

CONSPECTUS OF THE GENUS *AMYEMA* TIEGHEM  
(LORANTHACEAE)

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SUMMARY

The Australasian/Malesian genus *Amyema* is reviewed. Particular attention is given to the species of the Malesian region, as a precursor to a treatment of Loranthaceae for Flora Malesiana. *Amyema* comprises 92 species, and is distributed from the southeast Asian mainland (Malaya, Thailand) throughout the Malesian region to the southwest Pacific (Samoa) and Australia. Major centres of species richness are in the Philippines, New Guinea, and Australia. The genus is part of a floristic element of Gondwanan derivation, which has diversified in the northern part of the Australian plate, and reached the Malesian region from the east following the establishment of Charles's Line.

A comprehensive approach to species circumscription for the entire genus necessitates numerous nomenclatural changes to earlier regional treatments. Eight species are described as new, viz., *A. arthrocaulis*, *A. eburna*, *A. enneantha*, *A. irrubescens*, *A. pyriformis*, *A. rhytidoderma*, *A. scheffleroides*, and *A. vernicosa*. One subspecies, *A. miraculosa* subsp. *latifolia*, is described as new.

INTRODUCTION

One objective in preparing this conspectus is to provide a precursor to a treatment of the family Loranthaceae for Flora Malesiana. In the Malesian region the family comprises 21–23 genera and more than 200 species. For a family of this size, publication of a comprehensive revision in close conjunction with a flora treatment would involve considerable duplication of information, and inflation of publication costs. In any case, the work of a previous student of the family, B.H. Danser, provides a good basis for revisionary study (see below). For these reasons, it was concluded that publication of material precursive to a flora treatment could conveniently take the form of a series of updating accounts of selected genera or groups of genera. They will deal in suitable detail with those topics relevant to a critical study of the family, but not appropriate to a concise flora treatment, including biogeography and putative phylogeny, nomenclatural issues, and the rationale for the taxonomic decisions made.

Critical studies of the Loranthaceae relevant to the Malesian region were made by Danser, the major works being revisions for the Netherlands Indies (Danser, 1931) and the Philippines (Danser, 1935) in widely circulated journals. Revisions and flora treatments by the present author (Barlow, 1966, 1974, 1984) are also accessible. In this conspectus the very extensive synonymy provided in these earlier revisions has not been repeated where it remains unchanged, and wherever possible reference has been made to previous species descriptions.

In the case of *Amyema*, this study completes my revision of the entire genus. Treatments of the Australian and New Guinean/Pacific species have been published previously (Barlow, 1966, 1974, 1983), but now require updating, and a conspectus of the entire genus is therefore presented. This allows a synthesis for the genus of its biogeographic history and patterns of speciation, dispersal, and ecological and host preference differentiation. However, for those species which are taxonomically unchanged and for which there is no significant additional information, only brief summaries are provided, with reference to previous published work.

Specimen label data have been accumulated in computer files, and lists of specimens examined will only be published where they represent significant new findings or newly recognized taxa. Extracts from these files can be provided on request, and reference copies relevant to this paper have been lodged at the Australian National Herbarium.

For additional introductory notes see the first contribution in this series (Barlow, 1991).

## AMYEMA

*Amyema* Tieghem, Bull. Soc. Bot. France 41 (1894) 499. — Type: *Amyema congener* (Sieber ex Schultes & Schultes f.) Tieghem (lecto, designated by Barlow, Austral. J. Bot. 14, 1966, 452).

For descriptions and extensive synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 318; Philipp. J. Sci. 58 (1935) 61; Barlow, Austral. J. Bot. 14 (1966) 452; *ibid.* 22 (1974) 561. Danser's descriptions do not cover the species he placed in *Dicymanthes*, which he treated as a distinct genus (see below).

A genus of 92 species distributed from the southeast Asian mainland to Australia and islands of the southwestern Pacific. Representation in southeast Asia is limited to a single species which occurs in Malaya and Thailand, and species richness increases eastwards from Sumatra and Borneo to the Philippines, and southwards to New Guinea and Australia, where most of the species are found. A few species extend into the Pacific, one reaching the Caroline Islands and Samoa.

The species are found in a wide range of habitats from closed humid forests to arid woodlands, with a correspondingly wide range of adaptive structural and physiological variations. Attachment to the host can be through secondary haustoria on extensive epicortical runners, or only through simple or complex primary haustoria which sometimes have longitudinal strands in the cortical or cambial layers of the host stems. Leaf architecture varies from a simple bifacial pattern with pennate venation to thick isobilateral curvined leaves. Variations in inflorescence and flower structure apparently related to pollination and to protection from predation are numerous. Host specificity ranges from very low (usual in rain forest species) to very high (common in open and arid woodlands), and when high may be associated with remarkable vegetative mimicry of the host.

### *Diagnostic features*

Intrafamilial classification of Loranthaceae is based mainly on ovary and seedling characters, but is seriously in need of revision. As a member of the informal group L31-39 'Amyemae' (Barlow et al., 1989), *Amyema* is characterized by an almost

completely undifferentiated ovary with ovules totally absent (Maheshwari et al., 1957; Bhatnagar & Johri, 1983), cotyledons not emerging on germination, and very large chromosomes ( $x = 9$ ). Most of the readily observable external characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Amyema* is a simple dichasium (triad). The triads are often aggregated into conflorescences, and the plesiomorphic state for the genus is probably an axillary multi-rayed umbel of triads, which in turn may be a reduction from the raceme with whorls of triads which occurs in the related genus *Dactyliophora* Tieghem (Barlow, 1966, 1974, 1990). Vestigial structures and occasional aberrant developments indicate that the simpler inflorescence types which occur in some species of *Amyema* are derived by reduction. These include simple umbels (by reduction of triads to single flowers), umbels of dyads (through loss of the central flowers of the triads), capitula (through shortening of the umbel rays and flower pedicels), and solitary flowers.

The flowers in *Amyema* are hermaphrodite, 4- to 6-merous, and basically chori-petalous, although in some species the petals remain coherent in the lower part for some time after anthesis, and in some cases even are shortly fused. The epipetalous stamens have basifixed, immobile, introrse anthers with simple filaments.

Vegetative features are diverse. Phyllotaxy may be decussate, scattered or verticillate, or a combination of these. The leaves are simple, petiolate or sessile, bifacial or isobilateral, with penninerved to curvinerved venation. There is a general correlation between haustorial structure and habitat, the species of dense humid forests usually being scandent, having long epicortical roots (runners) which produce haustoria and new leafy stems, whilst species of open semi-arid communities often have only the primary haustorium, which may be structurally complex, sometimes producing strands which spread in the cambial or cortical zones of the host.

### *Generic relationships*

*Amyema* is the largest genus in its group, and one of the largest in the family. Most of the related genera are small, more homogeneous, and apparently derived. They are mostly sympatric with *Amyema* and are usually characterized by inflorescence and flower specializations which are probably adaptations for protection and pollination. In this sense, *Amyema* represents the core of variability of its subfamilial group, from which a number of satellite genera have differentiated.

Only two small genera in the group are possible exceptions to this pattern. *Dactyliophora*, a genus of two species in Papuasias, is probably close to the stem of the amyemoid stock, differing only in its more complex and possibly ancestral conflorescence structure (Barlow, 1974, 1990). The monotypic genus *Cecarria*, of eastern Malesia and northeastern Australia, exhibits some character states which are probably plesiomorphic for the family, and is probably a relict of the early Gondwanan history of the family (Barlow, 1983).

All of these other amyemoid genera will be discussed in more detail separately.

### *Biogeographic history*

The loranth presumably originated in the mesic, warm to mild, closed forests of Gondwanaland, the parasitic habit arising not in response to water stress but to com-

petition for nutrients in complex ecosystems. Four main lines of evolution apparently occurred independently in the Afro-Indian, Indian-Indosinian, Australasian-Papuanian, and South American regions of Gondwanaland, from genomically different basal stocks, and were isolated by the fragmentation of the supercontinent (Barlow, 1990). The Australasian-Papuanian line is represented by the amyemoid group of genera.

In *Amyema* there is considerable morphological diversity in New Guinea, including a significant retention of plesiomorphic characters. The origin of the genus was probably in mesic forests at the northern margin of the Australian tectonic plate, followed by radiation into areas of seasonal, arid and subalpine climates as they appeared. The species of *Amyema* which occur to the north and west of Charles's Line are presumably derived from stocks which reached there from an Australian-Papuanian source subsequent to the late Tertiary contact of the Australian and Sunda plates.

Like all loranth, dispersibility in *Amyema* is low, and the spread of the genus across Malesia to the Asian mainland has probably been mostly over exposed land surfaces. Although the convergence of the Australian and Sunda plates began in the mid-Miocene, it was probably not before latest Miocene or early Pliocene that a land migration route from Australia and New Guinea to Celebes and the Philippines was established (Audley-Charles, 1981). By the late Pliocene, lowered sea levels would have exposed extensive land on both sides of the contact boundary and dispersal of *Amyema* would have been facilitated.

Present-day species richness suggests that the eastern mesic forest block from New Guinea to the Philippines has been the main corridor for migration and speciation of *Amyema* in Malesia. There is a rapid decline in species numbers to the west, and many of the species represented there are widespread, occurring on more than one island. As in the genus *Scurrula* (Barlow, 1991) the widespread species are lowland ones for which sea level minima could have provided migration opportunities. Many of the local endemics, especially in the Philippines, are derived upland species.

The few small, morphologically specialized genera which are derived from the amyemoid stock are all centred in New Guinea. They include *Distrianthes* (1 sp.), *Papuanthes* (1 sp.) and *Sogerianthe* (5 spp.). They are probably no older than the vertical uplift which has followed the emplacement of exotic terranes on the New Guinean margin of the Australian plate (Barlow, 1990). Whilst perhaps younger than the Miocene collision with Sundaland, they are Gondwanan in derivation and belong with the autochthonous subelement of the Australian flora.

#### *Infrageneric classification*

In a genus as large as *Amyema* it would be usual for subgenera or sections to be distinguished. Recognition of such taxa would be a good indicator of phylogeny and species relationships. However, it is highly likely that any species groups distinguished on the basis of the morphological characters used in this study would be polyphyletic (see notes on *Dicymanthes*, for example). The Australian species, occupying perhaps the oldest part of the territory of the genus, are mostly derived taxa adapted to the now extensive seasonally dry and arid environments, and have probably been derived in parallel from different ancestral groups of the primitive mesic forests. The secondary diversification of the genus in Malesia has probably also involved parallel



development in different immigrant stocks. Infrageneric taxa have consequently not been distinguished, and the species have been arranged in alphabetical order. Notes on relationships, both phyletic and biogeographic, are given for species wherever possible.

### *Species circumscription*

The information sources for the study of the Malesian taxa have been herbarium specimens and earlier taxonomic concepts, notably those of Danser. In this respect, species circumscription employed here is conventionally morphological. However, earlier work on the Australian and New Guinean taxa has been based on extensive field work, supported by data on chromosome numbers and karyotype, pollination biology and genetic system. Field observations have contributed to knowledge of the dynamics of local populations and of hybridization. This experience has been used as a comparative base for the assessment of systematic status of the Malesian entities.

Herbarium material was assembled and sorted geographically for examination, if necessary with secondary altitudinal sorting. Among the sympatric entities so assembled for each area, internally homogeneous and distinct taxa were recognized as species. As in most large angiosperm genera, variability in *Amyema* is greatest in widespread lowland species, and application of taxonomic judgement was therefore most critical in the matching of the entities of adjoining geographic areas in order to determine the extent of conspecificity.

Satisfactory conclusions about conspecificity of entities in different islands should take account of geophysical and palaeoclimatic history. For *Amyema* and other Loranthaceae, Danser's taxonomic concepts must be reviewed against this background. Danser made important theoretical contributions to the species concept, but in applications in his own systematic work he was probably influenced by contemporary views on historical biogeography of the Malesian region. He frequently accepted different species for each of the major islands of the region, often based on small quantitative differences, whereas our present knowledge of the amplitude and frequency of coastline and climate changes might have led him to different conclusions. The geographical integrity of a Malesian species, especially a lowland one, is not weakened by its occurrence on a number of islands, even when dispersibility is low. Application of taxonomic judgement based on experience with the family is most critical, therefore, in assessing the significance of morphological differences in isolated populations in terms of the most recent interruption to gene flow between them. Where entities on different islands are obviously very closely related and show quantitative character differences which may relate to local environment, both physical and biotic, I consider it preferable to treat them as conspecific.

### *Infraspecific categories*

In earlier work on the Australian species of *Amyema*, I recognized subspecies within a number of widespread species. These subspecies are ecogeographically discrete entities which are probably an outcome of the clinal differentiation which can occur in open vegetation systems in such a large land area. A few varieties have also been recognized to account for striking morphological variants lacking geographic or population integrity.

Differentiation of subspecies appears to be less usual in humid tropical ecosystems. Further observation suggests that some of the subspecies I recognized in earlier work on New Guinean species may not have a sound biological basis. In this conspectus reference is given to the existence of subspecies, where appropriate, but emphasis is given primarily to the delineation of species. The only exception is in *A. miraculosa*, where well-defined subspecies already exist in Australia and the taxon in Timor must be placed in context with them.

#### *Gender of Amyema*

In his description of the genus, Van Tieghem (1894b) cited a derivation from the Greek  $\alpha$  ('privatif') and  $\mu\upsilon\epsilon\omega$  ("j'enseigne") = "non encore enseigné." Van Tieghem had synthesized other genus names from Greek word roots, and apparently believing that he had done so in the case of 'amyema', accordingly determined the gender as feminine. In accordance with Article 76 of the International Code of Botanical Nomenclature, adopted in August 1987, the name retains the gender assigned by Van Tieghem, and in this treatment the adjectival epithets cited are accordingly feminine.

There is a word in classical Greek which on transliteration is 'amyema' and which means "those not yet initiated in eleusinian mysteries." The word is clearly derived from the same root as Van Tieghem used. Whilst Van Tieghem was undoubtedly an accomplished Greek scholar, and his intention in formulating the name and applying a gender can hardly be challenged, I have previously treated the genus name *Amyema* as neuter because of the existence of the Greek word, not noticed by Van Tieghem, with meaning conforming with that given by him. In so doing I followed a Recommendation which was valid at the time but which is now superseded.

#### *Status of Danser's genus Dicymanthes*

Numerous genus names attributable to Van Tieghem and other authors, and now placed in synonymy under *Amyema*, are reviewed and listed in earlier works (Danser, 1933; Barlow, 1974), and need no further discussion here. An exception is Danser's genus *Dicymanthes*, first placed in synonymy with *Amyema* by Barlow (1974). Most of the Malesian species placed by Danser in *Dicymanthes* appear to form a natural group, striking because of the capitate inflorescence formed from two sessile triads. However, the condensation of a two-rayed umbel of triads into a head through reduction of the rays is not a major variation in the genus, and is probably less significant than some of the other variations in inflorescence structure. Acceptance of a genus based on this character would remove the integrity of the residue left in *Amyema*.

In any case, the inflorescence structure in *Dicymanthes* is most probably polyphyletic. In addition to the Malesian species referred to above, it occurs in *A. maidenii* of arid and semi-arid Australia, and in *A. tetrapetala* of New Guinea, which Danser included in *Dicymanthes*. It also occurs in the related Australian genus *Diplatia* which is further distinguished by some highly specialized bract characters. Other species in Malesia show inflorescence reductions which closely approach *Dicymanthes*. All of these species have characters which suggest that they are not directly related to the core group of the genus. *Dicymanthes* is therefore retained in synonymy with *Amyema*.

For further notes on the lack of a sharp discontinuity between *Dicymanthes* and *Amyema*, see note under *A. tristis*.

## KEY TO THE SPECIES

- 1a. Leaves flat . . . . . 2  
 b. Leaves terete . . . . . 110
- 2a. Leaves with opposite and decussate phyllotaxy, sometimes displaced . . . . . 3  
 b. Leaves with verticillate phyllotaxy, usually ternate or quaternate, sometimes up to 8-verticillate, sometimes displaced to irregular spirals . . . . . 84
- 3a. Inflorescence a pedunculate umbel of 2 or more dyads, triads, or tetrads . . . . . 4  
 b. Inflorescence other than a pedunculate umbel of dyads, triads, or tetrads (e.g., a head, simple umbel, solitary flower, or sessile cluster) . . . . . 60
- 4a. Flowers in dyads . . . . . 5  
 b. Flowers in triads . . . . . 8  
 c. Flowers in tetrads . . . . . 57
- 5a. Corolla robust, rusty or rarely white-tomentose; fruit globular to broadly ellipsoid; bract enlarged under fruit . . . . . 6  
 b. Corolla slender, glabrous and green at maturity; fruit ovoid or pear-shaped; bract not enlarged under fruit . . . . . 7
- 6a. Flowers in the dyads sessile or nearly so; indumentum white (NW Australia) . . . . . 24. *A. eburna*  
 b. Flowers in the dyads normally distinctly pedicellate; indumentum rusty (N Australia) . . . . . 8. *A. bifurcata*
- 7a. Fruit narrowly ellipsoid, c. 10 mm long; leaf lamina more than 8 cm long (NE Australia) . . . . . 9. *A. biniflora*  
 b. Fruit narrowly pear-shaped, c. 15 mm long; leaf lamina up to 9 cm long (NW Australia) . . . . . 64. *A. pyriformis*
- 8a. Triads with all flowers closely sessile . . . . . 9  
 b. Triads with at least the lateral flowers pedicellate, sometimes very shortly so 20
- 9a. Rays in the umbel 2–4 . . . . . 10  
 b. Rays in the umbel 5 or more . . . . . 17
- 10a. Corolla in mature bud glabrous . . . . . 11  
 b. Corolla in mature bud densely tomentose . . . . . 16
- 11a. Corolla 4-merous (New Guinea) . . . . . 4. *A. arthrocaulis*  
 b. Corolla 5- or 6-merous . . . . . 12
- 12a. Leaves sessile and cordate at the base (New Guinea) . . . . . 16. *A. cercidioides*  
 b. Leaves petiolate (sometimes very shortly so) and attenuate or contracted at the base . . . . . 13
- 13a. Ovary and fruit densely white-tomentose in the lower part, otherwise glabrous (E Australia) . . . . . 48. *A. lucasii*  
 b. Ovary and fruit glabrous or uniformly shortly brown-tomentose . . . . . 14
- 14a. Corolla in mature bud obtuse, 14–18 mm long; anther equal to the free part of the filament (Java, Bali, Flores) . . . . . 84. *A. tristis*  
 b. Corolla in mature bud acute, 20–40 mm long; anther much shorter than the free part of the filament . . . . . 15
- 15a. Flowers in a linear row in the triad, the bracts not together forming a cupule subtending the triad (New Guinea and SW Pacific islands) . . . . . 3. *A. artensis*

- b. Flowers in an equilateral disposition in the triad, the bracts together forming a subtending cupule (New Guinea, E Australia) . . . . . 13. *A. caudiciflora*
- 16a. Indumentum golden; leaves oblong to elliptic, penninerved (W Australia) . . . . . 56. *A. nestor*
- b. Indumentum white; leaves lanceolate to oblong, curvinerved (Central Australia) . . . . . 42. *A. hilliana*
- 17a. Rays in the umbel 10–30 (Philippines) . . . . . 43. *A. incarnatiflora*
- b. Rays in the umbel 5–8 . . . . . 18
- 18a. Leaf lamina mostly acute and acuminate at the apex; anther longer than the free part of the filament (New Guinea, N Australia) . . . . . 30. *A. friesiana*
- b. Leaf lamina obtuse or rounded at the apex; anther shorter than the free part of the filament . . . . . 19
- 19a. Corolla in mature bud 18–20 mm long; anthers c. 1.5 mm long; leaf lamina often folded (Borneo) . . . . . 82. *A. triantha*
- b. Corolla in mature bud 20–40 mm long; anthers 2–3 mm long; leaf lamina flat (New Guinea, E Australia) . . . . . 13. *A. caudiciflora*
- 20a. Rays in the umbel 2–5 . . . . . 21
- b. Rays in the umbel 6 or more . . . . . 49
- 21a. Rays in the umbel mostly 2 or 3 . . . . . 22
- b. Rays in the umbel mostly 4 or 5 . . . . . 39
- 22a. Corolla in mature bud glabrous or with a few scattered hairs . . . . . 23
- b. Corolla in mature bud tomentose . . . . . 33
- 23a. Leaves penninerved; haustorial attachments on epicortical runners . . . . . 24
- b. Leaves curvinerved; haustorial attachments lacking epicortical runners . . . 25
- 24a. Corolla 4-merous; leaf lamina mostly less than 1 cm wide (New Guinea) . . . . . 45. *A. kebarensis*
- b. Corolla 5-merous; leaf lamina mostly more than 2 cm wide (New Guinea, SW Pacific islands) . . . . . 3. *A. artensis*
- 25a. Ovary white- or pale brown-tomentose in the lower part, glabrous above. . . 26
- b. Ovary glabrous or with a uniformly sparse indumentum . . . . . 28
- 26a. Rays of the umbel tomentose (New Guinea, N & E Australia) . . . . . 18. *A. conspicua*
- b. Rays of the umbel glabrous . . . . . 27
- 27a. Leaves attenuate and cuneate at the base, shortly petiolate (NW Australia) . . . . . 23. *A. dolichopoda*
- b. Leaves truncate to cordate at the base, sessile (W Australia) 7. *A. benthamii*
- 28a. Corolla in mature bud ridged or winged longitudinally . . . . . 29
- b. Corolla in mature bud terete or angular but not ridged or winged longitudinally . . . . . 30
- 29a. Leaves more than 2 cm wide; pedicels winged (NW Australia) . . . . . 80. *A. thalassia*
- b. Leaves less than 2 cm wide; pedicels terete (Timor, Australia) . . . . . 55. *A. miraculosa*
- 30a. Leaf lamina lanceolate to narrowly obovate, mostly less than 5 mm wide (S Australia) . . . . . 52. *A. melaleucaea*
- b. Leaf lamina oblong to orbicular, mostly more than 15 mm wide . . . . . 31

- 31a. Leaves sessile or nearly so, abruptly contracted to cordate at the base; rays of umbel not strongly divergent; flower buds acute (NE Australia)
  - 33. *A. glabra*
  - b. Leaves attenuate or contracted at the base to a petiole 3–6 mm long; rays of umbel divergent; flower buds obtuse . . . . . 32
- 32a. Corolla 4-merous, with a globular inflation at the base in the mature bud; anthers transversely septate (Borneo, Java) . . . . . 34. *A. gravis*
  - b. Corolla 5-merous, uniformly slender in the mature bud; anthers not transversely septate (New Guinea, N Australia) . . . . . 50. *A. mackayensis*
- 33a. Leaves less than 7 mm wide; host *Melaleuca* . . . . . 34
  - b. Leaves mostly more than 10 mm wide; host not *Melaleuca* . . . . . 35
- 34a. Corolla more than 15 mm long (N Australia) . . . . . 39. *A. herbertiana*
  - b. Corolla less than 15 mm long (SE Australia) . . . . . 31. *A. gaudichaudii*
- 35a. Leaves cordate at the base, sessile (N Australia) . . . . . 35. *A. haematodes*
  - b. Leaves attenuate or contracted at the base, distinctly petiolate . . . . . 36
- 36a. Ovary abruptly widened and then contracted just below the calyx (Australia)
  - 65. *A. quandang*
  - b. Ovary uniformly cylindrical or funnel-shaped . . . . . 37
- 37a. Rays of the umbel 1–3 mm long, not strongly divergent (N Australia)
  - 89. *A. villiflora*
  - b. Rays of the umbel 5–10 mm long, divergent . . . . . 38
- 38a. Tomentum golden; leaf more or less penninerved (W Australia) 56. *A. nestor*
  - b. Tomentum white; leaf curvinerved (Central Australia) . . . . . 42. *A. hilliana*
- 39a. Leaves curvinerved; haustorial attachments lacking epicortical runners . . . 40
  - b. Leaves penninerved; haustorial attachments on epicortical runners . . . . . 43
- 40a. Triads usually with all flowers pedicellate (Australia) . . . . . 54. *A. miquelii*
  - b. Triads with the central flower sessile . . . . . 41
- 41a. Corolla in mature bud brown-tomentose (SE Australia) . . . 59. *A. pendula*
  - b. Corolla in mature bud glabrous or with a few scattered hairs . . . . . 42
- 42a. Ovary glabrous or nearly so; hosts mangroves (New Guinea, N Australia)
  - 50. *A. mackayensis*
  - b. Ovary tomentose; hosts not mangroves (E Australia) . . . . . 17. *A. congener*
- 43a. Corolla mostly 5-merous . . . . . 44
  - b. Corolla 4-merous . . . . . 47
- 44a. Central flowers of the triads mostly pedicellate (Philippines, Celebes, Lesser Sunda Islands) . . . . . 15. *A. celebica*
  - b. Central flowers of the triads sessile . . . . . 45
- 45a. Inflorescence parts robust; bracts of the lateral flowers of the triads appressed to the ovary and enclosing it in early bud stages (New Guinea, N Australia)
  - 67. *A. queenslandica*
  - b. Inflorescence parts slender; bracts of the lateral flowers spreading . . . . . 46
- 46a. Leaves dull on both sides; corolla 14–20 mm long; inflorescence and ovary glabrous (Bismarck Archipelago) . . . . . 57. *A. novaebritanniae*
  - b. Leaves usually more lustrous or glossy above; corolla 20–40 mm long; inflorescence and ovary usually shortly tomentose (New Guinea and SW Pacific islands) . . . . . 3. *A. artensis*

- 47a. Leaf lamina 10–15 cm long; corolla 35–40 mm long (New Guinea)  
     see *A. tenuisepala* under 3. *A. artensis*
- b. Leaf lamina less than 8 cm long; corolla 15–20 mm long . . . . . 48
- 48a. Floral bract with a complex dorsal protuberance; inflorescence peduncle very slender, more than 18 mm long (New Guinea) . . . . . 19. *A. corniculata*
- b. Floral bract constricted near the apex forming a simple dorsal protuberance; inflorescence peduncle slender to robust, less than 18 mm long (New Guinea)  
     58. *A. pachypus*
- 49a. Rays in the umbel 15 or more, arising from depressions in a globular dilation of the peduncle apex . . . . . 50
- b. Rays in the umbel 6–12, not arising from depressions in a dilated peduncle apex or if so then the dilation not globular . . . . . 51
- 50a. Leaf lamina broadly ovate to orbicular; indumentum red-brown; corolla c. 50 mm long, distinctly choripetalous (New Guinea) . 76. *A. stronglyphylla*
- b. Leaf lamina narrow-lanceolate to ovate; indumentum tawny brown; corolla 30–40 mm long, with petals often cohering at the base long after anthesis (Philippines) . . . . . 36. *A. haenkeana*
- 51a. Corolla 4-merous . . . . . 52
- b. Corolla 5- or 6-merous . . . . . 53
- 52a. Peduncle 11–16 mm long, not strongly dilated at the apex (Celebes)  
     44. *A. irrubescens*
- b. Peduncle 20–45 mm long, dilated to c. 2 mm wide at the apex (New Guinea)  
     92. *A. wichmannii*
- 53a. Triads usually with all flowers pedicellate (Australia) . . . . . 54. *A. miquelii*
- b. Triads with the central flower sessile . . . . . 54
- 54a. Corolla in mature bud 14–20 mm long (Bismarck Archipelago)  
     57. *A. novaebritanniae*
- b. Corolla in mature bud more than 25 mm long . . . . . 55
- 55a. Leaf lamina lanceolate to oblong-ovate, up to 3 cm wide, acute at the apex; peduncle slender but dilated at the apex (Philippines) . . . . . 86. *A. urdanetensis*
- b. Leaf lamina ovate to broadly spatulate or orbicular, more than 3 cm wide, rounded at the apex; peduncle uniformly robust . . . . . 56
- 56a. 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 (New Guinea, NE Australia) . . . . . 67. *A. queenslandica*
- b. Rays of the umbel 7–12; bracts of the lateral flowers up to 2 mm long, spreading (Celebes, New Guinea) . . . . . 69. *A. rigidiflora*
- 57a. Leaves penninerved; haustorial attachments on epicortical runners . . . . . 58
- b. Leaves curvinerved; haustorial attachments lacking epicortical runners . . . . . 59
- 58a. Tetrads with all flowers sessile; petals coherent at the base into a tube 4–5 mm long (New Guinea) . . . . . 78. *A. tetraflora*
- b. Tetrads with three flowers shortly pedicellate; petals coherent at the base into a tube 10–12 mm long (New Guinea) . . . . . 10. *A. brassii*
- 59a. Leaves soon glabrous, often tinted yellow; mature fruit yellow, glabrous (Australia) . . . . . 54. *A. miquelii*

- b. Leaves long remaining brown-tomentose; mature fruit brown, tomentose (SE Australia) . . . . . 59. *A. pendula*
- 60a. Inflorescence a pedunculate or sessile 6- or 9-flowered head formed from 2 or 3 sessile triads . . . . . 61
  - b. Inflorescence not as above (a pedunculate or sessile simple umbel, a solitary flower or a head of 3–5 flowers) . . . . . 73
- 61a. Peduncle less than 12 mm long; leaves penninerved; haustorial attachments on epicortical runners . . . . . 62
  - b. Peduncle more than 15 mm long; leaves curvinerved; haustorial attachments lacking epicortical runners . . . . . 72
- 62a. Leaves sessile . . . . . 63
  - b. Leaves obscurely or distinctly petiolate . . . . . 64
- 63a. Leaves truncate to cordate at the base; peduncle rudimentary (inflorescence sessile) (Philippines, Celebes, Lesser Sunda Islands) . . . 20. *A. cuernosensis*
  - b. Leaves cuneate to truncate at the base; peduncle 2–5.5 mm long (Philippines, Celebes) . . . . . 25. *A. edanoi*
- 64a. Corolla 4-merous; bracts c. 6 mm long (New Guinea) . . 79. *A. tetrapetala*
  - b. Corolla 5- or 6-merous; bracts less than 3 mm long . . . . . 65
- 65a. Petals with deflexed spurs on the inside above the base forming a nectar chamber . . . . . 66
  - b. Petals lacking deflexed spurs on the inside above the base . . . . . 68
- 66a. Peduncle 5–11 mm long; leaf lamina obtuse or rounded at the apex (Bali)
  - b. Peduncle 2–4 mm long . . . . . 47. *A. longipes* . . . . . 67
- 67a. Leaf lamina acuminate at the apex, mostly more than 12 cm long; bracts of the lateral flowers appressed to the ovary (Philippines) . . . . . 74. *A. seriata*
  - b. Leaf lamina acute at the apex, mostly less than 12 cm long; bracts of the lateral flowers spreading (Java, Lesser Sunda Islands) . . . . . 84. *A. tristis*
- 68a. Leaves strongly bifacial, glossy grey/green above and dull brown below . . 69
  - b. Leaves not or only weakly bifacial, dull on both sides at least when dry . . 70
- 69a. Inflorescence peduncle up to 3 mm long; anther about equal to the free part of the filament (Lesser Sunda Islands, Moluccas) . . . . . 40. *A. hexameres*
  - b. Inflorescence peduncle 5–9 mm long; anther much shorter than the free part of the filament (New Guinea, SW Pacific islands) . . . . . 3. *A. artensis*
- 70a. Inflorescence sessile; petiole broad, 1–3 mm long (Philippines) 2. *A. apoensis*
  - b. Inflorescence pedunculate; petiole slender . . . . . 71
- 71a. Inflorescence peduncle 4–5 mm long; petiole distinct, 5–15 mm long (Philippines) . . . . . 41. *A. hexantha*
  - b. Inflorescence peduncle usually 2–4 mm long; petiole obscure, 0.5–4 mm long (Java, Lesser Sunda Islands) . . . . . 84. *A. tristis*
- 72a. Lateral flowers of the triad sessile (Australia) . . . . . 51. *A. maidenii*
  - b. Lateral flowers of the triad shortly pedicellate (Central Australia)
    - 77. *A. subcapitata*
- 73a. Inflorescence a pedunculate capitulum formed from a single cymule of 3–5 sessile flowers . . . . . 74

- b. Inflorescence a simple umbel . . . . . 75
- c. Inflorescence a single flower, usually on an articulate pedicel . . . . . 81
- 74a. Haustoria produced on epicortical runners which also bear inflorescences; flowers in regular triads on a peduncle c. 1 mm long; anthers sessile (Philippines) . . . . . 14. *A. cauliflora*
- b. Haustoria lacking epicortical runners; inflorescences axillary; flowers in clusters of 3–5 on a peduncle 5–15 mm long; anthers shorter than free part of filament (SW Australia) . . . . . 29. *A. fitzgeraldii*
- 75a. Peduncle of the umbel obsolete or up to 1 mm long . . . . . 76
- b. Peduncle of the umbel distinct, usually more than 2 mm long. . . . . 77
- 76a. Corolla 8–22 mm long; leaf rounded or obtuse at the apex (from Thailand to Moluccas and Lesser Sunda Islands) . . . . . 5. *A. beccarii*
- b. Corolla 25–40 mm long; leaf acuminate and acute at the apex (New Guinea) . . . . . 75. *A. squarrosa*
- 77a. Corolla 4-merous (Lesser Sunda Islands) . . . . . 81. *A. timorana*
- b. Corolla 5- or 6-merous . . . . . 78
- 78a. Rays of the umbel 2 . . . . . 79
- b. Rays of the umbel more than 2 . . . . . 80
- 79a. Leaves penninerved, mostly rounded at the apex; peduncle more than 1 mm thick; corolla in the mature bud robust, obtuse, longitudinally ribbed or angled (NE Australia) . . . . . 91. *A. whitei*
- b. Leaves curvinerved, mostly acuminate; peduncle less than 1 mm thick; corolla in mature bud thin, slender, acute, not longitudinally ribbed or angled (New Guinea, NE Australia) . . . . . 73. *A. seemeniana*
- 80a. Rays of the umbel 3–6 (N Australia) . . . . . 70. *A. sanguinea*
- b. Rays of the umbel c. 12 (Moluccas) . . . . . 85. *A. umbellata*
- 81a. Corolla 4-merous . . . . . 82
- b. Corolla 5- or 6-merous . . . . . 83
- 82a. Leaves 4–7 cm long, acuminate acute, almost sessile; articulate peduncle c. 3 mm long (New Guinea) . . . . . 38. *A. hastifolia*
- b. Leaves 1.8–4 cm long, rounded, distinctly petiolate; articulate peduncle 4–8 mm long (New Guinea) . . . . . 28. *A. finisterrae*
- 83a. Corolla 8–22 mm long (from Thailand to Moluccas and Lesser Sunda Islands) . . . . . 5. *A. beccarii*
- b. Corolla 40–55 mm long (New Guinea) . . . . . see *A. curvifolia* under 38. *A. hastifolia*
- 84a. Inflorescence a pedunculate umbel of 2 or more triads or tetrads . . . . . 85
- b. Inflorescence other than a pedunculate umbel of triads or tetrads (e. g., a head, simple umbel, solitary flower, or sessile cluster) . . . . . 103
- 85a. Flowers in tetrads (New Guinea) . . . . . 22. *A. dilatipes*
- b. Flowers in triads . . . . . 86
- 86a. Triads with all flowers sessile . . . . . 87
- b. Triads with at least the lateral flowers pedicellate . . . . . 91
- 87a. Rays in the umbel more than 10 (Philippines) . . . . . 43. *A. incarnatiflora*
- b. Rays in the umbel 4–8 . . . . . 88
- c. Rays in the umbel 2 or 3 . . . . . 90



- 88a. Leaves mostly in regular whorls of 5 or 6, rarely quaternate, (New Guinea, SW Pacific Islands) . . . . . **71. A. scandens**  
 b. Leaves ternate or rarely quaternate, frequently scattered . . . . . 89
- 89a. Leaves sessile or sometimes minutely petiolate (New Guinea)  
     **13. A. caudiciflora**  
 b. Leaves petiolate (New Guinea, E Australia) . . . . . **60. A. plicatula**
- 90a. Leaf lamina linear-lanceolate, concave above, less than 1 cm wide (New Guinea) . . . . . **12. A. canaliculata**  
 b. Leaf lamina ovate or lanceolate-ovate, flat, more than 2 cm wide (Philippines)  
     **87. A. vernicosa**
- 91a. Rays in the umbel 2–5 . . . . . 92  
 b. Rays in the umbel 6–14 . . . . . 98  
 c. Rays in the umbel 15 or more . . . . . 102
- 92a. Leaves sessile . . . . . 93  
 b. Leaves petiolate . . . . . 95
- 93a. Leaves 7.5–10 cm long (Philippines) . . . . . **68. A. rhytidoderma**  
 b. Leaves mostly less than 5 cm long . . . . . 94
- 94a. Corolla more than 25 mm long, sparsely to densely hairy (Philippines)  
     **49. A. luzonensis**  
 b. Corolla less than 21 mm long, glabrous (Philippines) **6. A. benguetensis**
- 95a. Petals with dorsal appendages forming a crown near the apex of the flower bud (Philippines) . . . . . **88. A. verticillata**  
 b. Petals without dorsal appendages . . . . . 96
- 96a. Triads with the central flower sessile (New Guinea and SW Pacific islands)  
     **A. artensis**  
 b. Triads with all flowers pedicellate . . . . . 97
- 97a. Leaves regularly verticillate (mostly quaternate); lamina thin, mostly less than 8 cm long; petals usually 4 (Philippines) . . . . . **1. A. acuta**  
 b. Leaves opposite, scattered, or quaternate; lamina thickly coriaceous, mostly more than 8 cm long; petals usually 5 (Philippines, Celebes, Lesser Sunda Islands) . . . . . **15. A. celebica**
- 98a. Rays of the umbel 6–8. . . . . 99  
 b. Rays of the umbel 9 or more . . . . . 101
- 99a. Leaf lamina less than 10 cm long; inflorescence axis mostly more than 10 mm long (Philippines) . . . . . **1. A. acuta**  
 b. Leaf lamina more than 10 cm long; inflorescence axis less than 10 mm long 100
- 100a. Petals 5, coherent at the base for 1–3 mm (Philippines)  
     **37. A. halconensis**  
 b. Petals 4, eventually free to the base (Lesser Sunda Islands)  
     **72. A. scheffleroides**
- 101a. Leaves opposite, ternate, or scattered ternate; lamina up to 10 cm long (Celebes) . . . . . **44. A. irrubescens**  
 b. Leaves in whorls of 3–6; lamina 10–30 cm long (Celebes, Lesser Sunda Islands, Moluccas) . . . . . **62. A. polytrias**
- 102a. Inflorescence peduncle up to 10 mm long; petals 4 (Philippines)  
     **21. A. curranii**

- b. Inflorescence peduncle more than 25 mm long; petals 5 or 6 (Philippines) **36. A. haenkeana**
- 103a. Inflorescence a pedunculate or sessile 9-flowered head formed from 3 sessile triads . . . . . 104
- b. Inflorescence not as above (a pedunculate or sessile simple umbel or a solitary flower) . . . . . 105
- 104a. Leaf lamina less than 8 cm long; inflorescence peduncle 12–15 mm long; petals lacking a deflexed spur on the inside above the base (Philippines) **87. 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 (Lesser Sunda Islands) **26. A. enneantha**
- 105a. Inflorescence a sessile 1- to 3-flowered umbel (i. e., the flowers sometimes seemingly solitary) . . . . . 106
- b. Inflorescence a pedunculate simple umbel . . . . . 107
- 106a. 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 (from Thailand to Moluccas and Lesser Sunda Islands) . . . . . **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 (Philippines) **90. A. wenzelii**
- 107a. Rays of the umbel c. 12 (Moluccas) . . . . . **85. A. umbellata**
- b. Rays of the umbel 3–6 . . . . . 108
- 108a. Petals 6 (NE Australia) . . . . . **66. A. quaternifolia**
- b. Petals 4 or rarely 5 . . . . . 109
- 109a. Peduncle of the umbel 2–5 mm long; corolla mostly less than 20 mm long (Java, Borneo, Philippines, Lesser Sunda Islands, Celebes, Moluccas, New Guinea) . . . . . **27. A. fasciculata**
- b. Peduncle of the umbel 8–11 mm long; corolla more than 20 mm long (Philippines) . . . . . **61. A. polillensis**
- 110a. Flowers in dyads; petals usually 4; free part of filament shorter than the anther (Central Australia) . . . . . **32. A. gibberula**
- b. Flowers in triads; petals usually 5; free part of filament longer than the anther . . . . . 111
- 111a. Central flower of triad pedicellate (N Australia) . . . . . **83. A. tridactyla**
- b. Central flower of triad sessile . . . . . 112
- 112a. Inflorescence and flowers tomentose . . . . . 113
- b. Inflorescence and flowers glabrous . . . . . 114
- 113a. Indumentum of corolla short, grey; fruit almost glabrous, pink; corolla very slender in bud (E Australia) . . . . . **11. A. cambagei**
- b. Indumentum of corolla long, white or pale brown; fruit tomentose, white; corolla robust in bud (S Australia) . . . . . **46. A. linophylla**
- 114a. Leaves 5–8 mm long (W Australia) . . . . . **53. A. microphylla**
- b. Leaves 20–80 mm long (S Australia) . . . . . **63. A. preissii**

### 1. *Amyema acuta* (Tieghem) Danser

*Stemmatophyllum acutum* Tieghem, Bull. Soc. Bot. France 41 (1894) 546. — *Amyema acuta* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 293. — Type: *Cuming 1973* (holo P), Philippines, Manila.

*Loranthus medinillicola* Merrill, Philipp. J. Sci. C 9 (1914) 287. — *Amyema medinillicola* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *McGregor BS 19842* (lecto US, see below), Philippines, Luzon, Ifugao, Mt Polis, ii.1913.

*Amyema mosea* Danser, Philipp. J. Sci. 58 (1935) 77. — Type: *Ramos & Edaño BS 47338* (lecto UC, see below), Philippines, Luzon, Isabela, Mt Moises, iii.1926.

For description and further synonymy see Danser, Philipp. J. Sci. 58 (1935) 74–78 under *A. acuta*, *A. medinillicola*, and *A. mosea*. *Amyema acuta* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of regularly verticillate (mostly quaternate), shortly petiolate, bifacial leaves, mostly 4- (rarely to 2- or 6-)rayed umbels of triads with all flowers pedicellate, and predominantly 4-merous flowers lacking appendages at the tip of the flower bud. The flower colour is described as red, orange, or yellow, frequently red in the lower part and orange or yellow above.

The species is recorded only from Luzon in the Philippines, in highlands mostly at elevations from 1200 to 2400 m, rarely as low as 600 m (fig. 1; 19 collections seen). Habitat details are poorly known (the species has been twice recorded in primary forests), and hosts are unknown.

*Amyema acuta* is probably closely related to *A. celebica*, with which it may be more or less parapatric. The latter species is vegetatively more robust, with larger

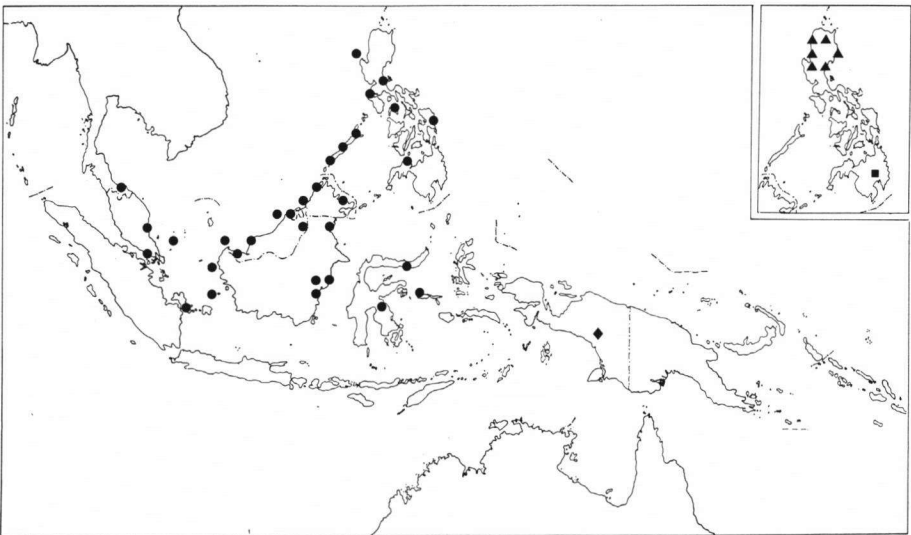


Fig. 1. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ▲ = *A. acuta* (Tieghem) Danser; ■ = *A. apoensis* (Elmer) Barlow; ◆ = *A. arthrocaulis* Barlow; ● = *A. beccarii* (Tieghem) Danser.

leaves which are less distinctly bifacial and with more prominent venation. The phyllotaxy in *A. celebica* is mostly decussate and often displaced, but sometimes leaves may be crowded into pseudowhorls and are rarely truly quaternate. Inflorescence and flower characters in the two species are very similar, although *A. celebica* usually has longer flowers which are 5-merous. See notes under *A. celebica* on similarity, nomenclature, and biogeography.

Danser (1935) segregated *A. mosea* from *A. acuta* on the basis of its glabrous inflorescence and shorter peduncle and corolla, but also expressed reservations about its specific status. Danser's specimen annotations show that he had previously placed them in *A. acuta*. Whilst the specimens examined in the present study show some plasticity in indumentum and floral dimensions, these differences appear to have little taxonomic value in this case. Similarly, Danser (1935) segregated *A. medinillicola* from *A. acuta* on the basis of small differences in corolla and leaf dimensions which appear to have little taxonomic value.

The holotypes of *Amyema mosea* and *Loranthus medinillicola* (PNH) are no longer extant. An isotype of *A. mosea* in UC, annotated by Danser, has been seen and designated lectotype of this name. An isotype of *L. medinillicola* in US has been seen and designated lectotype of that name.

## 2. *Amyema apoensis* (Elmer) Barlow, *comb. nov.*

*Loranthus apoensis* Elmer, Leafl. Philipp. Bot. 3 (1911) 1073. — *Dicymanthes apoensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Elmer 11454* (lecto L, see below; iso BO, NY, U), Philippines, Mindanao, Davao, Todaya, Mt Apo, viii.1909.

Glabrous. *Stems* terete, dilated at the nodes; internodes straight, mostly 6–15 cm long. *Leaves* decussate; lamina elliptic to broadly elliptic, 9–15 cm long, 4–8 cm wide, thickly coriaceous, dull on both sides when dry but slightly shining and darker green above when fresh, shortly attenuate at the base into an obscure flattened petiole 1–3 mm long, shortly acuminate and acute at the apex; venation pennate, faintly visible on both sides. *Inflorescences* in groups at the nodes, capitate, of 2 sessile triads on an obscure peduncle c. 0.5 mm long immersed in the bark and seemingly sessile; bracts spreading, broadly ovate, rounded, c. 2 mm long. *Ovary* narrowly funnel-shaped, c. 2.5 mm long; calyx limb erect, funnel-shaped, entire or weakly lobed, c. 2 mm long. *Corolla* in the mature bud relatively slender, almost cylindrical, 18–22 mm long; petals 5, lacking a deflexed spur inside just above the base. *Anther* 1.5–2 mm long; about half as long as the free part of the filament. *Fruit* not seen.

*Amyema apoensis* is known only from Mindanao in the Philippines (fig. 1; 2 collections seen), at elevations of 1830 and 2130 m. Habitat details and hosts are poorly known; the species is recorded from a damp wooded ravine and from dense forest, and recorded once as parasitic on *Ficus*.

The species is a member of the *Dicymanthes* species group (see above). Within this group it can be identified by its combination of relatively thick, almost isobilateral leaves with obscure flattened petioles, sessile inflorescences, free parts of the filaments distinctly longer than the anthers, and the absence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as pink or

brick red in the lower part and yellowish above. *Amyema apoensis* is probably closely related to *A. hexantha*, which occurs at the same locality and elsewhere in Mindanao, and differs in its distinctly petiolate leaves and long inflorescence peduncles.

Danser (1935) considered *Loranthus (Dicymanthes) apoensis* to be synonymous with *Amyema (Dicymanthes) cuernosensis*. The latter species differs in its sessile leaves often cordate at the base, shorter free part of the staminal filament, and presence of deflexed spurs forming a nectar chamber at the base of the corolla. However, in the differences cited above *A. apoensis* is distinct from all other species of the group, and specific status appears justified. The species is probably a young endemic, derived in situ in the highlands of Mindanao from the core stock of the *Dicymanthes* group.

The holotype of *Loranthus apoensis* (PNH) is no longer extant. An isotype in L has been seen and designated lectotype of the name. Other isotypes in NY and U (28006) have been seen.

Additional specimen examined: *Elmer 11813* (L, NY), Philippines, Mindanao, Davao, Todaya, Mt Apo (Mt Calelan), 1830 m, on oak, ix.1909.

### 3. *Amyema artensis* (Montrouzier) Danser

*Loranthus artensis* Montrouzier, Mém. Acad. Lyon 10 (1860) 213. — *Amyema artensis* (Montrouzier) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 293. — Type: *Montrouzier 199* (holo P), New Caledonia, Ile Art.

*Loranthus aneityensis* Guillaumin, J. Arnold Arbor. 13 (1932) 88. — *Amyema aneityensis* (Guillaumin) Danser, Rec. Trav. Bot. Néerl. 31 (1934) 223. — Type: *Kajewski 753* (holo NY; iso BRI, K), New Hebrides, Aneityum I, Analgauhaut Bay, 50 m, 12.ii.1929.

*Amyema papuana* Danser, Blumea 3 (1938) 46. — *Amyema artensis* var. *papuana* (Danser) Barlow, Austral. J. Bot. 22 (1974) 568. — Type: *Brass 4095* (holo L 936,139-483), New Guinea, Papua, Central, Mt Tafa, 2300 m, 27.v.1933.

*Amyema wichmannii* subsp. *aggregata* Barlow, Austral. J. Bot. 22 (1974) 598. — Type: *Galore & Wood NGF 41009* (holo LAE), New Guinea, Papua, Milne Bay, Idup Track to Mt Simpson, 1250 m.

Doubtful species provisionally included here:

*Loranthus tenuisepalus* Krause, Bot. Jahrb. Syst. 57 (1922) 482. — *Amyema tenuisepala* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Ledermann 12396* (B, not extant), New Guinea, Felsspitze, 1400–1500 m.

For descriptions and extensive additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 564, 566 under *A. aneityensis* and *A. artensis*; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 323, 344 under *A. bamleri* and *A. gracilis*; Danser, *ibid.*, 14 (1936) 88, 89 under *A. aneityensis* and *A. artensis*. *Amyema artensis* has few specialized characters other than the very few-rayed umbel, and thus presents a relatively generalized facies for the genus. The most common form of the species can be identified locally by its combination of decussate distinctly bifacial petiolate leaves, 2-rayed umbels, triads with the central flowers sessile and lateral flowers pedicellate, and 5-merous flowers. However, the species is relatively polymorphic, and forms with ternate or quaternate leaves and/or 3- to 5-rayed umbels are common, as well as others in which the lateral flowers of the triads are more or less sessile and/or the umbel rays are conrescent so that the inflorescence is capitate. The flower colour

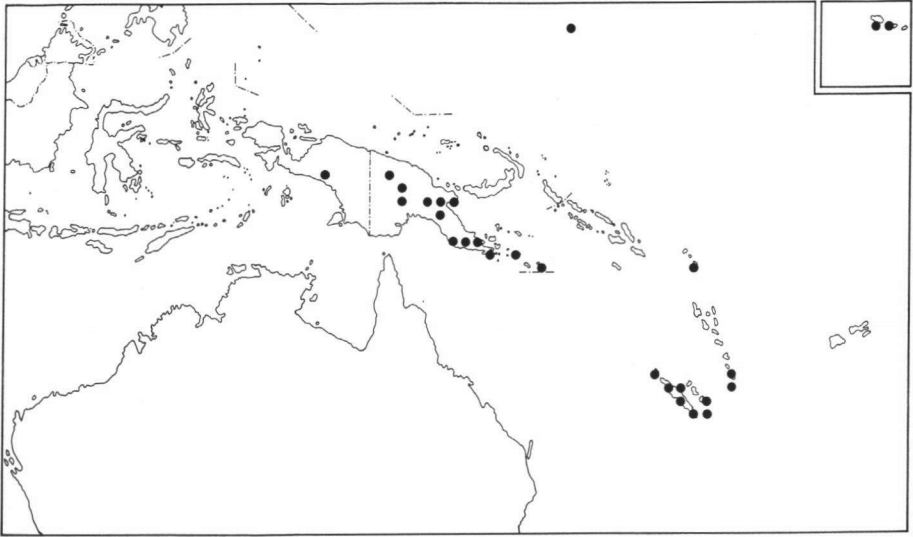


Fig. 2. Distribution of *Amyema artensis* (Montrouzier) Danser. Symbols show recorded occurrence in 1° grid cells. Inset shows occurrence in Samoa.

is described as various shades of red, pink, or orange, and frequently red or bright pink in the lower part and orange, yellow, or paler pink above.

The species is distributed from New Guinea to several island groups in the southwest Pacific, including the Solomons, Louisiades, New Caledonia and adjoining islands, Vanuatu, Caroline Islands, and Samoa (fig. 2; 105 collections seen). On the New Guinean mainland the species usually occurs at elevations from 1500 to 2500 m, but has been recorded from 1190 to 3400 m. In the other island groups it appears to range generally from sea level to the highest elevations which exist. Apart from the specimens previously placed in *A. aneityensis* and now included in *A. artensis* (see below), additional collections seen in the present study have not extended the known area. In New Guinea the species has been recorded from primary and secondary rain forests, parasitic on numerous different hosts, and in the other island groups from humid and gallery forests, again parasitic on various hosts.

*Amyema artensis* shows distinct morphological and ecogeographic links to other species of the Papuan region, especially *A. novaebritanniae* and *A. pachypus*. Together these species form a complex which has probably diversified extensively during the genesis of landforms in the region. *Amyema novaebritanniae* is endemic to the Bismarck Archipelago, and thus has a geographic replacement pattern with *A. artensis*. The two species differ consistently, but in relatively minor characters of leaf texture and inflorescence structure. Perhaps of more significance is the link from *A. artensis* to the species of the subalpine zone in New Guinea, exemplified by the sympatry but altitudinal separation of *A. artensis* and *A. pachypus*, and the approximate geographic replacement pattern of *A. artensis* and *A. wichmannii* (see below). *Amy-*

*ema artensis* is notable in the family for its wide distribution to remote islands (exceeded only by *Decaisnina forsteriana* which ranges from the Solomon Islands to Tahiti), and the polymorphy of the species complex is probably in part a consequence of its disjunctions.

The subalpine species *A. pachypus* occurs within the geographic range of *A. artensis* in New Guinea, but at generally higher elevations. With increasing elevation *A. artensis* shows increasing similarity to *A. pachypus*, especially in the smaller leaves and shorter, thicker, more strongly articulated inflorescence parts. However, these variations may be largely influenced by environment, and *A. pachypus* remains distinct in its 4-merous flowers and bracts constricted below the apex.

Further eastwards, at higher elevations in the Milne Bay District of New Guinea, *A. artensis* shows considerable variability in inflorescence characters and a closer resemblance to the subalpine species *A. wichmannii*. This may also be an environmentally-induced parallel variation, because there is no geographic contact between the two species, and intergradation is unlikely. The specimen from the highlands of the Milne Bay District distinguished by Barlow (1974) as *A. wichmannii* subsp. *aggregata* is therefore probably misplaced in this species. Along with several other specimens from the area, it is distinctive in having 4 or 5 rays in the umbel and sometimes a very weakly dilated apex of the peduncle, but this is probably a local extreme of variation in *A. artensis* rather than a disjunct differentiate of *A. wichmannii*. *Amyema wichmannii* subsp. *aggregata* is accordingly placed in synonymy with *A. artensis*. *Amyema wichmannii* differs from *A. artensis* in having 6–12 rays in the umbel and 4-merous flowers.

Danser (1936) and Barlow (1974) both accepted *A. aneityensis* as a distinct species, but with comments on its close affinities with *A. artensis*. *Amyema aneityensis* is distinguished primarily on its normally quaternate phyllotaxy and correspondingly greater number of rays in the umbel. Re-examination of the variation patterns in the present study has shown that ternate and occasionally quaternate phyllotaxy occur through much of the range of *A. artensis*, and that umbels with more than 2 rays are similarly of frequent occurrence. As suggested by Danser, *A. aneityensis* is apparently only a local form of *A. artensis* in Vanuatu.

Re-examination of the variation patterns in the present study has also shown that the narrow and acuminate-leaved form I distinguished previously as var. *papuana* (based on *Amyema papuana* Danser) has no geographic integrity, and may be only a juvenile state. It is therefore treated as equivalent to *A. artensis*.

One extreme variant in *A. artensis* highlights the polymorphy of some species of Loranthaceae, and the difficulty in circumscribing taxa and constructing comprehensive keys. A few specimens from Rossel Island and from New Caledonia show unusual inflorescences in which the two umbel rays are completely fused longitudinally, so that superficially the triads appear sessile. There is a correlated reduction in the pedicels of the lateral flowers of the triads, so that the inflorescence resembles a capitulum of sessile flowers not unlike that of the *Dicymanthes* species group. Whilst such variations are relatively robust indicators of specific or supraspecific difference elsewhere in the genus, in this case they occur mixed with normally developed inflorescences on the same specimen. The occurrence of this variation on both Rossel Island and New Caledonia suggests that it existed, at least in lowland populations,

prior to the dispersal of *A. artensis* southwestwards into the Coral sea lands. See note under *A. scandens*.

The status of *A. tenuisepala* is doubtful, and it is included in *A. artensis* tentatively. The species is based on a single collection by Ledermann from the Hunstein Mts of New Guinea, and there appear to be no duplicates of the type, which is no longer extant. However, Danser (1931) saw the specimen, accepted the species, and provided a detailed description. The description generally agrees with *A. artensis*, but differs in the 4-merous corolla, 4-rayed umbel, the relatively short inflorescence axis, and the free part of the staminal filament.

#### 4. *Amyema arthrocaulis* Barlow, *spec. nov.*

Species nova *A. scandenti* (Tieghem) Danser affinis, sed caulibus articulatis, foliis decussatis oblanceolatis vel anguste spathulatis, corolla 4-mera differt. — Typus: *Brass 11299* (holo L; iso CANB), New Guinea, 18 km NE Lake Habbema, 2200 m, xi.1938.

Glabrous. *Stems* slender, enlarged and distinctly articulated at the nodes; internodes with fully developed leaves 2–4 cm long. *Leaves* opposite; lamina oblanceolate to narrowly spatulate, 5–7 cm long, 1–2 cm wide, relatively thick, drying dark-coloured on both sides, gradually attenuate at the base into an obscurely defined petiole 5–10 mm long, rounded at the apex; venation pennate, raised below but indistinct. *Inflorescences* several at the nodes and developing successively; peduncle 13–15 mm long; rays 4, 5–8 mm long; flowers all sessile in the triads; bracts triangular, 1–1.5 mm long, broadly acute, forming a small spreading involucre below the triads. *Ovary* slender, 3 mm long, constricted below the limb; limb truncate, 1 mm long, slightly spreading. *Corolla* in the mature bud slender, 26–30 mm long, red below and yellow towards the apex, quadrangular when dry, acute; petals 4, free, lacking a spur on the inside just above the base. *Anther* slender, with a short knob-like sterile tip, c. 2.5 mm long, half as long as the free part of the filament. *Stigma* hardly wider than the style. *Fruit* not seen.

*Amyema arthrocaulis* is known only from the type collection from the highlands of Irian Jaya (fig. 1). Habitat details and hosts are unknown. The specimen was referred to *A. scandens* by Barlow (1974) and cited as a selected example of an 'intermediate' specimen which could not be placed in any of the three subspecies then recognized. Re-examination in the present study suggests that it represents an entity, like *A. cercidioides* and *A. canaliculata*, which has acquired a level of morphological and genetic differentiation and isolation consistent with specific status. Differences previously overlooked or not given sufficient weight include the opposite leaves, articulate stems, 4-merous flowers, and relatively short free part of the staminal filament. See notes under *A. scandens* and the species mentioned above.

The articulate stems and 4-merous flowers which distinguish this species within the *A. scandens* species complex are also found in other unrelated species of the New Guinean highlands. These character states may therefore be the result of parallel changes in response to the same selection pressures. *Amyema arthrocaulis* is probably a young endemic, derived in situ in the New Guinean highlands from the core stock of the *A. scandens* complex.



The specific epithet is derived from the Greek *arthro-* ('jointed') and *caulos* ('stem'), and alludes to the distinctive stems articulated at the nodes and with relatively short internodes.

### 5. *Amyema beccarii* (Tieghem) Danser

*Stemmatophyllum beccarii* Tieghem, Bull. Soc. Bot. France 41 (1894) 506, 546. — *Amyema beccarii* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Beccari* 688 (holo P; iso BM, BO, K), Borneo, Sarawak.

*Stemmatophyllum nodosum* Tieghem, Bull. Soc. Bot. France 41 (1894) 506, 546. — *Amyema nodosa* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Cuming* 1952 (lecto P, see below; iso BM, K), Philippines. Syntype: *Cuming* 1958 (BM, K, P), Philippines, 1841.

*Loranthus hutchinsonii* Merrill, Philipp. J. Sci. C 4 (1909) 138. — *Amyema hutchinsonii* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Mearns & Hutchinson* FB4554 (lecto L, see below), Philippines, Mindanao, Misamis, Mt Malindang, 1100 m, v.1906.

For additional synonymy see Danser (1931, 1935) under *A. beccarii* and *A. nodosa*.

Glabrous. *Stems* terete, dilated at the nodes, much branched. *Leaves* usually quaternate, rarely decussate; lamina narrowly obovate to obovate or elliptic, (3–)5–9 (–14) cm long, (1–)2.5–5(–6) cm wide, relatively thick, dull on both sides, attenuate at the base into a petiole (3–)5–10(–15) mm long, rounded to obtuse at the apex; venation obscure except for the midrib distinct in the lower part. *Inflorescences* many at the nodes and also arising on the internodes and epicortical runners, apparently sessile 1- to 3- (usually 2-)flowered umbels; peduncle obscure, sunken in the bark; pedicels (0.5–)2–4 mm long; bracts ovate, acute or obtuse, c. 1 mm long. *Ovary* obovoid, 2–2.5 mm long; calyx limb entire, slightly spreading, 0.5–1 mm long. *Corolla* in the mature bud 13–22 mm long, usually slightly inflated at the base, rounded at the apex; petals 5 or 6, separating to the base. *Anther* 2–5 mm long, obtuse, sessile or much longer than the free part of the filament. *Fruit* obovoid, 7–8 mm long, crowned by the persistent calyx limb.

*Amyema beccarii* is recorded from Sumatra, peninsular Malaysia, and Thailand to Borneo, from Palawan and Luzon to Mindanao in the Philippines, and also from Celebes and Moluccas (fig. 1; 39 collections seen), mostly at low elevations but ranging to at least 1300 m. Habitat details are poorly known; the species apparently occurs in rain forest, and has been recorded as parasitic on *Barringtonia*, *Gonystylus*, *Melastoma*, *Palaquium*, *Psychotria*, and *Shima*. *Amyema beccarii* represents the furthest extension of the genus northwards, and is its only species occurring on the Asian mainland. As a lowland species with low host specificity, it has presumably expanded its area to the north and west during periods of minimum sea level.

*Amyema beccarii* represents one of the extremes of inflorescence reduction in the genus, and the sessile, few-flowered, simple umbels arise from the epicortical runners and lenticels as well as at the nodes. This combination of characters is distinctive for the species, being shared only with the closely related Philippine species *A. wenzelii*. The latter species differs in its larger leaves, sessile anthers, and almost sessile flowers. Such cauliflory is relatively common in the amyemas of humid forests and tends to be correlated with reduced inflorescences. The corolla in *A. beccarii*

is most commonly described as red, orange, or yellow in the lower part and green above, sometimes with a purple zone at the tip.

*Amyema beccarii* is occasionally confused with *A. fasciculata*, in which the inflorescence can also be interpreted as a few-flowered simple umbel. Apparently, inflorescence reduction to a simple umbel has occurred independently several times in *Amyema*. The derived simple umbels may not be homologous, as they could represent, for example, reductions to solitary cymules (i. e., triads with all flowers pedicellate) by elimination of the peduncle and all but one ray of the conflorescence, or reductions of each cymule in the conflorescence to a single flower. In the case of *A. beccarii* the variation in the number of rays suggests that they may represent the true rays of the basic conflorescence, and that the true peduncle is lacking and the cymules are reduced to single flowers. See note under *A. fasciculata*. *Amyema fasciculata* differs from *A. beccarii* in its shortly but distinctly pedunculate umbels.

Danser (1935) expressed doubts that *A. nodosa* and *A. hutchinsonii* were specifically distinct from *A. beccarii*. The present study has shown not only that these three names refer to a single continuum of variation, but also that its total area extends over much of the Malesian region. Because of its common occurrence in lowland habitats, its dispersal has presumably been facilitated by lowered sea levels in the Quaternary.

Van Tieghem (1894) based *Loranthus nodosus* on two collections by Cuming, which are therefore syntypes. The specimen *Cuming 1952* in P, annotated by Van Tieghem, bears flowers, and is here designated lectotype of the name. The holotype of *Loranthus hutchinsonii* (PNH) is no longer extant, but an isotype in L has been seen and designated lectotype of that name.

## 6. *Amyema benguetensis* (Merrill) Danser

*Loranthus benguetensis* Merrill, Philipp. J. Sci. C 4 (1909) 134. — *Amyema benguetensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Curran, Merritt & Zschokke FB 16064* (lecto US 711604, see below; iso NY), Philippines, Luzon, Benguet, Mt Pulog, i.1909.

For description see Danser, Philipp. J. Sci. 58 (1935) 73. *Amyema benguetensis* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of small, regularly quaternate, sessile, bifacial leaves, mostly 4- (rarely to 2- or 6-)rayed umbels of triads with all flowers pedicellate, and glabrous corollas less than 21 mm long. The flower colour has been recorded only once, as yellow in the lower part and red above.

The species is recorded only from Luzon in the Philippines, in highlands at elevations from 1200 to 1600 m (fig. 3; 4 collections seen). Additional collections seen in the present study have not extended the previously known area. Habitat details are poorly known; there is one record of *Pinus* as host.

*Amyema benguetensis* is closely related to *A. luzonensis*, and probably also to *A. rhytidoderma*. The three species form a complex endemic to Luzon, with distinct altitudinal zonation. *Amyema benguetensis* occurs at the middle elevations between the lowland *A. luzonensis* and the highland *A. rhytidoderma*. *Amyema benguetensis* is hardly distinguishable vegetatively from *A. luzonense*, but is constantly different in

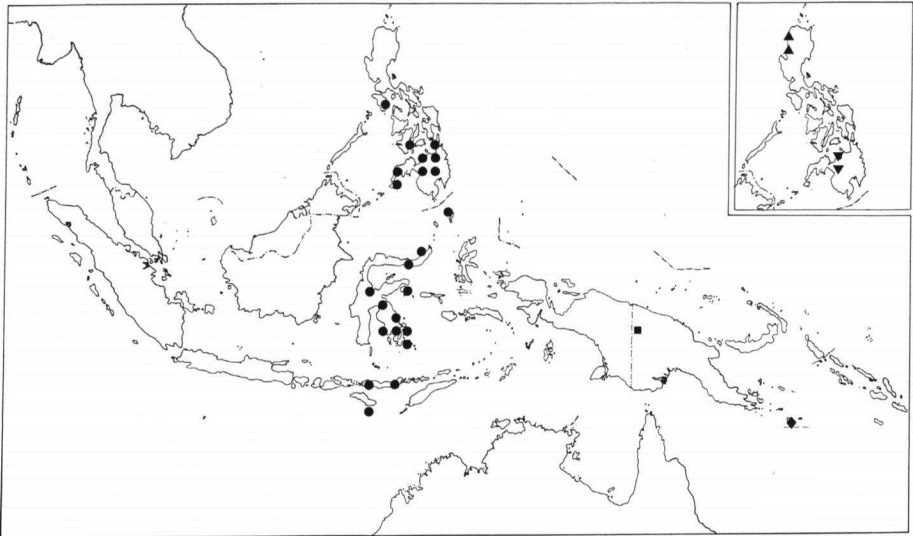


Fig. 3. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ▲ = *A. benguetensis* (Merrill) Danser; ◆ = *A. brassii* Barlow; ■ = *A. canaliculata* Barlow; ▼ = *A. cauliflora* (Merrill) Barlow; ● = *A. celebica* (Tieghem) Danser.

the shorter, glabrous flowers. *Amyema benguetensis* differs from *A. rhytidoderma* in having smaller leaves, glabrous flowers, and longer inflorescence parts. See notes under *A. luzonensis* on similarity and biogeography.

Danser (1935) doubted that *A. benguetensis* was specifically distinct from *A. luzonensis*. Whilst the two entities are very closely related and clearly of common derivation, the constant differences shown in the materials examined support their retention as distinct species. The differences shown by *A. rhytidoderma* at higher elevations do not represent a simple unidirectional cline, which further supports this treatment.

The holotype of *Loranthus benguetensis* (PNH) is no longer extant. Isotypes in US (711604) and NY have been seen. The specimen in US is larger, and bears flowers, and is here designated lectotype of the name.

## 7. *Amyema benthamii* (Blakely) Danser

*Loranthus benthamii* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 393. — *Amyema benthamii* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Jutson s.n.* [lecto NSW 67396, fide Barlow, Austral. J. Bot. 14 (1966) 458], Western Australia, Comet Vale, xii.1917.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 103. *Amyema benthamii* can be identified locally by its combination of opposite sessile leaves truncate to cordate at the base, 2-rayed umbels of triads with the central flower sessile and lateral flowers pedicellate, and ovary and fruit densely white-tomentose in the lower part. The flower colour is usually red in the lower part and green above.

The species occurs in semi-arid woodlands of Western Australia and Northern Territory, very commonly parasitic on *Brachychiton* but recorded on various other hosts, especially in the northern part of its range. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are thick, curvined and isobilateral, and few-rayed umbels of triads.

In the Kimberley region of Western Australia *A. benthamii* intergrades into *A. dolichopoda*. *Amyema benthamii* was previously circumscribed more broadly to include most of this variation, and some specimens previously placed in *A. benthamii* are now referred to *A. dolichopoda* or treated as intergrades. See note under *A. dolichopoda*.

### 8. *Amyema bifurcata* (Bentham) Tieghem

*Loranthus bifurcatus* Bentham, Fl. Austral. 3 (1867) 393. — *Amyema bifurcata* (Bentham) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: *Brown s.n.* (holo BM; iso CANB, MEL), Australia, Carpentaria Island H (North I., Sir Edward Pellew Group) and Groote I., 17–25.xii.1802 and 15.i.1803.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 112. *Amyema bifurcata* can be identified locally by its combination of opposite, pendulous, eucalyptoid leaves, 2-rayed umbels of dyads, robust flowers with a dense rusty-brown indumentum, and enlarged concave bracts appressed to the ovary. The red flower colour is obscured by the indumentum.

The species occurs widely in tropical and subtropical Australia, exclusively parasitic on *Eucalyptus* to which it shows a close visual resemblance in its pendulous falcate leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

A distinctive entity in the Kimberley region of Western Australia, with sessile flowers and ivory-white indumentum, was distinguished by Barlow (1983) as a variety *eburna*. Additional materials now available indicate that this entity should be accorded specific rank. See discussion under *A. eburna*.

### 9. *Amyema biniflora* Barlow

*Amyema biniflora* Barlow, Austral. J. Bot. 14 (1966) 459. — Type: *Banks & Solander s.n.* (holo BM; iso MEL, NSW).

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 112. *Amyema biniflora* can be identified locally by its combination of opposite, pendulous, eucalyptoid leaves, 2-rayed umbels of dyads, slender almost glabrous flowers, and small bracts. The flower colour is usually red in the lower part and green above.

The species occurs disjunctly in tropical and subtropical Queensland, exclusively parasitic on *Eucalyptus* to which it shows a close visual resemblance in its pendulous

falcate leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

### 10. *Amyema brassii* Barlow

*Amyema brassii* Barlow, Austral. J. Bot. 22 (1974) 568. — Type: *Brass* 27827 (holo L 958,003-492; iso CANB, K, LAE 31009), New Guinea, Sudest I., Mt Riu, west slopes, 600 m, 25.viii. 1956.

For description see Barlow, Austral. J. Bot. 22 (1974) 568. *Amyema brassii* can be identified by its combination of large opposite bifacial very shortly petiolate leaves, unusual umbels of tetrads with the outermost flower sessile and the lateral and innermost flowers shortly pedicellate, and shortly gamopetalous corolla. The flower colour is described as pink.

*Amyema brassii* is known only from Tagula I., Milne Bay District, Papua New Guinea (fig. 3; 2 collections seen), at elevations of 600 and 740 m. Habitat details and hosts are unknown. Because of the shortly gamopetalous corollas and unusual floral tetrads, the species is very distinctive in the genus, and with the related *A. tetraflora* comprises a small satellite of the main field of variation. See note under *A. tetraflora*.

### 11. *Amyema cambagei* (Blakely) Danser

*Loranthus cambagei* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 392; *ibid.* 48 (1923) 143. — *Amyema cambagei* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Maiden & Cambage s.n.* (lecto NSW), New South Wales, Grose R., on *Casuarina cunninghamiana*, ix.1906.

For description and further typification see Barlow, Flora of Australia 22 (1984) 108. *Amyema cambagei* can be identified locally by its combination of slender terete leaves, few-rayed umbels of triads, and slender flowers with a short grey indumentum. The flower colour is pink, partly obscured by the indumentum.

The species occurs in open forests and woodlands of eastern Australia, exclusively parasitic on several species of Casuarinaceae to which it shows a close visual resemblance in its slender terete leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, scleromorphic leaves, and few-rayed umbels of triads.

### 12. *Amyema canaliculata* Barlow

*Amyema canaliculata* Barlow, Austral. J. Bot. 22 (1974) 569. — Type: *Henty & Foreman* NGF 42624 (holo LAE 112946; iso L), New Guinea, Sepik, Telefomin, Freida R., Prospect Ck, 600 m, on *Dacrydium*, 24.vi.1969.

For description see Barlow, Austral. J. Bot. 22 (1974) 569. *Amyema canaliculata* can be identified locally by its combination of scattered-ternate, very narrow, strong-

ly channeled leaves without visible venation, inflorescence with a short peduncle and few umbel rays, and flowers all sessile in the triads. The flower colour is pink.

*Amyema canaliculata* is known only through the type specimen from the Freida River area, Papua New Guinea (fig. 3), at an elevation of 600 m. Habitat details are unknown other than the host record on *Dacrydium*. It is a differentiate of the *A. scandens* species complex which is well developed in New Guinea and extends to New Caledonia. Within this complex it is distinct in its leaf characters and unusual non-dicotyledonous host. See discussion under *A. scandens*.

### 13. *Amyema caudiciflora* (Lauterbach) Danser

*Loranthus caudiciflorus* Lauterbach, Nova Guinea 8 (1910) 290. — *Amyema caudiciflora* (Lauterbach) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Versteeg 1473* (holo L; iso K, WRSL), New Guinea, southwest, Nordrivier near Geitenkamp, 10.vii.1907.

*Loranthus gigantifolius* Krause, Nova Guinea 14 (1923) 102. — *Amyema gigantifolia* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Lam 1875* (lecto L, see below), New Guinea, ridge to the Doorman Top, 1450 m, 2.xi.1920.

*Amyema scandens* subsp. *crassifolia* Barlow, Austral. J. Bot. 22 (1974) 588. — Type: *Hoogland & Schodde 7243* (holo CANB 84223; iso L 961,203-66), New Guinea, W Highlands, Lagaip Valley, Kepilam, 2480 m, 30.vii.1960.

Glabrous. *Stems* usually robust, slightly enlarged at the nodes, with papery bark when older; internodes terete, with scattered, large, raised lenticels, 4–8(–13) cm long. *Leaves* ternate, scattered-ternate, or quaternate; lamina usually ovate or obovate or rarely lanceolate, (7–)12–21 cm long, (3–)6–10 cm wide, thick, dull on both sides, 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 or rarely obtuse or broadly acute at the apex; venation pennate, obscure except for the midrib distinct and raised below. *Inflorescences* several at the nodes and arising in groups from the lenticels of older stems; peduncle (3–)10–15(–27) mm long, 1–2 mm thick; rays 4–6, 5–9 mm long; flowers all sessile in the triads; bracts triangular, c. 1.5 mm long, rounded, forming a small spreading involucre below the triads. *Ovary* barrel-shaped, 2.5–4 mm long; calyx limb truncate or weakly toothed, 1–1.5 mm long, erect. *Corolla* in the mature bud slender, 27–35 mm long, usually shortly rounded or obtuse, 5- or 6-merous. *Anther* 2.5–4 mm long, about half as long as the free part of the filament. *Stigma* knob-like, 1.2–1.5 times wider than the style. *Fruit* ovoid to nearly globular, 8–10 mm long, crowned by the calyx limb and often by long persistent styles.

*Amyema caudiciflora* is endemic to New Guinea (fig. 8; 33 collections seen), in highlands at elevations from (500–)1250 to 2500 m. The species occurs in primary and secondary rain forest, probably parasitic on a wide range of hosts including *Calophyllum*, *Castanopsis*, *Macaranga*, *Nothofagus*, and *Opocunonia*.

*Amyema caudiciflora* is a member of the *Amyema scandens* species complex that can be identified in the Papuasian region by the inflorescence of a 4- to 8-rayed umbel of triads with all flowers closely sessile in an equidistant arrangement. Within this group it can be identified by its leaves which are ternate, scattered ternate or quaternate, sessile or nearly so, thick, mostly recurved at the margin and rounded at the apex. The corolla is nearly always described as pink, rarely light or dark red.

The two species accepted here as *A. caudiciflora* and *A. plicatula* essentially represent a change of rank for two subspecies of *A. scandens* circumscribed by Barlow (1974). For further discussion see under *A. plicatula*. *Amyema caudiciflora* represents the entity formerly designated as *A. scandens* subsp. *crassifolia*. Its cohesive area is consistent with its recent differentiation as an adaptive biotype in the emerging montane ecosystems of New Guinea.

The holotype of *Loranthus gigantifolius*, Lam 1875 (B), is not extant. An isotype in L has been seen and designated lectotype of the name.

For further discussion, see under *A. scandens*.

#### 14. *Amyema cauliflora* (Merrill) Barlow, *comb. nov.*

*Loranthus cauliflorus* Merrill, Philipp. J. Sci. 1: Suppl. (1906) 105. — *Dicymanthes cauliflora* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Clemens 55* (M, probably not extant, see below), Philippines, Mindanao, Lanao, Lake Lanao, W of Camp Keithley.

For description see Danser, Philipp. J. Sci. 58 (1935) 93. The species is known only from Mindanao, Philippines (fig. 3; 1 collection seen). The species is quite distinctive in the genus by virtue of its inflorescence, which is a capitulum formed from a single triad of sessile flowers on a very short peduncle. Flower colour is described as bright red. Habitat details and hosts are unknown.

Danser (1929, 1935) included the species in his genus *Dicymanthes* (see above), noting that it was exceptional in having an inflorescence of only one triad rather than two. He considered the species to be closely related to *D. seriata* (= *A. seriata*), which is similar vegetatively and has a typical 6-flowered capitate inflorescence. Whilst the two species are known only from very few specimens from the same general area, the additional material seen in the present study indicates that they are distinct. See note under *A. seriata*.

The holotype of *A. cauliflora* is apparently not extant. The specimen cited below agrees closely with Danser's description. It is not selected as neotype, however, because being a fruiting specimen its conformity with some of the floral characters described cannot be determined.

Specimen examined: *Sulit 3060 PNH 10218* (L), Philippines, Mindanao, Bukidnon, Mt Intiway, 1000 m, 11.ii.1949.

#### 15. *Amyema celebica* (Tieghem) Danser

*Rhizanthemum celebicum* Tieghem in Morot, J. de Bot. 15 (1901) 364. — *Amyema celebica* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Forsten 175* (holo P; iso L 908,128-274, -284), Celebes, Tondano, v.1860.

*Loranthus bicoloratus* Elmer, Leaflet Philipp. Bot. 2 (1908) 470. — Type: *Elmer 9950* (lecto L, see below), Philippines, Negros, N Oriental, Dumaguete, iv.1908.

*Loranthus basilanensis* Merrill, Philipp. J. Sci. C 4 (1909) 134. — *Amyema basilanensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Hutchinson FB 3447* (holo M, not seen), Philippines, Basilan, Moro, Point Matangal, 3 m.

*Amyema anisomeres* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 322. — Type: *Kjellberg 2577* (holo BO), Celebes, near Kp. Latoe (Malili).

For description and further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 328; Philipp. J. Sci. 58 (1935) 80. *Amyema celebica* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of displaced opposite to irregularly whorled, shortly petiolate, weakly bifacial leaves, few-rayed umbels of triads with all flowers pedicellate, and predominantly 5-merous flowers. The flower colour is described as yellow, orange, red, or purple, sometimes grading to green above.

The species is recorded from Celebes (including Talaud Is.), Philippines (Negros, Basilan, Mindoro, Mindanao), and Lesser Sunda Islands (Sumba, Flores), mostly at low elevations up to 700 m but less frequently up to 1900 m (fig. 3; 31 collections seen). Habitat details and hosts are unknown.

*Amyema celebica* is probably closely related to *A. acuta*, with which it may be more or less parapatric. It is vegetatively more robust than *A. acuta*, with larger leaves which are less distinctly bifacial and with more prominent venation. The phyllotaxy in *A. celebica* is mostly decussate and often displaced, but sometimes leaves may be crowded into pseudowhorls and are rarely truly quaternate, whereas *A. acuta* has regularly whorled phyllotaxy. Inflorescence and flower characters in the two species are very similar, although *A. celebica* usually has longer, 5-merous flowers.

*Amyema acuta* and *A. celebica* have contiguous distributions in eastern Malesia, together extending through the Philippine Islands to Celebes and the central Lesser Sunda Islands. They have probably diverged ecogeographically from a common ancestor, *Amyema acuta* being a northerly differentiate which occurs mostly at higher elevations, and is generally less robust vegetatively.

Correct application of the name *A. celebica* is made difficult by the fragmentary state of the type specimen. In vegetative characters the specimen also resembles *A. acuta*, having relatively small regularly quaternate leaves. However, the slender stems suggest that the specimen was taken from young growth, so that the leaves may not have reached mature size and thickness. The flowers are 5-merous, but are relatively short for *A. celebica* and fall within the range for *A. acuta*. If the specimen were to be referred to the species here treated as *A. acuta* it would represent a major geographic disjunction for that species, and would obviate the otherwise clear geographical relationship between the two species. Because the specimen is not inconsistent with other specimens from Celebes and the southern Philippines it is better placed with them. If the type and the name *A. celebica* were applied to the species here treated as *A. acuta*, the next available basionym for the species here treated as *A. celebica* would be *Loranthus bicoloratus* Elmer.

The holotype of *Loranthus bicoloratus* (PNH) is no longer extant. An isotype in L has been seen and designated lectotype of the name. This specimen allows confirmation of Danser's view that *L. bicoloratus* is conspecific with *A. celebica*. Type material of *Loranthus basilanensis* has not been seen. However, other specimens referred to this species by Danser have been seen, and agree closely with *A. celebica*. Danser (1935) considered *A. basilanensis* to be a small-flowered form of the latter species.

Danser (1935) considered *A. anisomeres* to be distinct from *A. celebica* in having the central flower of the triad sessile, but this condition is not consistent. In some specimens the pedicel of the central flower is shorter than those of the laterals, and



even within a specimen the central flowers can be sessile or pedicellate. This is true even of the type specimen of *A. anisomeres*.

### 16. *Amyema cercidioides* (Krause) Danser

*Loranthus cercidioides* Krause, Nova Guinea 14 (1923) 103. — *Amyema cercidioides* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Lam 1893* (holo L 926,134-985; iso K, U 78803), New Guinea, Doorman Top, 1450 m, 3.xi.1920.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 329; Barlow, Austral. J. Bot. 22 (1974) 570. The species can be identified locally by its combination of opposite sessile leaves cordate at the base, inflorescence with a short peduncle and few umbel rays, and flowers all sessile in the triads.

*Amyema cercidioides* is still known only through the type specimen from the New Guinean highlands (fig. 4). Habitat details and hosts are unknown.

The species is a differentiate of the *A. scandens* species complex. Because of the extreme polymorphy of this complex, the lack of further collections of *A. cercidioides* raises some doubt about its taxonomic status. *Amyema caudiciflora* in particular has a discrete area in the highlands of New Guinea and is distinguished by its thick, sessile leaves. Whilst *A. cercidioides* may be an extreme form of this entity, its distinctive opposite leaves with cordate base suggest a level of differentiation consistent with specific status. See notes under *A. scandens* and *A. caudiciflora*.

### 17. *Amyema congener* (Sieber ex Schultes & J.H. Schultes) Tieghem

*Loranthus congener* Sieber ex Schultes & J.H. Schultes, Syst. Veg. 7, 1 (1829) 114. — *Amyema congener* (Sieber ex Schultes & J.H. Schultes) Tieghem, Bull. Soc. Bot. France 41 (1984) 507. — Type: *Sieber 243* (holo not seen; iso BM, G, K).

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 95. *Amyema congener* can be identified locally by its combination of flat leaves more than 1 cm wide, 3- to 5-rayed umbel of triads with the central flower sessile, tomentose calyx, and glabrous corolla lacking longitudinal ridges. Flower colour is predominantly green or yellow, sometimes with red in the lower part.

The species occurs in eastern Australia from the Torres Strait islands to southern New South Wales, in rain forest and open forest, parasitic on many hosts but often on Casuarinaceae, *Acacia*, *Geijera*, and other Loranthaceae. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. There are three subspecies with minor differences in leaf and inflorescence characters, but strong ecogeographic separation, particularly in respect of habitat and host preferences.

### 18. *Amyema conspicua* (F.M. Bailey) Danser

*Loranthus conspicuus* F.M. Bailey, Queensland Agric. J. 26 (1911) 198. — *Amyema conspicua* (F.M. Bailey) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Bancroft s.n.* (holo BRI), Queensland, Eidsvoid, ii.1911.

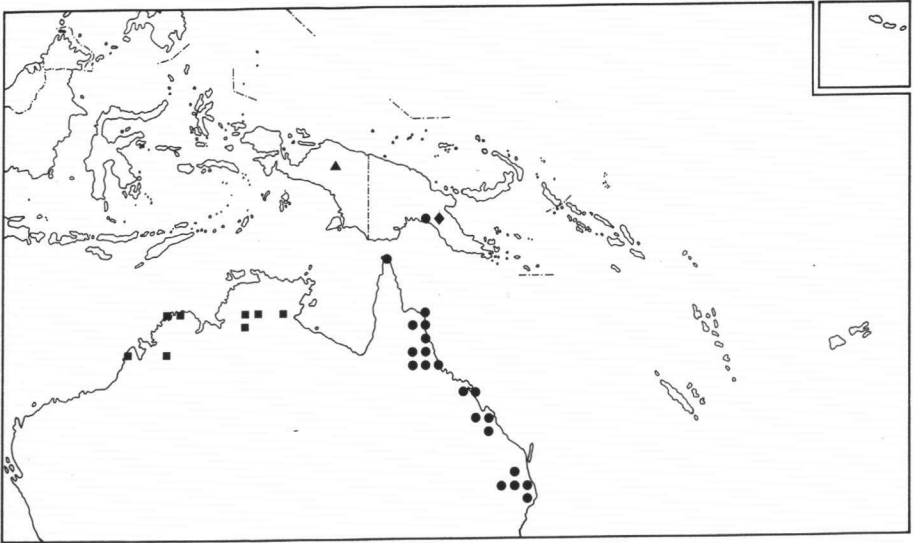


Fig. 4. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ▲ = *A. cercidioides* (Krause) Danser; ◆ = *A. conspicua* (F.M. Bailey) subsp. *fulvicalyx* Barlow; ● = subsp. *conspicua*; ■ = subsp. *obscurinervis* Barlow.

For description and further synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 571; *Flora of Australia* 22 (1984) 101. *Amyema conspicua* can be identified locally by its combination of flat petiolate leaves more than 1 cm wide, 2-rayed umbel of triads with the central flower sessile, tomentose inflorescence, ovary distinctively white-tomentose in the lower part, and glabrous corolla. Flower colour is predominantly green.

The species occurs in New Guinea, Arnhem Land, and eastern Australia from the Torres Strait islands to northern New South Wales, in rain forests and open forests, parasitic on many different hosts (fig. 4). It shows features common in Australian amyemas of open forests and woodlands (even in New Guinea), including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. There are three subspecies with minor differences in leaf and indumentum characters but strong ecogeographic separation. Only one subspecies, *fulvicalyx* Barlow, was previously recorded for the Flora Malesiana area (Barlow, 1974), from uplands of the Morobe District, Papua New Guinea, but the present study has revealed the occurrence also of subsp. *conspicua*, in the Gulf District of Papua New Guinea, parasitic on *Avicennia*.

Additional specimens seen in the present study have extended the known range of the third subspecies, *obscurinervis* Barlow, through the Kimberley region to the northwest coast of Western Australia. In the western part of its range intergradation appears to occur with the related species *A. benthamii*, *A. dolichopoda*, and *A. villiflora*. See note under *A. dolichopoda*.

### 19. *Amyema corniculata* Danser

*Amyema corniculata* Danser, *Brittonia* 2 (1936) 133. — Type: *Brass 4564* (holo NY; iso L), New Guinea, Wharton Range, Murray Pass, 2840 m, vi–ix.1933.

For descriptions see Danser, *Brittonia* 2 (1936) 133; Barlow, *Austral. J. Bot.* 22 (1974) 573. *Amyema corniculata* can be distinguished from its subalpine congeners in New Guinea by its inflorescence with very slender parts, regular spreading 4-rayed umbel of triads, and bracts with complex dorsal protuberances. The flower colour is described as red.

*Amyema corniculata* is known only from subalpine forests on the slopes of Mt Albert Edward, Papua New Guinea (fig. 5; 3 collections seen), at an elevation of 2840 m. Hosts are unknown. The species is a local endemic related to other species of high elevations in New Guinea, especially *A. pachypus* and *A. artensis*. See note under *A. pachypus*.

### 20. *Amyema cuernosensis* (Elmer) Barlow, *comb. nov.*

*Loranthus cuernosensis* Elmer, *Leafl. Philipp. Bot.* 2 (1908) 469. — *Dicymanthes cuernosensis* (Elmer) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 311. — Type: *Elmer 9525* (lecto L, see below; iso U 27322), Philippines, Negros, N Oriental, Dumaguete, Cuernos Mts, iii.1908.

*Dicymanthes breviflora* Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 363. — Type: *Forsten s.n.* (lecto L, see below), Celebes, near Tondano, 1840; *Koorders 43009a* (syn: BO, not seen), Java, Besoeki, G. Idjèn, Litjin, 500 m.

*Dicymanthes lombocana* Danser, *Blumea* 2 (1936) 58. — Type: *Elbert 1700* (holo L), Lesser Sunda Islands, Lombok, Rindjani Volcano, E side, 1300–1500 m, 2.vi.1909.

For full descriptions see Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 363, under *Dicymanthes breviflora*; Philipp. J. Sci. 58 (1935) 98, under *D. cuernosensis*; *Blumea* 2 (1936) 58, under *D. lombocana*.

The essential characters for an integrated description are as follows: Glabrous or the inflorescence and flowers sparsely brown tomentose. *Stems* terete, dilated at the nodes; internodes mostly 7–10 cm long. *Leaves* decussate, sessile; lamina elliptic to ovate, 6–20 cm long, 3–8 cm wide, usually thick, grey and often glossy above, dull brown below, truncate to cordate at the base, usually weakly acuminate and acute at the apex; venation pennate with the midrib prominent towards the base and the major lateral veins visible. *Inflorescence* capitate, of two sessile triads on a very short or obscure peduncle 0.5–1.5(–2.5) mm long immersed in the bark and seemingly sessile; bracts spreading, usually suborbicular, (0.5–)1–2 mm long. *Ovary* ellipsoid to shortly cylindrical, 2–2.5 mm long; calyx limb erect, entire, 0.5–1 mm long. *Corolla* in the mature bud slender, very weakly clavate, acute or obtuse, (12–) 17–23 mm long; petals 5, each usually with a deflexed spur inside just above the base. *Anther* (1–)2.5–4 mm long; usually approximately equal to the free part of the filament. *Fruit* ellipsoid, crowned by the calyx limb.

*Amyema cuernosensis* is recorded from Negros and Mindanao in the Philippines, from Celebes and Java, and from Bali, Flores and Lombok in the Lesser Sunda Islands (fig. 5; 13 collections seen), at elevations from 800 to 1800 m. Habitat details and hosts are poorly known; there is one record as parasitic on *Lantana*.

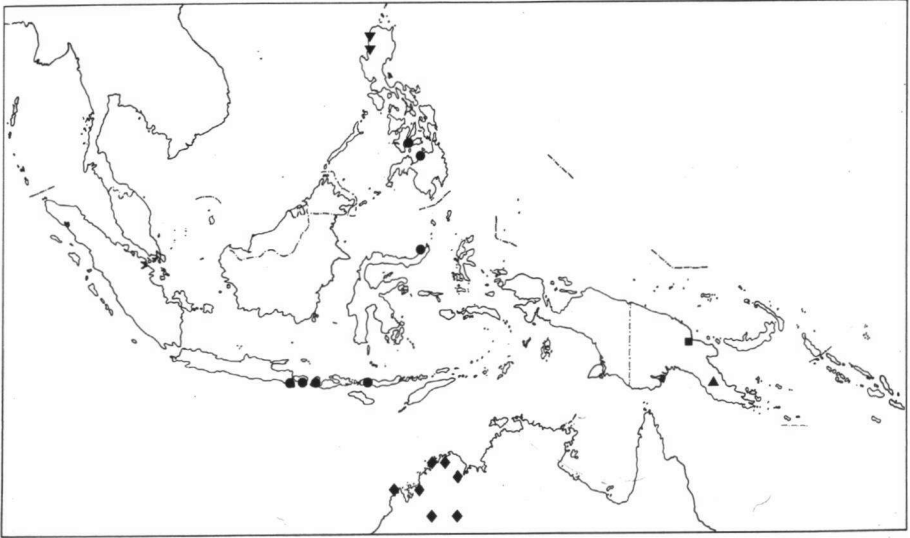


Fig. 5. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ▲ = *A. corniculata* Danser; ● = *A. cuernosensis* (Elmer) Barlow; ▼ = *A. curranii* (Merr.) Danser; ■ = *A. dilatipes* Barlow; ◆ = *A. dolichopoda* Barlow.

The species is a member of the *Dicymanthes* species group (see above). Within this group it can be identified by its combination of leaves sessile and usually cordate at the base, very short peduncle which gives the impression of a sessile inflorescence, relatively long-clavate tip of the flower bud, free parts of the filaments about as long as the anthers, and presence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as bright red, or yellow or orange in the lower part and orange or red above.

*Amyema cuernosensis* is probably related to *A. edanoi* which occurs in the Philippines and Celebes. It differs from *A. edanoi* in its more distinctly bifacial leaves more strongly cordate at the base, obscure inflorescence peduncles, and anthers approximately equal to the free parts of the filaments. Its relatively wide distribution in Malesia suggests that it is one of the older differentiates of the *Dicymanthes* species group.

In describing *Dicymanthes breviflora*, Danser (1931) commented on its close resemblance to *D. cuernosensis*, citing the shorter corolla lacking deflexed spurs as differential characters. The present study has shown that *D. breviflora* falls within the range of variability of *A. cuernosensis*, and that deflexed spurs are in fact present on the type specimen. The specimens from the Lesser Sunda Islands similarly conform with *A. cuernosensis*, although the type of *D. lombocana* is unusual in its poorly developed bracts and its anthers longer than the free parts of the filaments.

The holotype of *Loranthus cuernosensis* (PNH) is no longer extant. An isotype in L has been seen and designated lectotype of the name. An isotype in U has also been seen.

Danser did not nominate a type for *Dicymanthes breviflora*. Of the two cited collections, which are therefore syntypes, the description was based on one and the illustration on the other. The use by Danser of the fruiting specimen of Forsten for the description implies his acceptance of this specimen as representative of the species, and it is accordingly chosen as lectotype of the name.

## 21. *Amyema curranii* (Merrill) Danser

*Loranthus curranii* Merrill, Philipp. J. Sci. C 4 (1909) 144. — *Amyema curranii* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Jacobs 7578* (neo L, here chosen, see below), Philippines, Luzon, Mt Tabayoc, 2000–2100 m, 19.ii.1968 [holo *Curran FB 5035* (not extant), Philippines, Luzon, Mountain Province, Benguet, Mt Santo Tomas, 2250 m, on *Podocarpus*].

For description see Danser, Philipp. J. Sci. 58 (1935) 66. Danser described the central flowers of the triad as sessile but they may be subsessile on pedicels up to 0.3 mm long. *Amyema curranii* can be identified locally by its combination of many-rayed umbels of triads as described above and 4-merous flowers. The flower colour is consistently described as red.

The species is apparently endemic to Luzon, Philippines (fig. 5; 3 collections seen), recorded at elevations from 1200 to 2400 m. Other habitat details and hosts are unknown. It is similar to *A. incarnatiflora* (see note there). It is also similar to *A. haenkeana*, which is common at lower elevations in Luzon. However, these two species may not be closely related, as the many-rayed umbel is probably a symplesiomorphic state, and the 4-merous flowers of *A. curranii* indicate links to other species. *Amyema curranii* has few other specialized characters, and thus presents a generalized facies for the genus.

Danser (1935) described the corolla of *A. curranii* as gamopetalous, split on one side by the flexing of the style. Choripetalous corollas are usual in the genus, although the petals may sometimes remain coherent long after anthesis. See note under *A. haenkeana*.

The holotype of *Loranthus curranii* (PNH) is no longer extant, and no isotypes have been located. The specimen *Jacobs 7578* agrees closely with the description of the species, is from a comparable upland locality in Luzon, and is accordingly chosen as neotype.

## 22. *Amyema dilatipes* Barlow

*Amyema dilatipes* Barlow, Austral. J. Bot. 22 (1974) 575. — Type: *Brass 30053* (holo L 961,157-190; iso CANB 101990, K), New Guinea, E Highlands, Mt Wilhelm, E slopes, 3560 m, 20.vi.1959.

For description see Barlow, Austral. J. Bot. 22 (1974) 575. The species is distinctive in its combination of ternate or quaternate leaves on triangular or quadrangular stems, long inflorescence peduncle dilated at the apex, with many rays, flowers in tetrads, and forked bracts. The flower colour is described as red or reddish orange.

The species is known from the Eastern Highlands District of Papua New Guinea, in subalpine communities at elevations from 3300 to 3750 m (fig. 5; 15 collections seen). Recorded hosts are *Rapanea* and *Eurya*. *Amyema dilatipes* is apparently a young local endemic, related to the other subalpine species of New Guinea (see below). Specialization has not involved reduction in the inflorescence but rather an elaboration, including the production of flowers in distinctive tetrads.

In the original treatment of the species, hybridization with other subalpine congeners was suggested. Further analysis indicates that *A. dilatipes* is now confined to Mt Wilhelm (4509 m), the adjacent Mt Kerigomna, and nearby Mt Michael (3810 m). The putative hybrids are known from the slightly lower Mt Piora (3717 m) and Mt Amungwiwa (3277 m), further to the southeast. It is likely that *A. dilatipes* had a larger area during the most recent cool phase which occurred 18,000–16,000 years ago (Hope, 1986), and that the hybrids on Piora and Amungwiwa are phantoms of its recent occurrence there. The other likely parents of the putative hybrids, *A. pachypus* and *A. wichmannii*, occur at slightly lower elevations than *A. dilatipes*, and are now the dominant loranthus of the subalpine vegetation on Piora and Amungwiwa. See notes under *A. pachypus* and *A. wichmannii*.

### 23. *Amyema dolichopoda* Barlow

*Amyema dolichopoda* Barlow, *Brunonia* 5 (1983) 209. — Type: *Lazarides 8649* (holo CANB), Western Australia, 75 km WNW of Wyndham, c. 7 km SSW of Paradise Pool on Ernest R., 20.iii.1978.

For description see Barlow, *Flora of Australia* 22 (1984) 103. *Amyema dolichopoda* can be identified locally by its combination of opposite leaves cuneate at the base with a short or obscure petiole, 2-rayed umbels of triads with glabrous rays and the central flower sessile and lateral flowers pedicellate, and ovary and fruit densely white-tomentose in the lower part. The flower colour is usually orange or red in the lower part and green or yellow above.

The species is known from the Kimberley Region of Western Australia (fig. 5; 7 collections seen), in open woodlands and mangrove swamps. Recorded hosts include *Acacia* spp., *Grewia* and *Lumnitzera*. *Amyema dolichopoda* shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

*Amyema dolichopoda* is closely related to *A. benthamii*, *A. conspicua* and *A. villiflora*, and these species together form a complex in which species circumscription is made difficult by apparent hybridization. All four species occur in the Kimberley region, where *A. dolichopoda* is endemic, and the resultant intergradation has masked the identity of the local species. The sympatry of these species in the Kimberley region may be a consequence of distributional changes resulting from Recent climatic fluctuations. *Amyema dolichopoda* sens. str. differs from the other species in the group in its more open inflorescence, in which the peduncle, rays, and pedicels continue to elongate after anthesis. It is most closely related to *A. benthamii* which differs in its sessile cordate leaves. *Amyema dolichopoda* can be distinguished from *A. conspicua* and *A. villiflora* by its glabrous inflorescence segments and corolla.

#### 24. *Amyema eburna* (Barlow) Barlow, *comb. et stat. nov.*

*Amyema bifurcata* var. *eburna* Barlow, *Brunonia* 5 (1983) 208. — Type: *Kenneally 1961* (holo CANB; iso PERTH), Western Australia, Wyndham, The Bastion, 6.viii.1974.

Young parts, inflorescences, flowers, and fruits clothed in a dense ivory-white tomentum which fades on the leaves with age. *Stems* slender, pendulous. *Leaves* opposite; lamina linear to lanceolate, often falcate, 6.5–16 cm long, 0.6–1.7 cm wide, attenuate at the base into a distinct slender petiole 8–17 mm long, attenuate but finally rounded at the apex; veins 3–5, parallel, visible on both sides. *Inflorescences* solitary or paired in the leaf axils, a pedunculate 2-rayed umbel of dyads; peduncle longitudinally ridged, 10–35 mm long; rays slightly dilated towards the apex, 7–18 mm long; pedicels of the flowers usually absent or obscure but sometimes up to 2 mm long; central bracts (at the end of the ray) variable, sometimes narrowly triangular and c. 1 mm long but often expanded and foliose, up to 10 mm long; lateral bracts rounded, concave, 3–5 mm long, closely enclosing the ovary. *Ovary* cup-shaped, 2–3 mm long; calyx limb erect, finely serrate, c. 0.5 mm long. *Corolla* in the mature bud robust, globose at the base, slightly narrowed in the middle, rounded at the apex, 23–30 mm long, petals 5, usually remaining coherent in the globose part at the base. *Anther* 3–3.5 mm long, about equal to the free part of the filament. *Style* longitudinally ridged; stigma turbinate, twice as wide as the style. *Fruit* broadly ellipsoid, not seen mature.

*Amyema eburna* is known only from the Kimberley region in the north of Western Australia (fig. 6; 8 collections seen), in open woodlands in lowlands, exclusively parasitic on *Eucalyptus*.

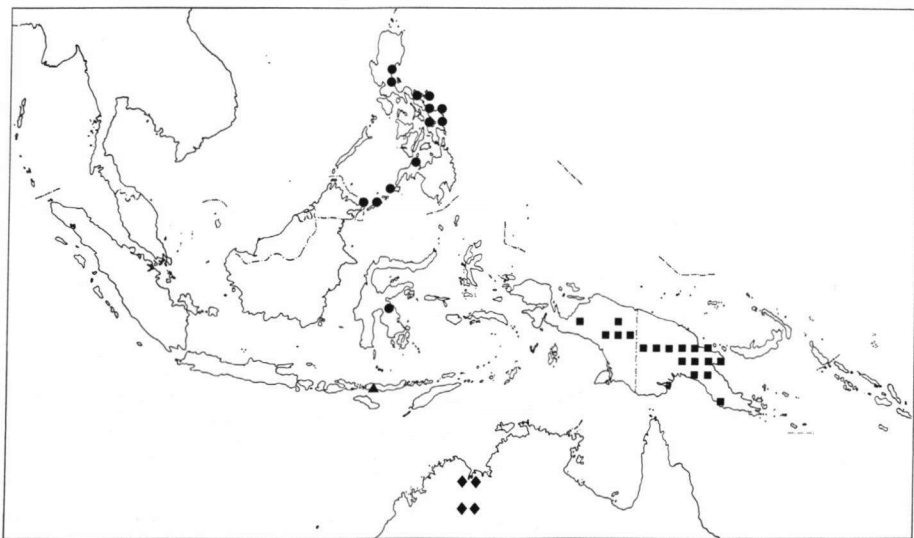


Fig. 6. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ◆ = *A. eburna* (Barlow) Barlow; ● = *A. edanoi* (Merrill) Barlow; ▲ = *A. enneantha* Barlow; ■ = *A. finisterrae* (Warburg) Danser.

The species is closely related to *A. bifurcata*, *A. biniflora*, and *A. pyriformis*, with which it shares the bifurcate inflorescence. The bracts show that this inflorescence structure is derived from a 2-rayed umbel of triads through loss of the central flowers of the triads. Within this species group *A. eburna* can be identified by its combination of distinctive ivory-white indumentum and flowers sessile or subsessile. It is most similar to *A. bifurcata* which differs primarily in its rusty brown indumentum. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences. The red flower colour is obscured externally by the indumentum, but distinct on the insides of the petals after anthesis.

Barlow (1983, 1984) treated this entity as a variety of *A. bifurcata*. Additional specimens subsequently examined show that it has a wide area in the Kimberley region, sympatric with *A. bifurcata*, and is consistently different in its subsessile flowers as well as the indumentum colour. It is therefore accorded specific rank. I am pleased to acknowledge the contribution of Dr. B.L. Rye, who studied the material in preparation of the Kimberley flora, and who first expressed to me the opinion that *A. eburna* should have specific status.

## 25. *Amyema edanoi* (Merrill) Barlow, *comb. nov.*

*Loranthus edanoi* Merrill, Philipp. J. Sci. C 13 (1918) 275. — *Dicymanthes edanoi* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Ramos & Edaño BS 26241* (lecto US, see below; iso P) Philippines: Luzon, Nueva Ecija, Mt Umingan, 40 m, viii–ix.1916.

*Loranthus samarensis* Merrill, Philipp. J. Sci. C 13 (1918) 276. — *Dicymanthes samarensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Ramos BS 24265* (lecto US 1293545, see below), Philippines, Samar, Catubig R., 12 m, ii–iii.1916.

*Dicymanthes suluana* Danser, Philipp. J. Sci. 58 (1935) 97. — Type: *Ramos & Edaño BS 43894* (lecto UC 258179, see below; iso BO, NY, P), Philippines, Sulu, Jolo, Mt Daho, 2000 ft (600 m), ix.1924.

For description see Danser, Philipp. J. Sci. 58 (1935) 94, 96, 97 under *Dicymanthes edanoi*, *D. samarensis*, and *D. suluana*.

The essential characters for an integrated description are as follows: Glabrous except for the inflorescence and flowers which are usually sparsely brown tomentose. *Stems* terete, dilated at the nodes; internodes mostly 10–15 cm long. *Leaves* decussate, sessile; lamina narrowly ovate to ovate, 9–15(–22) cm long, 4.5–7(–11) cm wide, widest near the middle, thin, dull on both sides, sharply cuneate to truncate or rarely slightly cordate at the base, weakly acuminate and acute at the apex; venation pennate with the midrib and the major lateral veins visible but hardly raised. *Inflorescence* capitate, of two sessile triads on a peduncle 2–6 mm long; bracts deflexed or spreading, nearly orbicular, 1–1.75 mm long. *Ovary* shortly cylindrical, 2–3 mm long; calyx limb erect, entire, 0.5–0.8 mm long. *Corolla* in the mature bud relatively slender, weakly clavate, acute, 11–16(–23) mm long; petals 5, each with a deflexed spur inside just above the base. *Anther* (1.5–)2.5(–3.5) mm long; usually longer than the free part of the filament. *Fruit* ellipsoid, crowned by the calyx limb.

*Amyema edanoi* is recorded widely in the Philippines (Luzon, Catanduanes, Samar, Sulu, Biliran, Leyte, Mindanao, Lapid-Lapid) and also once from Celebes



(fig. 6; 29 collections seen), recorded at low elevations from sea level to 1000 m. Habitat details and hosts are poorly known but the species apparently occurs in rain forests and has been recorded as parasitic on *Ficus* and *Xanthophyllum*.

The species is a member of the *Dicymanthes* species group (see above). Within this group it can be identified by its combination of leaves sessile and usually cuneate to truncate at the base, distinct inflorescence peduncle 2–6 mm long, free parts of the filaments shorter than the anthers, and presence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as red or yellowish brown.

*Amyema edanoi* is probably related to *A. cuernosensis*, which ranges from the southern Philippines to the Lesser Sunda Islands. The latter species differs from *A. edanoi* in its more distinctly bifacial leaves more strongly cordate at the base, obscure inflorescence peduncles, and anthers approximately equal to the free parts of the filaments. Whilst the two species have some geographic overlap, they may have differentiated ecogeographically from a common ancestral stock.

Danser (1935) doubted that *Dicymanthes samarensis* and *D. suluana* were specifically distinct from *D. edanoi*. The present study has shown no sharp distinction between the entities which, when united, show a continuous and relatively small range of variation.

The holotypes of *Loranthus edanoi*, *L. samarensis*, and *Dicymanthes suluana* (PNH) are no longer extant. An isotype of *Loranthus edanoi* in US has been seen and designated lectotype of the name, and a fragmentary isotype in P has also been seen. An isotype of *L. samarensis* in US has been seen and designated lectotype of the name. An isotype of *Dicymanthes suluana* in UC, with several inflorescences and a collectors' label, has been seen and designated lectotype of the name, and isotypes in BO, NY, and P have also been seen.

## 26. *Amyema enneantha* Barlow, *spec. nov.*

Species nova *A. cuernosensi* (Elmer) Barlow affinis, sed foliis ternatis obscure petiolatis, inflorescentia triadorum 3 composita, bracteis dimorphis, corolla longiore differt. — Typus: *Kostermans & Wirawan 706* (holo L; iso CANB 334444), Lesser Sunda Islands, Flores, western, Mt Ranaka, 1600 m, 28.iv.1955.

Glabrous. *Stems* terete, dilated at the nodes; internodes mostly 8–14 cm long. *Leaves* ternate; lamina narrowly ovate, 8–15 cm long, 3.5–6 cm wide, thickly coriaceous, dark grey and glossy above, dull brown below, attenuate at the base into an obscure terete petiole 0–5 mm long, shortly acuminate and acute at the apex; venation pennate, obscure except for the midrib which is prominent and raised towards the base on both surfaces. *Inflorescences* in groups at the nodes, capitate, of 3 (rarely 2) sessile triads on a very short or obscure peduncle 0.5–1 mm long which is immersed in the bark and seemingly sessile; central bracts spreading, concave, broadly ovate, shortly acute at the apex, c. 3 mm long; lateral bracts erect, obovate, shortly acuminate and acute, c. 2.5 mm long. *Ovary* funnel-shaped, c. 3 mm long; calyx limb erect, entire, c. 1 mm long. *Corolla* in the mature bud relatively robust, almost cylindrical, slightly narrowed 4–5 mm below the apex, 22–30 mm long; petals 5, each with a deflexed spur inside just above the base. *Anther* 3–4.5 mm long; usually

slightly longer than the free part of the filament. *Fruit* ellipsoid to nearly globular, c. 8 mm long and 5 mm diam., crowned by a neck and the calyx limb 1.5 mm long.

*Amyema enneantha* is endemic to Flores, Lesser Sunda Islands (fig. 6; 6 collections seen), at elevations from 1500 to 2400 m. Habitat details and hosts are unknown.

The species is a member of the *Dicymanthes* species group (see above). Within this group it is singular in having ternate leaves and inflorescences of 3 rather than the usual 2 triads. It can be further identified by its combination of bifacial leaves, very short inflorescence peduncle, dimorphic bracts, and presence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as pink or red, or white in the lower part and red above. *Amyema enneantha* is probably a local endemic, closely related to and perhaps differentiated from *A. cuernosensis* which ranges from the Philippines to the Lesser Sunda Islands. The ternate phyllotaxy and the distinctive inflorescences of three triads are presumably pleiotropic effects of a single genetic change, but specific status is supported by the additional small differences in leaf shape and corolla and anther dimensions.

The specific epithet is derived from the Greek *ennea-* ('nine') and *anthos* ('flower'), and alludes to the distinctive nine-flowered inflorescences formed from three sessile triads.

## 27. *Amyema fasciculata* (Blume) Danser

*Loranthus fasciculatus* Blume, Bijdr. 13 (1825) 661. — *Amyema fasciculata* (Blume) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Blume s.n.* (holo L; iso L) Java, Res. Tjerebon, G. Tjeremai, near Linggadjati.

*Amyema aquilonia* Danser, Philipp. J. Sci. 58 (1935) 86. — Type: *Ramos BS 33296* (lecto L, see below), Philippines, Luzon, Ilocos Norte, Mt Palimlim, 1050 m, viii.1918.

*Amyema apoda* Barlow, Austral. J. Bot. 22 (1974) 565. — Type: *Pleyte 708* (holo L), New Guinea, Sorong, Kemoe, 50 m, 28.viii.1948.

For full descriptions and further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 330, under *A. fasciculata*, Philipp. J. Sci. 58 (1935) 84, 86, under *A. fasciculata* and *A. aquilonia*, and Barlow, Austral. J. Bot. 22 (1974) 565, under *A. apoda*.

The essential characters for an integrated description are as follows: Glabrous or the young inflorescence and flowers tomentose. *Stems* terete, dilated at the nodes. *Leaves* decussate, ternate, or quaternate, sometimes scattered; lamina very variable, narrowly elliptic to obovate, (3–)5–10(–20) cm long, 1–4(–12) cm wide, thinly to thickly coriaceous, dull on both sides or somewhat lustrous above, gradually attenuate at the base into a winged petiole obscure or up to 20 mm long, usually obtuse at the apex; venation pennate, obscure except for the midrib which is distinct towards the base. *Inflorescences* several at the nodes and arising along the internodes, simple 2- to 4-flowered umbels; peduncle slender, 1–6 mm long; rays (0.5–)2–3 mm long; bracts spreading, acute, c. 0.5 mm long. *Ovary* slightly funnel-shaped, 1.5–2.5 mm long; calyx limb erect, entire or very weakly toothed, 0.2–0.5 mm long. *Corolla* in the mature bud relatively slender, obtuse, 14–18 mm long; petals 4 (rarely 5). *Anther* 2–2.5 mm long; much longer than the free part of the filament. *Fruit* ellipsoid, crowned by the calyx limb.

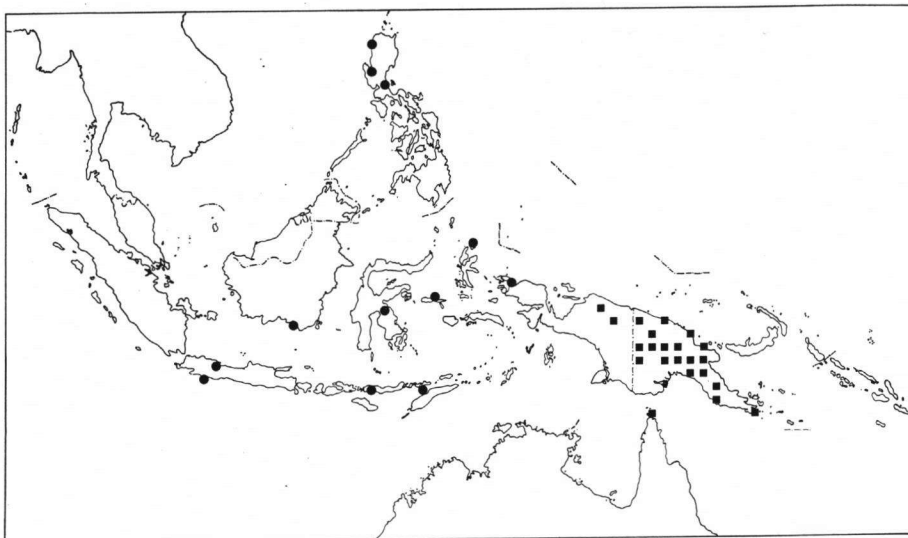


Fig. 7. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ● = *A. fasciculata* (Blume) Danser, ■ = *A. friesiana* (Schumann) Danser.

*Amyema fasciculata* is distributed widely but possibly sparsely in the Malesian region, being recorded from the Philippines (Luzon), Borneo, Celebes, Java, Lesser Sunda Islands (Flores, Alor), Moluccas (Sula, Morotai), and Irian Jaya (fig. 7; 19 collections seen), at low elevations from sea level to 1500 m. Habitat details and hosts are unknown.

*Amyema fasciculata* represents one of the extremes of inflorescence reduction in the genus, and the few-flowered simple umbels frequently arise from the epicortical runners and lenticels as well as at the nodes. Such cauliflory is relatively common in the amyemas of humid forests and tends to be correlated with reduced inflorescences. The corolla in *A. fasciculata* is described as red or violet in the lower part and green above.

*Amyema beccarii* is occasionally confused with *A. fasciculata*, in which the inflorescence can also be interpreted as a few-flowered simple umbel. Inflorescence reduction to a simple umbel has apparently occurred independently several times in *Amyema*. The derived simple umbels may not be homologous, as they could represent, for example, reductions to solitary cymules (i.e., triads with all flowers pedicellate) by elimination of the peduncle and all but one ray of the conflorescence, or reductions of each cymule in the conflorescence to a single flower. In the case of *A. fasciculata* the basic conflorescence has apparently been reduced to a seemingly simple umbel by elimination of the rays (Danser, 1931), leaving cymules of pedicellate flowers sessile at the apex of the common peduncle. See the note under *A. beccarii*. *Amyema fasciculata* differs from *A. beccarii* in its shortly but distinctly pedunculate umbels.

In describing *A. aquilonia*, Danser (1935) commented on its close resemblance to *A. fasciculata*, citing smaller leaves and inflorescence parts and lack of tomentum as differential characters, and expressed doubts that they were specifically distinct. Similarly, in describing *A. apoda*, Barlow (1974) commented on its close resemblance to *A. fasciculata* and *A. aquilonia*. The present study has indicated that these three entities are all part of a single relatively polymorphic pattern of variation, distributed over much of the Malesian region. However, although the leaf size shows a considerable range, the differences between all of these collections are minor, and the species is no more polymorphic than some of the other widespread ones in the region. Because of its common occurrence in lowland habitats, its dispersal has presumably been facilitated by lowered sea levels in the Quaternary.

The type specimen of *Loranthus obovatus* Blume (= *Scurrula obovata*) bears three separate leaves which belong with *Amyema fasciculata*. Danser (1931: 443) gave a detailed account of the confusion surrounding the application of the names *Loranthus obovatus* Blume and *Loranthus fasciculatus* Blume, which apparently is due to aggregation of material of the two quite distinct species on the one sheet. The three separate leaves agree entirely with the holotype material of *L. fasciculatus*, and are probably part of the same gathering.

The holotype of *Amyema aquilonia* (PNH) is no longer extant. An isotype in L has been seen and designated lectotype of the name.

## 28. *Amyema finisterrae* (Warburg) Danser

*Loranthus finisterrae* Warburg, Bot. Jahrb. Syst. 16 (1893) 20. — *Amyema finisterrae* (Warburg) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Hellwig 322* (B, not extant), New Guinea, Finisterre Mts, 2000 m.

For description and further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 332; Barlow, Austral. J. Bot. 22 (1974) 576. Along with the closely related *A. hastifolia*, the species is distinct from all its congeners in its inflorescence which is a solitary flower on an articulate 'pedicel'. *Amyema finisterrae* can be distinguished from *A. hastifolia* by its smaller, more rounded, more distinctly petiolate leaves and different dimensions of the inflorescence and flower. The flower colour is described as various shades of red from dark pink to purple, frequently having these colours in the lower part and being paler, or green, or yellow above.

The species is common in the highlands of New Guinea at elevations from 1300 to 2600 m (fig. 6; 64 collections seen), in primary and secondary rain forests, parasitic on various hosts including *Acalypha*, *Aglaiia*, *Castanopsis*, *Dimorphanthera*, *Dodonaea*, *Ficus*, and *Glochidion*.

The inflorescence of a solitary flower on an articulate pedicel represents the extreme of inflorescence reduction and specialization in the genus. The basal segment is probably homologous with the peduncle or ray of a more complex umbellate inflorescence, and the distal one is presumably the true pedicel of the flower. *Amyema finisterrae* and *A. hastifolia* are probably directly related young endemics of the emerging New Guinean highlands, possibly more distantly related to the *A. artensis* complex. Whilst the other highland species of New Guinea mostly have high numbers of flow-

ers in the inflorescence, adaptation in these two species appears to have favoured production of flowers sequentially rather than simultaneously.

### 29. *Amyema fitzgeraldii* (Blakely) Danser

*Loranthus fitzgeraldii* Blakely, Proc. Linn. Soc. New S. Wales 49 (1924) 86. — *Amyema fitzgeraldii* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Maiden s.n.* [lecto NSW, fide Barlow, Austral. J. Bot. 14 (1966) 464], Western Australia, Minginew, on *Acacia rostellifera*, x.1909.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 118. *Amyema fitzgeraldii* can be identified by its combination of overall white tomentum, small opposite leaves, and especially by the inflorescence of a pedunculate head of 3–5 flowers of which the central flower is ebracteate. The green flower colour is partially obscured by the indumentum.

The species occurs in arid and semi-arid woodlands of Western Australia and South Australia, exclusively parasitic on *Acacia*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

The capitate inflorescence superficially resembles that of *A. cauliflora* and the several other species placed by Danser in *Dicymanthes*, but probably represents one of several parallel lines of specialization. See note under *Amyema* above. The inflorescence has probably been derived by reduction from a more complex confluence to a single cymule in which the number of lateral flowers is variable but usually exceeds the two found in a normal triad. The nearest related species is probably *A. maidenii*, in which the inflorescence consists of two sessile triads.

### 30. *Amyema friesiana* (Schumann) Danser

*Loranthus friesianus* Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, Nachtr. (1905) 258. — *Amyema friesiana* (Schumann) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Nyman 41* (lecto WRS�, see below), New Guinea, Stephansort, 22.xii.1898.

For descriptions see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 295; Barlow, Austral. J. Bot. 22 (1974) 577; *Flora of Australia* 22 (1984) 95. *Amyema friesiana* is a member of the *Amyema scandens* species complex, which can be identified in the Papuasian region by the inflorescence of a 4- to 8-rayed umbel of triads with all flowers closely sessile in an equidistant arrangement. Within this group it can be identified by its leaves, which are regularly opposite, distinctly petiolate, almost curvined, and acuminate acute at the apex. The corolla is described as orange or red, often shading to paler orange, yellow, or green above.

The species is common and widespread in New Guinea (fig. 7; 65 collections seen), usually at elevations from 1500 to 2000 m, but recorded from sea level to 2600 m, in primary and secondary rain forests, parasitic on various hosts including *Acalypha*, *Calicarpa*, *Elaeocarpus*, *Ficus*, *Geunsia*, *Macaranga*, *Nauclea*, *Nothofagus*, and commonly *Homalanthus*. It also occurs in Cape York Peninsula, Queensland. It is closely related to *A. triantha* and *A. plicatula*, and these species together

form a cluster of opposite-leaved entities near the stem of the *A. scandens* complex. See notes under *A. scandens* and *A. triantha*.

### 31. *Amyema gaudichaudii* (DC.) Tieghem

*Loranthus gaudichaudii* DC., Prod. 4 (1830) 295. — *Amyema gaudichaudii* (DC.) Tieghem, Bull. Soc. Bot. France 42 (1895) 82, 84. — Type: *Gaudichaud s.n.* (holo G), New South Wales, Port Jackson, 1829.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 106. *Amyema gaudichaudii* can be identified locally by its combination of opposite, small, lanceolate leaves 2–5 mm wide, very slender 2- or 3-rayed umbels of triads, and slender corollas only 7–10 mm long. The flower colour is red.

The species occurs disjunctly in southern Queensland and central coastal New South Wales, in open swamp woodland exclusively parasitic on *Melaleuca*, to some species of which it shows a close visual resemblance in its small narrow leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvilinear and isobilateral, and reduced inflorescences.

*Amyema gaudichaudii* is closely related to *A. herbertiana* and *A. melaleucae*, and together these species form a complex specialized for *Melaleuca* as host. The three species differ in flower dimensions and indumentum. They are now widely separated in different coastal and subcoastal areas of Australia and may be ecogeographic differentiates of a formerly much more widespread common ancestor.

### 32. *Amyema gibberula* (Tate) Danser

*Loranthus gibberulus* Tate, Trans. Roy. Soc. S. Austral. 8 (1886) 71. — *Amyema gibberula* (Tate) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Murray s.n.* (holo AD), South Australia, Lake Eyre west, William Tableland.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 109, 110. *Amyema gibberula* can be identified locally by its combination of terete leaves, 1- or 2-rayed umbels of triads, and robust 4-merous flowers with a dense white indumentum and almost sessile anthers. The yellow to red flower colour is obscured by the indumentum.

The species occurs in arid woodlands of inland Australia, exclusively parasitic on *Hakea* and *Grevillea*, to which it shows a close visual resemblance in its terete needle-like leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are scleromorphic, and reduced inflorescences.

### 33. *Amyema glabra* (Domin) Danser

*Loranthus glaber* Domin, Biblioth. Bot. 89 (1921) 55. — *Amyema glabra* (Domin) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 295. — Type: *Domin 3622* (holo PR), Queensland, Carpet Creek near Harveys Creek, i.1910.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 99. *Amyema glabra* can be identified locally by its combination of opposite elliptic to ovate leaves sessile or nearly so and truncate or cordate at the base, 2-rayed umbels of triads, slender flowers, and glabrous habit except for the ovary which is sometimes sparsely brown tomentose in the lower part. The flower colour is red in the lower part and yellow or green above.

The species has a small area in wet tropical north Queensland, occurring in rain forests and mangrove forests parasitic on various hosts. It nevertheless shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences. Its specialization for humid forests is therefore probably secondary.

#### 34. *Amyema gravis* Danser

*Amyema gravis* Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 336. — Type: *van Steenis 2645* (lecto L 932,342-974, see below), Java, Pasoeroean, i.1929. Syntypes: *Backer 24350, 28653; Ernst 29g*; see below.

For description and further synonymy see Danser, *Bull. Jard. Bot. Buitenzorg* III, 11 (1931) 336. *Amyema gravis* can be identified locally by its combination of opposite, thick, obovate, shortly petiolate leaves, few-rayed umbels of triads with the central flower sessile and the lateral flowers pedicellate, 4-merous flowers, and transversely septate anthers about as long as the free part of the filament. The flower colour is described as yellowish green in the lower part and red above.

The species is recorded only from Borneo and Java, including the Kangean Archipelago, in maritime communities (fig. 8; 5 collections seen). It is specialized for mangroves as hosts, and has been recorded on *Avicennia*, *Rhizophora*, and *Sonneratia*, to which it shows a close visual resemblance in its thick rounded leaves (cf. Barlow & Wiens, 1977).

*Amyema gravis* shares with *A. mackayensis* and *A. thalassia*, and with species of other loranth genera, the specialization for mangroves as hosts. This adaptation has probably developed in parallel several times, and it is not likely that *A. gravis* has a direct relationship with any of these species. It is most similar to *A. mackayensis*, differing in its longer 4-merous corolla with a globular expansion at base and constricted neck, anthers slightly longer than the free part of the filament and transversely septate, and pear-shaped fruit.

Danser (1931) did not nominate a type for *A. gravis* from the six collections he cited with his description. His description was based on four of these, which are therefore syntypes. A good specimen of *van Steenis 2645* in L agrees with Danser's description and is chosen as lectotype. For citation of the syntypes, see Danser (1931).

#### 35. *Amyema haematodes* (Schwarz) Danser

*Loranthus haematodes* Schwarz, *Repert. Spec. Nov. Regni. Veg.* 24 (1928) 82. — *Amyema haematodes* (Schwarz) Danser, *Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect.* 29 (6) (1933) 29. — Type: *Barlow 516* (neo NT; iso AD, BRI), Northern Territory, abandoned rice garden c. 13 mi (21 km) SE of Darwin, 4.i.1963.

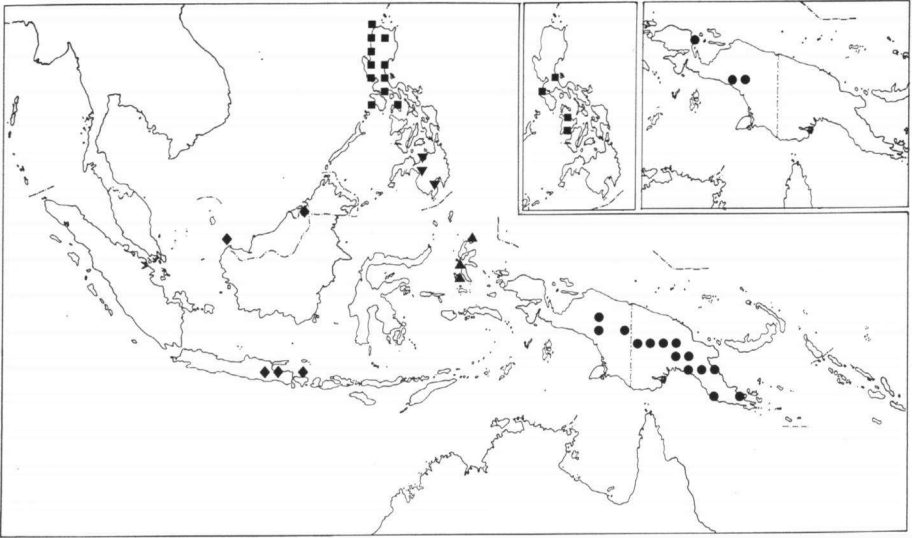


Fig. 8. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ● = *A. caudiciflora* (Lauterbach) Danser; ◆ = *A. gravis* Danser; ■ = *A. haenkeana* (Schultes) Danser; ◼ = *A. halconensis* (Merrill) Danser (inset); ● = *A. hastifolia* (Ridley) Danser (inset); ▲ = *A. hexameres* (Danser) Danser; ▼ = *A. hexantha* (Merrill) Barlow.

For description and note on neotypification see Barlow, *Flora of Australia* 22 (1984) 104. *Amyema haematodes* can be identified locally by its combination of opposite, elliptic to ovate, sessile leaves cordate at the base, and 3-rayed umbels of triads with a brown and white tomentum. The flower colour is obscured by the indumentum.

*Amyema haematodes* is known only from a very small area near Darwin, Northern Territory (2 collections seen), in monsoon woodland, parasitic on *Barringtonia*. It is coded accordingly in the list of rare or threatened Australian plants (Briggs & Leigh, 1988). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

### 36. *Amyema haenkeana* (Schultes) Danser

*Loranthus haenkeanus* Schultes, *Syst. Veg.* 7, 1 (1829) 113. — *Amyema haenkeana* (Schultes) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 295. — Type: *Haenke s.n.* (UC 470099, possible iso, see below), Philippines.

*Loranthus eucalyptiphyllus* Merrill, *Philipp. J. Sci.* C 9 (1915) 444. — Type: *Vanoverbergh 1505* (lecto P, see below), Philippines, Luzon, Bontoc, vii.1913.

For description and further synonymy see Danser, *Philipp. J. Sci.* 58 (1935) 63. *Amyema haenkeana* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combi-



nation of tawny tomentum on the inflorescences and flowers, scattered ternate or decussate phyllotaxy, lanceolate or narrowly ovate leaves with long petioles, umbels of numerous triads with 5- or 6-merous flowers, and petals remaining coherent at the base after anthesis. The flower colour is mostly described as red, rarely yellow.

The species is recorded from Luzon, Mindoro, Sibuyan, and Calamianes in the Philippines, in lowlands up to 450 m elevation (fig. 8; 25 collections seen). Habitat details and hosts are unknown.

*Amyema haenkeana* is distinctive in its many-rayed umbel, scattered ternate leaves and dense floral indumentum. In inflorescence structure it is similar to the New Guinean *A. strongylophylla*, but the several differences in phyllotaxy and floral characters suggest that there is no direct relationship. It is also similar to the Philippine *A. curranii* which occurs at higher elevations in Luzon (see note under *A. curranii*).

*Amyema haenkeana* shares with a few other species of the Philippines and New Guinea a weakly gamopetalous corolla as an apomorphic state, probably of multiple origin. The petals may remain coherent in the basal 1–10 mm for some time after anthesis, but the tube is the result of some interlocking of marginal epidermal cells rather than developmentally-moderated fusion. Adaptations for bird pollination are also apomorphic in the family, and the formation of a corolla tube is probably one of several associated developmental responses.

The sheet UC 470099 bears fragments of two collections, labelled as the types of *Loranthus haenkeanus* and the conspecific *L. malifolius* Schultes. Danser accepted the former as the genuine type, which is a Haenke collection. However, the label also indicates that the specimen is a fragment of *Cuming* 1947, and if this is correct then the specimen has no type status. Van Tieghem studied *Cuming* 1947 in distinguishing his genus *Candollina*, but in making the combination *C. haenkeana* clearly referred to the earlier description of the species.

The holotype of *Loranthus eucalyptiphyllus* (PNH) is no longer extant. An isotype in P has been seen and designated lectotype of the name.

### 37. *Amyema halconensis* (Merrill) Danser

*Loranthus halconensis* Merrill, Philipp. J. Sci. C 2 (1907) 271. — *Amyema halconensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — Type: Merrill 5664 (lecto US 710824, see below; iso NY), Philippines, Mindoro, Mt Halcon, xi.1906.

For description and further synonymy see Danser, Philipp. J. Sci. 58 (1935) 69. *Amyema halconensis* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of bifacial distinctly petiolate leaves in whorls of 3–8, umbels of 6 or 7 triads with a short peduncle 3–7 mm long and triads with all flowers variably pedicellate, and petals remaining coherent in the lower 1–2(–few) mm after anthesis. The flower colour is described as yellow. See note on gamopetalous corollas under *A. haenkeana*.

The species is recorded from Luzon, Mindoro, and Panay in the Philippines, in lowlands up to 100 m elevation (fig. 8; 2 collections seen). Habitat details and hosts are unknown.

*Amyema halconensis* is closely related to *A. irrubescens*, *A. polytrias*, and *A. scheffleroides*, and these species together form a complex which extends from the northern Philippines through Celebes and the Moluccas to the Lesser Sunda Islands. The complex has probably differentiated during the genesis of landforms in the region. See note on geographical and morphological relationships under *A. polytrias*.

The holotype of *Loranthus halconensis* (PNH) is no longer extant. An isotype in US has been seen and designated lectotype of the name. An isotype in NY, lacking flowers, has also been seen.

### 38. *Amyema hastifolia* (Ridley) Danser

*Loranthus hastifolius* Ridley, Trans. Linn. Soc. Bot. 9 (1916) 146. — *Amyema hastifolia* (Ridley) Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 337. — Type: *Kloss s.n.* (holo BM), New Guinea, Nassau Mts, 1080–1470 m, 13.ii.1913.

Doubtful species provisionally included here:

*Loranthus curvifolius* Krause, Bot. Jahrb. Syst. 57 (1922) 465, 490. — *Amyema curvifolia* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — Type: *Ledermann 13077* (B, not extant), New Guinea, Fels Spitze, 1400–1500 m.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 337; Barlow, Austral. J. Bot. 22 (1974) 577. See also Barlow, Austral. J. Bot. 22 (1974) 574 under *A. curvifolia*. Along with the closely related *A. finisterrae*, *A. hastifolia* is distinct from all its congeners in its inflorescence which is a solitary flower on an articulate 'pedicel'. *Amyema finisterrae* can be distinguished from *A. hastifolia* by its smaller, more rounded, more distinctly petiolate leaves and different dimensions of the inflorescence and flower. The flower colour is described as pinkish red to dark red in the lower part and paler red or yellow above.

The species is endemic to the highlands of New Guinea (Irian Jaya), from 1250 to 2800 m (fig. 8; 3 collections seen). Other habitat details and hosts are unknown.

The status of *A. curvifolia* is doubtful. The species is based on two collections by Ledermann from the Hunstein Mountains of New Guinea, which were the types of *Loranthus curvifolius* and *L. heterochromus* Krause. There appear to be no duplicates of the types, which are no longer extant. Danser (1931) saw the specimens, accepted the two species, and provided detailed descriptions. Danser's descriptions generally agree with Krause's original descriptions, although they differ in the dimensions of some parts, notably the corollas. The two descriptions are closely similar, and Barlow (1974) treated the two entities as conspecific under the name *A. curvifolia*.

In several respects the characters of *A. curvifolia*, as described by Krause and Danser, agree with those of *A. hastifolia*. This applies particularly to the inflorescence, which is described and illustrated as a solitary flower on a short articulate pedicel, inserted along the stem internodes or on the epicortical runners. These characters agree with those of *A. hastifolia*, which also occurs in the central highlands of New Guinea and is the only species of the genus in New Guinea with cauline inflorescences. The descriptions differ primarily in leaf dimensions, which are much greater than otherwise seen in *A. hastifolia*, and in the flowers, which are larger and 6-merous rather than 4-merous.

If the description of *A. curvifolia* is not based on mixed material, then it clearly represents a very distinct and unusual species. However, the floral characters agree with those of *A. squarrosa* and *A. seemeniana* subsp. *melastomifolia*, and it is possible that floral fragments of one of these species had become confused with the original specimens of *L. curvifolius* and *L. heterochromus*. It may be noted that the type of *L. squarrosus* is also a Ledermann collection from the same area, and its collector's number, *Ledermann 10377*, is similar to that of the type of *L. curvifolius*, which is *Ledermann 13077*. Because subsequent field work in the Hunstein Mountains has yielded no additional material, the species is provisionally treated as doubtful.

For notes on inflorescence structure and biogeography, see under *A. finisterrae*.

### 39. *Amyema herbertiana* Barlow

*Amyema herbertiana* Barlow, Austral. J. Bot. 14 (1966) 468. — Type: *Martin s.n.* (holo NT), Northern Territory, Mainoru, iv.1962.

For description see Barlow, Flora of Australia 22 (1984) 104. *Amyema herbertiana* can be identified locally by its combination of opposite, small, lanceolate leaves 3–6 mm wide, slender, white-tomentose, 2- or 3-rayed umbels of triads, and clavate corolla buds c. 25 mm long. The pink flower colour is obscured by the indumentum.

The species occurs in Arnhem Land, Northern Territory, and in northern Queensland, in open swamp woodland, and is exclusively parasitic on *Melaleuca*, to some species of which it shows a close visual resemblance in its small narrow leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences. For note on relationships, see under *A. gaudichaudii*.

### 40. *Amyema hexameres* (Danser) Barlow, *comb. nov.*

*Dicymanthes hexameres* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 364. — Type: *Lam 3621* (holo BO), Moluccas, Morotai, Goegoeti, E of Pilaro, 40 m, 26.vi.1926.

For full description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 364, under *Dicymanthes hexameres*.

The essential characters of the species are as follows: Glabrous except for the ovary and sometimes the corolla which are shortly and sparsely brown tomentose. *Stems* terete, dilated at the nodes; internodes mostly 7–10 cm long. *Leaves* decussate; lamina elliptic to ovate, 8–15 cm long, 5–7.5 cm wide, coriaceous, glossy grey-green above, dull brown below, truncate and finally shortly cuneate at the base to a distinct petiole 5–10 mm long, obtuse or broadly acute at the apex; venation pinnate with the midrib raised below and a few lateral veins visible. *Inflorescences* in groups at the nodes and scattered on the epicortical runners, capitate, of two sessile triads on a peduncle (0.5–)2–2.5 mm long; bracts spreading, triangular, 1–1.5 mm long. *Ovary* shortly cylindrical, 2–3 mm long; calyx limb erect, entire, c. 0.5 mm long. *Corolla* in the mature bud relatively slender, weakly clavate, acute, 20–25 mm long;

petals 5, lacking a deflexed spur inside just above the base. *Anther* 2.5–4 mm long, usually slightly longer than the free part of the filament. *Fruit* obovoid, crowned by the calyx limb.

*Amyema hexameres* is recorded from the Moluccas (fig. 8; 5 collections seen), at low elevations from sea level to 1050 m. Habitat details and hosts are unknown, but the species apparently occurs in humid forests.

The species is a member of the *Dicymanthes* species group (see above). Within this group it can be identified by its combination of leaves petiolate and strongly bifacial, distinct but short inflorescence peduncle, anthers mostly more than 3 mm long and slightly longer than the free parts of the filaments, and absence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as pink or red, or red in the lower part and yellow above. *Amyema hexameres* is most similar to *A. hexantha*, which is endemic to Mindanao, Philippines, and from which it differs in its shorter inflorescence peduncle and more distinctly bifacial leaves. See note under *A. hexantha*.

#### 41. *Amyema hexantha* (Merrill) Barlow, *comb. nov.*

*Loranthus hexanthus* Merrill, Philipp. J. Sci. C 4 (1909) 137. — *Dicymanthes hexantha* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Williams 2565* (lecto NY, see below), Philippines, Mindanao, Todaya, Mt Apo, 2800 ft (850 m), 4.iv.1905. Syntype: *Clemens s.n.* (M, not extant), Philippines, Mindanao, Lake Lanao, S side, Vicar's Landing.

For description see Danser, Philipp. J. Sci. 58 (1935) 91 under *Dicymanthes hexantha*. The species is a member of the *Dicymanthes* species group (see above), in which the inflorescence is capitate, of two sessile triads on a short peduncle. Within this group it can be identified by its combination of leaves distinctly petiolate and not strongly bifacial, inflorescence peduncle distinct, c. 5 mm long, and absence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as pale to bright red.

*Amyema hexantha* is endemic to Mindanao, Philippines (fig. 8; 5 collections seen), recorded elevations from 850 to 1800 m. Habitat details and hosts are unknown.

The species is similar to *A. hexameres* which has an adjoining area from the Moluccas to the Lesser Sunda Islands, and from which it differs in its longer inflorescence peduncle and less distinctly bifacial leaves. These two species are unusual in the *Dicymanthes* species group in lacking the deflexed spurs which form a nectar chamber at the base of the corolla, a character state which they share only with *A. apoensis*. However, this is probably a plesiomorphic state, and the three species may not be directly related.

Danser (1935) cited only *Clemens s.n.* as the type of *Loranthus hexanthus*. In the original description Merrill cited two collections, viz., *Clemens s.n.* and *Williams 2565*. Since Danser presented no additional comment, it is concluded that his failure to cite *Williams 2565* as a type was an omission, and that his reference to *Clemens s.n.* does not constitute lectotypification. The two collections are therefore syntypes. The originals of *Clemens s.n.* and *Williams 2565* (PNH) are no longer extant. A duplicate of *Williams 2565* in NY has been seen and is chosen as lectotype of the

name. It is a substantial flowering specimen, annotated by Danser, and conforms with the description.

#### 42. *Amyema hilliana* (Blakely) Danser

*Loranthus hillianus* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 393. — *Amyema hilliana* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — Type: Hill 220 (holo NSW), Northern Territory, Macdonnell Range, 20 mi (32 km) NW by W of Meyers Hill, 1.vi.1911.

For description see Barlow, Flora of Australia 22 (1984) 115. *Amyema hilliana* can be identified locally by its combination of overall white tomentum, flat lanceolate or elliptic leaves 1–2.5 cm wide, and 2-rayed umbel of triads with the central flower sessile. The green flower colour is partly obscured by the indumentum.

The species occurs in semi-arid woodlands of inland Australia, exclusively parasitic on *Acacia*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences.

#### 43. *Amyema incarnatiflora* (Elmer) Danser

*Loranthus incarnatiflorus* Elmer, Leaflet Philipp. Bot. 6 (1913) 1969. — *Amyema incarnatiflora* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — Type: Elmer 11817 (lecto L, see below), Philippines, Mindanao, Davao, Todaya, Mt Apo, ix.1909.

*Loranthus preslii* Elmer, Leaflet Philipp. Bot. 6 (1913) 1970. — Type: Elmer 13741 (lecto L, see below), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, ix.1912.

For description and further synonymy see Danser, Philipp. J. Sci. 58 (1935) 70. *Amyema incarnatiflora* has few specialized characters and thus presents a generalized facies for the genus. The species can be identified by its combination of inflorescence characters, especially the 10- to 30-rayed umbels with the rays arising from depressions in a globular dilation of the peduncle apex, and the triads with all flowers sessile. The flower colour is described as pink or red, sometimes shading to green in the upper part.

*Amyema incarnatiflora* is endemic to the Philippines, with several records from Mindanao and one collection (no longer extant) from Luzon (fig. 9; 5 collections seen) at elevations from sea level to 1725 m. Habitat details and hosts are unknown. It is generally similar to *A. curranii* which is common at higher elevations in Luzon and which differs in having 4-merous variably pedicellate flowers. These two species are possibly local differentiates from a common stock with ternate phyllotaxy and multi-rayed umbels of triads.

Danser (1935) described the corolla of *A. incarnatiflora* as shortly gamopetalous. Whilst it is not clear from the material available, the corolla may be choripetalous. Choripetalous corollas are usual in the genus, although the petals may sometimes remain coherent long after anthesis. See note under *A. haenkeana*.

The holotypes of *Loranthus incarnatiflorus* and *L. preslii* (PNH) are no longer extant. In each case an isotype in L has been seen and designated lectotype of the name.

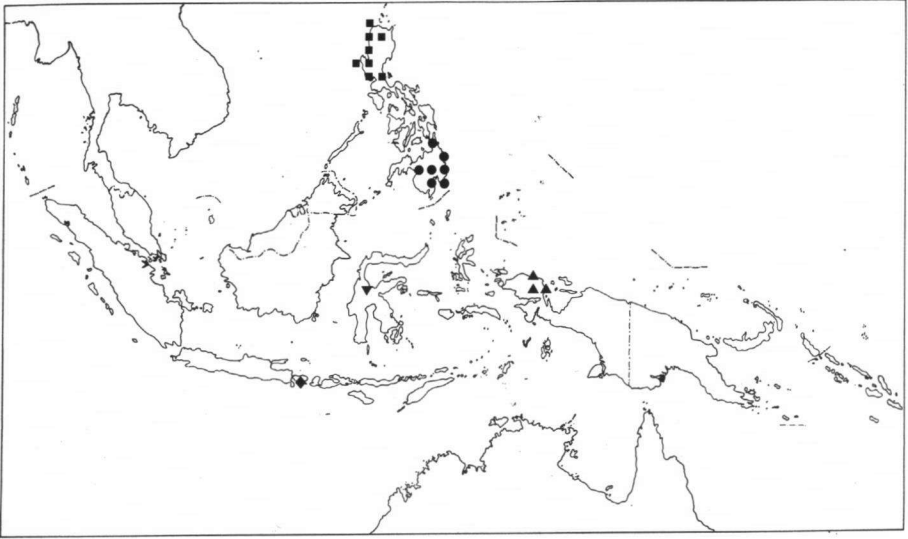


Fig. 9. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ● = *A. incarnatiflora* (Elmer) Danser; ▼ = *A. irrubescens* Barlow; ▲ = *A. kebarensis* Barlow; ◆ = *A. longipes* (Danser) Barlow; ■ = *A. luzonensis* (Schultes) Danser.

#### 44. *Amyema irrubescens* Barlow, *spec. nov.*

Species nova *A. polytriatii* Danser affinis, sed foliis decussatis vel ternatis parvioribus, pedunculo inflorescentiae ad apicem non globoso labio deflexo absente, radiis in duo verticillos non insertis differt. — Typus: *van Balgooy* 3326 (holo L 470346), Celebes, Mt Roroka Timbu, summit, 2450 m, on *Phyllocladus*, 14.v.1979.

Glabrous. *Stems* robust, producing new shoots at the older nodes. *Leaves* decussate, ternate or scattered-ternate; lamina ovate, widest near the middle, 6–9 cm long, 3–4.5 cm wide, coriaceous, dark and glossy above, dull below, attenuate at the base into a petiole rounded below channeled above and 4–8 mm long, broadly acute to obtuse at the apex; venation pennate, obscure except for the midrib which is prominent and raised on the lower surface. *Inflorescences* in groups at the nodes and arising along the internodes, pedunculate umbels of triads with all flowers pedicellate (sometimes very shortly); peduncle relatively robust, 11–16 mm long; rays 9–11, not strongly divergent, 3–4.5 mm long; pedicel of central flower of triad 0–0.5 (–1.5) mm long; pedicels of lateral flowers of triad only slightly divergent, c. 1 mm long; bracts erect, concave, acute, c. 2 mm long. *Ovary* funnel-shaped, c. 2.5 mm long; calyx limb erect, entire, c. 0.75 mm long. *Corolla* in the mature bud c. 32 mm long, weakly clavate; petals 4, lacking a deflexed spur inside near the base. *Anther* 2.5–3 mm long; free part of filament 4–5 mm long. *Stigma* not wider than style. *Fruit* not seen mature.

*Amyema irrubescens* is known only through the type specimen and one other from the same locality in central Celebes (fig. 9; 2 collections seen), at an elevation

of 2450 m. Habitat details and hosts are poorly known, but its unusual occurrence as a parasite on a gymnosperm, *Phyllocladus*, indicates relatively high host specificity in a temperate montane forest habitat.

*Amyema irrubescens* is closely related to *A. polytrias*, from which it is possibly separated by altitudinal zonation and host preference, although occurring sympatrically. It differs from *A. polytrias* in its smaller leaves which are fewer in each whorl, and in lacking a globose dilation with a deflexed lip at the apex of the peduncle. It can be further distinguished from other congeners by its combination of leaves usually ternate and distinctly bifacial, umbels with 9–11 rays and triads with all flowers pedicellate. The species has few specialized characters, and thus presents a relatively generalized facies for the genus. The corolla colour has not been recorded.

The species is probably a locally specialized differentiate sharing common ancestry with *A. polytrias*. It is separated from *A. polytrias* by a sharp morphological discontinuity. The loranth flora in the Malesian region appears to be characterized by rapid differentiation of local species in highland situations, and it is apparent that Celebes is no exception. See note under *A. polytrias*.

The specific epithet is derived from the Latin *ruber* ('red'), and alludes to the distinctive reddish-green colour of the leaf upper surface.

Additional specimen examined: *de Vogel 5377* (L), Celebes, Central, Mt Roroka Timbu, W slope, 1°16' S 120°18' E, 2450 m, 15.v.1979.

#### 45. *Amyema kebarensis* Barlow

*Amyema kebarensis* Barlow, Austral. J. Bot. 22 (1974) 579. — Type: *van Royen & Sleumer 8256* (holo L 963,204-39; iso CANB 131383), New Guinea, Vogelkop, Kebar Valley, opposite Andjai, 700 m, on *Vaccinium cavendishoides* and *Trochocarpa laurina*, 19.xii.1961.

For description see Barlow, Austral. J. Bot. 22 (1974) 579. *Amyema kebarensis* has few specialized characters and thus presents a relatively generalized facies for the genus. It can be distinguished locally by its very slender habit, its small, thin, very narrow acuminate leaves, 3- or 4-rayed umbel of triads, and 4-merous corolla. The flower colour is described as red or purple in the lower part and green or yellow above.

*Amyema kebarensis* is known only from the Vogelkop, Irian Jaya (fig. 9; 5 collections seen), from 700 to 2100 m elevation. Habitat details are poorly known; recorded hosts are *Clethra* sp., *Vaccinium cavendishoides*, and *Trochocarpa laurina*. The species is probably a young local endemic, but its affinities are difficult to assess.

#### 46. *Amyema linophylla* (Fenzl) Tieghem

*Loranthus linophyllus* Fenzl in Endl. et al., Enum. Pl. (1837) 56. — *Amyema linophylla* (Fenzl) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: *Huegel s.n.* (holo W, not seen), Western Australia, Swan R.

For description see Barlow, Flora of Australia 22 (1984) 109. *Amyema linophylla* can be identified locally by its combination of terete leaves 1–2.5 mm thick, few-rayed umbels of triads, and moderately robust flowers with a dense white indumentum. The flower colour is pink, partly obscured by the indumentum.

The species occurs in semi-arid woodlands of temperate Australia, exclusively parasitic on several species of Casuarinaceae, to which it shows a close visual resemblance in its terete needle-like leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, scleromorphic leaves, and few-rayed umbels of triads.

There are two subspecies which differ in indumentum density and in dimensions of inflorescence and flower parts, and which have disjunct areas in eastern and Western Australia respectively. They are presumably the result of ecogeographic divergence following range disruption.

#### 47. *Amyema longipes* (Danser) Barlow, *comb. nov.*

*Dicymanthes longipes* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 365. — Type: *Sarip 377* (holo BO, not seen; iso L), Lesser Sunda Islands, Bali, G. Batoekaoe, c. 1935 m, 8.x.1918.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 365, under *Dicymanthes longipes*. The species is a member of the *Dicymanthes* species group (see above) in which the inflorescence is capitata, of two sessile triads on a short peduncle. Within this group it can be identified by its combination of leaves shortly petiolate, relatively thick and not strongly bifacial, inflorescence peduncle distinct, 5–11 mm long, and the presence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla is described as red.

*Amyema longipes* is endemic to Bali, Lesser Sunda Islands (fig. 9; 3 collections seen), recorded from elevations from 1600 to 1935 m. Habitat details and hosts are unknown.

The species is similar to *A. hexantha* which is endemic to Mindanao in the Philippines, and from which it differs in its longer inflorescence peduncle and presence of deflexed spurs which form a nectar chamber at the base of the corolla. However, the similarities may be parallelisms and the species may not be directly related. The only species of the complex which is sympatric with *A. longipes* is *A. cuernosensis* which has sessile leaves and inflorescences.

#### 48. *Amyema lucasii* (Blakely) Danser

*Loranthus lucasii* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 393. — *Amyema lucasii* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — Type: *Jackson s.n.* (lecto NSW), New South Wales, 40–50 mi (64–80 km) NW of Collarenebri, xii.1911.

For description see Barlow, Flora of Australia 22 (1984) 103. *Amyema lucasii* can be identified locally by its combination of opposite, elliptic, petiolate leaves, 4-rayed umbels of triads with all flowers sessile, and ovary distinctly white-tomentose in the lower part. The flower colour is green or red.

The species occurs in open and semi-arid woodlands of inland eastern Australia and is almost exclusively parasitic on *Flindersia maculosa*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.



**49. *Amyema luzonensis* (Schultes) Danser**

*Loranthus luzonensis* Schultes, Syst. Veg. 7, 1 (1829) 104. — *Amyema luzonensis* (Schultes) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 296. — Type: not seen.

*Stemmatophyllum sessilifolium* Tieghem, Bull. Soc. Bot. France 41 (1894) 506, 546. — *Amyema sessilifolia* (Tieghem) Danser, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 29 (6) (1933) 34. — Type: *Cuming 1956* (holo P), Philippines, 'Manille'.

For description and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 72. The description is amended as follows: Central flowers sometimes and lateral flowers very rarely sessile in the triads; corolla in the mature bud gradually inflated, widest at 3/4 of its length, then gradually tapered but finally with an acute tip in last 2 mm. *Amyema luzonensis* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of small, regularly quaternate, sessile, bifacial leaves 1–6 cm long, mostly 4- (rarely to 2- or 7-)rayed umbels of triads with all flowers usually pedicellate (see above), and tomentose corollas more than 25 mm long. The flower colour has been recorded as red, orange, or yellow, sometimes shading to green in the upper part.

*Amyema luzonensis* is apparently endemic to and common in Luzon, Philippines (fig. 9; 10 collections seen), and recorded at low elevations from sea level to 900 m. Other habitat details and hosts are unknown.

Along with *A. benguetensis* and *A. rhytidoderma*, *A. luzonensis* forms a complex endemic to Luzon, with distinct altitudinal zonation. *Amyema luzonensis* occurs in the lowlands, with the other two species at higher elevations. For notes on differences between the species, see under *A. benguetensis*. The three species have probably differentiated ecogeographically from a common ancestor in response to the altitudinal zonation of habitats in Luzon. However, the differences between the species do not represent a simple altitudinal cline. Whilst the change from *A. luzonensis* to *A. benguetensis* principally involves floral characters (corolla length and indumentum), the change to *A. rhytidoderma* at the highest elevations involves a striking increase in leaf size and a reversal of the corolla indumentum state. The affinity of the complex may be with *A. acuta* which has similar inflorescence structure and phyllotaxy.

Danser (1935) expressed doubts about conspecificity of *A. sessilifolia* with *A. luzonensis* because Van Tieghem's description of the former did not appear to conform with the type specimen, which agrees closely with *A. luzonensis*. However, the inflorescences on the specimen are damaged by insect infestation, and most triads are aborted. This may have led Van Tieghem to describe the inflorescence as a simple umbel.

**50. *Amyema mackayensis* (Blakely) Danser**

*Loranthus mackayensis* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 392; *ibid.* 48 (1923) 131.

— *Amyema mackayensis* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Tryon s.n.* (holo NSW), Queensland, Mackay.

*Loranthus cynceus-sinus* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 392; *ibid.* 48 (1923) 131. — *Amyema mackayensis* subsp. *cyncei-sinus* (Blakely) Barlow, Austral. J. Bot. 14 (1966) 472. — Type: *Fitzgerald 1705* (holo NSW; iso PERTH), Western Australia, West Kimberley, Cygnet Bay, xi.1906.

For descriptions and additional synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 580; *Flora of Australia* 22 (1984) 96. *Amyema mackayensis* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of glabrous habit, shortly petiolate elliptic to orbicular leaves 2–6 cm long, few-rayed umbel of triads with the central flower sessile, and corolla lacking longitudinal ridges in bud. The species is also identified by its habitat and host specialization (see below). Flower colour is red, yellow, or green, sometimes grading from red in the lower part to paler hues above.

The species occurs in New Guinea and northern Australia (fig. 10), exclusively in mangrove communities, and is recorded as parasitic on *Avicennia*, *Camptostemon*, *Ceriops*, *Excoecaria*, *Lumnitzera*, *Rhizophora*, and *Sonneratia*. It shows features common in Australian amyemas of open forests and woodlands (even in New Guinea), including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. Its habitat and host specialization are correlated with the relatively small rounded leaves which are usually very thick and fleshy when fresh. The species therefore often shows a close visual resemblance to its host (Barlow & Wiens, 1977).

Two subspecies were recognized by Barlow (1966), based on Blakely's *Loranthus mackayensis* and *L. cygneus-sinus*, from northeastern and northwestern Australia respectively. The two subspecies have very minor differences in inflorescence and flower dimensions, and these differences are weakened by the intermediate nature of the specimens from Torres Strait and southern New Guinea. *Amyema mackayensis* is best treated as a species without designated subspecies but with some minor local variation in inflorescence dimensions.

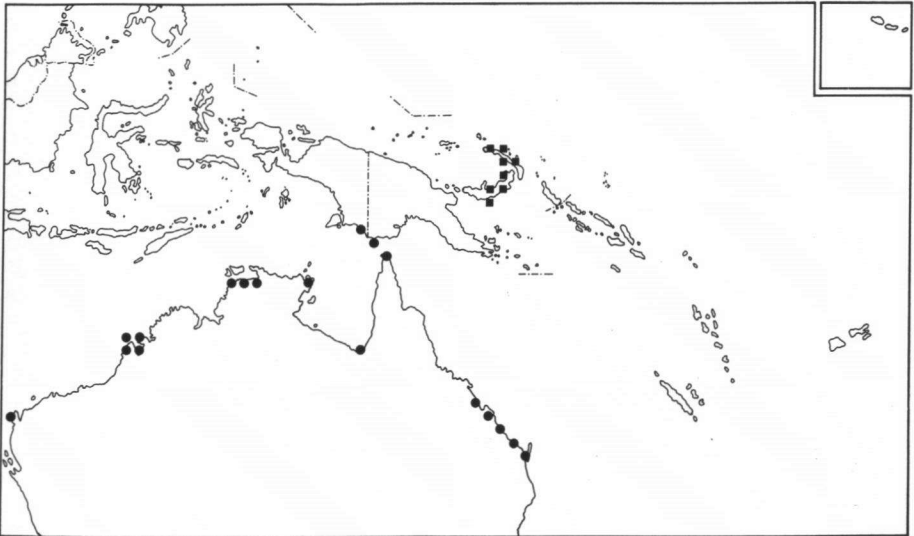


Fig. 10. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ● = *A. mackayensis* (Blakely) Danser; ■ = *A. novaebritanniae* (Schumann) Danser.

In northwestern Australia *Amyema mackayensis* is sympatric with *A. thalassia*, which is also specialized for mangrove hosts. The latter species differs in its longitudinally winged rays, pedicels and corolla buds, and in its 4-merous flowers. See note under *A. gravis* on similarities and relationships.

### 51. *Amyema maidenii* (Blakely) Barlow

*Loranthus maidenii* Blakely, Proc. Linn. Soc. New S. Wales 49 (1924) 87. — *Amyema maidenii* (Blakely) Barlow, Proc. Linn. Soc. New S. Wales 87 (1962) 57. — Type: *Boorman s.n.* (lecto NSW), New South Wales, Tarcoon, xi.1903.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 117. *Amyema maidenii* can be identified by its combination of overall white tomentum, small opposite leaves, and by the inflorescence of a pedunculate head of two sessile triads with all flowers sessile. The flower colour is green.

The species occurs in arid and semi-arid woodlands of inland Australia, parasitic exclusively on *Acacia*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

The capitate inflorescence superficially resembles those of the several species placed by Danser in *Dicymanthes*, but probably represents one of several parallel lines of specialization (see note under *Amyema* above). *Amyema maidenii* is closely related to *A. subcapitata*, in which the lateral flowers of the triads are shortly pedicellate, even though the triads are sessile.

There are two subspecies which differ in leaf and indumentum characters, and have parapatric areas and different host preferences.

### 52. *Amyema melaleucae* (Lehmann ex Miquel) Tieghem

*Loranthus melaleucae* Lehmann ex Miquel in Lehmann, Pl. Preiss. 1 (1845) 281. — *Amyema melaleucae* (Lehmann ex Miquel) Tieghem, Bull. Soc. Bot. France 42 (1895) 82, 84. — Type: *Preiss 1616* (holo not seen; iso MEL), Western Australia, Rottneet I., 18.viii.1839.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 104. *Amyema melaleucae* can be identified locally by its combination of glabrous habit, opposite, small, lanceolate leaves 2–4 mm wide, mostly 2-rayed umbels of triads, and clavate corolla buds 14–22 mm long. The flower colour is red.

The species occurs in coastal and subcoastal swamp woodland in southern Australia, parasitic exclusively on *Melaleuca*, to some species of which it shows a close visual resemblance in its small narrow leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences. For note on relationships, see under *A. gaudichaudii*.

### 53. *Amyema microphylla* Barlow

*Amyema microphylla* Barlow, Brunonia 5 (1983) 210. — Type: *Craven 5135* (holo CANB), Western Australia, Lake Way, 26° 45' S 120° 23' E, 25.iv.1978.

For description see Barlow, *Flora of Australia* 22 (1984) 106. *Amyema microphylla* can be identified by its combination of glabrous habit, distinctive, terete, shortly mucronate leaves only 5–8 mm long, 2-rayed umbels of triads, and clavate 4-merous corolla buds c. 20 mm long. The flower colour is red.

The species is known only from three collections from the Wiluna area, Western Australia, at the margins of salt lakes, parasitic on *Melaleuca*, to which it shows a close visual resemblance in its very small linear leaves (cf. Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, scleromorphic leaves, and reduced inflorescences. The affinity of the species is probably with *A. melaleucae*, *A. herbertiana*, and *A. gaudichaudii* which have similar inflorescences and are host-specific for *Melaleuca*. For note on biogeography, see under *A. gaudichaudii*.

#### 54. *Amyema miquelii* (Lehmann ex Miquel) Tieghem

*Loranthus miquelii* Lehmann ex Miquel in Lehmann, Pl. Preiss. 1 (1845) 280. — *Amyema miquelii* (Lehmann ex Miquel) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: *Preiss 1617* (not seen), Western Australia, York, 13.iii.1839.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 111. *Amyema miquelii* can be identified by its combination of opposite, pendulous, eucalyptoid leaves, and 3- to 7-rayed umbels of triads with all flowers pedicellate. The flower colour is usually red, sometimes orange or yellow.

The species occurs throughout most of mainland Australia, in open forest and woodland, usually parasitic on *Eucalyptus* but locally common on *Acacia* and rarely on other hosts. It often shows a close visual resemblance to its eucalypt hosts in its pendulous falcate leaves (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, a highly complex primary haustorium, and leaves which are curvined and isobilateral.

#### 55. *Amyema miraculosa* (Miquel) Tieghem

*Loranthus miraculosus* Miquel in Lehmann, Pl. Preiss. 1 (1845) 281. — *Amyema miraculosa* (Miquel) Tieghem, Bull. Soc. Bot. France 42 (1895) 83, 84. — Type: *Preiss 1609* (not seen), Western Australia, Wicklow, 18.iii.1841.

For descriptions and additional synonymy see Barlow, *Flora of Australia* 22 (1984) 98; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 339. *Amyema miraculosa* can be identified by its combination of opposite, narrow, isobilateral leaves, 2- to 4-rayed umbel, and longitudinally ridged corolla when in bud. The species has a relatively unspecialized inflorescence structure and in this respect presents a rather generalized facies for the genus. Flower colour is red, usually grading from very dark in the lower part to paler hues above.

The species occurs widely in Australia, mostly in arid and semi-arid woodlands and predominantly in temperate habitats. It is also known from two collections from

Timor (fig. 11). In Australia it is parasitic on various hosts but common on *Santalum*, Casuarinaceae, Myoporaceae, and other *Amyema* species; from Timor it is recorded on *Pittosporum*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. The species often shows a close visual resemblance to its preferred santalaceous and myoporaceous hosts (Barlow & Wiens, 1977). Its closest similarities are with *Amyema melaleucæ* and related species, and it is distinguished from these primarily by leaf size and the longitudinal ridges on the corolla bud.

Two subspecies were recognized by Barlow (1966), based on *Loranthus miraculosus* and Blakely's var. *boormanii*. These two subspecies differ in corolla length and in leaf dimensions and shape. They have parapatric distributions, with *A. miraculosa* subsp. *miraculosa* occupying a limited area in temperate Western Australia and subsp. *boormanii* occurring throughout the remainder of the species range in Australia.

Danser (1931) referred two collections from Timor to *A. miraculosa*. He apparently had little Australian material available, and may have been guided by the descriptions and illustrations in Blakely (1923), which emphasized the more common eastern Australian material now placed in subsp. *boormanii*. When Danser later saw a Western Australian collection which is referable to the more diminutive typical subspecies of *A. miraculosa*, he did not recognize it as being conspecific with the materials he had previously seen, and described it as a new species, *A. apiculata* (Danser, 1937).

The Timor specimens are distinct from both of the Australian subspecies in some minor vegetative and floral characters. This suggests that there has been significant ecogeographic differentiation, sufficient for recognition of a third subspecies.

#### KEY TO THE SUBSPECIES

- 1a. Corolla 8–12 mm long; lamina mostly less than 5 cm long, contracted at the base to a distinct petiole (SW Western Australia) . . . . . a. subsp. *miraculosa*
- b. Corolla 15–25 mm long; lamina 4–11 cm long, attenuate at the base to an obscure petiole. . . . . 2
- 2a. Lamina lanceolate to narrowly elliptic, thickly coriaceous; ovary funnel-shaped; calyx limb 0.5–1 mm long (inland southern Australia) . . b. subsp. *boormanii*
- b. Lamina lanceolate-spathulate, thin; ovary cylindrical below, abruptly widened above; calyx limb 1–1.5 mm long (Timor) . . . . . c. subsp. *latifolia*

#### a. subsp. *miraculosa*

No additions to the synonymy and the description in Barlow, *Flora of Australia* 22 (1984) 98.

#### b. subsp. *boormanii* (Blakely) Barlow

No additions to the synonymy and the description in Barlow, *Flora of Australia* 22 (1984) 99.

**c. subsp. *latifolia* Barlow, *subsp. nov.***

Subspecies nova *A. miraculosa* subsp. *boormaniae* (Blakely) Barlow similis, sed lamina lanceolata-spathulata tenui, ovario parte inferiore cylindrico parte superiore abrupte dilatato, calyce longiore differt. — Typus: *Forbes 3543* (holo BM; iso CANB 402356, L), Timor, Turskain, 1200 m, 1882–1883.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 339 and key above. The flower colour is recorded as purple.

The subspecies is confined to Timor (fig. 11; 3 collections seen). Habitat details are poorly known; the subspecies is recorded once as parasitic on *Pittosporum*.

*Amyema miraculosa* is presumably of long establishment in Australia, with subsp. *latifolia* the result of more recent isolation and differentiation of a population of the species in Timor. However, *A. miraculosa* apparently does not now occur in north-western Australia near Timor. It is unlikely that dispersal to Timor has involved a distance dispersal event from the present-day area of the species in Australia. *Amyema miraculosa* probably had a greater area in northern Australia during the cooler, drier Quaternary climatic maxima, when exposed land in the region would have been most extensive and dispersal to Timor most likely. The presence of a subspecies in Timor may therefore be a relict of the Quaternary climatic cycles in the region. Its persistence there through subsequent warmer, pluvial cycles has presumably involved adaptive response which may be reflected in the differences associated with its subspecific rank, notably its relatively large leaves with thin texture.

The subspecific epithet is derived from the Latin *latus* ('broad') and *folium* ('leaf'), and alludes to the main diagnostic character of the subspecies.

**56. *Amyema nestor* (S. Moore) Danser**

*Loranthus nestor* S. Moore, J. Bot. 35 (1897) 170. — *Amyema nestor* (S. Moore) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Moore s.n.* (holo BM), Western Australia, Goldfields, near Brickey Soak, vi.1895.

For description see Barlow, Flora of Australia 22 (1984) 115. *Amyema nestor* can be identified locally by its combination of overall white or golden tomentum, flat elliptic or ovate leaves 1–2.5 cm wide with pennate venation, 2-rayed umbel of triads with the central flower sessile, and robust flowers c. 25 mm long. The red flower colour is partly obscured by the indumentum.

The species occurs in arid and semi-arid woodlands of Western Australia, parasitic exclusively on *Acacia*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, isobilateral leaves, and few-rayed inflorescences.

**57. *Amyema novaebritanniae* (Schumann) Danser**

*Loranthus novaebritanniae* (.. *vae-bri* ..) Schumann in Schumann & Lauterbach, Fl. Deutsch. Schutzgeb. Südsee, Nachtr. (1905) 259. — *Amyema novaebritanniae* (Schumann) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Schlechter 13765* (lecto K, see below), New Britain, near Mandres, xi.1901.

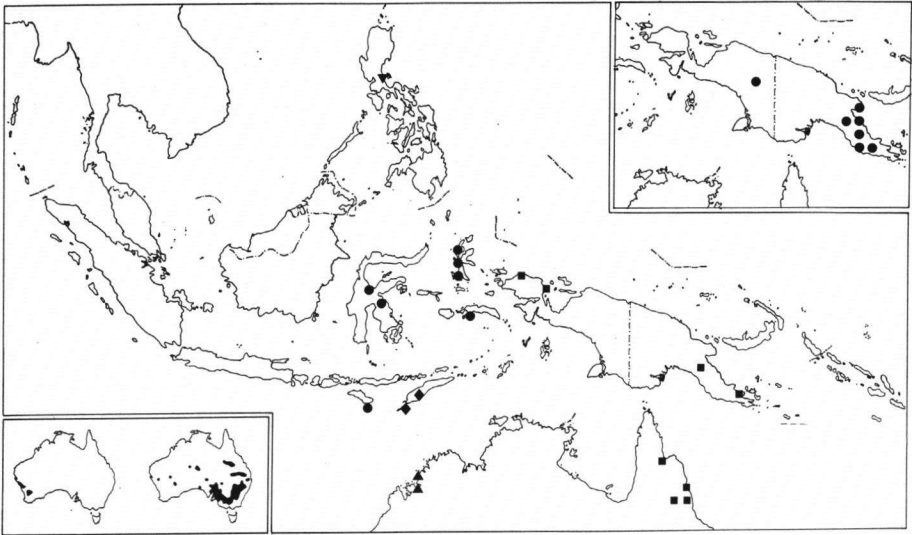


Fig. 11. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. Australian distributions reproduced from the Flora of Australia 22 (1984), with permission of the Australian Government Printing Service. ◆ and lower left and right insets = *A. miraculosa* (Miquel) Tieghem subsp. *boormanii* (Blakely) Barlow, subsp. *latifolia* Barlow, and subsp. *miraculosa* respectively; ● = *A. pachypus* (Burkill) Danser (inset); ▼ = *A. polillensis* (Robinson) Danser; ● = *A. polytrias* Danser; ▲ = *A. pyriformis* Barlow; ■ = *A. queenslandica* (Blakely) Danser.

For description and additional synonymy see Barlow, Austral. J. Bot. 22 (1974) 581. *Amyema novaebritanniae* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of glabrous slender parts, thin, acute, isobilateral petiolate leaves, few-rayed umbel, and distinctly pedicellate lateral flowers. The flower colour is described as red, mostly grading to yellow or green in the upper part.

The species occurs in New Britain and New Ireland (fig. 10; 9 collections seen), from sea level to 1060 m elevation. Habitat details and hosts are unknown. It is probably closely related to *A. artensis* which is common in eastern New Guinea and extends to New Caledonia and a few other Pacific islands. *Amyema artensis* differs in its generally fewer-rayed umbel, sparse inflorescence indumentum, and bifacial leaves. See note under *A. artensis*.

The holotype of *Loranthus novaebritanniae* (B) is no longer extant. An isotype in K has been seen and designated lectotype of the name.

### 58. *Amyema pachypus* (Burkill) Danser

*Loranthus pachypus* Burkill, Kew Bull. (1899) 109. — *Amyema pachypus* (Burkill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 297. — Type: *Guilianetti s. n.* (holo K), New Guinea, Mt Scratchley, 3000–4000 m, 1896.

*Amyema clavipes* Danser, Brittonia 2 (1936) 132. — Type: Brass 4972 (holo NY; iso L 936,139-497), New Guinea, Central Division, Mt Tafa, 2400 m, iv.1933.

For descriptions see Barlow, Austral. J. Bot. 22 (1974) 570, 582 under *A. clavipes* and *A. pachypus*. *Amyema pachypus* can be identified locally by its combination of opposite bifacial leaves, its umbel of triads with few, relatively thick rays, and its bracts constricted below the apex but lacking a distinct dorsal protuberance. The flower colour is described as pink to dark red.

The species occurs in the highlands of New Guinea (fig. 11; 32 collections seen) in subalpine vegetation from 2300 to 3800 m elevation. Recorded hosts include *Dacrycarpus*, *Drimys*, *Podocarpus*, *Prunus*, *Rapanea*, and *Rhododendron*. The subalpine species of *Amyema* in New Guinea are a closely related natural group, and intergradation between them apparently occurs (see notes under *A. dilatipes*). A geographic replacement pattern exists between *A. pachypus* and *A. wichmannii* (see note under *A. wichmannii*). For note on possible relationship with *A. artensis*, with which *A. pachypus* is sympatric but tends to replace at higher elevations, see there.

Barlow (1974) maintained *A. pachypus* and *A. clavipes* as distinct although very closely related species, with virtually identical areas and an altitudinal separation. Further study has confirmed the altitudinal gradation in the characters used to distinguish the taxa, which are mainly the length, thickness and articulation of axis segments. However, they are probably segregates from a single gene pool, and *A. clavipes* and *A. pachypus* are therefore treated as conspecific, resulting in an entity which is more concordant with patterns of variation in the genus.

### 59. *Amyema pendula* (Sieber ex Sprengel) Tieghem

*Loranthus pendulus* Sieber ex Sprengel, Syst. Veg. Suppl. (1827) 139. — *Amyema pendula* (Sieber ex Sprengel) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: Sieber 241 (holo K; iso BM, G, MEL), New Holland, Port Jackson.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 110. *Amyema pendula* can be identified by its combination of rusty brown indumentum on young leaves and inflorescences, opposite, pendulous, eucalyptoid leaves, and 3- to 5-rayed umbels of triads or tetrads with the central flowers sessile and the lateral flowers pedicellate. The flower colour is usually red, sometimes grading to orange or yellow above, but partially obscured by the indumentum.

The species occurs in southeastern Australia, in open forest and woodland, parasitic on many *Eucalyptus* species and locally common on several *Acacia* species. It often shows a close visual resemblance to its eucalypt hosts in its pendulous falcate leaves (Barlow & Wiens, 1977). The species shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, a highly complex primary haustorium, and leaves which are curvined and isobilateral.

There are two subspecies which differ in inflorescence and floral characters. They have contiguous areas, and their differences probably reflect adaptations to available pollinator guilds.



**60. *Amyema plicatula* (Krause) Danser**

- Loranthus plicatulus* Krause, Nova Guinea 14 (1923) 102. — *Amyema plicatula* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — *Amyema scandens* subsp. *plicatula* (Krause) Barlow, Austral. J. Bot. 22 (1974) 588. — Type: *Lam 641* (holo L; iso K, U), New Guinea, Mamberamo R., Pionierbivak, 70 m, 16.vii.1920.
- Amyema obovata* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 340. — Type: *Lam 591* (holo BO, not seen; iso L), New Guinea, Otke R., near Pionierbivak, 70 m, 8.vii.1920.
- Amyema ovariosa* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 340. — Type: *Docters van Leeuwen 9383* [lecto L, fide Barlow, Austral. J. Bot. 22 (1974) 586], New Guinea, Pionierbivak, 50 m, vi.1926.
- Amyema cephalanthera* Danser, Brittonia 2 (1936) 131. — Type: *Brass 6023* (holo L), New Guinea, western, Oriomo R., Wuroi, 30 m, i-iii.1934.
- Amyema pentactis* Danser, Blumea 3 (1940) 397. — Type: *Clemens 8307a* (holo B, not extant, photograph seen, see below), New Guinea, Morobe, Sattelberg, Abe, 5000–6000 ft (1500–1800 m), 15–18.vi.1938.
- Amyema duurenii* Barlow, Proc. Roy. Soc. Qd. 75 (1964) 13. — Type: *van Duuren s.n.* (holo BRI), New Guinea, Papua, Kairuku, Ukua Estate, ii.1963.
- Amyema angularis* Barlow, Austral. J. Bot. 22 (1974) 565. — Type: *Eyma 5387* (holo L 952,990–86), New Guinea, Wissel Lake region near biv. Digatara Pass, 1.xi.1939.

Glabrous or rarely the inflorescence and flowers shortly and sparsely brown- or white-tomentose. *Stems* usually robust and distinctly lenticellate, enlarged at the nodes, angular or terete when young but terete when older. *Leaves* opposite, ternate, scattered-ternate, or rarely quaternate; lamina elliptic to ovate or obovate, or rarely almost orbicular, (4–)7–13(–16) cm long, (2.5–)5–8(–10) cm wide, thinly to thickly coriaceous, dull on both sides, cuneate or attenuate at the base into a petiole (3–)5–15 mm long, often undulate at the margin, mostly rounded or rarely broadly acute at the apex; venation pennate, obscure to distinct with the midrib usually raised below. *Inflorescences* several at the nodes; peduncle (5–)12–25 mm long, 1–2 mm thick; rays 4–6(–8), (4–)6–10 mm long; flowers all sessile in the triads; bracts triangular, 1–2 mm long, broadly acute, forming a small spreading involucre below the triads. *Ovary* funnel- to barrel-shaped, 2–3 mm long; calyx limb truncate or weakly lobed, 0.5–1 mm long, erect. *Corolla* in the mature bud slender, (16–)20–28 mm long, usually rounded or obtuse, 5- or 6-merous. *Anther* c. 2 mm long, about one fourth as long as the free part of the filament. *Stigma* knob-like, about 1.5 times wider than the style. *Fruit* ellipsoid to obovoid, 7–10 mm long, crowned by the calyx limb and often by long persistent styles.

*Amyema plicatula* is recorded from New Guinea, New Britain, and eastern Australia (fig. 12; 19 collections seen), mostly at low elevations but ranging to 2400 m. The species occurs in primary and secondary rain forest, probably parasitic on a wide range of hosts including *Calophyllum*, *Discocalyx*, *Dysoxylum*, *Galbulimina*, *Maniltoa*, and *Pasania*.

*Amyema plicatula* is a member of the *Amyema scandens* species complex which can be identified in the Papuasian region by the inflorescence of a 4- to 8-rayed umbel of triads with all flowers closely sessile in an equidistant arrangement. Within this group it can be identified by its leaves which are mostly opposite, ternate, or scattered ternate, petiolate, mostly undulate at the margin and rounded at the apex. The corolla is described as pink or red.

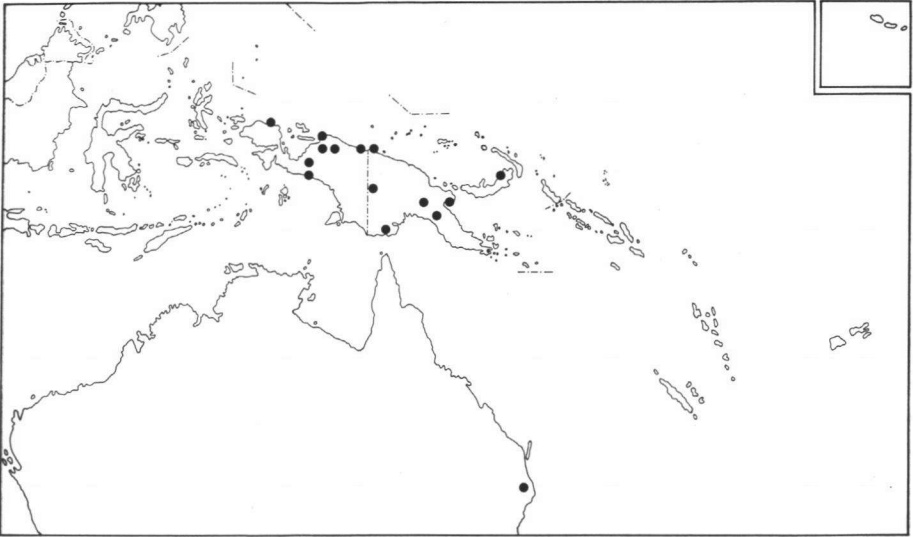


Fig. 12. Distribution of *Amyema plicatula* (Krause) Danser. Symbols show recorded occurrence in 1° grid cells.

The two species accepted here as *A. caudiciflora* and *A. plicatula* essentially represent a change of rank for two subspecies of *A. scandens* circumscribed by Barlow (1974). Three subspecies were then recognized within *A. scandens*, differing in phyllotaxy and leaf and petiole characters, and apparently having different areas. These subspecies were circumscribed relatively narrowly, and many other specimens were treated as a residue of intergrades within *A. scandens*. Re-examination of the variation patterns in the present study has confirmed the existence of three modal morphological types, but has also shown that virtually all of the specimens formerly placed in the residue group can be referred to one or another of these three entities, and that each of these still has a strong ecogeographic integrity. These more broadly circumscribed entities appear to retain considerable morphological integrity in a complex situation of altitudinal zonation and area disjunction, and it is concluded that they are more appropriately accorded specific status. *Amyema plicatula* represents the entity formerly treated by me as *A. scandens* subsp. *plicatula*.

A more critical study of the variation patterns in the *A. scandens* complex has shown that some local New Guinean forms previously accorded specific status, each based only on a single collection, are part of the continuum of variation in *A. plicatula* and, accordingly, are treated as conspecific. *Amyema angularis* was formerly distinguished as a form with small leaves and triangular young stems. *Amyema obovata* was formerly distinguished, with some doubt, on the basis of its opposite thin leaves and slender inflorescences and flowers. *Amyema pentactis* was formerly distinguished on the basis of its opposite, thick, broadly elliptic to nearly orbicular leaves.

The recent discovery of a population indistinguishable from *A. plicatula* in remnant subtropical rain forest in northern New South Wales represents a striking appar-

ent disjunction of 2400 km in the species range. The alternatives that the population represents either recent arrival as a waif by distance dispersal, or a relict of a former continuous range, seem equally unlikely. Although the Loranthaceae of eastern Australian humid forests are relatively well known, it is possible that other populations will be found in the intervening area.

The type of *A. pentactis*, *Clemens 8307a* (B), is not extant, and there are apparently no duplicates. However, a clear photograph accompanies Danser's description. There is also a specimen *Clemens 8307* in L, which agrees closely with the original description and photograph and has identical label information as the type, and which may therefore be from the same gathering.

For further discussion, see under *A. scandens*.

### 61. *Amyema polillensis* (Robinson) Danser

*Loranthus polillensis* Robinson, Philipp. J. Sci. C 6 (1911) 200. — *Amyema polillensis* (Robinson) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — Type: *McGregor BS 10384* (lecto US, see below), Philippines, Polillo, x-xi.1909.

For description see Danser, Philipp. J. Sci. 58 (1935) 83. The description is amended as follows: corolla 4-merous, the petals remaining coherent in pairs after anthesis; anthers with a broad flat connective continuous with a flattened filament c. 0.6 mm wide. The species can be identified by its combination of 4- to 7-whorled phyllotaxy, broadly elliptic leaves with distinct petioles c. 25 mm long, and inflorescence of a pedunculate simple umbel of 4-6 4-merous flowers. The flower colour has not been recorded.

*Amyema polillensis* is endemic to the Philippines, being recorded from Polillo and the adjacent mainland of Luzon (fig. 11; 1 collection seen), apparently at low elevations. Other habitat details and hosts are unknown.

The distinctive simple umbel is probably derived by reduction of the triads of the basic confluence to single flowers. *Amyema polillensis* is apparently similar in this respect to the poorly known *A. umbellata* from the Moluccas. However, the reductions to a simple umbel may be a parallelism, and the two species may be unrelated local endemics. See notes under *Amyema* and *A. fasciculata*.

The holotype of *Loranthus polillensis* (PNH) is no longer extant. An isotype in US has been seen and designated lectotype of the name.

### 62. *Amyema polytrias* Danser

*Amyema polytrias* Danser, Blumea 3 (1940) 391. — Type: *Grevenstuk 212* (holo BO not seen; iso L), Lesser Sunda Islands, Sumba, Kanangar, 21.vii.1938.

Plant robust; 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, rarely entirely glabrous; epicortical runners present. *Leaves* in whorls of 3-6 or sometimes more through development of additional supernumerary ones, rarely scattered; lamina narrowly ovate to ovate, 10-20(-30) cm long, (2.5-)4.5-7(-12) cm wide, cuneate-attenuate at the base into a distinct petiole, rounded below,

channeled above, (7–)10–35 mm long, acute to shortly acuminate at the apex, drying olive above and brown below; midrib flat or slightly depressed above, raised and prominent below; venation pennate, slightly visible on both surfaces. *Inflorescences* few at the nodes or arising from the epicortical runners, pedunculate umbels of triads with all flowers pedicellate (sometimes very shortly); peduncle 10–25(–30) mm long, globose at the apex with a deflexed lip; rays (9–)11 or 12, attached in 2 whorls, moderately divergent, (1.5–)3.5–5.5 mm long; pedicels (0.2–)1–1.5(–3) mm long; bracts erect to spreading, narrowly acute, 1–1.5 mm long. *Ovary* narrowly funnel-shaped, 1.5–2 mm long; calyx limb slightly spreading, weakly lobed, 0.75–1 mm long. *Corolla* in the mature bud (25–)34–40 mm long, weakly clavate; petals 4, slender, free to the base. *Anther* 2–3.5 mm long; free part of filament 3–4 mm long. *Stigma* hardly wider than style. *Fruit* ellipsoid, 6–8 mm long.

*Amyema polytrias* is recorded from Celebes, Lesser Sunda Islands (Sumba), and several Moluccan islands (fig. 11; 11 collections seen), at elevations from sea level to 2200 m. Habitat details are poorly known; the only recorded host is *Knema*.

The species has few specialized characters and thus presents a relatively generalized facies for the genus. It can be identified locally by its combination of relatively large verticillate leaves, globose inflorescence peduncle lipped at the apex, umbels with many rays in two whorls, and triads with all flowers variably pedicellate. The apparently supernumerary leaves in the whorls may be correlated developmentally with the presence of a supernumerary whorl of rays in the umbel. There is a tendency for the rays in this whorl to be fused longitudinally, giving the impression of fewer rays than the actual number present. The corolla is described mostly as pink to red in the lower part, shading to yellow or green towards the apex.

Danser (1940) described *A. polytrias* subsequent to his major regional revision, and had only the type collection available. Additional specimens seen in the present study show the species to be distributed relatively widely to several islands in the region of Charles's Line. The type collection is itself a somewhat atypical representative of the species, and the supplementary description is based on all specimens examined. Danser considered *A. polytrias* to be closely related to *A. celebica*, but the additional materials indicate that the taxonomic distance between them is substantial. *Amyema polytrias* differs strikingly from *A. celebica* in phyllotaxy, in the number and insertion of the umbel rays, and in the 4-merous corolla.

*Amyema polytrias* is at the core of a small species complex which also includes *A. halconensis*, *A. irrubescens*, and *A. scheffleroides*. These species share verticillate phyllotaxy and inflorescences with relatively many rays in the umbel. The area of the complex extends from the northern Philippines through Celebes and the Moluccas to the Lesser Sunda Islands. The complex has probably differentiated ecogeographically during the genesis of landforms in the region, extending northwards and westwards from the region of Charles's Line at times of lowered sea level. *Amyema irrubescens* is a local endemic in Celebes, separated from *A. polytrias* by altitudinal zonation and possibly host preference. It differs from *A. polytrias* in having smaller leaves, fewer in each whorl. The Philippine *A. halconensis* differs from *A. polytrias* in its shorter inflorescence parts, fewer rays in the umbel, and in its 5-merous corollas with the petals shortly coherent at the base after anthesis. *Amyema scheffleroides*,

from Sumbawa, differs in its glabrous habit, shorter and more slender inflorescence parts, and fewer rays in the umbel. All three species also differ from *A. polytrias* in lacking a globose dilation with a deflexed lip at the apex of the peduncle.

### 63. *Amyema preissii* (Miquel) Tieghem

*Loranthus preissii* Miquel in Lehmann, Pl. Preiss. 1 (1845) 280. — *Amyema preissii* (Miquel) Tieghem, Bull. Soc. Bot. France 42 (1895) 82, 84. — Type: *Preiss 1611* (not seen), Western Australia, Perth, 8.iii.1841.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 108. *Amyema preissii* can be identified by its combination of glabrous habit, terete leaves, 2- or 3-rayed umbels of triads, and slender but distinctly clavate flower buds. The flower colour is red.

The species is widespread in Australia, occurring in open forests and woodlands, and is almost exclusively parasitic on many species of *Acacia*, rarely on *Cassia*. With its slender terete leaves, it blends visually with some of its more common hosts (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, scleromorphic leaves, and few-rayed umbels of triads. One of the few cases of polyploidy in the family is found infraspecifically in *A. preissii* (Martin, 1983).

### 64. *Amyema pyriformis* Barlow, *spec. nov.*

Species nova *A. biniflorae* Barlow affinis, sed foliis brevioribus, inflorescentia glabra, bracteis parvis, fructu anguste pyriformi aurea differt. — Typus: *Kenneally 9600* (holo PERTH 1436570; iso CANB 346887, PERTH 1436589), Western Australia, W Kimberley, 30 km ESE of mouth of Sale R., 16° 02' S 124° 46' E, on *Eucalyptus rupestris*, 13.v.1986.

Slender glabrous shrub. *Stems* pendulous; internodes 4–5 cm long. *Leaves* opposite or scattered; lamina narrowly lanceolate, 5–9 cm long, 0.6–1 cm wide, gradually attenuate at the base to a slender petiole 5–10 mm long, dull on both sides, shortly rounded or broadly acute at the apex; venation parallel, obscure except for the midrib which is faintly visible but not raised. *Inflorescences* solitary in the leaf axils, a 2-rayed umbel of dyads; peduncle slender, perpendicular to the stem, 10–20 mm long; rays spreading, 6–10 mm long, bearing at the tip a rounded concave bract c. 0.7 mm long; pedicels 6–8 mm long; floral bracts rounded, erect, c. 1.2 mm long. *Fruit* narrowly pear-shaped, 12 mm long, crowned by the persistent calyx limb c. 1 mm long. *Flowers* not seen.

*Amyema pyriformis* is endemic to the West Kimberley District, Australia (fig. 11; 2 collections seen), occurring in lowlands. Habitat details are poorly known, but the species presumably occurs in open forests, exclusively parasitic on *Eucalyptus*.

*Amyema pyriformis* is closely related to *A. bifurcata*, *A. biniflora* and *A. eburna*, which all occur in northern Australia and share the bifurcate inflorescence and specialization for *Eucalyptus* as host, to which they show close visual resemblance in their pendulous falcate leaves (Barlow & Wiens, 1977). *Amyema pyriformis* shows fea-

tures common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences. It can be identified by its combination of glabrous habit, short leaf lamina less than 10 cm long, small bracts, and striking narrowly pear-shaped golden-yellow fruit. Even though flowers have not been seen, these differences clearly represent a distinct species which is a young local endemic, probably differentiated within the species complex in adaptation to its particular eucalypt host.

The specific epithet is derived from the Latin *pyriformis* ('pear-shaped'), in direct allusion to the distinctive fruit shape.

Additional specimen examined: *Wilson 10778* (PERTH), Western Australia, Bonaparte Archipelago, Augustus Island, 15°20' S 124°30' E, on *Eucalyptus*, 15.v. 1972.

### 65. *Amyema quandang* (Lindley) Tieghem

*Loranthus quandang* Lindley in Mitchell, Three Exped. Austral. 2 (1838) 69. — *Amyema quandang* (Lindley) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: *Mitchell s.n.* (holo CGE), New South Wales, Lachlan R., 34°14' S 144°25' E, 9.v.1835.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 114. *Amyema quandang* can be identified locally by its combination of short white tomentum on the inflorescence and flowers, lanceolate to ovate leaves 3–12 cm long, 2-rayed umbel of triads with the central flower sessile, and the ovary abruptly expanded and then narrowed just below the calyx. The pink, orange, or green flower colour is partly obscured by the indumentum.

The species occurs widely in Australia, mostly in inland areas in semi-arid and arid woodland, exclusively parasitic on *Acacia* and showing a close visual resemblance to some of its common and widespread hosts (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. There are two varieties with very minor differences in leaf shape.

### 66. *Amyema quaternifolia* Barlow

*Amyema quaternifolia* Barlow, Austral. J. Bot. 14 (1966) 482. — Type: *Staples s.n.* (holo BRI; iso AD, CANB, NSW, NT), Queensland, 1 mi (1.6 km) S of Daintree, 11.x.1964.

For description see Barlow, *Flora of Australia* 22 (1984) 119. *Amyema quaternifolia* can be identified locally by its combination of quaternate leaves, inflorescence of a pedunculate, simple, 2- to 4-flowered umbel, and 6-merous flowers. The flower colour is red.

*Amyema quaternifolia* is known only from the Daintree and Atherton Tableland areas of north Queensland, in rain forest, parasitic on various hosts. It is probably closely related to other Australian species with simple umbels, including *A. sanguinea* and *A. whitei*. See note under *A. sanguinea*.

**67. *Amyema queenslandica* (Blakely) Danser**

*Loranthus queenslandicus* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 392. — *Amyema queenslandica* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — Type: Dixon s.n. (holo NSW), Queensland, near Herberton.

*Amyema involvens* Barlow, Austral. J. Bot. 22 (1974) 578. — Type: Barlow 943 (holo AD 9701-5167; iso L, LAE), New Guinea, Morobe, Mt Kaindi, 2440 m, 10.ii.1965.

For descriptions see Barlow, Austral. J. Bot. 22 (1974) 578; Flora of Australia 22 (1984) 94, under *A. involvens* and *A. queenslandica*. *Amyema queenslandica* can be identified locally by its combination of robust habit, opposite, broadly obovate, petiolate leaves, 4- to 8-rayed umbels of triads, and particularly by its dimorphic bracts, the acute central ones being erect whilst the rounded concave laterals envelop the ovary. The species has few specialized characters other than the bract dimorphy and thus presents a relatively generalized facies for the genus. Flower colour is predominantly yellow, sometimes orange or red.

The species occurs in New Guinea, in highlands from 840 to 2440 m elevation, and also in north Queensland, from sea level to 950 m (fig. 11; 26 collections seen). It occurs almost exclusively in rain forests, parasitic on various hosts. In New Guinea it has been recorded on *Nothofagus* and *Timonius*, and in Australia on *Canarium*, *Cryptocarya*, *Dysoxylum* and *Ficus*.

Critical comparison of the material of *A. queenslandica* from Australia and *A. involvens* from New Guinea shows that there are no significant morphological differences, and they are accordingly treated as conspecific. *Amyema queenslandica* is distinctive among its Australian congeners in its growth habit and morphology, and the Australian populations are probably the result of relatively recent immigration from New Guinea. The species is similar to and possibly related to *A. rigidiflora*, which differs in having more rays in the umbel and in lacking the bract dimorphism.

**68. *Amyema rhytidoderma* Barlow, *spec. nov.***

Species nova *A. luzonensi* (Schultes & J.H. Schultes) Danser similis, sed forma robustiore, lamina ampliore, pedunculo brevior, radiis brevioribus differt. — Typus: Jacobs 7332 (holo L 140042), Philippines, Luzon, Mt Pulog, 16° 36' N 120° 54' E, 2300–2500 m, 5.ii.1968.

Glabrous except for inflorescences and flowers with a dense indumentum of short, straight or crisped, white to brown, simple hairs. *Leaves* regularly quaternate, sessile or nearly so and more or less imbricate at the nodes; lamina ovate, 7.5–10 cm long, 3.5–5.5 cm wide, contracted to truncate at the base and sometimes with a petiole to 2 mm long, olive green and finely rugose above, pale brown and smooth below, acute at the apex; venation pennate, visible on both surfaces with the midrib raised and distinct below. *Inflorescences* several at nodes, pedunculate umbels of triads with all flowers pedicellate; peduncle (perhaps immature) 4 mm long; rays 3, c. 1 mm long; pedicels of the flowers 0.5–1 mm long; bracts narrowly triangular, erect to slightly spreading, glabrous above, acute, c. 1.5 mm long. *Ovary* funnel-shaped, c. 1.5 mm long; calyx limb truncate, ciliate, 0.5 mm long. *Corolla* in bud (perhaps immature) c. 18 mm long, slender, acute; petals 4, lacking a deflexed spur inside above the base. *Anther* 2 mm long, approximately equal to the free part of the fila-

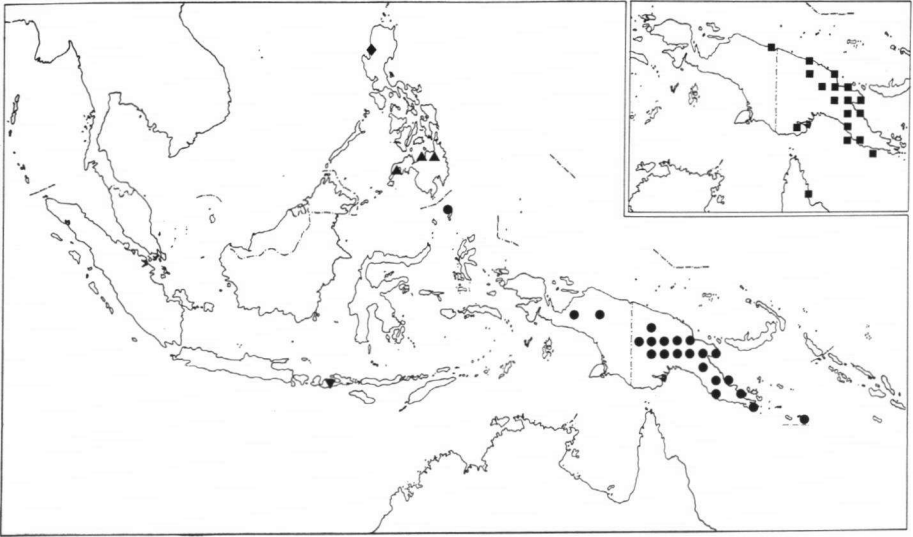


Fig. 13. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ◆ = *A. rhytidoderma* Barlow; ● = *A. rigidiflora* (Krause) Danser; ▼ = *A. scheffleroides* Barlow; ■ = *A. seemeniana* (Schumann) Danser; ▲ = *A. seriata* (Merrill) Danser.

ment. *Style* gradually narrowed in the upper third; stigma 1.5 times as wide as top of style. *Fruit* not known.

*Amyema rhytidoderma* is known only through the type specimen from Mt Pulog in Luzon (fig. 13), at an elevation of 2300–2500 m. Habitat details and hosts are unknown.

The affinity of the species is probably with *A. luzonensis* and *A. benguetensis*, which occur in Luzon at lower elevations. Together the three species form an altitudinally zoned complex, and presumably share a common ancestor. For notes on morphological and geographic relationships, see under *A. benguetensis* and *A. luzonensis*. The species has few specialized characters, and thus presents a relatively generalized facies for the genus. Flower colour is described as bright red.

The specific epithet is derived from the Greek *rhytido-* ('wrinkled') and *derma* ('skin'), and alludes to the finely rugose upper leaf surface.

### 69. *Amyema rigidiflora* (Krause) Danser

*Loranthus rigidiflorus* Krause, Bot. Jahrb. Syst. 57 (v.1922) 465. — *Amyema rigidiflora* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — *Amyema strongylophylla* subsp. *rigidiflora* (Krause) Barlow, Austral. J. Bot. 22 (1974) 594. — Type: *Ledermann 9095* (lecto K, see below), New Guinea, Sepikgebiet, 850 m.

*Loranthus barbellatus* Blakely, Proc. Roy. Soc. Qd. 34 (viii.1922) 27. — *Amyema barbellata* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 294. — *Amyema strongylophylla* subsp. *barbellata* (Blakely) Barlow, Austral. J. Bot. 22 (1974) 594. — Type: *White 231* (holo NSW), New Guinea, Papua, Astrolabe Range, vii–viii.1918.



For descriptions and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 324, 344, under *A. barbellata* and *A. rigidiflora*; Barlow, Austral. J. Bot. 22 (1974) 594, under *A. strongylophylla* subsp. *barbellata* and *rigidiflora*. *Amyema rigidiflora* can be identified locally by its combination of robust habit, opposite, broadly obovate, petiolate leaves, 7- to 12-rayed umbels of triads, and bracts of the lateral flowers spreading and not more than 2 mm long. The species has few specialized characters and thus presents a relatively generalized facies for the genus. Flower colour is predominantly orange to red, less frequently yellow; often grading to yellow in the upper part.

The species occurs widely in New Guinea, and in Celebes (Talaud Islands) from sea level to 2150 m elevation (fig. 13; 45 collections seen). It occurs both in open forests and in rain forests. It has been recorded several times as parasitic on *Castanopsis* and *Eucalyptus* and has also been recorded on *Aglaia*, *Macaranga*, and *Saurauia*.

Barlow (1974) treated both *A. rigidiflora* and *A. barbellata* as distinct subspecies of *A. strongylophylla*, but commented on their close similarity and on their sharp differences from the typical subspecies. Study of the materials now available indicates that *A. rigidiflora* and *A. barbellata* cannot be maintained as distinct, even as subspecies. On the other hand, the sharp differences from *A. strongylophylla* are confirmed, and it is concluded that they are properly treated as distinct species. For differences, see note under *A. strongylophylla*. *Amyema rigidiflora* is similar, and possibly related, to *A. queenslandica* (see note there).

## 70. *Amyema sanguinea* (F. Mueller) Danser

*Loranthus sanguineus* F. Mueller, Fragm. 1 (1859) 177. — *Amyema sanguinea* (F. Mueller) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 298. — Type: *Mueller s.n.* (holo MEL), Northern Territory: bank of Victoria R., x.1855.

For description and further synonymy see Barlow, Flora of Australia 22 (1984) 118. *Amyema sanguinea* can be identified by its combination of pedunculate, 3- to 7-rayed, simple umbels, large, robust, 6-merous flowers ribbed or angular in bud, and distinctly capitate stigma. The flower colour is usually red, sometimes grading to orange or yellow.

The species occurs widely in tropical and subtropical Australia, including arid areas, in open forest and woodland, usually parasitic on *Eucalyptus* but sometimes on other Myrtaceae including *Melaleuca* and *Tristania*. It often shows a close visual resemblance to its eucalypt hosts in its pendulous falcate leaves (Barlow & Wiens, 1977).

*Amyema sanguinea* is probably closely related to *A. whitei* and *A. quaternifolia*, all of which share robust 6-merous flowers in simple umbels, and the presence of epicortical runners with secondary haustoria. Van Tieghem (1894a) based a separate genus, *Pilostigma*, on *A. sanguinea*, but the species group is probably a derived satellite of the main field of variation in the genus *Amyema*. Simple umbels have almost certainly been derived independently in several other species of the genus, and there are other species of *Amyema* which show more extreme inflorescence reductions. See notes above under *Amyema* and *A. fasciculata*.

The species of this group are possibly also related to *A. timorana* which has a similar habit to *A. sanguinea*, and differs primarily in having 4-merous instead of 6-merous flowers. This suggests that the species group has had a long period of establishment and wide distribution on the northern part of the Australian plate.

There are two varieties of *A. sanguinea* with minor but conspicuous differences in leaf shape.

### 71. *Amyema scandens* (Tieghem) Danser

*Neophylum scandens* Tieghem, Bull. Soc. Bot. France 41 (1894) 509. — *Amyema scandens* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Balansa* 498 (holo P; iso P), New Caledonia, Prony Bay, ix.1868.

Doubtful species provisionally included here:

*Loranthus schultzei* Krause, Bot. Jahrb. Syst. 57 (1922) 478. — *Amyema schultzei* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Schultze* 305 (B, not extant), New Guinea, Sepik R., bivouac 48.

For descriptions and extensive further synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 354, under *A. verticillifolia*; *ibid.* 14 (1936) 92; Barlow, Austral. J. Bot. 22 (1974) 583. The following taxa are excluded from this synonymy: *Loranthus caudiciflorus*, *L. gigantifolius*, *L. plicatulus*, *Amyema cephalanthera*, *A. duurenii*, *A. ovariosa*, and *A. scandens* subsp. *crassifolia*.

The species description by Barlow (1974) is amended as follows: Glabrous or rarely the inflorescence and flowers shortly and sparsely tomentose. *Stems* usually robust and distinctly lenticellate, enlarged at the nodes, terete. *Leaves* verticillate, mostly in whorls of 5–8, rarely quaternate; lamina very variable, lanceolate to ovate or rarely broadly ovate or obovate, 5–20 cm long, 2.5–7 cm wide, thinly to thickly coriaceous, dull on both sides or with the upper surface somewhat glossy, attenuate, cuneate or rarely truncate at the base into a petiole 3–10(–15) mm long, sometimes undulate at the margin, mostly acute or obtuse or less often rounded at the apex; venation pennate, mostly obscure except for the midrib which is raised below. *Inflorescences* several at the nodes and often on the epicortical runners; peduncle 6–12 (–30) mm long, 0.8–1.5 mm thick; rays 4–8, (3–)4–10 mm long; flowers all sessile in the triads; bracts triangular, c. 1 mm long, rounded at the apex, forming a small spreading involucre below the triads. *Ovary* funnel- to barrel-shaped, 2–3 mm long; calyx limb truncate, 0.5–1 mm long, erect or slightly funnel-shaped. *Corolla* in the mature bud slender, (20–)25–40 mm long, usually acute or shortly rounded, 5- or 6-merous. *Anther* (2.5–)3–4 mm long, usually about one third as long as the free part of the filament. *Stigma* knob-like, about 1.5 times wider than the style. *Fruit* ellipsoid to obovoid, 7–10 mm long, crowned by the calyx limb and often by long persistent styles.

*Amyema scandens* is recorded from New Guinea and New Caledonia (including Lifu and Isle of Pines) (fig. 14; 105 collections seen), at elevations from sea level to 1600 m. The species occurs in primary and secondary rain forest and open humid forests, parasitic on a wide range of hosts including *Calophyllum*, *Eugenia*, *Garcinia*, *Nothofagus*, and *Terminalia*.

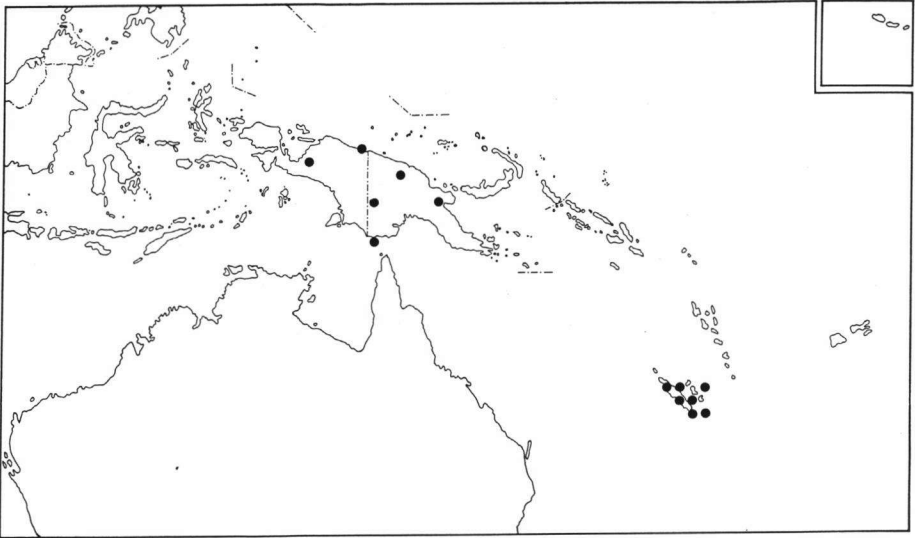


Fig. 14. Distribution of *Amyema scandens* (Tieghem) Danser. Symbols show recorded occurrence in 1° grid cells.

The *Amyema scandens* species complex can be identified in the Papuan region by the inflorescence of a 4- to 8-rayed umbel of triads with all flowers closely sessile in an equidistant arrangement. In addition to *A. scandens*, the complex includes *A. arthrocaula*, *A. canaliculata*, *A. caudiciflora*, *A. cercidioides*, *A. friesiana*, *A. plicatula*, and *A. triantha*. For further discussion on the two species accepted here as *A. caudiciflora* and *A. plicatula*, see notes under those species. Within the complex *A. scandens* can be identified by its leaves, which are verticillate and mostly in whorls of 5–8 (rarely quaternate), petiolate, flat, and mostly lanceolate to ovate. The corolla is consistently described as red, in shades ranging from pale to dark and from bright to dull.

The *Amyema scandens* complex is centred in New Guinea, and extends south-eastwards to Australia and New Caledonia. To the west, its occurrence in Borneo represents a significant disjunction (see note under *A. triantha*). Half of the species in the complex are relatively localized in New Guinea and are apparently young endemics which have differentiated from the major more continuous body of variation as the rapid evolution of landforms created a greater diversity of niches to be occupied. They differ primarily in vegetative characters including phyllotaxy, petiole development, and leaf shape and texture. Apart from the triads of sessile flowers, the species have few specialized characters, and thus present a relatively generalized facies for the genus. As a whole, the complex appears to comprise vigorous robust biotypes which have occupied a range of habitats, and from a lowland base have reached some remote localities.

*Amyema scandens* itself has become the most abundant loranth in New Caledonia, presumably reaching there by dispersal from New Guinea. The most common bio-

type in New Caledonia is one with relatively small, ovate, rounded leaves 7–10 cm long, suggesting that some local differentiation has taken place. The New Guinean specimens mostly have longer, lanceolate, acute or obtuse leaves, which may represent the ancestral state of the species. Many New Caledonian specimens also show this state, so that the full range of variation of the species can therefore be found in New Caledonia. Variation between the larger- and smaller-leaved biotypes is continuous and no infraspecific taxa have been distinguished.

The holotype of *A. schultzei* (B) is no longer extant. No isotypes are known, and no other specimens were referred to the species by Danser. The species is clearly a member of the *A. scandens* complex, and from the descriptions and illustration appears to be conspecific with *A. scandens* itself. In the absence of specimens this cannot be confirmed, and the species must remain doubtful.

## 72. *Amyema scheffleroides* Barlow, *spec. nov.*

Species nova *A. halconensi* (Merrill) Danser affinis, sed inflorescentia glabra, petalis 4 omnino liberis differt. — Typus: *Kostermans 18294* (holo L; iso A, BO, K, LE, P, none seen), Sumbawa, between Batudulang and Pukis, Batulante Mt, 700–800 m, 18.iv.1961.

Glabrous. *Stems* relatively slender; internodes 5–10 cm long. *Leaves* in whorls of 4–6; lamina ovate, c. 14 cm long, c. 6 cm wide, coriaceous, slightly lustrous above, dull below, shortly cuneate at the base into a stout petiole rounded below channeled above and 15–20 mm long, shortly attenuate and acute at the apex; venation pennate, faint except for the midrib which is prominent and raised on the lower surface. *Inflorescence* a pedunculate umbel of triads with all flowers pedicellate (sometimes very shortly); peduncle slender, 3–4 mm long; rays c. 6, spreading, 1.5–2 mm long; pedicels c. 1 mm long or sometimes those of the central flowers shorter; bracts spreading, narrowly triangular, acute, c. 1 mm long. *Ovary* narrowly funnel-shaped, c. 2 mm long; the calyx limb funnel-shaped, obtusely 4-toothed, c. 1 mm long. *Corolla* in the mature bud c. 33 mm long, inflated in the middle, contracted near the apex, acute; petals 4, lacking a deflexed spur inside near the base. *Anther* c. 3 mm long; free part of filament 1.5–2 mm long. *Stigma* no wider than style. *Fruit* not seen.

*Amyema scheffleroides* is known only through the type specimen from Sumbawa in the Lesser Sunda Islands (fig. 13), collected in a humid forest on andesite at an elevation of 700–800 m. Host preference is not known.

*Amyema scheffleroides* is closely related to *A. halconensis* and the other species in the *A. polytrias* species group. It is very similar to *A. halconensis* in vegetative and general inflorescence characters, and differs in being entirely glabrous and in its 4-merous corolla with the petals entirely free at anthesis. For notes on other differences within the *A. polytrias* species group, and on geographic relationships, see under *A. polytrias*. The species has few specialized characters, and thus presents a relatively generalized facies for the genus. It can be identified locally by its combination of verticillate leaves in whorls of 4–6, umbels with c. 6 rays, and triads with all flowers variably pedicellate. The corolla colour is described as brownish towards the base, dirty yellow above and greenish towards the tip.

The species is probably a locally specialized differentiate of the *A. polytrias* group. It has a large geographic disjunction from its most similar taxon, *A. halconensis*, which occurs in Luzon. The similarities of the two taxa may therefore be parallelisms.

The specific epithet alludes to the superficial similarity of the distinctly petiolate, ovate, verticillate leaves to the foliage of *Schefflera*.

### 73. *Amyema seemeniana* (Schumann) Danser

*Loranthus seemenianus* Schumann in Schumann & Hollrung, Fl. Kaiser Wilh. Land (1889) 106. — *Amyema seemeniana* (Schumann) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Hollrung 345* (lecto K, see below; iso WRSL), New Guinea, near Hatzfeldhafen, x.1886.

For descriptions and further synonymy see Barlow, Austral. J. Bot. 22 (1974) 589; Flora of Australia 22 (1984) 122; Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 320, 338, 345, under *A. articulata*, *A. melastomifolia* and *A. seemeniana*. Along with the closely related and sympatric *A. squarrosa*, the species is distinct from most of its congeners in its inflorescence which is a slender, pedunculate, 2-flowered simple umbel, bearing flowers with a thin inflated corolla in which the petals may remain coherent for some time after anthesis. *Amyema seemeniana* can be distinguished from *A. squarrosa* by its more curvinerved leaves and distinct inflorescence peduncle more than 2 mm long. The flower colour is variable, mostly described as various shades of red from pale pink to dark red, or of pale to dark orange, and occasionally of yellow or green or almost white, frequently having the orange or red colours in the lower part and being paler, or green, or yellow above.

The species is common in New Guinea (fig. 13; 60 collections seen), at elevations from sea level to 2150 m, in primary and secondary rain forests, parasitic on numerous hosts including *Acalypha*, *Albizia*, *Ficus*, *Ilex*, *Nauclea*, *Planchonella*, *Psychotria*, *Sarcocephalus*, and *Xanthophyllum*. It also occurs in Cape York Peninsula, Queensland.

The reduced inflorescence is probably a parallel development to other simple umbels in the genus (see notes under *Amyema* above and under *A. fasciculata* and *A. sanguinea*). *Amyema seemeniana* comprises three subspecies, *seemeniana*, *flexuosa* Barlow and *melastomifolia* (Krause) Barlow, which differ in qualitative and quantitative floral characters and in leaf size, and have strong geographic and altitudinal separation.

The holotype of *Loranthus seemenianus* (B) is no longer extant. An isotype in K has been seen and designated lectotype of the name. An isotype in WRSL has also been seen.

For note on the possible identity of the doubtful species *A. curvifolia*, see note under *A. hastifolia*.

### 74. *Amyema seriata* (Merrill) Barlow, *comb. nov.*

*Loranthus seriatus* Merrill, Philipp. J. Sci. C 9 (1914) 285. — *Dicymanthes seriata* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 311. — Type: *Reillo BS 16424* (lecto US 714930, see below; iso P), Philippines, Mindanao, Zamboanga, Santa Maria (Mt Pulongbato), ix-x.1912.

For description see Danser, Philipp. J. Sci. 58 (1935) 92, under *Dicymanthes seriata*. The species is a member of the *Dicymanthes* species group (see above), in which the inflorescence is capitate, of two sessile triads on a short peduncle. Within this group it can be identified by its combination of leaves distinctly but shortly petiolate, inflorescence peduncle 2–4 mm long, bracts of lateral flowers appressed to the ovary and not forming part of the inflorescence involucre, and presence of deflexed spurs forming a nectar chamber at the base of the corolla. The corolla colour has not been recorded.

*Amyema seriata* is endemic to Mindanao, Philippines (fig. 13; 3 collections seen), possibly in highlands but there are no recorded elevations. Habitat details and hosts are unknown. The species is similar to *A. hexantha*, which is also endemic to Mindanao, and which differs in its spreading lateral bracts which form part of the floral involucre, its lack of deflexed spurs at the base of the corolla, and the longer free part of the staminal filament.

Mindanao is a centre of diversity of the *Dicymanthes* species group, with 5 of the 9 Sundaland species occurring there and together accounting for most of the morphological diversity in the group. *Amyema seriata* and *A. hexantha* are perhaps two of the less specialized members of the group occurring there, the former lacking a complete floral involucre and the latter a well-defined nectar chamber. As suggested by Danser (1935), *A. cauliflora* may share common ancestry with *A. seriata*, but is more specialized in the reduction of the capitulum to a single triad.

The holotype of *Loranthus seriatus* (PNH) is no longer extant. An isotype in US has been seen and designated lectotype of the name. An isotype in P has also been seen.

## 75. *Amyema squarrosa* (Krause) Danser

*Loranthus squarrosus* Krause, Bot. Jahrb. Syst. 57 (1922) 485. — *Amyema squarrosa* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Ledermann 10377* (lecto L 941, 174–80, see below; iso K), New Guinea, Sepik Region, Lordberg, 1000 m, 1912–1913.

*Amyema rhopalanthes* Danser, Brittonia 2 (1936) 134. — *Amyema squarrosa* subsp. *rhopalanthes* (Danser) Barlow, Austral. J. Bot. 22 (1974) 592. — Type: *Brass 5782* (holo NY; iso L 936, 139–511, L 946, 294–170), New Guinea, Papua, Oriomo R., Wuroi, 5 m, i–iii.1934.

For descriptions see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 348; Barlow, Austral. J. Bot. 22 (1974) 591. Along with the closely related and sympatric *A. seemeniana*, the species is distinct from most of its congeners in its inflorescence which is a slender, pedunculate, 2-flowered simple umbel, bearing flowers with a thin inflated corolla in which the petals may remain coherent for some time after anthesis. The reduced inflorescence is probably a parallel development to other simple umbels in the genus (see notes under *Amyema* above and under *A. fasciculata* and *A. sanguinea*). For differences from *A. seemeniana*, see there. The flower colour is variable, often described as various shades of red from pale pink to dark red or pale to dark orange, often having these colours in the lower part and being paler, or green or yellow above.

The species occurs in New Guinea (fig. 15; 14 collections seen), mostly in highlands at elevations from 1000 to 1060 m, but has also been recorded in the Fly River lowlands. Habitat details are poorly known, but the species apparently occurs in rain forests. The only recorded host is *Saurauia*.

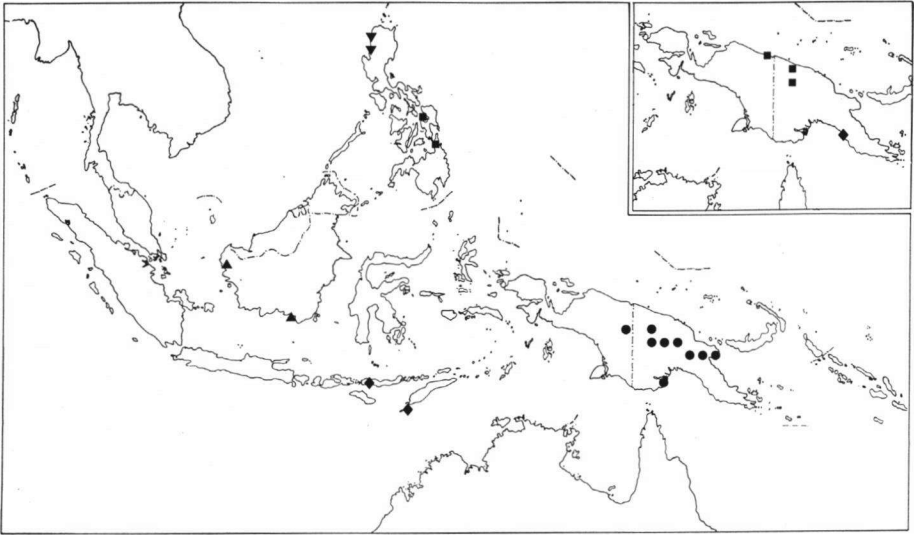


Fig. 15. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. ● = *A. squarrosa* (Krause) Danser; ■ = *A. strongylophylla* (Lauterbach) Danser (inset); ◆ = *A. tetraflora* (Barlow) Barlow (inset); ◆ = *A. timorana* Danser; ▲ = *A. trianaha* (Korthals) Tieghem; ■ = *A. urdanetensis* (Elmer) Danser; ▼ = *A. verticillata* (Merrill) Danser.

Barlow (1974) recognized two subspecies, *squarrosa* and *rhopalanthes*. The latter subspecies differs only in an apparently more strongly inflated corolla, but is disjunct geographically and altitudinally. Further examination of the type material in the present study indicates that there are no real differences in corolla inflation, and notwithstanding the geographic disjunction, subsp. *rhopalanthes* cannot be sustained as a distinct entity.

The holotype of *Loranthus squarrosus* (B) is no longer extant. An isotype in L has been seen and designated lectotype of the name. An isotype in K has also been seen.

For comment on the possible identity of the doubtful species *A. curvifolia*, see note under *A. hastifolia*.

## 76. *Amyema strongylophylla* (Lauterbach) Danser

*Loranthus strongylophyllus* Lauterbach, Nova Guinea 8 (1912) 815. — *Amyema strongylophylla* (Lauterbach) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Gjellerup 307* (lecto L, see below; iso K, U 32783, WRSL).

For descriptions see Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 348; Barlow, Austral. J. Bot. 22 (1974) 593, under *A. strongylophylla* subsp. *strongylophylla*. All additional synonymy given by Barlow (1974) is here referred to *A. rigidiflora*; see there. *Amyema strongylophylla* can be identified locally by its combination of robust habit, short dense red-brown indumentum, opposite broadly obovate to orbicular petiolate leaves, and 15- to 20-rayed umbels of triads. The species has few

specialized characters, and thus presents a relatively generalized facies for the genus. Flower colour is predominantly red, sometimes grading to orange in the upper part, and partly obscured by the indumentum.

The species occurs in a limited area in northern New Guinea (fig. 15; 7 collections seen), in lowlands mostly at elevations below 300 m, and recorded once at 600 m. Habitat details are poorly known; the only recorded host is *Timonius timon*.

Barlow (1974) treated both *A. rigidiflora* and *A. barbellata* as distinct subspecies of *A. strongylophylla*, but commented on their sharp differences from the typical subspecies. In the present study these differences between *A. strongylophylla* and the other two entities are confirmed, and it is concluded that they are properly treated as distinct species. *Amyema strongylophylla* differs from *A. rigidiflora* (which includes *A. barbellata*) in its denser, more rust-coloured indumentum, generally larger leaves, inflorescence peduncle with the rays arising from depressions in a globular dilation at the tip, more rays in the umbel, and longer flowers. *Amyema strongylophylla* has a more restricted area than *A. rigidiflora*, apparently without overlap, and occurs at generally lower elevations.

The holotype of *Loranthus strongylophyllus* (B) is no longer extant. An isotype in L has been seen and designated lectotype of the name. Isotypes in K, U and WRS� have also been seen.

### 77. *Amyema subcapitata* Barlow

*Amyema subcapitata* Barlow, *Brunonia* 5 (1983) 210. — Type: *Weber AS9* (holo CANB), Northern Territory, Ross R. near Trephina Gorge, 26.ix.1981.

For description see Barlow, *Flora of Australia* 22 (1984) 117. *Amyema subcapitata* can be identified by its combination of white or rusty brown tomentum on young parts and inflorescences, small opposite leaves, and by the inflorescence of a pedunculate head of two sessile triads with the central flowers sessile and the lateral flowers pedicellate. The flower colour is described as yellow-green.

The species is known only through the type specimen from the Macdonnell Ranges, central Australia, parasitic on *Acacia*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and reduced inflorescences.

The capitate inflorescence superficially resembles those of the several species placed by Danser in *Dicymanthes*, but probably represents one of several parallel lines of specialization (see note under *Amyema* above). *Amyema subcapitata* is closely related to *A. maidenii* in which all flowers of the triads are sessile.

### 78. *Amyema tetraflora* (Barlow) Barlow

*Ungula tetraflora* Barlow, *Proc. Roy. Soc. Qd.* 75 (1964) 16. — *Amyema tetraflora* (Barlow) Barlow, *Austral. J. Bot.* 22 (1974) 595. — Type: *van Duuren s.n.* (holo BRI 039104), New Guinea, Ukua Estate via Kairuku, ix.1962.

For description see Barlow, *Austral. J. Bot.* 22 (1974) 595. *Amyema tetraflora* can be identified locally by its combination of large, opposite, bifacial, very shortly



petiolate leaves, unusual umbels of tetrads with all flowers sessile, and shortly gamopetalous corolla. The flower colour is described as light mauve.

*Amyema tetraflora* is known only from the Kairuku Subdistrict of Papua New Guinea (fig. 15; 3 collections seen), at low elevations up to 50 m. Habitat details and hosts are unknown. The species is very distinctive in its shortly gamopetalous corollas and unusual floral tetrads, and with the related *A. brassii* comprises a small satellite of the main field of variation in the genus. It can be distinguished from *A. brassii* by its shorter corolla tube and tetrads with all flowers sessile.

Production of flowers in tetrads rather than triads occurs in *Amyema* in a few apparently distantly related species or species groups, and the condition has probably arisen independently several times. It is presumably established as an inflorescence elaboration resulting from modification of the basic dichasial uniflorescence of the genus.

### 79. *Amyema tetrapetala* (Danser) Barlow

*Dicymanthes tetrapetala* Danser, Blumea 3 (1940) 399. — *Amyema tetrapetala* (Danser) Barlow, Austral. J. Bot. 22 (1974) 595. — Type: *Womersley NGF 19321* (neo CANB 153818, see below; isoneo L), New Guinea, Morobe, Wagau, 4000 ft (1220 m), 13.vi.1964.

For description see Barlow, Austral. J. Bot. 22 (1974) 595. The species was placed by Danser in his genus *Dicymanthes*, in which the inflorescence is capitate, of two sessile triads on a short peduncle. The species probably is not closely related to other species ascribed to that genus, and probably has no very close relatives. See discussion on *Dicymanthes* under *Amyema* above. Within the *Dicymanthes* group it can be identified by its enlarged bracts, forming an involucre which considerably exceeds the ovaries, and by its 4-merous flowers. The corolla colour has been recorded as various shades of red in the lower part, grading to orange or yellow above.

*Amyema tetrapetala* is endemic to New Guinea, being recorded from a few localities in the Morobe District (fig. 16; 5 collections seen), in highlands at elevations from 1200 to 2200 m. The species occurs in primary rain forest, but hosts are unknown.

*Dicymanthes tetrapetala* was based on *Mayr 819* (B, no longer extant), New Guinea, Saruwaged Mts, Ogeramngang, 1500 m, 22.iii.1929. No isotypes have been located. The specimen *Womersley NGF 19321* (CANB) bears a number of mature inflorescences, agrees closely with Danser's description, and is duplicated in L. It is accordingly selected as neotype.

### 80. *Amyema thalassia* Barlow

*Amyema thalassia* Barlow, Proc. Linn. Soc. New S. Wales 87 (1962) 57. — Type: *Lane-Poole s.n.* (holo PERTH; iso NSW), Western Australia, Broome, Pender Bay, 26.x.1919.

For description and additional synonymy see Barlow, Flora of Australia 22 (1984) 99. *Amyema thalassia* can be identified locally by its combination of glabrous habit, shortly petiolate obovate to orbicular leaves 2.5–5 cm long, 2-rayed umbel of triads

with the central flower sessile, longitudinally winged rays, pedicels and corolla buds, and 4-merous flowers. The species is also identified by its habitat and host specialization (see below). Flower colour is red in the lower part, grading to green above.

The species occurs in northwestern Australia, exclusively in mangrove communities and recorded as parasitic on *Avicennia*, *Bruguiera*, and *Excoecaria*. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. Its habitat and host specialization are correlated with the relatively small rounded leaves, which are usually very thick and fleshy when fresh. The species therefore often shows a close visual resemblance to its host (Barlow & Wiens, 1977).

*Amyema thalassia* is sympatric with *A. mackayensis*, which is also exclusively parasitic on mangroves. For further notes, see under *A. mackayensis* and *A. gravis*.

### 81. *Amyema timorana* Danser

*Amyema timorana* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 350. — Type: *Teijsmann s.n.* (holo BO, not seen), Lesser Sunda Islands, Timor, Okabati.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 350. *Amyema timorana* can be identified locally by its combination of opposite narrow thin pendulous leaves, 2- or 3-rayed, pedunculate, simple umbels, and robust, clavate, 4-merous flowers. The flower colour has not been recorded.

The species is recorded from Timor and Flores in the Lesser Sunda Islands (fig. 15; 2 collections seen), at elevations from lowlands up to 1200 m. Habitat details and hosts are unknown. The species is very distinctive in its slender pendulous habit and few-rayed simple umbels, and is probably related to the *Amyema sanguinea* species group of northern Australia. Along with species such as *Amyema miraculosa*, *A. timorana* may represent a biogeographic link illustrating the close geophysical relationship in late Tertiary times between the Australian mainland and the Outer Banda Arc (Audley-Charles, 1981). See note under *A. sanguinea*.

### 82. *Amyema triantha* (Korthals) Tieghem

*Loranthus trianthus* Korthals, Verh. Bat. Genootsch. 17 (1839) 227, 265. — *Amyema triantha* (Korthals) Tieghem, Bull. Soc. Bot. France 41 (1894) 507. — Type: *Korthals s.n.* (holo L; iso P), Borneo, near Drongo.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 350. The description is amended as follows: inflorescence peduncle 15–18 mm long; rays 6, 5–7 mm long; bracts spreading, rounded; anther c. 1.5 mm long; free part of the filament (2.5–)4.5 mm long; style 18–19 mm long. *Amyema triantha* is a member of the *Amyema scandens* species complex, which can be identified by the inflorescence of a 4- to 8-rayed umbel of triads with all flowers closely sessile in an equidistant arrangement. Within this group it can be identified by its

combination of opposite, broadly elliptic to obovate, shortly petiolate leaves, short corolla 18–19 mm long, and short anthers c. 1.5 mm long. The corolla colour has not been recorded.

The species occurs in Borneo (fig. 15; 3 collections seen), apparently in lowlands. Habitat details and hosts are unknown. The *A. scandens* complex is otherwise well developed in New Guinea and extends to New Caledonia and eastern Australia, and the area of *A. triantha* therefore represents a significant geographic disjunction. The progenitor of *A. triantha* presumably reached Borneo by westward migration from New Guinea, and its absence from the intervening territory in the Moluccas and Celebes, if real, may be the result of subsequent extinction. See additional notes under *A. scandens*.

*Amyema triantha* is most closely related to *A. friesiana* and *A. caudiciflora*, and these species together form a cluster of opposite-leaved entities near the stem of the *A. scandens* complex. It differs from both species in having leaves often folded, shorter flowers, and much shorter anthers, and further differs from *A. friesiana* in its leaves being widest in the middle, with slightly less curvinerved venation and shorter, much thicker petioles, and less robust flower buds.

### 83. *Amyema tridactyla* Barlow

*Amyema tridactyla* Barlow, *Brunonia* 5 (1983) 211. — Type: *Martensz & Schodde AE 584* (holo CANB; iso BRI, DNA, NT), Northern Territory, 2–3 mi (3–5 km) N of El Sharana, 25.i.1973.

For description see Barlow, *Flora of Australia* 22 (1984) 108. *Amyema tridactyla* can be identified by its combination of glabrous habit, terete leaves, 2-rayed umbels of triads with all flowers pedicellate, and yellow-green ellipsoid fruits c. 13 mm long. The flower colour is red.

The species is known only from Arnhem Land, Northern Territory, in escarpment shrublands, parasitic on Myrtaceae including *Calytrix*, *Melaleuca* and *Baekkea*. With its slender terete leaves it blends visually with some of its more common hosts (Barlow & Wiens, 1977). It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, scleromorphic leaves, and few-rayed umbels of triads.

### 84. *Amyema tristis* (Zollinger) Tieghem

*Loranthus tristis* Zollinger, *Nat. Geneesk. Arch.* 2 (1845) 579. — *Amyema tristis* (Zollinger) Tieghem, *Bull. Soc. Bot. France* 41 (1894) 507. — Type: *Zollinger 2937* (holo P; iso P), Java, † Besoeki, G. Raung, 5000 ft (1500 m), 10.vi.1845.

*Dicymanthes elliptica* Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 364. — Type: *Iboet 509* (holo BO; iso L), Lesser Sunda Islands, Sumba, Kananggar, 16.v.1925.

For description and further synonymy see Danser, *Bull. Jard. Bot. Buitenzorg III*, 11 (1931) 351. The description is amended as follows: inflorescence peduncle (1.5–) 2.5–4(–5) mm long; rays (0–)1–2 mm long; petals either with or lacking a deflexed spur inside just above the base; anther 2–3 mm long; free part of the filament 2.5–4 mm long.

*Amyema tristis* is recorded from Java and the Lesser Sunda Islands (Bali, Sumba, Flores) (fig. 16; 7 collections seen), recorded at elevations from 575 to 1500 m. Habitat details are poorly known; the only recorded hosts are *Bischofia* and *Villebrunnia*.

The species is very closely related to the *Dicymanthes* species group (see notes below and under *Amyema* above), having generally similar vegetative and floral characters and differing only in that the inflorescence is subcapitate, consisting of 2 triads of sessile flowers usually on very short rays. Within the *Dicymanthes* group it can be identified by its combination of leaves shortly and distinctly petiolate (rarely subsessile), inflorescence peduncle 1.5–5 mm long, rays 0–2 mm long, anthers more than 2.5 mm long and equal to or shorter than the free part of the filament. The corolla is described as red, or golden in the lower part and red above.

*Amyema tristis* is remarkable for its heterogeneity in characters which are otherwise of importance in the diagnosis of species in the *Dicymanthes* group. The deflexed spurs which form a nectar chamber at the base of the corolla in some species, are present in some specimens but absent in others. More significantly, the short inflorescence rays which distinguish *A. tristis* from the *Dicymanthes* group are variable, sometimes being only 0.5 mm long, so that the inflorescence appears capitate. *Amyema tristis* may therefore represent a transitional state in the evolution of a capitate inflorescence through reduction of the umbel rays.

The extent of this heterogeneity is shown by the specimen *Iboet 509*, which is the type and only specimen of *Dicymanthes elliptica* Danser. In vegetative characters the specimen is indistinguishable from *A. tristis*. In inflorescence characters the specimen indeed belongs in Danser's *Dicymanthes*, having a capitate inflorescence of two sessile triads. However, the specimen *Horsfield s.n.* (K) differs from it only in having minute rays 0.5 mm long, and on this basis Danser retained the latter specimen in *A. tristis*. On the basis of the heterogeneity of the species, I have concluded that *Dicymanthes elliptica* is conspecific with *A. tristis*, and that the variability within the species includes the capitate inflorescence which is diagnostic of *Dicymanthes*.

The basis of the heterogeneity in *A. tristis* is difficult to explain. If it is a breakdown in development, showing reversal to a plesiomorphic state, a correlation between variability in inflorescence development and nectar chamber spurs would not be expected. Such a correlation might be more likely a result of hybridization, which could lead to segregation in unlinked characters, but might be expected to show variation in vegetative characters as well. The remaining alternative is that *A. tristis* is a direct progenitor of part of the *Dicymanthes* species group, and still expresses the variability from which the *Dicymanthes* inflorescence was selected.

### 85. *Amyema umbellata* Danser

*Amyema umbellata* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 352. — Type: *Toxopeus 215* (holo BO not seen), Moluccas, Buru, Nal' Besi, 1040 m.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 352. *Amyema umbellata* can be identified by its opposite, ternate, or quaternate leaves, very distinctive, pedunculate, many-rayed, simple umbel, and 5-merous corollas 30–32 mm long. The flower colour is described as light pink.

The species is known only from the type specimen from the Moluccas (fig. 16). Habitat details and hosts are unknown.

The type (BO) has not been located, so that it has not been possible to confirm the very unusual inflorescence structure of the species. Whilst it must therefore be treated as doubtful in this conspectus, the detailed description and illustration given by Danser (1931) indicates that the species is very distinctive. The most similar species is *A. polillensis*, which differs in its 4- to 7-whorled phyllotaxy, 4- to 6-rayed umbel, and 4-merous flowers. See note under *A. polillensis*.

### 86. *Amyema urdanetensis* (Elmer) Danser

*Loranthus urdanetensis* Elmer, Leaflet Philipp. Bot. 6 (1913) 1963. — *Amyema urdanetensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Elmer 14092* (lecto L, see below), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, 6000 ft (1830 m), x.1912.

For description and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 68. *Amyema urdanetensis* can be identified locally by its combination of opposite leaves 4–8 cm long, tomentose inflorescence, peduncle 20–32 mm long, and 5- to 8-rayed umbel. The species has few specialized characters, and thus presents a generalized facies for the genus.

*Amyema urdanetensis* is recorded from Leyte and Mindanao, Philippines (fig. 15; 2 collections seen), at an elevation of 1830 m. Other habitat details and hosts are unknown. It is similar to the New Guinean species *A. queenslandica* and *A. rigidiflora*, differing in its narrower acute leaves and more slender inflorescence parts, but because these species share plesiomorphic character states the relationship may not be direct.

Danser (1935) described the corolla of *A. urdanetensis* as gamopetalous but deeply split at anthesis. Choripetalous corollas are usual in the genus, although the petals may sometimes remain coherent long after anthesis. See note under *A. haenkeana*.

The holotype of *Loranthus urdanetensis* (PNH) is no longer extant. An isotype in L has been seen and designated lectotype of the name.

### 87. *Amyema vernicosa* Barlow, *spec. nov.*

Species nova *A. tristi* (Zollinger) Tieghem similis, sed foliis ternatis, petiolo longiore, pedunculo longiore, radiis inflorescentiarum 3, anthera brevior differt. — Typus: *Mendoza 1479 = PNH 18467* (holo L; iso L), Philippines, Luzon, Albay, Mayon Volcano, 1000 m, 24.vi.1953.

Glabrous except for the inflorescence and corolla sparsely and the ovary densely covered with short, crisped, tawny or brown, simple hairs. *Leaves* ternate or scattered-ternate; lamina ovate or lanceolate-ovate, widest in or below middle, 4–7 cm long, 2.5–3.5 cm wide, shining above, paler and dull below, broadly cuneate at the base into a distinct slender terete petiole 12–20 mm long, acute or rounded-obtuse at the apex; venation pennate, obscure above, distinct with the midrib raised below. *Inflorescences* in groups at the nodes, pedunculate umbels of triads with all flowers sessile; peduncle 12–15 mm long, rays 3, 0.5–1(–3.5) mm long; bracts triangular, concave, acute, c. 1 mm long, forming a small involucre below each triad. *Ovary* funnel-shaped or slightly barrel-shaped, c. 2 mm long; calyx limb almost glabrous,

erect, truncate, 0.5 mm long. *Corolla* in the mature bud c. 25 mm long; petals 4 or 5, lacking a spur inside above the base. *Anther* c. 1.5 mm long, about half the length of the free part of the filament. *Stigma* as wide as the style.

*Amyema vernicosa* is known only through the type collection from Mayon Volcano in Luzon (fig. 16), at an elevation of 1000 m. Habitat details and hosts are unknown.

The species is probably a local endemic which shows contraction of the inflorescence to a subcapitate state. It therefore shows some similarities to the *Dicymanthes* species group (see notes under *Amyema* above). It is similar to *A. tristis*, which occurs in the Lesser Sunda Islands, and which is probably near the stem of the *Dicymanthes* group, but the similarity is probably the result of convergence rather than direct relationship (see notes under *A. tristis*). It differs from *A. tristis* in its ternate, more distinctly bifacial leaves with longer petioles, much longer inflorescence peduncle, longer flowers, and anthers much shorter than the free parts of the filaments. The species can be identified locally by its combination of the above characters, the 3-rayed umbel with very short rays, and triads with all flowers sessile. The corolla colour has been recorded as red at the base, yellow above, and green at the tip. *Amyema vernicosa* is very distinct in its combination of vegetative, inflorescence and indumentum characters, which are strong indicators of its specific status.

The specific epithet is derived from the Latin *vernicosus* ('varnished'), and alludes to the glossy upper surface of the leaf.

### 88. *Amyema verticillata* (Merrill) Danser

*Cleistoloranthus verticillatus* Merrill, Philipp. J. Sci. C 4 (1909) 150. — *Amyema verticillata* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: Curran, Merriitt & Zschokke FB 16229 (holo PNH, not extant, see below; iso US), Philippines, Luzon, Benguet, Mt Pulog, i.1909.

For description and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 79. The description is amended as follows: corolla appendage spreading, perpendicular to corolla lobes, commonly bilobed, up to 1.2 mm long. *Amyema verticillata* can be identified locally by its combination of quaternate petiolate leaves, 4-rayed umbel of triads, and particularly the presence of a corona near the apex of the bud, formed by dorsal appendages on the petals. The flower colour is described as pink or red, sometimes grading to yellow at the tip.

The species is endemic to northern Luzon, Philippines (fig. 15; 6 collections seen), recorded in highlands at elevations from 1670 to 2500 m. Other habitat details and hosts are unknown. Its closest affinities may be with *A. acuta*, with which it is sympatric in the highlands of Luzon. It differs from *A. acuta*, and from all other species of *Amyema*, in its distinctive corona. Whilst field study is necessary to explain the function of the corona, it may possibly transmit false signals on the stage of anthesis which the flower has reached. *Amyema verticillata* has few other specialized characters, and thus presents a generalized facies for the genus.

The holotype of *Cleistoloranthus verticillatus* (PNH) is no longer extant. An isotype in US has been seen, but lacks flowers or fruits. Whilst this may be the only extant isotype, it would be a poor lectotype, and lectotypification is accordingly deferred.

### 89. *Amyema villiflora* (Domin) Barlow

*Loranthus quandang* var. *villiflorus* Domin, *Biblioth. Bot.* 89 (1921) 55. — *Amyema villiflora* (Domin) Barlow, *Austral. J. Bot.* 14 (1966) 485. — Type: *Domin s.n.* (holo PR), Queensland, Russell R., i.1910.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 102. *Amyema villiflora* can be identified locally by its combination of flat petiolate leaves more than 1 cm wide, 2-rayed umbel of triads with the central flower sessile, and tomentose inflorescence and corolla. Flower colour is variable but commonly red, orange, or yellow in the lower part and paler or grading to green above.

The species occurs in northern Australia from the Kimberley region to Cape York (fig. 16), in rain forest and open forest, parasitic on a wide range of hosts, but frequently on *Terminalia* and *Acacia* in open forest situations. It shows features common in Australian amyemas of open forests and woodlands, including a lack of epicortical runners, leaves which are curvined and isobilateral, and few-rayed inflorescences. There are two subspecies with minor differences in corolla and indumentum characters and apparent ecogeographic separation.

Additional specimens seen in the present study have extended the known range of the species, through the Kimberley region to the northwest coast of Western Australia. In the western part of its range intergradation appears to occur with the related species *A. benthamii*, *A. conspicua*, and *A. dolichopoda*. See note under *A. dolichopoda*.

### 90. *Amyema wenzelii* (Merrill) Danser

*Loranthus wenzelii* Merrill, *Philipp. J. Sci.* C 8 (1913) 370. — *Amyema wenzelii* (Merrill) Danser, *Bull. Jard. Bot. Buitenzorg* III, 10 (1929) 299. — Type: *Wenzel 24* (lecto US 1171835, see below; iso L), Philippines, Leyte, Dagama, Panda, 60 m, 20.iv.1913.

For description see Danser, *Philipp. J. Sci.* 58 (1935) 89. *Amyema wenzelii* can be identified locally by its combination of quaternate leaves, very distinctive cauliflorous inflorescences of a 2- or 3-flowered umbel with a rudimentary peduncle sunken below bark level and very short rays, and sessile anthers with a broad connective. Superficially the flowers appear to be sessile in small clusters. Although the anthers are sessile, the decurrent filament is clearly visible on the inner face of the petal. The flower colour is described as yellow in the lower part and green in the upper part.

*Amyema wenzelii* is recorded from Leyte and Bohol, Philippines (fig. 16; 3 collections seen), at low elevations from 60 to 600 m. Other habitat details and hosts are unknown. It is closely related to *A. beccarii*, with which it possibly has a parapatric geographic relationship. It differs from *A. beccarii* in its larger leaves, sessile anthers, and almost sessile flowers. For notes on inflorescence structure and relationships, see under *A. beccarii* and *A. fasciculata*.

The holotype of *Loranthus wenzelii* (PNH) is no longer extant. An isotype in US has been seen and designated lectotype of the name. An isotype in L has also been seen.

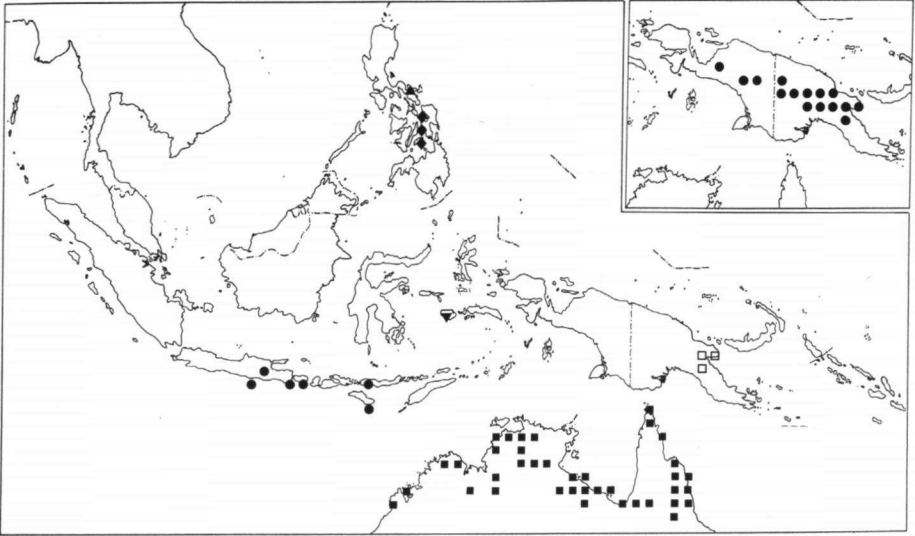


Fig. 16. Distribution of *Amyema* species. Symbols show recorded occurrence in 1° grid cells. □ = *A. tetrapetala* (Danser) Barlow; ● = *A. tristis* (Zollinger) Tieghem; ▼ = *A. umbellata* Danser; ▲ = *A. vernicosa* Barlow; ■ = *A. villiflora* (Domin) Barlow; ◆ = *A. wenzelii* (Merrill) Danser; ● = *A. wichmannii* (Krause) Danser (inset).

### 91. *Amyema whitei* (Blakely) Danser

*Loranthus whitei* Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 400. — *Amyema whitei* (Blakely) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Mitchell s.n.* (holo NSW), Queensland, Atherton scrub, ix.1911.

For description see Barlow, *Flora of Australia* 22 (1984) 122. *Amyema whitei* can be identified locally by its combination of opposite penninerved leaves rounded at the apex, inflorescence of a pedunculate simple 2-flowered umbel, and robust 6-merous flowers longitudinally ribbed or angled in bud. The flower colour is usually red, rarely yellow.

*Amyema whitei* occurs in north Queensland, where it is locally common in rain forests, parasitic on various hosts. It is probably closely related to other Australian species with simple umbels, including *A. sanguinea* and *A. quaternifolia*. See note under *A. sanguinea*.

### 92. *Amyema wichmannii* (Krause) Danser

*Loranthus wichmannii* Krause, Bot. Jahrb. Syst. 57 (1922) 465. — *Amyema wichmannii* (Krause) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 299. — Type: *Pulle 979* (lecto L, see below; iso L), New Guinea, Wichmann Mts, 2900 m, 28.i.1913.

For descriptions see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 354; Barlow, *Austral. J. Bot.* 22 (1974) 596. Additional synonymy is unchanged other than



the transfer of *A. wichmannii* subsp. *aggregata* to *A. artensis* (see below). *Amyema wichmannii* can be identified locally by its combination of opposite bifacial leaves, its umbel of triads with a long peduncle dilated at the apex and bearing 6–12 rays, and 4-merous flowers. The flower colour is described as red in various shades, and often so dark in the lower part as to appear black.

The species occurs in the highlands of New Guinea (fig. 16; 76 collections seen), common in subalpine vegetation from Wissel Lakes to Mt Amungwiwa, mostly at elevations from 2750 to 3600 m, rarely down to 2000 m and up to 4025 m. Recorded hosts include *Ardisia*, *Drimys*, *Eurya*, *Rapanea*, *Rhododendron*, and *Vaccinium*.

The subalpine species of *Amyema* in New Guinea are a closely related natural group of apparently young species. Geographic and altitudinal replacement patterns exist, and intergradation between some of the species occurs. *Amyema wichmannii* has apparently hybridized in the recent past with *A. dilatipes* (see notes there). *Amyema wichmannii* has similar habitat requirements to *A. pachypus*, and they have a geographic replacement pattern along the New Guinean mountain axis. The two species have probably differentiated ecogeographically.

Barlow (1974) distinguished three subspecies in *A. wichmannii*, with relatively discrete areas in New Guinea. The present study has shown that the specimen from the highlands of the Milne Bay District on which subsp. *aggregata* was based is probably misplaced. Along with several other additional specimens seen from that area, distinctive in having 4 or 5 rays in the umbel, it is probably a local extreme of variation in *A. artensis* and not a disjunct subspecies of *A. wichmannii*. See note under *A. artensis*. After examination of all the materials available for the present study the status of the other two subspecies, *wichmannii* and *pura* Barlow, is confirmed. They have a geographic replacement pattern, with a contact zone in the Star Mountains near the Papua New Guinean border with Irian Jaya. The observed gradation between them is steep, indicating that the gene pools represented by the subspecies have considerable integrity. For further discussion of the subspecies see Barlow (1974).

#### ACKNOWLEDGMENTS

Much of the work for this conspectus was undertaken whilst the author was Van Der Klaauw Visiting Professor at the Rijksherbarium, University of Leiden. The Director and Staff are thanked sincerely for their support and advice.

The Directors of the following Herbaria are thanked for specimen loans whilst the work was completed in Australia: BO, CANB, L, NY, P, U, UC, US. Dr H.J. Eichler (CANB) is thanked for his nomenclatural advice.

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## INDEX TO SPECIES NAMES

The list below includes only names mentioned in this conspectus. It should be used in conjunction with the comprehensive indexes in Danser (1929; 1931; 1935; 1938). The numbers mentioned here refer to species numbers. New species and subspecies and new combinations are printed in **bold**, synonyms are given in *italics*.

*Amyema* Tieghem

- acuta* (Tieghem) Danser 1  
*aneityensis* (Guillaumin) Danser 3  
*angularis* Barlow 60  
*anisomeres* Danser 15  
*apoda* Barlow 27  
*apoensis* (Elmer) Barlow 2  
*aquilonia* Danser 27  
*artensis* (Montrouzier) Danser 3  
     var. *papuana* (Danser) Barlow 3  
*arthrocaulis* Barlow 4  
*articulata* (Krause) Danser 73  
*barbellata* (Blakely) Danser 69  
*basilanensis* (Merrill) Danser 15  
*beccarii* (Tieghem) Danser 5  
*benguetensis* (Merrill) Danser 6  
*benthamii* (Blakely) Danser 7  
*bifurcata* (Bentham) Tieghem 8  
     var. *eburna* Barlow 24  
*biniflora* Barlow 9  
*brassii* Barlow 10  
*cambagei* (Blakely) Danser 11  
*canaliculata* Barlow 12  
*caudiciflora* (Lauterbach) Danser 13  
*cauliflora* (Merrill) Barlow 14  
*celebica* (Tieghem) Danser 15  
*cephalanthera* Danser 60  
*cercidioides* (Krause) Danser 16  
*clavipes* Danser 58  
*congener* (Sieber ex Schultes &  
     J. H. Schultes) Tieghem 17  
*conspicua* (F. M. Bailey) Danser 18  
     subsp. *conspicua* 18  
     subsp. *fulvicalyx* Barlow 18  
     subsp. *obscurinervis* Barlow 18  
*corniculata* Danser 19  
*cuernosensis* (Elmer) Barlow 20  
*curranii* (Merrill) Danser 21  
*curvifolia* (Krause) Danser 38  
*dilatipes* Barlow 22  
*dolichopoda* Barlow 23  
*durenii* Barlow 60

## (Amyema)

- eburna*** (Barlow) Barlow 24  
***edanoi*** (Merrill) Barlow 25  
***enneantha*** Barlow 26  
*fasciculata* (Blume) Danser 27  
*finisterrae* (Warburg) Danser 28  
*fitzgeraldii* (Blakely) Danser 29  
*friesiana* (Schumann) Danser 30  
*gaudichaudii* (DC.) Tieghem 31  
*gibberula* (Tate) Danser 32  
*gigantifolia* (Krause) Danser 13  
*glabra* (Domin) Danser 33  
*gravis* Danser 34  
*haematodes* (Schwarz) Danser 35  
*haenkeana* (Schultes) Danser 36  
*halconensis* (Merrill) Danser 37  
*hastifolia* (Ridley) Danser 38  
*herbertiana* Barlow 39  
***hexameres*** (Danser) Barlow 40  
***hexantha*** (Merrill) Barlow 41  
*hilliana* (Blakely) Danser 42  
*huichinsonii* (Merrill) Danser 5  
*incarnatiflora* (Elmer) Danser 43  
*involvens* Barlow 67  
***irrubescens*** Barlow 44  
*kebarensis* Barlow 45  
*linophylla* (Fenzl) Tieghem 46  
***longipes*** (Danser) Barlow 47  
*lucasii* (Blakely) Danser 48  
*luzonensis* (Schultes) Danser 49  
*mackayensis* (Blakely) Danser 50  
     subsp. *cycnei-sinus* (Blakely) Barlow 50  
*maidenii* (Blakely) Barlow 51  
*medinilicola* (Merrill) Danser 1  
*melaleuca* (Lehmann ex Miquel) Tieghem 52  
*melastomifolia* (Krause) Danser 73  
*microphylla* Barlow 53  
*miquelii* (Lehmann ex Miquel) Tieghem 54  
*miraculosa* (Miquel) Tieghem 55  
     subsp. *boormanii* (Blakely) Barlow 55b  
     subsp. *latifolia* Barlow 55c  
     subsp. *miraculosa* 55a

## (Amyema)

- mosea* Danser 1  
*nestor* (S. Moore) Danser 56  
*nodosa* (Tieghem) Danser 5  
*novaebritanniae* (Schumann) Danser 57  
*obovata* Danser 60  
*ovariosa* Danser 60  
*pachypus* (Burkill) Danser 58  
*papuana* Danser 3  
*pendula* (Sieber ex Sprengel) Tieghem 59  
*pentactis* Danser 60  
*plicatula* (Krause) Danser 60  
*polillensis* (Robinson) Danser 61  
*polytrias* Danser 62  
*preissii* (Miquel) Tieghem 63  
*pyriformis* Barlow 64  
*quandang* (Lindley) Tieghem 65  
*quaternifolia* Barlow 66  
*queenslandica* (Blakely) Danser 67  
*rhopalanthes* Danser 75  
*rhytidoderma* Barlow 68  
*rigidiflora* (Krause) Danser 69  
*sanguinea* (F. Mueller) Danser 70  
*scandens* (Tieghem) Danser 71  
     subsp. *crassifolia* Barlow 13  
     subsp. *plicatula* (Krause) Barlow 60  
*scheffleroides* Barlow 72  
*schultzei* (Krause) Danser 71  
*seemeniana* (Schumann) Danser 73  
     subsp. *flexousa* Barlow 73  
     subsp. *melastomifolia* (Krause)  
         Barlow 73  
     subsp. *seemeniana* 73  
*seriata* (Merrill) Barlow 74  
*sessilifolia* (Tieghem) Danser 49  
*squarrosa* (Krause) Danser 75  
     subsp. *rhopalanthes* (Danser) Barlow 75  
*strongylophylla* (Lauterbach) Danser 76  
     subsp. *barbellata* (Blakely) Barlow 69  
     subsp. *rigidiflora* (Krause) Barlow 69  
*subcapitata* Barlow 77  
*tenuisepala* (Krause) Danser 3  
*tetraflora* (Barlow) Barlow 78  
*tetrapetala* (Danser) Barlow 79  
*thalassia* Barlow 80  
*timorana* Danser 81  
*triantha* (Korthals) Tieghem 82  
*tridactyla* Barlow 83  
*tristis* (Zollinger) Tieghem 84

## (Amyema)

- umbellata* Danser 85  
*urdanetensis* (Elmer) Danser 86  
*vernica* Barlow 87  
*verticillata* (Merrill) Danser 88  
*verticillifolia* (Krause) Danser 71  
*villiflora* (Domin) Barlow 89  
*wenzelii* (Merrill) Danser 90  
*whitei* (Blakely) Danser 91  
*wichmannii* (Krause) Danser 92  
     subsp. *aggregata* Barlow 3  
     subsp. *pura* Barlow 92  
     subsp. *wichmannii* 92

*Cleistoloranthes* Merrill

- verticillatus* Merrill 88

*Dicymanthes* Danser

- apoensis* (Elmer) Danser 2  
*breviflora* Danser 20  
*cauliflora* (Merrill) Danser 14  
*cuernosensis* (Elmer) Danser 20  
*edanoi* (Merrill) Danser 25  
*elliptica* Danser 84  
*hexameres* Danser 40  
*hexantha* (Merrill) Danser 41  
*lombocana* Danser 20  
*longipes* Danser 47  
*samarensis* (Merrill) Danser 25  
*seriata* (Merrill) Danser 74  
*suluana* Danser 25  
*tetrapetala* Danser 79

*Loranthus* Jacq.

- aneityensis* Guillaumin 3  
*apoensis* Elmer 2  
*artensis* Montrouzier 3  
*barbellatus* Blakely 69  
*basilanensis* Merrill 15  
*benguetensis* Merrill 6  
*benthamii* Blakely 7  
*bicoloratus* Elmer 15  
*bifurcatus* Bentham 8  
*camagei* Blakely 11  
*caudiciflorus* Lauterbach 13  
*cauliflorus* Merrill 14  
*cercidioides* Krause 16  
*congener* Sieber ex Schultes &  
     J.H. Schultes 17

## (Loranthus)

- conspicuus* F.M. Bailey 18  
*cuernosensis* Elmer 20  
*curranii* Merrill 21  
*curvifolius* Krause 38  
*cycneus-sinus* Blakely 50  
*edanoi* Merrill 25  
*eucalyptiphyllus* Merrill 36  
*fasciculatus* Blume 27  
*finisterrae* Warburg 28  
*fitzgeraldii* Blakely 29  
*friesianus* Schumann 30  
*gaudichaudii* DC. 31  
*gibberulus* Tate 32  
*gigantifolius* Krause 13  
*glaber* Domin 33  
*haematodes* Schwarz 35  
*haenkeanus* Schultes 36  
*halconensis* Merrill 37  
*hastifolius* Ridley 38  
*heterochromus* Krause 38  
*hexanthus* Merrill 41  
*hillianus* Blakely 42  
*hutchinsonii* Merrill 5  
*incarnatiflorus* Elmer 43  
*linophyllus* Fenzl 46  
*lucasii* Blakely 48  
*luzonensis* Schultes 49  
*mackayensis* Blakely 50  
*maidenii* Blakely 51  
*medinillicola* Merrill 1  
*melaleucaae* Lehmann ex Miquel 52  
*miquelii* Lehmann ex Miquel 54  
*miraculosus* Miquel 55  
*nestor* S. Moore 56  
*novaebritanniae* Schumann 57  
*pachypus* Burkill 58

## (Loranthus)

- pendulus* Sieber ex Sprengel 59  
*plicatulus* Krause 60  
*polillensis* Robinson 61  
*preissii* Miquel 63  
*preslii* Elmer 43  
*quandang* Lindley 65  
     var. *villiflorus* Domin 89  
*queenslandicus* Blakely 67  
*rigidiflorus* Krause 69  
*samarensis* Merrill 25  
*sanguineus* F. Mueller 70  
*schultzei* Krause 71  
*seemenianus* Schumann 73  
*seriatus* Merrill 74  
*squarrosus* Krause 75  
*strongylophyllus* Lauterbach 76  
*tenuisepalus* Krause 3  
*trianthus* Korthals 82  
*tristis* Zollinger 84  
*urdanetensis* Elmer 86  
*wenzelii* Merrill 90  
*whitei* Blakely 91  
*wichmannii* Krause 92
- Neophylum* Tiegh.  
     *scandens* Tieghem 71
- Rhizanthemum* Tiegh.  
     *celebicum* Tieghem 15
- Stemmatophyllum* Tieghem  
     *acutum* Tieghem 1  
     *beccarii* Tieghem 5  
     *nodosum* Tieghem 5  
     *sessilifolium* Tieghem 49
- Ungula* Barlow  
     *tetraflora* Barlow 78