 1 cm wide . . . **31. A. kebarensis**
 b. Corolla 5-merous; leaf lamina mostly more than 2 cm wide **3. A. artensis**
- 19a. Corolla mostly 5-merous 20
 b. Corolla 4-merous 23
- 20a. Central flowers of the triads mostly pedicellate **11. A. celebica**
 b. Central flowers of the triads sessile 21
- 21a. Inflorescence parts robust; bracts of the lateral flowers of the triads appressed to the ovary and enclosing it in early bud stages **41. A. queenslandica**
 b. Inflorescence parts slender; bracts of the lateral flowers spreading 22
- 22a. Leaves dull on both sides; corolla 14–20 mm long; inflorescence and ovary glabrous **36. A. novaebritanniae**
 b. Leaves usually more lustrous or glossy above; corolla 20–40 mm long; inflorescence and ovary usually shortly tomentose **3. A. artensis**
- 23a. Floral bract with a complex dorsal protuberance; inflorescence peduncle very slender, more than 18 mm long **14. A. corniculata**
 b. Floral bract constricted near the apex forming a simple dorsal protuberance; inflorescence peduncle slender to robust, less than 18 mm long . . . **37. A. pachypus**
- 24a. Rays in the umbel 15 or more, arising from depressions in a globular dilation of the peduncle apex 25

- b. Rays in the umbel 6–12, not arising from depressions in a dilated peduncle apex or if so then the dilation not globular. 26
- 25a. Leaf lamina broadly ovate to orbicular; indumentum red-brown; corolla c. 50 mm long, distinctly choripetalous 49. **A. stronglylophylla**
- b. Leaf lamina narrow lanceolate to ovate; indumentum tawny brown; corolla 30–40 mm long, petals often cohering at the base long after anthesis 24. **A. haenkeana** N.B. See also *Dactyliophora verticillata*, in which reduced inflorescences can resemble those of *Amyema*.
- 26a. Corolla 4-merous 27
- b. Corolla 5- or 6-merous 28
- 27a. Peduncle 11–16 mm long, not strongly dilated at the apex . . 30. **A. irrubescens**
- b. Peduncle 20–45 mm long, dilated to c. 2 mm wide at the apex 59. **A. wichmannii**
- 28a. Corolla in mature bud 14–20 mm long 36. **A. novaebritanniae**
- b. Corolla in mature bud more than 25 mm long 29
- 29a. Leaf lamina lanceolate to oblong-ovate, up to 3 cm wide, acute at the apex; peduncle slender but dilated at the apex 55. **A. urdanetensis**
- b. Leaf lamina ovate to broadly spatulate or orbicular, more than 3 cm wide, rounded at the apex; peduncle uniformly robust 30 N.B. See also *Dactyliophora verticillata*, in which reduced inflorescences can resemble those of *Amyema*.
- 30a. Rays of the umbel 4–8; bracts of the lateral flowers of the triads c. 3 mm long, appressed to the ovary and enclosing it in early bud stages . 41. **A. queenslandica**
- b. Rays of the umbel 7–12; bracts of the lateral flowers up to 2 mm long, spreading 43. **A. rigidiflora**
- 31a. Tetrads with all flowers sessile; petals coherent at the base into a tube 4–5 mm long 50. **A. tetraflora**
- b. Tetrads with three flowers shortly pedicellate; petals coherent at the base into a tube 10–12 mm long 7. **A. brassii**
- 32a. Inflorescence a pedunculate or sessile 6- or 9-flowered head formed from 2 or 3 sessile triads 33
- b. Inflorescence not as above (a pedunculate or sessile simple umbel, a solitary flower or a 3-flowered head) 43
- 33a. Leaves sessile 34
- b. Leaves obscurely or distinctly petiolate 35
- 34a. Leaves truncate to cordate at the base; peduncle rudimentary (inflorescence sessile) 15. **A. cuernosensis**
- b. Leaves cuneate to truncate at the base; peduncle 2–5.5 mm long . 18. **A. edanoi**
- 35a. Corolla 4-merous; bracts c. 6 mm long 51. **A. tetrapetala**
- b. Corolla 5- or 6-merous; bracts less than 3 mm long 36
- 36a. Petals with deflexed spurs on the inside above the base forming a nectar chamber 37
- b. Petals lacking deflexed spurs on the inside above the base 39

- 37a. Inflorescence peduncle 5–11 mm long; leaf lamina obtuse or rounded at the apex **32. A. longipes**
 b. Inflorescence peduncle mostly 2–4 mm long 38
- 38a. Leaf lamina acuminate at the apex, mostly more than 12 cm long; bracts of the lateral flowers appressed to the ovary **47. A. seriata**
 b. Leaf lamina acute at the apex, mostly less than 12 cm long; bracts of the lateral flowers spreading **53. A. tristis**
- 39a. Leaves glossy grey/green above and dull brown below 40
 b. Leaves dull on both sides at least when dry 41
- 40a. Inflorescence peduncle up to 3 mm long; anther about equal to the free part of the filament **27. A. hexameres**
 b. Inflorescence peduncle 5–9 mm long; anther much shorter than the free part of the filament **3. A. artensis**
- 41a. Inflorescence sessile; petiole broad, 1–3 mm long **2. A. apoensis**
 b. Inflorescence pedunculate; petiole slender 42
- 42a. Inflorescence peduncle 4–5 mm long; petiole distinct, 5–15 mm long **28. A. hexantha**
 b. Inflorescence peduncle usually 2–4 mm long; petiole obscure, 0.5–4 mm long **53. A. tristis**
- 43a. Inflorescence a pedunculate capitulum formed from a single cymule of 3 sessile flowers **10. A. cauliflora**
 b. Inflorescence a simple umbel 44
 c. Inflorescence a single flower, usually on an articulate pedicel 47
- 44a. Peduncle of the umbel obsolete or up to 1 mm long 45
 b. Peduncle of the umbel distinct, usually more than 2 mm long 46
- 45a. Corolla 8–22 mm long; leaf rounded or obtuse at the apex **5. A. beccarii**
 b. Corolla 25–40 mm long; leaf acuminate and acute at the apex **48. A. squarrosa**
- 46a. Rays of the umbel 2 **46. A. seemeniana**
 b. Rays of the umbel c. 12 **54. A. umbellata**
- 47a. Corolla 5- or 6-merous, 8–22 mm long **5. A. beccarii**
 b. Corolla 4-merous, mostly 20–45 mm long 48
- 48a. Leaves 4–7 cm long, acuminate acute, almost sessile; articulate peduncle c. 3 mm long **26. A. hastifolia**
 b. Leaves 1.8–4 cm long, rounded, distinctly petiolate; articulate peduncle 4–8 mm long **21. A. finisterrae**
- 49a. Inflorescence a pedunculate umbel of 2 or more triads or tetrads 50
 b. Inflorescence other than a pedunculate umbel of triads or tetrads (e.g., a head, simple umbel, solitary flower or sessile cluster) 68
- 50a. Flowers in tetrads **17. A. dilatipes**
 b. Flowers in triads 51
- 51a. Triads with all flowers sessile 52
 b. Triads with at least the lateral flowers pedicellate 56

- 52a. Rays in the umbel more than 10 29. *A. incarnatiflora*
 b. Rays in the umbel 4–8 53
 c. Rays in the umbel 2–3 55
- 53a. Leaves mostly in regular whorls of 5 or 6, rarely quaternate ... 44. *A. scandens*
 b. Leaves ternate or rarely quaternate, frequently scattered 54
- 54a. Leaves sessile or sometimes minutely petiolate 9. *A. caudiciflora*
 b. Leaves petiolate 38. *A. plicatula*
- 55a. Leaf lamina linear-lanceolate, concave above, less than 1 cm wide
 8. *A. canaliculata*
 b. Leaf lamina ovate or lanceolate-ovate, flat, more than 2 cm wide
 56. *A. vernicosa*
- 56a. Rays in the umbel 2–5 57
 b. Rays in the umbel 6–14 63
 c. Rays in the umbel 15 or more 67
- 57a. Leaves sessile 58
 b. Leaves petiolate 60
- 58a. Leaves 7.5–10 cm long 42. *A. rhytidoderma*
 b. Leaves mostly less than 5 cm long 59
- 59a. Corolla more than 25 mm long, sparsely to densely hairy ... 33. *A. luzonensis*
 b. Corolla less than 21 mm long, glabrous 6. *A. benguetensis*
- 60a. Petals with dorsal appendages forming a crown near the apex of the flower bud
 57. *A. verticillata*
 b. Petals without dorsal appendages 61
- 61a. Triads with the central flower sessile 3. *A. artensis*
 b. Triads with all flowers pedicellate 62
- 62a. Leaves regularly verticillate (mostly quaternate); lamina thin, mostly less than 8 cm
 long; petals usually 4 1. *A. acuta*
 b. Leaves opposite, scattered or quaternate; lamina thickly coriaceous, mostly more
 than 8 cm long; petals usually 5 11. *A. celebica*
- 63a. Rays of the umbel 6–8 64
 b. Rays of the umbel 9 or more 66
- 64a. Inflorescence axis more than 10 mm long; leaf lamina less than 10 cm long
 1. *A. acuta*
 b. Inflorescence axis less than 10 mm long; leaf lamina more than 10 cm long... 65
- 65a. Petals 5, coherent at the base for 1–3 mm 25. *A. halconensis*
 b. Petals 4, eventually free completely to the base 45. *A. scheffleroides*
- 66a. Leaves opposite, ternate or scattered ternate; lamina up to 10 cm long
 30. *A. irrubescens*
 b. Leaves in whorls of 3–6; lamina 10–30 cm long 40. *A. polytrias*
- 67a. Inflorescence peduncle up to 10 mm long; petals 4 16. *A. curranii*
 b. Inflorescence peduncle more than 25 mm long; petals 5 or 6 . 24. *A. haenkeana*
- 68a. Inflorescence a pedunculate or sessile 9-flowered head formed from 3 sessile
 triads 69

- b. Inflorescence not as above (a pedunculate or sessile simple umbel or a solitary flower) 70
- 69a. Leaf lamina less than 8 cm long; inflorescence peduncle 12–15 mm long; petals lacking a deflexed spur on the inside above the base **56. *A. vernicosa***
- b. Leaf lamina more than 8 cm long; inflorescence peduncle c. 1 mm long; petals with a deflexed spur on the inside above the base **19. *A. enneantha***
- 70a. Inflorescence a sessile 1- to 3-flowered umbel (i. e., the flowers sometimes seemingly solitary) 71
- b. Inflorescence a pedunculate simple umbel 72
- 71a. Leaf lamina narrowly to broadly obovate, mostly rounded at the apex, mostly less than 10 cm long; pedicels of the flowers distinct, mostly 1–4 mm long; anthers on a short free filament **5. *A. beccarii***
- b. Leaf lamina ovate, shortly acuminate and obtuse at the apex, mostly more than 12 cm long; pedicels of the flowers very short or absent so that the inflorescence resembles a sessile cluster; anthers sessile **58. *A. wenzelii***
- 72a. Rays of the umbel c. 12 **54. *A. umbellata***
- b. Rays of the umbel 3–6 73
- 73a. Peduncle of the umbel 2–5 mm long; corolla mostly less than 20 mm long **20. *A. fasciculata***
- b. Peduncle of the umbel 8–11 mm long; corolla more than 20 mm long **39. *A. polillensis***

KEY TO THE SPECIES OF INDONESIA (EXCL. IRIAN JAYA) AND MALAYSIA

- 1a. Inflorescence a pedunculate umbel of 2 or more triads 2
- b. Inflorescence other than a pedunculate umbel of triads (e. g., a head, simple umbel, solitary flower or sessile cluster) 10
- 2a. Triads with all flowers closely sessile 3
- b. Triads with at least the lateral flowers pedicellate, sometimes very shortly so 4
- 3a. Rays in the umbel 2–4; corolla 14–18 mm long; anther equal to the free part of the filament; leaf lamina flat **53. *A. tristis***
- b. Rays in the umbel 5 or more; corolla 18–20 mm long; anther much shorter than the free part of the filament; leaf lamina often folded **52. *A. triantha***
- 4a. Rays in the umbel 2–5 5
- b. Rays in the umbel 6 or more 7
- 5a. Rays in the umbel mostly 4 or 5; central flowers of the triads mostly pedicellate **11. *A. celebica***
- b. Rays in the umbel mostly 2 or 3; central flowers of the triads sessile 6
- 6a. Corolla in mature bud ridged or winged longitudinally, lacking a globular inflation at the base; anthers not transversely septate **35. *A. miraculosa***
- b. Corolla in mature bud terete or angular but not ridged or winged longitudinally, with a globular inflation at the base; anthers transversely septate **23. *A. gravis***

- 7a. Corolla 5- or 6-merous; triads with the central flower sessile; leaves opposite **43. A. rigidiflora**
 b. Corolla 4-merous; triads with all flowers shortly pedicellate; leaves rarely opposite, mostly in whorls of 3–6 (rarely scattered) 8
- 8a. Rays of the umbel 6–8; peduncle less than 10 mm long . . . **45. A. scheffleroides**
 b. Rays of the umbel 9 or more; peduncle more than 10 mm long 9
- 9a. Leaves opposite, ternate or scattered ternate; lamina up to 10 cm long **30. A. irrubescens**
 b. Leaves in whorls of 3–6; lamina 10–30 cm long **40. A. polytrias**
- 10a. Inflorescence a pedunculate or sessile 6- or 9-flowered head formed from 2 or 3 sessile triads 11
 b. Inflorescence not as above (a pedunculate or sessile simple umbel or a solitary flower) 16
- 11a. Leaves ternate; inflorescence 9-flowered **19. A. enneantha**
 b. Leaves opposite; inflorescence 6-flowered 12
- 12a. Leaves sessile 13
 b. Leaves obscurely or distinctly petiolate 14
- 13a. Leaves truncate to cordate at the base; peduncle rudimentary (inflorescence sessile) **15. A. cuernosensis**
 b. Leaves cuneate to truncate at the base; peduncle 2–5.5 mm long . . **18. A. edanoi**
- 14a. Leaves glossy grey/green above and dull brown below; petiole distinct, 5–10 mm long; inflorescence peduncle 0.5–2.5 mm long **27. A. hexameres**
 b. Leaves dull on both sides at least when dry; petiole short or obscure, mostly less than 5 mm long; inflorescence peduncle usually 2–11 mm long 15
- 15a. Peduncle 5–11 mm long; leaf lamina obtuse or rounded at the apex **32. A. longipes**
 b. Peduncle usually 2–4 mm long; leaf lamina acute at the apex **53. A. tristis**
- 16a. Inflorescence a sessile 1- to 3-flowered umbel (i. e., the flowers sometimes seemingly solitary) **5. A. beccarii**
 b. Inflorescence a pedunculate simple umbel 17
- 17a. Rays of the umbel c. 12; corolla 5- or 6-merous **54. A. umbellata**
 b. Rays of the umbel 3–6; corolla mostly 4-merous **20. A. fasciculata**

KEY TO THE PHILIPPINE SPECIES

- 1a. Inflorescence a pedunculate umbel of 2 or more triads 2
 b. Inflorescence other than a pedunculate umbel of triads (e. g., a head, simple umbel, solitary flower or sessile cluster) 13
- 2a. Triads with all flowers closely sessile 3
 b. Triads with at least the lateral flowers pedicellate 4
- 3a. Rays in the umbel more than 10, arising from depressions in a globular dilation of the end of the peduncle **29. A. incarnatiflora**

- b. Rays in the umbel 3, arising at the end of an unthickened peduncle **56. *A. vernicosa***
- 4a. Rays in the umbel 2–5 5
- b. Rays in the umbel 6–14 10
- c. Rays in the umbel 15 or more 12
- 5a. Leaves sessile 6
- b. Leaves petiolate 8
- 6a. Leaves 7.5–10 cm long **42. *A. rhytidoderma***
- b. Leaves mostly less than 5 cm long 7
- 7a. Corolla more than 25 mm long, sparsely to densely hairy ... **33. *A. luzonensis***
- b. Corolla less than 21 mm long, glabrous **6. *A. benguetensis***
- 8a. Petals with dorsal appendages forming a crown near the apex of the flower bud ..
..... **57. *A. verticillata***
- b. Petals without dorsal appendages 9
- 9a. Leaves regularly verticillate (mostly quaternate); lamina thin, mostly less than 8 cm
long; petals usually 4 **1. *A. acuta***
- b. Leaves opposite, scattered or quaternate; lamina thickly coriaceous, mostly more
than 8 cm long; petals usually 5 **11. *A. celebica***
- 10a. Leaves opposite **55. *A. urdanetensis***
- b. Leaves with verticillate phyllotaxy, sometimes displaced to irregular spirals .. 11
- 11a. Inflorescence axis more than 10 mm long; leaf lamina less than 10 cm long; petals
4, free to the base **1. *A. acuta***
- b. Inflorescence axis less than 10 mm long; leaf lamina more than 10 cm long; petals
5, coherent at the base for 1–3 mm **25. *A. halconensis***
- 12a. Inflorescence peduncle up to 10 mm long; petals 4 **16. *A. curranii***
- b. Inflorescence peduncle more than 25 mm long; petals 5 or 6 . **24. *A. haenkeana***
- 13a. Leaves with opposite and decussate phyllotaxy, although sometimes displaced 14
- b. Leaves with verticillate phyllotaxy, usually ternate or quaternate, sometimes up to
8-verticillate, sometimes displaced to irregular spirals 21
- 14a. Inflorescence a pedunculate or sessile 6-flowered head formed from 2 sessile
triads 15
- b. Inflorescence not as above (a pedunculate or sessile simple umbel, a solitary flow-
er or 3-flowered head)..... 19
- 15a. Leaves sessile 16
- b. Leaves obscurely or distinctly petiolate 17
- 16a. Leaves truncate to cordate at the base; peduncle rudimentary (inflorescence ses-
sile) **15. *A. cuernosensis***
- b. Leaves cuneate to truncate at the base; peduncle 2–5.5 mm long . **18. *A. edanoi***
- 17a. Petals with deflexed spurs on the inside above the base forming a nectar chamber;
bracts of the lateral flowers appressed to the ovary, not forming part of the involu-
cre **47. *A. seriata***
- b. Petals lacking deflexed spurs on the inside above the base; bracts of the lateral
flowers spreading, forming part of the involucre 18

- 18a. Inflorescence sessile; petiole broad, 1–3 mm long **2. A. apoensis**
- b. Inflorescence peduncle 4–5 mm long; petiole slender, 5–15 mm long **28. A. hexantha**
- 19a. Inflorescence a pedunculate capitulum formed from a single cymule of 3 sessile flowers **10. A. cauliflora**
- b. Inflorescence a simple umbel or solitary flower 20
- 20a. Inflorescence a sessile 1- to 3-flowered umbel (i. e., the flowers sometimes seemingly solitary); pedicels of the flowers mostly 1–4 mm long; corolla 5- or 6-merous **5. A. beccarii**
- b. Inflorescence a pedunculate 2- to 4-flowered simple umbel; the peduncle 2–5 mm long; pedicels mostly 2–3 mm long; corolla mostly 4-merous **20. A. fasciculata**
- 21a. Inflorescence a 9-flowered head formed from 3 sessile triads, on a peduncle 12–15 mm long **56. A. vernicosa**
- b. Inflorescence not as above (a pedunculate or sessile simple umbel or a solitary flower) 22
- 22a. Inflorescence a sessile 1- to 3-flowered umbel (i. e., the flowers sometimes seemingly solitary) 23
- b. Inflorescence a pedunculate simple umbel 24
- 23a. Leaf lamina narrowly to broadly obovate, mostly rounded at the apex, mostly less than 10 cm long; pedicels of the flowers distinct, mostly 1–4 mm long; anthers on a short free filament **5. A. beccarii**
- b. Leaf lamina ovate, shortly acuminate and obtuse at the apex, mostly more than 12 cm long; pedicels of the flowers very short or absent so that the inflorescence resembles a sessile cluster; anthers sessile **58. A. wenzelii**
- 24a. Umbel 2- to 4-flowered; peduncle 2–5 mm long; corolla mostly less than 20 mm long; leaves 2- to 4-verticillate **20. A. fasciculata**
- b. Umbel 4- to 6-flowered; peduncle 8–11 mm long; corolla more than 20 mm long; leaves 4- to 7-verticillate **39. A. polillensis**

KEY TO THE NEW GUINEAN SPECIES (INCL. BISMARCK ARCH.)

- 1a. Leaves with opposite and decussate phyllotaxy, although sometimes displaced 2
- b. Leaves with verticillate phyllotaxy, usually ternate or quaternate, sometimes up to 8-verticillate, sometimes displaced to irregular spirals 28
- 2a. Inflorescence a pedunculate umbel of 2 or more triads or tetrads 3
- b. Inflorescence other than a pedunculate umbel of triads or tetrads (e. g., a head, simple umbel, solitary flower or sessile cluster) 23
- 3a. Flowers in triads 4
- b. Flowers in tetrads 22
- 4a. Triads with all flowers closely sessile 5
- b. Triads with at least the lateral flowers pedicellate, sometimes very shortly 9

- 5a. Corolla 4-merous **4. A. arthrocaulis**
 b. Corolla 5- or 6-merous 6
- 6a. Leaves sessile or with a short obscure petiole rarely 3 mm long 7
 b. Leaves with distinct petioles mostly more than 4 mm long 8
- 7a. Leaves almost orbicular, cordate at the base **12. A. cercidioides**
 b. Leaves mostly ovate or obovate (rarely narrower), attenuate or cuneate at the base
 **9. A. caudiciflora**
- 8a. Flowers in a linear row in the triad, the bracts not together forming a cupule subtending the triad; rays in the umbel 2–4 **3. A. artensis**
 b. Flowers in an equilateral disposition in the triad, the bracts together forming a subtending cupule; rays in the umbel 5–8 **22. A. friesiana**
- 9a. Rays in the umbel 2–5 10
 b. Rays in the umbel 6 or more 18
- 10a. Leaves curvinerved; haustorial attachments lacking epicortical runners 11
 b. Leaves pinninerved; haustorial attachments on epicortical runners 12
- 11a. Inflorescence axis and rays tomentose; ovary white- or pale brown-tomentose in the lower part, glabrous above **13. A. conspicua**
 b. Inflorescence axis and rays glabrous; ovary glabrous or with a uniformly sparse indumentum **34. A. mackayensis**
- 12a. Corolla 4-merous 13
 b. Corolla mostly 5-merous 16
- 13a. Leaf lamina mostly less than 1 cm wide **31. A. kebarensis**
 b. Leaf lamina mostly more than 2 cm wide 14
- 14a. Leaf lamina 10–15 cm long; corolla 35–40 mm long **3. A. artensis**
 b. Leaf lamina less than 8 cm long; corolla 15–20 mm long 15
- 15a. Floral bract with a complex dorsal protuberance; inflorescence peduncle very slender, more than 18 mm long **14. A. corniculata**
 b. Floral bract constricted near the apex forming a simple dorsal protuberance; inflorescence peduncle slender to robust, less than 18 mm long
 **37. A. pachypus**
- 16a. Inflorescence parts robust; bracts of the lateral flowers of the triads appressed to the ovary and enclosing it in early bud stages **41. A. queenslandica**
 b. Inflorescence parts slender; bracts of the lateral flowers spreading 17
- 17a. Leaves dull on both sides; corolla 14–20 mm long; inflorescence and ovary glabrous **36. A. novaebritanniae**
 b. Leaves usually more lustrous or glossy above; corolla 20–40 mm long; inflorescence and ovary usually shortly tomentose **3. A. artensis**
- 18a. Rays in the umbel 15 or more, arising from depressions in a globular dilation of the peduncle apex **49. A. stronglyphylla**
 N.B. See also *Dactyliophora verticillata*, in which reduced inflorescences can resemble those of *Amyema*.
 b. Rays in the umbel 6–12, not arising from depressions in a dilated peduncle apex or if so then the dilation not globular 19

- 19a. Corolla 4-merous; inflorescence peduncle distinctly widened upwards 59. **A. wichmannii**
 b. Corolla 5- or 6-merous; inflorescence peduncle not widened upwards 20
- 20a. Corolla in mature bud 14–20 mm long 36. **A. novaebritanniae**
 b. Corolla in mature bud more than 25 mm long 21
- 21a. Rays of the umbel 4–8; bracts of the lateral flowers of the triads c. 3 mm long, appressed to the ovary and enclosing it in early bud stages 41. **A. queenslandica**
 b. Rays of the umbel 7–12; bracts of the lateral flowers up to 2 mm long, spreading 43. **A. rigidiflora**
 N.B. See also *Dactyliophora verticillata*, in which reduced inflorescences can resemble those of *Amyema*.
- 22a. Tetrads with all flowers sessile; petals coherent at the base into a tube 4–5 mm long 50. **A. tetraflora**
 b. Tetrads with three flowers shortly pedicellate; petals coherent at the base into a tube 10–12 mm long 7. **A. brassii**
- 23a. Inflorescence a pedunculate or sessile 6-flowered head formed from two sessile triads 24
 b. Inflorescence not as above (a pedunculate or sessile simple umbel, a solitary flower or a head of 3–5 flowers) 25
- 24a. Corolla 4-merous; central bracts of the triads c. 6 mm long 51. **A. tetrapetala**
 b. Corolla 5- or 6-merous; central bracts of the triads less than 3 mm long 3. **A. artensis**
- 25a. Inflorescence a simple umbel 26
 b. Inflorescence a single flower, usually on an articulate pedicel 27
- 26a. Peduncle of the umbel obsolete or up to 1 mm long; leaf lamina weakly pinninerved, the main lateral veins diverging from near the base 48. **A. squarrosa**
 b. Peduncle of the umbel distinct, usually more than 2 mm long; leaf lamina distinctly curvinerved from the base 46. **A. seemeniana**
- 27a. Leaves 4–7 cm long, acuminate acute, almost sessile; articulate peduncle c. 3 mm long 26. **A. hastifolia**
 b. Leaves 1.8–4 cm long, rounded, distinctly petiolate; articulate peduncle 4–8 mm long 21. **A. finisterrae**
- 28a. Inflorescence a 2- to 4-flowered simple umbel 20. **A. fasciculata**
 b. Inflorescence a pedunculate umbel of 2 or more triads or tetrads 29
- 29a. Flowers in tetrads 17. **A. dilatipes**
 b. Flowers in triads 30
- 30a. Triads with at least the lateral flowers pedicellate 3. **A. artensis**
 b. Triads with all flowers sessile 31
- 31a. Rays in the umbel 2 or 3; leaf lamina linear-lanceolate, concave above, less than 1 cm wide 8. **A. canaliculata**
 b. Rays in the umbel 4–8; leaf lamina lanceolate to nearly orbicular, flat, more than 1 cm wide 32

- 32a. Leaves mostly in regular whorls of 5 or 6, rarely quaternate . . . 44. *A. scandens*
 b. Leaves ternate or rarely quaternate, frequently scattered 33
 33a. Leaves sessile or sometimes with a very short thick petiole . . . 9. *A. caudiciflora*
 b. Leaves distinctly petiolate 38. *A. plicatula*

1. *Amyema acuta* (Tiegh.) Danser

Amyema acuta (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 293. — *Stemmatophyllum acutum* Tiegh., Bull. Soc. Bot. France 41 (1894) 546. — Type: *Cuming* 1973, Philippines, Manila. [For synonymy see Danser, Philipp. J. Sc. 58 (1935) 74–78; Barlow, Blumea 36 (1992) 307].

Glabrous except for the young inflorescence and flowers sometimes softly pubescent. *Leaves* regularly verticillate (mostly quaternate); lamina lanceolate to ovate-lanceolate, mostly 5–10 cm long, mostly 1.5–4 cm wide, attenuate to shortly cuneate at the base to a petiole 3–10 mm long, mostly acuminate and acute at the apex, dull or slightly glossy above, dull and distinctly paler below; venation pinnate with the midrib prominent below. *Inflorescences* at the nodes, pedunculate, mostly 4- (rarely 2- to 6-)rayed umbels of triads with all flowers pedicellate; peduncle 10–40(–60) mm long; rays 3–8 mm long; pedicels 1–2 mm long. *Corolla* in mature bud mostly 4-merous, 18–28 mm long, slender, weakly clavate and obtuse at the apex, frequently red below and orange or yellow above. *Anther* 2–3 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Recorded from primary forests, mostly from 1200 to 2400 m altitude, rarely down to 600 m; no hosts recorded.

Note — Closely related to *Amyema celebica*; for differences see Barlow, Blumea 36 (1992) 307, 320.

2. *Amyema apoensis* (Elmer) Barlow

Amyema apoensis (Elmer) Barlow, Blumea 36 (1992) 308. — *Loranthus apoensis* Elmer, Leaf. Philipp. Bot. 3 (1911) 1073. — *Dicymanthes apoensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Elmer* 11454, lecto, Mindanao, Mt Apo.

Glabrous. *Leaves* opposite; lamina elliptic to broadly elliptic, 9–15 by 4–8 cm, shortly attenuate at the base to an obscure petiole 1–3 mm long, shortly acuminate and acute at the apex, dull on both sides when dry but slightly darker above; venation pinnate, faintly visible on both sides. *Inflorescences* at the nodes, a subsessile 6-flowered head of 2 sessile triads on a peduncle c. 0.5 mm long which is immersed in the bark. *Corolla* in mature bud 5-merous, 18–22 mm long, uniformly slender, mostly pink or red below and yellowish above. *Anther* 1.5–2 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — Humid forests, 1830–2130 m altitude; the only recorded host is *Ficus*.

Notes — 1. Closely related to *Amyema hexantha*, which is sympatric but occurs at lower altitudes; for distinction see Barlow, Blumea 36 (1992) 309.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

3. *Amyema artensis* (Montrouz.) Danser

Amyema artensis (Montrouz.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 293; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 209. — *Loranthus artensis* Montrouz., Mém. Acad. Lyon 10 (1860) 213. — Type: *Montrouzier 199*, New Caledonia, Ile Art.

Amyema wichmannii subsp. *aggregata* Barlow, Austral. J. Bot. 22 (1974) 598; in Handb. Fl. Papua New Guinea 2 (1981) 226; Van Royen, Alpine Fl. New Guinea 3 (1982) 2270. — Type: *Galore & Wood NGF 41009*, Papua New Guinea, Mt Simpson.

[For extensive additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 323, 344; 14 (1936) 88, 89; Barlow, Austral. J. Bot. 22 (1974) 564, 566; *Blumea* 36 (1992) 309].

Glabrous except for the inflorescence and ovary usually shortly and densely brown tomentose. *Leaves* opposite or in whorls of 3 or 4; lamina usually oblong to ovate or obovate, rarely lanceolate, 4–9(–14) by 1.5–4(–7) cm, shortly cuneate to almost truncate at the base to a petiole (3–)5–8 mm long, obtuse or rounded (rarely acute or acuminate) at the apex, usually shining and often red above, dull below, often recurved at the margins; venation pinnate with the midrib and the main laterals visible on both sides. *Inflorescences* at the nodes, pedunculate 2- (rarely 3- to 5-)rayed umbels of triads with the central flowers sessile; peduncle (5–)8–20 mm long; rays 3–6 mm long; lateral flowers usually on pedicels 1–3 mm long but sometimes sessile. *Corolla* in mature bud 5-merous, 20–30 mm long, slender, weakly clavate and acute at the apex, mostly red or bright pink below and orange, yellow or paler pink above. *Anther* c. 1.5 mm long, about one fifth as long as the free part of the filament. — **Fig. 3a–c.**

Distribution — Western Pacific from Caroline Islands southeastwards to New Caledonia and Samoa; *Malesia*: New Guinea including Louisiade Archipelago.

Habitat & Ecology — Primary and secondary forests, in mainland New Guinea mostly from 1500 to 2500 m altitude, but recorded from 1190–3400 m; in other island groups from sea level to the highest altitudes which exist; recorded hosts too numerous to list.

Notes — 1. For discussion of species circumscription and relationships with *Amyema novaebritanniae* and *A. pachypus*, see Barlow, *Blumea* 36 (1992) 310.

2. For discussion of occurrence on remote Pacific islands, see Barlow & Schodde, *Beaufortia* 43 (1993) 124.

4. *Amyema arthrocaulis* Barlow

Amyema arthrocaulis Barlow, *Blumea* 36 (1992) 312. — Type: *Brass 11299*, Irian Jaya, Lake Habbema.

Glabrous. *Leaves* opposite; lamina oblanceolate to narrowly spatulate, 5–7 by 1–2 cm, gradually attenuate at the base to an obscure petiole 5–10 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals raised below but indistinct. *Inflorescences* at the nodes, pedunculate 4-rayed umbels of triads with all flowers sessile; peduncle 13–15 mm long; rays 5–8 mm long. *Corolla* in mature bud 4-merous, 26–30 mm long, uniformly slender, quadrangular when dry, acute at the

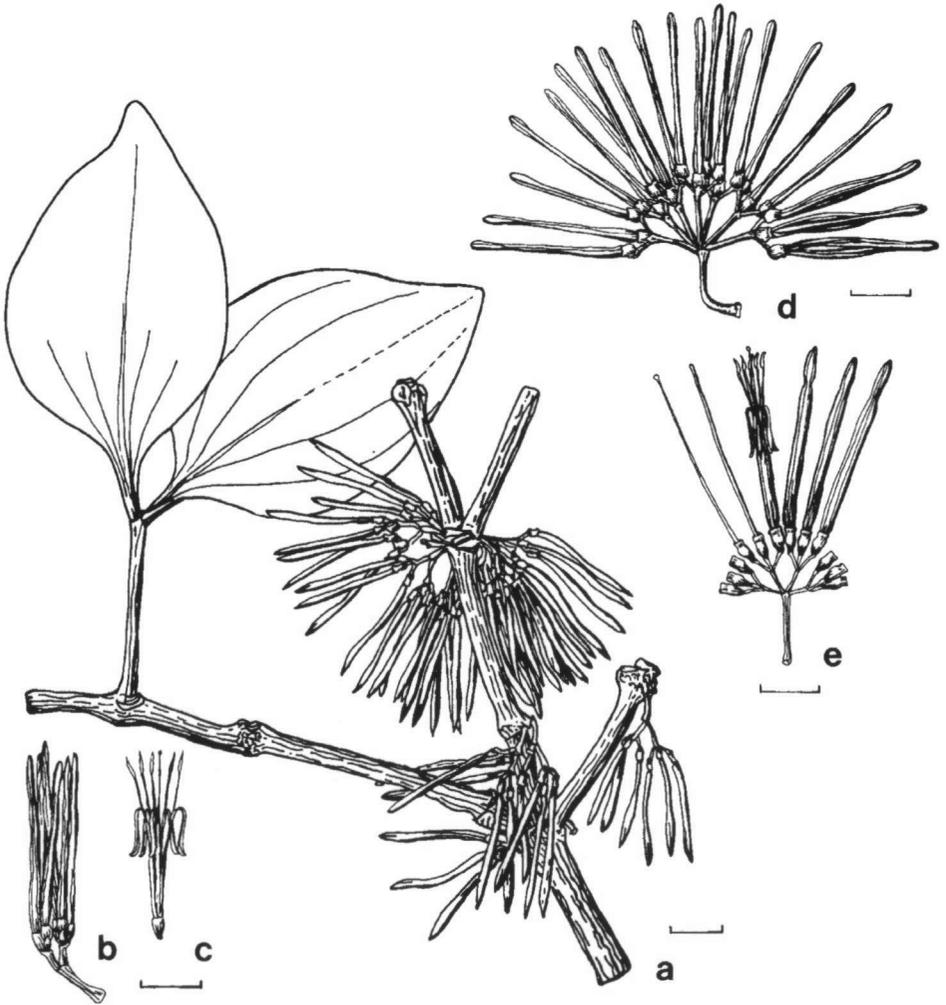


Fig. 3. *Amyema artensis* (Montrouz.) Danser. a. Twig with flower buds; b. inflorescence; c. flower. — *A. rigidiflora* (K. Krause) Danser. d. Inflorescence. — *A. celebica* (Tiegh.) Danser. e. Inflorescence (a: Ledermann 13363; b, c: Docters van Leeuwen 10989; d: Lam 2908; e: Lam 2648). Redrawn from Danser (1931). Scale bars represent 1 cm.

apex, red below and yellow above. *Anther* c. 2.5 mm long, with a short knob-like sterile tip, about half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Known from type locality only, 2200 m altitude; no host recorded.

Note — Probably related to *Amyema scandens*; for distinction as a species see Barlow, *Blumea* 36 (1992) 312.

5. *Amyema beccarii* (Tiegh.) Danser

Amyema beccarii (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Stemmatophyllum beccarii* Tiegh., Bull. Soc. Bot. France 41 (1894) 506, 546. — Type: *Beccari* 688, Sarawak.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 326; Philipp. J. Sc. 58 (1935) 87; Barlow, *Blumea* 36 (1992) 313].

Glabrous. *Leaves* usually quaternate, rarely decussate; lamina narrowly obovate to elliptic, mostly 4–10 cm long, mostly 2–5 cm wide, attenuate at the base to a petiole mostly 4–12 mm long, rounded to obtuse at the apex, dull on both sides; venation pinnate with the midrib raised in the basal part and otherwise obscure. *Inflorescences* many at the nodes and along the internodes and epicortical runners, sessile 1- to 3- (usually 2-) flowered umbels; pedicels (0.5–)2–4 mm long. *Corolla* in mature bud 5- or 6-merous, 13–22 mm long, usually slightly inflated at the base, rounded at the apex, mostly red, orange or yellow below and green above, sometimes with a purple zone at the tip. *Anther* 2–5 mm long, sessile or much longer than the free part of the filament. — Fig. 4, 9g, h.

Distribution — Thailand; *Malesia*: northern parts from Philippines to Bangka, Borneo, Celebes, Moluccas (Sulu Is, Taliabu).

Habitat & Ecology — Mostly in humid forests, 0–1300 m altitude; recorded hosts include *Barringtonia*, *Gonystylus*, *Melastoma*, *Palaquium*, *Psychotria*, and *Schima*.

Note — Closely related to *Amyema wenzelii*; the species can also be confused with *A. fasciculata*; for discussion see Barlow, *Blumea* 36 (1992) 314.

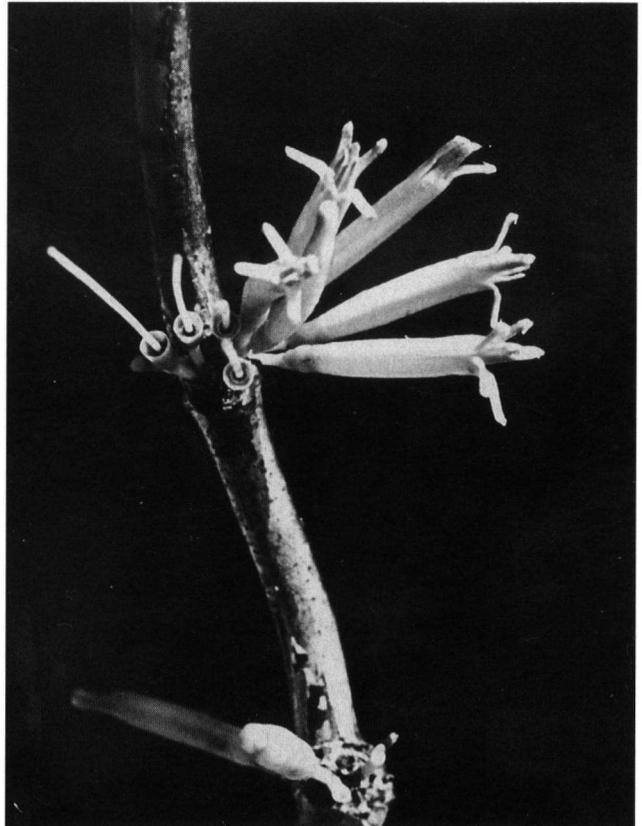


Fig. 4. *Amyema beccarii* (Tiegh.) Danser, node with several inflorescences. Borneo, W Kalimantan, Pasir Pandjang (*Elsener H 93*). Photo A. Elsener, 1965.

6. *Amyema benguetensis* (Merr.) Danser

Amyema benguetensis (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Loranthus benguetensis* Merr., Philipp. J. Sc., Bot. 4 (1909) 134. — Type: Curran, Merritt & Zschokke FB 16064, lecto, Luzon, Mt Pulog.

Glabrous. *Leaves* quaternate, sessile, crowded on branchlets with short internodes; lamina narrowly oblong to ovate, mostly 2.5–5 cm long, 1–2 cm wide, cuneate at the base, shortly rounded to acute at the apex, glossy on both sides but darker above; venation pinnate with the midrib prominent below. *Inflorescences* at the nodes, pedunculate, (2–)4(–6)-rayed umbels of triads with all flowers pedicellate; peduncle 8–16 mm long; rays 2–4 mm long; pedicels 0.5–2 mm long. *Corolla* in mature bud 4- or 5-merous, 15–20 mm long, slender, weakly clavate and acute, yellow below and red above. *Anther* 2–2.5 mm long, narrowed upwards, with a broad connective, nearly twice as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Uplands from 1200 to 1600 m altitude; the only recorded host is *Pinus*. Hosts other than dicotyledons are rare in *Loranthaceae*.

Note — Closely related to *Amyema luzonensis* and *A. rhytidoderma*; for differences and species circumscription see Barlow, Blumea 36 (1992) 314.

7. *Amyema brassii* Barlow

Amyema brassii Barlow, Austral. J. Bot. 22 (1974) 568; in Handb. Fl. Papua New Guinea 2 (1981) 210; Blumea 36 (1992) 317. — Type: Brass 27827, Sudest I. [= Tagula], Mt Riu.

Glabrous except for the inflorescence and flowers shortly and sparsely tomentose. *Leaves* opposite; lamina lanceolate, 12–20 by 3–6 cm, shortly cuneate at the base to a petiole c. 3 mm long, acuminate and acute at the apex, glossy above, dull below; venation pinnate with the midrib prominent on both sides and other venation obscure. *Inflorescences* at the nodes, pedunculate c. 6-rayed umbels of tetrads with the outermost flower sessile and the lateral and inner ones pedicellate; peduncle c. 4 mm long; rays 3–4 mm long; pedicels of the lateral and inner-facing flowers 1–2 mm long. *Corolla* in mature bud 6-merous, c. 35 mm long, inflated at the base, weakly clavate and acute at the apex, pink; petals in the open flower coherent in the lower 10–12 mm. *Anther* c. 3 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Papua New Guinea (Louisiades Archipelago: Tagula I.).

Habitat & Ecology — 600–700 m altitude; no hosts recorded.

Note — Similar to *Amyema tetraflora*; for differences see Barlow, Blumea 36 (1992) 369.

8. *Amyema canaliculata* Barlow

Amyema canaliculata Barlow, Austral. J. Bot. 22 (1974) 569; in Handb. Fl. Papua New Guinea 2 (1981) 211; Blumea 36 (1992) 317. — Type: Henty & Foreman NGF 42624, Papua New Guinea, Prospect Creek.

Glabrous. *Leaves* scattered ternate; lamina linear-lanceolate, 7–13 by 0.3–0.6 cm, thick, convex below and strongly concave above, attenuate at the base to an obscure petiole c. 3 mm long, rounded and shortly mucronate at the apex, dull on both sides; venation invisible. *Inflorescences* at the nodes, pedunculate 3-rayed umbels of triads with all flowers sessile; peduncle c. 2 mm long; rays c. 4 mm long. *Corolla* in mature bud 5-merous, c. 24 mm long, uniformly slender, shortly rounded or obtuse at the apex, pink. Other floral characters unknown.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Known from type locality only, 600 m altitude; the recorded host is *Dacrydium*. Hosts other than dicotyledons are rare in *Loranthaceae*.

9. *Amyema caudiciflora* (Lauterb.) Danser

Amyema caudiciflora (Lauterb.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Loranthus caudiciflorus* Lauterb., Nova Guinea 8 (1910) 290. — Type: *Versteeg 1473*, New Guinea, Irian Jaya, 'Noordrivier'.

[For additional synonymy see Barlow, *Blumea* 36 (1992) 318].

Glabrous. *Leaves* ternate, scattered ternate or quaternate; lamina usually ovate or obovate (rarely lanceolate), (7–)12–21 by (3–)6–10 cm, cuneate or attenuate at the base and sessile or with a short thick petiole up to 3 mm long, often recurved at the margin, mostly rounded at the apex, dull on both sides; venation pinnate with the midrib distinct and raised below. *Inflorescences* at the nodes and along the internodes, pedunculate 4- to 6-rayed umbels of triads with all flowers sessile; peduncle (3–)10–15(–27) mm long; rays 5–9 mm long. *Corolla* in mature bud 5- or 6-merous, 27–35 mm long, uniformly slender, shortly rounded or obtuse at the apex, mostly pink, rarely red. *Anther* 2.5–4 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Highlands, in primary and secondary rain forest, mostly from 1250 to 2500 m altitude but occurring down to 500 m; recorded hosts include *Calophyllum*, *Castanopsis*, *Macaranga*, *Nothofagus*, *Opocunonia*.

Note — Closely related to *Amyema scandens*; for differences and species circumscription see Barlow, *Blumea* 36 (1992) 318.

10. *Amyema cauliflora* (Merr.) Barlow

Amyema cauliflora (Merr.) Barlow, *Blumea* 36 (1992) 319. — *Loranthus cauliflorus* Merr., Philipp. J. Sc. 1, Suppl. (1906) 105. — *Dicymanthes cauliflora* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Clemens 55*, Mindanao.

Glabrous. *Leaves* opposite; lamina ovate, up to 21 cm long, up to 8 cm wide, shortly cuneate at the base to a petiole up to 25 mm long, acuminate and acute at the apex, dull on both sides but darker above; venation pinnate with the midrib and the incurved main laterals prominent on both sides. *Inflorescences* at the nodes and along the internodes and epicortical runners, a head of 3 sessile flowers on a peduncle 1–2 mm long. *Corolla*

in mature bud 5- or 6-merous, 15–22 mm long, inflated at the base, weakly clavate and obtuse at the apex, angular, pink or red. *Anther* 4–6 mm long, sessile or nearly so.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — Recorded once from 1000 m altitude; no host recorded.

Note — For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

11. *Amyema celebica* (Tiegh.) Danser

Amyema celebica (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Rhizanthemum celebicum* Tiegh. in Morot, J. de Bot. 15 (1901) 364. — Type: *Forsten 175*, Celebes, Tondano. [For further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 328; Philipp. J. Sc. 58 (1935) 80; Barlow, *Blumea* 36 (1992) 319].

Glabrous. *Leaves* mostly opposite, often scattered, sometimes quaternate; lamina lanceolate or elliptic to ovate, (6–)8–20 by (2–)4–7 cm, attenuate to truncate at the base to a petiole 10–20 mm long, obtuse to shortly acuminate and acute at the apex, dull on both sides, sometimes slightly darker above; venation pinnate with the midrib and the main laterals visible on both sides and prominent below. *Inflorescences* at the nodes and rarely on the epicortical runners, pedunculate (2–)4-rayed umbels of triads with all flowers pedicellate or rarely with the central flowers apparently sessile; peduncle (3–)10–25 (–50) mm long; rays (2–)5–10 mm long; pedicels (0–)2–4 mm long. *Corolla* in mature bud 5-merous, (15–)25–35 mm long, slender, acute at the apex, yellow, orange, red or purple, sometimes grading to green above. *Anther* 2–3.5 mm long, equal to or shorter than the free part of the filament. — Fig. 3e.

Distribution — *Malesia*: Philippines, Celebes, Lesser Sunda Islands (Sumba, Flores).

Habitat & Ecology — Mostly from 0 to 700 m but less frequently to 1900 m; no hosts recorded.

Note — Closely related to *Amyema acuta*; for differences and species circumscription see Barlow, *Blumea* 36 (1992) 307, 320.

12. *Amyema cercidioides* (K. Krause) Danser

Amyema cercidioides (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294; Barlow, Austral. J. Bot. 22 (1974) 570; in Handb. Fl. Papua New Guinea 2 (1981) 211. — *Loranthus cercidioides* K. Krause, Nova Guinea 14 (1923) 103. — Type: *Lam 1893*, Irian Jaya, 'Doorman Top'.

Glabrous. *Leaves* opposite; lamina almost orbicular, 9–12 by 8–10 cm, cordate at the base, sessile, rounded at the apex, dull on both sides; venation pinnate with the midrib and the incurved main laterals distinct on both sides. *Inflorescences* at the nodes, pedunculate 3- or 4-rayed umbels of triads with all flowers sessile; peduncle c. 5 mm long; rays 6 mm long. *Corolla* in mature bud 6-merous, probably 24–27 mm long, not seen mature. *Anther* not seen mature, shorter than the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Known only from the type collection from 1450 m altitude; no host recorded.

Note — Closely related to *Amyema caudiciflora*, differing in opposite leaves cordate at the base.

13. *Amyema conspicua* (F.M. Bailey) Danser

Amyema conspicua (F.M. Bailey) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294; Barlow, Austral. J. Bot. 22 (1974) 571; in Handb. Fl. Papua New Guinea 2 (1981) 212. — *Loranthus conspicuus* F.M. Bailey, Queensl. Agric. J. 26 (1911) 198. — Type: *Bancroft s.n.*, Queensland, Eidsvold.

Glabrous except for the very young parts, inflorescences and ovaries white- or brown-tomentose. *Leaves* opposite; lamina oblong to ovate or obovate, 3–8 by 1–4.5 cm, attenuate to cuneate at the base to a petiole 1–6 mm long, rounded at the apex, dull on both sides; venation curvinerved, distinct on both sides. *Inflorescences* at the nodes, pedunculate 2-rayed umbels of triads with the central flowers sessile; peduncle (3–)4–8(–9) mm long; rays 1–2.5 mm long, densely tomentose above and glabrous or sparsely tomentose below; pedicels of the lateral flowers 0.5–1 mm long, with the same indumentum as the rays. *Corolla* in mature bud 4- or 5-merous, 14–25 mm long, slender, weakly clavate and acute at the apex, mostly green, rarely yellow or orange. *Anther* 1.5–2 mm long, about one fifth as long as the free part of the filament.

Distribution — Australia; *Malesia*: New Guinea.

Habitat & Ecology — See under the subspecies.

Notes — 1. There are 3 subspecies, of which 2 occur in Malesia. The external differences between these are probably not greater than the diversity within other polymorphic Malesian species; recognition of subspecies is more relevant in Australia, where ecogeographic divergence in open communities across a large land area is more striking, and may reflect stronger differentiation of gene pools.

2. The species is one of the relatively few loranthids in Malesia which lacks epicortical runners.

KEY TO THE SUBSPECIES

- 1a. Indumentum white; leaves widest at or below the middle, not recurved at the margin **a. subsp. *conspicua***
- b. Indumentum brown, mixed with white on the ovary; leaves widest above the middle, recurved at the margin **b. subsp. *fulvicalyx***

a. subsp. *conspicua*

Distribution — Eastern Australia; *Malesia*: Papua New Guinea, Gulf Province.

Habitat & Ecology — In Australia known from coastal districts, in open and closed forests, parasitic on many hosts, including mangroves, but common on *Alphitonia*. In New Guinea known only from mangrove communities; the only recorded host is *Avicennia*.

b. subsp. *fulvicalyx* Barlow

Amyema conspicua (F.M. Bailey) Danser subsp. *fulvicalyx* Barlow, Austral. J. Bot. 22 (1974) 573. — Type: *Barlow 951*, Papua New Guinea, Wau.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Disturbed forests, 1200–1800 m; no hosts recorded.

14. *Amyema corniculata* Danser

Amyema corniculata Danser, Brittonia 2 (1936) 133; Barlow, Austral. J. Bot. 22 (1974) 573; in Handb. Fl. Papua New Guinea 2 (1981) 212. — Type: *Brass 4564*, Papua New Guinea, Murray Pass.

Glabrous. *Leaves* opposite; lamina ovate to nearly orbicular, 2–4 by 1.8–2.5 cm, shortly cuneate at the base to a petiole 2–4 mm long, rounded at the apex, glossy above, dull below; venation pinnate with only the midrib faintly visible. *Inflorescences* at the nodes, pedunculate 4-rayed umbels of triads with the central flowers sessile; peduncle 19–26 mm long, very slender; rays 3–4 mm long, spreading, thicker than the peduncle; pedicels of the lateral flowers c. 2 mm long; bracts with complex dorsal protuberances. *Corolla* in mature bud 4-merous, 16–18 mm long, very slender, weakly clavate and acute at the apex, red. *Anther* c. 1 mm long, about one third as long as the free part of the filament.

Distribution — *Malesia*: New Guinea, known only from Mt Albert Edward in Papua New Guinea.

Habitat & Ecology — Subalpine forests, 2840 m altitude; no hosts recorded.

Note — Closely related to other subalpine *Amyema* species in New Guinea; for differences see Barlow, Austral. J. Bot. 22 (1974) 573; Blumea 36 (1992) 323.

15. *Amyema cuernosensis* (Elmer) Barlow

Amyema cuernosensis (Elmer) Barlow, Blumea 36 (1992) 323. — *Loranthus cuernosensis* Elmer, Leaflet Philipp. Bot. 2 (1908) 469. — *Dicymanthes cuernosensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Elmer 9525*, lecto, Philippines, Negros.

Dicymanthes breviflora Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 363; Backer & Bakh. f., Fl. Java 2 (1965) 71. — Type: *Forsten s.n.*, Celebes, Tondano.

Dicymanthes lombocana Danser, Blumea 2 (1936) 58. — Type: *Elbert 1700*, Lombok, Mt Rindjani.

Glabrous or the inflorescence and flowers sparsely brown-tomentose. *Leaves* opposite; lamina elliptic to ovate, 6–20 by 3–8 cm, truncate to cordate at the base, sessile, usually weakly acuminate and acute at the apex, grey and often glossy above, dull brown below; venation pinnate with the midrib prominent towards the base and the main laterals visible on both sides. *Inflorescences* at the nodes; a subsessile 6-flowered head of 2 sessile triads on a short or obscure peduncle 0.5–1.5(–2.5) mm long. *Corolla* in mature bud 5-merous, (12–)17–23 mm long, slender, very weakly clavate and acute or obtuse at the apex, yellow to red, sometimes paler below. *Anther* (1–)2.5–4 mm long, usually about equal to the free part of the filament.

Distribution — *Malesia*: Java, Philippines, Celebes, Lesser Sunda Islands (Bali, Lombok, Flores).

Habitat & Ecology — 800–1800 m altitude; the only recorded host is *Lantana*.

Notes — 1. Related to *Amyema edanoi*; for differences see Barlow, *Blumea* 36 (1992) 324.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

16. *Amyema curranii* (Merr.) Danser

Amyema curranii (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Loranthus curranii* Merr., Philipp. J. Sc., Bot. 4 (1909) 144. — Type: *Curran FB 5035*, holo, Luzon, Mt Santo Tomas; *Jacobs 7578*, neo, Luzon, Mt Tabayoc.

Glabrous except for the inflorescences and flowers shortly tomentose. *Leaves* ternate or scattered ternate; lamina narrowly ovate, 5–18 by 1.5–5 cm, shortly cuneate from the rounded base to a petiole 5–18 mm long, shortly acuminate and acute at the apex, glossy above, dull below; venation pinnate with the midrib prominent below and the midrib and main laterals distinct above. *Inflorescences* at the nodes, pedunculate 18- to 40-rayed umbels of triads with the central flowers sessile or very shortly pedicellate and the lateral flowers pedicellate; peduncle 6–13 mm long, dilated at the apex; rays 3–4 mm long; pedicels of the central flowers 0–0.3 mm long, of the lateral flowers 0.5–1.5 mm long. *Corolla* in mature bud 4-merous, 30–35 mm long, slender, clavate and obtuse at the apex, red. *Anther* 2–3 mm long, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — 1200–2400 m altitude; no hosts recorded.

Note — Similar to *Amyema incarnatiflora*, differing in its variably pedicellate 4-merous flowers.

17. *Amyema dilatipes* Barlow

Amyema dilatipes Barlow, Austral. J. Bot. 22 (1974) 575; in Handb. Fl. Papua New Guinea 2 (1981); Van Royen, Alpine Fl. New Guinea 3 (1982) 2264. — Type: *Brass 30053*, Papua New Guinea, Mt Wilhelm.

Glabrous. *Leaves* ternate or quaternate; lamina narrowly ovate to elliptic, (2–)4–7 by 1.2–3 cm, shortly cuneate at the base to a petiole (2–)4–6 mm long, acute at the apex, glossy above, dull below; venation pinnate with the midrib distinct on both sides and the main laterals visible above. *Inflorescences* at the nodes and on the epicortical runners, pedunculate 14- to 22-rayed umbels of tetrads with the central flowers sessile; peduncle mostly 30–70 mm long, dilated up to 7 mm wide at the apex; rays 7–11 mm long; pedicels of the lateral flowers 3–5 mm long; bracts variously lobed, branched or twisted. *Corolla* in mature bud 4-merous, 25–40 mm long, slender, clavate and acute to rounded at the apex, red or orange. *Anther* 2–3 mm long, about equal to the free part of the filament. — Fig. 5d, e.

Distribution — *Malesia*: Papua New Guinea (Eastern Highlands Province).

Habitat & Ecology — Subalpine communities from 3300 to 3750 m altitude; recorded hosts include *Eurya* and *Rapanea*.

Note — For a discussion of apparent phantom hybrids, see Barlow, *Blumea* 36 (1992) 326.

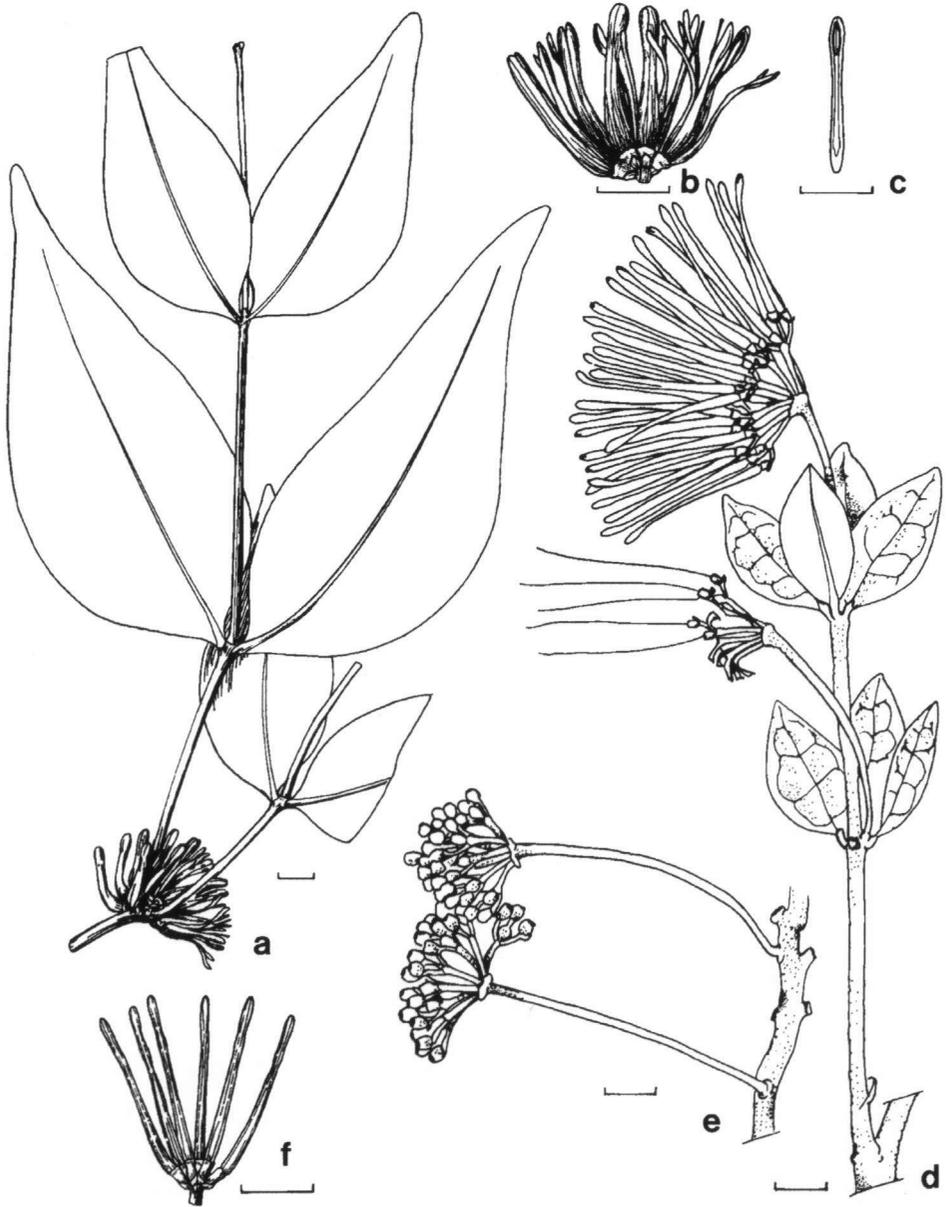


Fig. 5. *Amyema edanoi* (Merr.) Barlow. a. Flower-bearing twig; b. inflorescence; c. section of flower bud. — *A. dilatipes* Barlow. d. Flower-bearing twig; e. inflorescences with young fruit. — *A. hexameres* (Danser) Barlow. f. Inflorescence (a–e: not cited; f: *Lam* 3621). a–c Redrawn from Danser (1935); d, e redrawn from Barlow (1981); f redrawn from Danser (1931). Scale bars represent 1 cm.

18. *Amyema edanoi* (Merr.) Barlow

Amyema edanoi (Merr.) Barlow, *Blumea* 36 (1992) 328. — *Loranthus edanoi* Merr., *Philipp. J. Sc., Bot.* 13 (1918) 275. — *Dicymanthes edanoi* (Merr.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 311. — Type: *Ramos & Edaño BS 26241*, lecto, Luzon, Mt Umangan. [For additional synonymy see Barlow, *Blumea* 36 (1992) 328].

Glabrous or the inflorescence and flowers sparsely brown tomentose. *Leaves* opposite; lamina narrowly ovate to ovate, 9–15(–22) by 4.5–7(–11) cm, shortly cuneate to slightly cordate at the base, sessile, weakly acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib and the main laterals visible on both sides. *Inflorescences* at the nodes, a 6-flowered head of 2 sessile triads on a peduncle 2–6 mm long. *Corolla* in mature bud 5-merous, 11–16(–23) mm long, slender, weakly clavate and acute at the apex, red or yellowish brown. *Anther* mostly c. 2.5 mm long, usually longer than the free part of the filament. — **Fig. 5a–c.**

Distribution — *Malesia*: Philippines, Celebes.

Habitat & Ecology — Humid forests from 0 to 1000 m altitude; recorded hosts include *Ficus* and *Zanthophyllum*.

Notes — 1. Related to *Amyema cuernosensis*; for differences see there.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

19. *Amyema enneantha* Barlow

Amyema enneantha Barlow, *Blumea* 36 (1992) 329. — Type: *Kostermans & Wirawan 706*, Flores, Mt Ranaka.

Glabrous. *Leaves* ternate; lamina narrowly ovate, 8–15 by 3.5–6 cm, attenuate at the base to an obscure petiole 0–5 mm long, shortly acuminate and acute at the apex, dark grey and glossy above, dull brown below; venation pinnate, obscure except for the midrib prominent and raised towards the base on both sides. *Inflorescences* at the nodes, a subsessile 9-flowered head of 3 sessile triads on a very short or obscure peduncle 0.5–1 mm long. *Corolla* in mature bud 5-merous, 22–30 mm long, moderately robust, almost cylindrical, obtuse at the apex, pink or red, sometimes white below. *Anther* 3–4.5 mm long, usually slightly longer than the free part of the filament.

Distribution — *Malesia*: Lesser Sunda Islands (Flores).

Habitat & Ecology — 1500–2400 m altitude; no hosts recorded.

Note — Related to *Amyema cuernosensis*. For discussion of differences from this species and the equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298, 330.

20. *Amyema fasciculata* (Blume) Danser

Amyema fasciculata (Blume) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 295; Backer & Bakh. f., *Fl. Java* 2 (1965) 71; Barlow, *Blumea* 36 (1992) 330. — *Loranthus fasciculatus* Blume, *Bijdr.* (1826) 661. — Type: *Blume s.n.*, Java, Mt Ceremai.

Amyema aquilonia Danser, Philipp. J. Sc. 58 (1935) 86. — Type: *Ramos BS 33296*, Luzon, Mt Palimlim.

Amyema apoda Barlow, Austral. J. Bot. 22 (1974) 565; in Handb. Fl. Papua New Guinea 2 (1981) 209. — Type: *Pleyte 708*, Irian Jaya, Sorong.

[For guide to further synonymy see Barlow, *Blumea* 36 (1992) 330].

Glabrous or the young inflorescence and flowers tomentose. *Leaves* opposite, ternate or quaternate; lamina very variable, narrowly elliptic to obovate, (3–)5–10(–20) by 1–4(–12) cm, attenuate at the base to a winged petiole obscure or up to 20 mm long, usually obtuse at the apex, dull on both sides or somewhat lustrous above; venation pinnate with the midrib distinct towards the base. *Inflorescences* at the nodes and along the internodes, simple 2- to 4-flowered umbels; peduncle slender, 1–6 mm long; rays (0.5–) 2–3 mm long. *Corolla* in mature bud 4- or rarely 5-merous, 14–18 mm long, rather slender, obtuse at the apex, mostly red or violet below and green above. *Anther* 2–2.5 mm long, much longer than the free part of the filament. — **Fig. 9e, f.**

Distribution — *Malesia*: Philippines, Borneo and Java southeastwards to Bird's Head Peninsula in New Guinea.

Habitat & Ecology — 0–1500 m altitude; no hosts recorded.

Note — The species can be confused with *Amyema beccarii*; for discussion see Barlow, *Blumea* 36 (1992) 314.

21. *Amyema finisterrae* (Warb.) Danser

Amyema finisterrae (Warb.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 213; Van Royen, *Alpine Fl. New Guinea* 3 (1982) 2259. — *Loranthus finisterrae* Warb., Bot. Jahrb. 16 (1893) 20. — Type: *Hellwig 322*, Papua New Guinea, Finisterre Mts.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 332; Barlow, Austral. J. Bot. 22 (1974) 576].

Glabrous. *Leaves* opposite; lamina oblong to elliptic or spatulate, 1.8–4(–6) by 1.5–3 cm, cuneate at the base to a petiole 4–7 mm long, mostly rounded (rarely acuminate and acute) at the apex, dull on both sides or somewhat lustrous above, recurved at the margins; venation pinnate with the midrib usually visible and the main laterals diverging near the base. *Inflorescences* at the nodes, a single pedicellate flower on a slender ebracteate peduncle 2–4(–6) mm long (i.e., a flower on a jointed 'pedicel'); pedicel 1.5–3 mm long, slender, wider at the apex, usually with a single bract. *Corolla* in mature bud 4-merous, (13–)20–35 mm long, quadrangular, sometimes winged, acute or obtuse at the apex, mostly dark pink, red or purple, often paler or shading to yellow or green above. *Anther* 2–3 mm long, about half as long as the free part of the filament. — **Fig. 6c.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Primary and secondary humid forests, 1300–2600 m altitude; recorded hosts include *Acalypha*, *Aglaia*, *Castanopsis*, *Dimorphanthera*, *Dodonaea*, *Ficus*, and *Glochidion*.

Note — For discussion of inflorescence structure and comparison with the related *Amyema hastifolia*, see Barlow, *Blumea* 36 (1992) 332.

22. *Amyema friesiana* (K. Schum.) Danser

Amyema friesiana (K. Schum.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295; Barlow, Austral. J. Bot. 22 (1974) 577; in Handb. Fl. Papua New Guinea 2 (1981) 215. — *Loranthus friesianus* K. Schum. in K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Schutzgeb. Südsee (1905) 258. — Type: *Nyman 41*, lecto, Papua New Guinea, 'Stephansort'.

Glabrous except for the inflorescences and flowers sparsely to densely white- or brown-tomentose. *Leaves* opposite; lamina lanceolate to broadly ovate, often falcate or oblique, (6-)8-15(-20) by 3-7(-10) cm, shortly cuneate at the base to a petiole (8-) 10-20(-30) mm long, mostly acuminate and acute at the apex, dull on both sides; venation nearly curvined, distinct on both sides. *Inflorescences* at the nodes, pedunculate 5- to 8-rayed umbels of triads with all flowers sessile; peduncle 18-30 mm long; rays 5-10 mm long. *Corolla* in mature bud 6-merous, 28-35 mm long, slender, weakly clavate and acute or obtuse or rounded at the apex, orange or red, often paler or shading to yellow or green above. *Anther* 2.5-3 mm long, about 3 times as long as the free part of the filament. — Fig. 8c, d.

Distribution — Australia (Cape York Peninsula); *Malesia*: New Guinea.

Habitat & Ecology — Primary and secondary humid forests at 0-2600 m altitude but mostly at 1500-2000 m; recorded hosts include *Acalypha*, *Callicarpa*, *Elaeocarpus*, *Ficus*, *Geunisia*, *Macaranga*, *Nauclea*, *Nothofagus* and commonly *Homalanthus*.

Note — For discussion of species distinction within the *Amyema scandens* complex, see Barlow, Blumea 36 (1992) 333, 363, 371.

23. *Amyema gravis* Danser

Amyema gravis Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 336; Backer & Bakh. f., Fl. Java 2 (1965) 71. — Type: *van Steenis 2645*, lecto, Java, Pasuruan.

Glabrous. *Leaves* opposite; lamina obovate, 2.5-5 by 1.5-3 cm, shortly cuneate to truncate at the base to a petiole mostly 3-5 mm long, rounded at the apex, thick, dull on both sides; venation indistinct. *Inflorescences* at the nodes, pedunculate 2- to 5-rayed umbels of triads with the central flowers sessile; peduncle (3-)6-18(-22) mm long; rays 3-6 mm long; pedicels of the lateral flowers 1-2 mm long. *Corolla* in mature bud 4-merous, 28-30 mm long, inflated at the base, clavate and obtuse at the apex, yellowish green below and red above. *Anther* c. 4 mm long, transversely septate, slightly longer than the free part of the filament.

Distribution — *Malesia*: Borneo, Java.

Habitat & Ecology — Maritime communities, parasitic on mangroves, recorded on *Avicennia*, *Rhizophora*, and *Sonneratia*.

Note — For comparison with other mistletoe parasites of mangroves, see Barlow, Blumea 36 (1992) 335.

24. *Amyema haenkeana* (Schult. & Schult. f.) Danser

Amyema haenkeana (Schult.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — *Loranthus haenkeanus* Schult. & Schult. f., Syst. Veg. 7, 1 (1828) 113. — Type: *Haenke s.n.*, Philippines. [For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 63].

Glabrous except for a dense tawny tomentum on the inflorescence and flowers. *Leaves* opposite or ternate, usually scattered; lamina lanceolate or narrowly ovate, 8–22 (–30) by 1–7 (–12) cm, shortly cuneate to slightly cordate at the base to a petiole 10–25 mm long, somewhat acuminate but finally obtuse or rounded at the apex, dull on both sides or slightly lustrous above; venation pinnate with the midrib prominent below. *Inflorescences* at the nodes and on the epicortical runners, pedunculate 30- to 50-rayed umbels of triads with the central flowers mostly sessile; peduncle (10–)20–50 mm long, dilated at apex; rays 5–10 mm long; pedicels of the lateral flowers 1–2 mm long. *Corolla* in mature bud 5- or 6-merous, 30–38 mm long, slightly dilated at the base, clavate and obtuse at the apex, mostly red, rarely yellow; petals shortly coherent at the base after anthesis. *Anther* 1–4 mm long, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — 0–450 m altitude; no hosts recorded.

25. *Amyema halconensis* (Merr.) Danser

Amyema halconensis (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — *Loranthus halconensis* Merr., Philipp. J. Sc., Bot. 2 (1907) 271. — Type: *Merrill 5664*, lecto, Mindoro, Mt Halcon. [For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 69].

Glabrous except for the inflorescences and flowers sparsely to densely white- or pale brown-tomentose. *Leaves* in whorls of 3–8; lamina lanceolate to oblong, 10–21 by 2–8 cm, shortly cuneate at base to a petiole 8–20 mm long, usually acuminate and acute at apex, glossy above, dull below; venation pinnate, distinct above and the midrib prominent for its full length below. *Inflorescences* at the nodes and on the epicortical runners, pedunculate 6- to 8-rayed umbels of triads with all flowers variably pedicellate; peduncle 3–7 mm long; rays 1–3 mm long; pedicels 0.5–1.5 mm long, rarely obsolete. *Corolla* in mature bud (4–)5(–6)-merous, 22–33 mm long, slightly dilated in the lower part, weakly clavate and acute at apex, yellow; petals long coherent after anthesis, especially in the lower 1–2 mm. *Anther* 2–3 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Lowlands, only recorded from 0 to 100 m altitude; no hosts recorded.

Note — For species distinction within the *Amyema polytrias* species group, see Barlow, Blumea 36 (1992) 356.

26. *Amyema hastifolia* (Ridl.) Danser

Amyema hastifolia (Ridl.) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 337; Barlow, Austral. J. Bot. 22 (1974) 577; in Handb. Fl. Papua New Guinea 2 (1981) 215. — *Loranthus hastifolius* Ridl., Trans. Linn. Soc. Bot. 9 (1916) 146. — *Rhizomonanthes hastifolia* (Ridl.) Danser, Verh. Kon. Ned. Akad. Wet. Amst. Afd. Natuurk., Sect. 2, 29 (1933) 101. — Type: *Kloss s.n.*, New Guinea, Irian Jaya, Nassau Mts.

Loranthus curvifolius & *heterochromus* K. Krause, Bot. Jahrb. 57 (1922) 465. — *Amyema curvifolia* & *heterochroma* (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1929) 330, 337; Barlow, Austral. J. Bot. 22 (1974) 574. — Types: *Ledermann 13077 & 12569*, New Guinea, 'Felsspitze'.

Glabrous except for the inflorescence and ovary thinly tomentose. *Leaves* opposite; lamina elliptic to ovate, 4–7 by 2–5 cm, shortly cuneate at the base to a petiole c. 2 mm long, shortly acuminate and acute at the apex, lustrous above, dull below; venation pinnate but almost curvinnerved, with the midrib distinct on both sides and the main laterals distinct above. *Inflorescences* at the nodes, along the internodes and on the epicortical runners, a single pedicellate flower on a slender ebracteate peduncule about 2 mm long (i. e., a flower on a jointed 'pedicel'); pedicel 0.5–1 mm long, funnel-shaped, with a single bract. *Corolla* in mature bud 4-merous, c. 40 mm long, quadrangular, acute at the apex, mostly red below and paler red or yellow above. *Anther* c. 5 mm long, about equal to the free part of the filament. — Fig. 6 a, b.

Distribution — *Malesia*: New Guinea (Irian Jaya).

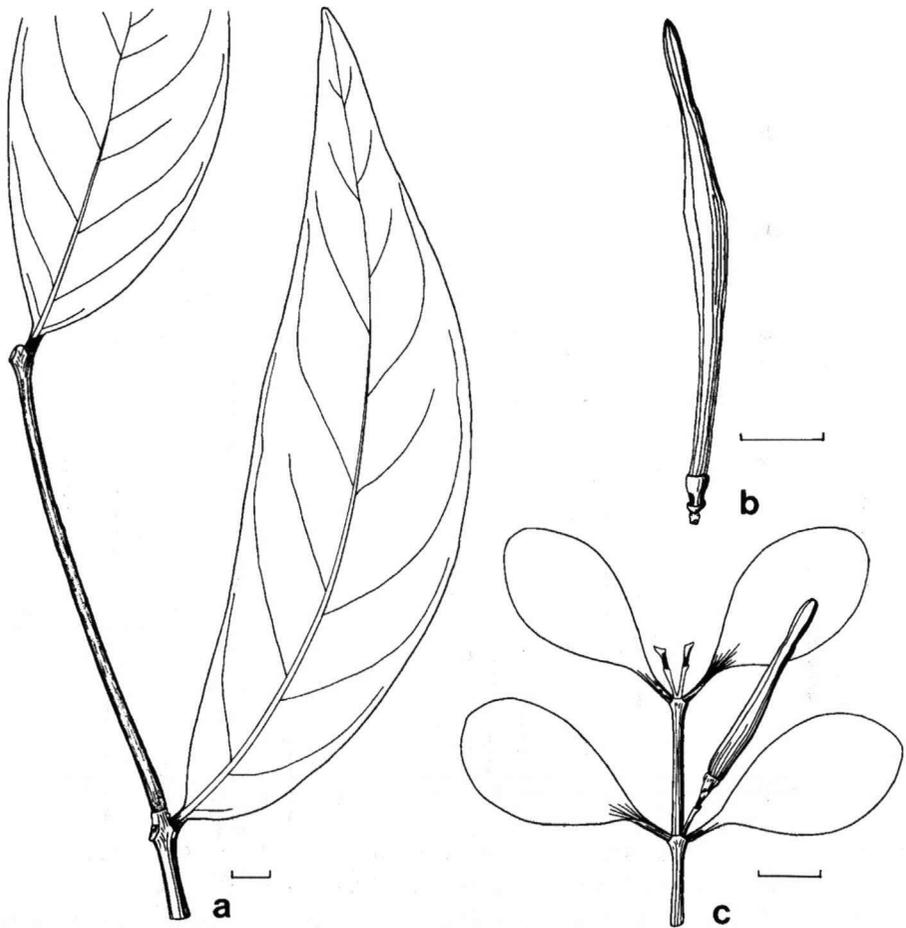


Fig. 6. *Amyema hastifolia* (Ridl.) Danser. a. Twig with leaves; b. flower bud. — *A. finisterrae* (Warb.) Danser. c. Twig with leaves and flowers (a, b: *Ledermann 13077*; c: *Hellwig 322*). Redrawn from Danser (1931). Scale bars represent 1 cm.

Habitat & Ecology — Highlands, 1250–2800 m altitude; no hosts recorded.

Note — For discussion of inflorescence structure, comparison with the related *Amyema finisterrae*, and synonymy of *Amyema curvifolia* see Barlow, *Blumea* 36 (1992) 332, 338.

27. *Amyema hexameres* (Danser) Barlow

Amyema hexameres (Danser) Barlow, *Blumea* 36 (1992) 339. — *Dicymanthes hexameres* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 364. — Type: *Lam 3621*, Moluccas, Guguti.

Glabrous except for the ovary and sometimes the corolla shortly and sparsely brown-tomentose. *Leaves* opposite; lamina elliptic to ovate, 8–15 by 5–7.5 cm, truncate and finally shortly cuneate at the base to a petiole 5–10 mm long, obtuse or broadly acute at the apex, glossy grey-green above, dull brown below; venation pinnate with the midrib raised below and the main laterals visible. *Inflorescences* at the nodes and on the epicortical runners, a 6-flowered head of 2 sessile triads on a peduncle (0.5–)2–2.5 mm long. *Corolla* in mature bud 5-merous, 20–25 mm long, relatively slender, weakly clavate and acute, pink or red and sometimes yellow above. *Anther* 2.5–4 mm long, usually slightly longer than the free part of the filament. — Fig. 5f.

Distribution — *Malesia*: Northern Moluccas.

Habitat & Ecology — Probably in humid forests, 0–1050 m altitude; no hosts recorded.

Notes — 1. Similar to *Amyema hexantha*; for differences see Barlow, *Blumea* 36 (1992) 340.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

28. *Amyema hexantha* (Merr.) Barlow

Amyema hexantha (Merr.) Barlow, *Blumea* 36 (1992) 340. — *Loranthus hexanthus* Merr., Philipp. J. Sc., Bot. 4 (1909) 137. — *Dicymanthes hexantha* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Williams 2565*, lecto, Mindanao, Mt Apo.

Glabrous. *Leaves* opposite; lamina mostly ovate, 6–18 by 3–9 cm, cuneate at the base to a petiole 5–10 mm long, acuminate and obtuse at the apex, dull on both sides but slightly darker above; venation pinnate with the midrib prominent below and the midrib and main laterals visible above. *Inflorescences* at the nodes, a 6-flowered head of 2 sessile triads on a peduncle 3–5 mm long. *Corolla* in mature bud 5-merous, c. 17 mm long, slightly inflated at the base, clavate and obtuse at the apex, angular in the upper part, red. *Anther* 2–2.5 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — 850–1800 m altitude; no hosts recorded.

Notes — 1. Similar to *Amyema hexameres*; for differences see Barlow, *Blumea* 36 (1992) 340.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

29. *Amyema incarnatiflora* (Elmer) Danser

Amyema incarnatiflora (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — *Loranthus incarnatiflorus* Elmer, Leaflet. Philipp. Bot. 6 (1913) 1969. — Type: *Elmer 11817*, lecto, Mindanao, Mt Apo.

[For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 70].

Glabrous except for the inflorescence and ovary white-tomentose and the corolla sparsely so. *Leaves* opposite or ternate, frequently scattered; lamina lanceolate to ovate, 5–12 by 2–6.5 cm, shortly cuneate to weakly cordate at the base to a petiole 5–25 mm long, mostly acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib visible above and prominent below. *Inflorescences* at the nodes and on the epicortical runners, pedunculate 10- to 30-rayed umbels of triads with all flowers sessile; peduncle 8–25 mm long, dilated at the apex; rays 1–6 mm long. *Corolla* in mature bud 5-merous, 25–30 mm long, slightly dilated at the base, clavate and obtuse at the apex, pink or red and sometimes shading to green above. *Anther* 1.5–2.5 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — 0–1725 m altitude; no hosts recorded.

Note — Similar to *Amyema curranii*, which differs in its variably pedicellate 4-merous flowers.

30. *Amyema irrubescens* Barlow

Amyema irrubescens Barlow, Blumea 36 (1992) 342. — Type: *van Balgooy 3326*, Celebes, Mt Roroka Timbu.

Glabrous. *Leaves* opposite, ternate or scattered; lamina ovate, 6–9 by 3–4.5 cm, attenuate at the base to a petiole 4–8 mm long, broadly acute or obtuse at the apex, dark and glossy above, dull below; venation pinnate with the midrib prominent below. *Inflorescences* at the nodes and along the internodes, pedunculate 9- to 11-rayed umbels of triads with all flowers shortly pedicellate; peduncle 11–16 mm long; rays 3–4.5 mm long; pedicels 0.5–1.5 mm long or sometimes obsolete. *Corolla* in mature bud 4-merous, c. 32 mm long, slender, weakly clavate and acute at the apex. *Anther* 2.5–3 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Celebes.

Habitat & Ecology — Known from two collections at 2450 m altitude; recorded as parasitic on *Phyllocladus*. Hosts other than dicotyledons are rare in *Loranthaceae*.

Note — For species distinction within the *Amyema polytrias* species group, see Barlow, Blumea 36 (1992) 343, 356.

31. *Amyema kebarensis* Barlow

Amyema kebarensis Barlow, Austral. J. Bot. 22 (1974) 579; in Handb. Fl. Papua New Guinea 2 (1981) 216. — Type: *van Royen & Sleumer 8256*, Irian Jaya, Kebar Valley.

Glabrous except for a few scattered hairs on the inflorescences and flowers. *Leaves* opposite; lamina narrowly lanceolate, 4–7 cm long, mostly 0.4–0.7 cm wide, attenuate

at the base to a petiole 1–3 mm long, acuminate and acute at the apex, dull on both sides, often rolled when dry; venation obscure. *Inflorescences* at the nodes, pedunculate 3- or 4-rayed umbels of triads with the central flowers sessile; peduncle mostly 8–15 mm long, slender; rays c. 8 mm long, slender, wider towards the apex; pedicels of the lateral flowers 2–3 mm long. *Corolla* in mature bud 4-merous, c. 18 mm long, very slender, rounded at the apex, red or purple below and green or yellow above. *Anther* c. 2 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea (Bird's Head Peninsula).

Habitat & Ecology — 700–2100 m altitude; recorded hosts include *Clethra*, *Vaccinium*, and *Trochocarpa*.

32. *Amyema longipes* (Danser) Barlow

Amyema longipes (Danser) Barlow, *Blumea* 36 (1992) 344. — *Dicymanthes longipes* Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 365. — Type: *Sarip* 377, Bali, Mt Batukau.

Glabrous. *Leaves* opposite; lamina ovate to obovate, 3–8 by 2–5 cm, attenuate to shortly cuneate at the base to a petiole 2–7 mm long, obtuse or rounded at the apex, dull on both sides but slightly darker above; venation pinnate with the midrib prominent below and the other veins obscure. *Inflorescences* at the nodes, a 6-flowered head of 2 sessile triads on a peduncle 5–11 mm long. *Corolla* in mature bud 5-merous, 20–23 mm long, rather slender, not clavate, acute at the apex, red. *Anther* c. 2 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Bali.

Habitat & Ecology — 1600–1935 m altitude; no hosts recorded.

Notes — 1. Similar to *Amyema hexantha*; for differences see Barlow, *Blumea* 36 (1992) 344.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

33. *Amyema luzonensis* (Schult. & Schult. f.) Danser

Amyema luzonensis (Schult. & Schult. f.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 296. — *Loranthus luzonensis* Schult. & Schult. f., *Syst. Veg.* 7, 1 (1829) 104. — Type: *Haenke s. n.*, Philippines.

[For additional synonymy see Danser, *Philipp. J. Sc.* 58 (1935) 72; Barlow, *Blumea* 36 (1992) 345].

Glabrous except for the inflorescence and flowers sparsely tomentose. *Leaves* quaternate; lamina oblong to obovate, 1–6 by 0.8–2 cm, truncate or rounded at the base, sessile, rounded at the apex, glossy above, dull below; venation pinnate with the midrib and the main laterals faintly visible above and the midrib prominent below. *Inflorescences* at the nodes, pedunculate mostly 4-rayed umbels of triads usually with all flowers pedicellate but sometimes with the central flowers and very rarely the lateral flowers sessile; peduncle 7–30 mm long; rays 1–4 mm long; pedicels 0–2 mm long. *Corolla* in mature bud 4-merous, 25–38 mm long, gradually inflated to 3/4 of its length, thence attenuate

to an acute apex, red orange or yellow below, sometimes shading to green above. *Anther* 2–4 mm long, longer than the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — 0–900 m altitude; no hosts recorded.

Note — Closely related to *Amyema benguetensis* and *A. rhytidoderma*; for discussion see Barlow, *Blumea* 36 (1992) 314, 345.

34. *Amyema mackayensis* (Blakely) Danser

Amyema mackayensis (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 216. — *Loranthus mackayensis* Blakely, Proc. Linn. Soc. New South Wales 47 (1922) 392; 48 (1923) 131. — Type: *Tryon s. n.*, Queensland, Mackay.
[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 580; *Blumea* 36 (1992) 345].

Glabrous except for the ovary very rarely sparsely brown-tomentose. *Leaves* opposite; lamina elliptic to orbicular, mostly 2.5–5 cm long, mostly 1.5–4 cm wide, cuneate at the base to a petiole 3–6 mm long, rounded at the apex, thick, dull on both sides; venation curvinerved, obscure. *Inflorescences* at the nodes, pedunculate mostly 3- or 4-rayed umbels of triads with the central flowers sessile; peduncle 6–22 mm long; rays 4–10 mm long; pedicels of the lateral flowers 2–5 mm long. *Corolla* in mature bud 5-merous, 10–28 mm long, slender, clavate and obtuse at the apex, red, yellow or green, sometimes paler above. *Anther* 1.5–3 mm long, about half as long as the free part of the filament.

Distribution — Northern Australia; *Malesia*: southern New Guinea.

Habitat & Ecology — Exclusively in mangrove communities; recorded as parasitic on *Avicennia*, *Camptostemon*, *Ceriops*, *Excoecaria*, *Lumnitzera*, *Rhizophora*, and *Sonneratia*.

Notes — 1. For discussion of status of former subspecies, see Barlow, *Blumea* 36 (1992) 346.

2. The species is one of the relatively few loranthids in *Malesia* which lacks epicortical runners.

35. *Amyema miraculosa* (Miq.) Tiegh.

Amyema miraculosa (Miq.) Tiegh., Bull. Soc. Bot. France 42 (1895) 83, 84. — *Loranthus miraculosus* Miq. in Lehm., Pl. Preiss. 1 (1845) 281. — Type: *Preiss 1609*, Western Australia, Wicklow.
[For additional synonymy see Barlow in Fl. Australia 22 (1984) 98, 99].

Glabrous except for the ovary and young vegetative parts very rarely sparsely tomentose. *Leaves* opposite; lamina lanceolate to elliptic or obovate-spathulate, 2.5–10 by 0.5–3 cm, attenuate or cuneate at the base to a petiole 2–10 mm long, acute to rounded at the apex, dull on both sides; venation curvinerved, distinct on both sides. *Inflorescences* at the nodes, pedunculate 2- or 3-rayed umbels of triads with the central flowers sessile; peduncle 6–30 mm long; rays 3–10 mm long; pedicels of the lateral flowers 1.5–7 mm long. *Corolla* in mature bud 4- or 5-merous, 8–25 mm long, slender, clavate and obtuse at the apex, ridged or winged in the upper part, red, mostly very dark below

and paler above. *Anther* 1–2 mm long, about one quarter as long as the free part of the filament.

Distribution — Australia; *Malesia*: Timor.

Habitat & Ecology — See under the subspecies.

Notes — 1. There are 3 subspecies, of which 1 occurs in Malesia. The differences between these are possibly not greater than the diversity within other polymorphic Malesian species; recognition of subspecies is more relevant in Australia, where ecogeographic divergence in open communities across a large land area is more striking, and may reflect stronger differentiation of gene pools.

2. The species is one of the relatively few loranth in Malesia which lacks epicortical runners.

subsp. *latifolia* Barlow

Amyema miraculosa (Miq.) Tiegh. subsp. *latifolia* Barlow, *Blumea* 36 (1992) 350. — Type: *Forbes 3543*, Timor.

Leaf lamina lanceolate-spathulate, 5–8 by 2–3 cm, thin, attenuate at the base to a petiole c. 5 mm long. *Inflorescence* peduncle c. 20 mm long, deflexed; rays 3, c. 5 mm long, pedicels of the lateral flowers c. 2.5 mm long. *Corolla* 20–25 mm long, purple.

Distribution — *Malesia*: Timor.

Habitat & Ecology — Probably open woodlands; the only host record is *Pittosporum*.

Note — For discussion of relationship with Australian subspecies, see Barlow, *Blumea* 36 (1992) 350.

36. *Amyema novaebritanniae* (K. Schum.) Danser

Amyema novaebritanniae (K. Schum.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 297; Barlow, *Austral. J. Bot.* 22 (1974) 581; in *Handb. Fl. Papua New Guinea* 2 (1981) 217. — *Loranthus novaebritanniae* K. Schum. in K. Schum. & Lauterb., *Nachr. Fl. Deutsch. Schutzgeb. Südsee* (1905) 259. — Type: *Schlechter 13765*, New Britain.

Loranthus jambosae G.M. Schulze, *Notizbl. Berl.-Dahl.* 13 (1936) 53. — *Amyema jambosae* (G.M. Schulze) Danser, *Bull. Jard. Bot. Buitenzorg* III, 14 (1936) 91. — Type: *Peekel 1222*, New Ireland.

Glabrous. *Leaves* opposite; lamina elliptic to ovate, 4–8 by 2–4.5 cm, thin, cuneate at the base to a petiole 10–15 mm long, undulate at the margin, usually acute at the apex, dull on both sides; venation pinnate with the midrib distinct and raised below. *Inflorescences* at the nodes, pedunculate 4- to 7-rayed umbels of triads with the central flowers sessile; peduncle 5–12 mm long; rays 5–8 mm long; pedicels of the lateral flowers 2–3 mm long. *Corolla* in mature bud 5-merous, 14–20 mm long, slender, clavate and obtuse at the apex, mostly red below and yellow or green above. *Anther* 0.7–1.5 mm long, about one quarter as long as the free part of the filament.

Distribution — New Britain, New Ireland.

Habitat & Ecology — Probably in mesic forests, at 0–1060 m altitude; no hosts recorded.

Note — Similar to *Amyema artensis*; for discussion see Barlow, *Blumea* 36 (1992) 351.

37. *Amyema pachypus* (Burkill) Danser

Amyema pachypus (Burkill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297; Barlow, Austral. J. Bot. 22 (1974) 582; in Handb. Fl. Papua New Guinea 2 (1981) 218; Van Royen, Alpine Fl. New Guinea 3 (1982) 2262; Barlow, Blumea 36 (1992) 352. — *Loranthus pachypus* Burkill, Kew Bull. (1899) 109. — Type: *Giulianetti s.n.*, Papua New Guinea, Mt Scratchley.

Amyema clavipes Danser, Brittonia 2 (1936) 131; Barlow, Austral. J. Bot. 22 (1974) 570; in Handb. Fl. Papua New Guinea 2 (1981) 211. — Type: *Brass 4972*, Papua New Guinea, Mt Tafa.

Glabrous except for the inflorescence and flowers rarely sparsely brown tomentose, sometimes glaucous. *Leaves* opposite; lamina elliptic to ovate or obovate, mostly 2.5–6 cm long, mostly 1.2–3 cm wide, attenuate to shortly cuneate at the base to a petiole 2–8 mm long, obtuse or rounded at the apex, sometimes with a small mucro, slightly lustrous above, dull below; venation pinnate with the midrib and the main laterals faintly visible. *Inflorescences* at the nodes, pedunculate 3- to 5-rayed umbels of triads with the central flowers sessile; peduncle mostly 8–16 mm long; rays 3.5–7 mm long, usually thicker than the peduncle; pedicels of the lateral flowers 2–4 mm long. *Corolla* in mature bud 4-merous, 14–19 mm long, slender, clavate and rounded at the apex, pink to dark red. *Anther* 0.5–1 mm long, about one third as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Subalpine communities, from 2300 to 3800 m altitude; recorded hosts include *Dacrycarpus*, *Drimys*, *Podocarpus*, *Prunus*, *Rapanea*, and *Rhododendron*. Hosts other than dicotyledons are rare in *Loranthaceae*.

38. *Amyema plicatula* (K. Krause) Danser

Amyema plicatula (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298; 11 (1931) 342; Barlow, Blumea 36 (1992) 353. — *Loranthus plicatulus* K. Krause, Nova Guinea 14 (1923) 102. — Type: *Lam 641*, New Guinea, Irian Jaya, 'Pionierbivak'.

Amyema obovata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 340; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 217. — Type: *Lam 591*, Irian Jaya, 'Pionierbivak'.

Amyema ovariosa Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 340. — Type: *Docters van Leeuwen 9383*, Irian Jaya, 'Pionierbivak'.

Amyema cephalanthera Danser, Brittonia 2 (1936) 131. — Type: *Brass 6023*, Papua New Guinea, Oriomo River.

Amyema pentactis Danser, Blumea 3 (1940) 397; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 218. — Type: *Clemens 8307a*, Papua New Guinea, 'Sattelberg'.

Amyema duurenii Barlow, Proc. Roy. Soc. Queensl. 75 (1964) 13. — Type: *van Duuren s.n.*, Papua New Guinea, Kairuku.

Amyema angularis Barlow, Austral. J. Bot. 22 (1974) 565; in Handb. Fl. Papua New Guinea 2 (1981) 208. — Type: *Eyma 5387*, Irian Jaya, Wissel Lake region.

Glabrous except for the inflorescence and flowers rarely sparsely brown- or white-tomentose. *Leaves* opposite, ternate, scattered ternate or rarely quaternate; lamina elliptic to ovate or obovate or rarely almost orbicular, mostly 7–13 cm long, mostly 5–8 cm wide, attenuate or cuneate at the base to a petiole mostly 5–15 mm long, broadly acute to rounded at the apex, dull on both sides; venation pinnate with the midrib raised below and other venation obscure. *Inflorescences* at the nodes, pedunculate 4- to 8-rayed umbels of triads with all flowers sessile; peduncle mostly 12–25 mm long; rays 4–10 mm

long. *Corolla* in mature bud 5- or 6-merous, 16–28 mm long, slender, obtuse or rounded at the apex, pink or red. *Anther* c. 2 mm long, about one quarter as long as the free part of the filament. — **Fig. 8e.**

Distribution — Eastern Australia; *Malesia*: New Guinea, New Britain.

Habitat & Ecology — Primary and secondary humid forests, mostly 0–500 m altitude, rarely to 2400 m; recorded hosts include *Calophyllum*, *Discocalyx*, *Dysoxylum*, *Galbulimima*, *Maniltoa*, and *Pasania*.

Note — Closely related to *Amyema scandens*; for differences and species circumscription see Barlow, *Blumea* 36 (1992) 353.

39. *Amyema polillensis* (C. B. Rob.) Danser

Amyema polillensis (C. B. Rob.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — *Loranthus polillensis* C. B. Rob., Philipp. J. Sc., Bot. 6 (1911) 200. — Type: *McGregor BS 10384*, lecto, Philippines, Polillo.

Glabrous. *Leaves* verticillate in whorls of 4–7; lamina elliptic, c. 17 cm long, c. 7 cm wide, attenuate at the base to a petiole 15–25 mm long, shortly acuminate and acute at the apex, thick, dull on both sides; venation pinnate with the midrib visible above and raised below. *Inflorescences* at the nodes, pedunculate 4- to 6-rayed simple umbels; peduncle 8–11 mm long, dilated at the apex; pedicels c. 4 mm long. *Corolla* in mature bud 4-merous, 21–23 mm long. *Anther* c. 2.5 mm long, about 3 times as long as the free part of the filament, with a broad flat connective continuous with a flattened filament c. 0.6 mm wide.

Distribution — *Malesia*: Philippines (Luzon, Polillo).

Habitat & Ecology — Probably low altitudes; no hosts recorded.

Note — For discussion of relationships see Barlow, *Blumea* 36 (1992) 355.

40. *Amyema polytrias* Danser

Amyema polytrias Danser, *Blumea* 3 (1940) 391. — Type: *Grevenstuk 212*, Sumba.

Glabrous except for the inflorescence (especially the rays) and the ovary usually with an indumentum of sparse to dense short stiff erect brown or buff hairs. *Leaves* verticillate in whorls of 3–6 or sometimes more; lamina narrowly ovate to ovate, mostly 10–25 cm long, mostly 4–8 cm wide, cuneate at the base to a petiole mostly 10–35 mm long, shortly acuminate and acute at the apex, lustrous olive above, dull brown below; venation pinnate with the midrib and the main laterals faintly visible on both sides. *Inflorescences* at the nodes and along the epicortical runners, pedunculate 9- to 12-rayed umbels of triads with all flowers pedicellate; peduncle 10–30 mm long, globose at the apex with a deflexed lip; rays mostly 3.5–5.5 mm long; pedicels variable, 0.2–3 mm long. *Corolla* in mature bud 4-merous, 25–40 mm long, slender, weakly clavate and acute at the apex, pink or red below and yellow or green above. *Anther* 2–3.5 mm long, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Celebes, Sumba, Moluccas.

Habitat & Ecology — 0–2200 m altitude; the only recorded host is *Knema*.

Note — For discussion of species distinction in the *Amyema polytrias* complex, and relationships, see Barlow, *Blumea* 36 (1992) 356.

41. *Amyema queenslandica* (Blakely) Danser

Amyema queenslandica (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298; Barlow, *Blumea* 36 (1992) 359. — *Loranthus queenslandicus* Blakely, Proc. Linn. Soc. New S Wales 47 (1922) 392.

— Type: *Dixon s.n.*, Queensland, near Herberston.

Amyema involvens Barlow, Austral. J. Bot. 22 (1974) 578; in Handb. Fl. Papua New Guinea 2 (1981) 216. — Type: *Barlow 943*, Papua New Guinea, Mt Kaindi.

Glabrous except for the young shoots, inflorescences and sometimes the flowers sparsely tomentose. *Leaves* opposite; lamina ovate to orbicular or broadly spatulate, 3–8 by 2.5–6 cm, shortly cuneate at the base to a petiole 5–10 mm long, thick, rounded at the apex, slightly lustrous above, dull below; venation almost curvinerved, indistinct. *Inflorescences* at the nodes, pedunculate 4- to 8-rayed robust umbels of triads with the central flowers sessile; peduncle 10–25 mm long; rays 5–10 mm long; pedicels of the lateral flowers 3–5 mm long; bracts dimorphic, the central ones acute, erect, the lateral ones concave, rounded, enclosing the ovary. *Corolla* in mature bud 5- or 6-merous, 30–35 mm long, robust, obtuse at the apex, mostly yellow, rarely orange or red. *Anther* 3–4 mm long, about equal to the free part of the filament.

Distribution — Australia (North Queensland); *Malesia*: New Guinea.

Habitat & Ecology — Humid forests, 840–2440 m altitude in New Guinea; recorded hosts there include *Nothofagus* and *Timonius*.

42. *Amyema rhytidoderma* Barlow

Amyema rhytidoderma Barlow, *Blumea* 36 (1992) 359. — Type: *Jacobs 7332*, Luzon, Mt Pulog.

Glabrous except for inflorescences and flowers with a dense indumentum of short, straight or crisped, white to brown, simple hairs. *Leaves* quaternate; lamina ovate, 7.5–10 by 3.5–5.5 cm, contracted to truncate at the base, sessile or with a petiole to 2 mm long, acute at the apex, olive green and finely rugose above, pale brown and smooth below; venation pinnate, visible on both surfaces with the midrib raised below. *Inflorescences* at the nodes, pedunculate 3-rayed umbels of triads with all flowers pedicellate; peduncle c. 4 mm long; rays c. 1 mm long; pedicels 0.5–1 mm long. *Corolla* in bud (perhaps immature) 4-merous, c. 18 mm long, slender, acute, bright red. *Anther* c. 2 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — 2300–2500 m altitude; no host recorded.

Note — Closely related to *Amyema luzonensis* and *A. benguetensis*; for differences and species circumscription see Barlow, *Blumea* 36 (1992) 314.



Fig. 7. *Amyema rigidiflora* (K. Krause) Danser. Kubor Range, Papua New Guinea (Vink 16386). Photo W. Vink, 1963.

43. *Amyema rigidiflora* (K. Krause) Danser

Amyema rigidiflora (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298; Barlow, Blumea 36 (1992) 360. — *Loranthus rigidiflorus* K. Krause, Bot. Jahrb. 57 (1922) 465. — *Amyema strongylophylla* subsp. *rigidiflora* (K. Krause) Barlow, Austral. J. Bot. 22 (1974) 594; in Handb. Fl. Papua New Guinea 2 (1981) 224. — Type: *Ledermann 9095*, lecto, New Guinea, Sepik.

Loranthus obtusus K. Krause, Bot. Jahrb. 57 (1922) 479, 480. — Type: *Schlechter 17991*, Papua New Guinea, Finisterre Mts.

Loranthus barbellatus Blakely, Proc. Roy. Soc. Queensl. 34 (1922) 27. — *Amyema barbellata* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294; 11 (1931) 324. — *Amyema strongylophylla* subsp. *barbellata* (Blakely) Barlow, Austral. J. Bot. 22 (1974) 594; in Handb. Fl. Papua New Guinea 2 (1981) 224. — Type: *White 231*, Papua New Guinea, Finisterre Mts.

Glabrous except for the inflorescence and usually the flowers sparsely to densely brown or yellow-brown tomentose. *Leaves* opposite; lamina broadly obovate to nearly orbicular, mostly 4–10 cm long, mostly 3.5–6 cm wide, shortly cuneate at the base to a petiole 5–10 mm long, rounded at the apex, dull on both sides; venation pinnate but somewhat curvined with the midrib and the main laterals visible on both sides. *Inflorescences* at the nodes, pedunculate 7- to 12-rayed umbels of triads with the central flowers sessile; peduncle 15–30 mm long, robust, dilated at the apex; rays 6–13 mm long; pedicels of the lateral flowers 2–4 mm long. *Corolla* in mature bud 5- or 6-merous, 20–40 mm long, moderately robust, acute to truncate at the apex, mostly orange to red below and often grading to yellow above. *Anther* 3–5 mm long, about equal to the free part of the filament. — **Fig. 3 d, 7.**

Distribution — *Malesia*: Celebes (Talaud), New Guinea.

Habitat & Ecology — Open and humid forests, 0–2150 m altitude; recorded hosts include *Aglaiia*, *Castanopsis*, *Eucalyptus*, *Macaranga*, and *Saurauia*.

Note — For distinction as a species from *Amyema strongylophylla*, see Barlow, Blumea 36 (1992) 361.

44. *Amyema scandens* (Tiegh.) Danser

Amyema scandens (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299; Barlow in Handb. Fl. Papua New Guinea 2 (1981) 218. — *Neophylum scandens* Tiegh., Bull. Soc. Bot. France 41 (1894) 509. — Type: *Balansa 498*, New Caledonia, Prony Bay.

[For a guide to extensive additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 583; Blumea 36 (1992) 362].

Glabrous except for the inflorescence and flowers very rarely shortly and sparsely tomentose. *Leaves* mostly in whorls of 5–8; lamina variable, lanceolate to ovate or rarely broadly ovate or obovate, 5–20 by 2.5–7 cm, attenuate, cuneate or rarely truncate at the base to a petiole 3–15 mm long, mostly acute or obtuse or less often rounded at the apex, dull on both sides or with the upper surface somewhat glossy; venation pinnate with the midrib raised below, otherwise obscure. *Inflorescences* at the nodes and along the epicortical runners, pedunculate 4- to 8-rayed umbels of triads with all flowers sessile; peduncle mostly 6–12 mm long; rays 3–10 mm long. *Corolla* in mature bud 5- or

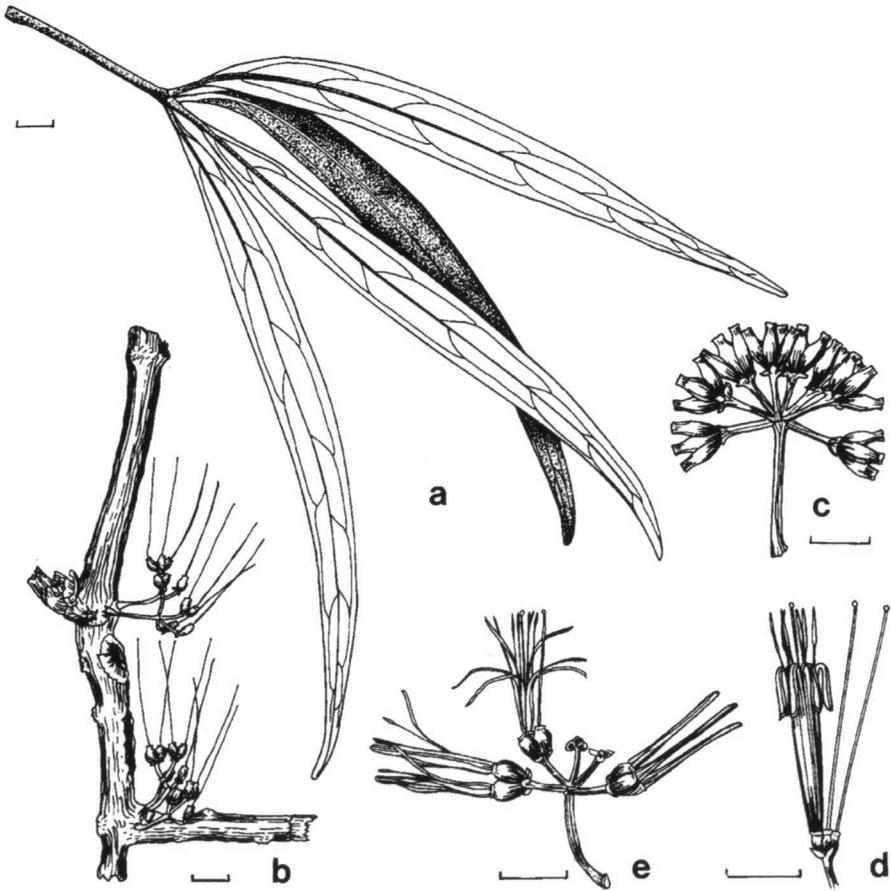


Fig. 8. *Amyema scandens* (Tiegh.) Danser. a. Twig with leaves; b. stem with inflorescences. — *A. friesiana* (K. Schum.) Danser. c. Inflorescence with young fruits; d. triad of flowers. — *A. plicatula* (K. Krause) Danser. e. Inflorescence (a, b: Mayr 640; c: Docters van Leeuwen 11071; d: Ledermann 7019; e: Schlechter 20304). Redrawn from Danser (1931). Scale bars represent 1 cm.

6-merous, 20–40 mm long, slender, acute or shortly rounded at apex, various shades of red. Anther 2.5–4 mm long, about one third as long as the free part of the filament. — Fig. 8 a, b.

Distribution — New Caledonia; *Malesia*: New Guinea.

Habitat & Ecology — Primary and secondary closed and open humid forests, 0–1600 m altitude; recorded hosts include *Calophyllum*, *Eugenia*, *Garcinia*, *Nothofagus*, and *Terminalia*.

Note — For discussion of species distinction within the *Amyema scandens* complex, see Barlow, *Blumea* 36 (1992) 333, 363, 371.

45. *Amyema scheffleroides* Barlow

Amyema scheffleroides Barlow, *Blumea* 36 (1992) 364. — Type: *Kostermans 18294*, Sumbawa, Mt Batulante.

Glabrous. *Leaves* in whorls of 4–6; lamina ovate, c. 14 cm long, c. 6 cm wide, shortly cuneate at the base to a petiole 15–20 mm long, shortly attenuate and acute at the apex, slightly lustrous above, dull below; venation pinnate with the midrib prominent below, otherwise obscure. *Inflorescences* at the nodes and probably along the epicortical runners, pedunculate c. 6-rayed umbels of triads with all flowers pedicellate; peduncle 3–4 mm long; rays 1.5–2 mm long; pedicels c. 1 mm long or sometimes those of the central flowers shorter. *Corolla* in mature bud 4-merous, c. 33 mm long, inflated in the middle, contracted near the apex and acute, brownish below and dirty yellow grading to green above. *Anther* c. 3 mm long, about twice as long as the free part of the filament.

Distribution — Sumbawa, only known from the type specimen.

Habitat & Ecology — 700–800 m altitude; no host recorded.

Note — Closely related to *Amyema polytrias*; for differences see Barlow, *Blumea* 36 (1992) 364.

46. *Amyema seemeniana* (K. Schum.) Danser

Amyema seemeniana (K. Schum.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 299; Barlow, *Austral. J. Bot.* 22 (1974) 589; in *Handb. Fl. Papua New Guinea* 2 (1981) 220; *Blumea* 36 (1992) 365. — *Loranthus seemenianus* K. Schum. in K. Schum. & Hollr., *Fl. Kaiser Wilhelm Land* (1889) 106. — Type: *Hollrung 345*, lecto, New Guinea, 'Hatzfeldhafen'.

Glabrous except for the inflorescence and flowers sometimes sparsely to densely brown- or white-tomentose. *Leaves* opposite; lamina broadly lanceolate to broadly ovate, 6–30 by 3–13 cm, shortly cuneate at the base to a petiole 5–18 mm long, obtuse to acuminate and acute at the apex, dull on both sides; venation curvined with 3–5 veins distinct on both sides. *Inflorescences* at the nodes, a 2-flowered simple umbel; peduncle 3–8 mm long; pedicels 2–6 mm long. *Corolla* in mature bud usually 5-merous, 30–65 mm long, thin, curved, more or less inflated, acute or obtuse or rounded at the apex, variable in colour but mostly pink or red and often grading to green or yellow above. *Anther* 5–7 mm long, about equal to the free part of the filament. — **Fig. 9a–d.**

Distribution — Australia (Cape York Peninsula); *Malesia*: New Guinea.

Habitat & Ecology — See under the subspecies.

Notes — 1. Closely related to *Amyema squarrosa*; for differences see Barlow, *Blumea* 36 (1992) 365.

2. There are three subspecies which differ in qualitative and quantitative floral characters and in leaf size, and have strong geographic and altitudinal separation; for discussion see Barlow, *Austral. J. Bot.* 22 (1974) 590.

KEY TO THE SUBSPECIES

- 1a. Anthers strongly curved or hooked; the calyx limb short, irregular, usually infolded; leaf lamina to 12 cm long, mostly acuminate and acute **b. subsp. *flexuosa***

- b. Anthers slightly curved or straight; the calyx limb more than 1 mm long, membranous 2
- 2a. Leaf lamina to 10 cm long, not acuminate; corolla 30–35 mm long; ovary constricted below the spreading calyx limb a. subsp. *seemeniana*
- b. Leaf lamina to 30 cm long, acuminate; corolla 40–65 mm long; ovary not constricted below the erect calyx limb c. subsp. *melastomatifolia*



Fig. 9. *Amyema seemeniana* (K. Schum.) Danser subsp. *seemeniana*. a. Flower-bearing twig; b. flower bud; c. flower; d. twig with fruits. — *A. fasciculata* (Blume) Danser. e. Twig with flowers; f. inflorescence with young fruits. — *A. beccarii* (Tiegh.) Danser. g. Inflorescence with flower buds; h. flower (a–c: Hollrung 345; d: Schlechter 18380; e: Ramos BS 33296; f: Bakhuizen van den Brink 5795; g: Endert 1507; h: Endert 1882). a–d, f–h Redrawn from Danser (1931); e redrawn from Danser (1935). Scale bars represent 1 cm.

a. subsp. seemeniana

Loranthus articulatus K. Krause, Bot. Jahrb. 57 (1922) 485. — *Amyema articulata* (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 293; 11 (1931) 322. — Type: *Schlechter 18380*, Papua New Guinea, Keneyia R.

Distribution — *Malesia*: Northeastern New Guinea.

Habitat & Ecology — Humid forests and disturbed sites, 0–1100 m altitude; recorded hosts include *Acalypha*, *Albizia*, *Ilex*, *Sarcocephalus*, and *Zanthoxylum*.

b. subsp. flexuosa Barlow

Amyema seemeniana (K. Schum.) Danser subsp. *flexuosa* Barlow, Austral. J. Bot. 22 (1974) 591. — Type: *Darbyshire 743*, Papua New Guinea, Yule I.

Distribution — Australia (Cape York Peninsula); *Malesia*: New Guinea.

Habitat & Ecology — Humid forests and disturbed sites, 0–480 m altitude; recorded hosts include *Ficus* and *Planchonella*.

c. subsp. melastomatifolia (K. Krause) Barlow

Amyema seemeniana (K. Schum.) Danser subsp. *melastomatifolia* (K. Krause) Barlow, Austral. J. Bot. 22 (1974) 591. — *Loranthus melastomatifolius* K. Krause, Bot. Jahrb. 57 (1922) 465, 488. — Type: *Schlechter 17809*, Papua New Guinea, Kani Mts.

Distribution — *Malesia*: Northeastern New Guinea.

Habitat & Ecology — Humid forests, 1000–2150 m altitude; recorded hosts include *Nauclea* and *Psychotria*.

Note — The original spelling of the epithet is followed here; Danser in Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297 amended it to *melastomifolia*, and was followed by Barlow in Austral. J. Bot. 22 (1974) 591 and Blumea 36 (1992) 365.

47. Amyema seriata (Merr.) Barlow

Amyema seriata (Merr.) Barlow, Blumea 36 (1992) 365. — *Loranthus seriatus* Merr., Philipp. J. Sc., Bot. 9 (1914) 285. — *Dicymanthes seriata* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Reillo BS 16424*, lecto, Mindanao, Mt Pulongbato.

Glabrous. *Leaves* opposite; lamina ovate, 8–16 by 4.5–7.5 cm, cuneate to rounded at the base to a petiole 5–8 mm long, shortly acuminate and broadly acute at the apex, dull on both sides but darker above; venation pinnate with the midrib and the incurved main laterals prominent on both sides and the midrib raised below. *Inflorescences* at the nodes and along the internodes and epicortical runners, a 6-flowered head of 2 sessile triads on a peduncle 2–4 mm long. *Corolla* in mature bud 5-merous, c. 17 mm long, weakly inflated at the base, clavate and acute at the apex. *Anther* 2.5–4 mm long, sessile or nearly so.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — Possibly in highlands; no hosts recorded.

Notes — 1. Similar to *Amyema hexantha*; for differences see Barlow, *Blumea* 36 (1992) 366.

2. For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, *Blumea* 36 (1992) 298.

48. *Amyema squarrosa* (K. Krause) Danser

Amyema squarrosa (K. Krause) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 299; Barlow, *Austral. J. Bot.* 22 (1974) 591; in *Handb. Fl. Papua New Guinea* 2 (1981) 222; *Blumea* 36 (1992) 366. — *Loranthus squarrosus* K. Krause, *Bot. Jahrb.* 57 (1922) 485. — Type: *Ledermann 10377*, lecto, Papua New Guinea, 'Lordberg'.

Glabrous except for the inflorescence and flowers sometimes sparsely brown-tomentose. *Leaves* opposite; lamina lanceolate to broadly ovate, 8–18 by 2.5–6 cm, shortly cuneate at the base to a petiole 4–9 mm long, acuminate and acute at the apex, dull on both sides; venation pinnate but somewhat curvinerved with the veins distinct below. *Inflorescences* at the nodes, a 2-flowered simple umbel; peduncle obscure or up to 1 mm long; pedicels 2–4 mm long. *Corolla* in mature bud 5-merous, 25–36 mm long, thin, more or less inflated, acute or obtuse or rounded at the apex, variable in colour but mostly pink or red and often grading to green or yellow above. *Anther* 2.5–3 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Probably in closed humid forests, mostly from 1000 to 1100 m altitude, rarely in lowlands; the only recorded host is *Saurauia*.

Note — Closely related to *Amyema seemeniana*; for differences see Barlow, *Blumea* 36 (1992) 365.

49. *Amyema strongylophylla* (Lauterb.) Danser

Amyema strongylophylla (Lauterb.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 299; Barlow, *Austral. J. Bot.* 22 (1974) 593; in *Handb. Fl. Papua New Guinea* 2 (1981) 223. — *Loranthus strongylophyllus* Lauterb., *Nova Guinea* 8 (1912) 815. — Type: *Gjellerup 307*, lecto, Irian Jaya.

Glabrous except for the inflorescence and flowers densely red-brown tomentose. *Leaves* opposite; lamina broadly obovate to orbicular, 8–13 by 5.5–11 cm, shortly cuneate at the base to a petiole 5–10 mm long, rounded at the apex, dull on both sides; venation pinnate but somewhat curvinerved with the midrib and the main laterals usually distinct on both sides. *Inflorescences* at the nodes, pedunculate 15- to 20-rayed umbels of triads with the central flowers sessile; peduncle 15–30 mm long, robust, globosely dilated at the apex; rays 6–13 mm long, arising in depressions; pedicels of the lateral flowers 2–4 mm long. *Corolla* in mature bud 5- or 6-merous, c. 50 mm long, acute or obtuse at the apex, mostly red below and sometimes grading to orange above but with the colour partly obscured by the indumentum. *Anther* 5–8 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Northern New Guinea.

Habitat & Ecology — Lowlands from 0 to 600 m altitude; the only recorded host is *Timonius*.

Note — Additional synonymy given by Barlow, Austral. J. Bot. 22 (1974) 593 is now referred to *Amyema rigidiflora*; for discussion, distinction as a species and differences from *A. rigidiflora*, see Barlow, Blumea 36 (1992) 367.

50. *Amyema tetraflora* (Barlow) Barlow

Amyema tetraflora (Barlow) Barlow, Austral. J. Bot. 22 (1974) 595; in Handb. Fl. Papua New Guinea 2 (1981) 224; Blumea 36 (1992) 369. — *Ungula tetraflora* Barlow, Proc. Roy. Soc. Queensl. 75 (1964) 16. — Type: *van Duuren s.n.*, Papua New Guinea, Ukuu.

Glabrous except for the inflorescence and flowers sparsely tomentose. *Leaves* opposite; lamina broadly lanceolate to ovate, 17–25 by 7–12 cm, rounded to slightly cordate at the base to a petiole 2–4 mm long, acuminate and acute at the apex, glossy above, dull below; venation pinnate, distinct, with the main laterals incurved near the margin. *Inflorescences* at the nodes and along the epicortical runners, pedunculate 4- to 6-rayed umbels of tetrads with all flowers sessile; peduncle 2–4 mm long; rays 1–2.5 mm long. *Corolla* in mature bud 6-merous, 26–32 mm long, slender, slightly clavate and obtuse at the apex, light mauve; petals after anthesis coherent in the lower 4–5 mm. *Anther* c. 3 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Papua New Guinea (Kairuku Subprovince).

Habitat & Ecology — 0–50 m altitude; no hosts recorded.

Note — Similar to *Amyema brassii*; for differences see Barlow, Blumea 36 (1992) 369.

51. *Amyema tetrapetala* (Danser) Barlow

Amyema tetrapetala (Danser) Barlow, Austral. J. Bot. 22 (1974) 595; in Handb. Fl. Papua New Guinea 2 (1981) 225; Blumea 36 (1992) 369. — *Dicymanthes tetrapetala* Danser, Blumea 3 (1940) 399. — Type: *Womersley NGF 19321*, neo, Papua New Guinea, Wagau.

Glabrous except for young parts, inflorescence and ovary shortly brown-tomentose. *Leaves* opposite; lamina broadly lanceolate, mostly 10–15 cm long, 4–8 cm wide, attenuate at the base to a petiole c. 5 mm long, acuminate and acute at the apex, dull on both sides but slightly darker above; venation pinnate with the midrib and the main laterals visible above and raised below. *Inflorescences* at the nodes; a 6-flowered head of 2 sessile triads on a peduncle 3–6 mm long, subtended by 6 bracts c. 6 mm long. *Corolla* in mature bud 4-merous, 35–42 mm long, slender, acute at the apex, angular, red below grading to orange or yellow above. *Anther* 3–4 mm long, about one third as long as the free part of the filament.

Distribution — *Malesia*: Papua New Guinea (Morobe Province).

Habitat & Ecology — Primary humid forests, 1200–2200 m; no hosts recorded.

Note — For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, Blumea 36 (1992) 298, 369.

52. *Amyema triantha* (Korth.) Tiegh.

Amyema triantha (Korth.) Tiegh., Bull. Soc. Bot. France 41 (1894) 507. — *Loranthus trianthus* Korth., Verh. Bat. Genootsch. 17 (1839) 227, 265. — Type: *Korthals s.n.*, Borneo, near Drongo. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 350].

Glabrous except for the inflorescence and flowers shortly tomentose when young. *Leaves* opposite; lamina elliptic to obovate, 10–16 by 6–12 cm, cuneate at the base to an obscure petiole c. 5–10 mm long, obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, pedunculate c. 6-rayed umbels of triads with all flowers sessile; peduncle 15–18 mm long; rays 5–7 mm long. *Corolla* in mature bud 6-merous, c. 20 mm long, weakly clavate and obtuse at the apex. *Anther* c. 1.5 mm long, about one third or half as long as the free part of the filament.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Apparently in lowlands; no hosts recorded.

Note — For discussion of species distinction within the *Amyema scandens* complex, see Barlow, Blumea 36 (1992) 333, 363, 371.

53. *Amyema tristis* (Zoll.) Tiegh.

Amyema tristis (Zoll.) Tiegh., Bull. Soc. Bot. France 41 (1984) 507; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 351; Backer & Bakh. f., Fl. Java 2 (1965) 71; Barlow, Blumea 36 (1992) 371. — *Loranthus tristis* Zoll., Nat. Geneesk. Arch. 2 (1845) 579. — *Phoenicanthemum triste* (Zoll.) Miq., Fl. Ind. Bat. 1, 1 (1856) 826. — Type: *Zollinger 2937*, Java, Mt Raung. *Dicymanthes elliptica* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 364. — Type: *Iboet 509*, Sumba, Kananggar.

Glabrous except for the flowers sometimes sparsely hairy. *Leaves* opposite; lamina elliptic to ovate or rarely obovate, 6–15 by 3–7.5 cm, cuneate at the base, sessile or with a short petiole to 3 mm long, somewhat acuminate and obtuse to acute at the apex, dull on both sides; venation pinnate with the midrib and the main laterals visible. *Inflorescences* at the nodes, pedunculate subcapitate usually 2-rayed umbels of triads with all flowers sessile; peduncle 1.5–5 mm long; rays mostly 1–2 mm long (but rarely obscure, with inflorescence then a 6-flowered head of 2 sessile triads). *Corolla* in mature bud 5-merous, 14–21 mm long, weakly clavate and obtuse at the apex, mostly red, sometimes golden below. *Anther* 2–3 mm long, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Java, Lesser Sunda Islands (Bali, Sumba, Flores).

Habitat & Ecology — 575–1500 m altitude; recorded hosts include *Bischofia* and *Villebrunea*.

Note — For discussion of equivalence of *Dicymanthes* and *Amyema*, see Barlow, Blumea 36 (1992) 298, 372.

54. *Amyema umbellata* Danser

Amyema umbellata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 352. — Type: *Toxopeus 215*, Moluccas, Buru.

Glabrous except for the inflorescence and ovary papillose hairy. *Leaves* opposite, ternate or quaternate; lamina lanceolate, 10–16 by 2.5–4.5 cm, cuneate at the base to a petiole 10–15 mm long, acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct. *Inflorescences* at the nodes, pedunculate c. 12-rayed simple umbels; peduncle 4–5 mm long; pedicels c. 2.5 mm long. *Corolla* in mature bud 5-merous, 30–32 mm long, broadly acute at the apex, light pink. *Anther* c. 3 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Moluccas (Buru).

Habitat & Ecology — No host recorded.

Note — A doubtful species, possibly rare; see also Barlow, *Blumea* 36 (1992) 373.

55. *Amyema urdanetensis* (Elmer) Danser

Amyema urdanetensis (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — *Loranthus urdanetensis* Elmer, Leaflet Philipp. Bot. 6 (1913) 1963. — Type: *Elmer 14092*, lecto, Mindanao, Mt Urdaneta. [For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 68].

Glabrous except for the inflorescence and ovary densely tomentose. *Leaves* opposite, sometimes scattered; lamina lanceolate, 4–8 by 1–3 cm, cuneate to somewhat rounded at the base to a petiole 5–12 mm long, somewhat acuminate and acute at the apex, more or less glossy and darker above, dull below; venation pinnate with the midrib raised below and visible above and the main laterals indistinct. *Inflorescences* at the nodes, pedunculate 5- to 8-rayed umbels of triads with the central flowers sessile; peduncle 20–30 mm long; rays 2–5 mm long; pedicels of the lateral flowers c. 0.5 mm long. *Corolla* in mature bud 5-merous, 30–35 mm long, slightly dilated upwards, weakly clavate and obtuse at the apex, yellow, or red below and yellow above. *Anther* 1.5–2 mm long, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines (Leyte, Mindanao).

Habitat & Ecology — Recorded from 1830 m altitude; no host recorded.

Note — Similar to *Amyema queenslandica* and *A. rigidiflora*; for discussion see Barlow, *Blumea* 36 (1992) 373.

56. *Amyema vernicosa* Barlow

Amyema vernicosa Barlow, *Blumea* 36 (1992) 373. — Type: *Mendoza 1479 (PNH 18467)*, Luzon, Mayon Volcano.

Glabrous except for the inflorescence and flowers sparsely to densely tawny- or brown-tomentose. *Leaves* ternate (sometimes scattered); lamina ovate or lanceolate-ovate, 4–7 by 2.5–3.5 cm, cuneate at the base to a petiole 12–20 mm long, acute or rounded-obtuse at the apex, distinctly shining above, dull below; venation pinnate, obscure above and the midrib raised and the main laterals distinct below. *Inflorescences* at the nodes, pedunculate 3-rayed umbels of triads with all flowers sessile; peduncle 12–15 mm long; rays 0.5–1 (rarely to 3.5) mm long. *Corolla* in mature bud 4- or 5-merous, c. 25 mm long, red below grading to yellow and green above. *Anther* c. 1.5 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Recorded from 1000 m altitude; no host recorded.

Note — For a discussion of the specific distinction of *Amyema vernicosa*, see Barlow, *Blumea* 36 (1992) 374.

57. *Amyema verticillata* (Merr.) Danser

Amyema verticillata (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — *Cleistoloranthus verticillatus* Merr., Philipp. J. Sc., Bot. 4 (1909) 150. — Type: Curran, Merritt & Zschokke FB 16229, Luzon, Mt Pulog.

[For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 79].

Glabrous. *Leaves* quaternate; lamina lanceolate-oblong, mostly 3–6 cm long, 1–3 cm wide, cuneate at the base to a petiole 3–10 mm long, shortly acuminate and acute or obtuse at the apex, dull on both sides but darker above; venation pinnate with the midrib raised below and other veins indistinct. *Inflorescences* at the nodes, pedunculate 4-rayed umbels of triads with all flowers pedicellate or the central flower sessile; peduncle 10–15 mm long; rays 5–7 mm long; pedicels of the central flowers very short or obscure; pedicels of the lateral flowers 1–1.5 mm long. *Corolla* in mature bud 4-merous, 13–14 mm long, slender, clavate and truncate at the apex, with a corona formed from spreading, bilobed dorsal appendages up to 1.2 mm long, pink or red, sometimes grading to yellow above. *Anther* 1–1.5 mm long, about one third as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Northern Luzon).

Habitat & Ecology — Highlands, 1670–2500 m altitude; no hosts recorded.

Note — The corona on the corolla is distinctive; for discussion see Barlow, *Blumea* 36 (1992) 374.

58. *Amyema wenzelii* (Merr.) Danser

Amyema wenzelii (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — *Loranthus wenzelii* Merr., Philipp. J. Sc., Bot. 8 (1913) 370. — Type: Wenzel 24, lecto, Leyte.

Glabrous. *Leaves* quaternate; lamina oblong or ovate, 11–27 by 5–15 cm, cuneate to rounded at the base to a petiole 10–20 mm long, acuminate and obtuse at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct and the midrib raised below. *Inflorescences* many at the nodes and along the internodes and epical runners, apparently sessile mostly 2- or 3-flowered umbels; peduncle rudimentary, immersed in the bark; pedicels up to 2 mm long. *Corolla* in mature bud 5-merous, 12–14 mm long, slightly inflated, obtuse at the apex, yellow below and green above. *Anther* c. 2.5 mm long, sessile, with a broad flat connective continuous with a flattened filament c. 0.5 mm wide decurrent on the face of the petal.

Distribution — *Malesia*: Philippines (Leyte, Bohol).

Habitat & Ecology — 60–800 m altitude; no hosts recorded.

Note — Closely related to *Amyema beccarii*; for distinction as a species see Barlow, *Blumea* 36 (1992) 375.

59. *Amyema wichmannii* (K. Krause) Danser

Amyema wichmannii (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299; Barlow, Austral. J. Bot. 22 (1974) 596; in Handb. Fl. Papua New Guinea 2 (1981) 225; P. Royen, Alpine Fl. New Guinea 3 (1982) 2266; Barlow, Blumea 36 (1992) 376. — *Loranthus wichmannii* K. Krause, Bot. Jahrb. 57 (1922) 465. — Type: *Pulle 979*, lecto, Irian Jaya, Wichmann Mts.

Loranthus keysseri K. Krause, Bot. Jahrb. 62 (1929) 474. — Type: *Keysser s. n.*, Papua New Guinea, Saruwaged Mts.

Glabrous except for a few cilia on the bracts. *Leaves* opposite; lamina broadly lanceolate to almost orbicular, mostly 4–10 cm long, mostly 2–4 cm wide, cuneate at the base to a petiole 2–8 mm long, usually acute or obtuse with a small mucro at the apex, lustrous above, dull below; venation pinnate, mostly obscure. *Inflorescences* at the nodes, pedunculate 6- to 12-rayed umbels of triads with all flowers pedicellate or the central flowers sessile; peduncle mostly 22–40 mm long, dilated up to 3 mm wide at the apex; rays mostly 6–10 mm long; pedicels of the central flowers 0–4 mm long; pedicels of the lateral flowers 1.5–5 mm long; bracts with rounded dorsal protuberances. *Corolla* in mature bud 4-merous, mostly 20–28 mm long, slender, strongly clavate and acute or rounded at the apex, red, often nearly black in the lower part. *Anther* 1–2 mm long, about equal to or half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — See under the subspecies.

Notes — 1. Related to *Amyema dilatipes* and *A. pachypus*; for discussion see Barlow, Blumea 36 (1992) 377.

2. There are two subspecies which differ in inflorescence characters and have geographic separation; for discussion see Barlow, Austral. J. Bot. 22 (1974) 590; Blumea 36 (1992) 377.

KEY TO THE SUBSPECIES

- 1a. Central flower of the triad usually on a pedicel 2–4 mm long with the bract at its base; leaves with pustular spots below **a. subsp. *wichmannii***
 b. Central flower of the triad sessile; leaves mostly lacking pustular spots below
 **b. subsp. *purum***

a. subsp. *wichmannii*

Distribution — Irian Jaya, Papua New Guinea (Star Mts).

Habitat & Ecology — Subalpine communities mostly from 2800 to 3420 m altitude, rarely down to 2000 m; recorded hosts include *Drimys*, *Rapanea*, *Rhododendron*, and *Vaccinium*.

b. subsp. *purum* Barlow

Amyema wichmannii (K. Krause) Danser subsp. *purum* Barlow, Austral. J. Bot. 22 (1974) 597. — Type: *Brass 30674*, Papua New Guinea, Mt Wilhelm.

Distribution — Papua New Guinea.

Habit & Ecology — Subalpine communities from 2350 to 3680 m altitude; recorded hosts include *Ardisia*, *Drimys*, *Eurya*, *Rapanea*, and *Rhododendron*.

AMYLOTHECA

Amylotheca Tiegh., Bull. Soc. Bot. France 41 (1895) 261. — Type species: *Amylotheca dictyophleba* (F. Muell.) Tiegh.

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 545; in Flora of Australia 22 (1984) 73].

Aerial stem-parasitic shrubs, often robust, with epicortical runners bearing secondary haustoria. *Leaves* mostly opposite, sometimes displaced; venation pinnate. *Inflorescences* axillary, primarily a raceme of decussate pairs of pedunculate dichasia (triads), sometimes variously reduced (see below); bracts single under each flower, not enlarged to form an involucre. *Corolla* 6-merous, regular, gamopetalous. *Anthers* basifixed, immobile. *Style* simple, articulate above the base, usually with a small knob-like stigma. *Fruit* ellipsoid to globular, usually with a persistent nipple-like style base. — Fig. 10, 11.

Distribution — Four species distributed from Thailand and Peninsular Malaysia eastwards and southwards to New Guinea, Australia, New Caledonia and New Hebrides. In *Malesia* 3 species, 1 in northwestern Malesia and 2 in New Guinea.

Habitat & Ecology — Humid forests and open woodlands, common in lowlands but extending to montane forests at 2850 m in New Guinea. Host specificity is low.

Morphology — The plesiomorphic inflorescence state for the genus is an axillary raceme of uniformly spaced opposite pairs of triads. Simpler inflorescences are derived by reduction, and occur primarily as infraspecific rather than interspecific variations. The inflorescence is often subumbellate, and the triads may be reduced to single flowers so that the inflorescence may appear to be a simple raceme or even a 2-flowered simple umbel (Fig. 10).

Taxonomy — Danser (1931) included *Decaisnina* in *Amylotheca*, which was therefore more broadly circumscribed than it is here. *Amylotheca* is closely related to *Decaisnina*, which is probably the least specialized genus in the group. The major difference is in the corolla, which is essentially choripetalous in *Decaisnina*, although usually with the petals coherent at the base into a short tube, and distinctly gamopetalous to the middle or higher in *Amylotheca*. For further discussion of generic relationships see Barlow, Blumea 38 (1993) 110.

KEY TO THE SPECIES

- 1a. Leaves more or less glaucous; lamina truncate or shortly cuneate at the base into a sharply defined dark coloured petiole more than 10 mm long; style articulate 0–0.5 mm above the base 3. *A. duthieana*
- b. Leaves not glaucous; lamina attenuate at the base into an obscure winged petiole less than 10 mm long; style articulate 2–3 mm above the base 2

- 2a. Leaves mostly acuminate and acute at the apex, 12–20 cm long; inflorescence parts robust; peduncles of the triads mostly 1–3 mm long **1. A. acuminatifolia**
 b. Leaves mostly rounded, rarely acute at the apex, 5–14 cm long; inflorescence parts slender; peduncles of the triads mostly 3–7 mm long **2. A. dictyophleba**

1. *Amylotheca acuminatifolia* Barlow

Amylotheca acuminatifolia Barlow, Austral. J. Bot. 22 (1974) 545; in Handb. Fl. Papua New Guinea 2 (1981) 227. — Type: *Eyma* 4888, Irian Jaya, 'Prauwbivak'.

Glabrous. *Leaves* opposite; lamina narrowly ovate, 12–20 by 2.5–7 cm, attenuate at the base to an obscure winged petiole 2–5 mm long, acuminate and acute at the apex, lustrous above, dull below; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme of 2 or 3 decussate pairs of triads with the central flowers sessile and the lateral flowers pedicellate; axis 6–10 mm long; peduncles of the triads 1–3(–6) mm long; pedicels of the lateral flowers 2–5 mm long. *Corolla* in mature bud 6-merous, 45–65 mm long, robust, slightly inflated, weakly clavate and acute or obtuse at the apex, red below and yellow above; tube in the open flower 25–35 mm long. *Anther* 5–7 mm long, acute, about equal to the free part of the filament. *Style* articulate 2–3 mm above the base.

Distribution — *Malesia*: New Guinea (Irian Jaya).

Habitat & Ecology — Probably in closed humid forests from 1650 to 2850 m altitude; no hosts recorded.

Note — For differences from *Amylotheca dictyophleba* see Barlow, *Blumea* 38 (1993) 111.

2. *Amylotheca dictyophleba* (F. Muell.) Tiegh.

Amylotheca dictyophleba (F. Muell.) Tiegh., Bull. Soc. Bot. France 41 (1894) 262; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1936) 242; Barlow, Austral. J. Bot. 22 (1974) 547; in Handb. Fl. Papua New Guinea 2 (1981) 227. — *Loranthus dictyophlebus* F. Muell., Rept. Burdekin Exped. (1860) 14. — Type: *Beckler s. n.*, lecto, New South Wales, Hastings River.

[For guide to extensive additional synonymy see Barlow, *Blumea* 38 (1993) 111].

Glabrous. *Leaves* opposite; lamina narrowly to broadly ovate or elliptic, 5–14 by 1.5–12 cm, shortly cuneate to truncate at the base to an obscure winged petiole 2–8 mm long, obtuse or rounded or rarely acute at the apex, usually lustrous above, dull below; venation pinnate with the midrib, the main laterals and reticulate veins usually distinct on both sides. *Inflorescences* at the nodes, a raceme of 1–6 decussate, often subumbellate pairs of triads or single flowers; triads (when present) with the central flowers sessile and the lateral flowers pedicellate or sometimes sessile; axis 3–12(–28) mm long; peduncles of the triads or single flowers 3–7(–10) mm long; pedicels of the lateral flowers (when present) 2–4 mm long. *Corolla* in mature bud 6-merous, (28–)35–60 mm long, slightly to strongly inflated, weakly clavate and acute or obtuse at the apex, red or orange or yellow below, usually paler and green or yellow above; tube in the open flower (15–)18–30 mm long. *Anther* (3–)5–8 mm long, acute, about equal to the free part of the filament. *Style* articulate 1–3 mm above the base. — **Fig. 10.**

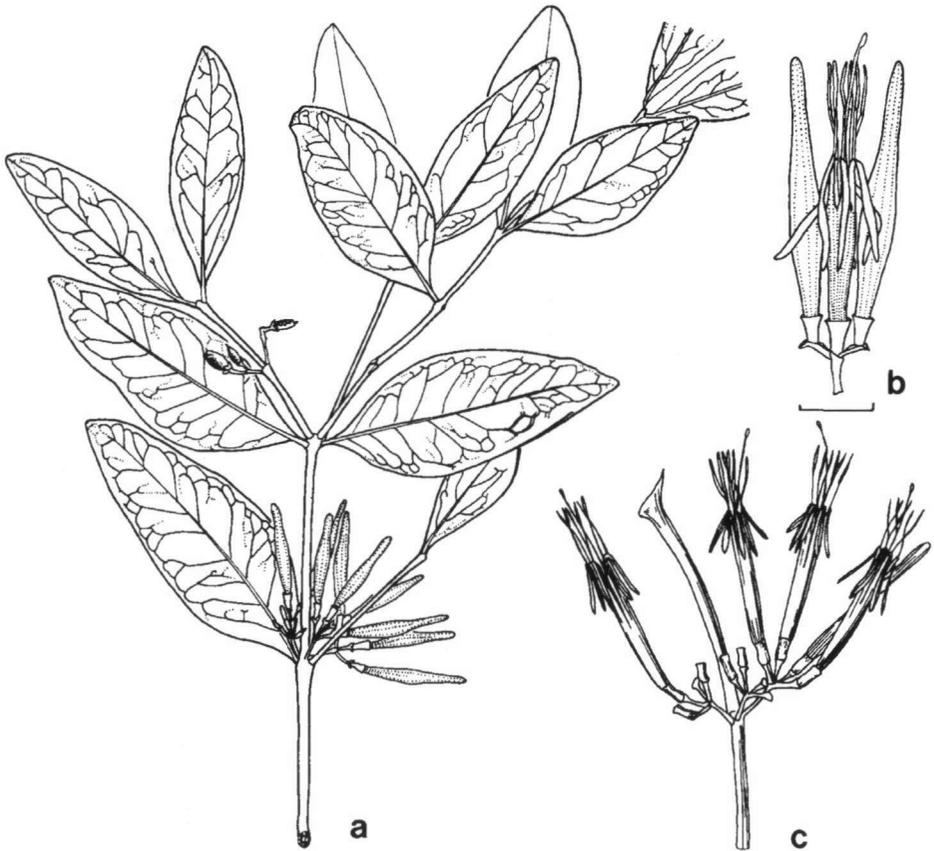


Fig. 10. *Amylotheca dictyophleba* (F. Muell.) Tiegh. a. Flower-bearing twig; b. triad of flowers; c. inflorescence as a few-flowered simple umbel (a, c: not cited; b: MacKee 27192). a Redrawn from Barlow (1981); b redrawn from Barlow (1996); c redrawn from Danser (1934). Scale bars represent 1 cm.

Distribution — Eastern Australia, New Caledonia, New Hebrides; *Malesia*: southern New Guinea.

Habitat & Ecology — Mostly in primary and secondary closed forests, 0–1000 m altitude, rarely to 1500 m; recorded on numerous hosts.

Note — For circumscription as a species see Barlow, *Blumea* 38 (1993) 112.

3. *Amylotheca duthieana* (King) Danser

Amylotheca duthieana (King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 301. — *Loranthus duthieanus* King, J. As. Soc. Beng. 56, ii (1888) 94. — Type: *Scortechini s. n.*, Perak. [For additional synonymy see Barlow, *Blumea* 38 (1993) 112].



Fig. 11. *Amylotheca duthieana* (King) Danser, with spiderhunter (*Arachnothera*), a pollinator bird. Borneo, Sarawak, Lambir Hills Nature Reserve (*Nagamasu 4669*). Photo Takakazu Yumoto, 1992, with permission.

Glabrous but often glaucous, robust. *Leaves* opposite or scattered; lamina oblong to ovate or broadly elliptic, 7–15 by (2–)3.5–7 cm, thick, truncate or shortly cuneate at the base to a dark-coloured petiole 10–25 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct on both sides and the midrib prominent and dark-coloured below. *Inflorescences* at the nodes, a raceme of 1–5 decussate pairs of triads with all flowers pedicellate; axis 3–20 mm long; peduncles of the triads 1.5–5 mm long; pedicels of the flowers 0.5–2 mm long. *Corolla* in mature bud 6-merous, 45–70 mm long, robust, gradually widened upwards, weakly clavate and obtuse at the apex, red in the lower part, usually dark purple, brown or black at the apex; tube in the open flower 30–48 mm long. *Anther* 2–3.5 mm long, obtuse, about half as long as the free part of the filament. *Style* articulate c. 0.5 mm above the base. — Fig. 11.

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

Habitat & Ecology — Humid forests, 0–700 m altitude; frequently recorded as parasitic on *Shorea*, other recorded hosts include *Dipterocarpus* and *Gonystylus*.

Note — For circumscription as a species see Barlow, *Blumea* 38 (1993) 113.

BARATHRANTHUS

Barathranthus Miq., *Fl. Ind. Bat.* 1, 1 (1856) 834. — Type species: *Barathranthus axanthus* (Korth.) Miq [For synonymy see Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 392].



Fig. 12 & 13. *Barathranthus axanthus* (Korth.) Miq., flower buds (left) & flowers (right). Borneo, W Kalimantan, Pasir Pandjang (Elsener H 98). Photos A. Elsener, 1965.

Aerial stem-parasitic shrubs with epicortical runners bearing secondary haustoria. *Leaves* opposite or displaced, sometimes with fully developed ones alternating with very reduced ones and then sometimes apparently superposed. *Inflorescence* capitate, a very condensed spike, with the flowers placed in small hollows; bracts single under each flower. *Flowers* hermaphrodite or functionally unisexual with plants dioecious. *Corolla* 4-merous, choripetalous, regular. *Anthers* basifixed, immobile. *Style* straight, simple; stigma small. *Fruit* ellipsoid to globose. — Fig. 12–14.

Distribution — Four species from Sri Lanka southeastwards to Indochina and Malesia; in *Malesia* 2 species reaching Borneo and Java.

Habitat & Ecology — Probably in humid forests, 0–1900 m altitude. Host specificity is probably low.

Morphology — The flower head is seemingly sessile; its receptacle is the condensed, convex axis of a spike, and the flowers are inserted in small hollows of this axis; the floral bracts enclose the base of each flower but do not form an involucre around the inflorescence.

Taxonomy — The genus is probably related to *Loranthus* and to the larger genus *Helixanthera*, differing in its condensed, capitate inflorescence. It also shares with *Loranthus* the existence of dioecy among its species.

There has been some uncertainty about the spelling of *Barathranthus*. The name was first used by Korthals in Verh. Bat. Genootsch. 17 (1839) 250, 262, as a section of *Loranthus*. Miquel in Fl. Ind. Bat. 1, 1 (1856) 834 raised the section to generic rank, as *Baratranthus*, citing p. 262 of Korthals' work. However, on p. 262 Korthals had used the spelling *Barathranthus*. Miquel's spelling was adopted by Pfeiffer in Index Nom. Gen. (1979) 177, with *Barathranthus* listed as an orthographic variant. In Korthals' original work the orthographically correct *Barathranthus* was used in his enumeration (p. 262), and *Baratranthus* was used in a preamble in Dutch on p. 250 (C. Kalkman, personal communication). The latter spelling is best treated as a typographic error, and *Barathranthus* is accordingly confirmed as the correct spelling.

KEY TO THE SPECIES

- 1a. Young internodes terete; many of the leaves vestigial and deciduous; flowers unisexual, dioecious; corolla less than 8 mm long **1. B. axanthus**
 b. Young internodes 4-angular; leaves all fully developed; flowers hermaphrodite; corolla more than 10 mm long **2. B. productus**

1. *Barathranthus axanthus* (Korth.) Miq.

Barathranthus axanthus (Korth.) Miq., Fl. Ind. Bat. 1, 1 (1856) 834; Backer & Bakh. f., Fl. Java 2 (1965) 72. — *Loranthus axanthus* Korth., Verh. Bat. Genootsch. 17 (1839) 262. — Type: *Korthals s.n.*, Sumatra, Mt Malintang.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 393].

Glabrous except for a dense rusty stellate tomentum on the young vegetative parts and inflorescences. Stem internodes somewhat angular when young but soon terete. *Leaves* opposite or displaced, with pairs of normally developed leaves usually separated by one or more pairs of vestigial ones; normally developed lamina narrowly ovate to ovate, 6–16 by 2–7.5 cm, cuneate to truncate at the base to a petiole 5–17 mm long, acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib visible above and prominent below and other venation obscure; vestigial leaves 5–7 mm long, channeled above, deciduous. *Inflorescences* at the nodes, a 6- to 12-flowered capitate spike; axis 1–2 mm long; bracts c. 0.5 mm long, concave. *Flowers* unisexual, dioecious. *Corolla* in mature bud cylindric or somewhat narrowed in the middle, angular, obtuse, in male flowers c. 4 mm long, in female flowers 2.5–3 mm long, usually white to yellow but sometimes pink or red. *Anther* c. 1.5 mm long, not transversely septate, sessile. — **Fig. 12, 13, 14b–d.**

Distribution — Cambodia; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

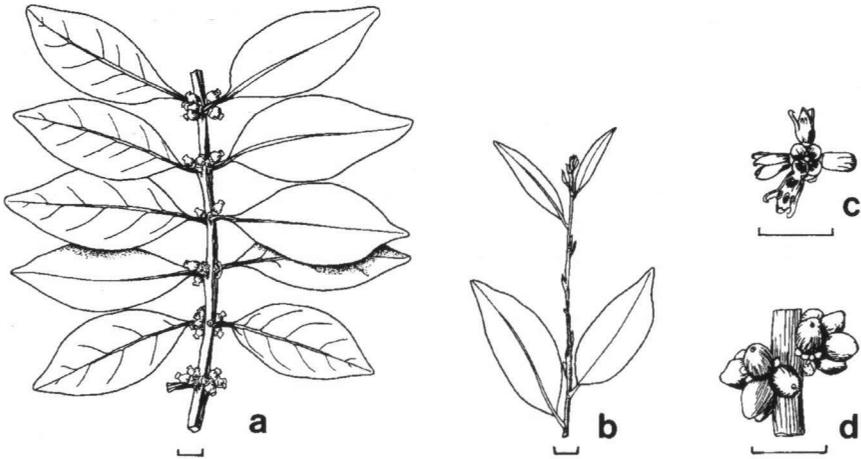


Fig. 14. *Barathranthus productus* (King) Tiegh. a. Fruit-bearing twig. — *B. axanthus* (Korth.) Miq. b. Very young twig with two kinds of leaves; c. male inflorescence from above, with upper four flowers removed; d. portion of stem with two infructescences (a: Wray 2949; b: Sapiin 2610; c: Docters van Leeuwen 7643; d: Docters van Leeuwen 5451). Redrawn from Danser (1931). Scale bars represent 1 cm.

Habitat & Ecology — 0–1900 m altitude; the only recorded hosts are *Antidesma* and *Ficus*.

Note — Apart from probably *Loranthus odoratus*, this is the only dioecious species of *Loranthaceae* in Malesia.

2. *Barathranthus productus* (King) Tiegh.

Barathranthus productus (King) Tiegh., Bull. Soc. Bot. France 41 (1984) 501. — *Loranthus productus* King, J. As. Soc. Beng. 56, ii (1887) 91. — Syntypes: *Scortechini* 391, 581, *Kunstler* 3240, Perak. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 396].

Glabrous. Stem internodes quadrangular. *Leaves* opposite; lamina narrowly ovate to ovate, 5–13 by 2–6 cm, cuneate at the base to a petiole 6–16 mm long, weakly attenuate and shortly rounded or obtuse at the apex, dull on both sides or darker and slightly lustrous above; venation pinnate with the midrib visible and other veins obscure on both sides. *Inflorescences* at the nodes, a 2- to 6-flowered capitate spike; axis c. 1 mm long; bracts 1.5–2.5 mm long, concave; flowers hermaphrodite. *Corolla* in mature bud 9–13 mm long, cylindric, weakly angular, obtuse or rounded at the apex, white or yellow. *Anther* c. 3 mm long, strongly reflexed, transversely septate, about equal to the free part of the filament. — **Fig. 14a.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — Mostly 900–1800 m altitude; no hosts recorded.

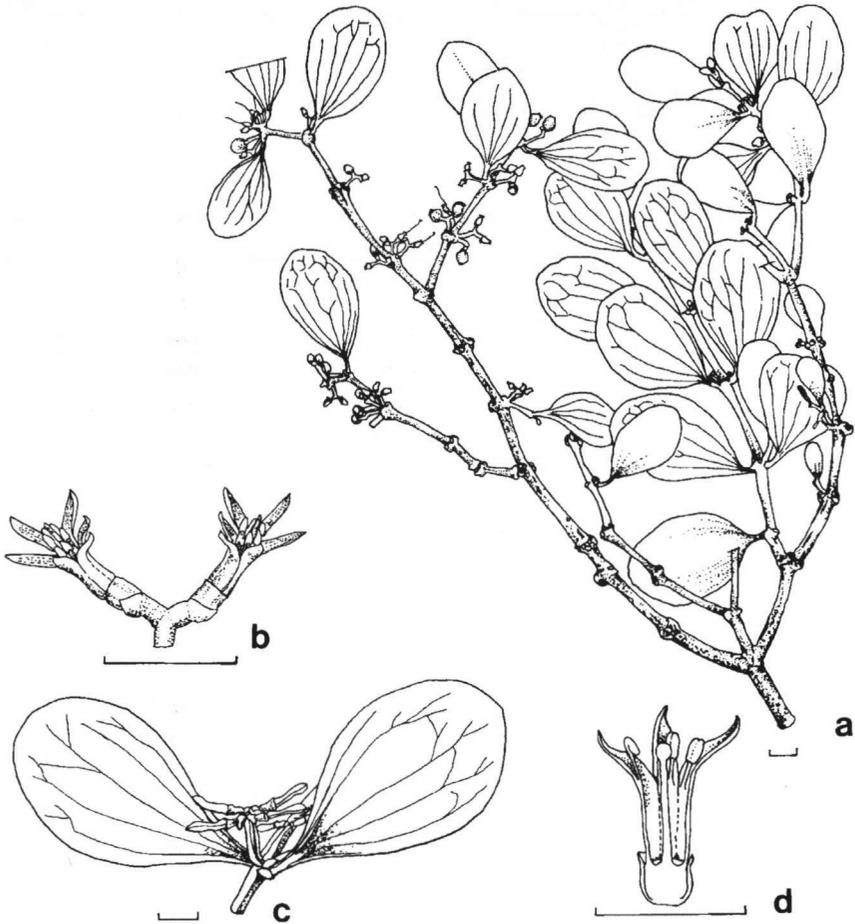


Fig. 15. *Cecarria obtusifolia* (Merr.) Barlow. a. Fruit-bearing twig; b. two-flowered inflorescence; c. twig with four-flowered inflorescence; d. flower in sectional view (a, b, d: not cited; c: *Hyland 10884*), a, b, d Redrawn from Barlow (1981); c redrawn from Barlow (1984). Scale bars represent 1 cm.

CECARRIA

Cecarria Barlow in Barlow & Wiens, *Brittonia* 25 (1973) 28, 34. — Type species: *Cecarria obtusifolia* (Merr.) Barlow.

Aerial stem-parasitic shrubs (haustorial structure unknown). *Leaves* opposite. *Inflorescences* axillary, a simple 2-flowered umbel, rarely produced into a 4-flowered raceme or spike of decussate pairs; bracts solitary under each flower. *Corolla* 6-merous, chori-petalous, regular. *Stamens* slightly unequal in length; anthers dorsifixed, versatile. *Style* simple, with a knob-like stigma. *Fruit* nearly globular. — Fig. 15.

Distribution — Genus of one species ranging from the Philippines to New Guinea, and extending beyond Malesia to Queensland (Cape York Peninsula) and the Solomon Islands.

Habitat & Ecology — Closed and open humid forests, in lowlands and foothills. Host specificity is probably low.

Morphology & Taxonomy — *Cecarria* shows several character states which appear to be primitive for the family, especially its open, pale-coloured, choripetalous, apparently insect-attracting corolla and dorsifixed versatile anthers; for discussion of phylogenetic importance see Barlow in Barlow & Wiens, *Brittonia* 25 (1973) 26; *Blumea* 40 (1995) 16.

Biogeography — The genus *Cecarria* has an unusual distribution which extends across Charles's Line; for discussion see Barlow, *Blumea* 40 (1995) 16.

***Cecarria obtusifolia* (Merr.) Barlow**

Cecarria obtusifolia (Merr.) Barlow in Barlow & Wiens, *Brittonia* 25 (1973) 34; in *Handb. Fl. Papua New Guinea* 2 (1981) 229. — *Phrygilanthus obtusifolius* Merr., *Philipp. J. Sc.* 1, Suppl. (1906) 189. — Type: *Borden FB 1813*, lecto, Luzon, Lamao River.

[For additional synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 557; in *Fl. Austral.* 22 (1984) 90].

Glabrous. *Leaves* opposite; lamina obovate, 3–5.5 by 2–4.5 cm, cuneate at the base to an obscure petiole 2–6 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* few at the nodes, developing successively, a 2-flowered umbel or produced into a 4-flowered raceme or spike; axis 6–9(–20) mm long; pedicels 0–3 mm long, the lower ones often shorter when the inflorescence is prolonged into a raceme. *Corolla* in mature bud 6-merous, 10–14 mm long, cylindric, weakly clavate and obtuse at the apex, white to pale creamy green; petals reflexed near the middle at anthesis. *Anther* ovoid, c. 1.5 mm long, with a short sterile tip, on a free filament c. 2 mm long. — **Fig. 15.**

Distribution — Solomon Islands, Australia (Cape York Peninsula); *Malesia*: Philippines (Luzon, Mindanao), Lesser Sunda Islands (Flores, Timor), New Guinea.

Habitat & Ecology — Closed and open humid forests, 300–1350 m altitude; recorded hosts include *Calophyllum*, *Casuarina*, *Syzygium*, and *Xanthostemon*.

CYNE

Cyne Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 291, 306. — Type species: *Cyne banahaensis* (Elmer) Danser.

[For additional synonymy see Barlow, *Blumea* 38 (1993) 101].

Aerial stem-parasitic shrubs with epicortical runners bearing secondary haustoria. *Leaves* opposite, usually darker and glossier above than below; venation pinnate. *Inflorescences* in the leaf axils or depressions at the stem nodes, developing successively, sessile or almost so, a very contracted or capitate raceme of one or more decussate pairs of dichasia (triads) or rarely dyads, developing beneath the stem periderm which forms

a blister-like calyptra which falls in one piece or ruptures as the flowers expand; triads and individual flowers sessile or with minute peduncles and pedicels, these sometimes developing only in fruit; bracts single under each flower and together forming an involucre under each triad. *Corolla* 6-merous, regular, choripetalous although with the petals coherent into a short tube at the base after anthesis. *Anthers* basifixed, sessile. *Style* simple, often articulate above the base, usually with a small knob-like stigma. *Fruit* ellipsoid, usually with a persistent nipple-like style base. — **Fig. 16.**

Distribution — Six species distributed in eastern *Malesia* from the Philippines to New Guinea.

Habitat & Ecology — Humid and open forests, 0–1500 m altitude; there are no specific host records.

Morphology — The basic inflorescence structure is a raceme of decussate triads, as in *Decaisnina*, but with a very contracted axis. The least specialized inflorescences are very short racemes with only one or two pairs of triads on very short peduncles, whilst the most extreme are sessile heads in depressions in the stem. There is no involucre of imbricate bracts subtending the entire inflorescence, as in some related genera, and the primary diagnostic character for the genus is the bubble-like or pellicle-like calyptra, developed from the stem periderm, which covers the young inflorescence. As the inflorescence expands the calyptra is displaced or irregularly split.

Open flowers of most species are unknown, although the available material suggests that floral characters are relatively uniform.

Taxonomy — The genus is very closely related to *Decaisnina*. Some species show a clear transition to the latter in inflorescence structure, and the diagnostic character for *Cyne* is the presence of the calyptra. For further discussion see Barlow, *Blumea* 38 (1993) 102.

KEY TO THE SPECIES

- 1a. Leaves completely sessile 2
- b. Leaves obscurely to distinctly petiolate 3
- 2a. Leaves of each pair united at the margins into a cup **5. *C. perfoliata***
- b. Leaves of each pair not united at the margins **4. *C. papuana***
- 3a. Inflorescence a sessile head of usually 3 sessile pairs of triads 4
- b. Inflorescence a contracted raceme with an axis 1–4 mm long and usually 1 or 2 pairs of triads 5
- 4a. Young internodes quadrangular; leaves shortly acuminate at the apex **6. *C. quadriangula***
- b. Young internodes terete; leaves obtuse or rounded at the apex **2. *C. banahaensis***
- 5a. Inflorescence axis 3–4 mm long; triads pedunculate; lateral flowers shortly pedicellate **1. *C. baetorta***
- b. Inflorescence axis c. 1 mm long; triads and lateral flowers sessile **3. *C. monotrias***

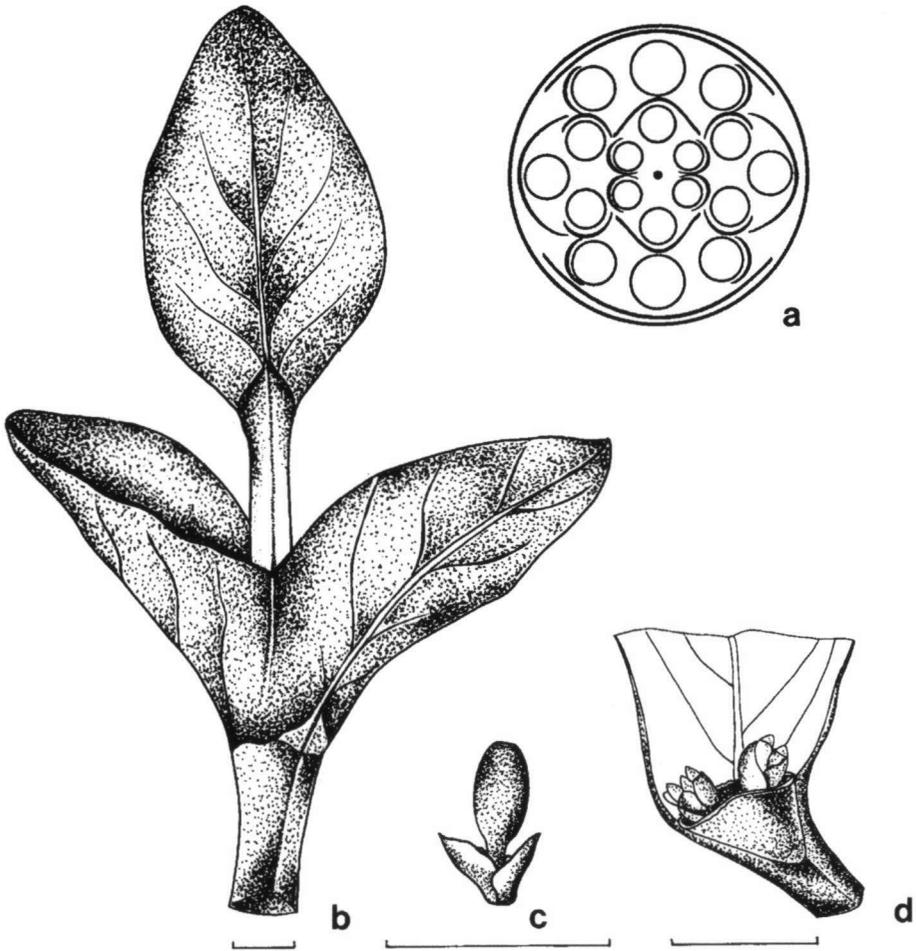


Fig. 16. *Cyne*. a. Generalized diagram of inflorescence. — *C. perfoliata* (Danser) Barlow. b. Twig with leaves; c. fruiting triad; d. stem node with one leaf removed showing young inflorescences (b–d: *Carr 14027*). a Redrawn from Danser (1933); b drawing Sandie McIntosh; c, d redrawn from Barlow (1974). Scale bars represent 1 cm.

1. *Cyne baetorta* Barlow

Cyne baetorta Barlow, *Blumea* 38 (1993) 103. — Type: *Coode 5651*, Mindoro, Suban River.

Glabrous. *Leaves* opposite; lamina elliptic, 5–7 by 3.5–5 cm, cuneate to shortly attenuate at the base to a winged petiole 4–7 mm long, rounded or obtuse at the apex, red above, pale green-brown below, dull on both sides; venation pinnate, obscure except for the dark brown midrib raised below. *Inflorescences* few in hollows at the nodes, arising through a periderm layer which remains as a basal involucre, a raceme of 2

(rarely 3) pairs of triads with the central flowers sessile and the lateral flowers shortly pedicellate; axis 3–4 mm long; peduncles of the triads c. 2 mm long; pedicels of the lateral flowers up to 0.5 mm long. *Flowers* unknown.

Distribution — *Malesia*: Philippines (Mindoro).

Habitat & Ecology — 1100–1200 m altitude; no hosts recorded.

Note — For distinction as a species see Barlow, *Blumea* 38 (1993) 103.

2. *Cyne banahaensis* (Elmer) Danser

Cyne banahaensis (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 306. — *Loranthus banahaensis* Elmer, Leaflet Philipp. Bot. 1 (1908) 288. — Type: *Elmer 9115*, lecto, Luzon, Mt Banahao. [For additional synonymy see Barlow, *Blumea* 38 (1993) 104].

Glabrous. *Leaves* opposite or displaced; lamina elliptic to ovate or obovate, 6–15 by 3.5–7(–9) cm, cuneate to attenuate at the base to a winged petiole 4–15 mm long, attenuate and obtuse or rounded at the apex, green above, brown below, dull on both sides; venation pinnate, distinct on both sides with the midrib raised below. *Inflorescences* few in hollows at the nodes, arising below a periderm layer which is usually shed, a sessile head of usually 3 pairs of triads with all flowers sessile. *Corolla* in mature bud 6-merous, 13–20 mm long, weakly inflated at the base, slender in the middle, weakly clavate and obtuse at the apex, yellow, sometimes red above; petals in the open flower coherent in the lower 2–5 mm. *Anther* 3–3.5 mm long, acute.

Distribution — *Malesia*: Philippines (Luzon, Samar, Mindanao).

Habitat & Ecology — 0–1100 m altitude; no hosts recorded.

Note — For relationships and distinction as a species see Barlow, *Blumea* 38 (1993) 104.

3. *Cyne monotrias* Barlow

Cyne monotrias Barlow, *Blumea* 38 (1993) 105. — Type: *Eyma 2655*, Ceram.

Glabrous. *Leaves* opposite; lamina elliptic, 4.5–6 by 2.5–3 cm, cuneate at the base to a winged petiole 8–12 mm long, rounded or obtuse at the apex, darker above than below, dull on both sides; venation pinnate, obscure above and distinct below. *Inflorescences* few in hollows at the nodes, arising through a periderm layer which remains as a basal involucre, a condensed spike of 1 (rarely 2) sessile triads with all flowers sessile; axis c. 1 mm long. *Corolla* in mature bud 6-merous, c. 13 mm long, weakly inflated at the base, slender in the middle, yellow; petals in the open flower coherent in the lower part. Other flower characters unknown.

Distribution — *Malesia*: Moluccas (Ceram).

Habitat & Ecology — The recorded host is a species of *Euphorbiaceae*.

Note — For discussion of morphology and distinction as a species see Barlow, *Blumea* 38 (1993) 105.

4. *Cyne papuana* (Danser) Barlow

Cyne papuana (Danser) Barlow, *Blumea* 38 (1993) 106. — *Amylothecha papuana* Danser, *Blumea* 3 (1938) 38. — *Decaisnina papuana* (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 540; in *Handb. Fl. Papua New Guinea* 2 (1981) 238. — Type: *Carr 15502*, Papua New Guinea, Isuarava.

Glabrous. Stem internodes dilated upwards and 2-edged when young. *Leaves* opposite, sessile; lamina elliptic, c. 8 cm long, 4–5 cm wide, truncate to shortly cuneate at the base, rounded or obtuse at the apex, slightly glossy above, dull below; venation pinnate, obscure except for the midrib raised below. *Inflorescences* few at the nodes, arising through a periderm layer which remains as a basal involucre, a raceme of 1 or 2 pairs of triads with the central flowers sessile and the lateral flowers very shortly pedicellate; axis 2–4 mm long; peduncles of the triads c. 1 mm long; pedicels of the lateral flowers up to 0.5 mm long. *Corolla* in mature bud 6-merous, c. 30 mm long, pale green below, red above. Other flower characters unknown.

Distribution — *Malesia*: New Guinea, only known from the type collection.

Habitat & Ecology — 1375 m altitude; no host recorded.

Note — For discussion of morphology and taxonomic position see Barlow, *Blumea* 38 (1993) 105.

5. *Cyne perfoliata* (Danser) Barlow

Cyne perfoliata (Danser) Barlow, *Blumea* 3 (1993) 106. — *Tetradyas perfoliata* Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 362; Barlow, *Austral. J. Bot.* 22 (1974) 552; in *Handb. Fl. Papua New Guinea* 2 (1981) 254. — Type: *Forbes 299*, Papua New Guinea, Sogeri.

Glabrous. Stem internodes slightly 2-edged when young. *Leaves* opposite, sessile, those of each pair fused at the margins in the lower 1.5–2 cm into a sheath which completely encircles the stem and encloses the inflorescences; lamina ovate, c. 10 cm long, c. 6 cm wide, rounded or obtuse at the apex, slightly lustrous above, dull below; venation pinnate, distinct on both sides. *Inflorescences* few at the nodes, apparently arising through a periderm layer which remains as a basal involucre, a subsessile head of a few pairs of triads or dyads; peduncles of the triads or dyads obscure but reaching c. 1 mm in fruit; pedicels of the flowers obscure but reaching c. 1.5 mm in fruit. *Corolla* not seen mature, pale pinkish yellow. — **Fig. 16 b–d.**

Distribution — *Malesia*: New Guinea (Papua New Guinea: Central Province).

Habitat & Ecology — 960–1500 m altitude; no hosts recorded.

Notes — 1. For discussion of morphology and taxonomic position see Barlow, *Blumea* 38 (1993) 106.

2. An unusual and apparently rare species; assessment of its conservation status is needed.

6. *Cyne quadriangula* Danser

Cyne quadriangula Danser, *Philipp. J. Sc.* 58 (1935) 38. — Type: *Ramos & Pascasio BS 35119* (not located), Mindanao, Bucas Grande I.

Glabrous. Stem internodes quadrangular when young. *Leaves* opposite; lamina oblong to elliptic, 8–14 by 3.5–5 cm, truncate to shortly cuneate at the base to a petiole 6–14 mm long, shortly acuminate and obtuse at the apex, dull on both sides; venation pinnate, the midrib and main laterals distinct. *Inflorescences* few in hollows at the nodes, arising below a periderm layer which is usually shed. *Corolla* chocolate-coloured. Other characters unknown.

Distribution — *Malesia*: Philippines (Mindanao: Bucas Grande I.).

Habitat & Ecology — Low altitude; no hosts recorded.

Note — A doubtful species with no specimens extant, very similar to *Cyne banahaensis*; for discussion see Barlow, *Blumea* 38 (1993) 107.

DACTYLIOPHORA

Dactyliophora Tiegh., Bull. Soc. Bot. France 41 (1894) 549. — Type species: *Dactyliophora verticillata* (Scheff.) Tiegh.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 355].

Aerial stem-parasitic shrubs with epicortical runners bearing secondary haustoria. *Leaves* opposite or ternate. *Inflorescences* axillary or borne on the epicortical runners, consisting of 1–4 whorls of dichasia (triads) in racemose order on a common axis; triads pedunculate, with the central flower sessile and the lateral flowers pedicellate; bracts solitary under each flower. *Corolla* usually 6-merous, choripetalous, regular. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* ellipsoid or ovoid. — Fig. 17.

Distribution — Genus of 2 species distributed in Ceram and New Guinea, and extending beyond Malesia to Queensland (Cape York Peninsula) and the Solomon Islands.

Habitat & Ecology — Closed humid lowland forests. Host specificity is probably low.

Morphology & Taxonomy — Closely related to *Amyema*. When the inflorescence is occasionally reduced to a single node, it is essentially an umbel of triads, which is the basic inflorescence structure in *Amyema*. For further discussion, see Barlow, *Austral. J. Bot.* 22 (1974) 558.

KEY TO THE SPECIES

- 1a. Leaves opposite or ternate, rounded at the apex, mostly less than 10 cm long; inflorescence axis 2–3 mm thick **1. *D. novaeguineae***
- b. Leaves opposite, acute and more or less acuminate at the apex, mostly more than 10 cm long; inflorescence axis 1–2 mm thick **2. *D. verticillata***

1. *Dactyliophora novaeguineae* (F.M. Bailey) Danser

Dactyliophora novaeguineae (F.M. Bailey) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 307; Barlow, *Austral. J. Bot.* 22 (1974) 558; in *Handb. Fl. Papua New Guinea* 2 (1981) 231. — *Loranthus novae-guineae* F.M. Bailey, *Contr. Fl. New Guinea reimpr. ex Rep. Brit. New Guinea* (1902) 3. — Type: *Le Hunte s. n.*, Goodenough I.

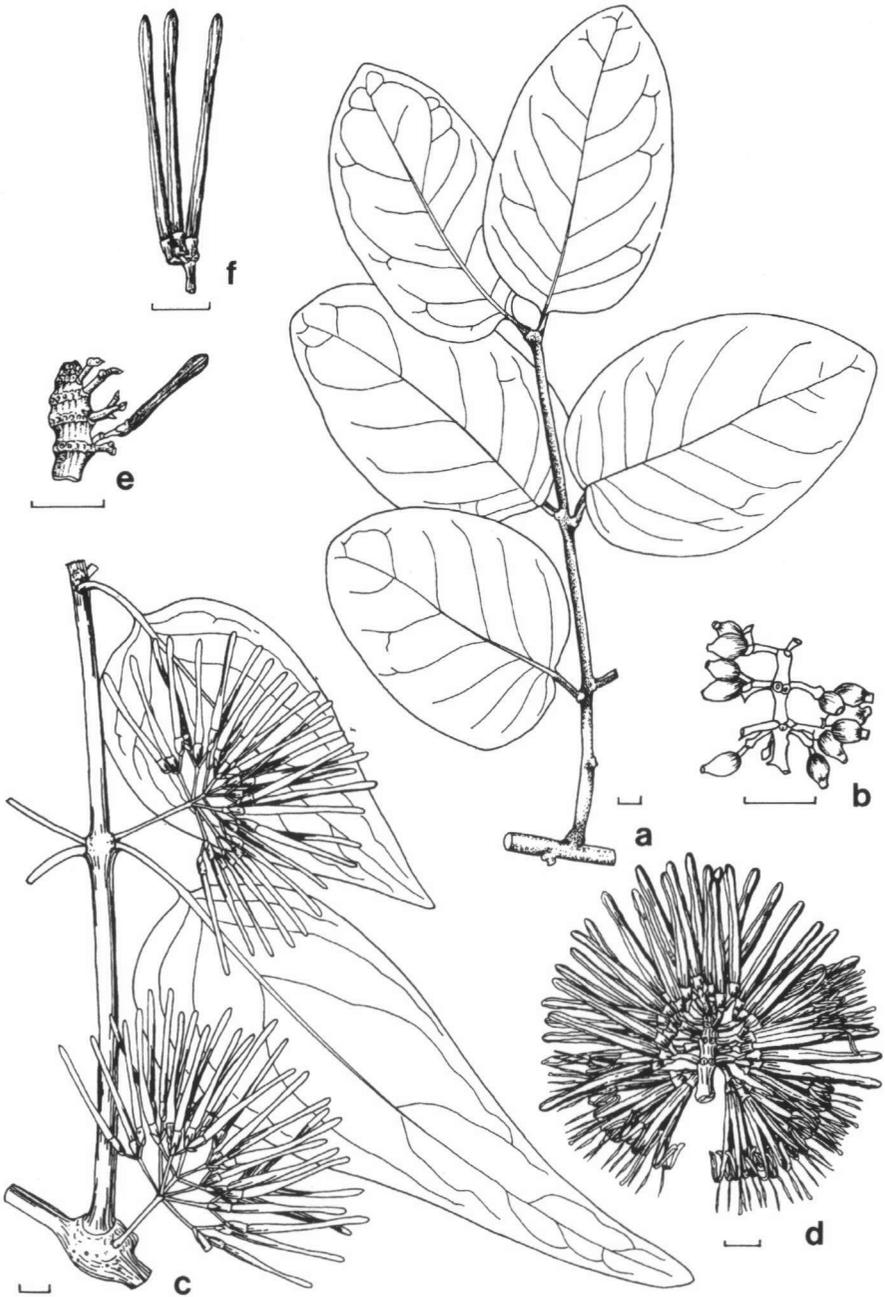


Fig. 17. *Dactylophora novaeguineae* (F.M. Bailey) Danser. a. Twig with leaves; b. infructescence. — *D. verticillata* (Scheff.) Tiegh. c. Flower-bearing twig; d. inflorescence; e. inflorescence axis; f. triad of flower buds (a: not cited; b: *Le Hunte s.n.*; c: *Kajewski 2497*; d: *Mayr 232*; e: probably *Zippel s.n.*; f: *Docters van Leeuwen 9477*). a Redrawn from Barlow (1981), b, d–f redrawn from Danser (1931), c redrawn from Danser (1935). Scale bars represent 1 cm.

Glabrous except for the inflorescence, calyx and usually the corolla shortly brown tomentose. *Leaves* opposite or rarely scattered ternate; lamina elliptic to ovate or almost orbicular, 5–10(–15) by 3.5–7(–12) cm, cuneate at the base to a petiole 8–20 mm long, rounded or obtuse at the apex, dull or slightly lustrous above, dull and usually paler below; venation pinnate with the midrib and the main laterals distinct on both sides and the midrib prominent below. *Inflorescences* at the nodes, a raceme with usually 3 whorls of triads; axis 15–35 mm long, usually 2–3 mm thick, flowerless in the lower (8–)12–20 mm; triads at the first node mostly 8–12, at the second node mostly 8–10, at the third node (4–)6–8(–10); peduncles of the triads 5–8 mm long; pedicels of the lateral flowers c. 2 mm long. *Corolla* in mature bud 6-merous, 25–36 mm long, cylindric, acute at the apex, red or orange below, orange or yellow above. *Anther* 4–6 mm long, slightly longer than the free part of the filament. — **Fig. 17a, b.**

Distribution — Australia (Cape York Peninsula); *Malesia*: New Guinea.

Habitat & Ecology — Closed and open humid forests, 0–100 m altitude; recorded hosts include *Hibiscus*, *Intsia*, *Mallotus*, *Maniltoa*, *Rhizophora*, and *Serianthes*.

2. *Dactylophora verticillata* (Scheff.) Tiegh.

Dactylophora verticillata (Scheff.) Tiegh., Bull. Soc. Bot. France 41 (1894) 550; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 359; Barlow, Austral. J. Bot. 22 (1974) 560; in Handb. Fl. Papua New Guinea 2 (1981) 233. — *Dendrophthoe verticillata* Scheff., Ann. Jard. Bot. Buitenzorg 1 (1876) 27. — Type: *Teijsmann 7591*, Irian Jaya, Doreh.

Dactylophora salomonina Danser, J. Arnold Arbor. 16 (1935) 206; Barlow, Austral. J. Bot. 22 (1974) 559; in Handb. Fl. Papua New Guinea 2 (1981) 233. — Type: *Kajewski 2497*, Guadalcanal, Mt Tutuke.

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 560].

Glabrous except for the inflorescence, calyx and corolla shortly white to brown tomentose. *Leaves* opposite; lamina elliptic to ovate, 8–30 by 4–12 cm, mostly truncate to weakly cordate at the base to a petiole 10–30 mm long, attenuate or acuminate and acute at the apex, dull or slightly lustrous on both sides, often paler below; venation pinnate with the midrib and the main laterals distinct on both sides and the midrib prominent below. *Inflorescences* at the nodes and on the epicortical runners, a raceme with 1–5 whorls of triads, these sometimes condensed together or displaced into spirals; axis variable, 5–35 mm long, 1–2 mm thick, flowerless in the lower 3–30 mm; triads at the first node 8–10, at the second node (when present) 4–12, at the third node (when present) c. 10, at the fourth and fifth nodes (when present) 4–6; peduncles of the triads 3–10 mm long; pedicels of the lateral flowers 1–3 mm long. *Corolla* in mature bud usually 6-merous, less frequently 5- to 8-merous, 25–50 mm long, slender, weakly clavate and acute at the apex, red, pink, orange or yellow below, paler and yellowish or greenish above. *Anther* 2.5–5 mm long, mostly equal to or slightly longer than the free part of the filament. — **Fig. 17c–f.**

Distribution — Solomon Islands; *Malesia*: Ceram, New Guinea.

Habitat & Ecology — Humid forests from 0 to 1200 m altitude; recorded hosts include *Albizia*, *Erythrina*, and *Ficus*.

Note — Barlow in Austral. J. Bot. 22 (1974) 559 recognized *Dactylophora verticillata* and *D. salomonina* as distinct species. Additional materials examined show that there is no sharp morphological distinction between the two, and they are here treated as conspecific. The resultant species is relatively uniform vegetatively, although rather polymorphic in inflorescence characters. Specimens from New Britain and the Solomon Islands often have long slender inflorescences with only one whorl of triads.

DECAISNINA

Decaisnina Tiegh., Bull. Soc. Bot. France 42 (1895) 434, 435. — Type species: *Decaisnina glauca* Tiegh. [= *D. triflora* (Span.) Tiegh.].

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 535; in Fl. Austral. 22 (1984) 74].

Aerial stem-parasitic shrubs, often robust, with epicortical runners bearing secondary haustoria. *Leaves* mostly opposite; venation pinnate. *Inflorescences* axillary or rarely terminal, a raceme of decussate pairs of pedunculate dichasia (triads); bracts single under each flower. *Corolla* 6- (rarely 5-)merous, regular, choripetalous although mostly with the petals weakly coherent in the lower part after anthesis. *Anthers* basifixed, immobile. *Style* simple, often articulate above the base, usually with a small knob-like stigma. *Fruit* ellipsoid, usually with a persistent nipple-like style base. — Fig. 18, 19.

Distribution — 25 species distributed from Java, Celebes and the Philippines south-eastwards to Australia and the Pacific as far as the Marquesas. In *Malesia* 21 species, with centres of species richness and diversity in the Philippines and New Guinea.

Habitat — Humid and open forests, mostly in lowlands, but with some species reaching altitudes of 2900 m.

Ecology — In Malesia some species are aggressive, with broad host ranges, sometimes occurring on cultivated trees.

Morphology — In many *Decaisnina* species the inflorescence is presented horizontally and the triads are secund, all turning upwards on their peduncles so that the inflorescence has a brush-like appearance. In some species the short corolla tube formed by the coherent petals is dilated to form a distinct nectar chamber.

Taxonomy — Circumscription of generic limits of *Decaisnina* and related genera has proved difficult, and has been revised progressively by Danser and then Barlow. Danser in his revisions included *Decaisnina* in *Amylothea*, with some reservations, thus circumscribing the latter genus more broadly than here. For a conspectus of these and related genera see Barlow, *Blumea* 38 (1993) 65–126.

KEY TO THE SPECIES

- 1a. Inflorescence subtended by an involucre of decussate scales at the base of the axis 2
- b. Inflorescence not subtended by an involucre of decussate scales at the base of the axis 6

- 2a. Inflorescence axis oriented vertically with the flowers not strongly secund; lateral flowers of the triads on distinct pedicels at least as long as the ovary 3
 - b. Inflorescence axis oriented horizontally with the flowers strongly secund, giving the inflorescence a brush-like appearance; lateral flowers of the triads on obscure pedicels much shorter than the ovary 5
- 3a. Stems and inflorescence parts very thick; internodes short and often crowded so that the leaves appear verticillate; corolla more than 30 mm long . . **20. D. viridis**
 - b. Stems and inflorescence parts slender to moderately robust; internodes normally developed with evenly spaced decussate leaf pairs; corolla less than 30 mm long 4
- 4a. Inflorescence axis less than 15 mm long; corolla 5-merous, hardly inflated at the base **14. D. ovatifolia**
 - b. Inflorescence axis more than 30 mm long; corolla 6-merous, distinctly inflated at the base **1. D. aherniana**
- 5a. Leaf lamina up to 8 cm long; triads crowded at the end of the inflorescence axis **16. D. revoluta**
 - b. Leaf lamina more than 10 cm long; triads distributed uniformly along the inflorescence axis **6. D. crassilimba**
- 6a. Anthers sessile or nearly so, with free filament less than 1 mm long 7
 - b. Anthers on distinct free filaments at least 2 mm long 9
- 7a. Corolla less than 10 mm long **12. D. micranthes**
 - b. Corolla 10–24 mm long 8
 - c. Corolla more than 24 mm long **13. D. miniata**
- 8a. Young internodes 4-angular; leaf lamina glossy on both sides, darker above, recurved at the margin; inflorescence and flowers shortly and densely tomentose **4. D. confertiflora**
 - b. Young internodes dilated and 2-angled in the upper part; leaf lamina dull on both sides, not recurved at the margin; inflorescence and flowers glabrous or sparsely hairy **7. D. cumingii**
- 9a. Triads in 1–3 pairs crowded near the apex of the inflorescence axis 10
 - b. Triads in several pairs distributed uniformly along much of the inflorescence axis 12
- 10a. Stems and inflorescence parts very thick; internodes short and often crowded so that the leaves appear verticillate; corolla inflated to 5 mm wide in the lower part **20. D. viridis**
 - b. Stems and inflorescence parts slender to robust; internodes normally developed with evenly spaced decussate leaf pairs; corolla not or slightly inflated at the base . . 11
- 11a. Leaf lamina acuminate acute at the apex; corolla 35–50 mm long . **3. D. celebica**
 - b. Leaf lamina obtuse to rounded at the apex, often with a small blunt mucro; corolla 23–30 mm long **5. D. congesta**
- 12a. Leaves with upper surface glossy or darker than the dull lower surface 13
 - b. Leaves dull and more or less the same colour on both sides 16
- 13a. Leaves sessile, truncate to amplexicaul at the base **2. D. amplexicaulis**
 - b. Leaves petiolate, or if sessile attenuate at the base 14

- 14a. Petals eventually separating to the base; anthers transversely septate prior to anthesis **9. *D. forsteriana***
 b. Petals remaining coherent in the lower part; anthers not transversely septate . . . 15
- 15a. Plant robust, usually with a short brown tomentum on the young parts and inflorescences; leaves with a distinct petiole mostly more than 10 mm long; corolla mostly more than 30 mm long **10. *D. hollrungii***
 b. Plant relatively slender, glabrous or rarely with the inflorescence sparsely pubescent; leaves with a petiole mostly less than 10 mm long; corolla less than 30 mm long **18. *D. sumbawensis***
- 16a. Corolla inflated and globular at the base 17
 b. Corolla not inflated at the base, or if so then not sharply contracted to form a globular dilation 18
- 17a. Young internodes strongly angular distally **21. *D. zollingeri***
 b. Young internodes not strongly angular distally **17. *D. stenopetala***
- 18a. Corolla pale green or yellow in the lower part; petals separating to the base at anthesis **8. *D. djamuensis***
 b. Corolla red in the lower part; petals cohering in the lower 1–15 mm after anthesis 19
- 19a. Triads with all flowers sessile **19. *D. triflora***
 b. Triads with the central flower sessile and the lateral flowers pedicellate 20
- 20a. Leaf lamina broadly lanceolate to elliptic, attenuate at the base to an obscure petiole 3–5 mm long; corolla 23–30 mm long **15. *D. pedicellata***
 b. Leaf lamina elliptic to almost orbicular, shortly cuneate at the base with a distinct petiole 25–40 mm long; corolla 30–50 mm long **11. *D. longipes***

1. *Decaisnina aherniana* (Merr.) Barlow

Decaisnina aherniana (Merr.) Barlow, *Blumea* 38 (1993) 74. — *Loranthus ahernianus* Merr., Philipp. J. Sc. 1, Suppl. (1906) 184. — *Amylothea aherniana* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Ahern's Collector FB 2140*, lecto, Luzon, Bosoboso.
 [For additional synonymy see Barlow, *Blumea* 38 (1993) 74].

Glabrous except for young inflorescences sometimes shortly pubescent. *Leaves* opposite (sometimes displaced); lamina lanceolate to ovate, mostly 6–16 cm long, mostly 2–6 cm wide, shortly cuneate to cordate at the base to a petiole 4–14 mm long, acute and often acuminate at the apex, glossy above, dull below; venation pinnate with the midrib prominent and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of 5–16 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers pedicellate; axis 36–90 mm long, subtended at the base by an involucre of 3–6 pairs of triangular keeled bracts up to 4 mm long; peduncles of the triads 5–12 mm long, usually not secund; pedicels of the lateral flowers 2.5–8 mm long. *Corolla* in mature bud 6-merous, 14–29 mm long, inflated at the base, clavate and obtuse at the apex, mostly white or yellow, rarely red; petals in the open flower separating to the base or coherent in the lower 5 mm. *Anther* 1.5–4 mm long, about half as long as the free part of the filament.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Humid forests from 0 to 1200 m altitude; recorded hosts include *Litsea*, *Semecarpus*, and *Syzygium*.

Note — Closely related to *Decaisnina ovatifolia*; for differences and distinction as a species see Barlow, *Blumea* 38 (1993) 75, 91.

2. *Decaisnina amplexicaulis* (Danser) Barlow

Decaisnina amplexicaulis (Danser) Barlow, *Blumea* 38 (1993) 76. — *Amylothecha amplexicaulis* Danser, *Philipp. J. Sc.* 58 (1935) 14. — Type: *Ramos & Edaño BS 38740*, lecto, Mindanao, Mt Candoon.

Glabrous. *Leaves* opposite; lamina ovate, 4–12 by 2–5 cm, weakly cordate at the base, sessile, rounded to acuminate and acute at the apex, somewhat glossy above, dull below; venation pinnate with the midrib prominent on both sides and the main laterals distinct above. *Inflorescences* at the nodes, a raceme of 5–10 opposite evenly spaced pairs of triads with all flowers sessile or the lateral flowers shortly pedicellate; axis 30–55 mm long; peduncles of the triads 1–2 mm long, secund; pedicels of the lateral flowers 0–0.5 mm long. *Corolla* in mature bud 6-merous, c. 33 mm long, slender above a rounded base, clavate and obtuse at the apex, purplish red below, white at the neck and light green above; petals in the open flower separating to the base. *Anther* 2.5–4 mm long, about equal to the free part of the filament. — **Fig. 18a, b.**

Distribution — *Malesia*: Philippines (Mindanao), New Guinea (Bird's Head Peninsula).

Habitat & Ecology — 230–1500 m altitude; no hosts recorded.

Note — For distinction as a species, see Barlow, *Blumea* 38 (1993) 76.

3. *Decaisnina celebica* (Hemsl.) Barlow

Decaisnina celebica (Hemsl.) Barlow, *Blumea* 38 (1993) 80. — *Loranthus celebicus* Hemsl., *Kew Bull.* (1896) 39. — *Amylothecha celebica* (Hemsl.) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 300. — Type: *Everett s.n.*, Celebes, Bonthain Peak (= Mt Lompobatang).

Glabrous. *Leaves* opposite; lamina lanceolate to ovate, 4–8 by 2–3 cm, attenuate at the base to a petiole 3–7 mm long, acuminate and acute at the apex, weakly glossy above, dull below; venation pinnate with the midrib prominent and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of 3–5 opposite pairs of triads with all flowers sessile; axis 20–34 mm long, lacking triads in the lower (12–)16–24 mm; peduncles of the triads 2–4 mm long, secund. *Corolla* in mature bud 6-merous, 39–49 mm long, slender, weakly clavate and acute at the apex, red below and yellow above; petals in the open flower coherent in the lower 10 mm. *Anther* c. 7 mm long, about equal to the free part of the filament.

Distribution — *Malesia*: Celebes (Mt Lompobatang).

Habitat & Ecology — 2000–2850 m altitude; no hosts recorded.

Note — Related to *Decaisnina sumbawensis*; also similar to *D. congesta*; for discussion see Barlow, *Blumea* 38 (1993) 80.

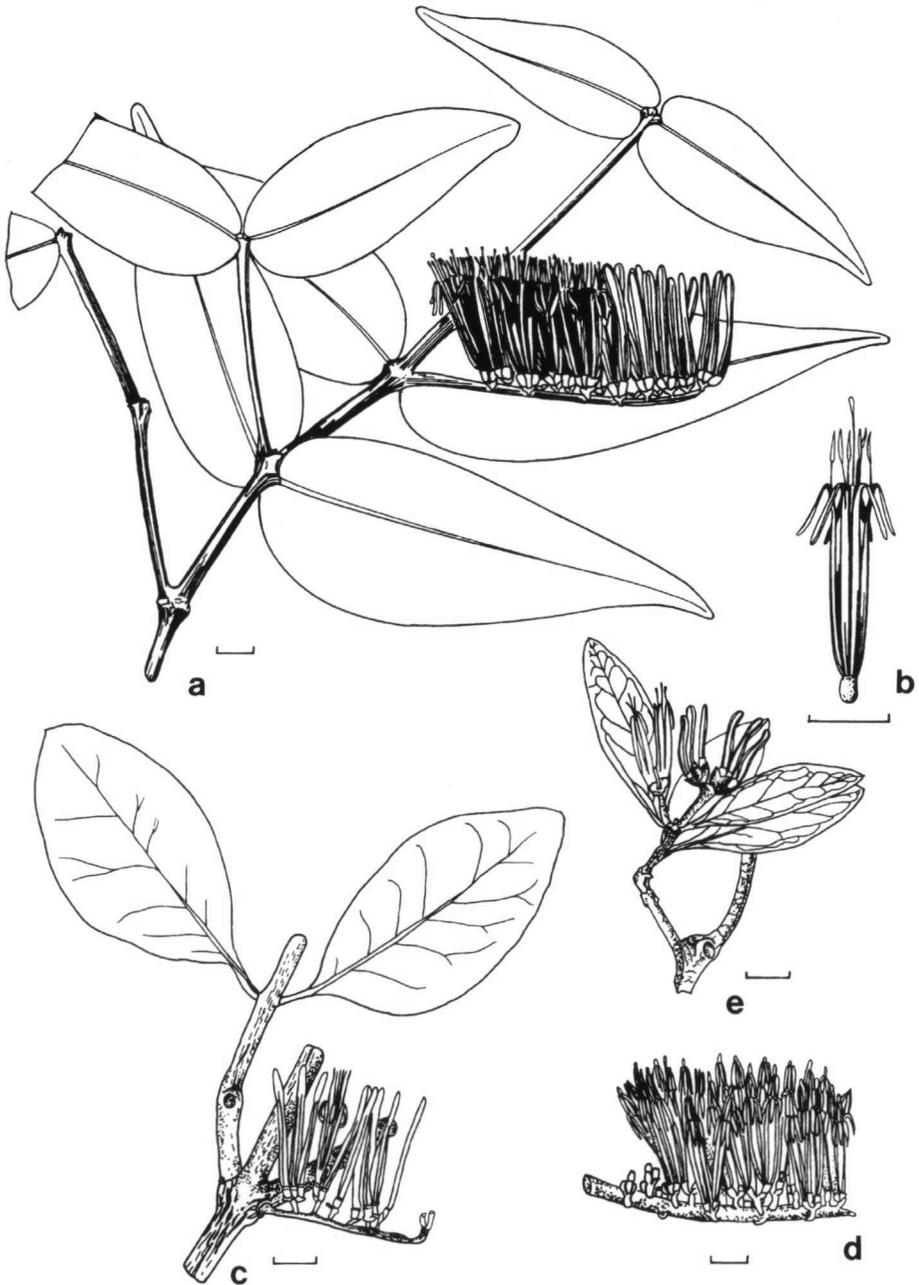


Fig. 18. *Decaisnina amplexicaulis* (Danser) Barlow. a. Flower-bearing twig; b. flower. — *D. hollrungii* (K. Schum.) Barlow. c. Flower-bearing twig; d. inflorescence. — *D. congesta* Barlow. e. Flower-bearing twig (a, b: Ramos & Edaño BS 38740; c: Barlow 3719; d: not cited; e: Gray 1168). a, b Redrawn from Danser (1935), c, e redrawn from Barlow (1984); d redrawn from Barlow (1981). Scale bars represent 1 cm.

4. *Decaisnina confertiflora* (Merr.) Barlow

Decaisnina confertiflora (Merr.) Barlow, *Blumea* 38 (1993) 80. — *Loranthus confertiflorus* Merr., *Philipp. J. Sc., Bot.* 13 (1918) 273. — *Amylothea confertiflora* (Merr.) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 300. — Type: *Wenzel 1249*, lecto, Leyte; see note 3.

Glabrous except for the inflorescences shortly and densely off-white tomentose and the young flowers sparsely so. Stem internodes distinctly 4-angular. *Leaves* opposite; lamina narrowly ovate, 12–20 by 5–8 cm, truncate or slightly cordate at the base to a petiole 12–15 mm long, acuminate and acute at the apex, glossy on both sides, darker above; venation pinnate with the midrib distinct above and prominent below and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a raceme of 10–15 opposite evenly spaced crowded pairs of triads with all flowers sessile; axis 20–30 mm long; peduncles of the triads 1–2 mm long, secund. *Corolla* in mature bud 6-merous, 16–20 mm long, slightly inflated at the base for 2–3 mm, slender above, weakly clavate and broadly acute or obtuse at the apex, red; petals in the open flower coherent in the inflated part. *Anther* c. 2 mm long, acute, much longer than the free part of the filament (subsessile).

Distribution — *Malesia*: Philippines (Leyte).

Habitat & Ecology — No data.

Notes — 1. Similar to *Decaisnina sumbawensis*, differing in angular stems, slightly cordate leaf lamina base, tomentose inflorescence, shorter corolla and subsessile anthers.

2. Barlow, in *Blumea* 38 (1993) 81, reported that no specimens had been located and treated the species as doubtful. Specimens subsequently located (see below) have confirmed the status of the species, and resulted in the amended description above.

3. The holotype of *Loranthus confertiflorus* Merr. (PNH) is no longer extant. An isotype in GH has been seen and identified as lectotype of the name, and other isotypes have been seen in GH, MO and NSW.

5. *Decaisnina congesta* Barlow

Decaisnina congesta Barlow, *Brunonia* 5 (1983) 204. — Type: *Gray 1168*, Queensland.

Glabrous. *Leaves* opposite; lamina elliptic, 5–8 by 2–4 cm, cuneate at the base to a distinct petiole 6–10(–15) mm long, obtuse or rounded at the apex with a small blunt mucro, dull on both sides but slightly darker above; venation pinnate with the midrib and the main laterals visible above and prominent below. *Inflorescences* at the nodes, a subcapitate raceme of 1–3 opposite pairs of triads with all flowers sessile; axis 8–13 mm long, with the triads crowded near the apex; peduncles of the triads 0–1 mm long, secund. *Corolla* in mature bud 6-merous, 23–30 mm long, slender, acute at the apex, mostly red below and green above; petals in the open flower coherent in the lower 2–5 mm. *Anther* 2.5–3.5 mm long, acute, about equal to the free part of the filament. — **Fig. 18e.**

Distribution — Queensland; *Malesia*: New Guinea.

Habitat & Ecology — Humid and open forests from 0 to 1875 m altitude; recorded hosts include *Alstonia*, *Engelhardtia*, and *Morus*.

Note — Possibly related to *Decaisnina triflora*; for distinction as a species see Barlow, *Blumea* 38 (1993) 81.

6. *Decaisnina crassilimba* (Merr.) Barlow

Decaisnina crassilimba (Merr.) Barlow, *Blumea* 38 (1993) 82. — *Loranthus crassilimbus* Merr., *Philipp. J. Sc., Bot.* 13 (1918) 274. — *Amylothea crassilimba* (Merr.) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 300. — Type: *Ramos & Edaño BS 26409*, lecto, Luzon, Mt Umingan.

Glabrous. *Leaves* opposite; lamina elliptic to ovate, 10–20 by 4–10 cm, shortly cuneate or truncate at the base to a distinct petiole 20–30 mm long, obtuse at the apex, glossy green above, dull red-brown below; venation pinnate with the midrib very prominent below and the main laterals obscure on both sides. *Inflorescences* at the nodes, a raceme of c. 9 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers shortly pedicellate or subsessile; axis 30–65 mm long, subtended at the base by an involucre of several pairs of scarious broadly triangular bracts up to 6 mm long; peduncles of the triads 4–10 mm long, secund; pedicels of the lateral flowers 0.5–1.5 mm long. *Corolla* in mature bud 6-merous, 22–33 mm long, moderately robust, weakly clavate and obtuse at the apex, mostly red or yellow below and yellow or green above; petals in the open flower separating completely or almost to the base. *Anther* 3.5–5 mm long, acute, 3–4 times as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon, Panay).

Habitat & Ecology — 300–1400 m altitude; no hosts recorded.

Note — For distinction as a species and taxonomic position, see Barlow, *Blumea* 38 (1993) 82.

7. *Decaisnina cumingii* (Tiegh.) Barlow

Decaisnina cumingii (Tiegh.) Barlow, *Blumea* 38 (1993) 82. — *Amylothea cumingii* Tiegh., *Bull. Soc. Bot. France* 41 (1894) 264. — Type: *Cuming 1969*, Philippines, 'Manille' [For additional synonymy see Barlow, *Blumea* 38 (1993) 82].

Glabrous except for young inflorescence parts sometimes shortly hairy. *Leaves* opposite or scattered; lamina mostly narrowly elliptic to ovate, 5–10(–14) cm long, mostly 3–6 cm wide, usually attenuate or cuneate at the base to a petiole up to 15 mm long, less commonly truncate or slightly cordate and more or less sessile, mostly somewhat attenuate and finally rounded at the apex, dull on both sides, sometimes darker above; venation pinnate with the midrib prominent below and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of (2–)3–7 opposite pairs of triads with all flowers sessile; axis (17–)25–70 mm long, flowerless in the lower (5–)10–20 mm; peduncles of the triads 0–4 mm long, secund. *Corolla* in mature bud 6- (rarely 5-)merous, (11–)13–19(–21) mm long, usually dilated but not globular in the lower part, moderately robust, shortly clavate and obtuse at the apex, mostly yellow or orange or red, darker below than above; petals in the open flower separating to the base or coherent in the lower 3 mm. *Anther* (1.5–)2.5–3(–4) mm long, acute, usually much longer than the free part of the filament and mostly subsessile or sessile.

Distribution — *Malesia*: Philippines, Moluccas.

Habitat & Ecology — Humid forests, 0–2300 m altitude; recorded hosts include *Kibatalia* and *Shorea*.

Note — Related to *Decaisnina zollingeri*; for differences and species circumscription see Barlow, *Blumea* 38 (1993) 83.

8. *Decaisnina djamuensis* (K. Krause) Barlow

Decaisnina djamuensis (K. Krause) Barlow, *Austral. J. Bot.* 22 (1974) 536; in *Handb. Fl. Papua New Guinea* 2 (1981) 234. — *Loranthus djamuensis* K. Krause, *Bot. Jahrb.* 57 (1922) 478. — *Amylothecha djamuensis* (K. Krause) Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 243. — Type: *Schlechter 17319*, New Guinea, Djamu (Ramu) River.

[For additional synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 536].

Glabrous except for the young stems and leaves brown scurfy. *Leaves* opposite; lamina narrowly ovate to ovate, 8–14 cm long, mostly 4–7 cm wide, attenuate or cuneate at the base to a distinct petiole c. 10 mm long, usually attenuate and acute to rounded at the apex, dull powdery green on both sides; venation pinnate with the brown midrib distinct and raised in the lower part and the main laterals indistinct on both sides. *Inflorescences* at the nodes, a raceme of 6–9 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers shortly pedicellate; axis 30–60 mm long; peduncles of the triads 1–3 mm long, secund; pedicels of the lateral flowers c. 0.5 mm long but longer under the fruit; bracts rounded, imbricate, c. 2.5 mm long. *Corolla* in mature bud 6-merous, (15–)20–26 mm long, slender, rounded at the apex, mostly green (rarely red) and sometimes shading to yellow or red above; petals in the open flower separating to the base. *Anther* c. 2.5 mm long, acute, slightly longer than the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Humid forests, mostly 0–200 m altitude, rarely up to 1050 m; recorded hosts include *Anisoptera*, *Cinnamomum*, and *Eucalyptopsis*.

Note — Related to *Decaisnina micranthes*; for differences see Barlow, *Blumea* 38 (1993) 85.

9. *Decaisnina forsteriana* (Schult. & Schult. f.) Barlow

Decaisnina forsteriana (Schult. & Schult. f.) Barlow in D. Walker (ed.), *Bridge and Barrier*, *Austral. Nat. Univ. Publ. BG/3* (1972) 185; Barlow, *Austral. J. Bot.* 22 (1974) 537; in *Handb. Fl. Papua New Guinea* 2 (1981) 235. — *Loranthus forsterianus* Schult. & Schult. f., *Syst. Veg.* 7, 2 (1830) 1612, 1730. — *Amylothecha forsteriana* (Schult. & Schult. f.) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 301. — Type: *Forster 76*, Tahiti.

[For additional synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 537].

Glabrous. *Leaves* opposite; lamina narrowly ovate to broadly ovate or rhomboid, 3–7 (–9) by 2.5–5 cm, cuneate or attenuate at the base to a distinct petiole 10–20 mm long, acute to rounded at the apex, dull on both sides or darker and slightly lustrous above, thin; venation pinnate with the midrib and the main laterals usually distinct on both sides. *Inflorescences* at the nodes, a raceme of mostly 3–6 opposite evenly spaced pairs of

triads with the central flower sessile and the lateral flowers pedicellate; axis 20–30 mm long; peduncles of the triads 4–6 mm long, secund; pedicels of the lateral flowers 0.5–2 mm long. *Corolla* in mature bud 6- (rarely 5-)merous, (25–)35–50 mm long, slender, clavate and obtuse at the apex, mostly red, often darker towards the tip, but predominantly yellow in some populations; petals in the open flower usually separating to the base but sometimes long coherent in the lower 2 mm. *Anther* 2–3(–5) mm long, obtuse below a short mucro, finely transversely septate prior to anthesis, slightly shorter than the free part of the filament.

Distribution — Solomon Islands eastwards to Tahiti and the Marquesas; *Malesia*: New Guinea (Louisiade Archipelago).

Habitat & Ecology — Humid and open forests from 0 to 1900 m altitude but most common in uplands; recorded hosts include *Diospyros*, *Ficus*, *Grewia*, *Homalanthus*, *Inocarpus*, *Metrosideros*, *Pittosporum*, and *Wikstroemia*.

Notes — 1. For a discussion of taxonomic affinities see Barlow, *Blumea* 38 (1993) 87.

2. The species is exceptional in *Loranthaceae* for its wide distribution to oceanic islands; for discussion see Barlow & Schodde, *Beaufortia* 43 (1993) 124.

10. *Decaisnina hollrungii* (K. Schum.) Barlow

Decaisnina hollrungii (K. Schum.) Barlow, *Austral. J. Bot.* 14 (1966) 434; 22 (1974) 538; in *Handb. Fl. Papua New Guinea* 2 (1981) 235. — *Loranthus hollrungii* K. Schum. in K. Schum. & Hollr., *Fl. Kaiser Wilhelm Land* (1889) 105. — *Amylotheca hollrungii* (K. Schum.) Tiegh., *Bull. Soc. Bot. France* 41 (1894) 263; Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 301. — Type: *Hollrung 659*, New Guinea, 'Augustafluss'.

[For additional synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 538].

Glabrous except for the leaf undersides frequently and the petioles, young stems and inflorescences sometimes shortly and sparsely brown tomentose. *Leaves* opposite; lamina lanceolate to ovate, (5–)8–18(–25) by (1.5–)4–8(–12) cm, cuneate to weakly cordate at the base to a petiole 5–30 mm long, acute or obtuse at the apex, glossy above, dull below; venation pinnate with the midrib prominent below and the main laterals distinct or obscure. *Inflorescences* at the nodes, a raceme of 5–14 evenly spaced opposite pairs of triads with all flowers sessile or sometimes the lateral flowers pedicellate; axis very variable, sometimes only 12 mm long, sometimes reaching 120 mm in fruit; peduncles of the triads 1.5–8 mm long, secund; pedicels of the lateral flowers 0–3 mm long. *Corolla* in mature bud 6-merous, (25–)30–40(–60) mm long, moderately robust, weakly clavate and obtuse at the apex, variable in colour but often red below and yellow or green above; petals in the open flower coherent in the lower 1–8 mm. *Anther* 3–4(–6) mm long, acute, about equal to the free part of the filament. — **Fig. 18c, d.**

Distribution — Queensland, Solomon Islands; *Malesia*: Moluccas (Tanimbar, Kei), New Guinea.

Habitat & Ecology — Humid forests, mostly at 0–2000 m altitude, rarely to 2900 m; recorded on numerous dicotyledonous hosts, frequently on *Ficus*.

Note — For taxonomic relationships see Barlow, *Blumea* 38 (1993) 87.

11. *Decaisnina longipes* Barlow

Decaisnina longipes Barlow, *Blumea* 38 (1993) 87. — Type: *Ridsdale NGF 30401*, New Britain, Kilege.

Glabrous. *Leaves* opposite; lamina elliptic to almost orbicular, 8–13 by 4.5–9 cm, cuneate at the base to a winged petiole 25–40 mm long, rounded at the apex, slightly glossy or dull above, dull below; venation pinnate with the midrib prominent below and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a raceme of 10–14 opposite pairs of triads, these often in loose whorls of 4, with the central flower sessile and the lateral flowers pedicellate; axis 35–70 mm long; peduncles of the triads 5–10 mm long, secund; pedicels of lateral flowers 1.5–3 mm long. *Corolla* in mature bud 6-merous, 30–50 mm long, slender, shortly rounded at apex, red below and yellow above; petals in the open flower coherent as a slender tube in the lower 2–15 mm. *Anther* 4–8 mm long, acute, about two or three times as long as the free part of the filament.

Distribution — *Malesia*: Northeastern New Guinea, Bismarck Archipelago.

Habitat & Ecology — Humid forests from 60 to 700 m altitude; no host records.

Note — For distinction as a species and taxonomic relationships see Barlow, *Blumea* 38 (1993) 88.

12. *Decaisnina micranthes* (Danser) Barlow

Decaisnina micranthes (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 540; in *Handb. Fl. Papua New Guinea* 2 (1981) 237. — *Amylothea micranthes* Danser, *Blumea* 2 (1936) 34. — Type: *de Bruyn 369*, lecto, New Guinea, Biak I.

Glabrous except for young shoots sometimes sparsely brown tomentose. *Leaves* opposite; lamina lanceolate to elliptic, 6–8 by 2.5–4 cm, shortly cuneate at the base to a distinct petiole c. 10 mm long, sometimes attenuate but finally rounded at the apex, dull powdery green on both sides; venation pinnate with the midrib distinct and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a raceme of c. 5 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers nearly so; axis 35–40 mm long; peduncles of the triads c. 1 mm long, secund. *Corolla* in mature bud 6-merous, 6–8 mm long, slender, weakly clavate and obtuse at apex, light green; petals in open flower separating to the base. *Anther* c. 1.5 mm long, acute, subsessile.

Distribution — *Malesia*: New Guinea (Irian Jaya: Biak I.).

Habitat & Ecology — Humid forests, 0–100 m altitude; recorded hosts include *Glochidion* and *Macaranga*.

Note — Related to *Decaisnina cumingii* and *D. djamuensis*; for differences see Barlow, *Blumea* 38 (1993) 89.

13. *Decaisnina miniata* (Elmer) Barlow

Decaisnina miniata (Elmer) Barlow, *Blumea* 38 (1993) 89. — *Loranthus miniatus* Elmer, *Leafl. Philipp. Bot.* 6 (1913) 1966, nom. illeg., non S. Moore (1897). — *Amylothea miniata* Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 301. — Type: *Elmer 13276*, lecto, Mindanao, Mt Urdaneta.

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 15–23 by 7–12 cm, cordate at the base, sessile, acuminate and acute at the apex, dull and somewhat glaucous above, dull below; venation pinnate with the midrib prominent below and the main laterals distinct on both sides, with the leaf upper surface bullate between them. *Inflorescences* at the nodes, a raceme of many opposite densely crowded pairs of triads with all flowers sessile; axis 15–30 mm long; peduncles of the triads 1–2 mm long, secund. *Corolla* in mature bud 6-merous, 25–28 mm long, slightly inflated at the base, slender, weakly clavate and obtuse at the apex, mostly red below and sometimes white and grey above; petals in the open flower coherent in the lower 1 mm. *Anther* 3–5 mm long, acute, subsessile.

Distribution — *Malesia*: Philippines (Siargao, Mindanao).

Habitat & Ecology — 0–380 m altitude; the only recorded host is *Canarium*.

14. *Decaisnina ovatifolia* (Merr.) Barlow

Decaisnina ovatifolia (Merr.) Barlow, *Blumea* 38 (1993) 90. — *Loranthus ovatifolius* Merr., *Philipp. J. Sc., Bot.* 3 (1908) 133. — *Amylotheca ovatifolia* (Merr.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 302. — Type: *Clemens 1195*, lecto, Mindanao.

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 3–8 by 1–5.5 cm, truncate to cordate at the base to a petiole 3–5 mm long, acute and often acuminate at the apex, glossy above, dull below; venation pinnate with the midrib prominent and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of about 5 opposite crowded pairs of triads with the central flower sessile and the lateral flowers pedicellate; axis 5–10 mm long, subtended at the base by an involucre of a few pairs of short triangular bracts; peduncles of the triads 1.5–3 mm long, not secund; pedicels of the lateral flowers 1–1.5 mm long. *Corolla* in mature bud 5-merous, 16–23 mm long, very weakly inflated at the base, weakly clavate and obtuse at the apex, red; petals in the open flower coherent in the lower 3–6 mm. *Anther* c. 1.5 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines (Bilar, Mindanao).

Habitat & Ecology — 0–610 m altitude; no hosts recorded.

Note — Closely related to *Decaisnina aherniana*; for differences see Barlow, *Blumea* 38 (1993) 91.

15. *Decaisnina pedicellata* (Danser) Barlow

Decaisnina pedicellata (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 541; in *Handb. Fl. Papua New Guinea* 2 (1981) 239. — *Amylotheca triflora* (Span.) Danser var. *pedicellata* Danser, *Blumea* 3 (1938) 39. — Type: *Carr 12077*, Papua New Guinea, Koitaki.

Glabrous. *Leaves* opposite; lamina broadly lanceolate to elliptic, somewhat falcate, 7–10 by 1.5–3.5 cm, cuneate at the base to a petiole 3–5 mm long, attenuate and obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib and the closely spaced main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme

of c. 4 opposite closely spaced pairs of triads with the central flower sessile and the lateral flowers pedicellate; axis c. 10 mm long; peduncles of the triads c. 2 mm long, secund; pedicels of the lateral flowers c. 1 mm long. *Corolla* in mature bud 6-merous, 25–28 mm long, slender, acute at the apex, pale pink to purple, sometimes darker below; petals in the open flower coherent in the lower 2–3 mm. *Anther* c. 1.5 mm long, acute, about one third as long as the free part of the filament.

Distribution — *Malesia*: Papua New Guinea (Sogeri Plateau).

Habitat & Ecology — 425–600 m altitude; the only recorded host is *Engelhardtia*.

Note — Probably related to *Decaisnina triflora*; for comparison see Barlow, *Blumea* 38 (1993) 92.

16. *Decaisnina revoluta* (Merr.) Barlow

Decaisnina revoluta (Merr.) Barlow, *Blumea* 38 (1993) 92. — *Loranthus revolutus* Merr., Philipp. J. Sc., Bot. 4 (1909) 142. — *Amylotheca revoluta* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Ramos BS 4785*, lecto, Luzon, Mt Tapulao.

Glabrous. *Leaves* opposite; lamina elliptic, 5–8 by 2–3.5 cm, attenuate or cuneate at the base to a winged petiole c. 10 mm long, obtuse at the apex, glossy and somewhat glaucous above, dull brownish below; venation regularly pinnate with the midrib and the main laterals distinct above and prominent below. *Inflorescences* at the nodes, a raceme of about 4 opposite subcapitate pairs of triads with the central flower sessile and the lateral flowers pedicellate; axis 30–35 mm long; peduncles of the triads c. 2 mm long, secund; pedicels of the lateral flowers c. 1 mm long. *Corolla* in mature bud 6-merous, 22–25 mm long, weakly inflated at the base, weakly clavate and obtuse at the apex, yellow below and red above; petals in the open flower separating to the base or shortly and weakly coherent. *Anther* c. 3 mm long, acute, slightly longer than the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Highlands, recorded at 2100 m altitude; no host recorded.

Note — Related to *Decaisnina crassilimba*; for differences see Barlow, *Blumea* 38 (1993) 93.

17. *Decaisnina stenopetala* (Oliver) Barlow

Decaisnina stenopetala (Oliver) Barlow, Austral. J. Bot. 22 (1974) 543; in Handb. Fl. Papua New Guinea 2 (1981) 239. — *Loranthus stenopetalus* Oliver, J. Linn. Soc. 15 (1877) 99. — *Amylotheca stenopetala* (Oliver) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Riedel s.n.*, Celebes, Gorontalo.

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 6–16 by 2–6 cm, usually attenuate to cuneate at the base to a petiole 5–10 mm long, attenuate or acuminate and acute or obtuse at the apex, thin and wrinkled and fragile when dry, dull on both sides or very slightly darker and more lustrous above; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme of 3–6 opposite evenly spaced pairs of triads with all flowers sessile; axis 20–40 mm long; pe-

duncles of the triads 0.5–1.5 mm long, secund. *Corolla* in mature bud 6-merous, 22–30 mm long, inflated at the base, slender in the middle, weakly clavate and obtuse at the apex, mostly red below and yellow or green above; petals in the open flower separating to the inflated basal part. *Anther* 3–4 mm long, acute, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Celebes, Lesser Sunda Islands, Moluccas, New Guinea (Bird's Head Peninsula).

Habitat & Ecology — Primary and disturbed humid forests, mostly from 0 to 500 m altitude, sometimes up to 1400 m; recorded hosts include *Aglaiia*, *Citrus*, *Euodia*, *Euphorbia*, *Ficus*, *Gnetum*, and *Weinmannia*.

Notes — 1. Closely related to *Decaisnina sumbawensis* and *D. zollingeri*; for comparison see Barlow, *Blumea* 38 (1993) 94.

2. The inflation of the corolla base may be transient, at anthesis, and not consistently visible.

18. *Decaisnina sumbawensis* (Tiegh.) Barlow

Decaisnina sumbawensis (Tiegh.) Barlow, *Blumea* 38 (1993) 95. — *Amylothea sumbawensis* Tiegh., *Bull. Soc. Bot. France* 41 (1894) 265. — Type: *Zollinger 3425*, Sumbawa.

Loranthus boholensis Merr., *Philipp. J. Sc., Bot.* 4 (1909) 141. — *Amylothea boholensis* (Merr.) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 300. — Type: *McGregor BS 1277*, Bohol.

Loranthus formicarium Elmer, *Leafl. Philipp. Bot.* 3 (1911) 1069. — *Amylothea formicaria* (Elmer) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 301. — Type: *Elmer 11304*, Mindanao.

Loranthus agusanensis Elmer, *Leafl. Philipp. Bot.* 6 (1913) 1962. — *Amylothea agusanensis* (Elmer) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 300. — Type: *Elmer 13405*, Mindanao.

Loranthus terminaliflorus Elmer, *Leafl. Philipp. Bot.* 6 (1913) 1970. — Type: *Elmer 14156*, Mindanao.

Amylothea parvifolia Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 248. — *Decaisnina parvifolia* (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 541. — Type: *Mayr 51*, Irian Jaya, Arfak Mts.

Glabrous except for the inflorescence rarely sparsely pubescent. *Leaves* opposite; lamina narrowly elliptic or ovate to broadly ovate, mostly 5–14 cm long, mostly 2–6 cm wide, cuneate to truncate at the base to a petiole 2–12 mm long, usually acuminate and acute to obtuse at the apex, shining and often varnished above, dull below; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme of 4–6 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers sessile or very shortly pedicellate; axis usually 20–40 mm long, flowerless in the lower 4–15 mm; peduncles of the triads 1.5–3 mm long, secund; pedicels of the lateral flowers (when present) up to 0.5 mm long. *Corolla* in mature bud 6-merous, 22–30 mm long, weakly inflated at the base, slender above, acute at the apex, mostly red below and green or yellow above; petals in the open flower coherent in the lower 1–3 mm. *Anther* 2–3 mm long, acute, usually slightly shorter than the free part of the filament. — **Fig. 19.**

Distribution — Eastern *Malesia*, from the Philippines, Celebes and Lesser Sunda Islands to western New Guinea.

Habitat & Ecology — Humid forests and agricultural lands, 0–2400 m altitude; recorded hosts include *Citrus*, *Coffea*, *Ficus*, and *Nothofagus*.

Note — The species is circumscribed broadly, including taxa such as *Amylotheca boholensis*, *A. formicaria* and *A. parvifolia* treated as distinct species by Danser; for discussion see Barlow, *Blumea* 38 (1993) 96.



Fig. 19. *Decasina sumbawensis* (Tiegh.) Barlow. Flores. Photo E. Schmutz, 1974, with permission.

19. *Decaisnina triflora* (Span.) Tiegh.

Decaisnina triflora (Span.) Tiegh., Bull. Soc. Bot. France 42 (1895) 436; Barlow, Austral. J. Bot. 22 (1974) 544; in Handb. Fl. Papua New Guinea 2 (1981) 239. — *Loranthus triflorus* Span., Linnaea 15 (1841) 208. — *Amylotheca triflora* (Span.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302; 11 (1931) 250; Blumea 3 (1938) 38, excl. var. *pedicellata* Danser [= *Decaisnina pedicellata* (Danser) Barlow]. — Type: *Spanoghe s.n.*, Timor.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 250; Barlow, Austral. J. Bot. 22 (1974) 544; Blumea 38 (1993) 97].

Glabrous except for the inflorescence axis rarely sparsely tomentose. *Leaves* opposite; lamina narrowly to broadly elliptic, 6–12 by mostly 3–6 cm, attenuate to cuneate at the base to a petiole mostly 4–15 mm long, rounded at the apex, relatively thick, dull and sometimes glaucous on both sides, sometimes slightly darker above; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme of 4–9 opposite evenly spaced pairs of triads with all flowers sessile; axis mostly 30–40 mm long; peduncles of the triads 3–6 mm long, secund. *Corolla* in mature bud 6-merous, 20–35 mm long, sometimes very slightly inflated at the base, slender to moderately robust, acute or obtuse at the apex, mostly red but variously orange or yellow or green, often yellow or green above; petals in the open flower coherent in the lower 1–4 mm. *Anther* 1.5–3 mm long, acute, equal to or shorter than the free part of the filament.

Distribution — Northern Australia; *Malesia*: Lesser Sunda Islands, Moluccas, New Guinea.

Habitat & Ecology — Closed and open humid and seasonal forests, 0–2300 m altitude, only reaching the higher altitudes in New Guinea; recorded hosts include *Acacia*, *Alphitonia*, *Barringtonia*, *Buchanania*, *Castanopsis*, *Dillenia*, *Elaeocarpus*, *Engelhardtia*, *Ervatamia*, *Ficus*, *Glochidion*, *Lithocarpus*, *Neoscortechinia*, and an unidentified species of *Euphorbiaceae*.

Note — For circumscription as a species see Barlow, Blumea 38 (1993) 98.

20. *Decaisnina viridis* (Merr.) Barlow

Decaisnina viridis (Merr.) Barlow, Blumea 38 (1993) 99. — *Loranthus viridis* Merr., Philipp. J. Sc. 1, Suppl. (1906) 189. — *Amylotheca viridis* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 303. — Type: *Borden FB 816*, lecto, Luzon, Mt Mariveles.

[For additional synonymy see Barlow, Blumea 38 (1993) 99].

Glabrous. *Leaves* opposite or rarely ternate; lamina lanceolate to elliptic, 6–12 by 2.5–6 cm, cuneate at the base to a petiole 10–35 mm long, shortly attenuate to acuminate and acute to rounded at the apex, glossy above, dull brown below; venation pinnate with the midrib distinct above and raised below and the laterals indistinct. *Inflorescences* at the nodes and apparently sometimes terminal, a raceme of 2 or 3 opposite usually subcapitate pairs of triads with the central flower sessile and the lateral flowers pedicellate; axis 17–50 mm long, subtended at the base by an involucre of short thick triangular erect bracts, thick and dilated upwards; peduncles of the triads 7–17 mm long, thick,

not secund; pedicels of the lateral flowers 3–8 mm long, thick. *Corolla* in mature bud 6-merous, 30–47 mm long, robust, inflated to more than 5 mm wide in the basal part, clavate and obtuse at the apex, yellow or green; petals in the open flower coherent in the lower 2.5–10 mm. *Anther* 6–8 mm long, obtuse, 1.2–2 times as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Gallery forests, 0–1650 m altitude; no hosts recorded.

Note — For distinction as a species and taxonomic position see Barlow, *Blumea* 38 (1993) 99.

21. *Decaisnina zollingeri* (Tiegh.) Barlow

Decaisnina zollingeri (Tiegh.) Barlow, *Blumea* 38 (1993) 100. — *Amylothecha zollingeri* Tiegh., Bull. Soc. Bot. France 41 (1894) 264. — Type: *Zollinger s.n.*, Celebes.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 252].

Glabrous. Stem internodes when young flattened towards the apex and 4-ridged, 2 ridges forming sharp edges and 2 forming crests on the flattened faces, terete when older. *Leaves* opposite or slightly displaced; lamina oblong to ovate, 4–8(–13) by 2–5.5 (–7.5) cm, truncate or shortly cuneate at the base to a petiole 2–4(–10) mm long, attenuate or acuminate and acute or obtuse at the apex, thin when dry, dull on both sides, sometimes slightly darker above; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a raceme of 3–8 opposite evenly spaced pairs of triads with the central flower sessile and the lateral flowers sessile or very shortly pedicellate; axis 25–50 mm long, lacking triads in the lower 10–20 mm; peduncles of the triads 1–2 mm long, secund. *Corolla* in mature bud 6-merous, 20–27 mm long, inflated at the base, slender in the middle, weakly clavate and obtuse at the apex, green or yellow, sometimes with red in the basal part; petals in the open flower separating to the inflated basal part. *Anther* 3–4 mm long, acute, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Java (Kangean Archipelago), Celebes, Lesser Sunda Islands (Alor), Moluccas, western New Guinea.

Habitat & Ecology — 0–620 m altitude; the only recorded host is *Albizia*.

Notes — 1. Closely related to *Decaisnina stenopetala*, *D. sumbawaensis* and possibly *D. cumingii*; for distinction as a species see Barlow, *Blumea* 38 (1993) 101.

2. The inflation of the corolla base may be transient at anthesis, and not consistently visible.

DENDROPHTHOE

Dendrophthoe Mart., Flora 1 (1830) 109; Tiegh., Bull. Soc. Bot. France 42 (1895) 241; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 397. — Type species: *Dendrophthoe farinosus* (Desr.) Mart. [= *Dendrophthoe pentandra* (L.) Miq.].

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 397].

Aerial stem-parasitic shrubs, often robust, usually with epicortical runners bearing secondary haustoria. *Leaves* commonly alternate or scattered, less commonly opposite. *Inflorescence* a simple raceme or spike, sometimes very few-flowered and seemingly umbellate; bract single under each flower, simple. *Corolla* 5- or rarely 4-merous, gamopetalous, usually weakly zygomorphic but sometimes regular. *Anthers* basifixed, immobile. *Style* simple, usually with a knob-like stigma. *Fruit* ovoid. — **Fig. 2, 20–23.**

Distribution — About 38 species in tropical Africa, southern Asia and southeastwards to Australia. In *Malesia* 21 species, without an obvious centre of diversity.

Habitat — Humid and open forests, more common in lowlands but some species reach altitudes above 2600 m.

Ecology — In *Malesia* many species are aggressive, with broad host ranges, often occurring on cultivated trees.

Phylogeny & Biogeography — *Dendrophthoe* displays several characters which may be plesiomorphic for Afro-Asian *Loranthaceae*. The genus is probably a relatively unspecialized derivative of a Gondwanan stock which reached Asia after fragmentation of Gondwana; for further discussion see Barlow in Baas et al. (eds.), *The plant diversity of Malesia* (1990) 273–292. Several more specialized Asian genera with $x = 9$ and relatively small chromosomes are probably derived in situ from a *Dendrophthoe*-like ancestral stock.

KEY TO THE SPECIES

- 1a. Anthers finely acuminate and acute 2
- b. Anthers blunt, sometimes broadly acute but not acuminate 5
- 2a. Corolla 55–90 mm long **12. *D. longituba***
- b. Corolla 18–55 mm long 3
- 3a. Bracts longer than the ovary; flowers closely sessile; inflorescence and flowers with a dense long loose indumentum **10. *D. lanosa***
- b. Bracts shorter than the ovary; flowers shortly pedicellate; inflorescence and flowers with a close tomentum or glabrescent 4
- 4a. Indumentum ochre to red-brown; stems robust; lamina 10–25 cm long; corolla less than 30 mm long **2. *D. constricta***
- b. Indumentum white to light ochre; stems slender; lamina mostly 5–10 cm long; corolla usually more than 30 mm long **1. *D. clementis***
- 5a. Inflorescence axis normally more than 40 mm long and bearing more than 20 flowers 6
- b. Inflorescence axis up to 30 mm long and bearing up to 20 flowers 10
- 6a. Corolla less than 50 mm long 7
- b. Corolla more than 50 mm long 9
- 7a. Inflorescence and flowers entirely glabrous; corolla mostly more than 30 mm long **7. *D. glabrescens***
- b. Inflorescence and flowers sparsely to densely ochre- to red-brown-tomentose; corolla mostly less than 30 mm long 8

- 8a. Leaves thickly coriaceous, bullate between the depressed midrib and lateral veins; anther much shorter than the free part of the filament; corolla split to near the middle at anthesis **4. D. flosculosa**
- b. Leaves thinly coriaceous, not bullate; veins not depressed; anther \pm equal to the free part of the filament; corolla split almost to the base at anthesis . **19. D. x rimituba**
- 9a. Corolla densely tomentose, lacking knobs on the petals; leaf lamina relatively thin **9. D. incarnata**
- b. Corolla in mature bud glabrous or nearly so, with a knob on each petal just below the neck; leaf lamina relatively thick **17. D. praelonga**
- 10a. Corolla tube regular, inflated and more or less bell-shaped. 11
- b. Corolla tube more or less curved, slender or weakly inflated, gradually widened upwards, usually split more deeply on one side 13
- 11a. Leaves linear to narrow lanceolate, pendulous; corolla 4-merous, in mature bud not winged or longitudinally ribbed in the inflated part; inflorescence a false umbel of 2 or 3 flowers of almost equal age **20. D. timorana**
- b. Leaves elliptic to ovate or obovate, spreading; corolla 5- or rarely 4-merous, in mature bud winged or longitudinally ribbed in the inflated part; inflorescence a few- to several-flowered raceme, sometimes subumbellate 12
- 12a. Corolla glabrous or nearly so; fruit warty; inflorescence 2- to 4-flowered **15. D. pauciflora**
- b. Corolla sparsely to densely white or grey (rarely brown) tomentose; fruit smooth; inflorescence usually 6- to 12-flowered **16. D. pentandra**
- 13a. Inflorescences several, clustered at enlarged gall-like leafless nodes 14
- b. Inflorescences solitary or few, in leaf axils or at younger leafless nodes 15
- 14a. Leaves thin, undulate at margin when dry, with slender petiole **5. D. gangliiformis**
- b. Leaves thick, not undulate at margin when dry, with a thick winged petiole **11. D. locellata**
- 15a. Corolla less than 20 mm long **6. D. gjellerupii**
- b. Corolla 20–30 mm long 16
- c. Corolla more than 30 mm long 18
- 16a. Inflorescence and flowers with a persistent thick red-brown indumentum; corolla in mature bud more or less cylindric **21. D. trichanthera**
- b. Inflorescence and flowers with a short tomentum, the corolla glabrescent; corolla in mature bud with a distinct neck 17
- 17a. Corolla 4-merous, obtuse in mature bud **18. D. quadrifida**
- b. Corolla 5-merous, attenuate towards an acute apex in mature bud **13. D. mearnsii**
- 18a. Leaves opposite, sessile, cordate at the base **8. D. hallieri**
- b. Leaves mostly scattered, petiolate, not cordate at the base 19
- 19a. Leaves usually darker and more lustrous on the upper surface . . . **3. D. curvata**
- b. Leaves dull on both sides 20
- 20a. Inflorescence entirely glabrous; calyx limb truncate **7. D. glabrescens**
- b. Inflorescence and flowers white tomentose, especially the ovary; calyx limb distinctly toothed **14. D. odontocalyx**

1. *Dendrophthoe clementis* (Merr.) Danser

Dendrophthoe clementis (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 307. — *Loranthus clementis* Merr., Philipp. J. Sc. 1, Suppl. (1906) 186. — Type: *Clemens s.n.*, Mindanao, Lake Lanao. [For additional synonymy see Danser, Philipp. J. Sc. 58 (1935) 112, excluding *Dendrophthoe (Loranthus) hallieri*].

Glabrous except for the ovary with a white or light ochre tomentum and the young parts tomentose but soon glabrescent. *Leaves* scattered; lamina narrowly elliptic to rhomboid, 5–10(–15) by 3–7 cm, cuneate to attenuate at the base to a petiole 5–15 mm long, sometimes attenuate and finally broadly acute to shortly rounded at the apex, dull on both sides; venation pinnate and somewhat curvined, the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes or rarely terminal on leafy branches, a (20–)30–50-flowered raceme; axis 15–55 mm long; pedicels mostly 1–3 mm long. *Corolla* in mature bud 5-merous, (25–)32–45 mm long, very slender, weakly clavate and acute at the apex, red or yellow, sometimes one colour below and the other above; tube in the open flower 20–30 mm long with the lobes reflexed or twisted slightly higher. *Anther* 2–3 mm long, acute, about half as long as the free part of the filament.

Distribution — *Malesia*: Borneo, Philippines.

Habitat & Ecology — 0–1500 m altitude; no hosts recorded.

Note — Closely related to *Dendrophthoe constricta* from Borneo and Celebes, differing in less robust habit, usually smaller leaves, paler indumentum, longer flowers and glabrous corolla.

2. *Dendrophthoe constricta* (Korth.) Danser

Dendrophthoe constricta (Korth.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 307; 11 (1931) 400. — *Loranthus constrictus* Korth., Verh. Bat. Genootsch. 17 (1839) 276. — Type: *Korthals s.n.*, Borneo, Mantalet River. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 400].

Glabrous except for young shoots, inflorescences and flowers ochre to red-brown stellate hairy, eventually glabrescent except for the ovary. *Leaves* scattered; lamina ovate or elliptic, (7–)10–25 by (3–)5–14 cm, cuneate to truncate at the base to a petiole 5–10 mm long, mostly obtuse or rounded or sometimes acute at the apex, dull on both sides; venation pinnate with the midrib and the somewhat curvined main laterals distinct above and prominent and raised below. *Inflorescences* at the nodes, a 10- to 20-flowered raceme; axis 10–20(–40) mm long; pedicels 0.5–1 mm long. *Corolla* in mature bud 5-merous, (18–)22–26(–30) mm long, slender, weakly clavate and acute at the apex, mostly cream or yellow or green below and red above; tube in the open flower 14–20 mm long with the lobes reflexed 2–4 mm higher, slightly curved. *Anther* 1–1.5 mm long, acute, half to one fourth as long as the free part of the filament.

Distribution — *Malesia*: Borneo, Celebes.

Habitat & Ecology — 0–2300 m altitude; recorded hosts include *Citrus*, *Dysoxylum*, *Erythroxylon*, *Ficus*, *Gnetum*, *Melastoma*, *Myristicaceae*, *Nephelium*, *Saurauia*, *Shorea*, and *Villebrunnea*.

Note — Occasional specimens with pale indumentum or an apparently slender habit show transition to *Dendrophthoe clementis*.

3. *Dendrophthoe curvata* (Blume) Miq.

Dendrophthoe curvata (Blume) Miq., Fl. Ind. Bat. 1, 1 (1856) 820; Tiegh., Bull. Soc. Bot. France 42 (1895) 252; Barlow, Blumea 40 (1995) 17. — *Loranthus curvatus* Blume, Bijdr. (1826) 665. — Type: *Blume s.n.*, Java, Mt Salak.

Loranthus falcatus auct. non L. f., Suppl. Pl. (1781) 211. — *Dendrophthoe falcata* auct. non (L. f.) Ettingsh., Denkschr. K. Akad. Wiss., Math.-Nat. Kl. Wien 32 (1872) 52; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 403; Backer & Bakh. f., Fl. Java 2 (1965) 73; Barlow, Austral. J. Bot. 22 (1974) 607; in Handb. Fl. Papua New Guinea 2 (1981) 240.

[For additional synonymy see Barlow, Blumea 40 (1995) 17].

Glabrous except for the young parts, inflorescence, ovary and usually the corolla white- to red-brown-tomentose, the leaves usually soon glabrescent; very rarely completely glabrous. *Leaves* scattered or subopposite; lamina narrowly to broadly ovate or obovate, (4–)10–15 by (1.5–)3–5(–8) cm, attenuate to cuneate at the base to a petiole usually 10–20 mm long, mostly obtuse or rounded (sometimes acute) at the apex, darker and glossy above or dull on both sides; venation pinnate with the midrib and the main laterals visible above and often more distinct below. *Inflorescences* at the nodes, a (2–) 5–10(–16)-flowered raceme; axis 10–25(–30) mm long; pedicels (1–)2–4(–5) mm long. *Corolla* in mature bud 5-merous, (28–)30–48 mm long, uniformly widened upwards, slightly narrowed to a neck and usually weakly clavate and acute at the apex, various shades of yellow to red and often differently coloured below and above; tube in the open flower 18–30 mm long with the lobes reflexed 4–6 mm higher, curved, more deeply split on one side. *Anther* 3–5 mm long, obtuse, 0.5–1 times as long as the free part of the filament. — Fig. 23e.

Distribution — Northern Australia, Solomon Islands; *Malesia*: widespread from Sumatra to New Guinea but absent from Philippines and Lesser Sunda Islands.

Habitat & Ecology — Predominantly in humid forests, common in lowlands, frequent up to 2000 m altitude, reaching 3000 m in Sumatra in specimens transitional to *Dendrophthoe × rimituba*; recorded hosts in Malesia include many genera from many different families.

Notes — 1. The species appears to be represented in Sumatra mostly by forms which are transitional to *Dendrophthoe × rimituba*. In Borneo transitional forms to *D. pentandra* are common (see note there).

2. The species has until recently been subsumed in *Dendrophthoe falcata*, which was regarded as a very polymorphic species extending from India to Australia. For the distinction of *D. curvata* as a species see Barlow, Blumea 40 (1995) 17–20.

4. *Dendrophthoe flosculosa* Danser

Dendrophthoe flosculosa Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 408. — Type: *Docters van Leeuwen* 3989, Sumatra, Fort de Kock (lecto L, here chosen from several syntypes cited by Danser).

Glabrous except for young shoots, inflorescences and flowers ochre to red-brown stellate hairy, eventually glabrescent except for the ovary. *Leaves* opposite or scattered; lamina narrow ovate to ovate, 8–21 by 3–9 cm, truncate at the base to a petiole 3–6(–10) mm long, acuminate and acute at the apex, somewhat lustrous above, dull below; venation pinnate with the midrib prominent and raised below and the midrib and main laterals distinct and depressed above with the lamina bullate between them. *Inflorescences* at the nodes, a (25–)30–60-flowered raceme; axis 15–80 mm long; pedicels 1.5–2.5 mm long. *Corolla* in mature bud 5-merous, 23–26 mm long, slender, weakly clavate and obtuse at the apex, red or orange, sometimes green above; tube in the open flower 16–19 mm long with the lobes reflexed 2–3 mm higher, curved. *Anther* c. 1.5 mm long, obtuse, about one third as long as the free part of the filament.

Distribution — *Malesia*: Sumatra.

Habitat & Ecology — 0–1550 m altitude; the only recorded host is *Citrus*.

Note — Danser circumscribed *Dendrophthoe flosculosa* more widely. Some specimens referred to *D. flosculosa* by Danser, including some syntypes, have been included in *D. × rimituba*. The lectotype is chosen in accordance with the more narrow circumscription of *D. flosculosa*. For distinction as a species, see Barlow, *Blumea* 40 (1995) 21–23.

5. *Dendrophthoe gangliiformis* Barlow

Dendrophthoe gangliiformis Barlow, *Blumea* 40 (1995) 21. — Type: *Jaag 1304*, Alor.

Glabrous except for young shoots, inflorescences and flowers shortly ochre to red-brown tomentose, the leaves and corollas soon glabrescent. *Leaves* scattered; lamina narrowly to broadly ovate, 6–16 by 3.5–7 cm, thin, cuneate at the base to a petiole 3–8 mm long, undulate at the margin, rounded or sometimes broadly obtuse at the apex, dull on both sides; venation pinnate with the midrib and the semicurvinerved main laterals prominent on both sides. *Inflorescences* many at the nodes, arising from cushion-like swellings, a short 4–10-flowered raceme; axis very slender, 12–20 mm long; pedicels 0.5–4 mm long. *Corolla* in mature bud 5-merous, 21–30 mm long, very slender, slightly widened upwards, narrowed to a neck, clavate and acute at the apex; tube in the open flower 14–20 mm long with the lobes reflexed 3–5 mm higher, curved. *Anther* 2–2.5 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Celebes, Lesser Sunda Islands (Alor), Moluccas (Tanimbar).

Habitat & Ecology — 0–800 m altitude; the only recorded host is *Ficus*.

6. *Dendrophthoe gjellerupii* (Lauterb.) Danser

Dendrophthoe gjellerupii (Lauterb.) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 309; 11 (1931) 409; Barlow, *Austral. J. Bot.* 22 (1974) 608; in *Handb. Fl. Papua New Guinea* 2 (1981) 242. — *Loranthus gjellerupii* Lauterb., *Nova Guinea* 8 (1912) 815. — Type: *Gjellerup 143*, Irian Jaya, 'Hollandia' (= Jayapura).

Glabrous except for the young shoots, inflorescences and flowers off-white to brown tomentose, the leaves soon glabrescent. *Leaves* opposite or scattered; lamina elliptic, 5–9 by 2.5–4 cm, cuneate or attenuate at the base to a petiole 8–12 mm long, obtuse or rounded at the apex, dull on both sides but darker above; venation pinnate with the midrib and the main laterals visible above and distinct below. *Inflorescences* at the nodes, a 4–8-flowered raceme; axis 6–16 mm long; pedicels (0–)1–2.5 mm long. *Corolla* in mature bud 5-merous, 12–16 mm long, slender, gradually widened upwards, constricted just below the apex, shortly clavate and rounded or truncate at the apex, yellow to red; tube in the open flower 8–10 mm long with the lobes reflexed 1–3 mm higher, curved. *Anther* c. 1 mm long, obtuse, about half as long as the free part of the filament.

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — 0–460 m altitude; recorded hosts include *Diospyros* and *Timonius*.

7. *Dendrophthoe glabrescens* (Blakely) Barlow

Dendrophthoe glabrescens (Blakely) Barlow, Proc. Linn. Soc. New S Wales 87 (1962) 55. — *Loranthus viellinus* var. *glabrescens* Blakely, Proc. Linn. Soc. New S Wales 50 (1925) 19. — Type: *Maiden s.n.*, Australia, Rockhampton.

Dendrophthoe pelagica Barlow, Austral. J. Bot. 22 (1974) 609; in Handb. Fl. Papua New Guinea 2 (1981) 242. — Type: *Brass 6330*, New Guinea, Daru I.

[For additional synonymy see Barlow in Fl. Austral. 22 (1984) 125].

Glabrous. *Leaves* scattered or subopposite; lamina narrow lanceolate to elliptic or obovate, 5–8(–20) by 1.5–4 cm, attenuate at the base to a petiole (3–)8–25 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib distinct and the main laterals usually visible on both sides. *Inflorescences* at the nodes, a (3–)5–10(–20)-flowered raceme; axis (5–)30–60 mm long; pedicels 3–6 mm long. *Corolla* in mature bud 5-merous, 30–45(–50) mm long, uniformly widened upwards, slightly narrowed to a neck, cylindrical or weakly clavate and acute at the apex, mostly yellow, often darkening with age, sometimes red especially in the upper part; tube in the open flower 20–35 mm long with the lobes reflexed 2–4 mm higher, curved. *Anther* 3–5 mm long, obtuse, 0.5–1 times as long as the free part of the filament.

Distribution — Australia; *Malesia*: Lesser Sunda Islands (Lombok, Timor, Alor), Papua New Guinea (Western Province).

Habitat & Ecology — Monsoon forests and woodlands, 0–1200 m altitude; recorded hosts in *Malesia* include *Eucalyptus*, *Melaleuca*, and *Rhizophora*.

Note — The species tends to geographically replace *Dendrophthoe curvata*, which mostly occurs in humid forests. At the interface between humid forests and seasonal monsoon vegetation in New Guinea and northern Australia there is a morphological transition which indicates there is introgression between the two species.

8. *Dendrophthoe hallieri* (Merr.) Danser

Dendrophthoe hallieri (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 309. — *Loranthus hallieri* Merr., Philipp. J. Sc., Bot. 4 (1909) 140. — Type: *Hallier 628*, Mindanao, Zamboanga.

Glabrous except for the young shoots, inflorescences and flowers shortly ochrous tomentose and soon glabrescent except for the ovary. *Leaves* opposite, sessile; lamina broadly ovate, 5–10 by 3–5.5 cm, cordate at the base, rounded at the apex, dull on both sides; venation pinnate but almost curvinerved with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a 3- to 5-flowered raceme; axis 2–8 mm long; the pedicels c. 2 long. *Corolla* in mature bud 5-merous, 30–35 mm long, slender, slightly inflated in the middle, weakly clavate and acute at the apex; tube in the open flower 14–17 mm long with the lobes reflexed 3–5 mm higher, curved. *Anther* c. 3 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — Low altitude; no hosts recorded.

9. *Dendrophthoe incarnata* (Jack) Miq.

Dendrophthoe incarnata (Jack) Miq., Fl. Ind. Bat. 1, 1 (1856) 821. — *Loranthus incarnatus* Jack in Roxb., Fl. Ind., ed. 1, 2 (1824) 213. — Type: *Jack s.n.*, Sumatra, Nias I.

Loranthus leucostachys Molk. in Miq., Pl. Jungh. (1852) 114. — *Dendrophthoe leucostachys* (Molk.) Miq., Fl. Ind. Bat. 1, 1 (1856) 819. — Type: *Junghuhn s.n.*, Sumatra, Tobing.

Dendrophthoe costulata Miq., Sumatra (1860) 138, 344. — Type: *Teijsmann 1082*, Sumatra, Singkarak.

Loranthus grandifrons King, J. As. Soc. Beng. 56, ii (1887) 93. — *Dendrophthoe grandifrons* (King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 309. — Syntypes: *King's Collector (Kunstler) 786, 2067, Scortechini 926*, all Peninsular Malaysia.

Dendrophthoe villosa Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 425. — Type: *Saimoendt 959*, Sumatra, Batang S Manau.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 411].

Glabrous except for the young shoots, inflorescences and flowers with a short dense white or ochrous stellate tomentum which persists on the ovary, corolla and stamen filaments, otherwise eventually glabrescent. *Leaves* scattered or subopposite; lamina narrowly to broadly ovate, 10–30 by (2–)4–16 cm, shortly attenuate to truncate or slightly cordate at the base to a petiole (7–)10–30 mm long, thin, acuminate and acute or obtuse at the apex, darker and somewhat glossy above or dull on both sides; venation pinnate with the midrib and the incurved main laterals distinct on both sides and more prominent below. *Inflorescences* at the nodes, a 12–40-flowered raceme; axis 50–85 mm long; pedicels 0.3–4 mm long. *Corolla* in mature bud 5-merous, (40–)50–110 mm long, relatively slender, sometimes distinctly narrowed above a globosely or ellipsoidally inflated base, gradually widened upwards, weakly clavate and acute at the apex, mostly pink or red below and green above; tube in the open flower 40–85 mm long, more deeply slit on one side, with the lobes reflexed 3–8 mm higher, curved. *Anther* 3–7 mm long, obtuse, equal to or slightly longer than the free part of the filament.

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

Habitat & Ecology — Mostly 0–200 m altitude, rarely to 1050 m; recorded hosts include *Citrus*, *Ficus*, and *Nephelium*.

Notes — 1. Sumatran plants usually have shorter more slender corollas with a more distinct nectar chamber than plants from Peninsular Malaysia and Thailand.

2. Some plants from Peninsular Malaysia and Thailand, with relatively short widened corollas, may be intergrades to *Dendrophthoe pentandra*.

10. *Dendrophthoe lanosa* (Korth.) Danser

Dendrophthoe lanosa (Korth.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 309; 11 (1931) 412. — *Loranthus lanosus* Korth., Tijdschr. Nat. Gesch. & Phys. 3 (1836) 191, 192. — Type: *Korthals s. n.*, Sumatra, Mt Malintang.

Loranthus siamensis Kurz, J. As. Soc. Beng. 40, ii (1871) 62. — *Dendrophthoe siamensis* (Kurz) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311; 16 (1938) 31. — Type from Thailand (Siam), Kanburi, Bukit Kethay.

Loranthus casuarinae Ridl., Trans. Linn. Soc. II, 3 (1893) 342, non Miq. (1844).

Dendrophthoe magna Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 416; Backer & Bakh. f., Fl. Java 2 (1965) 72. — Type: *van Steenis 4648*, Java, Mt Gedeh.

Densely red-brown lanate-hairy on the young vegetative parts, inflorescences and flowers, later glabrescent on the stems and leaf upper surfaces. *Leaves* opposite or scattered; lamina narrowly ovate, mostly 5–16 cm long, mostly 2–5 cm wide, truncate or slightly cordate at the base to a petiole 5–25(–35) mm long, acuminate and broadly acute at the apex, glossy above, dull below; venation pinnate with the midrib and main laterals distinct above and prominent below. *Inflorescences* at the nodes, a 3–10-flowered spike; axis (4–)6–30(–60) mm long; bracts foliaceous, 3–10(–15) mm long, appressed to the ovary. *Corolla* in mature bud 5-merous, 28–55 mm long, globose at the base, uniformly widened above, weakly clavate and obtuse at the apex, mostly pink or red beneath the indumentum; tube in the open flower 15–30 mm long, more deeply split on one side, with the lobes reflexed 6–10 mm higher, curved. *Anther* 3–4 mm long, acute, slightly shorter than the free part of the filament. — **Fig. 23c, d.**

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

Habitat & Ecology — 0–1800 m altitude; recorded hosts include *Dipterocarpus*, *Quercus*, and *Vatica*.

Note — *Dendrophthoe magna* was based on a plant with a longer inflorescence axis and shorter corolla. Variation in both characters is continuous and without any clear geographic pattern except that plants from Java generally have short corollas.

11. *Dendrophthoe locellata* Danser

Dendrophthoe locellata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 414. — Type: *Bünnemeijer 1131*, Celebes, Lombasang.

Glabrous except for young vegetative parts coarsely golden hairy and the young flowers tomentose but soon glabrescent except for the ovary. *Leaves* scattered; lamina ovate, 6–16 by 3–8 cm, shortly attenuate at the base to a petiole 4–10 mm long, acute at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct above and below. *Inflorescences* many at the nodes, arising from cushion-like swellings, a short 1–6-flowered raceme; axis 1–5 mm long; pedicels 1.5–2 mm long. *Corolla* in mature bud 5-merous, 35–40 mm long, slender, weakly clavate and obtuse at

the apex, red or orange; tube in the open flower 25–28 mm long with lobes reflexed 2–3 mm higher, slightly curved. *Anther* c. 5 mm long, obtuse, transversely septate or not, slightly longer than the free part of the filament. — **Fig. 22 d.**

Distribution — *Malesia*: Borneo, Celebes.

Habitat & Ecology — 0–950 m altitude; no hosts recorded.

12. *Dendrophthoe longituba* (Elmer) Danser

Dendrophthoe longituba (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 310. — *Loranthus longitubus* Elmer, Leaf. Philipp. Bot. 6 (1913) 1961. — Type: *Elmer 14043*, Mindanao, Mt Urdaneta.

Glabrous except for young shoots, inflorescences and flowers ochrous- to rusty-tomentose, the indumentum persisting on the inflorescence and ovary and usually on the leaf undersurface. *Leaves* scattered, subopposite or subverticillate; lamina ovate, 9–30 by (3.5–)6–16 cm, truncate to cordate at the base to a slender petiole 15–35 mm long, acuminate and acute at the apex, thin, dull on both sides but darker above; venation pinnate with the midrib and the incurved main laterals distinct above and prominent below. *Inflorescences* at the nodes and sometimes on the epicortical runners, a 10- to 20-flowered raceme (or spike); axis 30–60 mm long; pedicels (0–)0.5–1.5 mm long; bracts narrow, acute, longer than the ovary. *Corolla* in mature bud 5-merous, 65–70 mm long, slender, gradually widened to just above the middle and then finely tapered to the apex, mostly yellow, often with red or green in the basal or apical parts; tube in the open flower 40–45 mm long with the lobes reflexed c. 10 mm higher, slightly curved. *Anther* 5–6 mm long, finely acute, about equal to the free part of the filament. — **Fig. 20.**

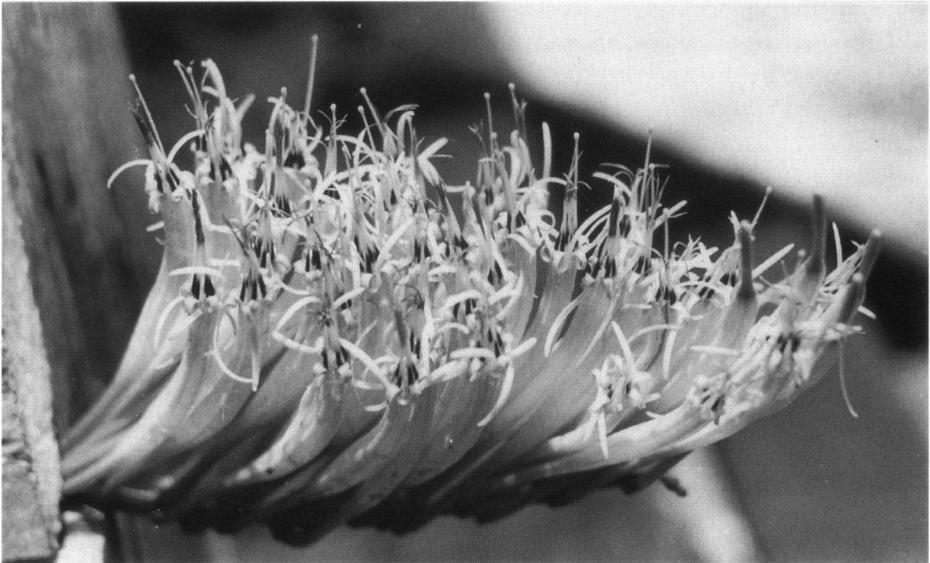


Fig. 20. *Dendrophthoe longituba* (Elmer) Danser. Borneo, NW Kalimantan, Bindjai. Photo A. Elsener, 1963.

Distribution — *Malesia*: Borneo, Philippines (Mindanao).

Habitat & Ecology — Mostly 0–900 m altitude, rarely to 1850 m; recorded hosts include *Citrus*, *Dipterocarpus*, *Hevea*, *Sandoricum*, and *Vitex*.

Note — Closely related to *Dendrophthoe incarnata* from Peninsular Malaysia and Sumatra, and to *D. praelonga* from Java, differing from both in more slender flowers with finely acute anthers.

13. *Dendrophthoe mearnsii* (Merr.) Danser

Dendrophthoe mearnsii (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 310. — *Loranthus mearnsii* Merr., Philipp. J. Sc., Bot. 2 (1907) 271. — Type: *Merrill 5733*, Mindoro, Mt Halcon.

Glabrous except for young vegetative parts, inflorescences and flowers with a short rusty tomentum, the stems, leaves and corollas glabrescent. *Leaves* scattered; lamina broadly ovate, 5–8 by 3–5.5 cm, shortly attenuate at the base to a petiole 6–10 mm long, rounded at the apex, thin, somewhat undulate at the margin, dull on both sides; venation pinnate with the midrib distinct above and prominent below and the main laterals visible on both sides. *Inflorescences* at the nodes, a c. 5-flowered raceme; axis slender, 6–14 mm long; pedicels 2.5–3.5 mm long. *Corolla* in mature bud 5-merous, 22–24 mm long, slender, slightly inflated and gradually widened upwards, narrowed to a neck, long clavate and acute at the apex, green below and red above; tube in the open flower c. 12 mm long, with the lobes reflexed c. 4 mm higher, nearly straight. *Anther* c. 3.5 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Philippines (Mindoro). Known from type specimen only; possibly rare.

Habitat & Ecology — Recorded at 1800 m altitude; no hosts recorded.

Note — Closely related to *Dendrophthoe curvata*, differing in thinner leaves, dark indumentum and shorter, long-acute corolla buds.

14. *Dendrophthoe odontocalyx* (Benth.) Tiegh.

Dendrophthoe odontocalyx (F. Muell. ex Benth.) Tiegh., Bull. Soc. Bot. France 42 (1895) 87. — *Loranthus odontocalyx* F. Muell. ex Benth., Fl. Austral. 3 (1867) 391. — Type: *Mueller s.n.*, N Australia, between McAdam Range and Providence Hill.

Leucobotrys pilosa Tiegh., Bull. Soc. Bot. France 41 (1894) 545. — *Loranthus pilosus* (Tiegh.) Engl., Nat. Pflanzenfam., Nachtr. 1 (1897) 128. — Type: *Zollinger 3415*, Sumbawa.

[For additional synonymy see Barlow in Fl. Austral. 22 (1984) 126].

Densely white-tomentose on all young parts, eventually glabrescent except for the inflorescence and calyx and sometimes the corolla and leaves. *Leaves* opposite or scattered; lamina narrow lanceolate to elliptic, sometimes falcate, 4–15(–25) by (0.5–)1–4 cm, attenuate or cuneate at the base to a petiole 5–15(–25) mm long, sometimes attenuate and finally obtuse or rounded at the apex, dull on both sides; venation pinnate but in narrow leaves almost curvinerved with the midrib prominent and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a 3- to 8-flowered raceme; axis 5–25(–40) mm long; pedicels 2–6 mm long. *Corolla* in mature bud 5-merous, 25–42 mm

long, gradually widened upwards, very weakly clavate and acute to rounded at the apex, red, pink, orange or yellow, often more yellowish or greenish above; tube in the open flower 12–25 mm long with the lobes reflexed 4–7 mm higher, curved. *Anther* 5–7 mm long, obtuse, usually slightly longer than the free part of the filament.

Distribution — Australia; *Malesia*: Java (East), Lesser Sunda Islands (Sumbawa, Alor, Timor).

Habitat & Ecology — Monsoon forests and woodlands, 50–900 m altitude; recorded hosts in Malesia include *Eucalyptus*, *Launea*, and *Stadmannia*.

Note — The species tends to geographically replace *Dendrophthoe curvata*, which mostly occurs in humid forests.

15. *Dendrophthoe pauciflora* Danser

Dendrophthoe pauciflora Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 417. — Types: *Riedel s.n.*, lecto, see note 2, Celebes, Gorontalo; *Forsten 455*, syn, Celebes; *Forsten s.n.*, syn, Celebes.

Dendrophthoe mirifica Danser, Philipp. J. Sc. 58 (1935) 115. — Type: *Reillo BS 16160*, Philippines, Basilan.

Glabrous except for young shoots, inflorescences and flowers white to red-brown stellate hairy and sometimes eventually glabrescent. *Leaves* scattered; lamina elliptic to ovate or obovate, 3–11 by 2–6 cm, thin, attenuate or cuneate at the base to a sometimes obscure petiole (1–)3–10 mm long, acute to rounded at the apex, dull on both sides but slightly darker above; venation pinnate but somewhat curvinerved, with the midrib and main laterals raised below and obscure or visible above. *Inflorescences* usually several at the nodes, a 2- to 4-flowered raceme, sometimes subumbellate, sometimes prolonged slightly beyond the flower pedicels; axis (0.75–)2–5 mm long; pedicels 0.75–4 mm long. *Corolla* in mature bud 4- or 5-merous, 11–15(–18) mm long, abruptly inflated 1 mm above the base to 5 mm wide, winged from base to apex, angular towards the apex but finally rounded, yellow below and red above; tube in the open flower 3–4.5(–11) mm long with the lobes reflexed 4 mm higher. *Anther* 1–3 mm long, obtuse, about 0.5–1.5 times as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Basilan), Celebes, Moluccas (Halmahera, Ambon).

Habitat & Ecology — 0–200 m altitude; the only recorded host is *Sesbania*.

Notes — 1. Closely related to *Dendrophthoe pentandra*, which reaches its eastward limits in Borneo and Flores; differs in having thinner leaves, shorter fewer-flowered inflorescence, more campanulate corolla tube and warty fruit.

2. Of the three syntypes cited above, *Riedel s.n.* (BO) is the most substantial, and is accordingly chosen as lectotype of the species name.

16. *Dendrophthoe pentandra* (L.) Miq.

Dendrophthoe pentandra (L.) Miq., Fl. Ind. Bat. 1, 1 (1856) 818; Backer & Bakh. f., Fl. Java 2 (1965) 72. — *Loranthus pentandrus* L., Mantissa 1 (1767) 63. — Type in LINN.

[For extensive additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 417; 16 (1938) 29].



Fig. 21. *Dendrophthoe pentandra* (L.) Miq. Borneo, W Kalimantan, Wjarumkop. Photo A. Elsener, 1964.

Glabrous except for the young shoots, inflorescences and flowers with a somewhat silky off-white to grey or less often brown tomentum, less dense on the distal part of the corolla. *Leaves* scattered or subopposite; lamina variable, mostly narrowly to broadly elliptic, mostly 6–13 cm long, (1.5–)3–8 cm wide, attenuate to cuneate at the base to a petiole 5–20 mm long, rounded to rarely acuminate and acute at the apex, dull on both sides but darker above; venation pinnate with the midrib and the somewhat curvined main laterals usually visible on both sides. *Inflorescences* at the nodes, a 6–12-flowered raceme; axis 10–20(–35) mm long; pedicels 1–4 mm long. *Corolla* in mature bud 5-merous, 12–20(–28) mm long (longer in some putative hybrids), inflated to c. 5 mm wide and angular or winged in the lower part, narrowed to a neck, clavate and obtuse or rounded at the apex, mostly green or yellow or orange, rarely red; tube in the open flower (2–) 6–12 mm long, narrowly to broadly campanulate, regular, with the lobes reflexed 4–8 mm higher and together often almost closing the neck. *Anther* 2–5 mm long, obtuse, longer or shorter than the free part of the filament. — Fig. 2, 21, 22c.

Distribution — From eastern India eastwards throughout Indochina; *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Java, rare in Philippines (Palawan, Luzon) and western Lesser Sunda Islands (Bali, Sumba, Flores).

Habitat & Ecology — Predominantly in humid forests but also in open forests and plantations, common in lowlands up to 500 m altitude, less frequently to 1650 m; recorded hosts many.

Notes — 1. Many intermediate specimens appear to be hybrids, especially with *Dendrophthoe curvata* in Borneo and *D. kerrii* in Indochina.

2. In absence of flowers *Dendrophthoe pentandra* may be difficult to distinguish from *D. curvata*. Typical *D. pentandra* differs from *D. curvata* in being more robust, with stouter stems and thicker darker glabrous leaves; the inflorescence is shorter and fewer-flowered; the corolla always bears a somewhat silky usually off-white indumentum, is inflated in the lower part, has a short regular tube, with the lobes fully reflexed almost closing the neck; the corolla appears to be normally of only one colour, whereas that of *D. curvata* is often differently coloured above and below.

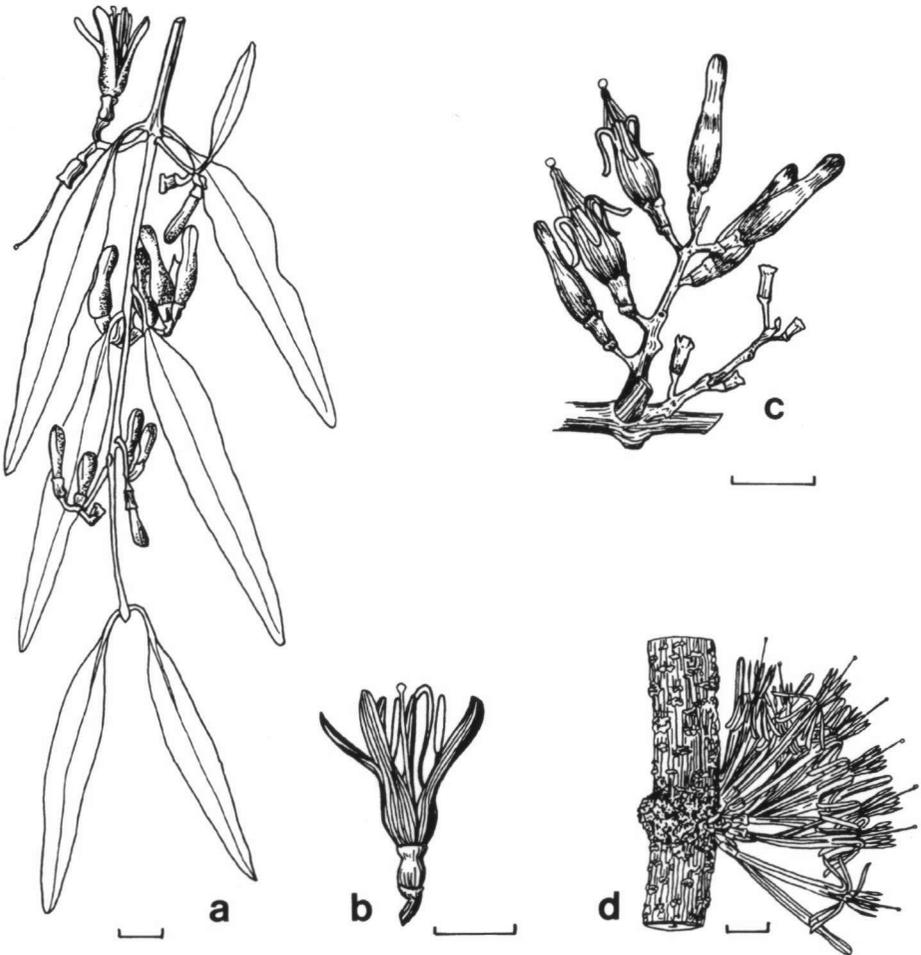


Fig. 22. *Dendrophthoe timorana* (Danser) Barlow. a. Flower-bearing twig; b. flower. — *D. pentandra* (L.) Miq. c. Inflorescence. — *D. locellata* Danser. d. Part of stem with inflorescence (a, b: *Teijsmann s. n.*; c: *Danser s. n.*; d: *Bünnemeijer 11312*). Redrawn from Danser (1931). Scale bars represent 1 cm.

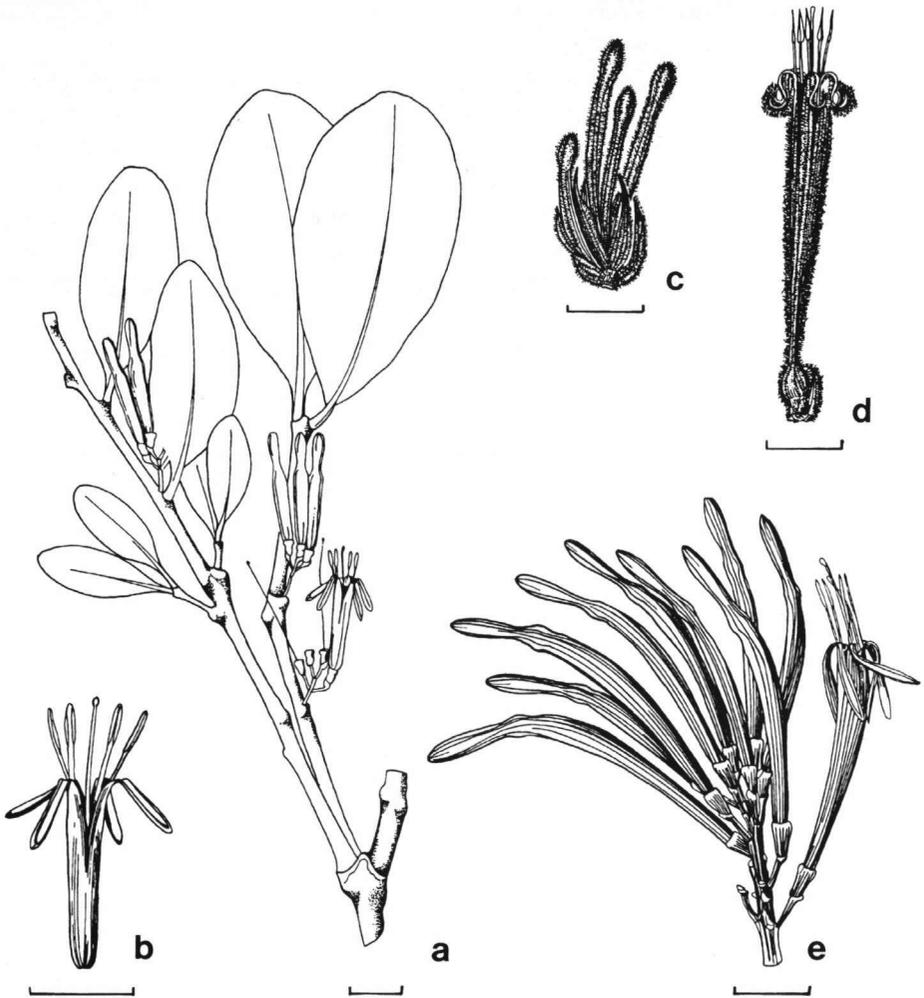


Fig. 23. *Dendrophthoe quadrifida* Danser. a. Flower-bearing twig; b. corolla with stamens and style. — *D. lanosa* (Korth.) Danser. c. Inflorescence with flower buds; d. flower with bract. — *D. curvata* (Blume) Miq. e. Inflorescence (a, b: Clemens 32743; c: Burkill & Haniff 17314; d: Hose 99; e: Backer 9817). a, b Redrawn from Danser (1936), c–e redrawn from Danser (1931). Scale bars represent 1 cm.

17. *Dendrophthoe praelonga* (Blume) Miq.

Dendrophthoe praelonga (Blume) Miq., Fl. Ind. Bat. 1, 1 (1856) 819; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 422; Backer & Bakh. f., Fl. Java 2 (1965) 73. — *Loranthus praelongus* Blume, Bijdr. (1826) 664. — Type: *Blume s. n.*, Java.

Dendrophthoe carinata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 399; Backer & Bakh. f., Fl. Java 2 (1965) 73. — Type: *Backer 8652*, Java, Mt Cikuray.

Glabrous except for the young shoots, inflorescences and flowers white to pale grey tomentose, soon glabrescent other than the ovary. *Leaves* scattered or rarely opposite; lamina ovate or elliptic, 7–20 by 5–12 cm, thick, cuneate to slightly cordate at the base to a petiole 2–12 mm long, obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib and the incurved main laterals distinct on both sides and more prominent below. *Inflorescences* at the nodes, a many-flowered raceme; axis 30–60 mm long; pedicels 1–4 mm long. *Corolla* in mature bud 5-merous, (52–)70–110 mm long, gradually widened upwards, thickened on each petal just below the neck, weakly clavate, sometimes angular, truncate or obtuse at the apex, mostly yellow or yellowish green, becoming orange or rarely red with age; tube in the open flower 35–55 mm long with the lobes reflexed 6–10 mm higher, curved. *Anther* 5–9 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Java.

Habitat & Ecology — Common in lowlands from 0 to 1000 m altitude, rarely up to 2300 m; recorded hosts include *Bombax*, *Dalbergia*, *Erythrina*, *Ficus*, *Hevea*, *Hibiscus*, *Lumnitzera*, *Pithecellobium*, *Sonneratia*, and *Swietenia*.

Note — Similar to *Dendrophthoe longituba* from Borneo, differing in thicker leaves less cordate at the base, with shorter petiole; thicker inflorescence axis with flowers more crowded; and robust corolla and obtuse anthers. Also similar to *D. incarnata* of Peninsular Malaysia and Sumatra, differing in thicker leaves; shorter inflorescence axis; and more robust glabrous corolla.

18. *Dendrophthoe quadrifida* Danser

Dendrophthoe quadrifida Danser, Blumea 2 (1936) 39. — Type: Clemens 32743, Mt Kinabalu.

Tomentum rusty, persistent on the inflorescence and ovary and sparsely on the corolla, the vegetative parts soon glabrescent. *Leaves* scattered or subopposite; lamina ovate, 2–6 by 1–3 cm, cuneate at the base to a petiole 3–8 mm long, rounded at the apex, dull on both sides but darker above; venation pinnate with the midrib prominent and the main laterals obscure on both sides. *Inflorescences* at the nodes, a 2–6-flowered raceme; axis 5–14 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 4-merous, 26–28 mm long, cylindrical below a short neck and clavate and obtuse at the apex, red, sometimes yellow above; tube in the open flower 10–12 mm long with the lobes reflexed 8–10 mm higher, straight. *Anther* c. 4 mm long, obtuse, slightly shorter than the free part of the filament. — Fig. 23 a, b.

Distribution — *Malesia*: Borneo (Mt Kinabalu), Moluccas (Halmahera).

Habitat & Ecology — 100–1500 m altitude; no hosts recorded.

19. *Dendrophthoe x rimituba* Barlow

Dendrophthoe x rimituba Barlow, Blumea 40 (1995) 21. — Type: Meijer 3343, Sumatra, Mt Merapi.

Glabrous except for the inflorescence densely and the flowers sparsely to densely red brown tomentose or sometimes the corolla glabrous. *Leaves* opposite or scattered; lami-

na narrowly ovate to ovate, (6–)8–15(–18) by (3–)6–9 cm, truncate to attenuate at the base to a petiole 7–20 mm long, thin, finely undulate at the margin, acuminate and acute at the apex, dull on both sides or darker and slightly lustrous above; venation pinnate with the midrib distinct above and raised below and the main laterals somewhat curvinnerved and usually visible. *Inflorescences* at the nodes, a 15–30-flowered raceme; axis 40–65 mm long; pedicels 1–3.5(–6) mm long. *Corolla* in mature bud 5-merous, 20–26 (–32) mm long, slender, gradually widened upwards, narrowed to a weak neck, abruptly widened and clavate below the rounded or obtuse apex, red; tube in the open flower 15–24 mm long with the lobes reflexed 2–3 mm higher, hardly curved but split almost to the base on one side. *Anther* 1.5–2 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Sumatra.

Habitat & Ecology — 0–1600 m altitude; the only recorded host is coffee.

Note — The species may be a stabilized hybrid derived from *Dendrophthoe flosculosa* and *D. curvata*. For distinction as a species, see Barlow (1995). Many Sumatran specimens appear to be intergrades to *D. curvata*, and are not resolved by the key.

20. *Dendrophthoe timorana* (Danser) Barlow

Dendrophthoe timorana (Danser) Barlow, *Blumea* 40 (1995) 23. — *Amyema timorana* Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 350. — Type: *Teijsmann s.n.*, Timor.

Glabrous except for the young parts, inflorescences and flowers densely white tomentose. *Leaves* scattered or subopposite, pendulous; lamina linear-lanceolate, 7–15 by 0.6–2.5 cm, attenuate at the base to a slender petiole 5–20 mm long, thin, attenuate and obtuse at the apex, dull on both sides; venation pinnate with only the midrib distinct. *Inflorescences* at the nodes, a 2- or 3-flowered subumbellate raceme; axis 5–12 mm long; the pedicels c. 3 mm long. *Corolla* in mature bud 4-merous, 12–18 mm long, robust, clavate and obtuse at the apex, green beneath the indumentum; tube in the open flower not seen but probably short, regular, with the lobes reflexed near the middle. *Anther* 3–5 mm long, obtuse, about twice as long as the free part of the filament. — **Fig. 22 a, b.**

Distribution — *Malesia*: Timor.

Habitat & Ecology — Seasonal open forests and woodlands from 0 to 1400 m altitude; recorded hosts include *Casuarina* (commonly) and *Albizia*.

Note — For explanation of transfer of the species from *Amyema* to *Dendrophthoe*, see Barlow, l.c.

21. *Dendrophthoe trichanthera* Barlow

Dendrophthoe trichanthera Barlow, *Austral. J. Bot.* 22 (1974) 609; in *Handb. Fl. Papua New Guinea* 2 (1981). — Type: *Brass 8667*, Papua New Guinea, Wassi-Kussa River.

Glabrous except for the inflorescence and flowers and sometimes the leaf undersurface densely rusty stellate hairy. *Leaves* opposite or scattered; lamina ovate, 3–9 by 1.5–

4.5 cm, cuneate or attenuate at the base to a petiole 5–15 mm long, obtuse or shortly rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct above and prominent below. *Inflorescences* at the nodes, a 4–6-flowered more or less subumbellate raceme; axis 4–10 mm long; pedicels 3–5 mm long, dilated upwards. *Corolla* in mature bud 5-merous, (20–)25–30 mm long, almost cylindrical, weakly clavate and rounded at the apex, the colour obscured by the indumentum; tube in the open flower (13–)15–19 mm long with the lobes reflexed 4–6 mm higher, slightly curved. *Anther* c. 3 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: New Guinea (Fly River area).

Habitat & Ecology — Seasonal open and gallery forest, 0–300 m altitude; recorded hosts include *Agonis*, *Halfordia*, *Melaleuca*, and *Terminalia*.

DISTRANTHES

Distrianthes Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 213; 11 (1931) 366. — Type species: *Distrianthes molliflora* (K. Krause) Danser.
[For synonymy see Barlow, Austral. J. Bot. 22 (1974) 598].

Aerial stem-parasitic shrubs, robust, with epicortical runners bearing secondary haustoria. *Leaves* opposite. *Inflorescence* capitate, consisting of two sessile dichasia (triads) at the apex of a common peduncle; central bracts of the triads enlarged and foliaceous, enclosing the flowers and connate at the margins over them during development; bracts subtending the lateral flowers small, narrow. *Corolla* 6-merous, gamopetalous, regular. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. — **Fig. 24.**

Distribution — One species endemic to New Guinea.

Habitat & Ecology — Humid forests, from lowlands to 1100 m altitude. Host specificity is probably low.

Morphology & Taxonomy — The genus is probably a specialized local derivative of the Australian/Papuan stock of which *Amyema* is the core. The 6-flowered capitate involucrate inflorescence is probably a parallel development to that of many *Amyema* species formerly referred to *Dicymanthes*, and to the involucrate head of *Papuanthes*. In addition to the involucre, the primary distinction from *Amyema* which it shares with *Papuanthes* is the gamopetalous corolla.

Distrianthes molliflora (K. Krause) Danser

Distrianthes molliflora (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 312; 11 (1931) 367; Barlow, Austral. J. Bot. 22 (1974) 598; in Handb. Fl. Papua New Guinea 2 (1981) 243. — *Loranthus molliflorus* K. Krause, Bot. Jahrb. 57 (1922) 488. — Type: *Schlechter 17784*, Papua New Guinea, Kani Mts.

Loranthus spathatus K. Krause, Bot. Jahrb. 57 (1922) 489. — *Distrianthes spathata* (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 312; 11 (1931) 367. — Type: *Schlechter 20136*, Papua New Guinea, Torricelli Mts.

Loranthus lamii K. Krause, Nova Guinea 14 (1923) 104. — *Distrianthes lamii* (K. Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 312; 11 (1931) 366. — Type: *Lam 1407*, Irian Jaya, Doorman R.

Glabrous except for the young shoots, inflorescences and flowers shortly brown tomentose and the ovary and corolla usually clothed with silky hairs up to 2 mm long. *Leaves* opposite; lamina elliptic to ovate, 12–25 by 4–12 cm, cuneate to truncate at the base to a petiole 4–12 mm long, recurved at the margin, usually acuminate and acute at the apex, lustrous above, dull below; venation pinnate with the midrib and main laterals distinct above and prominent below. *Inflorescences* few at the nodes and scattered along the epicortical runners; peduncle c. 2 mm long, dilated upwards, 2–4 mm wide at apex; central bracts ovate, 12–30(–40) mm long, 4–12 mm wide, acute, often with sutures not visible, later separating nearly to the base or splitting irregularly, orange or red; lateral bracts slender, acute, 1–10 mm long. *Corolla* in mature bud 40–65 mm long, slender, very gradually widened upwards, acute at apex, orange to deep red; tube in open flower 12–50 mm long, with petals reflexed and curled 10–16 mm below stigma. *Anther* 3–4 mm long, half to one third as long as the free part of the filament. — **Fig. 24.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Humid forests at 130–1100 m altitude; no hosts recorded.

Note — For comment on conspecificity with *Distrianthes lamii* and *D. spathata*, see Barlow (1974).

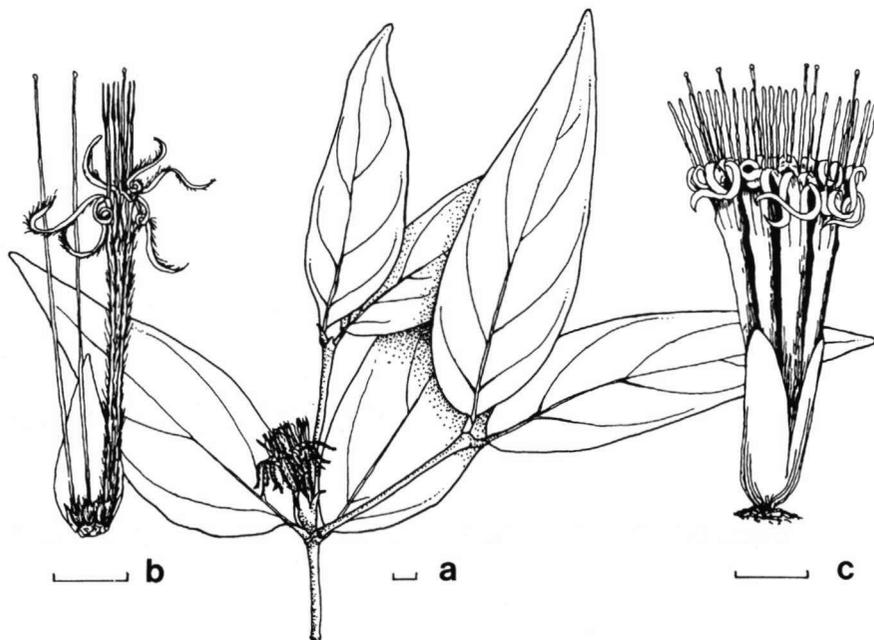


Fig. 24. *Distrianthes molliflora* (K. Krause) Danser. a. Twig with inflorescence; b. inflorescence in sectional view; c. inflorescence (a: not cited; b: *Schlechter 17784*; c: *Lam 1407*). a Redrawn from Barlow (1981), b, c redrawn from Danser (1931). Scale bars represent 1 cm.

ELYTRANTHE

Elytranthe Blume in Schult. & Schult. f., Syst. Veg. 7 (1830) 1611. — Type species: *Elytranthe albida* (Blume) Blume

[For synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 304].

Aerial stem-parasitic shrubs with epicortical runners bearing secondary haustoria. *Leaves* opposite. *Inflorescences* axillary, a few-flowered spike; axis decussately flattened, with the flowers inserted in hollows; bracts 3 under each flower, foliaceous and together enclosing the flower bud. *Corolla* 6-merous, gamopetalous, regular or nearly so. *Anthers* basifixed, immobile. *Style* simple, conical at the base, with a knob-like stigma. *Fruit* almost globular. — Fig. 25.

Distribution — Genus of two species distributed from eastern India to Vietnam. In *West Malesia* both species.

Habitat — Mostly open forests, mostly in highlands but extending down to sea level.

Ecology — Plants often robust, forming very large infestations, especially on *Castanea* and *Quercus*.

Morphology & Taxonomy — *Elytranthe* occupies an intermediate position between *Macrosolen*, in which the inflorescence is a simple raceme or spike, and *Lepidaria*, in which it has the same basic structure but is condensed, capitate and involucrate. In *Elytranthe* the spicate inflorescence is still clearly evident, although the bracts are enlarged and closely envelop the developing flowers. However, the inflorescence features of the two species of *Elytranthe* possibly represent parallel developments, so that the genus may not be natural. Danser in *Blumea* 2 (1936) 35 addressed these problems, but did not find a satisfactory solution. The inflorescence architecture of *Elytranthe albida* and *E. arnottiana* is hardly different from that of the *Macrosolen parasiticus* species group, which Danser had earlier referred to *Elytranthe* but transferred to *Macrosolen* in 1936. The most satisfactory treatment may be to treat *Elytranthe* and *Macrosolen* as congeneric, but confirmation requires a critical study of the inflorescence structure, function and homology. Because the name *Elytranthe* has priority over *Macrosolen*, which is a relatively large genus, union of the two would involve considerable nomenclatural change.

KEY TO THE SPECIES

- 1a. Corolla more than 40 mm long; inflorescence with a peduncle 1–15 mm long
 1. *E. albida*
 b. Corolla less than 15 mm long; inflorescence seemingly sessile .. 2. *E. arnottiana*

1. *Elytranthe albida* (Blume) Blume

Elytranthe albida (Blume) Blume in Schult. & Schult. f., Syst. Veg. 7 (1830) 1611; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 305; Backer & Bakh. f., Fl. Java 2 (1965) 70. — *Loranthus albidus* Blume, Verh. Bat. Genootsch. 9 (1823) 184. — Type: *Blume s.n.*, Java.

Loranthus leucosiphon Griff., Not. Pl. As. 4 (1854) 623. — *Elytranthe leucosiphon* (Griff.) Tiegh., Bull. Soc. Bot. France 42 (1895) 439. — Type: *Griffith s.n.*, Malaysia, Malacca.

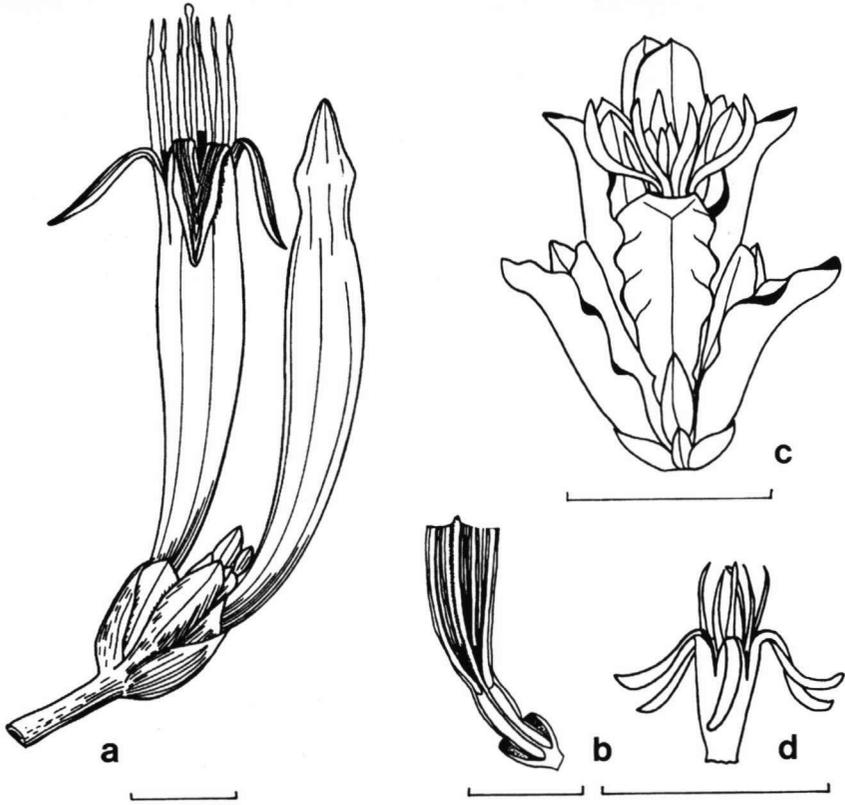


Fig. 25. *Elytranthe albida* (Blume) Blume. a. Inflorescence; b. sectional view of lower part of flower. — *E. arnottiana* (Korth.) Miq. c. Inflorescence; d. corolla and stamens (a, b: Backer 25952; c, d: Burkill 3394). Redrawn from Danser (1931). Scale bars represent 1 cm.

Glabrous. *Leaves* opposite; lamina narrowly to broadly ovate, 6–14 by 3–8 cm, cuneate to truncate at the base to a petiole 7–25 mm long, somewhat acuminate and broadly acute at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a pedunculate spike of 1–3 decussate pairs of flowers; peduncle (1–)5–10(–15) mm long, more or less terete, subtended by 1–3 pairs of small bracts at the base; flower-bearing axis 5–20 mm long, with decussate hollows c. 6 mm long; central bracts 7–12 by 4–6 mm, keeled, acute; lateral bracts as long as the central ones, keeled, obtuse. *Corolla* in mature bud 6-merous, 40–65 mm long, with a distinct nectar chamber at the base, gradually widened upwards, weakly winged above the middle, narrowed to a neck, clavate and acute at the apex, mostly white to pink below, blue-grey above; tube in the open flower 25–45 mm long, split slightly deeper on one side, with the lobes reflexed or twisted 5–10 mm higher. *Anther* 2.5–3.5 mm long, constricted at the base, acute, about half as long as the free part of the filament. — Fig. 25 a, b.

Distribution — India to Vietnam; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — Open and humid forests, commonly from 1000 to 1700 m altitude, less frequently down to sea level; recorded hosts include *Brownlowia*, *Castanopsis*, *Lithocarpus*, *Litsea*, *Shorea*, and *Quercus*.

2. *Elytranthe arnottiana* (Korth.) Miq.

Elytranthe arnottiana (Korth.) Miq., Fl. Ind. Bat. 1, 1 (1856) 832. — *Loranthus arnottianus* Korth., Verh. Bat. Genootsch. 17 (1839) 284. — Type: *Korthals s.n.*, Sumatra, Mt Malingtang. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 307].

Glabrous. *Leaves* opposite; lamina ovate to slightly obovate, 5–8 by 3–5 cm, cuneate to truncate at the base to a petiole 4–13 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib distinct below and the other venation indistinct. *Inflorescences* at the nodes, a spike of 1–3 decussate pairs of flowers, sessile or nearly so, subtended at the base by 1–3 pairs of bracts up to 5 mm long; flower-bearing axis 5–10 mm long, with decussate hollows 3–4 mm long; central bracts c. 10 by 4 mm, sometimes keeled, acute; lateral bracts c. 7 by 2.5 mm wide, obtuse or acute. *Corolla* in mature bud 6-merous, c. 10 mm long, with a weakly defined nectar chamber at the base, gradually widened upwards, slightly narrowed above the middle to a neck, clavate and broadly acute at the apex, green, sometimes orange-tinged below; tube in the open flower c. 6 mm long with the lobes reflexed c. 1 mm higher. *Anther* c. 1.5 mm long, obtuse, about equal to the free part of the filament. — **Fig. 25c, d.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Singapore.

Habitat & Ecology — Probably low altitudes; no hosts recorded.

HELIXANTHERA

Helixanthera Lour., Fl. Coch. 1 (1790) 142; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 368. — Type species: *Helixanthera parasitica* Lour. [For synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 368].

Aerial stem-parasitic shrubs, sometimes with epicortical runners bearing secondary haustoria, or rarely (not in *Malesia*) terrestrial root parasites. *Leaves* opposite, scattered or sometimes crowded to false whorls. *Inflorescence* a simple raceme or spike; bracts single under each flower. *Corolla* 4- to 6-merous, choripetalous, regular or nearly so. *Anthers* basifixed, immobile. *Style* straight, simple or with a constriction separating upper and lower segments with different outlines; stigma knob-like. *Fruit* ovoid. — **Fig. 26, 27.**

Distribution — About 35 species in tropical Africa, southern Asia and *Malesia*. In *Malesia* 11 species with their diversity centred on Peninsular Malaysia, Sumatra and Borneo, and reaching the Philippines, Celebes and Java.

Habitat — Humid and open forests and cultivated lands, commonly from 0 to 1800 m altitude but some species reaching 3000 m.

Ecology — Host specificity is low; some species are aggressive, with broad host ranges, often occurring on cultivated trees.

Morphology — Several groups of species in *Helixanthera* are defined by differences especially in the form of the ovary, corolla and style. The ovary may be of the shortly cylindrical or urceolate form typical of the family generally, or greatly elongated. The corolla in bud may be slightly curved, gradually tapered and acute (described as ‘beak-like’ by Danser) or regular; in the latter case it may be campanulate and winged below or not. The style may reach to the top of the flower, as in most loranth, or only to near the base of the anthers; it may be simple or articulate, with lower and upper segments which may differ in width and angularity.

Taxonomy — Combinations of the differences mentioned above have provided the basis for recognition of segregate genera, especially by Van Tieghem. Danser (1929, 1933) considered that there was little to justify the acceptance of a large number of small genera based on these differences, and his view is followed here. However, circumscription of a single diverse genus *Helixanthera* presents some difficulties in distinction of the closely related genus *Loranthus* (see discussion there).

KEY TO THE SPECIES

- 1a. Corolla more than 15 mm long 2
- b. Corolla less than 13 mm long 4
- 2a. Pedicels flattened, winged and widened upwards; corolla 6-merous . . **1. H. alata**
- b. Pedicels angular but not flattened or winged; corolla 5-merous 3
- 3a. Pedicel shorter than ovary; inflorescence axis 20–60 mm long **3. H. crassipetala**
- b. Pedicel mostly longer than the ovary; inflorescence axis 50–250 mm long **4. H. cylindrica**
- 4a. Style reaching to the top of the anthers; inflorescence axis less than 70 and often less than 50 mm long 5
- b. Style reaching only to near the base of the anthers; inflorescence axis more than 60 and often more than 100 mm long 8
- 5a. Flowers sessile; petals commonly 5, sometimes 4 6
- b. Flowers pedicellate, sometimes very shortly; petals 4 7
- 6a. Leaves rounded at the apex; inflorescence axis up to 40 mm long; corolla rounded in bud, 3.5–5 mm long; anther shorter than the free filament **9. H. sessiliflora**
- b. Leaves acute at the apex; inflorescence axis more than 45 mm long; corolla acute in bud, 5–7 mm long; anther longer than the free filament **6. H. maxwelliana**
- 7a. Inflorescence of 10–30 flowers distributed along an axis 15–70 mm long; free filament longer than the anther **2. H. coccinea**
- b. Inflorescence of 2–5 flowers subumbellately crowded near the tip of an axis 5–20 mm long; free filament much shorter than the anther **5. H. ligustrina**
- 8a. Style angular in the lower part below a constriction near the middle, more slender above. 9
- b. Style terete or angular, gradually widened upwards, lacking a constriction 10

- 9a. Flowers sessile; bracts strongly reflexed, with a dorsal spur-like sac; style weakly constricted **11. *H. spicata***
 b. Flowers pedicellate, sometimes very shortly; bracts not strongly reflexed, sometimes with a dorsal transverse fold but lacking a sac; style strongly constricted **7. *H. parasitica***
- 10a. Inflorescence sometimes subtended by an involucre of a few narrow bracts up to 5 mm long; ovary barrel-shaped or shortly cylindric, usually with irregular wrinkles or furrows persisting to the young fruit; corolla 3.5–8.5 mm long **8. *H. pulchra***
 b. Inflorescence subtended by an involucre of numerous linear bracts up to 15 mm long; ovary cylindric, longer than wide, usually slightly narrowed below the calyx limb, sometimes longitudinally weakly angled or furrowed; corolla 7–12 mm long **10. *H. setigera***

1. *Helixanthera alata* (Tiegh.) Danser

Helixanthera alata (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 370. — *Coleobotrys alata* Tiegh., Bull. Soc. Bot. France 41 (1894) 542. — Type: *Beccari 11*, Sumatra, Mt Singgalang. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 370].

Glabrous except for the young parts shortly and densely tomentose. *Leaves* subopposite, scattered or spirally arranged; lamina lanceolate to elliptic, 5–8 by 1.5–2.5 cm, attenuate or cuneate at the base to a slender petiole 8–16 mm long, attenuate and acute to shortly rounded at the apex, glossy above, dull below; venation pinnate with the midrib distinct and raised on both sides and the secondary and tertiary veins obscure but numerous and more or less parallel at c. 45° to the midrib. *Inflorescences* at the nodes and also terminal on short leafy shoots, a 1- to 8-flowered raceme; axis 5–70 mm long, distinctly angular; pedicels 25–40 mm long, strongly winged, widened upwards and 3–5 mm wide at the apex. *Ovary* narrowly cylindric, 5–7 mm long; calyx limb c. 1 mm long, erect, irregular at the margin. *Corolla* in mature bud 6-merous, 25–30 mm long, uniformly slender and angular, asymmetrically acute (beak-like) at the apex. *Anther* c. 10 mm long, acute, slightly shorter than the free part of the filament. *Style* reaching to the top of the anthers, uniformly slender and 6-angular, lacking a constriction; stigma about as wide as the style.

Distribution — *Malesia*: Sumatra, known only from Mt Singgalang.

Habitat & Ecology — 1600–2400 m altitude; no hosts recorded.

Note — Closely related to and probably derived from the more widespread *Helixanthera cylindrica*, having closely similar leaf, inflorescence and flower architecture, but very distinct in the long flattened pedicels.

2. *Helixanthera coccinea* (Jack) Danser

Helixanthera coccinea (Jack) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 317. — *Loranthus coccineus* Jack, Mal. Misc. 1 (1820) 8. — Type: *Jack*, Singapore (not located). [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 374].

Plant dark rusty tomentose on all young parts, the leaves and fruits soon glabrescent. *Leaves* scattered or subopposite; lamina narrowly to broadly ovate, 4–12 by 2.5–7 cm, truncate to slightly cordate at the base to a slender petiole 10–22 mm long, attenuate and shortly rounded or obtuse at the apex, thin, dull on both sides; venation pinnate with the midrib visible above and raised below and a few main laterals faintly visible on both sides. *Inflorescences* at the nodes, a 10–30-flowered raceme; axis 15–70 mm long, slender, flexuose; pedicels 0.5–2 mm long; bracts simple, ovate, c. 1 mm long. *Ovary* urceolate, c. 1.5 mm long; calyx limb c. 0.3 mm long, weakly toothed. *Corolla* in mature bud 4-merous, 4–6.5(–8) mm long, strongly keeled in the lower part, weakly clavate and broadly acute at the apex, greenish or reddish brown to bright red. *Anther* c. 1 mm long, obtuse, nearly as long as the free part of the filament. *Style* 3.5–6(–7.5) mm long, reaching to the top of the anthers, distinctly widened upwards, lacking a constriction; quadrangular; stigma capitate, 1.5 times as wide as the style apex.

Distribution — Andaman Islands, Burma to Vietnam; *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Borneo, Palawan.

Habitat & Ecology — Mostly 0–500 m altitude, rarely to 1800 m; the only recorded host is *Dalbergia*.

3. *Helixanthera crassipetala* (King) Danser

Helixanthera crassipetala (King) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 376. — *Loranthus crassipetalus* King, J. As. Soc. Beng. 56, ii (1887) 91. — Syntypes: *Scortechini* 363, 521, Perak, Mt Idjou.

Helixanthera dura Danser, Rec. Trav. Bot. Néerl. 31 (1934) 243. — Type: *Richards* 1926, Borneo, Mt Dulit. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 376].

Glabrous except for a short red-brown tomentum on the young shoots, inflorescences and flowers in some Bornean specimens. *Leaves* scattered or sometimes subverticillate; lamina broadly elliptic to obovate, 5–10 by 2–6.5 cm, cuneate at the base to a petiole 5–15 mm long, obtuse or rounded at the apex, dull or slightly glossy above, dull below; venation pinnate with the midrib distinct below and the many parallel secondary and tertiary veins obscure but forming a finely striate pattern above. *Inflorescences* at the nodes, a 3–16-flowered raceme or spike; axis 20–60 mm long; pedicels 0–4.5 mm long, up to 2 mm thick; bracts simple, ovate, c. 2 mm long. *Ovary* cylindrical, 5–7 mm long; calyx limb spreading, c. 1 mm long. *Corolla* in mature bud 5-merous, 17–22(–28) mm long, inflated up to 4 mm wide at the base, gradually narrowed upwards, robust, acute at the apex, yellow to green or pale orange brown. *Anther* 5–6 mm long, acute, almost as long as the free part of the filament. *Style* 16–25 mm long, reaching beyond the top of the anthers, slender, lacking a constriction, angular; stigma not wider than the style.

Distribution — *Malesia*: Peninsular Malaysia, Borneo.

Habitat & Ecology — 600–2100 m altitude; recorded hosts include *Eugenia* and *Lepospermum*.

Note — Closely related to *Helixanthera cylindrica*, differing in its shorter inflorescence, pedicels shorter than the ovary, and mostly shorter corolla wider at the base. The two species are sympatric and the specimens most difficult to place may be hybrids.

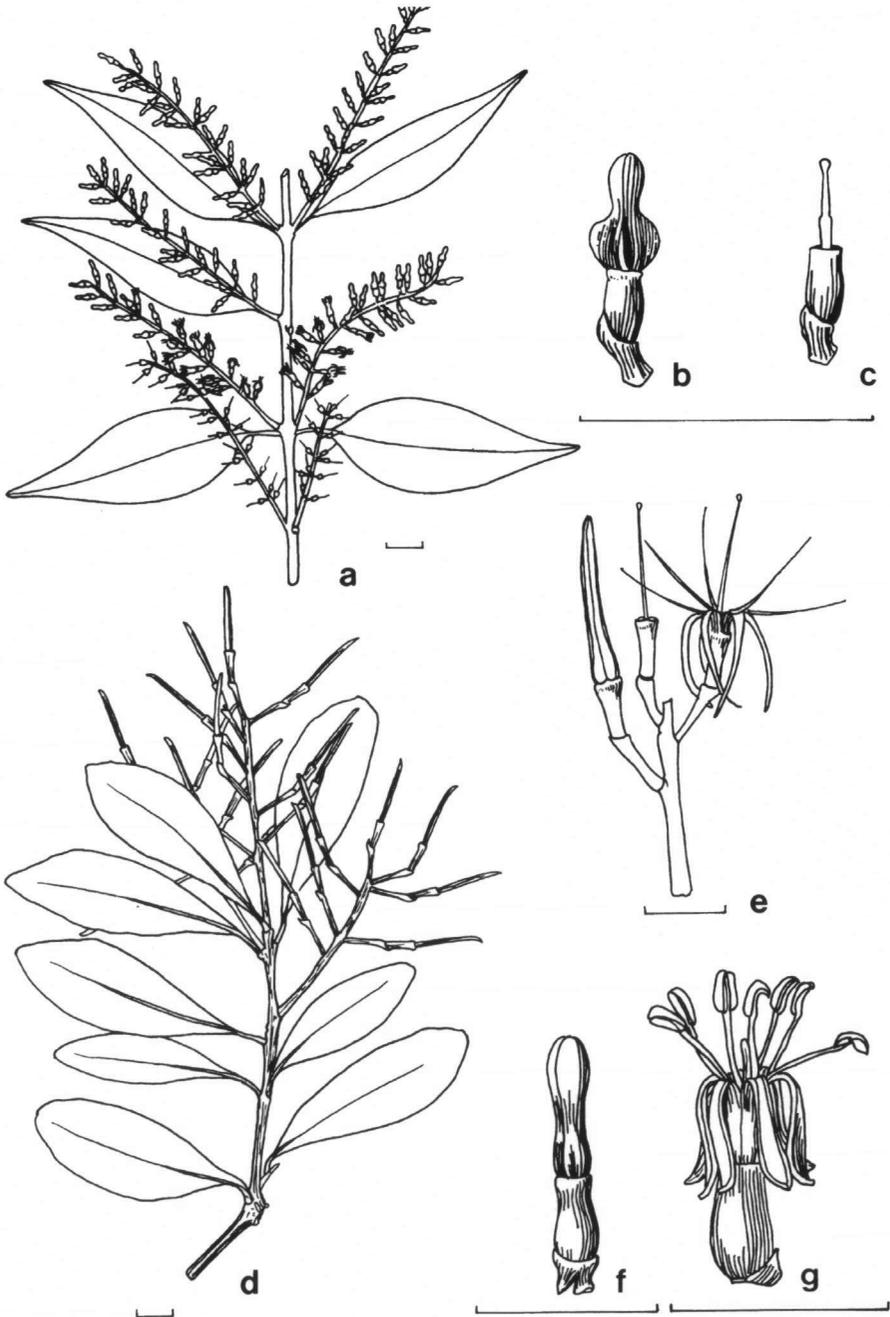


Fig. 26. *Helixanthera parasitica* Lour. a. Flower-bearing twig; b. flower bud; c. flower with petals and stamens removed. — *H. cylindrica* (Jack) Danser. d. Twig with leaves and flower buds; e. inflorescence. — *H. setigera* (Korth.) Danser. f. Flower bud; g. flower (a–c: Backer 25567; d, e: Danser 6710; f: Teijsmann 1079; g: Burkill 12450). Redrawn from Danser (1931). Scale bars represent 1 cm.

4. *Helixanthera cylindrica* (Jack) Danser

Helixanthera cylindrica (Jack) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 377; Backer & Bakh. f., Fl. Java 2 (1965) 71. — *Loranthus cylindricus* Jack in Roxb., Fl. Ind., ed. 1, 2 (1824) 213. — Type: Jack, Sumatra (probably not extant).

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 377].

Glabrous except for young internodes and sometimes the inflorescence and flowers sparsely brown tomentose and soon glabrescent. *Leaves* scattered, subopposite or subverticillate; lamina elliptic or ovate, 6–15(–20) by (0.8–)1.5–6 cm, attenuate or cuneate at the base to a petiole 8–15 mm long, irregular at the apex but normally somewhat attenuate and acute, dull or slightly glossy above, dull below; venation pinnate with the midrib distinct on both sides, the lateral veins usually distinct above and the many parallel tertiary veins obscure but forming a finely striate pattern above. *Inflorescences* at the nodes and rarely terminal, a few- to 25-flowered raceme; axis 50–250 mm long, angular; pedicels (1–)5–18(–27) mm long; bracts simple, rounded, 1–1.5 mm long. *Ovary* cylindrical, 5–8 mm long; calyx limb spreading, 1–1.5 mm long. *Corolla* in mature bud 5-merous, (15–)22–32(–40) mm long, often slightly inflated up to 3 mm wide in the lower 2–4 mm, gradually narrowed upwards, acute at the apex, mostly orange-red to bright red, sometimes yellow or yellow-green. *Anther* 5–8 mm long, acute, about two thirds as long as the free part of the filament. *Style* 15–32(–38) mm long, reaching to the top of the anthers, uniformly slender throughout and lacking a constriction; stigma capitate, slightly wider than the style. — **Fig. 26d, e.**

Distribution — Burma to Vietnam; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Celebes, Bali.

Habitat & Ecology — Somewhat aggressive, in humid and open forests, often on cultivated trees, 0–2000 m altitude; recorded hosts include *Dalbergia*, *Eugenia*, *Garcinia*, *Hevea*, *Leptospermum*, *Mangifera*, *Parkia*, *Planchonella*, *Schima*, *Tristania*.

Note — Closely related to *Helixanthera alata*, *H. crassipetala* and *H. maxwelliana*. Being the most widespread and least specialized species in the group, it is probably the one from which the others have differentiated.

5. *Helixanthera ligustrina* (Wall.) Danser

Helixanthera ligustrina (Wall.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 317. — *Loranthus ligustrinus* Wall. in Roxb., Fl. Ind., ed. 1, 2 (1824) 219. — Type: Wallich, Nepal.

Loranthus tenuis Merr., Philipp. J. Sc., Bot. 4 (1909) 136. — *Helixanthera tenuis* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 318; Philipp. J. Sc. 58 (1935) 106. — Type: Curran FB 6287, lecto (NY), Luzon, Lamao For. Res.; *Herb. Ateneo Manila 217*, syn. Luzon, Rizal.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 21].

Glabrous except for all young parts densely brown tomentose, eventually glabrescent except for the ovary. *Leaves* opposite or sometimes scattered; lamina lanceolate to ovate, mostly 3–7 cm long, mostly 1–2 cm wide, attenuate at the base to a petiole 1–6 mm long, acuminate and acute or shortly rounded at the apex, thin, dull on both sides but slightly darker above; venation pinnate with the midrib and the main laterals distinct above and the midrib prominent below. *Inflorescences* at the nodes, a 2- or 3- (rarely

to 5-)flowered raceme; axis 5–20 mm long, flattened upwards; pedicels 0.2–2 mm long, subumbellately crowded near the tip of the axis; bracts triangular, acute, c. 1 mm long. *Ovary* urceolate, 1–1.5 mm long; calyx limb slightly spreading, entire, c. 0.2 mm long. *Corolla* in mature bud 4-merous, 5–8 mm long, slightly keeled in the lower part, narrowed above, weakly clavate and obtuse at the apex, red or purple. *Anther* 2–2.5 mm long, obtuse, 2 to 3 times as long as the free part of the filament. *Style* 5–7 mm long, reaching to the top of the anthers, conical at the base, uniformly slender above, lacking a constriction; stigma capitate, about twice as wide as the style.

Distribution — Himalayas to southern China and Vietnam; *Malesia*: Philippines (Luzon).

Habitat & Ecology — 200–2400 m altitude; in Malesia the only recorded host is *Diospyros*.

Note — The species is recorded both as an aerial branch-parasite and a terrestrial root-parasite; in Malesia it apparently has the former growth habit.

6. *Helixanthera maxwelliana* (Gibbs) Danser

Helixanthera maxwelliana (Gibbs) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 380. — *Loranthus maxwellianus* Gibbs, J. Linn. Soc., Bot. 42 (1914) 132. — Type: Gibbs 4006, Mt Kinabalu. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 380].

Glabrous except for young shoots, inflorescences and flowers shortly red-brown tomentose. *Leaves* alternate or subopposite; lamina lanceolate to elliptic, 4–12(–20) by 1–3(–7) cm, cuneate at the base to a petiole 10–15 mm long, acuminate to shortly attenuate and acute at the apex, lustrous above, more or less dull below; venation pinnate with the midrib distinct on both sides and the many parallel secondary and tertiary veins obscure but forming a finely striate pattern above. *Inflorescences* at the nodes, a 13- to 25-flowered spike; axis 45–55 mm long; bracts simple, rounded, c. 1 mm long. *Ovary* cylindrical, 3–4 mm long; calyx limb erect, c. 1 mm long. *Corolla* in mature bud 5-merous, 5–7 mm long, sometimes slightly inflated up to 2 mm wide just above the base, narrowed upwards, acute at the apex, mostly red, rarely yellow to brown. *Anther* c. 2 mm long, acute, about half as long as the free part of the filament. *Style* 4–6 mm long, reaching to the top of the anthers, uniformly slender throughout and lacking a constriction; stigma capitate, slightly wider than the style.

Distribution — *Malesia*: endemic to Sabah.

Habitat & Ecology — 100–1800 m altitude; no hosts recorded.

Note — Closely related to *Helixanthera cylindrica*, differing in its much shorter, sessile flowers.

7. *Helixanthera parasitica* Lour.

Helixanthera parasitica Lour., Fl. Coch. 1 (1790) 142; Backer & Bakh. f., Fl. Java 2 (1965) 71. — Type: Loureiro s. n., Cochinchina.

Phoenicanthemum xestophyllum Miq., Fl. Ind. Bat. 1, 1 (1856) 823. — *Helixanthera xestophylla* (Miq.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 319. — Type: Korthals s. n., Borneo, Kalimantan, Luntuntur.

Helixanthera parviflora Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 384. — Type: *Dabong 778*, Borneo, Sarawak.

Helixanthera sumatrana Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 389. — Type: *Saimoendt 923*, Sumatra, Batang Sungai Manau.

Helixanthera annamica Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 18. — Type: *Poilane 24792*, Vietnam, Annam, Tia-Tia.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 381, 391].

Glabrous except for the inflorescence and flowers hairy when young, soon glabrescent except sometimes for the ovary remaining grey-white tomentose. *Leaves* opposite or subopposite; lamina ovate, 5–18 by 1.5–6(–8) cm, cuneate to truncate at the base to a petiole 5–20 mm long, acuminate and acute at the apex, thin, lustrous or dull on either side; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a many-flowered raceme; axis (50–)100–300 mm long; pedicels (0.3–)1–2 mm long, often verticillately clustered; bracts ovate or triangular, sometimes



Fig. 27. *Helixanthera parasitica* Lour. Borneo, W Kalimantan (*Elsener H 248*). Photo A. Elsener, 1973.

with a dorsal transverse fold, obtuse or acute, 0.7–1.5 mm long. *Ovary* campanulate, 1.5–3 mm long; calyx limb entire, spreading, 0.3–0.7 mm long. *Corolla* in mature bud 5-merous, (3–)4–9 mm long, strongly keeled in the lower part, narrowed to a slender neck, clavate and obtuse or rounded at the apex, mostly bright red, rarely almost white. *Anther* 1–2.5 mm long, obtuse, about equal to the free part of the filament. *Style* (2–) 3–5(–6) mm long, reaching to the base of the anthers, angular in the lower 1–3 mm below a distinct constriction, more slender above; stigma capitate, hardly wider than the style apex. — **Fig. 26a–c, 27.**

Distribution — Himalayas to southern China and Vietnam; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines.

Habitat & Ecology — Humid and open forests, also cultivated lands, 0–2000 m altitude; recorded hosts include *Aglaiia*, *Castanopsis*, *Casuarina*, *Decaspermum*, *Fagraea*, *Ficus*, *Hevea*, *Hopea*, *Lithocarpus*, *Quercus*, and *Saurauia*.

Note — The species is moderately polymorphic with respect to pedicel and corolla length and the form of the bract. The variation is continuous, without a clear geographic pattern, and subsumes the segregate species recognized by Danser (*Helixanthera annamica*, *H. parviflora*, *H. sumatrana*, *H. xestophylla*).

8. *Helixanthera pulchra* (DC.) Danser

Helixanthera pulchra (DC.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 318. — *Loranthus pulcher* DC., Prodr. 4 (1830) 295. — Type: *Wallich*, Penang I.

Loranthus pulcher DC. var. *sessiliflora* Ridl., Fl. Malay Penins. 3 (1924) 151. — *Helixanthera apodanthes* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 371. — Type: *Robinson s.n.*, lecto, see note 3, Perak, Mt Kerbau; *Ridley 16093*, syn, Pahang, Mt Tahan.

Helixanthera pierrei Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 25. — Type: *Pierre 673*, Cambodia, Mt Knang-Krepeu.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 384; 16 (1938) 25].

Glabrous except for young inflorescences and flowers sparsely tomentose. *Leaves* spirally arranged, sometimes crowded into false whorls; lamina lanceolate to elliptic or ovate, 10–23 by (2.5–)4–11 cm, cuneate to truncate at the base to a distinct petiole 10–25 mm long, acuminate and acute at the apex, lustrous above, dull below; venation pinnate with the midrib visible above and raised below and the main laterals few and faintly visible above. *Inflorescences* at the nodes, a many-flowered raceme or spike sometimes subtended by an involucre of a few narrow bracts up to 5 mm long; axis (100–)150–250 mm long; pedicels 0–2(–3) mm long; bracts strongly reflexed, with a dorsal spur-like sac, 1–2 mm long. *Ovary* campanulate or depressed barrel-shaped, 1.2–2 mm long and wide, usually with irregular wrinkles or furrows persisting to the young fruit. *Corolla* in mature bud 5-merous, (3.5–)5–7(–8.5) mm long, slender in the middle, weakly clavate and rounded at the apex, reddish yellow to bright red. *Anther* 1–1.5 mm long, obtuse, reflexed, slightly shorter than the free part of the filament. *Style* (2.5–)3–4.5 (–5.5) mm long, reaching to the base of the anthers, gradually widened upwards, lacking a constriction, angular; stigma as wide as the style.

Distribution — Southern Burma, Thailand; *Malesia*: Sumatra, Peninsular Malaysia.

Habitat & Ecology — 90–1350 m altitude; recorded hosts include *Eugenia*, *Hopea*, *Lithocarpus*, *Mangifera*, *Memecylon*, and *Microtropis*.

Notes — 1. Closely related to *Helixanthera setigera*, differing in the characters set out in the key. Discrimination between small-flowered forms of the two species is sometimes difficult, possibly owing to introgression or significant commonality in their gene pools.

2. The species is moderately polymorphic with respect to pedicel and corolla length and leaf dimensions. The variation lacks a strong geographic pattern, and subsumes the segregate species recognized by Danser (*H. apodanthes*, *H. pierreii*).

3. Of the two syntypes of the name *Loranthus pulcher* var. *sessiliflora* Ridl., on which *H. apodanthes* Danser was based, *Robinson s.n.* (K) is the most complete specimen, and is accordingly selected as lectotype.

9. *Helixanthera sessiliflora* (Merr.) Danser

Helixanthera sessiliflora (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 318. — *Loranthus sessiliflorus* Merr., Philipp. J. Sc. 1, Suppl. (1906) 188. — Type: *Whitford 1171*, lecto, see note, Luzon, Mt Mariveles; *Elmer 6057*, syn, Luzon, Baguio; *Merrill 4041*, syn, Mindoro, Baco River; *McGregor 125*, syn, Mindoro, Baco River.

Glabrous. *Leaves* opposite; lamina elliptic to obovate, 6–12 by 3–7 cm, cuneate to attenuate at the base to a petiole 5–10 mm long, obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib prominent and the main laterals somewhat curvined and faintly visible on both sides. *Inflorescences* at the nodes, a dense many-flowered spike; axis 20–40 mm long; bracts rounded, very concave, appressed to the axis, c. 0.8 mm long. *Ovary* shortly campanulate, c. 1 mm long; calyx limb erect, c. 0.2 mm long. *Corolla* in mature bud 4- or 5-merous, 3.5–5 mm long, slightly inflated and angular in the lower part, narrowed to a neck, clavate and rounded at the apex, red. *Anther* c. 1 mm long, obtuse, slightly longer than the free part of the filament. *Style* 3–4.5 mm long, reaching to the top of the anthers, uniformly slender throughout or widened upwards, lacking a constriction or sometimes constricted immediately below the stigma; stigma obconic, twice as wide as the style.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — 0–1600 m altitude; the only recorded host is *Citrus*.

Note — The originals of the four syntypes (PNH) are not extant; a specimen of *Whitford 1171* has been seen (US) and is designated lectotype of the species name.

10. *Helixanthera setigera* (Korth.) Danser

Helixanthera setigera (Korth.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 318; Backer & Bakh. f., Fl. Java 2 (1965) 72. — *Loranthus setigerus* Korth., Verh. Bat. Genootsch. 17 (1839) 265. — Type: *Korthals s.n.*, Borneo, Mt Sakumbang.

Phoenicanthemum longissimum Miq., Sumatra (1860) 138. — *Helixanthera longissima* (Miq.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 317. — Type: *Teijsmann 1079*, lecto, see note 2, Sumatra, Bondjol; *Diepenhorst 1379*, syn, Sumatra, Pariaman.

Loranthus validus Ridl., Fl. Malay Penins. 5 (1925) 330. — *Helixanthera valida* (Ridl.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 319. — Type: *Burkill SFN 12450*, Perak, Grik.

Helixanthera carinata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 373. — [*Loranthus pulcher* Ridl., J. Fed. Mal. States Mus. 8 (1917) 81, non DC.] — Type: *Robinson & Kloss 161*, holo, Sumatra, Mt Kerinci.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 380, 387].

Glabrous except for the inflorescence and flowers sparsely tomentose when young and soon glabrescent. *Leaves* opposite, usually displaced and often subverticillate; lamina lanceolate to ovate, (7–)10–25(–30) by (2.5–)4–9(–11) cm, cuneate to truncate at the base to a distinct petiole (8–)12–35 mm long, usually attenuate or shortly acuminate and acute at the apex, slightly lustrous olive green above, dull light brown below; venation pinnate with the midrib and the main laterals faintly to clearly visible on both sides. *Inflorescences* at the nodes, a many-flowered raceme or spike subtended by an involucre of numerous linear bracts up to 15 mm long; axis (150–)200–500(–850) mm long, 3–5 mm thick in the lower part and attenuate towards the tip; pedicels 0.25–2(–4) mm long, often verticillately clustered; bracts deltoid, very concave, often with a sac-like dorsal protuberance, finely acute, 1.5–3 mm long. *Ovary* cylindrical, 3–5 mm long; calyx limb erect, entire, 1–1.5 mm long. *Corolla* in mature bud 5- to 7-merous, (7–)8–12 mm long, not inflated at the base, clavate and rounded at the apex, yellow, orange or red. *Anther* 2–2.5 mm long, obtuse, about equal to the free part of the filament. *Style* (3–)5–8 mm long, reaching to the base of the anthers or lower, gradually widened upwards, lacking a constriction; stigma flat, as wide as the style. — **Fig. 26f, g.**

Distribution — Thailand; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, and Java, doubtfully recorded from Bali.

Habitat & Ecology — 0–3000 m altitude; the only recorded host is *Engelhardia*.

Notes — 1. The species is moderately polymorphic with respect to pedicel and corolla length and the form of the bract. The variation lacks a strong geographic pattern, and subsumes the segregate species recognized by Danser (*H. carinata*, *H. longissima*, *H. valida*).

2. Of the two syntypes of the name *Phoenicanthemum longissimum*, *Teijsmann 1079* (U, sh. 38933) is the most complete specimen, and is accordingly selected as lectotype.

3. For comparison with *Helixanthera pulchra*, see there.

11. *Helixanthera spicata* Danser

Helixanthera spicata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 389. — Type: *Endert 3567*, Borneo, Kalimantan, Kong Kemul.

Glabrous except for the inflorescence and flowers hairy when young, soon glabrescent. *Leaves* opposite; lamina ovate, 5–10 by 1.5–4 cm, cuneate or truncate at the base to a petiole 10–16 mm long, acuminate and acute at the apex, dull but polished on both sides; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes, a many-flowered spike; axis 60–120 mm long; bracts strongly reflexed, with a dorsal spur-like sac, c. 1 mm long. *Ovary* campanulate, c. 1.5 mm long; calyx limb entire, c. 0.2 mm long. *Corolla* in mature bud 5-merous, 4.5–5.5 mm long, strongly keeled in the lower part, narrowed to a slender neck, clavate and obtuse or rounded at the apex, pinkish to deep red. *Anther* c. 0.5 mm long, obtuse, about equal

to the free part of the filament. *Style* 3–4 mm long, reaching to the base of the anthers, angular in the lower 1–1.5 mm below a weak constriction, more slender above; stigma capitate, 1.5–2 times as wide as the style apex.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — 700–1700 m altitude; the only recorded host is *Quercus*.

Note — Closely related to *Helixanthera parasitica*, differing in the stem internodes strongly flattened, dilated upwards and angular; the bracts having a spur-like sac; the completely sessile flowers; and the style only weakly constricted.

LAMPAS

Lampas Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 291, 320. — Type species: *Lampas elmeri* Danser.

Aerial stem-parasitic shrubs. *Leaves* verticillate; venation pinnate. *Inflorescences* axillary, a subumbellate, subcapitate raceme of spirally arranged dichasia (triads) crowded towards the apex of the axis and subtended by an involucre formed from the enlarged central bracts of the outermost triads; bracts single under each flower. *Corolla* 6-merous, regular, gamopetalous to above the middle. *Anthers* basifixed, immobile. *Style* simple, articulate above the base, with a knob-like stigma. — Fig. 28.

Distribution — One species confined to Borneo (Sabah).

Habitat & Ecology — Unknown.

Morphology — The inflorescence is an axillary raceme of shortly pedunculate triads apparently crowded into a tight spiral towards the apex of the axis, although they may actually be in several oblique, many-flowered whorls condensed close together. The bracts are decurrent to the bases of the peduncles of the triads, those of the outer (lowermost) triads being longer and wider, with margins free from the peduncles, and together forming a short imbricate involucre subtending the flowers.

Taxonomy — The genus is closely related to *Decaisnina*, differing primarily in the gamopetalous corolla. For further discussion see Barlow, *Blumea* 38 (1993) 108.

Lampas elmeri Danser

Lampas elmeri Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 320. — [*Loranthus elmeri* Merr., Univ. Calif. Publ. Bot. 15 (1929) 53, non Merr. (1914)]. — Type: *Elmer 20664*, Sabah, Tawao.

Glabrous. *Leaves* quaternate; lamina elliptic to ovate, 9–25 cm long, (3–)7–18 cm wide, truncate or cuneate at the base to a thick winged petiole 10–35 mm long, acuminate and obtuse at the apex, dull on both sides, darker and/or lustrous above; venation pinnate but somewhat flabellate with the midrib and the main laterals distinct and the midrib prominent below. *Inflorescences* at the nodes, a raceme of 10–32 spirally arranged triads with the central flower sessile and the lateral flowers obscurely pedicellate; axis deflexed, 30–70 mm long, 3–5 mm thick, widened distally, with the triads crowded in the distal c. 6 mm; peduncles 1.5–2.5 mm long; pedicels c. 0.2 mm long; outer bracts ovate,

c. 7 mm long, acuminate; inner bracts narrower, c. 9 mm long. *Corolla* in mature bud 6-merous, 32–75(–80) mm long, gradually widened upwards, narrowed to a neck, weakly clavate and acute at the apex, red, usually pale yellow or green above; tube in the open flower 18–50 mm long and the lobes reflexed 6–18 mm higher. *Anther* c. 4 mm long, obtuse, almost twice as long as the free part of the filament. — Fig. 28.

Distribution — *Malesia*: Borneo (Sabah).

Habitat & Ecology — Altitude 100–700 m; the only recorded host is a species of the *Dilleniaceae*.

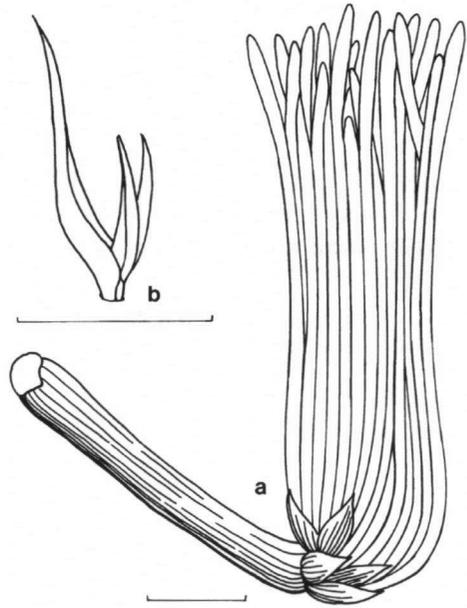


Fig. 28. *Lampas elmeri* Danser. a. Inflorescence, reconstructed from fragments; b. pedicel with bract and bracteoles (Elmer 20644). Redrawn from Danser (1931). Scale bars represent 1 cm.

LEPEOSTEGERES

Lepeostegeres Blume in Schult. & Schult. f., Syst. Veg. 7, 2 (1830) 1611, 1731. — Type species: *Lepeostegeres gemmiflorus* (Blume) Blume.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 258 or Barlow, Austral. J. Bot. 22 (1974) 550].

Aerial stem-parasitic shrubs, often robust, with epicortical runners bearing secondary haustoria. *Leaves* mostly opposite; venation pinnate. *Inflorescences* axillary, an involucre head composed of 6–12 opposite pairs of dichasia (triads) crowded on the flattened apex of a contracted axis; involucre bracts enlarged, decussate, imbricate, rigid; floral bracts single under each flower. *Corolla* 6-merous, regular, gamopetalous to near the middle. *Anthers* basifixed, immobile, acute. *Style* simple, articulate above the base, usually with a small knob-like stigma. *Fruit* ellipsoid to globular, usually with a persistent nipple-like style base. — Fig. 29–31.

Distribution — Endemic to *Malesia*; 9 species distributed from Peninsular Malaysia to New Guinea. The major centre of diversity and species richness is Borneo.

Habitat & Ecology — Humid closed lowland forests to montane and subalpine forests, 0–2800 m altitude; host specificity is probably low.

Morphology — The process of anthesis is unusual and characteristic, the corolla lobes becoming S-shaped at their point of reflexion prior to their separation from each other,

and usually separating downwards before the lobes finally split apart at the apex. In some species it is not certain whether the involucre bracts are deciduous or persistent after anthesis. For discussion of inflorescence and floral characters see Barlow, *Blumea* 38 (1993) 115.

Taxonomy — Other genera with involucre capitate inflorescences, such as *Lepidaria* and *Thaumasianthes*, may not be closely related owing to convergent evolution of this inflorescence state (see Fig. 32, 44). For further discussion on relationships and differences between these genera see Barlow, *Blumea* 38 (1993) 116.

KEY TO THE SPECIES

- 1a. Involucre bracts acute, sagittate **1. *L. acutibracteus***
- b. Involucre bracts obtuse to rounded, not sagittate 2
- 2a. Leaves long acuminate and acute at the apex 3
- b. Leaves acute to rounded at the apex but not long acuminate 4
- 3a. Young internodes strongly quadrangular; corolla lobes reflexed at 4/5 the corolla height; free part of the filament less than 10 mm long **9. *L. lancifolius***
- b. Young internodes terete; corolla lobes reflexed at 1/2 to 3/5 the corolla height; free part of the filament more than 10 mm long **3. *L. bahajensis***
- 4a. Involucre bracts spreading widely after anthesis; flowers in the inflorescence 30 or more **5. *L. centiflorus***
- b. Involucre bracts remaining appressed after anthesis, or deciduous; flowers in the inflorescence up to 30 5
- 5a. Anther 4–6 mm long, subsessile on free filament up to 1 mm long **2. *L. alveolatus***
- b. Anther 1.5–10 mm long, longer or shorter than a free filament which is more than 1 mm long 6
- 6a. Involucre bracts deciduous after anthesis 7
- b. Involucre bracts persistent 8
- 7a. Flowers and fruits sessile; corolla 35–40 mm long **7. *L. deciduus***
- b. Flowers pedicellate, the pedicels elongating under the fruits; corolla 23–32 mm long **6. *L. congestiflorus***
- 8a. Involucre less than 30 mm long; corolla less than 30 mm long; anther 1.5–2 mm long, shorter than the free filament **8. *L. gemmiflorus***
- b. Involucre more than 50 mm long; corolla more than 80 mm long; anther 9–10 mm long, longer than the free filament **4. *L. beccarii***

1. *Lepeostegeres acutibracteus* Danser

Lepeostegeres acutibracteus Danser, *Blumea* 2 (1936) 57. — Type: *Ramos BS 41187*, Philippines, Busuanga I.

Glabrous except for the young inflorescence involucre sometimes shortly brown tomentose. *Leaves* opposite; lamina oblong to ovate, 5–18 by 2–7 cm, shortly cuneate or truncate at the base to a winged petiole 3–12 mm long, very slightly acuminate and acute

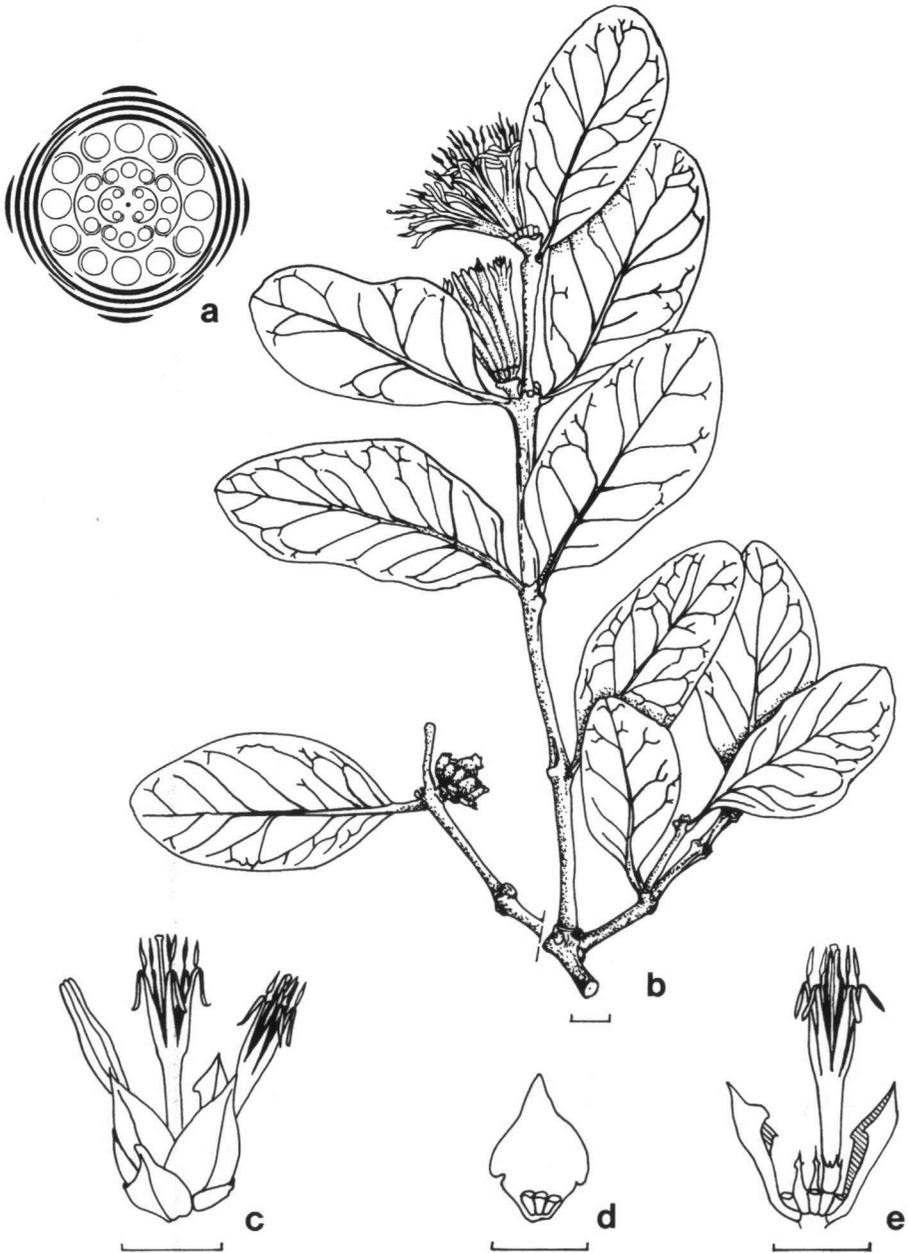


Fig. 29. *Lepeostegeres*. a. Generalized diagram of inflorescence. — *L. deciduus* Barlow. b. Flower- and fruit-bearing twig. — *L. acutibracteus* Danser. c. Inflorescence with some flowers removed; d. involucre bract from the fourth pair, with pedicels; e. receptacle with innermost involucre bracts, bracteoles, and one flower (b: not cited; c–e: *Ramos BS 41187*). a Redrawn from Danser (1933), b redrawn from Barlow (1981), c–e redrawn from Danser (1936). Scale bars represent 1 cm.

at the apex, glossy above, dull below; venation pinnate with the midrib and the main laterals obscure. *Inflorescences* at the nodes; axis 1–2 mm long, c. 3 mm wide, enlarging in fruit; involucre bracts in c. 5 pairs, the longest inner ones sagittate, keeled, acuminate, 15–23 mm long, spreading and possibly deciduous after anthesis; flowers in 2 or 3 pairs of sessile triads, all with pedicels 1.5–2 mm long. *Corolla* in mature bud 6-merous, 21–45 mm long, slender, gradually widened upwards, obtuse at the apex, red or yellow below, sometimes green above; tube in the open flower 9–18 mm long and the lobes reflexed 7–19 mm higher. *Anther* 1–3 mm long; free part of the filament 0.75–2 mm long. — **Fig. 29c–e.**

Distribution — *Malesia*: Philippines (Palawan).

Habitat & Ecology — 0–660 m altitude; no hosts recorded.

Note — For note on persistence of involucre bracts see Barlow, *Blumea* 38 (1993) 117.

2. *Lepeostegeres alveolatus* (Tiegh.) Danser

Lepeostegeres alveolatus (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 320. — *Stegastrum alveolatum* Tiegh., Bull. Soc. Bot. France 42 (1895) 447. — Type: *Beccari* 53, Celebes, near Kendari. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 260].

Glabrous. Stem internodes quadrangular when young. *Leaves* opposite; lamina ovate to obovate, 3–10 by 1.5–8 cm, cuneate at the base to a distinct petiole 8–16 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib distinct above and raised below and the main laterals obscure above and visible below. *Inflorescences* at the nodes; axis 4–6 mm long, 5–7 mm wide; involucre bracts in 8 or 9 pairs, the longest inner ones narrowly spatulate, 20–30 mm long, spreading somewhat after anthesis; the flowers in 1–3 pairs of sessile triads, all shortly pedicellate. *Corolla* in mature bud 6-merous, 28–33 mm long, slender, gradually widened upwards, obtuse at the apex, red or rarely greenish yellow; tube in the open flower 9–13 mm long and the lobes reflexed 12–14 mm higher. *Anther* 4–6 mm long; free part of the filament 0.5–1 mm long.

Distribution — *Malesia*: Borneo, Celebes.

Habitat & Ecology — 0–1100 m altitude; the only recorded host is a mangrove.

Note — A poorly known species possibly closely related to *Lepeostegeres congestiflorus*; for discussion see Barlow, *Blumea* 38 (1993) 118.

3. *Lepeostegeres bahajensis* (Korth.) Miq.

Lepeostegeres bahajensis (Korth.) Miq., Fl. Ind. Bat. 1, 1 (1856) 833. — *Loranthus bahajensis* Korth., Verh. Bat. Genootsch. 17 (1839) 285. — Type: *Korthals s.n.*, Borneo, Kalimantan. [For guide to additional synonymy see Barlow, *Blumea* 38 (1993) 118].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, (4–)6–10(–15) by (1.5–)2–4.5(–7) cm, truncate at the base to a distinct petiole (6–)10–18 mm long, acuminate and acute at the apex, dull on both sides but darker above; venation pinnate with the midrib distinct above and raised below and the main laterals obscure. *Inflorescences* at the nodes; axis (5–)6–8 mm long, 5–8 mm wide; involucre bracts in 5–8 pairs, the longest

inner ones narrowly spatulate, (20-)25-40(-50) mm long, remaining appressed after anthesis, red; flowers in 3 or 4 pairs of sessile triads, all with pedicels c. 0.5 mm long. *Corolla* in mature bud 6-merous, (30-)40-60 mm long, slender, very slightly inflated at the base, obtuse at the apex, yellow, pink or green, sometimes paler above; tube in the open flower (15-)20-30 mm long and the lobes reflexed 8-20 mm higher. *Anther* 4-7.5 mm long; free part of the filament 10-18(-22) mm long. — **Fig. 31 f.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Humid forests, mostly at 0-300 m altitude but rarely to 1200 m; recorded hosts include *Gaertnera* and *Syzygium*.

Note — For circumscription as a species see Barlow, *Blumea* 38 (1993) 119.

4. *Lepeostegeres beccarii* (King) Gamble

Lepeostegeres beccarii (King) Gamble, *J. As. Soc. Beng.* 75, ii (1914) 381. — *Loranthus beccarii* King, *J. As. Soc. Beng.* 56, ii (1888) 98. — Syntypes: *King's Collector 7956*, Perak; *Beccari PB 1171*, Sarawak.

[For additional synonymy see Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 262].



Fig. 30. *Lepeostegeres* prob. *beccarii* (King) Gamble. Borneo, NW Kalimantan, Sanggau. Photo A. Elsener, 1962.

Glabrous. *Leaves* opposite or slightly displaced; lamina narrowly ovate to ovate, 6–16 by 2–6 cm, cuneate to truncate at the base to a petiole 10–25 mm long, mostly obtuse at the apex, dull on both sides; venation pinnate with the midrib distinct above and raised below and the main laterals visible on both sides. *Inflorescences* at the nodes; axis 12–18 mm long, 12–18 mm wide; involucre bracts in 8–11 pairs, the longest inner ones oblong-spathulate, 60–90 mm long, remaining appressed after anthesis, red; flowers in 3 or 4 pairs of sessile triads, all with pedicels c. 0.5 mm long. *Corolla* in mature bud 6-merous, 90–120 mm long, slender, truncate or obtuse at the apex, red, occasionally yellow-green, sometimes yellow above; tube in the open flower 40–60 mm long and the lobes reflexed 35–45 mm higher. *Anther* 9–10 mm long; free part of the filament c. 4 mm long. — **Fig. 30, 31 e.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — Humid forests, 0–2150 m altitude; recorded hosts include *Schima*, *Symplocos*, and *Vernonia*.

5. *Lepeostegeres centiflorus* (Stapf) Tiegh.

Lepeostegeres centiflorus (Stapf) Tiegh., Compt. Rend. Acad. Sci. Paris 153 (1911) 1197. — *Loranthus centiflorus* Stapf, Trans. Linn. Soc., Bot. 4 (1894) 222. — Type: *Haviland 1247*, Sabah, Mt Kinabalu. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 264].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, (9–)14–18 by (4–)5–8.5 cm, shortly cuneate to slightly cordate at the base to a distinct petiole 9–18 mm long, mostly acute at the apex, lustrous above or dull on both sides; venation pinnate with the midrib distinct above and raised below and the main laterals obscure above and visible below. *Inflorescences* at the nodes; axis 4–10 mm long, c. 8 mm wide; involucre bracts in c. 8 pairs, the longest inner ones spatulate, 25–45 mm long, spreading to 30–70 mm wide after anthesis, green with red midveins; flowers in 5–9 pairs of sessile triads, all with pedicels 1–1.5 mm long. *Corolla* in mature bud 6-merous, 30–75 mm long, slightly inflated above the base, narrowed above, truncate or obtuse at the apex, pink or red or sometimes yellow, sometimes yellow above; tube in the open flower 8–17 mm long and the lobes reflexed 15–40 mm higher. *Anther* 3–6 mm long; free part of the filament 1–3 mm long. — **Fig. 31 d.**

Distribution — *Malesia*: Northeastern Borneo.

Habitat & Ecology — Humid forests mostly from 500 to 1700 m altitude, rarely down to 0 m; the only recorded host is *Dryobalanops*.

6. *Lepeostegeres congestiflorus* (Merr.) Merr.

Lepeostegeres congestiflorus (Merr.) Merr., Enum. Philipp. Flow. Pl. 2 (1923) 101. — *Loranthus congestiflorus* Merr., Philipp. J. Sc., Bot. 4 (1909) 147. — Type: *Curran FB 5037*, lecto, Luzon, Mt Tonglon.

Glabrous. *Leaves* opposite or slightly displaced; lamina elliptic to obovate, 5–10 by 2–5 cm, cuneate at the base to an obscure winged petiole 8–15 mm long, rounded at the apex, dull on both sides but darker above; venation pinnate with the midrib distinct above

and raised below and the main laterals obscure. *Inflorescences* at the nodes; axis 3–6 mm long, 3–4 mm wide; involucre bracts in 4–5(–7) pairs, the longest inner ones oblong, 20–25 mm long, deciduous after anthesis; flowers in 3–5 pairs of minutely pedunculate triads, all with pedicels 0.5–2 mm long at anthesis, elongating in fruit. *Corolla* in mature bud 6-merous, 23–32 mm long, slender, very slightly inflated at the base, obtuse at the apex, yellow or green, sometimes red below; tube in the open flower 2.5–5 mm long and the lobes reflexed 12–19 mm higher. *Anther* 3.5–5 mm long; free part of the filament 1–5 mm long.

Distribution — *Malesia*: Philippines.

Habitat & Ecology — (1650–)2000–2800 m altitude; no hosts recorded.

Note — Possibly related to *Lepeostegeres deciduus*; for discussion see Barlow, *Blumea* 38 (1993) 121.

7. *Lepeostegeres deciduus* Barlow

Lepeostegeres deciduus Barlow, *Austral. J. Bot.* 22 (1974) 550; in *Handb. Fl. Papua New Guinea* 2 (1981) 245. — Type: *Brass* 31467, Papua New Guinea, Mt Michael.

Glabrous. Stem internodes flattened and double-edged when young. *Leaves* opposite; lamina broadly ovate to obovate, 6–12 by 4–7 cm, cuneate at the base to a winged petiole 5–8 mm long, rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals distinct. *Inflorescences* at the nodes; axis 4–5 mm long, 5–7 mm wide; involucre bracts in c. 3 pairs, the longest inner ones oblong, c. 20 mm long, deciduous after anthesis; flowers in 3 or 4 pairs of sessile triads, all sessile. *Corolla* in mature bud 6-merous, 35–40 mm long, slender, acute at the apex, yellowish brown; tube in the open flower 18–24 mm long and the lobes reflexed c. 8 mm higher. *Anther* 4–6 mm long; free part of the filament 3–5 mm long. — **Fig. 29b.**

Distribution — *Malesia*: Papua New Guinea (Eastern Highlands Province).

Habitat & Ecology — Humid forests, (1036–)1500–2000 m altitude; the only recorded host is *Castanopsis*.

Note — For discussion of relationships and biogeography see Barlow, *Blumea* 38 (1993) 122.

8. *Lepeostegeres gemmiflorus* (Blume) Blume

Lepeostegeres gemmiflorus (Blume) Blume in *Schult. & Schult. f., Syst. Veg.* 7, 2 (1830) 1611; *Danser, Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 266; *Backer & Bakh. f., Fl. Java* 2 (1965) 69; Barlow, *Blumea* 38 (1993) 122. — *Loranthus gemmiflorus* Blume, *Verh. Bat. Genootsch.* 9 (1823) 187. — *Elytranthe gemmiflora* (Blume) G. Don, *Gen. Hist.* 3 (1834) 427. — Type: *Blume s. n.*, Java, Cibodas.

Glabrous. Stem internodes quadrangular when young. *Leaves* opposite; lamina ovate, 5–8 by 2–5 cm, truncate at the base to a distinct petiole 10–20 mm long, rounded or obtuse at the apex, dull on both sides; venation pinnate with the midrib distinct above and raised below and the main laterals visible on both sides. *Inflorescences* at the nodes; axis c. 5 mm long, 5–7 mm wide; involucre bracts in 7–9 pairs, the longest inner ones oblong, 14–20 mm long, remaining appressed after anthesis; flowers in 2–4 pairs of

sessile triads, all with pedicels 0.2–0.3 mm long. *Corolla* in mature bud 6-merous, 20–26 mm long, gradually widened upwards, obtuse at the apex, red or orange or yellow, sometimes greenish yellow above and/or crimson at the tip; tube in the open flower c. 8 mm long and the lobes reflexed 7–12 mm higher. *Anther* 1.5–2 mm long; free part of the filament 2–5 mm long.

Distribution — *Malesia*: Java (Western part).

Habitat & Ecology — 200–1600 m altitude; recorded hosts include *Erythrina*, *Ficus*, and *Ixora*.

9. *Lepeostegeres lancifolius* (Tiegh.) Danser

Lepeostegeres lancifolius (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 321. — *Stegastrum lancifolium* Tiegh., Bull. Soc. Bot. France 42 (1895) 447. — Type: *Beccari* 537, Sarawak, Kuching. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 269].

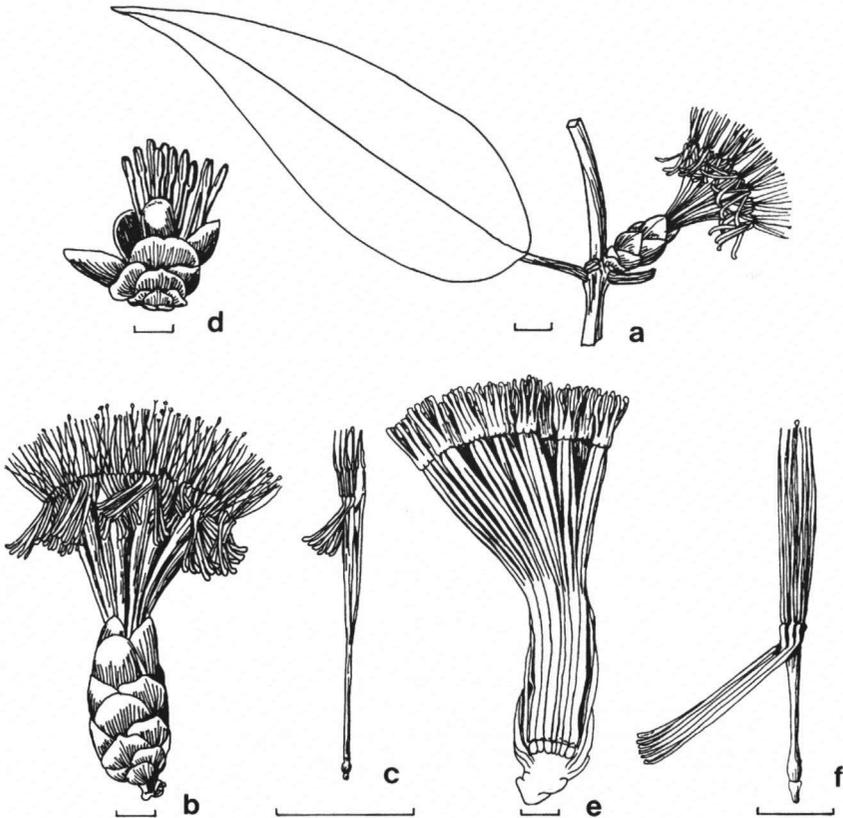


Fig. 31. *Lepeostegeres lancifolius* (Tiegh.) Danser. a. Flower-bearing portion of stem; b. inflorescence; c. flower. — *L. centiflorus* (Stapf) Tiegh. d. Inflorescence with most flower buds removed. — *L. beccarii* (King) Gamble. e. Inflorescence in sectional view. — *L. bahajensis* (Korth.) Miq. f. Flower (a: *Haviland* 1676; b, c: *Amdjah* 1095; d: *Elmer* 21083; e: *Endert* 2367; f: *Haviland* 536). Redrawn from Danser (1931). Scale bars represent 1 cm.

Glabrous. Stem internodes quadrangular when young. *Leaves* opposite; lamina narrowly ovate to ovate, 9–25 by 3–12 cm, shortly cuneate to slightly cordate at the base to a distinct petiole 12–28 mm long, acuminate and acute at the apex, glossy above, dull below; venation pinnate with the midrib distinct above and raised below and the main laterals obscure. *Inflorescences* at the nodes; axis 4–10 mm long, 6–7 mm wide; involucre bracts in (6–)8–12 pairs, the longest inner ones spatulate, (22–)25–45(–55) mm long, remaining appressed after anthesis, red; flowers in 2–4 pairs of sessile triads, all with pedicels 0.5–1.5 mm long. *Corolla* in mature bud 6-merous, (42–)50–75(–100) mm long, very slender, obtuse at the apex, red or rarely orange or green, sometimes with yellow-green above and then sometimes red at the tip; tube in the open flower 10–30 mm long and the lobes reflexed 10–30 mm higher. *Anther* 3–10 mm long; free part of the filament 6–10 mm long. — **Fig. 31 a–c.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Humid forests from 0 to 400 m altitude; the only recorded host is *Koompassia*.

Note — Similar to *Lepeostegeres beccarii*; for differences see Barlow, *Blumea* 38 (1993) 123.

LEPIDARIA

Lepidaria Tiegh., Bull. Soc. Bot. France 42 (1895) 439. — Type species: *Lepidaria bicarinata* Tiegh. [For synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 308; *Blumea* 2 (1936) 35; and note under Morphology & Taxonomy below].

Aerial stem-parasitic shrubs, often robust, with epicortical runners bearing secondary haustoria. *Leaves* opposite. *Inflorescences* axillary, a more or less sessile involucre head of 1–few decussate pairs of flowers on a short floral axis; involucre bracts decussate, enlarged, rigid, often keeled, brightly coloured, imbricate, tightly enclosing the developing flowers, the lower ones sterile and the upper ones subtending the flowers; lateral bracts 2 enclosing each flower. *Corolla* mostly 6-merous, gamopetalous, regular or nearly so, often more deeply split on one side. *Anthers* basifixed, immobile, often spurred at the base. *Style* simple, conical at the base, articulate above the base, with a knob-like stigma. *Fruit* ellipsoid to obovate. — **Fig. 32.**

Distribution — Genus of 8 species, endemic to northern and western *Malesia* except for 1 species which reaches peninsular Thailand. The centre of species richness is Borneo.

Habitat & Ecology — Mostly closed humid forests, ranging from lowlands to high montane communities at up to 3550 m altitude; host specificity is generally low.

Morphology & Taxonomy — Danser realigned *Macrosolen*, *Elytranthe* and *Lepidaria* in *Blumea* 2 (1936) 35, transferring *E. arnotiana* to *Lepidaria*, and reinstating the genus *Lepidella* for several species of *Lepidaria* (see notes under *Macrosolen* and *Elytranthe*). However, the basic generic character is the involucre of sterile, imbricate floral bracts

subtending an essentially capitate sessile inflorescence, and *Lepidaria* and *Lepidella* share this character and belong together. *Lepidella* represents the extreme in inflorescence reduction and compaction, with the 2 remaining pairs of flowers on a relatively flat receptacle, whereas in *Lepidaria* there are more pairs of flowers and the receptacle is stepped accordingly. *Lepidaria* (sens. lat.) is clearly distinct from *Elytranthe* (including *E. arnottiana*), where the inflorescence is a well-developed spike in which the function of the involucre is provided by the floral bracts.

KEY TO THE SPECIES

- 1a. Inflorescence of 6 or more pairs of flowers 2
- b. Inflorescence of 1–4 pairs of flowers 3
- 2a. Involucre c. 70 mm long; leaf lamina dark coloured at the margin, 9–15 cm long
..... 3. *L. oviceps*
- b. Involucre 35–50 mm long; leaf lamina not dark coloured at the margin, 12–24 cm
long 1. *L. bicarinata*
- 3a. Corolla more than 60 mm long; involucre more than 50 mm long 2. *L. kingii*
- b. Corolla 32–60 mm long; involucre 18–30 mm long 4
- c. Corolla less than 30 mm long; involucre less than 18 mm long 6
- 4a. Leaf lamina more than 9 cm long; involucre bracts strongly recurved at the apex ..
..... 4. *L. pulchella*
- b. Leaf lamina less than 9 cm long; involucre bracts not or only slightly recurved at
the apex 5
- 5a. Stem internodes angular or ridged longitudinally; leaf lamina broadly acute at the
apex 6. *L. sabaensis*
- b. Stem internodes terete; leaf lamina obtuse or rounded 8. *L. vaginata*
- 6a. Involucre bracts thin, flexible, acuminate and acute 7. *L. tetrantha*
- b. Involucre bracts rigid, rounded at the apex 5. *L. quadriflora*

1. *Lepidaria bicarinata* Tiegh.

Lepidaria bicarinata Tiegh., Bull. Soc. Bot. France 42 (1895) 440 ('*bicaremata*'). — Type: *Beccari 910*, Sarawak, Kuching.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 309].

Glabrous. *Leaves* opposite; lamina ovate to rarely obovate, 12–24 by 5–11 cm, cuneate at the base to a petiole 8–20 mm long, attenuate and finally acute to rounded at the apex, lustrous or dull green above, dull and brownish below; venation pinnate with the midrib and the main laterals distinct on both sides and the midrib prominent and often dark coloured below. *Inflorescences* at the nodes, a subsessile involucre capitate spike of usually 6 decussate pairs of flowers; involucre 35–50 mm long, mostly red, sometimes yellow at the base, comprising c. 14 pairs of bracts, the longer ones keeled, smooth or slightly undulate below the apex; floral axis 5–10 mm long; lateral bracts enclosing

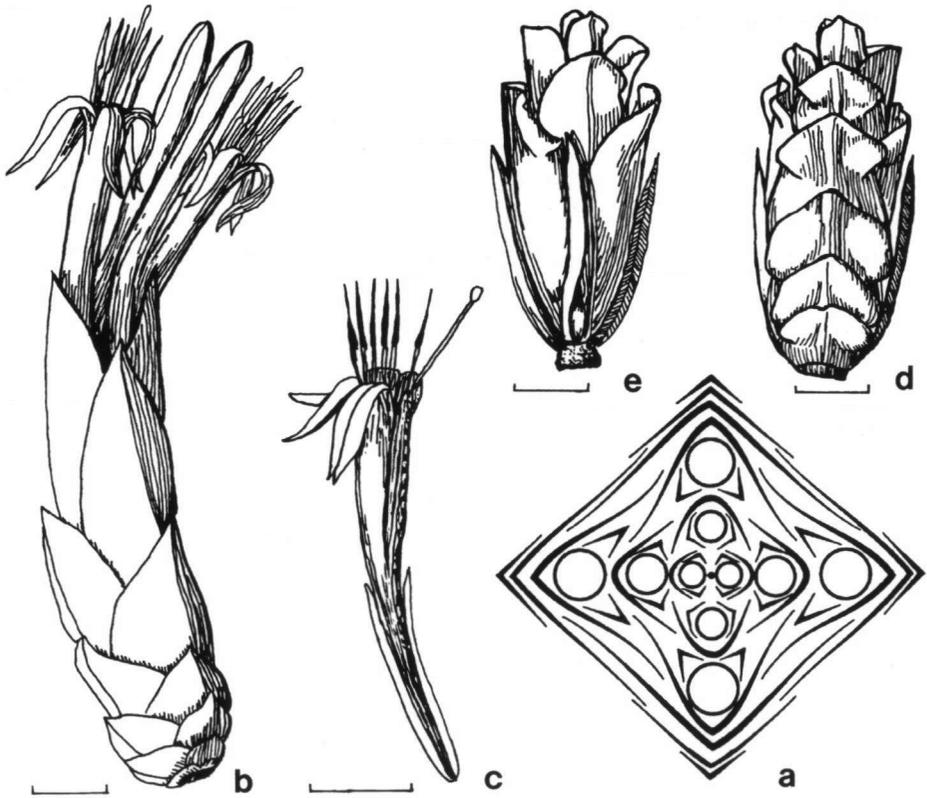


Fig. 32. *Lepidaria*. a. Generalized diagram of inflorescence. — *L. kingii* (King) Danser. b. Inflorescence; c. flower with bracteoles. — *L. bicarinata* Tiegh. d. Inflorescence; e. inflorescence, partly dissected (b: Burkill & Holttum 8692; c: Ridley 10771, d, e: not cited). a Redrawn from Danser (1933), b–e redrawn from Danser (1931). Scale bars represent 1 cm.

the flowers c. 25 mm long, keeled, acute. *Corolla* in mature bud 6-merous, 60–70 mm long, gradually widened upwards, winged above the middle to the acute or obtuse apex, mostly red or yellow below, yellow-green above; tube in the open flower 45–50 mm long, split slightly deeper on one side, with the lobes reflexed and twisted c. 5 mm higher. *Anther* c. 5 mm long, spurred at the base, acute, about half as long as the free part of the filament. — Fig. 32 d, e.

Distribution — *Malesia*: Sumatra, Borneo (Sarawak).

Habitat & Ecology — Foothills to 860 m altitude; the only recorded host is *Xanthophyllum*.

Note — Van Tieghem's derivation of the original spelling of the specific epithet from the French 'carène' (keel) was apparently an unintentional error, and was validly corrected by later authors.

2. *Lepidaria kingii* (King) Danser

Lepidaria kingii (Scort. ex King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 322. — *Loranthus kingii* Scort. ex King, J. As. Soc. Beng. 56, ii (1887) 99. — *Lepidella kingii* (Scort. ex King) Danser, Blumea 2 (1936) 37. — Type: *Scortechini 1251*, Perak.

Loranthus forbesii King, J. As. Soc. Beng. 56, ii (1887) 100. — *Lepidaria forbesii* (King) Tiegh., Bull. Soc. Bot. France 42 (1895) 441. — *Lepidella forbesii* (King) Danser, Blumea 2 (1936) 37. — Type: *Forbes 2844*, Sumatra, Kepala Curup.

Lepidaria malaiana Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 314. — *Lepidella malaiana* (Danser) Danser, Blumea 2 (1936) 37. — Type: *Burkill & Holttum 8692*, Malaya, Fraser Hill.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 310, 312].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 9–20 by 3.5–11 cm, shortly cuneate to slightly cordate at the base to a petiole 10–30 mm long, attenuate or acuminate and usually acute at the apex, dull on both sides or slightly lustrous above; venation pinnate with the midrib and the main laterals visible on both sides and the midrib prominent below. *Inflorescences* at the nodes, a sessile involucrate capitate spike of usually 2 decussate pairs of flowers; involucre 50–85 mm long, red, comprising 6–10 pairs of bracts, the upper ones oblong, keeled, acute, very slightly and finely undulate near the apex; floral axis 4–8 mm long; lateral bracts enclosing the flowers 15–30 mm long, keeled, acute. *Corolla* in mature bud 6-merous, 60–115(–130) mm long, widened upwards for three fourths its length, weakly winged below the neck, clavate acute to obtuse at the apex, yellow to red, ribbed with yellow to red; tube in the open flower 45–90 mm long, with 1 or 2 deeper splits on one side, with the lobes reflexed 3–6 mm higher. *Anther* 5–8 mm long, slightly spurred at the base, acute, slightly shorter to slightly longer than the free part of the filament. — **Fig. 32 b, c.**

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

Habitat & Ecology — 0–1680 m altitude; the only recorded host is *Vitex*.

Note — The difference in corolla symmetry used by Danser to distinguish *Lepidaria forbesii* and *L. malaiana* from *L. kingii* is only a transitory feature of anthesis. Corolla length is often longer in Bornean specimens than in Peninsular Malaysian ones, but the differences cited by Danser to distinguish these taxa do not exist. Even when *L. kingii* is circumscribed to include *L. forbesii* and *L. malaiana*, the species is not very polymorphic.

3. *Lepidaria oviceps* Danser

Lepidaria oviceps Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 315. — Type: *Hallier B 1945*, Kalimantan, Mt Kenepai.

Glabrous. *Leaves* opposite, sometimes displaced; lamina broadly ovate, 9–15 by 7–10 cm, shortly cuneate to truncate at the base to a petiole 8–20 mm long, thick, dark coloured at the margin, rounded at the apex, dull on both sides; venation pinnate with the midrib dark coloured and raised on both sides and the main laterals obscure. *Inflorescences* at the nodes, a sessile involucrate capitate spike of 6 or more decussate pairs of flowers; involucre c. 70 mm long, red, comprising c. 15 pairs of bracts, the upper ones oblong, obtuse, smooth, weakly keeled only near the apex; floral axis c. 6 mm

long; lateral bracts enclosing the flowers c. 30 mm long, keeled, obtuse. *Corolla* in mature bud and open flower not known.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Low altitudes; the only recorded host is *Gonostylus*.

4. *Lepidaria pulchella* Danser

Lepidaria pulchella Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 315. — Type: *Clemens 21837*, Sarawak, Upper Rejang River.

Glabrous or young parts scurfy. *Leaves* opposite, sometimes displaced; lamina ovate to elliptic, 10–20 by 5–10 cm, cuneate at the base to a petiole 10–20 mm long, attenuate and finally acute to rounded at the apex, lustrous or dull green above, dull and brownish below; venation pinnate with the midrib and the main laterals distinct on both sides and the midrib prominent below. *Inflorescences* at the nodes, a subsessile involucrate capitate spike of 2–3(–4) decussate pairs of flowers; involucre 20–30 mm long, mostly yellow or green below and orange or red above, comprising 10–12 pairs of bracts, the longer ones keeled, mostly strongly recurved along the upper margin; floral axis c. 5 mm long; lateral bracts enclosing the flowers c. 12 mm long, keeled, acute. *Corolla* in mature bud 6-merous, 45–60 mm long, gradually widened upwards, winged above the middle to the acute or obtuse apex, mostly red, usually streaked with white or yellow; tube in the open flower 32–45 mm long, with the lobes reflexed and twisted 3–5 mm higher. *Anther* 4–5 mm long, spurred at the base, acute, about three fourths as long as the free part of the filament.

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

Habitat & Ecology — Common from 0 to 1500 m altitude; recorded hosts include *Drypetes*, *Shorea*, and *Vatica*.

Note — Vegetatively similar to *Lepidaria bicarinata*, but differs in its fewer-flowered inflorescences with smaller involucre in which the bracts are more undulate or rolled back at the margins.

5. *Lepidaria quadriflora* Tiegh.

Lepidaria quadriflora Tiegh., Bull. Soc. Bot. France 42 (1895) 441. — *Lepidella quadriflora* (Tiegh.) Danser, Blumea 2 (1936) 37. — Type: *Cuming 1971*, Philippines, 'Manille'.

Loranthus williamsii Merr., Philipp. J. Sc., Bot. 4 (1909) 148. — *Lepidaria williamsii* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 322. — *Lepidella williamsii* (Merr.) Danser, Blumea 2 (1936) 37. — Type: *Williams 973*, Luzon, Baguio.

[For additional synonymy see Danser, Blumea 3 (1940) 394].

Glabrous. *Leaves* opposite; lamina narrowly ovate to elliptic, sometimes falcate, 5–8 by 1–3 cm, cuneate to attenuate at the base to an obscure petiole 1–7 mm long, attenuate and rounded at the apex, dull on both sides; venation pinnate with the midrib and the main laterals visible on both sides and the midrib prominent below. *Inflorescences* at the nodes, an involucrate capitate spike of usually 2 decussate pairs of flowers on a pedun-

cle 1–2 mm long; involucre 13–18 mm long, comprising 5 or 6 pairs of bracts, the upper ones broadly elliptic, smooth, rounded, deciduous at anthesis; floral axis 0.5–1 mm long; lateral bracts enclosing the flowers vestigial. *Corolla* in mature bud 5- or 6-merous, 22–33 mm long, gradually widened upwards, slightly narrowed above the middle to a neck, weakly clavate, angular and obtuse at the apex, red; tube in the open flower variable, 3.5–20 mm long, more deeply split on one side, with the lobes reflexed 3–20 mm higher. *Anther* 3.5–5.5 mm long, acute, 1–4 times as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — No habitat details or hosts recorded.

6. *Lepidaria sabaensis* (Stapf) Danser

Lepidaria sabaensis (Stapf) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 322. — *Loranthus sabaensis* Stapf, Trans. Linn. Soc., Bot. 4 (1894) 222. — *Lepidella sabaensis* (Stapf) Tiegh., Compt. Rend. Acad. Sci. 153 (1911) 1198. — Type: *Haviland 1079*, lecto, see note, Borneo, Mt Kinabalu.

Glabrous. Stem internodes compressed upwards, angular or longitudinally ridged. *Leaves* opposite; lamina ovate, 3.5–6 by 1.7–3 cm, cuneate to truncate at the base to a petiole 5–10 mm long, broadly acute at the apex, dull on both sides or slightly lustrous above; venation pinnate with the midrib raised below and other veins obscure. *Inflorescences* at the nodes, a sessile involucre capitate spike of usually 2 decussate pairs of flowers; involucre 18–22 mm long, pink to red, comprising c. 7 pairs of bracts, the upper ones broadly elliptic, keeled, otherwise smooth or slightly recurved near the apex, spreading at anthesis; floral axis c. 3 mm long; lateral bracts enclosing the flowers c. 15 mm long, keeled, obtuse. *Corolla* in mature bud 6-merous, 32–45 mm long, widened upwards, winged near the middle, clavate above a neck and angular and obtuse at the apex, orange or red below, green at the neck and yellow above; tube in the open flower 16–32 mm long, more deeply split on one side, with the lobes reflexed or twisted slightly higher. *Anther* c. 4 mm long, spurred at the base, acute, about half long as the free part of the filament.

Distribution — *Malesia*: Borneo (Sabah: Mt Kinabalu).

Habitat & Ecology — Mostly 3000–3550 m altitude, less often down to 2440 m; recorded hosts include *Leptospermum*, *Rhododendron*, and *Vaccinium*.

Note — In the original description of *Loranthus sabaensis* Stapf cited two collections, *Haviland 1079* & *1108*, which are therefore syntypes. Of the two specimens in K, the former bears more flowering material and is accordingly chosen as lectotype of the species name.

7. *Lepidaria tetrantha* (Merr.) Danser

Lepidaria tetrantha (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 322. — *Loranthus tetranthus* Merr., Philipp. J. Sc., Bot. 7 (1912) 79. — *Lepidella tetrantha* (Merr.) Danser, Blumea 2 (1936) 37. — Type: *Vanoverbergh 1294*, lecto, see note, Luzon, Malawey.

[For additional synonymy see Danser, Blumea 3 (1940) 394].

Glabrous. Stem internodes slightly compressed-angular. *Leaves* opposite; lamina ovate to elliptic, 5–7 by 1.5–2.5 cm, cuneate at the base to a petiole 3–5 mm long, attenuate or acuminate and acute to shortly rounded at the apex, dull green above, dull brown below; venation pinnate with the midrib distinct below and other veins obscure. *Inflorescences* at the nodes, a sessile involucre capitate spike of usually 2 decussate pairs of flowers; involucre 10–13 mm long, comprising c. 10 pairs of bracts, the upper ones narrowly ovate, thin, acuminate and acute, deciduous at anthesis; floral axis c. 0.5 mm long; lateral bracts vestigial. *Corolla* in the mature bud 6-merous, c. 22 mm long, widened upwards in the lower part, angular below the middle, weakly clavate above a long neck and acute at the apex, red below and green above; tube in the open flower 3–4 mm long with the lobes reflexed close to the apex. *Anther* c. 3 mm long, acute, about twice as long as the free part of the filament.

Distribution — *Malesia*: Philippines (Luzon).

Habitat & Ecology — Highlands; no host recorded.

Note — The holotype of *Loranthus tetranthus* (PNH) is no longer extant. An isotype (US, 900071) has been seen and designated lectotype of the species name.

8. *Lepidaria vaginata* Tiegh.

Lepidaria vaginata Tiegh., Bull. Soc. Bot. France 42 (1895) 440. — *Lepidella vaginata* (Tiegh.) Tiegh., Compt. Rend. Acad. Sci. 153 (1911) 1198. — Type: *Beccari 2579*, Borneo, Mt Matang. [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 318].

Glabrous. *Leaves* opposite; lamina elliptic or ovate, 5–8 by 3–6 cm, cuneate to truncate at the base to a petiole 10–20 mm long, obtuse or rounded at the apex, slightly lustrous above or dull on both sides; venation pinnate with the midrib distinct above and raised and dark coloured below and the main laterals distinct on both sides or obscure below. *Inflorescences* at the nodes, a sessile involucre capitate spike of 1 or 2 decussate pairs of flowers; involucre 20–25 mm long, comprising 8–10 pairs of bracts, the upper ones elliptic, obtuse, smooth except for the weakly keeled upper part, green below and brown above; floral axis c. 2.5 mm long; lateral bracts enclosing the flowers c. 12 mm long, keeled, broadly acute. *Corolla* in mature bud 6-merous, c. 50 mm long, slender in the lower 6–7 mm, with deflexed spurs inside forming a nectar chamber, widened above, winged just above the middle, clavate above a neck and acute at the apex, red, usually streaked with yellow; tube in the open flower 35–40 mm long, more deeply split on one side, with the lobes reflexed slightly higher. *Anther* 3–3.5 mm long, acute, about two thirds as long as the free part of the filament.

Distribution — *Malesia*: Borneo, known only from Mt Matang.

Habitat & Ecology — 500–800 m altitude; no hosts recorded.

LORANTHUS

Loranthus L., Sp. Pl. (1753) 351, *nom. cons.* — *Hyphear* Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 292, 319. — Type species: *Loranthus europaeus* Jacq. (see note). [For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 26, under *Hyphear*].

Aerial stem-parasitic shrubs, sometimes with epicortical runners bearing secondary haustoria. *Leaves* opposite or displaced. *Inflorescence* a simple spike; bracts single under each flower. *Flowers* probably mostly functionally unisexual but usually with organs of the other gender present, either apparently normally developed or vestigial. *Corolla* 4- to 6-merous, small, choripetalous, regular or nearly so. *Anthers* basifixed, immobile. *Style* straight, simple. *Fruit* nearly globular. — Fig. 33.

Distribution — Probably 2 species, from southeastern Europe to southern Asia as far as Japan. In *Malesia* 1 species, known from Sumatra and Celebes.

Habitat & Ecology — Mostly temperate or montane deciduous or evergreen forests; host specificity is probably high for *Quercus*, although *Pinus* and other hosts are also parasitized.

Taxonomy — In this genus several species have been distinguished on the basis of number of petals, and on plants being apparently dioecious or hermaphrodite. These variations have little systematic value; see Danser, *Blumea* 2 (1936) 44. The two species now accepted have robust differences in inflorescence insertion and structure.

Loranthus is very closely related to the larger genus *Helixanthera*, which extends from Africa to southern Asia and northwestern Malesia. *Helixanthera* is relatively polymorphic, with a few species groups which differ strikingly from each other in flower size, relative style length and presence or absence of an articulation in the style. It is difficult to discriminate *Loranthus* as an entity with differences greater than those which distinguish the groups within *Helixanthera*. The presence of unisexual flowers has sometimes been used to distinguish *Loranthus*, but the character appears to be variable even within the species of the genus. Danser [Bull. Jard. Bot. Buitenzorg III, 16 (1938) 26] accordingly expressed the view that *Loranthus* (*Hyphear*) and *Helixanthera* are congeneric. Further study is needed to resolve this issue, as the taxonomic consequence of uniting the genera would be the submergence of the larger genus *Helixanthera* into the very small genus *Loranthus*. For further discussion, see Barlow, *Blumea* 40 (1995) 24–25. Ban, Tap Chi Sinh HOC 16, 4 (1994) 48, 54, has without discussion apparently proposed union of these two genera. However, he has overlooked the nomenclatural conservation of *Loranthus*, and has accordingly placed *Hyphear* (1929) in synonymy under *Helixanthera* (1790).

Note — The originally designated type species of *Loranthus*, *L. americanus*, is referable to the large American genus *Psittacanthus*. The usual application of the name *Loranthus* has been restored by conservation, with the well-known *L. europaeus* nominated as type; the usual application of the name *Psittacanthus* is accordingly also retained.

***Loranthus odoratus* Wall.**

Loranthus odoratus Wall. in Roxb., Fl. Ind., ed. 1, 2 (1824) 215. — *Hyphear odoratum* (Wall.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 319. — Type: *Wallich s. n.*, India, 'Mountains of Chandagiri and Sheopore'.

Loranthus delavayi Tiegh., Bull. Soc. Bot. France 41 (1984) 535. — *Hyphear delavayi* (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 319. — *Helixanthera delavayi* (Tiegh.) Ban, Tap Chi Sinh HOC 16, 4 (1994) 48. — Syntypes: *Delavay 2312, 3667, 4653*, Yunnan, Moug nichan.

Glabrous. Stem internodes dilated upwards. *Leaves* opposite or subopposite; lamina narrowly ovate to ovate, 5–10 by 1.5–3 cm, attenuate or cuneate at the base to a sometimes obscurely defined petiole up to 20 mm long, acuminate and acute at the apex, dull on both sides or slightly lustrous above; venation pinnate with the midrib and the main laterals distinct on both sides and more prominent below. *Inflorescences* at the nodes, a many-flowered spike; axis 15–80 mm long, with the flowers inserted in shallow hollows. *Flowers* probably functionally unisexual but often with vestigial organs of the other sex. *Corolla* in mature bud 6-merous, 3–4 mm long, widened upwards, clavate and rounded at the apex, white, yellow or orange. *Anther* c. 1 mm long, obtuse, about equal to the free part of the filament. — **Fig. 33.**

Distribution — Nepal to southern China and Taiwan; *Malesia*: Sumatra, Celebes, and known from only two collections.

Habitat & Ecology — Mostly 1000–3000 m altitude; frequently parasitic on *Quercus*; in Malesia recorded once from oak-myrtle forest, parasitic on *Lithocarpus*.

Note — For discussion on further likely synonymy, see Danser, *Blumea* 2 (1936) 44; *Bull. Jard. Bot. Buitenzorg* III, 16 (1938) 27.

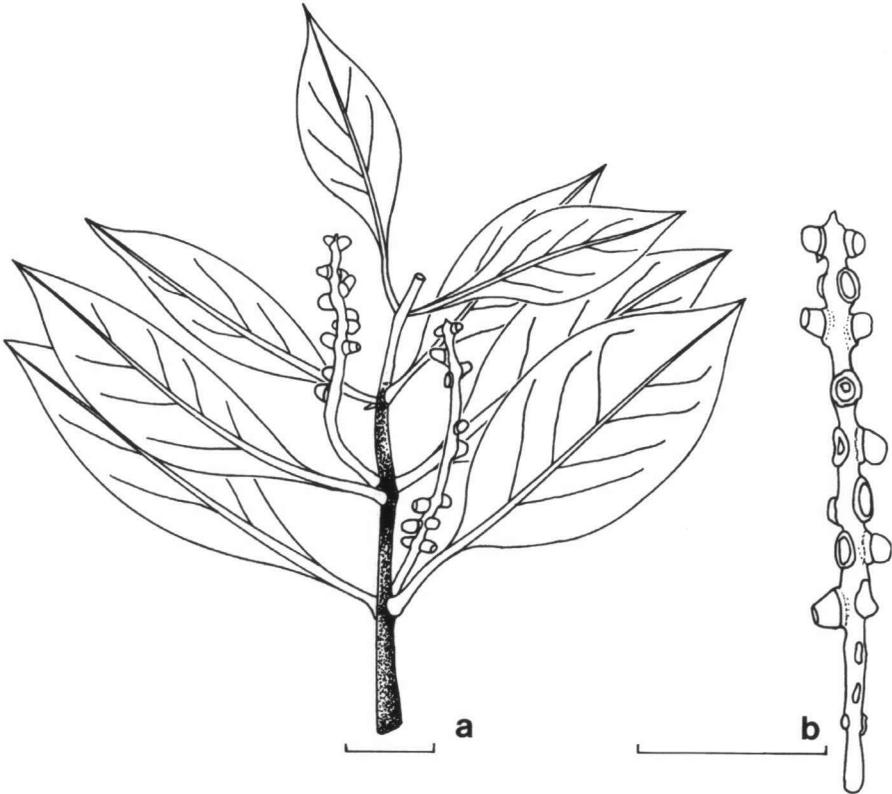


Fig. 33. *Loranthus odoratus* Wall. a. Twig with fruiting inflorescences; b. fruiting inflorescence (*Nicolson 3041*). Drawing Sandie McIntosh. Scale bars represent 1 cm.

LOXANTHERA

Loxanthera Blume in Schult. & Schult. f., Syst. Veg. 7, 2 (1830) 1612, 1730. — Type species: *Loxanthera speciosa* Blume

Aerial stem-parasitic shrubs with epicortical runners bearing secondary haustoria. *Leaves* opposite; venation pinnate. *Inflorescences* axillary, a raceme of decussate pairs of pedunculate dichasia (triads); bracts single under each flower. *Corolla* 6-merous, regular, gamopetalous to above the middle. *Anther* immobile, introrse, with an extension from the base which is free from the filament so that the filament appears dorsifixed. *Style* simple, articulate at the base, with a knob-like stigma. *Fruit* ellipsoid. — Fig. 34.

Distribution — Endemic to *Malesia*; 1 species distributed in western Malesia.

Habitat — Humid forests, possibly with high host specificity for *Ficus*.

Morphology — The distinctive feature of *Loxanthera* is the apparently dorsifixed, immobile introrse anther (see Fig.34). For discussion, see Barlow, Blumea 38 (1993) 114.

Taxonomy — The genus is possibly related to *Amylotheca*, differing primarily in the specialized anther structure. It is a member of the *Decaisnina* group of genera, differing from the latter also by its gamopetalous corolla. For further discussion see Barlow, Blumea 38 (1993) 114.

Loxanthera speciosa Blume

Loxanthera speciosa Blume in Schult. & Schult. f., Syst. Veg. 7, 2 (Oct.-Dec. 1830) 1612, 1649, 1730; Backer & Bakh. f., Fl. Java 2 (1965) 69; Barlow, Blumea 38 (1993) 115. — *Loranthus loxantherus* DC., Prodr. 4 (Sep. 1830) 316. — [*Loxanthera loxanthera* (DC.) Danser, Verh. Akad. Wet. Amst. Afd. Natuurk. 29, sect. 2 (1933) 90, nom. inval.] — Type: *Blume s.n.* (probably collected by Reinwardt), Java.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 254].

Glabrous. *Leaves* opposite; lamina narrow ovate to ovate, 6–14 by 2.5–8 cm, thick, shortly cuneate to slightly cordate at the base to a petiole 5–20 mm long, weakly acuminate and mostly acute at the apex, usually glossy above, dull below; venation pinnate with the midrib distinct and the main laterals obscure on both sides and the midrib prominent below. *Inflorescences* at the nodes, a raceme of 1–3 decussate pairs of triads with all flowers pedicellate; axis 5–15 mm long; peduncles of the triads 5–10 mm long; pedicels of the flowers 5–7 mm long. *Corolla* in mature bud 6-merous, 80–140 mm long, robust, inflated at the base, gradually widened upwards, clavate and usually obtuse at the apex, pink or red in the lower part, sometimes black at the apex; tube in the open flower 50–95 mm long. *Anther* 5–8 mm long, curved, attached at about one third its length, acute at the base, obtuse at the apex, much shorter than the free part of the filament. — Fig. 34.

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — Humid forests, 0–1600 m altitude; only recorded as parasitic on *Ficus*.

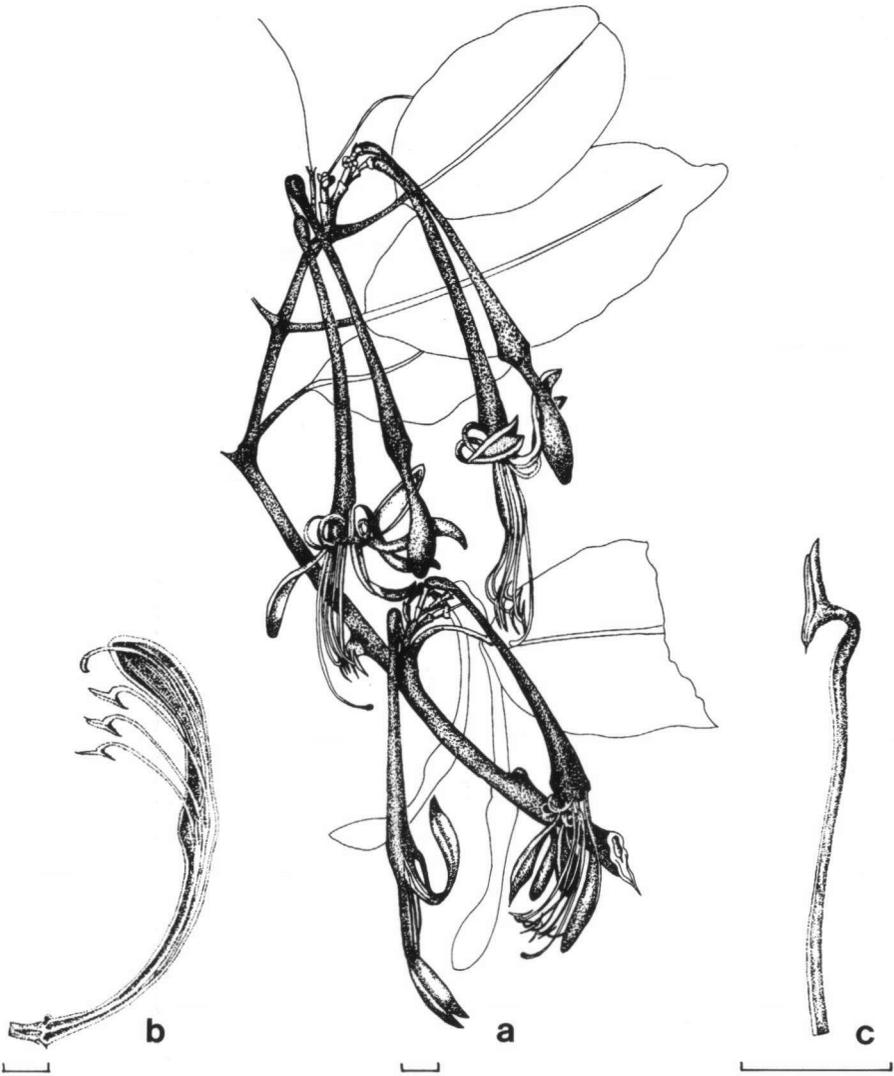


Fig. 34. *Loxanthera speciosa* Blume. a. Flower-bearing twig; b. flower in sectional view; c. upper part of stamen (Collection not cited). Redrawn from Blume (1851). Scale bars represent 1 cm.

MACROSOLEN

Macrosolen Blume in Schult. & Schult. f., Syst. Veg. 7, 2 (1830) 1731; Tiegh., Bull. Soc. Bot. France 42 (1895) 442; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 271. — Type species: *Macrosolen formosus* (Blume) Miq.

Blumella Tiegh., Bull. Soc. Bot. France 42 (1895) 441. — Type species: *Blumella loniceroides* (L.) Tiegh. [= *Macrosolen parasiticus* (L.) Danser].

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 271].

Aerial stem-parasitic shrubs, often robust, with epicortical runners bearing secondary haustoria. *Leaves* mostly opposite. *Inflorescences* axillary or inserted on the epicortical runners, a simple raceme or spike of decussate pairs of flowers, sometimes few-flowered and seemingly umbellate; bracts 3 under each flower, free or variously connate. *Corolla* 6-merous, gamopetalous, in mature bud with 6 keels or wings at the point of reflexion of the lobes, usually weakly zygomorphic but sometimes regular. *Anthers* basifixed, immobile. *Style* simple, usually with a knob-like stigma. *Fruit* ellipsoid to nearly globose. — Fig. 35–39.

Distribution — About 30 species in southern Asia and Malesia, extending from India to New Guinea. In *Malesia* 24 species, with the centre of diversity to the northwest, especially in Borneo.

Habitat — Humid and open forests and disturbed sites, more common in lowlands but with many species reaching altitudes of 2000–3000 m.

Ecology — In Malesia many species are aggressive, with broad host ranges, often occurring on cultivated trees.

Morphology — In some species the normally developed pairs of leaves alternate with scale leaves at intervening nodes, so that the leaves may appear to be superposed. This attribute occurs in a few species scattered in genera which are not closely related, such as *Barathranthus* and *Papuanthes* (Fig. 14), and may be a polyphyletic adaptation.

Taxonomy — Danser in *Blumea* 2 (1936) 35 revised the generic limits of *Elytranthe*, and transferred from *Elytranthe* to *Macrosolen* a few species which had earlier formed the basis of Van Tieghem's genus *Blumella*. The latter species do not occur in Malesia, but are correctly placed in *Macrosolen*, although perhaps constituting a distinct section. The two species still remaining in *Elytranthe* could possibly be accommodated in *Macrosolen* as well (see discussion under *Elytranthe*).

For discussion of taxonomic difficulty at the species level in *Macrosolen*, see Barlow, *Blumea* 40 (1995) 25–29.

KEY TO THE SPECIES

- 1a. Inflorescence of 1 or 2 pairs of flowers 2
- b. Inflorescence usually of more than 2 pairs of flowers in a raceme or spike 16
- 2a. Corolla more than 50 mm long 3
- b. Corolla 20–50 mm long 6
- c. Corolla less than 20 mm long 11
- 3a. Lateral bracts more or less connate but together not enclosing the ovary
 12. *M. formosus*
- b. Lateral bracts connate, together enclosing the ovary 4
- 4a. Stem internodes quadrangular when young; leaves usually cordate at the base, subsessile 17. *M. platyphyllus*
- b. Stem internodes terete from youth; leaves usually cuneate at the base, petiolate . . . 5
- 5a. Leaves widest below the middle; bracts not keeled 10. *M. dianthus*
- b. Leaves widest above the middle; bracts keeled 8. *M. crassus*

- 6a. Flowers usually subsessile; lateral bracts connate, enclosing the ovary **13. *M. geminatus***
 b. Flowers usually pedicellate, sometimes very shortly; lateral bracts free or connate but not enclosing the ovary 7
- 7a. Inflorescence normally a 2-flowered umbel 8
 b. Inflorescence normally racemose or subumbellate, sometimes reduced to 2 flowers but usually with more 9
- 8a. Lateral bracts free or nearly so, spreading; corolla in mature bud curved near the base, symmetrically winged **5. *M. bibracteolatus***
 b. Lateral bracts connate, appressed to the ovary when young; corolla in mature bud curved above the middle, asymmetrically winged **3. *M. arenis***
- 9a. Stem internodes two-edged when young; leaves usually cordate at the base and sessile **18. *M. pseudoperfoliatus***
 b. Stem internodes terete from youth; leaves cuneate or attenuate at the base, distinctly petiolate 10
- 10a. Leaves glossy above, acuminate and acute at the apex, mostly more than 5 cm long and 2 cm wide; inflorescence umbellate **21. *M. robinsonii***
 b. Leaves dull or lustrous above, mostly rounded at the apex, mostly less than 5 cm long and 2 cm wide; inflorescence racemose **11. *M. flammeus***
- 11a. Leaf lamina less than 5 cm long 12
 b. Leaf lamina mostly more than 5 cm long 14
- 12a. Corolla in mature bud crowned by a corona of dorsal appendages on the corolla lobes **9. *M. curtiflorus***
 b. Corolla in mature bud lacking a corona of dorsal appendages on the corolla lobes 13
- 13a. Leaves rounded at the apex; ovary shortly tomentose and more or less tuberculate; the distal part of the corolla weakly to strongly papillose in bud **16. *M. papillosus***
 b. Leaves acute at the apex; ovary and corolla glabrous **22. *M. surigaensis***
- 14a. Flowers usually subsessile **13. *M. geminatus***
 b. Flowers distinctly pedicellate 15
- 15a. Leaf lamina more than 12 cm long; anther c. 5 mm long, longer than the free part of the filament **2. *M. amboinensis***
 b. Leaf lamina less than 12 cm long; anther 1.5–2 mm long, much shorter than the free part of the filament **21. *M. robinsonii***
- 16a. Corolla in mature bud more than 50 mm long 17
 b. Corolla in mature bud 28–50 mm long 20
 c. Corolla in mature bud less than 28 mm long 23
- 17a. Stem internodes quadrangular when young; leaves usually cordate at the base, subsessile **17. *M. platyphyllus***
 b. Stem internodes terete from youth; leaves usually cuneate at the base, petiolate 18
- 18a. Leaf lamina more than 20 cm long, subsessile, bullate between the main veins; floral bracts 3–5 mm long **1. *M. acunae***

- b. Leaf lamina mostly less than 20 cm long, mostly cuneate at the base and distinctly petiolate, smooth; floral bracts 1–3 mm long 19
- 19a. Inflorescence of 1–4 pairs of flowers; axis 5–17 mm long, not subtended at the base by an involucre of short broadly triangular bracts; pedicels spreading, 3–7 mm long; bracts rounded, 1–2 mm long **12. M. formosus**
- b. Inflorescence of 2–7 pairs of flowers; axis 10–20 mm long, subtended at the base by an involucre of short broadly triangular bracts; pedicels appressed to the axis, 1–4 mm long; bracts keeled, acute, 2–3 mm long **24. M. x tubiflorus**
- 20a. Leaf lamina more than 15 cm long; free part of filament about 4 times as long as anther **4. M. beccarii**
- b. Leaf lamina mostly less than 12 cm long; free part of filament 1.5–2 times as long as the anther 21
- 21a. Stem internodes angular when young; leaves mostly cordate at the base and sessile; corolla more than 35 mm long **18. M. pseudoperfoliatus**
- b. Stem internodes terete from youth; leaves mostly cuneate to truncate at the base and petiolate; corolla less than 35 mm long 22
- 22a. Leaf lamina usually dull on both surfaces, rounded at the apex, attenuate at the base to a winged petiole **20. M. retusus**
- b. Leaf lamina glossy above, dull below, acuminate and mostly acute at the apex, shortly cuneate to truncate at the base to a sharply defined petiole **15. M. melintangensis**
- 23a. Leaf lamina more than 15 cm long; petiole mostly more than 15 mm long; free part of filament 3–5 times as long as the anther **14. M. macrophyllus**
- b. Leaf lamina mostly less than 15 cm long; petiole mostly less than 15 mm long; free part of filament 1–3 times as long as the anther 24
- 24a. Corolla tube more than 12 mm long 25
- b. Corolla tube mostly less than 10 mm long 26
- 25a. Leaf lamina usually dull on both surfaces, rounded at the apex, attenuate at the base to a winged petiole **20. M. retusus**
- b. Leaf lamina glossy above, dull below, acuminate and mostly acute at the apex, shortly cuneate to truncate at the base to a sharply defined petiole **15. M. melintangensis**
- 26a. Leaf lamina less than 6 cm long; the corolla about 7 mm long **19. M. pusillus**
- b. Leaf lamina mostly more than 6 cm long; the corolla more than 8 mm long ... 27
- 27a. Stem internodes quadrangular when young; leaf lamina thick, mostly sessile, mostly rounded towards the apex **23. M. tetragonus**
- b. Stem internodes terete from youth; leaf lamina coriaceous, distinctly petiolate, mostly attenuate or acuminate towards the apex 28
- 28a. Corolla tube mostly red, about one fourth the corolla length; anther 2–3.5 mm long **6. M. brevitubus**
- b. Corolla tube mostly yellow or green, about one half the corolla length; anther 0.5–2 mm long **7. M. cochinchinensis**

1. *Macrosolen acunae* (Merr.) Danser

Macrosolen acunae (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 343. — *Elytranthe acunae* Merr., Philipp. J. Sc., Bot. 13 (1918) 279. — Type: *Acuna* FB 23386, lecto, see note 2, Mindanao, Lanao.

Macrosolen nobilis Danser, Rec. Trav. Bot. Néerl. 31 (1934) 240. — Type: *Richards 1403*, Sarawak, Mt Dulit.

Glabrous. *Leaves* opposite, sometimes seemingly superposed; lamina ovate, 20–30 (–50) by 7–10 (–19) cm, truncate to cordate at the base, subsessile or with a petiole to 2 mm long, often bullate between the veins, acuminate and acute at the apex, lustrous above, dull below; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes and on the epicortical runners, a raceme of 2–6 opposite crowded pairs of flowers; axis 5–10 mm long, subtended at the base by an involucre of broad short bracts; pedicels 1–2 mm long; bracts erect, acuminate, 3–5 mm long. *Corolla* in mature bud 6-merous, 50–85 mm long, slender in the lower part, clavate, winged and acute at the apex, red or orange below and yellow or greenish above; tube in the open flower 28–60 mm long with the narrowly spathulate lobes reflexed 5–7 mm higher. *Anther* 4–5 mm long, saggitate at the base, subsacute; free part of the filament about twice as long, gradually widened upwards. — **Fig. 38a.**

Distribution — *Malesia*: Peninsular Malaysia, northern Borneo, Mindanao.

Habitat & Ecology — 150–600 m altitude; the only recorded host is *Koilolepas*.

Notes — 1. Similar vegetatively to *Macrosolen beccarii*, differing in the longer corolla with different proportions, especially at the apex.

2. The holotype of *Elytranthe acunae* (PNH) is not extant. An isotype has been seen (US) and designated lectotype of the species name.

2. *Macrosolen amboinensis* (Merr.) Danser

Macrosolen amboinensis (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 343. — *Elytranthe amboinensis* Merr., Interpr. Rumph. Herb. Amb. (1917) 206. — Type: *Robinson 515*, Moluccas, Ambon.

Glabrous. *Leaves* opposite; lamina ovate, 12–23 by 4–10 cm, cuneate to truncate at the base to a petiole 8–15 mm long, acuminate and acute at the apex, glossy above, dull below; venation pinnate with the midrib raised below and the major veins distinct above. *Inflorescences* at the nodes, an umbellate raceme of 1 or 2 opposite pairs of flowers; axis 4–7 mm long; pedicels 2–4 mm long; central bract c. 1.5 mm long, acute; lateral bracts slightly shorter, usually connate to near the apex. *Corolla* in mature bud 6-merous, 15–20 mm long, strongly winged and inflated to near the middle, cylindrical above, obtuse at the apex, green or red below, dark coloured in the middle and green above; tube in the open flower 4–6 mm long, campanulate, the lobes fully reflexed 3–5 mm higher. *Anther* c. 5 mm long, obtuse, slightly longer than the free part of the filament.

Distribution — *Malesia*: Moluccas (Ambon, Ceram).

Habitat & Ecology — Lowlands; no host recorded.

Note — Related to *Macrosolen geminatus*, differing in distinctly pedicellate flowers and more robust habit.

3. *Macrosolen avenis* (Blume) Danser

Macrosolen avenis (Blume) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 343; Backer & Bakh. f., Fl. Java 2 (1965) 70. — *Loranthus avenis* Blume, Verh. Bat. Genootsch. 9 (1823) 190. — Type: *Blume s.n.*, Java.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 275].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 4–10(–13) by 1.5–4(–6) cm wide, cuneate to truncate at the base to a petiole 2–6 mm long, usually acuminate and acute or obtuse at the apex, lustrous above, dull below; venation pinnate with the midrib distinct above and prominent below and the main laterals usually obscure on both sides. *Inflorescences* at the nodes, an umbel of usually 1 opposite pair of flowers; axis 0.5–6 mm long; pedicels 2–6 mm long; bracts triangular, acute, c. 1.5 mm long, connate only at the base and spreading as a shallow dish. *Corolla* in mature bud 6-merous, 30–40 mm long, slender, weakly and unequally winged near the middle, usually curved in the upper part and weakly clavate and acute or obtuse at the apex, mostly red or rarely yellow or green, sometimes violet above; tube in the open flower 20–28 mm long, split more deeply on the concave side, with the lobes reflexed 3–4 mm higher. *Anther* c. 2 mm long, acute, about half as long as the free part of the filament.

Distribution — Thailand to Vietnam; *Malesia*: Sumatra, Peninsular Malaysia, Java.

Habitat & Ecology — Mostly in highlands from 1700 to 2600 m altitude, less frequently down to 250 m in Indochina; the only recorded hosts are *Ardisia* and *Vaccinium*.

Note — Similar to *Macrosolen bibracteolatus*, differing in the bract and corolla characters described in the key. The species are sympatric only in eastern Indochina and northern Sumatra. Some specimens from these areas are difficult to discriminate, suggesting limited introgression.

4. *Macrosolen beccarii* Becc.

Macrosolen beccarii Tiegh. ex Becc., For. Born. (1902) 518. — Type: *Beccari 610*, Sarawak.

Macrosolen borneanus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 278. — Type: *Amdjah 329*, Kalimantan, 'Oeloe Tjihah'.

Glabrous. *Leaves* opposite, often apparently superposed; lamina ovate, 15–28(–37) by 5–13 cm, truncate to cordate at the base, subsessile or with a petiole to 4 mm long, acuminate and acute at the apex, glossy or lustrous above, dull below; venation pinnate with the midrib and the main laterals distinct on both sides and the reticulum often visible above. *Inflorescences* at the nodes, a raceme of 2–6(–8) opposite crowded pairs of flowers; axis 9–14 mm long, usually subtended at the base by an involucre of broad short bracts; pedicels c. 2 mm long; floral bracts erect, acuminate, c. 2 mm long. *Corolla* in mature bud 6-merous, 30–40 mm long, moderately robust, cylindric below, abruptly widened, clavate, strongly winged and obtuse at the apex, mostly red below and black above; tube in the open flower 15–20 mm long with the spatulate marginate lobes reflexed 5–8 mm higher. *Anther* 2–3 mm long, shortly saggitate at the base, acute; free part of the filament about four times as long, usually gradually widened upwards. — **Fig. 36 d–f.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Lowlands; the only recorded host is *Cephalomappa*.

Note — For comparison with *Macrosolen acunae*, see there.

5. *Macrosolen bibracteolatus* (Hance) Danser

Macrosolen bibracteolatus (Hance) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 343. — *Loranthus bibracteolatus* Hance, J. Bot. 18 (1880) 301. — Type: *Hance 20792 (ex Gerlach)*, not seen.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 9].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, mostly 8–12 cm long, 2–6 cm wide, cuneate at the base to a petiole 1–3 mm long, acuminate and acute or obtuse at the apex, glossy above, dull below; venation pinnate with the midrib and the main laterals distinct above and the midrib prominent below. *Inflorescences* at the nodes, an umbel of 1 opposite pair of flowers; axis 1–4 mm long; pedicels 1–4 mm long; bracts 0.8–1.5 mm long, concave, somewhat appressed at the bud stage, the laterals ones connate. *Corolla* in mature bud 6-merous, 25–35 mm long, often curved near the base, gradually widened upwards, winged in the upper part, clavate and obtuse at the apex, pink or red, sometimes yellow or green above; tube in the open flower 16–24 mm long with the lobes reflexed or twisted slightly higher. *Anther* c. 4 mm long, obtuse, equal to or shorter than the free part of the filament.

Distribution — Southern China (including Hainan) and Vietnam; *Malesia*: Sumatra, Borneo. The area of the species may be disjunct.

Habitat & Ecology — Mostly in highlands from 1800 to 3000 m altitude, less frequently down to 700 m; no hosts recorded.

Note — Similar to *Macrosolen arenis*; see there for comparison.

6. *Macrosolen brevitubus* Barlow

Macrosolen brevitubus Barlow, Blumea 40 (1995) 25. — Type: *Chew 980*, Sarawak, Marudi.

Glabrous. *Leaves* opposite; lamina narrowly ovate to elliptic, 8–13 by 2.5–5 cm, shortly cuneate to truncate at the base to a petiole 1–4 mm long, attenuate to acuminate and shortly rounded to acute at apex, lustrous or dull above, dull and paler below; venation pinnate with midrib and main laterals visible above and the midrib prominent below; lamina in juvenile state linear, to 15 cm long, 0.5–1 cm wide, otherwise similar to adult leaves. *Inflorescence* a raceme of 4 or 5 opposite pairs of flowers; axis 8–15 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 6-merous, 15–25 mm long, inflated in the lower part, winged below the middle, weakly clavate above a long neck and acute at apex, mostly red with one or two black bands at neck and apex; tube in the open flower 4–6 mm long with the narrowly spatulate lobes reflexed 3–5 mm higher. *Anther* 2–3.5 mm long, obtuse, about half to three fourths as long as the free part of the filament.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Lowland dipterocarp forest to 300 m altitude; the only recorded host is *Strombosia*.

Note — Related to *M. macrophyllus*; for distinction as a species see Barlow, l.c.



Fig. 35. *Macrosolen cochinchinensis* (Lour.) Tiegh. Borneo, NW Kalimantan, Sanggau. Photo A. Else-ner, 1961.

7. *Macrosolen cochinchinensis* (Lour.) Tiegh.

Macrosolen cochinchinensis (Lour.) Tiegh., Bull. Soc. Bot. France 41 (1894) 122; Backer & Bakh. f., Fl. Java 2 (1965) 69. — *Loranthus cochinchinensis* Lour., Fl. Coch. (1790) 195. — Type: not located.

[For extensive additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 279; 16 (1938) 5; Philipp. J. Sc. 58 (1935) 43].

Glabrous or rarely the inflorescence shortly pale-tomentose. *Leaves* opposite or scattered, the normally developed ones sometimes alternating with cataphylls; lamina narrowly to broadly elliptic or ovate, 4–16 by 2–7 cm, cuneate to truncate at the base to a petiole (1–)3–10 mm long; usually acuminate and acute but sometimes obtuse or shortly rounded at the apex, lustrous above, dull below; venation pinnate with the midrib prominent and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a sometimes subumbellate or spicate raceme of 2–7 opposite pairs of flowers; axis slender, 5–20(–40) mm long, subtended at the base by an involucre of 1 or 2 pairs of small broadly triangular bracts; pedicels slender, 0–6 mm long. *Corolla* in mature bud 6-merous, 8–18(–23) mm long, gradually widened or slightly inflated upwards, weakly winged near the middle, angular, clavate and obtuse or rarely acute at the apex, mostly yellow or green or rarely pink or red below, dark-coloured at the neck and yellow or red above; tube in the open flower 5–10(–14) mm long with the lobes reflexed slightly higher. *Anther* 0.5–2 mm long, acute, about half to one third as long as the free part of the filament. — Fig. 35.

Distribution — Southern Asia from the Himalayas eastwards to southern China and Indochina; *Malesia*: common and widespread from Peninsular Malaysia to New Guinea (Bird's Head Peninsula).

Habitat & Ecology — Humid and open forests and disturbed sites; very common in lowlands but occasionally reaching as high as 2270 m altitude; recorded hosts many.

Note — Barlow in Austral. J. Bot. 22 (1974) included in *Macrosolen cochinchinensis* all New Guinean specimens previously referred to *M. suberosus*. The latter name is now treated as conspecific with *M. geminatus* (see note there).

8. *Macrosolen crassus* Danser

Macrosolen crassus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 285. — Type: Endert 3552, Kalimantan, 'Kong Kemoel'.

Glabrous. *Leaves* opposite; lamina elliptic to oblong, widest above the middle, 6–13 by 2–4 cm, attenuate at the base to an obscure petiole 5–10 mm long, rounded at the apex, dull on both sides; venation pinnate with only the midrib visible above and prominent below. *Inflorescences* at the nodes, robust, mostly an umbel of 1 opposite pair of flowers, sometimes with the axis prolonged and rarely bearing a second pair of flowers; axis 3–10 mm long; pedicels 1.5–3 mm long, central bract keeled, 4–6 mm long; lateral bracts keeled, connate, together enclosing the ovary. *Corolla* in mature bud 6-merous, 70–110 mm long, robust, widened upwards, angular above, clavate and rounded at the apex, red; tube in the open flower 60–90 mm long with the lobes reflexed slightly

higher. *Anther* 8–10 mm long, obtuse, about two thirds as long as the free part of the filament. — **Fig. 38b.**

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — 80–540 m altitude; the only recorded host is *Casuarina*.

9. *Macrosolen curtiflorus* (Elmer) Danser

Macrosolen curtiflorus (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 344. — *Loranthus curtiflorus* Elmer, Leaflet. Philipp. Bot. 6 (1913) 1964. — Type: *Elmer 14089*, Mindanao, Cabadbaran.

Glabrous. Stem internodes more or less flattened quadrangular upwards when young. *Leaves* opposite; lamina elliptic, mostly 3–5 cm long, mostly 1.5–3 cm wide, shortly cuneate at the base to a petiole 5–8 mm long, obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib prominent and the main laterals visible on both sides. *Inflorescences* at the nodes, a subumbellate raceme of 2 opposite pairs of flowers; axis 6–10 mm long; pedicels 2–3 mm long. *Corolla* in mature bud 6-merous, c. 15 mm long, slightly inflated, 6-angular above the middle, with a crown at the apex formed from dorsal appendages on the segments; tube in the open flower c. 7 mm long. *Anther* c. 3 mm long.

Distribution — *Malesia*: Philippines (Mindanao).

Habitat & Ecology — 1800 m altitude; no host recorded.

Note — The species is known only from the type (PNH), which is no longer extant. If the diagnostic characters are correct, the species is singular in the genus in having a corona at the tip of the corolla bud. The conservation status of the species requires consideration.

10. *Macrosolen dianthus* (King) Danser

Macrosolen dianthus (King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 344. — *Loranthus dianthus* King, J. As. Soc. Beng. 56, ii (1887) 96. — Type: *Scortechini 604a*, lecto, see note 2, Perak. *Loranthus subsessilis* Merr., Philipp. J. Sc., Bot. 7 (1912) 263. — *Macrosolen subsessilis* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — Type: *Merrill 8315*, lecto, see note 2, Mindanao, Sax River.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 287; 16 (1938) 13].

Glabrous. *Leaves* opposite; lamina (in the Malesian region) narrowly ovate to ovate, 9–15 by 2.5–7 cm, shortly cuneate to truncate at the base to a petiole 2–8 mm long, acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib prominent below and the main veins distinct on both sides. *Inflorescences* at the nodes, a pseudo-umbel of 1 opposite pair of subsessile flowers; axis 1–3 mm long; pedicels 0–1 mm long; central bract orbicular, 2–3 mm long; lateral bracts 2–3 mm long, connate, together almost completely enclosing the ovary. *Corolla* in mature bud 6-merous, 55–85 mm long, winged at about two thirds the length, clavate and often minutely mucronate at the apex, red or green below, often green at the neck and red above; tube in the open flower 40–60 mm long with the lobes reflexed slightly higher. *Anther* 5–8 mm long, obtuse, equal to or shorter than the free part of the filament.

Distribution — Vietnam; *Malesia*: Peninsular Malaysia, Mindanao. The species area appears to be disjunct.

Habitat & Ecology — 100–600 m altitude; no hosts recorded.

Notes — 1. Closely related to *Macrosolen platyphyllus*; for differences see there. Specimens in Peninsular Malaysia and Indochina with leaves truncate to cordate at the base and rounded at the apex, referred to *M. krempffii* by previous authors, are possibly intergrades between *M. dianthus* and *M. platyphyllus*.

2. In the protologue of *Loranthus dianthus* King cited four collections, which are therefore syntypes. *Scortechini 604a*, seen by King and bearing an analysis by Gamble, is selected as lectotype of the species name. The holotype of *Loranthus subsessilis* (PNH) is no longer extant. Isotypes have been seen (US 901951, L); the former is more substantial and is designated lectotype of the species name.

11. *Macrosolen flammeus* Danser

Macrosolen flammeus Danser, Rec. Trav. Bot. Néerl. 31 (1934) 230. — Type: *Clemens 29807*, Sabah, Mt Kinabalu.

Glabrous except for the corolla rarely shortly tomentose. *Leaves* opposite; lamina narrowly ovate to narrowly obovate, 3–5.5 by 1.2–2 cm, cuneate to attenuate at the base to a petiole 2–5 mm long, recurved at the margin, mostly rounded and shortly mucronate or rarely acute at the apex, dull or slightly lustrous above, dull below; venation pinnate with the midrib distinct above and raised below and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of 1 or 2 opposite pairs of flowers; axis 2–7 (–13) mm long; pedicels 1–6 mm long; bracts small, the lateral ones usually connate. *Corolla* in mature bud 6-merous, 22–28 mm long, slender, angular, weakly alate above the middle, weakly clavate and acute at the apex, mostly red or pink below, dark coloured at the neck and green to yellow above; tube in the open flower 12–18 mm long with the lobes reflexed 3–4 mm higher. *Anther* 1.5–2 mm long, acute, about one fourth as long as the free part of the filament. — Fig. 36a.

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Known mostly from Mt Kinabalu from 2400 to 3000 m altitude but recorded down to sea level; recorded hosts include *Phyllocladus* and *Tristania*.

12. *Macrosolen formosus* (Blume) Miq.

Macrosolen formosus (Blume) Miq., Fl. Ind. Bat. 1 (1856) 27; Backer & Bakh. f., Fl. Java 2 (1965) 69.

— *Loranthus formosus* Blume, Bijdr. (1825) 664. — Type: *Blume s. n.*, Java.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 287].

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 10–16(–30) by 5–13 cm, cuneate at the base to a petiole 4–12 mm long (in Peninsular Malaysian specimens sometimes truncate or cordate at the base and subsessile), acuminate and acute at the apex, slightly lustrous above, dull below; venation pinnate with the midrib and the main laterals distinct on both sides. *Inflorescences* at the nodes and sometimes along the internodes and on the epicortical runners, a raceme (sometimes subumbellate or umbellate)

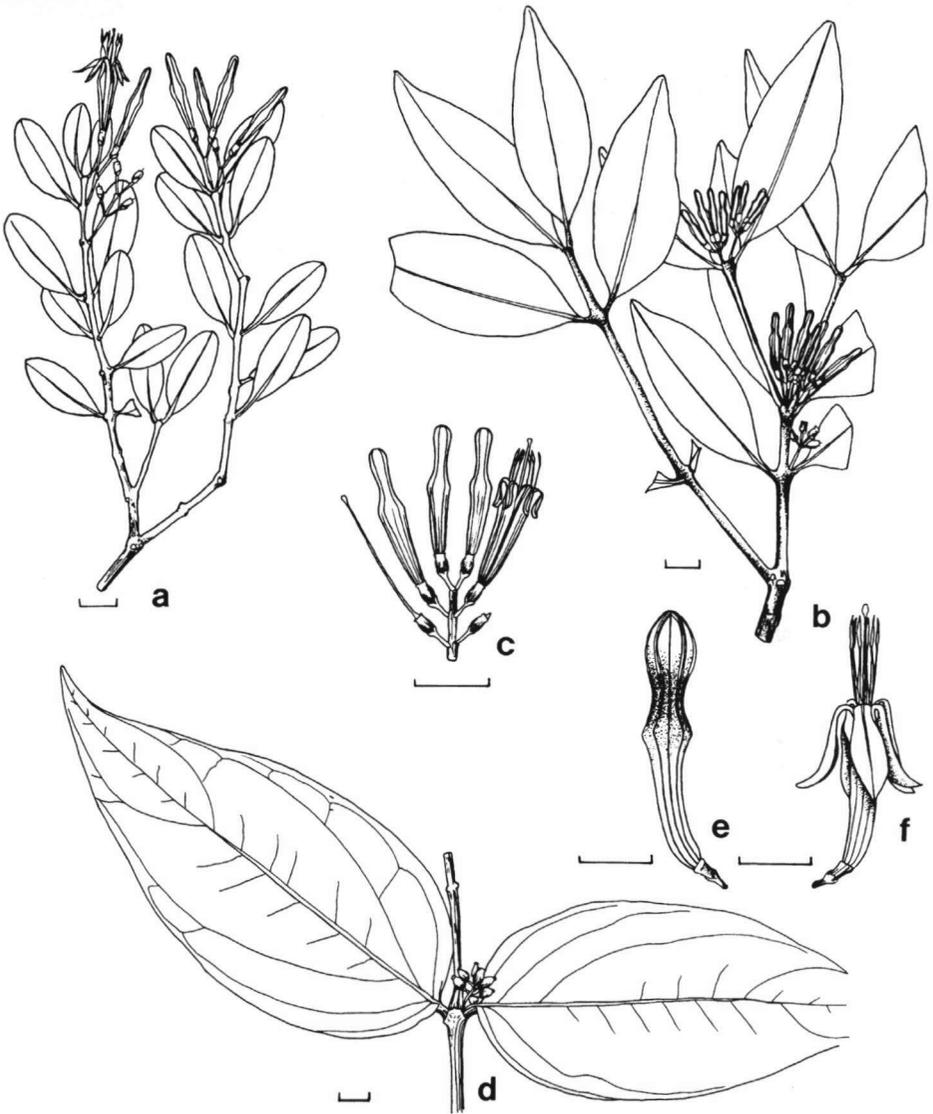


Fig. 36. *Macrosolen flammeus* Danser. a. Flower-bearing twig. — *M. melintangensis* (Korth.) Miq. b. Flower-bearing twig; c. inflorescence. — *M. beccarii* Becc. d. Part of stem with fruiting inflorescence; e. flower bud; f. flower (a: Clemens 29807; b: Ramos & Chan BS 30447; c: Endert 3999; d: Amdjah 329; e, f: Haviland =478). a Redrawn from Danser (1934), b redrawn from Danser (1935), c–f redrawn from Danser (1931). Scale bars represent 1 cm.

of 1–4 opposite pairs of flowers; axis 5–17 mm long; pedicels 3–7 mm long; bracts 1–2 mm long, rounded, the laterals sometimes connate. *Corolla* in mature bud 6-merous, 60–100 mm long, gradually widened upwards, moderately winged below the neck, cla-

vate, ribbed and rounded at the apex, mostly red or rarely yellow below and often striped green or darker red and white or cream above; tube in the open flower 45–75 mm long with the lobes reflexed or 5–7 mm higher. *Anther* 5–7 mm long, weakly sagittate at the base, acute, slightly shorter than the free part of the filament. — **Fig. 38e.**

Distribution — *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java.

Habitat & Ecology — Humid forests, mostly 800–1650 m altitude, less frequently down to 150 m; recorded hosts include *Diospyros* and *Ficus*.

Note — Peninsular Malaysian specimens with large sessile cordate leaves may be the result of introgression from species such as *Macrosolen acunae*.

13. *Macrosolen geminatus* (Merr.) Danser

Macrosolen geminatus (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 344. — *Loranthus geminatus* Merr., Philipp. J. Sc., Bot. 4 (1909) 146. — Type: *Merrill 5444*, lecto, see note 2, Mindanao.

Loranthus mcgregorii Merr., Philipp. J. Sc., Bot. 4 (1909) 146. — *Macrosolen mcgregorii* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — Type: *McGregor BS 1266*, lecto, see note 2, Bohol.

Loranthus angulatus Elmer, Leaflet Philipp. Bot. 3 (1911) 1074. — *Macrosolen angulatus* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 343. — Type: *Elmer 10804*, lecto, see note 2, Sibuyan, Mt Giting-Giting.

Elytranthe suberosa Lauterb., Nova Guinea 8 (1912) 816. — *Macrosolen suberosus* (Lauterb.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — Type: *Gjellerup 148*, lecto, Irian Jaya, 'Hollandia'.

Loranthus worcesteri Merr., Philipp. J. Sc., Bot. 9 (1914) 284. — *Macrosolen worcesteri* (Merr.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 346. — Type: *Fenix BS 15673*, see note 2, Mindanao.

Macrosolen coriaceous Danser, Blumea 2 (1936) 37. — Type: *Kaudern 507*, Celebes, Banggai.

Macrosolen cochinchinensis (Lour.) Tiegh. var. *lanceolatus* Barlow, Austral. J. Bot. 22 (1974) 556. — Type: *Womersley & Millar NGF 7755*, Papua New Guinea, near Karap.

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 554 (excl. *Loranthus cochinchinensis*)].

Glabrous, rarely somewhat glaucous. *Leaves* opposite; lamina usually elliptic or ovate, sometimes lanceolate, (4–)6–12(–16) by (1–)3–8 cm, cuneate to truncate at the base to a petiole 0–10(–15) mm long (i.e., rarely sessile), variable at the apex from acuminate and acute to bluntly obtuse or rounded, dull or glossy above, usually dull below; venation pinnate with the midrib prominent below and the larger veins distinct above. *Inflorescences* at the nodes, normally a spike of 1 or 2 or rarely 3 opposite subcapitate pairs of flowers; axis 3–8(–12) mm long, sometimes with an involucre of 1–3 pairs of small bracts at or near the base; pedicels vestigial or very rarely up to 2 mm long; central bract usually acute, 1.5–2 mm long; lateral bracts slightly shorter, usually connate to near the apex and enclosing the ovary. *Corolla* in mature bud 6-merous, 9–16(–23) mm long, strongly winged and inflated to near the middle, cylindrical above, obtuse at the apex, mostly yellow or red below, dark coloured in the middle and green or yellow above; tube in the open flower 3–8(–12) mm long, campanulate, with the lobes fully reflexed slightly higher. *Anther* 1–3.5 mm long, obtuse, longer or shorter than the free part of the filament. — **Fig. 37c, d.**

Distribution — *Malesia*: Philippines (southern part), Celebes, New Guinea.

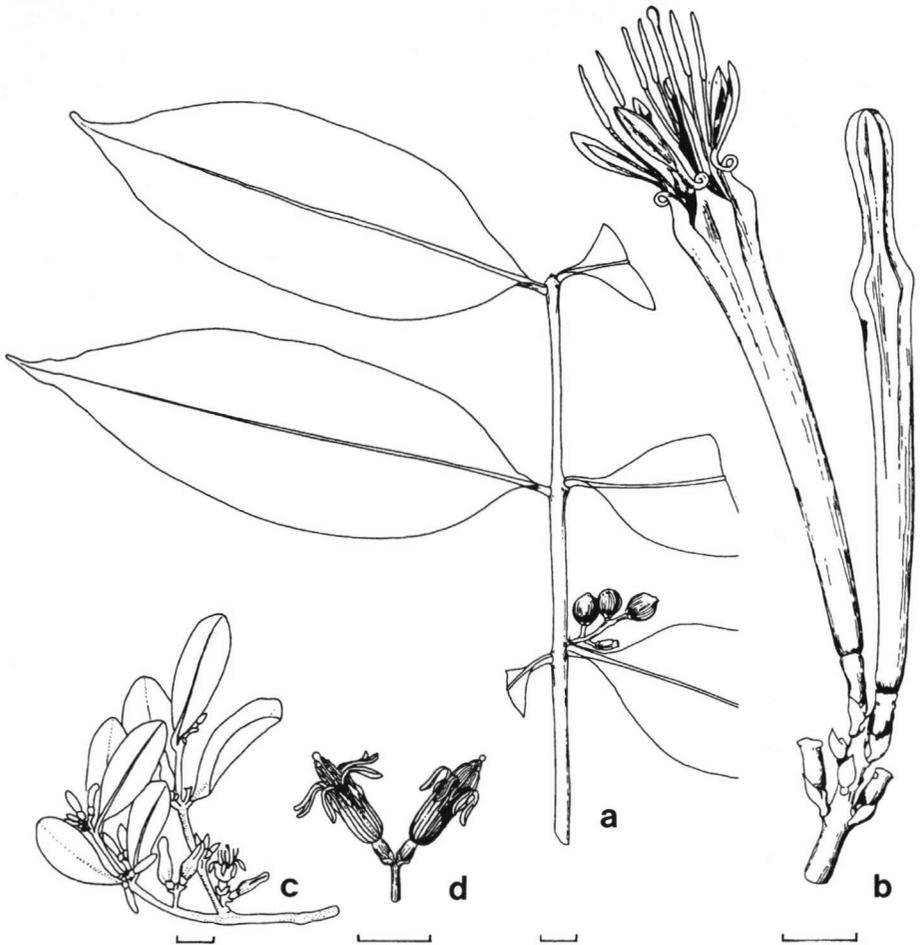


Fig. 37. *Macrosolen* × *tubiflorus* (Ridl.) Danser. a. Part of stem with fruiting inflorescence; b. inflorescence. — *M. geminatus* (Merr.) Danser. c. Flower-bearing twig; d. inflorescence (a – c: not cited; d: *Docters van Leeuwen 10006*). a, b Redrawn from Danser (1934), c redrawn from Barlow (1981), d redrawn from Danser (1931). Scale bars represent 1 cm.

Habitat & Ecology — Mostly in closed humid forests, 0–2300 m altitude; recorded hosts include *Alstonia*, *Castanopsis*, *Grewia*, *Nothofagus*, *Opocunonia*, and *Pittosporum*.

Notes — 1. There is no consistent basis on which *Macrosolen geminatus*, *M. angulatus*, *M. mcgregorii*, *M. worcesteri*, *M. suberosus*, *M. coriaceus* and *M. cochinchinensis* var. *lanceolatus* can be distinguished, and they are accordingly treated together as a single relatively polymorphic species. There is evidence of local race differentiation, especially in New Guinea and Celebes, mainly involving leaf shape and texture.

2. Barlow [1974, and in Handb. Fl. Papua New Guinea 2 (1981) 247] treated the New Guinean specimens of *M. suberosus* (= *M. geminatus*) as conspecific with *M. cochinchinensis*. True *M. cochinchinensis* occurs in New Guinea only in the Bird's Head Peninsula.

3. The holotype of *L. geminatus* (PNH) is no longer extant. Isotypes have been seen (US 710732, NY); the former is more substantial and is designated lectotype of the species name. The holotype of *L. mcgregorii* (PNH) is no longer extant. Isotypes have been seen (NY, US 439241); the former is more substantial and is designated lectotype of the species name. The holotype of *L. angulatus* (PNH) is no longer extant. Isotypes have been seen (NY, US 779402); the former is more substantial and is designated lectotype of the species name. The holotype of *L. worcesteri* (PNH) is no longer extant. A fragmentary isotype has been seen (US) but has not been designated lectotype of the species name, pending a search for a better specimen.

14. *Macrosolen macrophyllus* (Korth.) Miq.

Macrosolen macrophyllus (Korth.) Miq., Fl. Ind. Bat. 1 (1856) 829. — *Loranthus macrophyllus* Korth., Verh. Bat. Genootsch. 17 (1839) 280. — Type: *Korthals* 283, Sumatra, Mt Malintang.

Macrosolen curvinervis Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 286. — Type: *Endert* 2556, Kalimantan, 'Long Hoet'.

Glabrous. *Leaves* opposite; lamina broadly ovate, 15–28 by 8–15 cm, truncate to weakly cordate at the base to a petiole (5–)15–22 mm long, thick, obtuse or rounded or rarely shortly acuminate and acute at the apex, glossy above, dull or lustrous below; venation pinnate with the midrib and the strongly incurved main laterals distinct above and prominent below. *Inflorescences* at the nodes, a raceme of 3–6 opposite pairs of flowers; axis 15–25 mm long, slender; pedicels 2–4 mm long. *Corolla* in mature bud 6-merous, 20–25 mm long, inflated below, contracted to a slender neck, clavate, angular and acute at the apex, red below, black at the neck and green above; tube in the open flower 4–7 mm long with the lobes reflexed 4–6 mm higher. *Anther* c. 2 mm long, acute, one third to one fifth as long as the free part of the filament.

Distribution — *Malesia*: Sumatra, Borneo.

Habitat & Ecology — Lowlands to 1075 m altitude; no hosts recorded.

15. *Macrosolen melintangensis* (Korth.) Miq.

Macrosolen melintangensis (Korth.) Miq., Fl. Ind. Bat. 1, 1 (1856) 830. — *Loranthus melintangensis* Korth., Verh. Bat. Genootsch. 17 (1839) 281. — Type: *Korthals s.n.*, Sumatra, Mt Malintang.

Macrosolen javanus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 289; Backer & Bakh. f., Fl. Java 2 (1965) 70. — Type: *Docters van Leeuwen* 3024, Java, Mt Guntur.

[For extensive additional synonymy see Barlow, *Blumea* 40 (1995) 26].

Glabrous except for the inflorescence very rarely papillose hairy. *Leaves* opposite; lamina more or less ovate, (5–)8–12(–18) by 1.5–6 cm, shortly cuneate to truncate or very rarely cordate at the base to a petiole (3–)6–15(–18) mm long, usually slightly to strongly acuminate and acute at the apex but sometimes finally rounded, shining or glossy above, dull and paler below; venation pinnate, visible on the upper surface, with

only the midrib raised, dark coloured and visible below. *Inflorescences* at the nodes, a short sometimes subumbellate raceme of 2–4 opposite pairs of flowers; axis usually slender, 3–10(–16) mm long (or slightly longer in fruit), often subtended at the base by an involucre of a few acuminate prophylls; pedicels slender, (1–)2–4 mm long (to 5 mm in fruit). *Corolla* in mature bud 6-merous, (15–)20–30(–35) mm long, usually slender, slightly inflated and weakly 6-ribbed or 6-winged at or above the middle, clavate, angular and usually acute at the apex, mostly pink or red or orange, with a dark band at the neck and grading to yellow or green above; tube in the open flower mostly 12–18 mm long with the lobes reflexed 2–3 mm higher. *Anther* 1.5–3 mm long, about two thirds as long as the free part of the filament. — **Fig. 36b, c.**

Distribution — Thailand, Indochina; *Malesia*: Sumatra, Peninsular Malaysia, Borneo, Java, Philippines.

Habitat & Ecology — Common, mostly in highlands from 1000 to 2350 m altitude, less frequently down to sea level; the only recorded host is *Ficus*.

Note — For a discussion of circumscription as a species, see Barlow, *Blumea* 40 (1995) 26–29.

16. *Macrosolen papillosum* (Gamble) Danser

Macrosolen papillosum (Gamble) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — *Elytranthe papillosa* Gamble, Kew Bull. 1913 (1913) 45. — Type: *Ridley 2045*, Singapore, Kranji.

Glabrous except for the ovary shortly tomentose and more or less tuberculate and the distal part of the corolla weakly to strongly papillose in bud. *Leaves* opposite; lamina narrowly obovate to spatulate, 3–4 by 1–2 cm, attenuate at the base to a petiole 1–3 mm long, rounded at the apex, dull on both sides; venation almost curvinerved with the midrib and the main laterals visible above and only the midrib prominent below. *Inflorescences* at the nodes, an umbel of 1 pair of flowers, sometimes extended as a raceme of 2 pairs of flowers; axis 1.5–6 mm long; pedicels 1–2 mm long; bracts small, the lateral ones usually connate. *Corolla* in mature bud 6-merous, 10–15 mm long, widened upwards to 6 tooth-like wings in the middle, clavate and obtuse or rounded at the apex, yellow or green; tube in the open flower 5–8 mm long with the lobes reflexed 2–3 mm higher. *Anther* c. 1 mm long, obtuse, about half as long as the free part of the filament.

Distribution — *Malesia*: Peninsular Malaysia, Singapore, Borneo (Sarawak).

Habitat & Ecology — 0–1000 m altitude; no hosts recorded.

Note — Similar to *Macrosolen flammeus*, differing in shorter corollas with more distinct tooth-like wings, verrucose inflorescence parts and papillose fruits.

17. *Macrosolen platyphyllus* (King) Danser

Macrosolen platyphyllus (King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — *Loranthus platyphyllus* King, J. As. Soc. Beng. 56, ii (1887) 97. — Type: *Scortechini ?606*, Perak.

Macrosolen latifolius Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 291. — Type: *Haviland 2183*, lecto, see note 2, Sarawak, Kuching.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 294].

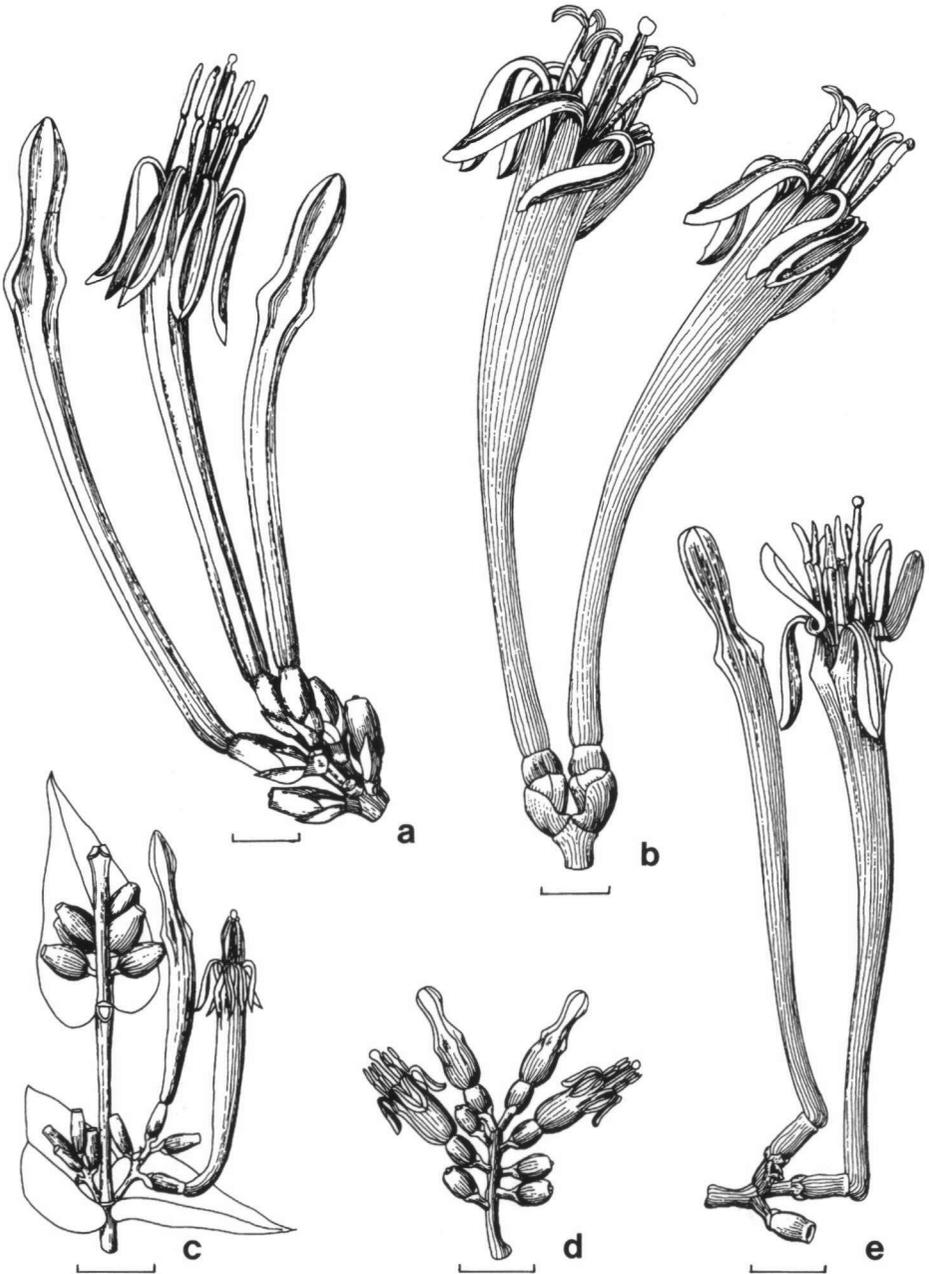


Fig. 38. *Macrosolen acunae* (Merr.) Danser. a. Inflorescence. — *M. crassus* Danser. b. Inflorescence. — *M. pseudoperfoliatus* (Zoll.) Miq. c. Part of stem with flowering and fruiting inflorescences. — *M. tetragonus* (Blume) Miq. d. Inflorescence. — *M. formosus* (Blume) Miq. e. Inflorescence (a: Richards 1403; b: Endert 3552; c: *Ultée* s. n.; d: Danser 6675; e: *Bakhuizen van den Brink* 5130). a Redrawn from Danser (1934), b–e redrawn from Danser (1931). Scale bars represent 1 cm.

Glabrous. Stem internodes distinctly quadrangular when young. *Leaves* opposite; lamina broadly ovate to cordate-orbicular, 7–19 by 5–13 cm, truncate to strongly cordate at the base, subsessile on a petiole 1–3 mm long, rounded at the apex, dull or slightly lustrous on either side; venation pinnate with the midrib and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme or spike of (1–)2–5 opposite pairs of flowers; axis 4–14 mm long; pedicels 0–1 mm long; central bract orbicular, 2–2.5 mm long; lateral bracts 2–2.5 mm long, connate, together almost completely enclosing the ovary. *Corolla* in mature bud 6-merous, 70–125(–150) mm long, winged at about four fifths the length, clavate, often angular and truncate at the apex, red or yellow below, often yellow at the neck and red or green above; tube in the open flower 55–110 mm long with the lobes reflexed or twisted 5–10 mm higher. *Anther* 3–8 mm long, obtuse, about equal to the free part of the filament.

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

Habitat & Ecology — 0–1000 m altitude; recorded hosts include *Hevea* (commonly), also *Parkia*.

Notes — 1. Closely related to *Macrosolen dianthus* and *M. annamicus* Danser, differing from both in the strongly angular stems and the inflorescences prolonged into a short raceme. In Peninsular Malaysia, where *M. platyphyllus* and *M. dianthus* are sympatric, the differentiation is strongest, *M. platyphyllus* also differing in its strongly cordate subsessile leaves.

2. In the diagnosis of *M. latifolius* Danser cited 3 collections, which are therefore syntypes. *Haviland 2183* (K) is the most complete specimen, bearing leaves and flowers, and is selected as lectotype of the species name.

18. *Macrosolen pseudoperfoliatus* (Zoll.) Miq.

Macrosolen pseudoperfoliatus (Zoll.) Miq., Fl. Ind. Bat. 1, 1 (1856) 828; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 295; Backer & Bakh.f., Fl. Java 2 (1965) 70. — *Loranthus pseudo-perfoliatus* Zoll., Genees. Nat. Arch. 2 (1845) 578. — *Elytranthe pseudoperfoliata* (Zoll.) Engl., Nat. Pflanzenfam., Nachtr. 1 (1897) 126. — Type: *Zollinger 2505*, Java, 'Goeboegklakah'.

Glabrous. Stem internodes distinctly two-edged when young. *Leaves* opposite; lamina narrowly ovate to ovate, 4–9 by 1–4 cm, usually cordate at the base and sessile, sometimes shortly cuneate at the base to a petiole up to 4 mm long, acuminate and acute at the apex, slightly lustrous above, dull below; venation pinnate with the midrib distinct and the main laterals visible on both sides. *Inflorescences* at the nodes, a sometimes subumbellate raceme of 1–4 opposite pairs of flowers; axis 5–20 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 6-merous, 35–45 mm long, slightly widened upwards, winged above the middle, angular, clavate and acute at the apex, red, sometimes with a dark band at the neck; tube in the open flower 24–30 mm long with the lobes reflexed 4–7 mm higher. *Anther* 2.5–3.5 mm long, acute, about half as long as the free part of the filament. — Fig. 38c.

Distribution — *Malesia*: Java.

Habitat & Ecology — 700–2260 m altitude; no hosts recorded.

19. *Macrosolen pusillus* Danser

Macrosolen pusillus Danser, Rec. Trav. Bot. Néerl. 31 (1934) 238. — Type: Richards 1993, Sarawak, Dulit Ridge.

Glabrous. *Leaves* opposite; lamina ovate, 4–5.5 by c. 2 cm, almost truncate at the base to a petiole 1–2 mm long, acuminate and acute at the apex, glossy above, dull below; venation pinnate with the midrib distinct above and raised below and the main laterals distinct above and obscure below. *Inflorescences* at the nodes, a raceme of 3 or 4 well-spaced opposite pairs of flowers; axis 10–15 mm long; pedicels 1–2.5 mm long. *Corolla* in mature bud 6-merous, c. 7 mm long, widened upwards, 6-winged, pink; tube in the open flower c. 2.5 mm long with the lobes reflexed c. 2.5 mm higher. *Anther* c. 1 mm long, obtuse, slightly shorter than the free part of the filament.

Distribution — *Malesia*: Borneo (Sarawak). Known from type collection only.

Habitat & Ecology — Open moss forest, 1300 m altitude; no host recorded.

20. *Macrosolen retusus* (Jack) Miq.

Macrosolen retusus (Jack) Miq., Fl. Ind. Bat. 1, 1 (1856) 828. — *Loranthus retusus* Jack in Roxb., Fl. Ind., ed. 1, 2 (1824) 212. — Type: Jack, Singapore (not located).

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 296].

Glabrous. *Leaves* opposite; lamina narrowly ovate to elliptic or often obovate, 5–10 by 2–7 cm, cuneate at the base to a winged petiole 3–5 mm long, rounded or rarely obtuse at the apex, slightly lustrous above or dull on both sides; venation pinnate with the midrib and the main laterals distinct above and only the midrib dark-coloured and prominent below. *Inflorescences* at the nodes, a raceme of 2–5 opposite pairs of flowers; axis 5–20 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 6-merous, 18–35 mm long, slender and hardly inflated in the lower part, winged at or above the middle, weakly clavate

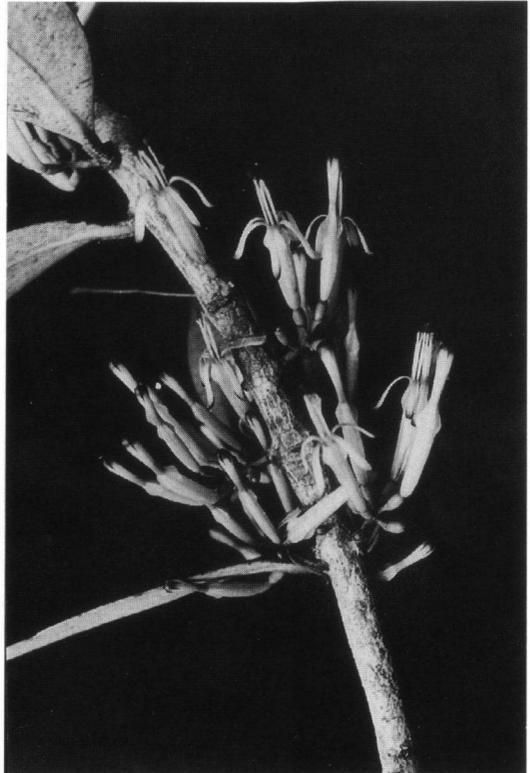


Fig. 39. *Macrosolen retusus* (Jack) Miq. Borneo, NW Kalimantan, Pasir Pandjang (Elsener H 91). Photo A. Elsener, 1965.

and broadly acute at the apex, mostly pink or violet below, green or rarely dark-coloured at the neck and pink to purple above; tube in the open flower 12–24 mm long with the lobes reflexed 2–3 mm higher. *Anther* 1.5–2 mm long, about half as long as the free part of the filament. — **Fig. 39.**

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

Habitat & Ecology — Mostly lowlands, 0–250 m altitude, rarely to 1500 m; recorded hosts include *Calophyllum*, *Eugenia*, and *Podocarpus*.

Note — Closely related to *Macrosolen melintangensis*, differing in the duller leaves, mostly rounded at the apex and attenuate into the petiole, and the slightly more robust inflorescence.

21. *Macrosolen robinsonii* (Gamble) Danser

Macrosolen robinsonii (Gamble) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — *Elytranthe robinsonii* Gamble, Kew Bull. 1913 (1913) 45. — Type: *Wray & Robinson 5404*, Malaya, Mt Tahan.

Glabrous. *Leaves* opposite; lamina narrowly ovate to ovate, 5–8(–12) by (1–)2–3.5 (–5) cm, cuneate at the base to a petiole 1–5(–10) mm long, acuminate and acute at the apex, glossy and sometimes red above, dull below; venation pinnate with the midrib and the main laterals distinct above and the midrib prominent and the main laterals visible below. *Inflorescences* at the nodes, an umbellate raceme of 1 or 2 opposite pairs of flowers; axis 1–5 mm long, usually subtended at the base by a few very small acute bracts; pedicels 1–2.5 mm long, bracts c. 1 mm long, the lateral ones partly connate. *Corolla* in mature bud 6-merous, 15–25(–30) mm long, somewhat inflated at the base, cylindrical and weakly angular below a distinct neck, clavate and obtuse at the apex, pink or red; tube in the open flower 10–16 mm long with the lobes reflexed or twisted slightly higher. *Anther* 1.5–2 mm long, bluntly acute, about two fifths as long as the free part of the filament.

Distribution — Vietnam; *Malesia*: Peninsular Malaysia.

Habitat & Ecology — 500–1500 m altitude; no hosts recorded.

Note — Similar to *Macrosolen melintangensis*, especially to its Peninsular Malaysian form formerly placed in *M. lowii*, differing in the shorter more subumbellate inflorescence and the inflated corolla tube.

22. *Macrosolen surigaoensis* (Elmer) Danser

Macrosolen surigaoensis (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 345. — *Loranthus surigaoensis* Elmer, Leaflet. Philipp. Bot. 6 (1913) 1966. — Type: *Elmer 14098* (not located), Mindanao, Mt Urdaneta.

Glabrous. *Leaves* opposite; lamina narrowly ovate, c. 4 cm long, c. 1.25 cm wide, shortly cuneate at the base to a petiole 3–5 mm long, acuminate and acute at the apex, dull on both sides; venation pinnate with the midrib raised and dark coloured below and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, an umbel of 1 pair of flowers; axis c. 10 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 6-merous, c. 12.5 mm long, slightly inflated and weakly 6-ribbed.

Distribution — *Malesia*: Philippines: Mindanao.

Habitat & Ecology — 1875 m altitude; no host recorded.

Note — A doubtful species, known only from the type collection, which is apparently not extant; similar to *Macrosolen cochinchinensis*, apparently differing in smaller leaves and 2-flowered inflorescence.

23. *Macrosolen tetragonus* (Blume) Miq.

Macrosolen tetragonus (Blume) Miq., Fl. Ind. Bat. 1, 1 (1856) 829; Backer & Bakh. f., Fl. Java 2 (1965)

70. — *Loranthus tetragonus* Blume, Bijdr. (1826) 663. — Type: *Blume s.n.*, Java, 'Tjiradjas'.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 300].

Glabrous. Stem internodes quadrangular when young, soon becoming terete. *Leaves* opposite; lamina mostly oblong to suborbicular, mostly 8–12 cm long, mostly 3–6 cm wide, thick, cuneate to truncate at the base and sessile or subsessile or with a petiole to 5 mm long, rounded or rarely attenuate and acute or obtuse at the apex, slightly lustrous above, dull below; venation pinnate with the midrib visible above and prominent below and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of (3–) 5–9 opposite pairs of flowers; axis 20–42 mm long; pedicels 1–3 mm long. *Corolla* in mature bud 6-merous, 13–18(–23) mm long, slightly inflated in the lower part, weakly winged near the middle, angular, clavate and obtuse at the apex, yellow or green or becoming red below, green at the neck and green or yellow above; tube in the open flower 6–9(–11) mm long with the lobes reflexed 2–4 mm higher. *Anther* 1.5–2.5 mm long, obtuse, about half as long as the free part of the filament. — Fig. 38d.

Distribution — *Malesia*: Sumatra, Java.

Habitat & Ecology — 0–1600 m altitude; no hosts recorded.

Note — Similar to *Macrosolen cochinchinensis*, differing in the angular young stems, thicker leaves and more robust inflorescences.

24. *Macrosolen x tubiflorus* (Ridl.) Danser

Macrosolen x tubiflorus (Ridl.) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 303. — *Elytranthe tubiflora* Ridl., J. Roy. As. Soc., Str. Br. 86 (1922) 306 ('*tubaeflora*'). — Type: *Yapp 501*, Perak, Mt Inas.

Macrosolen splendidus Danser, Rec. Trav. Bot. Néerl. 31 (1934) 234. — Type: *Clemens 28530*, Sabah, Mt Kinabalu.

Glabrous. *Leaves* opposite; lamina ovate, 10–20 by 4–8 cm, cuneate to truncate at the base to a petiole 4–10 mm long, mostly acuminate and acute at the apex, lustrous or glossy above, dull below; venation pinnate with the midrib distinct and the main laterals visible on both sides. *Inflorescences* at the nodes, a raceme of 2–7 opposite pairs of flowers; axis 10–20 mm long, subtended at the base by an involucre of short broadly triangular bracts; pedicels appressed to the axis, 1–4 mm long, bracts keeled, acute, 2–3 mm long. *Corolla* in mature bud 6-merous, 70–90 mm long, gradually widened upwards to a neck, weakly clavate and angular above, broadly acute at the apex, mostly

red below and usually longitudinally striped paler and darker above; tube in the open flower 50–65 mm long with the lobes reflexed 8–12 mm higher. *Anther* 5–6 mm long, slightly sagittate at the base, acute, about half as long as the free part of the filament. — **Fig. 37a, b.**

Distribution — *Malesia*: Peninsular Malaysia, Borneo.

Habitat & Ecology — Mostly in highlands from 1000 to 2100 m altitude but occasionally down to 180 m; the only recorded host is *Eugenia*.

Note — The species shows features of both *Macrosolen acunae* (especially in the inflorescence and flowers) and *M. formosus* (especially in the leaves); it is possibly of hybrid origin, although now perhaps persisting as a stable recognizable form, and has been designated accordingly. The species can be distinguished from *M. formosus* by its shorter inflorescence with more flowers on crowded and more appressed pedicels, and its narrower more acute corolla with weaker wings and ridges.

PAPUANTHES

Papuanthes Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 360. — Type species: *Papuanthes albertisii* (Tiegh.) Danser.

[For synonymy see Barlow, Austral. J. Bot. 22 (1974) 598].

Aerial stem-parasitic shrubs, robust, with epicortical runners bearing secondary haustoria. *Leaves* opposite. *Inflorescence* capitate, consisting of several flowers in two rows at the apex of a common peduncle, enclosed by two foliaceous bracts which are connate at the margins over them during development; flowers each on an articulate pedicel with a small bract at the apex of the distal segment and sometimes also at the apex of the proximal segment. *Corolla* 6-merous, gamopetalous, almost regular. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* ovoid. — **Fig. 40.**

Distribution — One species endemic to New Guinea.

Habitat & Ecology — Humid forests, from lowlands to 1550 m altitude; host specificity is probably low.

Morphology — The normally developed pairs of leaves sometimes alternate with scale leaves at intervening nodes just above the leaf-bearing nodes, so that the leaves may appear superposed (see note under *Macrosolen*).

The individual flowers, on articulate pedicels, may be homologous with the reduced inflorescences of *Sogerianthe* (see there). If so, the capitate involucrate conflorescence is a complex secondarily compound structure which probably represents a modified shoot system.

Taxonomy & Phylogeny — Like *Sogerianthe*, *Papuanthes* has $x = 9$ and relatively large chromosomes. It is probably a specialized local derivative of the Papuasian stock of which *Amyema* is the core. The most closely related genus is probably *Sogerianthe*, with which it shares gamopetalous corollas and articulate pedicels, and from which it differs in its compound capitate inflorescence.

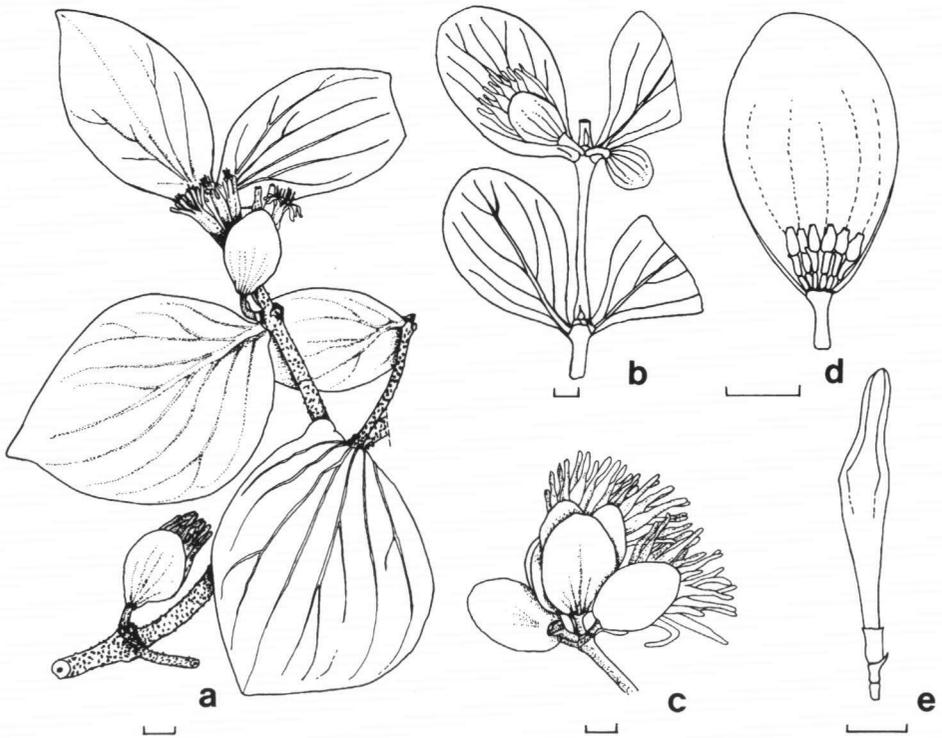


Fig. 40. *Papuanthes albertisii* (Tiegh.) Danser. a–c. Portions of stems with inflorescences; d. inflorescence with young fruits, sectional view; e. flower bud (Collections not cited). a, c Redrawn from Barlow (1981), b, d, e redrawn from Barlow (1974). Scale bars represent 1 cm.

Papuanthes albertisii (Tiegh.) Danser

Papuanthes albertisii (Tiegh.) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 360; Barlow, Austral. J. Bot. 22 (1974) 605; in Handb. Fl. Papua New Guinea 2 (1981) 249. — *Diplatia albertisii* Tiegh., Bull. Soc. Bot. France 41 (1894) 539. — Type: *d'Albertis s. n.*, Papua New Guinea, Fly River. [For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 605].

Glabrous. *Leaves* opposite, often seemingly superposed through extreme contraction of every second internode and reduction of every second pair of leaves to scales; lamina ovate, 8–20 by 5–12 cm, thick, truncate to slightly cordate at the base, sessile or with a terete petiole to 4 mm long, obtuse at the apex, dull on both sides; venation pinnate with the midrib and main laterals visible on both sides. *Inflorescences* at the nodes, a head of (8–)10–12(–15) flowers; peduncle stout, 4–12 mm long, 3–4 mm thick, flattened at the apex; involucre bracts ovate to orbicular, 25–40 by 20–25 mm, obtuse or rounded; pedicels 1.5–2 mm long, much enlarged under the fruit, articulate above the middle, with acute bracts c. 1.5 mm long. *Corolla* in mature bud 40–65 mm long, widened upwards, narrowed near the apex, rounded, pink or red; tube in the open flower 25–40

mm long with the petals reflexed 3–5 mm higher. *Anther* 3–4 mm long, about equal to the free part of the filament. — **Fig. 40.**

Distribution — *Malesia*: New Guinea.

Habitat & Ecology — Humid forests and gallery forests, from 0 to 1550 m altitude; recorded hosts include *Ficus*, *Myristica*, and *Terminalia*.

SCURRULA

Scurrula L., Sp. Pl. (1753) 110. — Type species: *Scurrula parasitica* L.

[For synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 427; Philipp. J. Sc. 58 (1935) 116].

Aerial stem-parasitic shrubs, more or less clothed in a tomentum of stellate and dendritic hairs, slender to moderately robust, with epicortical runners bearing secondary haustoria. *Leaves* opposite, different above and below (especially with respect to indumentum). *Inflorescence* a simple 3- to 10-flowered raceme of decussate flowers, rarely 2-flowered and apparently umbellate; bract single under each flower, simple. *Corolla* 4-merous, gamopetalous, zygomorphic, with the tube curved prior to anthesis, deeply split on the inner side of the curve; lobes reflexed to the outer side at anthesis. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* obovoid, club-like, distinctly stipitate. — **Fig. 41.**

Distribution — About 20 species from India to Taiwan and Malesia. In *Malesia* 8 species, with a centre of richness and diversity in Java (7 species).

Habitat — Humid and open forests and disturbed sites, from lowlands to 3000 m. Some species occur predominantly or exclusively in highlands above 1000 m.

Ecology — In Malesia some species are aggressive, apparently with broad host ranges including cultivated trees. The hosts also include other *Loranthaceae*; such epiparasitism is also common in other genera such as *Amyema* and *Lysiana* (*Loranthaceae*) and *Viscum* and *Notothixos* (*Viscaceae*), and probably results from a sharing of the bird dispersal agents.

Taxonomy & Phylogeny — The genus is related to *Dendrophthoe*, differing in fruit structure and the small more strongly zygomorphic 4-merous flowers. For discussion of Afro-Asian origins, see Barlow (1990).

The genus is also closely related to, and difficult to delineate from, the sympatric genus *Taxillus* (see Barlow 1990). Ban, Tap Chi Sinh HOC 16, 4 (1994) 49, 54, has without discussion apparently proposed union of *Scurrula* and *Taxillus*, but he erroneously placed *Scurrula* (1753) in synonymy under *Taxillus* (1895).

KEY TO THE SPECIES

- 1a. Corolla less than 20 mm long 2
- b. Corolla more than 20 mm long 5
- 2a. Indumentum of the corolla dense, with a layer of longer dendritic hairs above the shorter ones 3

- b. Indumentum of the corolla sparse to dense, lacking a layer of longer dendritic hairs above the shorter ones 4
- 3a. Corolla in the mature bud robust, obtuse, mostly 8–14 mm long 4. *S. ferruginea*
- b. Corolla in the mature bud slender to moderately robust, clavate, acute, mostly 12–24 mm long 6. *S. x montana*
- 4a. Indumentum generally pale-coloured, predominantly cream, less often a greyish or dark ochre; leaf lamina 5–10 cm long; corolla mostly 13–20 mm long 2. *S. atropurpurea*
- b. Indumentum very variable in colour from cream to dark reddish brown but predominantly of darker hues; leaf lamina 3–7 cm long; corolla mostly 8–16 mm long 8. *S. parasitica*
- 5a. Bract ovate or obovate, concave, longer than and enclosing the ovary 7. *S. oortiana*
- b. Bract linear to narrowly ovate or deltoid, flat or concave, mostly shorter than and not enclosing the ovary 6
- 6a. Leaf lamina less than 3 cm long; inflorescence of 2 equal-aged flowers, resembling a simple umbel 3. *S. didyma*
- b. Leaf lamina more than 3 cm long; inflorescence of 2 or more unequal-aged flowers, racemose 7
- 7a. Corolla in the mature bud robust, not or only weakly clavate towards the apex, 8–14 (–23) mm long 4. *S. ferruginea*
- b. Corolla in the mature bud slender, gradually and distinctly clavate towards the apex, 19–45 mm long 8
- 8a. Inflorescence a subumbellate raceme, with a short axis bearing 2 or 3 nearly equal-aged flowers near the apex; corolla obtuse; leaf lamina folded; indumentum creamy white 1. *S. aphodastrica*
- b. Inflorescence distinctly racemose, with an axis usually 12–20 mm long bearing more than 3 flowers developing successively; corolla acute; leaf lamina flat; indumentum ochre to reddish brown 9
- 9a. Corolla up to 24 mm long, its indumentum with a layer of longer dendritic hairs above the shorter ones 6. *S. x montana*
- b. Corolla mostly more than 24 mm long, its indumentum lacking a layer of longer dendritic hairs above the shorter ones 5. *S. lepidota*

1. *Scurrula aphodastrica* Barlow

Scurrula aphodastrica Barlow, *Blumea* 36 (1991) 68. — Type: *Schmutz* 2895, Flores.

Young parts with a dense creamy white indumentum of short stellate and dendritic hairs, becoming sparse on adult stems, leaves and corollas. *Leaves* opposite; lamina narrowly elliptic, 4–6 by 1.5–2.4 cm, attenuate at the base to an obscure winged petiole

3–4 mm long, often infolded along the midrib, obtuse or shortly rounded at the apex; venation obscure except for the midrib and a few major laterals visible on both sides. *Inflorescences* several at the nodes, arising successively from gall-like swellings, a 2- or 3-flowered subumbellate raceme; axis 1–2(–5) mm long; pedicels 2–4 mm long; bract deltoid, erect, c. 1 mm long. *Corolla* in mature bud 22–30 mm long, slender, narrowly clavate and obtuse at the apex; tube 16–24 mm long, split to the middle or lower. *Anther* 0.7–1 mm long, recurved, about half as long as the free part of the filament. *Fruit* 12–15 mm long including a stipe 6–10 mm long, truncate at the apex.

Distribution — *Malesia*: Lesser Sunda Islands (Flores).

Habitat & Ecology — 50–500 m altitude; recorded hosts include *Bridelia* and *Helicteres*.

Note — Closely related to *Scurrula atropurpurea*, differing in narrower folded leaves, subumbellate few-flowered inflorescences in dense clusters, and longer flowers.

2. *Scurrula atropurpurea* (Blume) Danser

Scurrula atropurpurea (Blume) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 349; 11 (1931) 429; Backer & Bakh. f., Fl. Java 2 (1965) 74; Barlow, Blumea 36 (1991) 70. — *Loranthus atropurpureus* Blume, Verh. Bat. Genootsch. 9 (1823) 186. — *Taxillus atropurpureus* (Blume) Ban, Tap Chi Sinh HOC 16, 4 (1994) 49. — Type: *Blume s.n.*, Java.

Loranthus philippinensis Cham. & Schltld., Linnaea 3 (1828) 204. — *Scurrula philippinensis* (Cham. & Schltld.) G. Don, Gen. Hist. 3 (1834) 422; Danser, Philipp. J. Sc. 58 (1935) 121; Backer & Bakh. f., Fl. Java 2 (1965) 74. — *Taxillus philippinensis* (Cham. & Schltld.) Ban, Tap Chi Sinh HOC 16, 4 (1994) 50. — Type: *Chamisso s.n.*, Philippines.

[For extensive additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 429; Philipp. J. Sc. 58 (1935) 121; excluding *Loranthus* (*Dendrophthoe*, *Scurrula*) *junghuhnii* = *Scurrula lepidota*; excluding *Loranthus* (*Dendrophthoe*, *Cichlanthus*) *repandus* = *Scurrula parasiitica*.]

Young parts with a dense cream or rarely greyish to dark ochre indumentum of stellate hairs, becoming sparse on adult stems, leaf upper surfaces and flowers. *Leaves* opposite; lamina elliptic to obovate, 5–10 by 2.3–5 cm, cuneate to slightly cordate at the base to a petiole 6–12 mm long, usually rounded at the apex; venation obscure except for the midrib and a few major laterals visible above. *Inflorescences* several at the nodes, a (2–)4–6(–8)-flowered raceme; axis 5–12 mm long; pedicels 2–3 mm long; bract deltoid, erect, c. 1.5 mm long. *Corolla* in mature bud (11–)13–20(–24) mm long, slender, narrowly clavate and acute at the apex; tube 7–15 mm long, deeply split. *Anther* c. 1 mm long, about half as long as the free part of the filament. *Fruit* 8–9 mm long including a thick stipe 2–3 mm long, contracted at the apex. — **Fig. 41.**

Distribution — Thailand to Vietnam; *Malesia*: Java, Philippines, Lesser Sunda Islands (Bali, Sumbawa), Moluccas.

Habitat & Ecology — Mostly 0–600 m altitude, less frequently to 2300 m; recorded hosts include *Acacia*, *Averrhoa*, *Grewia*, *Myristica*, and *Terminalia*.

Note — Conspecific with *Scurrula philippensis*; for discussion of species circumscription see Barlow, Blumea 36 (1991) 71.

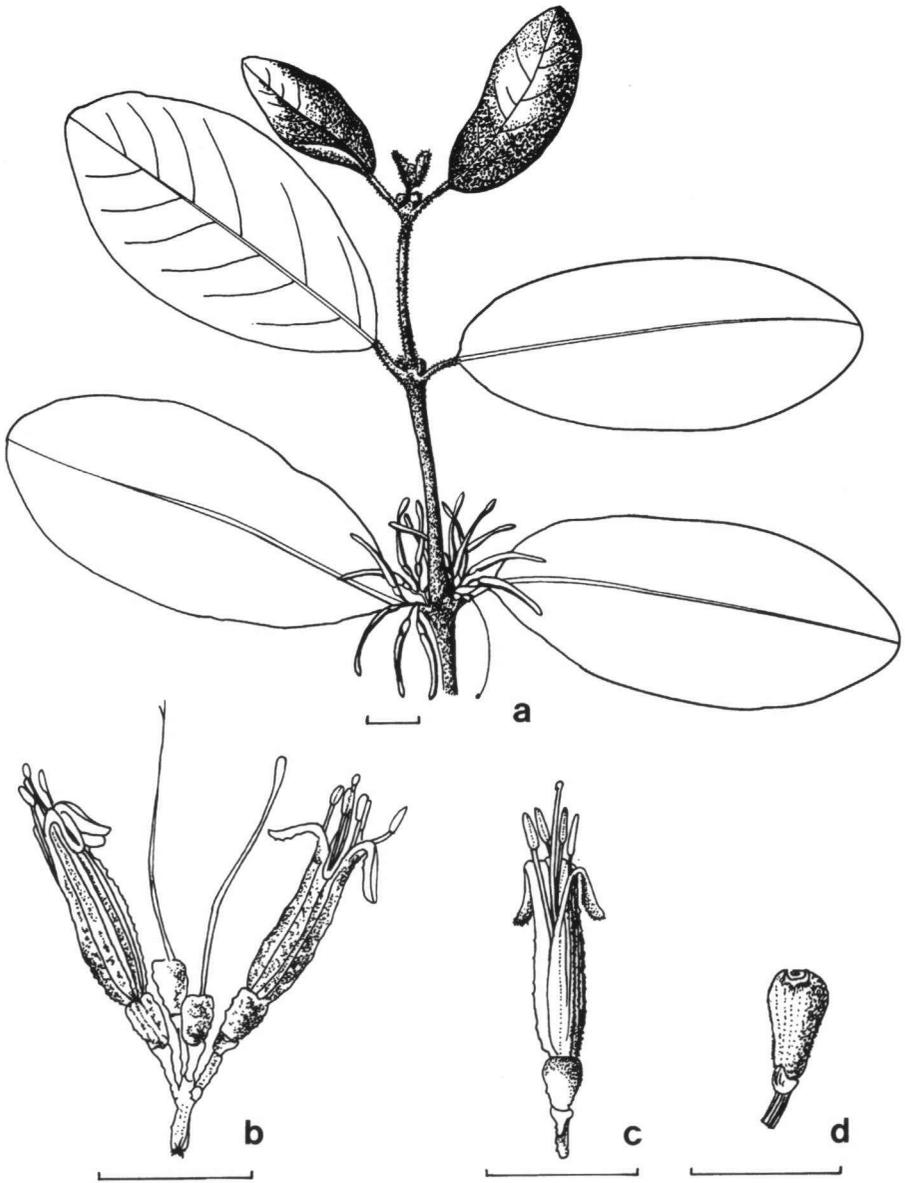


Fig. 41. *Scurrula atropurpurea* (Blume) Danser. a. Flower-bearing twig; b. inflorescence; c. flower; d. fruit (Collections not cited). a Redrawn from Blume (1830), b–d redrawn from Danser (1931). Scale bars represent 1 cm.

3. *Scurrula didyma* Barlow

Scurrula didyma Barlow, Blumea 36 (1991) 72. — Type: *ten Houten & Coert 40.28 (Herb. Coert 1570)*, Java, 'Batjangvlakte'.

Young parts with a short dense dark red-brown indumentum of stellate hairs, soon glabrescent on adult stems and leaf upper surfaces. *Leaves* opposite; lamina elliptic to ovate, 2–2.5 by 1–1.5 cm, cuneate at the base to a petiole c. 5 mm long, rounded at the apex; venation obscure except for the midrib raised in the lower part on the underside. *Inflorescences* produced successively at the nodes, a 2-flowered umbel; axis 1–3 mm long; pedicels 4–7 mm long; bract narrow, concave, erect, rounded, c. 1.5 mm long. *Corolla* in mature bud c. 25 mm long, robust, slightly inflated above the base, obtuse at the apex; open flower not seen. *Fruit* c. 10 mm long including a stipe c. 5 mm long, contracted at the apex.

Distribution — *Malesia*: Java.

Habitat & Ecology — Highlands from 2500 to 2950 m altitude; the only recorded host is *Vaccinium*.

Note — Possibly related to *Scurrula ferruginea*, but very distinct in its 2-flowered inflorescence with equal-aged flowers.

4. *Scurrula ferruginea* (Jack) Danser

Scurrula ferruginea (Roxb. ex Jack) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 350; 11 (1931) 432; Backer & Bakh. f., Fl. Java 2 (1965) 74; Barlow, Blumea 36 (1991) 73. — *Loranthus ferrugineus* Roxb. ex Jack, Mal. Misc. 1 (1820) 279. — *Taxillus ferrugineus* (Jack) Ban, Tap Chi Sinh HOC 16, 4 (1994) 49. — Type: *Jack*, Sumatra (probably not extant).

[For further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 432; Philipp. J. Sc. 58 (1935) 123].

Young parts with a dense ochre to reddish brown indumentum of short stellate and longer dendritic hairs, becoming sparse on adult stems and leaf upper surfaces. *Leaves* opposite; lamina elliptic to ovate or slightly obovate, (3–)5–10 by (1.5–)2–5.5 cm, cuneate to weakly cordate at the base to a petiole 2–6(–10) mm long, obtuse or rounded at the apex; venation obscure except for the midrib and a few major laterals visible above. *Inflorescences* several at the nodes, a 2- to 5-flowered raceme; axis 2–10(–15) mm long; pedicels 0.5–2.5(–4) mm long; bract narrow, erect, 1–2(–3) mm long. *Corolla* in mature bud (6–)8–14(–23) mm long, straight or slightly curved, usually robust, rarely relatively slender and weakly clavate, obtuse to truncate at the apex; tube 5–15 mm long, split to the middle or lower. *Anther* 0.5–1 mm long, about half as long as the free part of the filament. *Fruit* 8–10 mm long including a stipe 4–6 mm long, rounded at the apex.

Distribution — India to southern China and Vietnam; *Malesia*: Western parts, extending eastwards as far as Palawan, Celebes and Flores.

Habitat & Ecology — Primary forests and disturbed sites, mostly 0–1000 m altitude, less frequently to 1850 m; recorded hosts include *Coffea*, *Melastoma*, *Pithecellobium*, and *Saurauia*.

Note — Probably hybridizes with other *Scurrula* species; for discussion see Barlow, Blumea 36 (1991) 73.

5. *Scurrula lepidota* (Blume) G. Don

Scurrula lepidota (Blume) G. Don, Gen. Hist. 3 (1834) 422; Backer & Bakh. f., Fl. Java 2 (1965) 73. — *Loranthus lepidotus* Blume, Verh. Bat. Genootsch. 9 (1823) 191. — Type: *Blume s.n.*, Java.

Loranthus obovatus Blume, Bijdr. (1826) 663. — *Scurrula obovata* (Blume) G. Don, Gen. Hist. 3 (1834) 422; Backer & Bakh. f., Fl. Java 2 (1965) 74. — Type: *Reinwardt 1308*, Timor.

Loranthus kalahiensis Korth., Verh. Bat. Genootsch. 17 (1839) 271. — *Scurrula kalahiensis* (Korth.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 351. — Type: *Korthals s.n.*, Borneo, Mt Kalahien. *Loranthus ellipticus* Korth., Verh. Bat. Genootsch. 17 (1839) 272. — Type: *Korthals s.n.*, Borneo, Mt Kramat.

Loranthus medinensis Molck. in Miq., Pl. Jungh. (1852) 112. — *Scurrula medinensis* (Molck.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 352. — Type: *Junghuhn s.n.*, Java, Mt Ungarang.

Loranthus junghuhnii Molck. in Miq., Pl. Jungh. (1852) 113. — *Dendrophthoe junghuhnii* (Molck.) Miq., Fl. Ind. Bat. 1, 1 (1856) 817. — *Scurrula junghuhnii* (Molck.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 351. — Type: *Junghuhn s.n.*, Java, Mt Ungarang.

[For further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 437, 439–442; Barlow, Blumea 36 (1991) 75].

Young parts with a dense ochre to reddish brown indumentum of short stellate hairs, rarely with some longer dendritic ones soon disappearing, becoming sparse on adult stems, leaves and corollas. *Leaves* opposite; lamina narrowly elliptic to ovate or obovate, (3.5–)6–12 by (1.8–)3–5.5 cm, shortly cuneate to weakly cordate at the base to a petiole (3–)6–10(–15) mm long, obtuse or rounded at the apex; venation obscure except for the midrib and a few major laterals visible on both sides. *Inflorescences* several at the nodes, a (2–)4–8-flowered raceme; axis (2–)12–20(–25) mm long; pedicels (1–)4–7 mm long; bract elliptic, erect, variable, (0.5–)1–1.5(–3) mm long. *Corolla* in mature bud 19–45 mm long, usually slender, clavate, angular and acute at the apex; tube 13–30 mm long, sometimes slightly inflated, split to the middle or lower. *Anther* 1–2(–4) mm long, usually about two thirds as long as the free part of the filament. *Fruit* 8–12 mm long including a stipe 5–7 mm long, rounded at the apex.

Distribution — *Malesia*: Sumatra, Borneo, Java, Lesser Sunda Islands eastwards to Timor.

Habitat & Ecology — Mostly in highlands 1000–2400 m altitude, less frequently down to sea level, especially in Borneo; recorded hosts include *Ficus*, *Photinia*, and *Viburnum*.

Note — For discussion on species circumscription and conspecificity with *Scurrula junghuhnii*, *S. kalahiensis*, *S. medinensis* and *S. obovata* see Barlow, Blumea 36 (1991) 75.

6. *Scurrula x montana* Danser

Scurrula x montana Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 441; Backer & Bakh. f., Fl. Java 2 (1965) 74; Barlow, Blumea 36 (1991) 77. — Type: *Koorders 43003b*, lecto, Java, Gendingwaloh.

Young parts with a dense reddish brown indumentum of short stellate and dendritic hairs, becoming sparse on adult stems and leaf upper surfaces. *Leaves* opposite; lamina variable, mostly elliptic to ovate, 2.5–12 by 1.5–7 cm, truncate to weakly cordate at the base, sessile or with a petiole to 15 mm long, often undulate at the margin, rounded at

the apex; venation obscure except for the midrib and a few major laterals visible above. *Inflorescences* few at the nodes, a 2- to 12-flowered raceme; axis variable, 3–22 mm long, usually robust; pedicels 2–3 mm long; bracts very variable, usually narrowly deltoid or ovate, sometimes foliaceous, flat or concave, acute to rounded, shorter or longer than the ovary. *Corolla* in mature bud 12–24 mm long, relatively slender, clavate and acute or obtuse at the apex; tube 7–16 mm long, split to the middle or lower. *Anther* 1–2 mm long, about equal to the free part of the filament. *Fruit* 9–10 mm long including a stipe 5–6 mm long, contracted at the apex.

Distribution — *Malesia*: Sumatra, Java.

Habitat & Ecology — Highlands from 1275 to 2500 m altitude; probably commonly parasitic on *Casuarina*.

Note — Closely related to *Scurrula lepidota* and *S. oortiana*, and probably of hybrid origin; for discussion see Barlow, *Blumea* 36 (1991) 78.

7. *Scurrula oortiana* (Korth.) Danser

Scurrula oortiana (Korth.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 352; 11 (1931) 443; Backer & Bakh.f., Fl. Java 2 (1965) 73; Barlow, *Blumea* 36 (1991) 79. — *Loranthus oortianus* Korth., Verh. Bat. Genootsch. 17 (1839) 269. — *Dendrophthoe oortiana* (Korth.) Miq., Fl. Ind. Bat. 1, 1 (1856) 813. — Type: *Korthals s.n.*, lecto, Sumatra, Mt Singgalang.

Loranthus korthalsii Molck. in Miq., Pl. Jungh. (1852) 110. — *Dendrophthoe korthalsii* (Molck.) Miq., Fl. Ind. Bat. 1, 1 (1856) 814. — *Scurrula korthalsii* (Molck.) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 351; 11 (1931) 439; Backer & Bakh.f., Fl. Java 2 (1965) 73. — Type: *Junghuhn s.n.*, Java.

Young parts with a dense golden or red-brown indumentum of short stellate and dendritic hairs, becoming sparse on adult stems and leaves. *Leaves* opposite; lamina oblong to ovate or rarely obovate, mostly 9–14 cm long, 4.5–6 cm wide, truncate or weakly cordate at the base to a petiole 3–8 mm long, often undulate at the margin, obtuse or rounded at the apex; venation obscure except for the midrib and a few major laterals visible on both sides. *Inflorescences* few at the nodes, a 4- to 12-flowered raceme; axis 8–30(–40) mm long; pedicels 3–9 mm long; bract elliptic to nearly orbicular, concave, rounded, 5–7 mm long, enclosing the ovary. *Corolla* in mature bud 15–35(–43) mm long, slender, clavate and acute or obtuse at the apex; tube 10–25(–29) mm long, split to the middle or lower. *Anther* 2–3 mm long, about equal to the free part of the filament. *Fruit* 11–14 mm long including a stipe 7–10 mm long, truncate at the apex.

Distribution — *Malesia*: Sumatra, Java.

Habitat & Ecology — Highlands from 1000 to 2050 m altitude; recorded hosts include *Citrus*, *Eugenia*, *Ficus*, and *Saurauia*.

Note — For discussion on species circumscription and conspecificity of *Scurrula korthalsii*, see Barlow, *Blumea* 36 (1991) 80.

8. *Scurrula parasitica* L.

Scurrula parasitica L., Sp. Pl. (1753) 110; Danser, Philipp. J. Sc. 58 (1935) 118; Backer & Bakh.f., Fl. Java 2 (1965) 74; Barlow, *Blumea* 36 (1991) 80. — *Taxillus parasiticus* (L.) Ban, Tap Chi Sinh HOC 16,4 (1994) 50. — Type: in LINN.

Loranthus fuscus Blume, Verh. Bat. Genootsch. 9 (1823) 192. — *Scurrula fusca* (Blume) G. Don, Gen. Hist. 3 (1834) 420; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 434. — Type: *Blume s.n.*, Java.

Loranthus repandus DC., Prodr. 4 (1830) 300. — *Dendrophthoe repanda* (DC.) G. Don, Gen. Hist. 3 (1834) 420. — *Cichlanthus repandus* (DC.) Tiegh., Bull. Soc. Bot. France 42 (1895) 253. — Type: *Blume s.n.*, Java.

[For extensive further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 434; 16 (1938) 34; Philipp. J. Sc. 58 (1935) 118].

Young parts with a sparse to dense grey to dark brown or rarely paler indumentum of short stellate hairs, soon becoming sparse on adult stems and leaves. *Leaves* opposite; lamina narrowly ovate to obovate, 3–7(–9) by 1.5–3.5(–4.5) cm, thin, cuneate to truncate at the base to a petiole 3–10 mm long, acute, obtuse or rounded at the apex; venation obscure except for the midrib and a few major laterals visible on both sides. *Inflorescences* several at the nodes, a 2- to 6-flowered raceme; axis 1–6 mm long; pedicels 1–5 mm long; bract narrow, erect, 1–3 mm long. *Corolla* in mature bud 8–16 mm long, slender, weakly clavate and acute at the apex; tube 6–12 mm long, split to the middle or lower. *Anther* 0.7–1.5 mm long, about two thirds as long as the free part of the filament. *Fruit* 8–10 mm long including a stipe 4–8 mm long, rounded at the apex.

Distribution — India eastwards to China and Vietnam; *Malesia*: western parts, extending eastwards as far as the Philippines, Moluccas and Timor.

Habitat & Ecology — Common in a range of primary forests and disturbed sites, mostly from 0 to 1800 m altitude, less frequently to 2250 m; recorded hosts include *Annona*, *Dalbergia*, *Dendrophthoe*, *Glochidion*, *Manglietia*, *Melastoma*, *Moringa*, *Nerium*, *Schima*, and *Xylocarpus*.

Note — Probably hybridizes with other *Scurrula* species; for discussion see Barlow, *Blumea* 36 (1991) 81.

SOGERIANTHE

Sogerianthe Danser, Verh. Akad. Wet. Amst. Afd. Natuurk. 29 (1933) 106; Bull. Jard. Bot. Buitenzorg III, 14 (1936) 95. — Type species: *Sogerianthe sogerensis* (S. Moore) Danser.

[For synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 599].

Aerial stem-parasitic shrubs, with epicortical runners bearing secondary haustoria. *Leaves* opposite; venation pinnate but somewhat curvined. *Inflorescence* a solitary flower on an articulate pedicel (sometimes apparently not articulate owing to reduction of the peduncular segment); bracts 2 or 3 under the flower, free or connate. *Corolla* 6-merous, gamopetalous, regular. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* ovoid. — Fig. 42.

Distribution — Five species in New Guinea and Solomon Islands. In *Malesia* 4 species, all occurring in eastern mainland New Guinea, some extending to the Bismarck Archipelago.

Habitat & Ecology — Mostly in humid forests, from 0 to 2230 m altitude but more common in lowlands.

Taxonomy & Phylogeny — *Sogerianthe* has $x = 9$ and relatively large chromosomes; it is probably a specialized local derivative of the Papuan stock of which *Amyema* is the core. It differs from *Amyema* in its strongly gamopetalous corolla. The distinctive articulate floral pedicels also occur as an extreme inflorescence reduction in *Amyema*, notably in New Guinean species such as *A. finisterrae* and *A. hastifolia*. For discussion see Barlow, Austral. J. Bot. 14 (1966) 453.

KEY TO THE SPECIES

- 1a. Bracts united into a shallow 3-lobed cup; pedicel mostly not visibly articulate **1. *S. cupuliformis***
- b. Bracts free or with two of them partly or completely fused and placed opposite to and slightly to strongly imbricate with the third; pedicel obsolete or up to 7 mm long, when visible usually articulate near or above the middle **2**
- 2a. Bracts 1–1.5 mm long, not completely enclosing the ovary; pedicel mostly 4–7 mm long, articulate above the middle, rarely obsolete **4. *S. sogerensis***
- b. Bracts 2–4 mm long, imbricate, enclosing the ovary; pedicel 0.5–2 mm long, articulate near the middle or with the lower segment obsolete and thus apparently not articulate **3**
- 3a. Leaves long acuminate, brown tomentose below; corolla in bud ferruginous, finely acute **2. *S. ferruginea***
- b. Leaves obtuse to acute and shortly acuminate, more or less glabrous below; corolla in bud glabrous, rounded, clavate **3. *S. sessiliflora***

1. *Sogerianthe cupuliformis* Barlow

Sogerianthe cupuliformis Barlow, Austral. J. Bot. 22 (1974) 601; in Handb. Fl. Papua New Guinea 2 (1981) 251. — Type: *Brass* 25487, Normanby I.

Glabrous except for the inflorescence and ovary shortly brown tomentose. *Leaves* opposite; lamina ovate, 6–15 by (2–)4–7 cm, cuneate at the base, sessile or with a short obscure petiole, acuminate and acute at the apex, dull on both sides; venation distinct on both sides. *Inflorescences* several to many at the nodes; pedicel (1–)2–3(–4) mm long, not articulate; bracts 3, 1–1.5 mm long, connate at the margins to a shallow 3-lobed cup. *Corolla* in mature bud 24–32 mm long, inflated towards the middle, weakly clavate and acute at the apex, very pale yellow or green below and orange to red above; tube in the open flower 14–18 mm long with the petals reflexed 5–8 mm higher. *Anther* 2–4 mm long, shorter than or equal to the free part of the filament.

Distribution — New Britain, New Ireland, Bougainville, D'Entrecasteaux Islands, Louisiade Archipelago.

Habitat & Ecology — 0–900 m altitude; the only recorded host is *Ficus*.

Note — Closely related to *Sogerianthe sogerensis*, with which it has a geographical replacement pattern, differing in the more nearly sessile leaves, non-articulate pedicel and more regular bracteal cup.

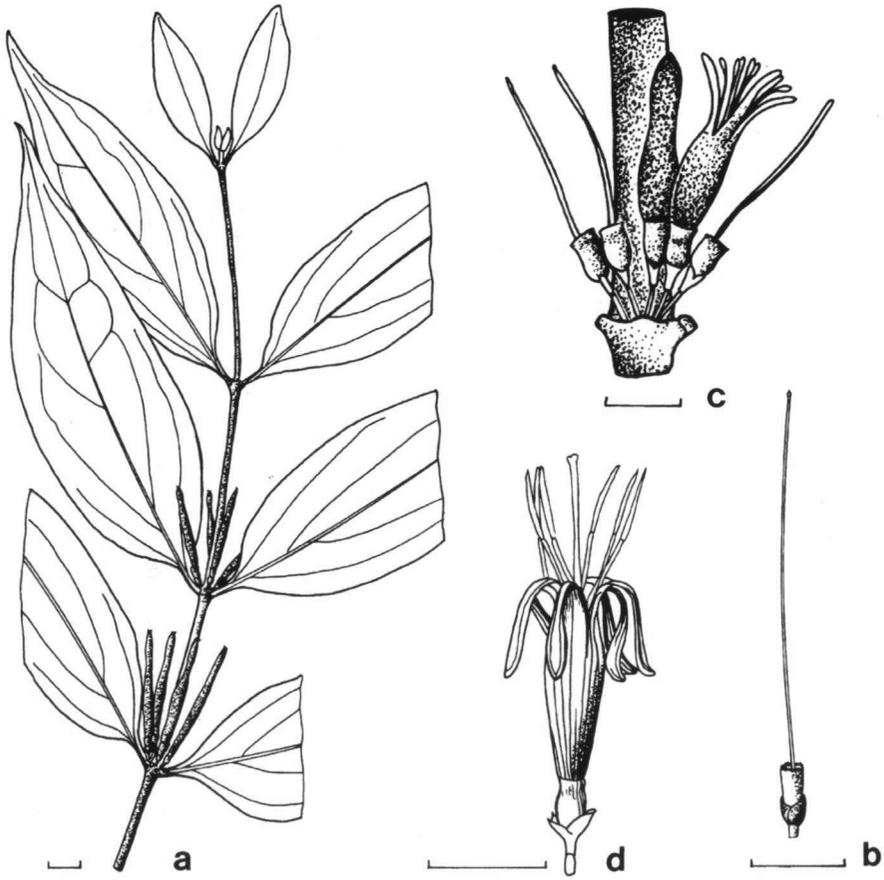


Fig. 42. *Sogierianthe ferruginea* Danser. a. Twig with inflorescences; b. inflorescence with corolla and stamens fallen. — *S. sogerensis* (S. Moore) Danser. c. Part of stem with inflorescences; d. inflorescence with open flower (a, b: Carr 13917; c: not cited, d: Forbes 715). a, b Redrawn from Danser (1938), c redrawn from Barlow (1974), d redrawn from Danser (1931). Scale bars represent 1 cm.

2. *Sogierianthe ferruginea* Danser

Sogierianthe ferruginea Danser, Blumea 3 (1938) 49. — Type: Clemens 4646, Papua New Guinea, Ogeramngang to Malang.

Young parts, inflorescences and flowers with a dense rusty tomentum, the stems and leaf upper surfaces eventually glabrescent. *Leaves* opposite; lamina ovate, 9–16 by 4–7 cm, attenuate or cuneate at the base to a petiole 4–10 mm long, acuminate and acute at the apex, dull and dark green above, paler below under the rusty indumentum; midrib and main laterals distinct above. *Inflorescences* several at the nodes; pedicel 0.5–2 mm long, articulate near the middle or with the peduncular segment obsolete and then apparently not articulate; bracts apparently 2 (owing to complete or nearly complete fusion of

two of the three bracts), 2–3 mm long, 2–4 mm wide, acute, imbricate and enveloping the ovary. *Corolla* in mature bud 28–38 mm long, slightly inflated towards the middle, weakly clavate and acute at the apex, pink or red, sometimes yellow above; tube in the open flower 16–22 mm long with the petals reflexed 5–8 mm higher. *Anther* c. 3 mm long, shorter than the free part of the filament. — **Fig. 42a, b.**

Distribution — *Malesia*: New Guinea (mainland).

Habitat & Ecology — Mesic forests from 900 to 1375 m altitude; no hosts recorded.

Notes — Treated by Barlow (1974) as conspecific with *Sogerianthe sessiliflora*, but examination of additional material of the latter confirms the differences recognized by Danser. Closely related to *S. sessiliflora*, differing in longer, acuminate leaves brown tomentose on the underside, and ferruginous corolla finely acute in bud.

3. *Sogerianthe sessiliflora* (Danser) Danser

Sogerianthe sessiliflora (Danser) Danser, Verh. Akad. Wet. Amst. Afd. Natuurk. 29 (1933) 106; Barlow, Austral. J. Bot. 22 (1974) 602; in Handb. Fl. Papua New Guinea 2 (1981) 251. — *Amyema sessiliflora* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 346. — Type: *Brass 1377*, lecto, New Guinea, Karaudi.

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 602, excluding *S. ferruginea*].

Glabrous or the flower buds rusty tomentose. *Leaves* opposite; lamina ovate, 6–14 by 3–5 cm, cuneate to truncate at the base to a petiole 3–5 mm long, shortly acuminate and acute or obtuse at the apex, dull on both sides; venation distinct, slightly more prominent below. *Inflorescences* many at the nodes; pedicel 0.5–2 mm long, articulate near the middle or with the peduncular segment obsolete and then apparently not articulate; bracts apparently 2 (owing to complete or nearly complete fusion of two of the three bracts), 2–3 mm long, 2–4 mm wide, acute, imbricate and enveloping the ovary. *Corolla* in mature bud 25–35 mm long, inflated below the middle, narrowed to a neck, weakly clavate and rounded at the apex, cream or very pale pink below and orange or red above; tube in the open flower 11–15 mm long with the lobes reflexed 5–8 mm higher. *Anther* 3–4 mm long, slightly longer than the free part of the filament.

Distribution — Solomon Islands; *Malesia*: eastern mainland New Guinea, Manus I., New Britain, New Ireland.

Habitat & Ecology — Mesic forests from 0 to 2230 m altitude; recorded hosts include *Calophyllum* and *Endiandra*.

4. *Sogerianthe sogerensis* (S. Moore) Danser

Sogerianthe sogerensis (S. Moore) Danser, Verh. Akad. Wet. Amst. Afd. Natuurk. 29 (1933) 106; Barlow, Austral. J. Bot. 22 (1974) 603; in Handb. Fl. Papua New Guinea 2 (1981) 252. — *Elytranthe sogerensis* S. Moore, J. Bot. 61, Suppl. (1923) 44. — Type: *Forbes 715*, New Guinea, Mt Woriwori.

[For additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 603].

Glabrous or the inflorescence and flower shortly and sparsely tomentose. *Leaves* opposite; lamina elliptic to ovate, 5–12 by 3–7 cm, cuneate at the base to a petiole 5–10 mm long, usually somewhat acuminate and acute to shortly rounded at the apex, dull on

both sides; venation distinct. *Inflorescences* several to many at the nodes; pedicel mostly 4–7 mm long and articulate above the middle, rarely obsolete; bracts 3, usually with two of these partly or completely fused and slightly imbricate with the third, 1–1.5 mm long, acute. *Corolla* in mature bud 25–35(–45) mm long, inflated below the middle, narrowed to a neck, weakly clavate and rounded or truncate at the apex, cream to red, sometimes darker above; tube in the open flower 12–18(–22) mm long with the lobes reflexed 4–6 mm higher. *Anther* 3–4 mm long, about equal to the free part of the filament. — **Fig. 42 c, d.**

Distribution — *Malesia*: New Guinea (mainland, eastern part), New Ireland.

Habitat & Ecology — Mesic forests from 0 to 1900 m altitude; recorded hosts include *Ficus*, *Kibara*, and *Mallotus*.

Note — On the New Guinean mainland the species is distinctive in the genus in its combination of long, articulate pedicel and small bracts. The specimens from New Ireland have a very short or obsolete pedicel, but otherwise agree with *Sogerianthe sogerensis*.

TAXILLUS

Taxillus Tiegh., Bull. Soc. Bot. France 42 (1895) 243. — Type species: *Taxillus tomentosus* (Roth) Tiegh., *T. ecurvus* (DC.) Tiegh., *T. bracteatus* (Wallich 1824, non Rich. 1792) Tiegh., syntypes.

Aerial stem-parasitic shrubs, more or less clothed in a tomentum of stellate hairs, slender to moderately robust, with epicortical runners bearing secondary haustoria. *Leaves* opposite. *Inflorescence* a simple few-flowered umbel; bract single under each flower, simple. *Corolla* 4- or 5-merous, gamopetalous, zygomorphic, with the tube curved prior to anthesis, deeply split on the inner side of the curve; lobes reflexed to the outer side at anthesis. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* ellipsoid. — **Fig. 43.**

Distribution — About 30 species in Africa, southern Asia from Pakistan to China, and southwards to Borneo. In *Malesia* 1 species.

Habitat & Ecology — Humid and open forests, from sea level to 3000 m; the species generally have broad host ranges.

Taxonomy & Phylogeny — The genus is related to *Dendrophthoe*, differing primarily in its umbellate inflorescence and the small more strongly zygomorphic flowers. For discussion of Afro-Asian origins, see Barlow (1990).

The genus is also closely related to, and difficult to delineate from the sympatric genus *Scurrula* (see note there).

Taxillus chinensis (DC.) Danser

Taxillus chinensis (DC.) Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 40. — *Loranthus chinensis* DC., Mém. Loranth. (1830) 28. — Type: *Staunton*, China.

Loranthus sakoembangensis Korth., Verh. Bat. Genootsch. 17 (1839) 285. — Type: *Korthals s.n.*, Borneo, Mt Sakoembang.

Loranthus estipitatus Stapf, Trans. Linn. Soc., Bot. 4 (1894) 221. — *Taxillus estipitatus* (Stapf) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 355. — Type: *Haviland 1351*, Borneo, Mt Kinabalu [For further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 40].

Young parts with a dense grey to dark brown or rarely paler indumentum of short stellate hairs, soon becoming sparse on adult stems and leaves and eventually on inflorescences and flowers. *Leaves* opposite; lamina elliptic to ovate, 2–4.5 by 1.5–3 cm, thin, cuneate at the base to a petiole 4–7 mm long, obtuse or rounded at the apex, dull on both sides or glossy above; venation pinnate with the midrib and major laterals visible above and prominent below. *Inflorescences* at the nodes, a 2-flowered umbel; peduncle (0.5–)1–6 mm long; pedicels 4–7 mm long; bract ovate, acute, 0.5–1 mm long. *Corolla* in mature bud 4-merous, (14–)22–32 mm long, slightly inflated at the base, slender above, strongly clavate and obtuse at the apex, greenish, often tinged yellow or brown, the colour somewhat obscured by the indumentum; tube (10–)15–22 mm long, split to the middle. *Anther* 1.5–2 mm long, about twice as long as the free part of the filament. *Fruit* 6–8 mm long, narrowly ellipsoid, warty, crowned by a collar c. 1 mm long. — Fig. 43.

Distribution — Burma to China and Vietnam; *Malesia*: Peninsular Malaysia, Borneo, northern Philippines.

Habitat & Ecology — Mesic and open forests, from 0 to 2700 m altitude but mostly at 600–1650 m; recorded hosts include *Acacia*, *Casuarina*, *Ficus*, *Litsea*, *Melastoma*, and *Scleropyrum*.

Notes — For discussion of status of *Taxillus estipitatus*, see Danser, Bull. Jard. Bot. Buitenzorg III, 16 (1938) 40. For discussion of conspecificity of *Loranthus sakoembangensis*, see Barlow, Blumea 36 (1991) 83.

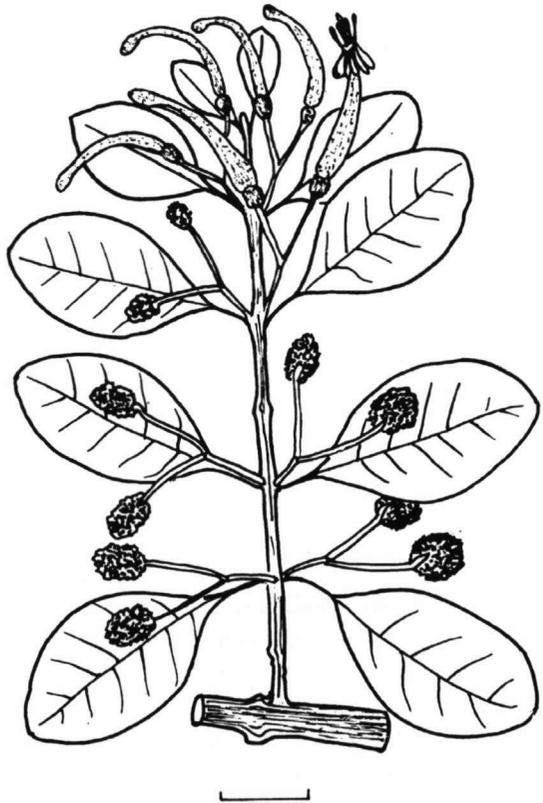


Fig. 43. *Taxillus chinensis* (DC.) Danser. Twig with flowers and fruits (*Ramos 1112*). Redrawn from Danser (1931). Scale bar represents 1 cm.

THAUMASIANTHES

Thaumasianthes Danser, Rec. Trav. Bot. Néerl. 30 (1933) 464. — Type species: *Thaumasianthes amplifolia* (Merr.) Danser.

Aerial stem-parasitic shrubs (haustorial structure unknown). *Leaves* opposite. *Inflorescences* axillary, a sessile involucrate head of 12–18 sessile flowers arranged mostly in triads on a short receptacle; involucre bracts decussate, each subtending a triad, imbricate, enclosing the developing flowers; bracts of the individual flowers usually 3, foliaceous and together enclosing the flower bud. *Corolla* 6-merous, gamopetalous, regular or nearly so. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* not known. — **Fig. 44.**

Distribution — Endemic to *Malesia*; one species known only from the Philippines.

Habitat & Ecology — Not recorded but probably confined to lowlands; ecology including host preferences unknown.

Morphology & Taxonomy — The triads of flowers in the inflorescence are apparently not the simple dichasia which occur in other genera. Each individual flower is subtended by three bracts, as in *Macrosolen*, and may therefore represent a reduced true dichasium. The whole inflorescence, with its foliaceous involucre bracts subtending the false triads, may therefore be a condensed complex branching system. Since the true units of the inflorescence are single flowers with three bracts, and not simple triads, the relationship of *Thaumasianthes* is probably with *Lepidaria* rather than with *Lepeostegeres*. However, its unique inflorescence structure confirms Danser's recognition of *Thaumasianthes* as a distinct and isolated genus.

Conservation status — The genus is known from only 4 collections in a limited area, the last made in 1923.

Thaumasianthes amplifolia (Merr.) Danser

Thaumasianthes amplifolia (Merr.) Danser, Rec. Trav. Bot. Néerl. 30 (1933) 465. — *Loranthus amplifolius* Merr., Philipp. J. Sc., Bot. 13 (1918) 277. — Type: *Ramos BS 17448*, Samar.

Loranthus ovibracteatus Merr., Philipp. J. Sc., Bot. 13 (1918) 278. — *Thaumasianthes ovibracteata* (Merr.) Danser, Rec. Trav. Bot. Néerl. 30 (1933) 466. — Type: *Ramos BS 24135*, Samar.

[For additional synonymy see Danser, Rec. Trav. Bot. Néerl. 30 (1933) 466].

Glabrous. *Leaves* opposite; lamina ovate to broadly ovate, 12–20 by 6–15 cm, cuneate to truncate at the base to a winged petiole 6–16 mm long, acute or obtuse at the apex, slightly lustrous above or dull on both sides; venation pinnate with the midrib distinct above and raised and dark coloured below and the main laterals distinct on both sides. *Inflorescences* at the nodes, a sessile involucrate capitulum of 12–18 flowers arranged in triads; involucre 15–20 mm long, comprising 4 to 5 pairs of bracts and many lateral bracts which enclose the individual flowers, the longest outer ones elliptic to broadly cuneate, truncate to acute, smooth or keeled; floral axis c. 4 mm long; lateral bracts enclosing the flowers 7–11 mm long, keeled, acute. *Corolla* in mature bud 6-me-

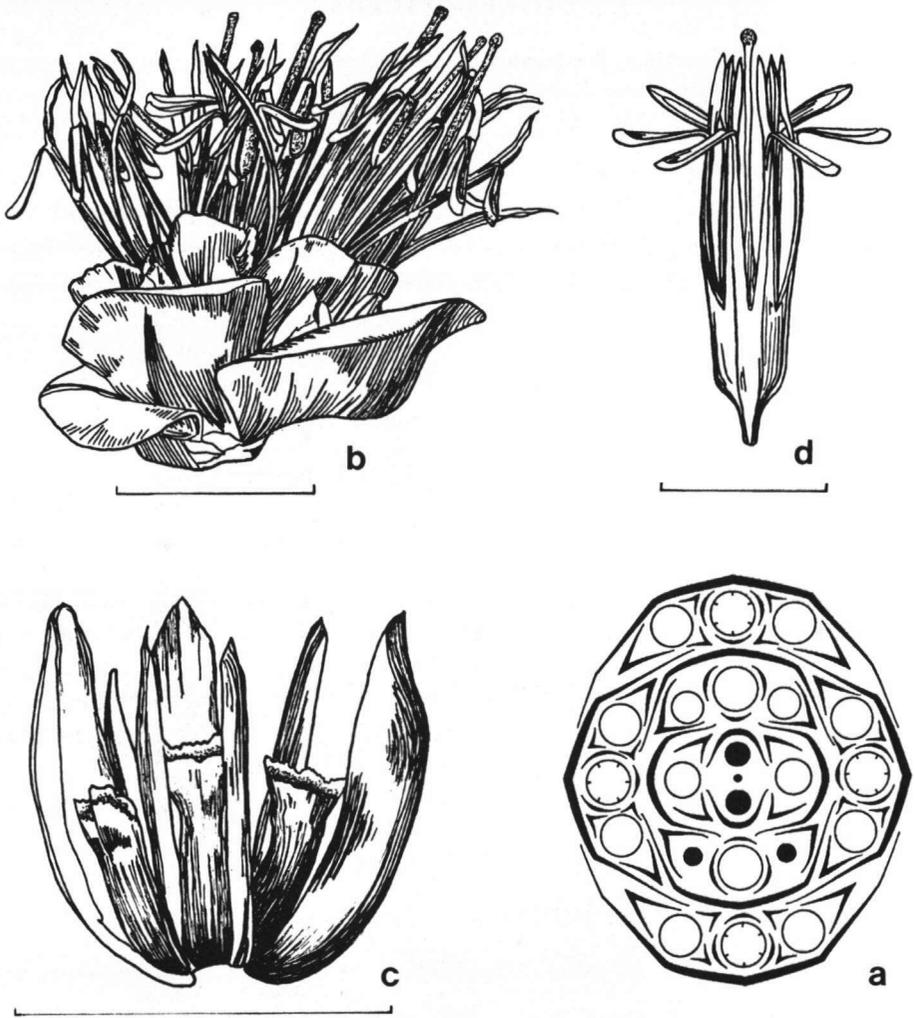


Fig. 44. *Thaumasiathanes*. a. Generalized diagram of inflorescence. — *T. amplifolia* (Merr.) Danser. b. Inflorescence; c. triad in early fruiting stage; d. corolla, style and stamens (Collection not cited). Redrawn from Danser (1933). Scale bars represent 1 cm.

rous, 18–21 mm long, inflated cylindric from just above the base, truncate at the apex, pink or red below, yellow or green above; tube in the open flower 5–6 mm long with the lobes reflexed c. 10 mm higher. *Anther* 2–2.5 mm long, acute, about 4 times as long as the free part of the filament. — **Fig. 44 b–d.**

Distribution — *Malesia*: Philippines (Samar, Leyte).

Habitat & Ecology — Lowlands, otherwise unknown.

TRITHECANTHERA

Trithecanthera Tiegh., Bull. Soc. Bot. France 41 (1894) 597. — Type species: *Trithecanthera xiphostachya* Tiegh.

Kingella Tiegh., Bull. Soc. Bot. France 42 (1895) 250. — Type species: *Kingella scortechinii* (King) Tiegh.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 425, 426].

Aerial stem-parasitic shrubs, mostly glabrous, robust, with epicortical runners bearing secondary haustoria. *Leaves* alternate, opposite or verticillate. *Inflorescence* a robust many-flowered raceme or spike; axis with a non-flowerbearing part at the base or apex; bract single under each flower, simple. *Corolla* 6-merous, strongly gamopetalous, thick and woody, regular or slightly zygomorphic with the tube curved prior to anthesis, more or less deeply split on the inner side of the curve. *Anthers* basifixed, immobile. *Style* simple, with a knob-like stigma. *Fruit* ellipsoid to obovoid. — **Fig. 45–47.**

Distribution — Endemic to *Malesia*; 5 species in Peninsular Malaysia and Borneo.

Habitat & Ecology — Humid forests, mostly in lowland dipterocarp forest to 1000 m; one species in highlands, 1000–3000 m; host specificity is probably low.



Fig. 45. *Trithecanthera sparsa* Barlow. With spiderhunter (*Arachnothera*), a pollinator bird. Borneo, Sarawak, Lambir Hills Nature Reserve (Nagamasu 4755). Photo Takakazu Yumoto, 1992, with permission.

Morphology & Taxonomy — The racemose inflorescences and gamopetalous corollas indicate relationship to *Dendrophthoe*. The genus is probably a local differentiate with strong specialization for bird pollination. Remarkable are the long robust corollas, and in some species the coloured non-flowerbearing part of the inflorescence axis, which may be either distal or proximal to the flowers, and may provide a perch for pollinators (H. Nagamasu, personal communication).

KEY TO THE SPECIES

- 1a. Leaves alternate, opposite or scattered 2
- b. Leaves verticillate in whorls of 4 or more 3
- 2a. Leaves mostly alternate, petiolate; inflorescence axis c. 55 mm long, bearing c. 20 flowers; corolla yellow 3. **T. sparsa**
- b. Leaves opposite, sessile or nearly so; inflorescence axis 140–190 mm long, bearing 40 or more flowers; corolla red 4. **T. superba**
- 3a. Inflorescence axis 20–40 mm long 2. **T. scortechinii**
- b. Inflorescence axis more than 200 mm long 4
- 4a. Leaves in whorls of c. 8; inflorescence axis lacking a sterile tip; flowers yellow 1. **T. flava**
- b. Leaves in whorls of 4; inflorescence axis with a sterile tip more than 150 mm long; flowers pink or red 5. **T. xiphostachya**

1. *Trithecanthera flava* Kosterm.

Trithecanthera flava Kosterm., New Crit. Malaysian Plants III, Sect. For. Pl. (1955) 21. — Type: *Kostermans 7566*, Borneo, Peak of Balikpapan.

Glabrous except for the inflorescence and flowers pale yellow-brown tomentose. *Leaves* in whorls of 7–9; lamina oblong, 22–40 by 7–9 cm, thick, attenuate at the base to a shortly winged petiole 25–40 mm long and 3–4 mm thick, acuminate and acute to shortly rounded at the apex, glossy or dull above and dull below; venation pinnate with the midrib distinct above and raised below and the main laterals obscure above and visible below. *Inflorescences* at the nodes, a raceme of 40–70 flowers densely crowded in several spiral rows; axis 220–320 mm long, 8–10 mm thick, with a non-flowerbearing basal part 170–220 mm long, lacking a non-flowerbearing prolongation; pedicels 1–3 mm long, 2–3 mm thick. *Corolla* in mature bud 100–150 mm long, c. 3 mm wide at the base and inflated to 6–10 mm wide above, thick in the lower part, thinner in the inflated part, yellow, sometimes orange above; tube in the open flower 80–125 mm long, with a single variable slit to about halfway, with the petals reflexed 12–20 mm below the apex. *Anther* c. 10 mm long, obtuse, about equal to the free part of the filament. — **Fig. 46a, b.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — 150–650 m altitude; recorded hosts include *Dipterocarpus* and *Schima*.

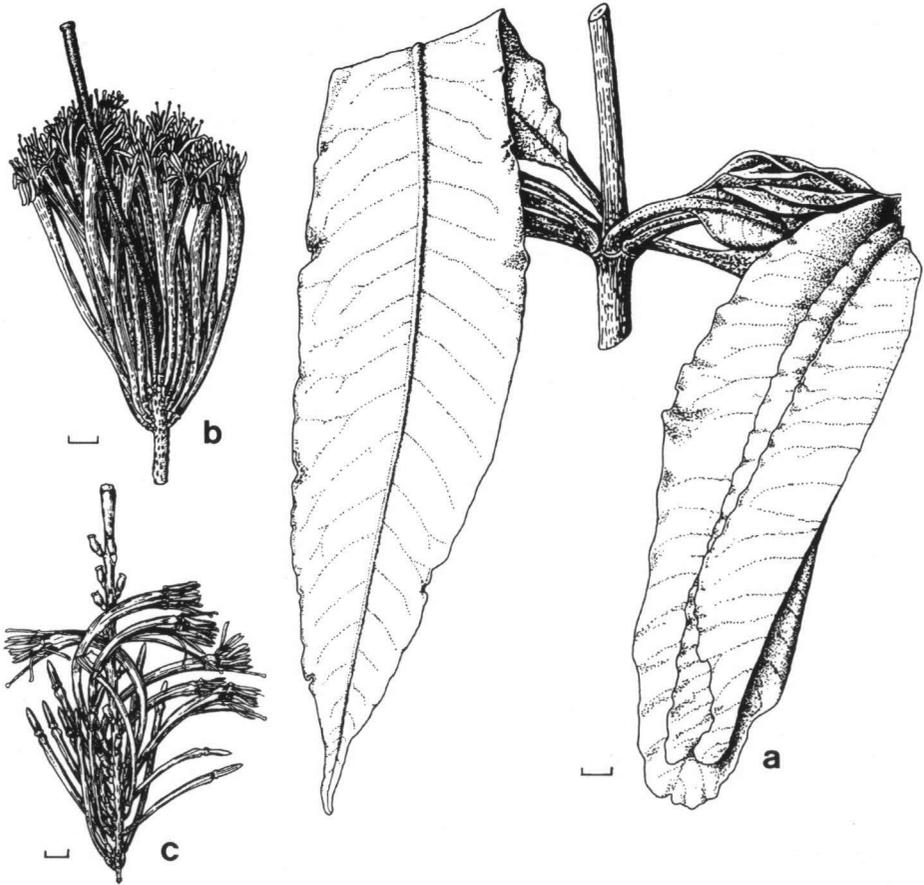


Fig. 46. *Trithecanthera flava* Kosterm. a. Portion of stem with leaves; b. inflorescence with some apical flowers fallen. — *T. superba* Danser. c. Inflorescence (a, b: *Kostermans 7566*; c: *Richards 1652*). a, b redrawn from *Kostermans (1955)*, c redrawn from *Danser (1934)*. Scale bars represent 1 cm.

2. *Trithecanthera scortechinii* (King) Danser

Trithecanthera scortechinii (King) Danser, Verh. Kon. Akad. Wet. Amst. Afd. Natuurk. Sect. 2, 29 (1933) 128. — *Loranthus scortechinii* King, J. As. Soc. Beng. 56, ii (1889) 94. — Syntypes: *Scortechini 90b*, Perak; *Kunstler 6020*, Perak, Larut.

[For additional synonymy see *Danser, Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 426].

Glabrous. *Leaves* in whorls of 6; lamina narrowly ovate to oblong, 18–24 by 6–9 cm, cuneate or truncate at the base to a petiole 25–40 mm long, shortly attenuate and acute at the apex, dull on both sides; venation pinnate with the midrib distinct above and prominent below and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a raceme of many flowers in 6 spirals; axis 20–40 mm long, 3–4 mm thick, with a non-flowerbearing basal part 3–7 mm long, with a mucronate sterile tip c. 1 mm long; pedicels 1–1.5 mm long. *Corolla* in the mature bud 120–130 mm long, gradually widen-

ed upwards, narrowed to a neck in the upper part, clavate, angular and obtuse at apex, yellow below, green above; tube in the open flower 75–90 mm long with the lobes reflexed 5–8 mm higher. *Anther* 7–8 mm long, obtuse, about twice as long as the free part of the filament.

Distribution — *Malesia*: Peninsular Malaysia.

Habitat & Ecology — 30–240 m altitude; no hosts recorded.

3. *Trithecanthera sparsa* Barlow

Trithecanthera sparsa Barlow, *Blumea* 40 (1995) 29. — Type: *Chai S 34045*, Sarawak, Bukit Senkajang.

Glabrous. *Leaves* mostly alternate, rarely opposite or scattered; lamina ovate, 10–16 (–30) by 6–12 cm, thick, attenuate or cuneate at the base to a winged petiole 10–14 mm long, obtuse or rounded at the apex, dull on both sides; venation pinnate with the midrib visible above and prominent below and the main laterals obscure on both sides. *Inflorescences* at the nodes, a raceme (or spike) of 20–30 usually sparsely inserted flowers; axis 50–80 mm long, 4–6 mm thick, with a non-flowerbearing basal part 5–10 mm long, lacking a sterile tip; pedicels 0–1 mm long, c. 2 mm thick. *Corolla* in the mature bud 65–75 mm long, gradually widened upwards, with 2 rows of small wings near the point of reflexion of the lobes 18–25 mm below the apex, narrowed to a neck in the upper part, clavate and angular and obtuse at the apex, yellow with a green band at the neck and apex; tube in the open flower c. 55 mm long, more deeply split on one side, with the lobes reflexed 3–4 mm higher. *Anther* 8–10 mm long, obtuse, about twice as long as the free part of the filament. — **Fig. 45.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — Mixed dipterocarp forest from 400 to 1000 m altitude; the only recorded host is *Shorea*.

4. *Trithecanthera superba* Danser

Trithecanthera superba Danser, *Rec. Trav. Bot. Néerl.* 31 (1934) 245. — Type: *Richards 1652*, Borneo, Mt Dulit.

Glabrous. *Leaves* opposite; lamina oblong, 14–20 by 6–11 cm, truncate to slightly cordate at the base, sessile or subsessile, rounded or obtuse at the apex, dull on both sides; venation pinnate with the midrib and main laterals distinct above and only the midrib prominent below. *Inflorescences* at the nodes, a raceme of many flowers in oblique whorls; axis 140–190 mm long, 3–5 mm thick, with a non-flowerbearing basal part 25–50 mm long, lacking a sterile tip; pedicels 1–3 mm long, 1–2 mm thick. *Corolla* in the mature bud 60–95 mm long, gradually widened upwards, slightly winged and narrowed to a short neck in the upper part, cylindrical and obtuse at the apex, red with a yellowish green band in the widest part; tube in the open flower 50–80 mm long, deeply split on one side, with the lobes reflexed 3–4 mm higher. *Anther* 7–10 mm long, obtuse, about twice as long as the free part of the filament. — **Fig. 46c.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — 1100–3000 m altitude; no hosts recorded.



Fig. 47. *Trithecanthera xiphostachya* Tiegh. Borneo, Mt Besar. Photo W. Forstreuter, 1989, with permission.

5. *Trithecanthera xiphostachya* Tiegh.

Trithecanthera xiphostachya Tiegh., Bull. Soc. Bot. France 41 (1894) 599. — Type: *Beccari 3148*, Sarawak, Batang Lupar.

[For additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 427].

Glabrous. *Leaves* in whorls of 4; lamina narrowly ovate to oblong, 20–30 by 8–11 cm, thick, truncate to slightly cordate at the base to a petiole 20–30 mm long, attenuate and acute at the apex, dull on both sides; venation pinnate with the midrib distinct above and prominent below and the main laterals faintly visible on both sides. *Inflorescences* at the nodes, a spike of many flowers in oblique whorls; axis 240–360 mm long, c. 10 mm thick at the base, thinner above, with a non-flowerbearing basal part 5–10 mm long, with a sterile tip 150–240 mm long. *Corolla* in the mature bud 120–150 mm long, gradually widened upwards, angular and narrowed to a short neck in the upper part, slightly clavate and obtuse at the apex, pink or red; tube in the open flower 75–105 mm long with the lobes reflexed 5–10 mm higher. *Anther* c. 15 mm long, obtuse, about 5 times as long as the free part of the filament. — **Fig. 47.**

Distribution — *Malesia*: Borneo.

Habitat & Ecology — 130–1000 m altitude; the only recorded host genus is *Pometia*, but hosts have been attributed to *Annonaceae*, *Guttiferae*, and *Myristicaceae*.

Note — Danser in Bull. Jard. Bot. Buitenzorg III, 10 (1929) 356 used the epithet *xiphostachys*, treating Van Tieghem's *xiphostachya* as an orthographic error. In view of Van Tieghem's Latin and Greek expertise, it is assumed that his use of the adjectival epithet was intentional, and it is followed here.