

**CONSPECTUS OF THE GENERA AMYLOTHECA, CYNE,
DECAISNINA, LAMPAS, LEPEOSTEGERES, AND LOXANTHERA
(LORANTHACEAE)**

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SUMMARY

The Australasian/Malesian group of genera *Amylotheca*, *Cyne*, *Decaisnina*, *Lampas*, *Lepeostegeres* and *Loxanthera* is reviewed. Particular attention is given to the species of the Malesian region, as a precursor to a treatment of Loranthaceae for *Flora Malesiana*. The genera are part of a floristic element of Gondwanan derivation which has diversified in the southeast Asian and western Malesian region, and has reached the Papuanian/Australasian region from the west following the establishment of Charles's Line. The six genera comprise 46 species (*Amylotheca* 4, *Cyne* 6, *Decaisnina* 25, *Lampas* 1, *Lepeostegeres* 9, *Loxanthera* 1). Along with the Australian genus *Lysiana* (8 species) they form a natural group with tribal or subtribal status. Major centres of species richness are in Borneo, the Philippines, and New Guinea.

Revised genus and species circumscriptions necessitate a number of nomenclatural changes to earlier regional treatments. Three species are described as new, viz., *Cyne baetorta*, *C. monotrias* and *Decaisnina longipes*. There are 15 new combinations, viz., *Cyne papuana*, *C. perfoliata*, *Decaisnina aherniana*, *D. amplexicaulis*, *D. angustata*, *D. celebica*, *D. confertiflora*, *D. crassilimba*, *D. cumingii*, *D. miniata*, *D. ovatifolia*, *D. revoluta*, *D. sumbawensis*, *D. viridis*, and *D. zollingeri*.

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 this paper the six genera *Amylotheca*, *Cyne*, *Decaisnina*, *Lampas*, *Lepeostegeres*, and *Loxanthera* are dealt with, and are collectively referred to as the 'decaisninoid' group. In the cases of *Amylotheca* and *Decaisnina*, treatments of the Australian and New Guinean/Pacific species have been published previously (Barlow, 1966, 1974, 1983), but now require updating, and for each a conspectus of the entire genus is therefore presented. This allows a synthesis for each 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, 1991b).

Species circumscription

The information sources for the study of the Malesian taxa have been herbarium specimens and earlier taxonomic concepts, notably those of Danser. Conclusions about conspecificity of entities in different islands have also taken account of geographical and palaeoclimatic history, with Danser's taxonomic concepts being reviewed against this background. For a fuller account of the systematic methodology employed, see the conspectus of *Amyema* in this series (Barlow, 1992).

AMYLOTHECA, CYNE, DECAISNINA, LAMPAS, LEPEOSTEGERES, LOXANTHERA

The six genera treated here comprise an apparently natural group, sharing a number of morphological features of primary taxonomic importance, and having comparable habitat requirements and geographic distributions. Although not circumscribed in the same way by previous authors, they have usually been kept together in infrafamilial classifications of the family. Infrafamilial classification of Loranthaceae is based mainly on ovary and seedling characters, but is seriously in need of revision. As the constituents of the informal group L 21–26 'Amylothecae' (Barlow et al., 1989), the generic group is characterized by a partially differentiated ovary with a placental column bearing rudimentary ovules (Maheshwari et al., 1957; Bhatnagar & Johri, 1983), cotyledons emerging on germination, and relatively large chromosomes ($x = 12$). Most of the readily observable external characters which together are diagnostic for the group are derived from inflorescence and flower structure.

Diagnostic features

The basic inflorescence unit (uniflorescence) in the decaisninoids is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, and the plesiomorphic state for the group is an axillary raceme of uniformly spaced opposite pairs of triads. Dichasial uniflorescences in a racemose arrangement are characteristic of genera such as *Gaiadendron*, *Notanthera* and *Nuytsia*, which are logical choices within the family for outgroup comparisons because of their plesiomorphic characters which show links with other families of Santalales (Barlow & Wiens, 1973).

The same outgroup comparisons indicate that capitate inflorescences represent a derived state. The condensation of the inflorescence into a capitulum is apparently an adaptive trend which has also occurred convergently in other loranth groups in the region, such as the amyemoid genera (Barlow, 1966, 1974, 1990) and *Macrosolen* and its allies. Along with the crowding of more or less sessile flowers in the inflorescence axis, there is a trend towards the development of outer floral bracts into an involucre which encloses the flowers during development, sometimes even until fruit ripening. In one genus, *Cyne*, an involucre is derived from stem periderm tissue. In all such derived capitate inflorescences, the basic triad uniflorescence in a racemose arrangement is still visible. The changes in loranth seem to be more frequent in the wet tropics, and may contribute to narrowing the guilds of animals which visit the plants as potential pollinators or predators.

Simpler inflorescences are probably derived by reduction. There is a trend for reduction of triads to single flowers, usually along with reduction in inflorescence elaboration, and this has also occurred convergently in other generic groups in the region. The transformation series postulated for *Amyema* (Barlow, 1966) illustrates the reductions which may occur. In *Amylotheca*, for example, the inflorescence is often a simple raceme of decussate flowers, and in *Lysiana* (see below) it is usually a 2-flowered simple umbel and may be a solitary flower. In these cases the basic triad unit is no longer apparent, but vestigial structures (especially supernumerary bracts) and occasional aberrant developments indicate the direction of change (Barlow, 1992).

The flowers of the decaisninoids are hermaphrodite, mostly 6-merous, and usually regular. Outgroup comparisons indicate that the plesiomorphic corolla state is choripetalous (Barlow, 1983), although it occurs in very few decaisninoid species. Even in the apparently least specialized genus, *Decaisnina*, the petals in most species remain weakly coherent in the lower part after anthesis. The short corolla tube so formed is sometimes dilated to form a distinct nectar chamber. Similar corolla characters are found in *Cyne*. In all other genera in the group the corolla is gamopetalous. Parallel trends in Loranthaceae from open choripetalous flowers to tubular gamopetalous ones are found in all continents, and are correlated with shifts from entomophily to ornithophily.

The epipetalous stamens have basifixed immobile introrse anthers with simple filaments which in some cases are very short so that the anther is sessile. In one genus, *Loxanthera*, the anther appears dorsifixed owing to development of a basal spur of the anther. The style is usually articulate above the base, leaving a distinct nipple on the fruit.

Vegetative features are relatively homogeneous. Leaves are simple, almost always opposite, and are frequently bifacial.

Generic relationships

The largest genus in the group, *Decaisnina*, exhibits all of the apparently plesiomorphic states, and is presumably the most primitive. The smaller more specialized genera are probably derived, along different lines of adaptation. The arrangement of the genera in this conspectus is an assessment of their levels of specialization and closeness of relationship to *Decaisnina* and to each other.

The only decaisninoid genus not dealt with here is *Lysiana*. This genus of 8 species is endemic to Australia, and has been revised elsewhere (Barlow, 1966, 1983, 1984). It shows the greatest accumulation of apomorphic characters in the group, and is presumably the only genus which has originated outside Malesia. Its diversity and wide geographic range in Australia are remarkable for a stock of intrusive Malesian origin (Barlow, 1990).

The seven genera in the group (including *Lysiana*) form a clearly defined natural cluster which merits taxonomic recognition, perhaps at tribal or subtribal level. The further relationships of the group are with the elytranthoid genera, which share the same basic genome and ovary and seed characters. The elytranthoid genera are centred in southeast Asia, and like the decaisninoids are part of the Indian-Indosinian phyletic line discussed below.

Biogeographic history

The loranth is presumably originated in the mesic, warm to mild, closed forests of Gondwana, the parasitic habit arising not in response to water stress but to competition for nutrients in complex ecosystems. Four main lines of evolution apparently occurred independently in the Afro-Indian, Indian-Indosinian, Australasian-Papuasian and South American regions of Gondwana, from genomically different basal stocks, and were isolated by the fragmentation of the supercontinent (Barlow, 1990). The Indian-Indosinian line is represented in part by the decaisninoid group of genera dealt with here. This line has undergone secondary radiation in the southeast Asian region following its arrival on Gondwanan fragments in early Tertiary time.

The decaisninoid genera are confined to the Malesian, Australasian and South Pacific regions, with only a small representation on the Asian mainland in Malaya and peninsular Thailand. With the exception of *Lysiana*, all of the genera occur in Malesia, and most have their centres of diversity there. It is likely, therefore, that the group has its centre of origin in the Malesian region.

Like all loranth, dispersibility in the decaisninoids is generally low, and the spread of the genus across Sundaland to Australasia and the Pacific 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 Celebes and the Philippines to Australia and New Guinea was established (Audley-Charles, 1981). By the late Pliocene, lowered sea levels would have exposed extensive land on both sides of the contact boundary (Charles's Line) and dispersal of the genera would have been facilitated. A feature of the decaisninoids is their balanced diversity on both sides of Charles's Line, matched

in Loranthaceae only by that of *Amyema* (Barlow, 1992). The species which occur to the south and east of Charles's Line are presumably derived from stocks which reached there from a western Malesian source subsequent to the late Tertiary contact of the Australian and Sunda plates. The degree of secondary radiation to the east of Charles's Line, involving several of the decaisninoid genera, indicates that these loranthids may have been among the earliest migrants from Sundaland. Among the groups of Indian-Indosinian Loranthaceae, the decaisninoids have penetrated the Australian/Pacific region more than any other.

Present day patterns of species richness and affinity suggest that the eastern mesic forest block from the Philippines to New Guinea has been the main corridor for migration and speciation of the decaisninoids in Papuasias. In turn, Papuasias has been a source for colonization of Australia, New Caledonia and remote continental and oceanic islands of the South Pacific. There is a rapid decline in species numbers to the east of New Guinea, and the few species represented there are widespread, occurring on more than one island.

In Malesia the decaisninoids occur mainly in lowland humid forests, although some species reach or are confined to subalpine habitats. Many of the species, nevertheless, have limited distributions, being confined to one major island. These species may therefore be very young with respect to the timing of Recent sea level fluctuations. This is consistent with the taxonomic difficulty presented by some of these genera.

KEY TO THE GENERA

A provisional key to all genera of Loranthaceae in the Malesian region can be found in Barlow (1991a).

- 1a. Petals free or weakly coherent in the lower part 2
- b. Petals fused into a distinct tube 3
- 2a. Inflorescence a very short raceme or sessile head of decussate triads, with an involucre of one piece formed from the stem periderm and lifting as one piece or rupturing irregularly as the inflorescence develops **2. Cyne**
- b. Inflorescence an elongated raceme of triads **1. Decaisnina**
- 3a. Inflorescence capitate or subcapitate, of several crowded triads at or near the end of a common axis 4
- b. Inflorescence not as above (an elongated raceme of triads or single flowers, or an umbel) 5
- 4a. Inflorescence a subumbellate raceme of triads spirally crowded near the apex of the axis; involucre segments developed from the central bracts of several outer triads and fused to the triad peduncles **3. Lampas**
- b. Inflorescence quite capitate, the flowers pedicellate or sessile on a flat receptacle; involucre segments developed from non-fertile bracts . . . **6. Lepeostegeres**
- 5a. Anthers prolonged downwards by a basal spur and apparently dorsifixed and immobile **5. Loxanthera**
- b. Anthers simple, basifixed, immobile 6

- 6a. Corolla tube straight, nearly regular; inflorescence mostly a raceme of triads or simple raceme; epicortical runners present 4. *Amylotheca*
 b. Corolla tube curved, more deeply split on one side; inflorescence a 2-flowered umbel or solitary flower; epicortical runners absent (see above; Australian genus treated elsewhere) *Lysiana*

1. DECAISNINA

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

For descriptions and synonymy see Barlow, Austral. J. Bot. 22 (1974) 535; Flora of Australia 22 (1984) 74. Danser (1931) included *Decaisnina* in *Amylotheca*, which was more broadly circumscribed than in this treatment.

A genus of 25 species distributed from Java, Celebes and the Philippines eastwards to New Guinea, Australia and across the South Pacific to Tahiti and the Marquesas. The major centres of species richness and diversity are the Philippines and New Guinea (see below). Range extension to oceanic Pacific islands involves only one species, *D. forsteriana*, which has achieved the widest distribution by distance dispersal of any loranth species.

The species are found in a range of habitats from rain forests to open tropical woodlands and monsoon scrubs, and from lowland to montane forests. Attachment to the host is exclusively through secondary haustoria on extensive epicortical runners. Leaf architecture is not very variable, ranging from a common simple bifacial pattern to thick or thin isofacial forms, always decussate and with pennate venation. Most variation is in inflorescence and flower structure, and is apparently related to pollination. Host specificity is generally low, but may be moderately high in open seasonally arid woodlands.

Diagnostic features

The infrafamilial classification of *Decaisnina* and the generic group to which it belongs is outlined above. For identification at the generic level the readily observable morphological characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Decaisnina* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, and the plesiomorphic state for the genus is an axillary raceme of uniformly spaced opposite pairs of triads. In many of the species the inflorescence is presented horizontally and the triads are secund, all turning upwards on their peduncles so that the inflorescence has a brush-like appearance. Simpler inflorescences are probably derived by reduction, but always comprise one or more pairs of triads in a racemose arrangement.

The flowers of *Decaisnina* are hermaphrodite, 6- or rarely 5-merous, regular and basically choripetalous, although in the majority of species the petals remain weakly coherent in the lower part after anthesis. In some species the short corolla tube so formed is dilated to form a distinct nectar chamber. The epipetalous stamens have basifixed immobile introrse anthers with simple filaments which in some cases are

very short so that the anther is subsessile. The style is usually articulate above the base, leaving a distinct nipple on the fruit.

Vegetative features are relatively homogeneous. Sessile or almost sessile cordate leaves are constant or occasional in several species of *Decaisnina*, and occur in species which are otherwise distinct in an array of other vegetative and reproductive characters. The condition is probably of multiple origin in the genus, perhaps as one of several modifications which appear to protect the developing inflorescence.

Generic relationships

Decaisnina is the largest genus in the group, and probably the least specialized. The related genera are all small, each characterized by a single distinctive feature, and apparently derived. In some cases the derived genera are characterized by capitate inflorescences subtended by well-developed involucre, apparently evolved convergently as adaptations for protection and/or presentation of the flowers. The homologies of these inflorescence structures are discussed under the individual genera, but it is noteworthy that most of the relevant basic structures are present in at least some of the species of *Decaisnina*.

The present study has revealed especially close links between *Decaisnina* and the unusual genus *Cyne*. In the latter genus the inflorescence is a sessile or subsessile capitulum or very condensed raceme formed from sessile or subsessile decussate triads, and therefore derivable from *Decaisnina* by reduction. The distinctive feature in *Cyne* is the development of the inflorescence in a hollow of the stem, below the periderm, which forms a blister-like operculum which lifts off, or through which the inflorescence emerges, as the flowers enlarge. The inflorescences in some species of *Cyne* show a clear transition in degree of reduction from those of *Decaisnina*. See notes under *Cyne*.

Biogeographic history

See notes above on the biogeography of the decaisninoids. *Decaisnina* is a distinctive genus in having a balanced distribution across Charles's Line, with centres of species richness on both the Sunda and Australo/Papuanian plates. It was presumably well represented in the intrusive Malesian stocks which penetrated New Guinea and northern Australia, and underwent significant differentiation and speciation in the process. Being basically a lowland genus, its distribution and differentiation have probably been influenced by the cyclic changes in climate and sea level which have succeeded the initial exchange. This is possibly why *Decaisnina* is taxonomically one of the most difficult genera of the entire region.

KEY TO THE SPECIES

- 1a. Inflorescence subtended by an involucre of decussate scales at the base of the axis 2
- b. Inflorescence not subtended by an involucre of decussate scales at the base of the axis 6
- 2a. Inflorescence axis oriented vertically with the flowers not strongly secund; lateral flowers of the triads on distinct pedicels at least as long as the ovary 3

- b. Inflorescence axis oriented horizontally with the flowers strongly secund, giving the inflorescence a brush-like appearance; lateral flowers of the triads on obscure pedicels much shorter than the ovary 5
- 3a. Stems and inflorescence parts very thick; internodes short and often crowded so that the leaves appear verticillate; corolla more than 30 mm long (Philippines) **24. D. viridis**
- b. Stems and inflorescence parts slender to moderately robust; internodes normally developed with evenly spaced decussate leaf pairs; corolla less than 30 mm long 4
- 4a. Inflorescence axis less than 15 mm long; corolla 5-merous, hardly inflated at the base (Philippines) **17. D. ovatifolia**
- b. Inflorescence axis more than 30 mm long; corolla 6-merous, distinctly inflated at the base (Philippines) **1. D. aherniana**
- 5a. Leaf lamina up to 8 cm long; triads crowded at the end of the inflorescence axis (Philippines) **19. D. revoluta**
- b. Leaf lamina more than 10 cm long; triads distributed uniformly along the inflorescence axis (Philippines) **9. D. crassilimba**
- 6a. Leaves sessile, truncate to amplexicaul at the base 7
- b. Leaves petiolate, or if sessile attenuate at the base 10
- 7a. Anther almost sessile (with free filament less than 1 mm long) 8
- b. Anther with free filament more than 1.5 mm long 9
- 8a. Corolla less than 20 mm long; young internodes angular (Philippines, Moluccas) **10. D. cumingii**
- b. Corolla more than 20 mm long; young internodes soon terete (Philippines) **16. D. miniata**
- 9a. Leaf lamina dull on both sides (Australia) **20. D. signata**
- b. Leaf lamina bifacial, glossy on the upper surface (Philippines, New Guinea) **2. D. amplexicaulis**
- 10a. Leaves distinctly bifacial with upper surface glossy or darker than the dull lower surface 11
- b. Leaves dull and more or less the same colour on both sides 17
- 11a. Corolla less than 10 mm long; anthers nearly sessile (New Guinea) **15. D. micranthes**
- b. Corolla 10–22 mm long; anthers sessile or nearly so 12
- c. Corolla more than 22 mm long; anthers on distinct free filaments more than 2 mm long 13
- 12a. Young internodes 4-angular; leaf lamina strongly bifacial, recurved at the margin; inflorescence and flowers shortly and densely tomentose (Philippines) **7. D. confertiflora**
- b. Young internodes dilated and 2-angled in the upper part; leaf lamina weakly bifacial, not recurved at the margin; inflorescence and flowers glabrous or sparsely hairy (Philippines, Moluccas) **10. D. cumingii**
- 13a. Stems and inflorescence parts very thick; internodes short and often crowded so that the leaves appear verticillate; corolla inflated to 5 mm wide in the lower part (Philippines) **24. D. viridis**

- b. Stems and inflorescence parts slender to robust; internodes normally developed with evenly spaced decussate leaf pairs; corolla not or slightly inflated at the base 14
- 14a. Triads in 1–3 pairs crowded near the apex of the inflorescence axis; leaves narrowly elliptic (New Guinea, Australia) **8. D. congesta**
- b. Triads in several pairs distributed uniformly along the inflorescence axis; leaves ovate 15
- 15a. Petals eventually separating to the base; anthers transversely septate prior to anthesis (Solomon Is. to Tahiti and Marquesas) **12. D. forsteriana**
- b. Petals remaining coherent in the lower part; anthers not transversely septate. . 16
- 16a. Plant robust, usually with a short brown tomentum on the young parts and inflorescences; leaves with a distinct petiole mostly more than 10 mm long and lamina strongly bifacial; corolla mostly more than 30 mm long (New Guinea, Solomon Is.) **13. D. hollrungii**
- b. Plant relatively slender, glabrous or rarely with the inflorescence sparsely pubescent; leaves with a petiole mostly less than 10 mm long and lamina weakly bifacial; corolla less than 30 mm long (Philippines, Celebes, Lesser Sunda Is., New Guinea) **22. D. sumbawensis**
- 17a. Corolla inflated and globular at the base 18
- b. Corolla not inflated at the base, or if so then not sharply contracted to form a globular dilation 20
- 18a. Corolla less than 20 mm long (Philippines, Moluccas) . . . **10. D. cumingii**
- b. Corolla more than 20 mm long 19
- 19a. Young internodes strongly angular distally **25. D. zollingeri**
- b. Young internodes not strongly angular distally **21. D. stenopetala**
- 20a. Leaves linear to lanceolate 21
- b. Leaves broadly lanceolate to orbicular 23
- 21a. Internodes strongly flattened (Australia) **4. D. biangulata**
- b. Internodes terete except when very young 22
- 22a. Leaves attenuate at the base to an obscure petiole, often falcate (Australia)
 - 5. D. brittenii**
 - b. Leaves truncate or cordate at the base, almost sessile, usually not falcate (Australia) **20. D. signata**
- 23a. Corolla less than 10 mm long; anthers nearly sessile (New Guinea)
 - 15. D. micranthes**
 - b. Corolla 10–20 mm long; anthers sessile or nearly so (Philippines, Moluccas)
 - 10. D. cumingii**
 - c. Corolla more than 20 mm long; anthers on distinct free filaments more than 2 mm long 24
- 24a. Triads crowded near the apex of the inflorescence axis 25
- b. Triads distributed uniformly along the inflorescence axis 26
- 25a. Leaf lamina acuminate, acute at the apex; corolla 35–50 mm long (Celebes)
 - 6. D. celebica**
 - b. Leaf lamina obtuse to rounded at the apex, often with a small blunt mucro; corolla 23–30 mm long (New Guinea, Australia) **8. D. congesta**

- 26a. Corolla pale green or yellow in the lower part; petals separating to the base at anthesis (New Guinea) 11. *D. djamuensis*
 b. Corolla red in the lower part; petals cohering in the lower 1–15 mm after anthesis 27
- 27a. Triads with all flowers sessile 28
 b. Triads with the central flower sessile and the lateral flowers pedicellate . . . 30
- 28a. Petals usually coherent for more than 2 mm; anther mostly slightly shorter than the free part of the filament (Lesser Sunda Is, Moluccas, New Guinea, Australia) 23. *D. triflora*
 b. Petals coherent in the lower 0–2 mm; anther mostly longer than the free part of the filament 29
- 29a. Lamina truncate or cordate at the base, sessile or nearly so (Australia)
 20. *D. signata*
 b. Lamina attenuate at the base into an obscure winged petiole (Australia)
 3. *D. angustata*
- 30a. Leaf lamina broadly lanceolate to elliptic, attenuate at the base to an obscure petiole 3–5 mm long; corolla 23–30 mm long (New Guinea)
 18. *D. pedicellata*
 b. Leaf lamina elliptic to almost orbicular, shortly cuneate at the base with a distinct petiole 25–40 mm long; corolla 30–50 mm long (New Guinea)
 14. *D. longipes*

1. *Decaisnina aherniana* (Merrill) Barlow, *comb. nov.*

Loranthus ahernianus Merrill, Philipp. J. Sci. 1 Suppl. (1906) 184. — *Amylothea aherniana* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Ahern's Collector FB 2140* (lecto US 708375, see below; iso BO, NY), Philippines, Luzon, Rizal, Bosoboso, xi–xii.1904.

Loranthus saccatus Elmer, Leafl. Philipp. Bot. 3 (1911) 1072. — *Amylothea saccata* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Elmer 11747* (lecto NY, see below; iso P, US), Philippines, Mindanao, Davao, Todaya, Mt Apo, ix.1909.

Loranthus lucidus Merrill, Philipp. J. Sci. C 9 (1914) 277. — Type: *Ramos BS 16647* (lecto L 913.280–192, see below; iso L, P), Philippines, Luzon, Laguna, San Antonio, ix–x.1912.

Loranthus cordilimbus Merrill, Philipp. J. Sci. 30 (1926) 391. — *Amylothea cordilimba* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *McGregor BS 43873* (lecto UC 256795, see below; iso NY), Philippines, Samar, Laquilacon, vi.1924.

For descriptions and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 23, 25 under *Amylothea saccata* and *A. aherniana*. *Decaisnina aherniana* can be identified by its combination of slender scandent habit, distinctly bifacial leaves acute and often acuminate at the apex, inflorescence with a basal involucre of decussate scales and long flexuose axis with many pairs of triads not secund at the base, and 6-merous corolla inflated in the lower part. The flower colour is mostly described as white to yellow, rarely red.

The species is endemic to the Philippines, widely distributed from Luzon to Mindanao, at elevations from sea level to 1200 m (Fig. 1; 16 collections seen). Habitat details are poorly known, but the species occurs in humid forests, and has been recorded as parasitic on *Litsea*, *Semecarpus* and *Syzygium*.

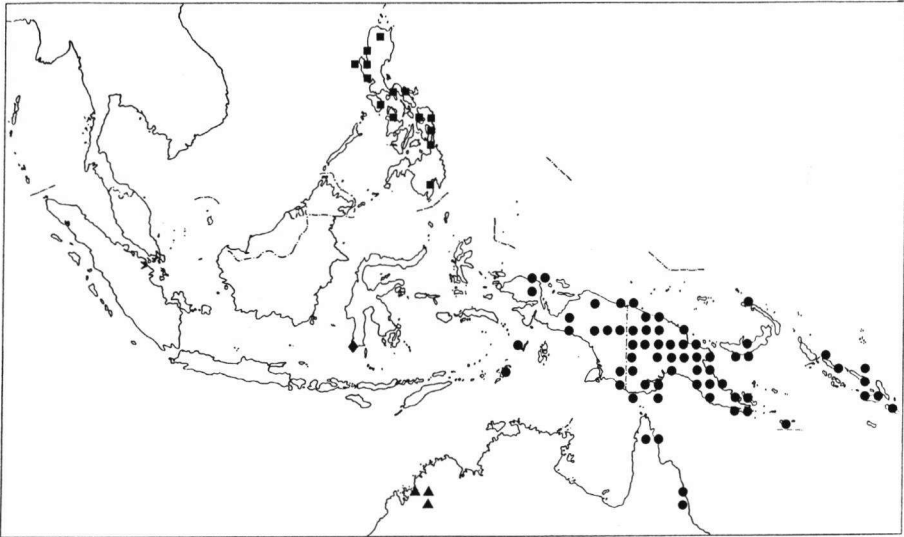


Fig. 1. Distributions of *Decaisnina* species. Symbols show recorded occurrence in 1° grid cells. ■ = *D. aherniana* (Merrill) Barlow. ▲ = *D. biangulata* (W. Fitzg.) Barlow. ◆ = *D. celebica* (Hemsley) Barlow. ● = *D. holrungii* (K. Schumann) Barlow.

Decaisnina aherniana is one of a distinctive group of species, confined to the Philippines, which is characterized by an involucre of decussate scales at the base of the inflorescence axis. The inflorescence is relatively unspecialized, having triads with distinctly pedicellate lateral flowers, and lacking the spatial orientation of the flowers seen in most species of the genus. The species group has presumably evolved *in situ*, and illustrates the important role of the Philippines as a centre of diversity of the genus. For further discussion of the biogeography of the genus see note under *Decaisnina* above.

Danser (1935) maintained *Amylotheca aherniana* and *A. saccata* as distinct species, citing differences in inflorescence and flower length. The materials now available indicate a continuous range of variation in corolla length (14–29 mm), inflorescence length (36–90 mm), number of pairs of triads (5–16), and leaf base (cuneate to cordate), with the various type specimens falling within this range. The materials are therefore treated as conspecific.

The holotypes of *L. ahernianus*, *L. saccatus*, *L. lucidus*, and *L. cordilimbus* (PNH) are no longer extant. An isotype of *L. ahernianus* in US has been seen and identified as lectotype of the species name, and other isotypes in BO and NY have been seen. An isotype of *L. saccatus* in NY has been seen and identified as lectotype of the species name, and other isotypes in L, P and US have been seen. An isotype of *L. lucidus* in L has been seen and identified as lectotype of the species name, and other isotypes in L and P have been seen. An isotype of *L. cordilimbus* in UC has been seen and identified as lectotype of the species name, and another isotype in NY has been seen.

2. *Decaisnina amplexicaulis* (Danser) Barlow, *comb. nov.*

Amylotheca amplexicaulis Danser, Philipp. J. Sci. 58 (1935) 14. — Type: *Ramos & Edaño BS 38740* (lecto: L, see below), Philippines, Mindanao, Bukidnon, Mt Candoon, vi–vii.1920.

For description see Danser, Philipp. J. Sci. 58 (1935) 14. The description is amended as follows: *leaf* lamina rounded to acuminate at the apex; *inflorescence* triads with the lateral flowers sessile or almost so; *anther* approximately equal to the free part of the filament. Apart from the sessile leaves, *Decaisnina amplexicaulis* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of relatively thin, distinctly bifacial leaves, sessile and cordate at the base, corolla more than 30 mm long, and free part of the anther filament more than 2 mm long. The flower colour has been recorded as purplish red in the lower part, white around the neck, and light green at the apex.

Decaisnina amplexicaulis occurs in Mindanao, Philippines, and in the Vogelkop, New Guinea (Fig. 2; 3 collections seen), recorded at elevations from 230 to 1500 m. Other habitat details and hosts are unknown. Danser (1935) saw only the type specimen from Mindanao, and the two additional specimens from the Vogelkop significantly extend the known area of the species. These latter specimens were previously referred to *D. triflora* (Barlow, 1974), and resolution of these misidentifications has clarified the circumscription and morphological boundaries of the latter species (see note under *D. triflora*).

See note under *Decaisnina* on the occurrence of sessile cordate leaves in the genus. In the Philippines sessile cordate leaves also occur in *D. miniata* and rarely in *D. cumingii*. *Decaisnina amplexicaulis* differs from both these species in having the free part of the staminal filament almost as long as the anther. It also differs from *D. mini-*

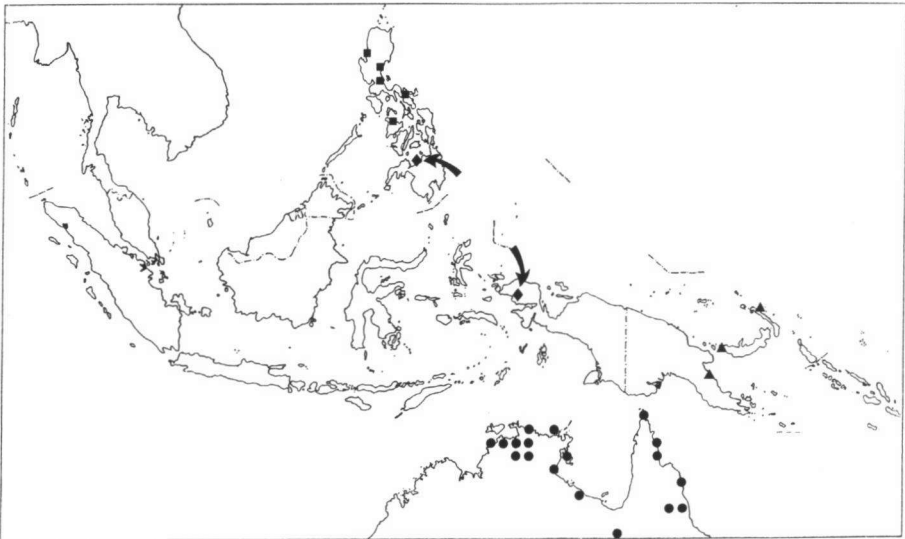


Fig. 2. Distributions of *Decaisnina* species. Symbols show recorded occurrence in 1° grid cells. ◆ = *D. amplexicaulis* (Danser) Barlow. ● = *D. brittenii* (Blakely) Barlow. ■ = *D. crassilimba* (Merrill) Barlow. ▲ = *D. longipes* Barlow.

ata in having smaller and less strongly bifacial leaves. It further differs from *D. cumingii* in having a more strongly bifacial leaf more strongly amplexicaul at the base, and in having much longer flowers.

Although poorly known, the existing records of *D. amplexicaulis* show that it occurs on both sides of Charles's Line. In view of the morphological diversity in *Decaisnina* in the Philippines, and the apparent biogeographic history of the genus, *D. amplexicaulis* has probably reached New Guinea by migration from the northwest. It presumably is part of the Malesian floristic element which has migrated into New Guinea along the eastern humid forest track.

The holotype of *Amylotheca amplexicaulis* (PNH) is no longer extant. An isotype in L has been seen and identified as lectotype of the species name.

Additional specimens examined: Vink & Vink BW 15302 (L), New Guinea, Vogelkop, NW side of L Ajamaru, Segior, 230 m, 10.iii.1962; Vink BW 15366 (L), New Guinea, Vogelkop, N of Ajamaru, Tubun, 260 m, 12.iii.1962.

3. *Decaisnina angustata* (Barlow) Barlow, *comb. et stat. nov.*

Decaisnina petiolata subsp. *angustata* Barlow, *Brunonia* 5 (1982) 205. — Type: *Kenneally 3049* (holo CANB; iso PERTH), Western Australia, Drysdale River National Park, Boiga Falls, 15° 08' S 127° 06' E, 4.viii.1975.

For descriptions see Barlow, *Brunonia* 5 (1982) 205; *Flora of Australia* 22 (1984) 76. The description is amended as follows: *leaves* glaucous and pale-coloured or non-glaucous and drying dark-coloured; *corolla* with petals coherent in the lower 0.5–1 mm, *anther* (1.5–)2–2.5(–3) mm long, mostly slightly longer than the free part of the filament, which is (1–)1.5–2 mm long. *Decaisnina angustata* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of isofacial elliptic to ovate often glaucous leaves attenuate at the base to an obscure winged petiole and rounded at the apex, triads with all flowers closely sessile and central bract often as long as the ovary, corolla 18–25 mm long, not inflated at the base, and anthers slightly longer than the free part of the filament. The flower colour is mostly described as red in the lower part, green or yellow above, and with one or two brown bands near the tip.

The species is distributed in northern Australia from the Kimberley region to Cape York Peninsula, in lowlands (Fig. 3; 27 collections seen). It occurs in monsoon woodlands, often in gallery communities, often parasitic on *Buchanania* and *Ficus* but also on various other hosts including *Canarium*, *Denhamia*, *Erythrophleum*, *Eucalyptus*, *Maranthes*, *Melaleuca*, *Terminalia*, and *Tristania*.

The entity treated here as *Decaisnina angustata* was previously accepted as a subspecies of *D. petiolata*, differing from the typical subspecies in its more attenuate leaves with more obscure petiole. Critical re-examination of the material of *D. petiolata* subsp. *petiolata* has shown that it cannot be kept apart from *D. triflora* (see note there). The former subsp. *angustata*, as the residue of the species previously named *D. petiolata*, is renamed accordingly.

Decaisnina angustata closely resembles *D. triflora*, differing in the less distinctly petiolate leaf, the shorter corolla tube, and in the free part of the filament being slightly shorter rather than slightly longer than the anther. Although none of these differ-

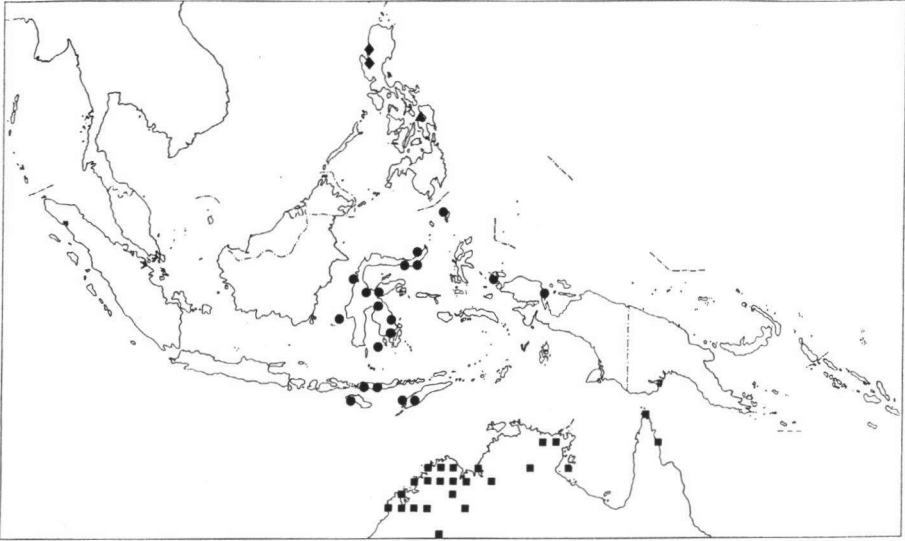


Fig. 3. Distributions of *Decaisnina* species. Symbols show recorded occurrence in 1° grid cells. ■ = *D. angustata* (Barlow) Barlow. ▲ = *D. confertiflora* (Merrill) Barlow. ◆ = *D. revoluta* (Merrill) Barlow. ● = *D. stenopetala* (Oliver) Barlow.

ences is sharply defined, the entity has a characteristic facies and strong geographic integrity. In a genus in which species limits are generally ill-defined, it is sufficiently distinct to be treated as a separate species.

Some specimens from Arnhem Land and Cape York Peninsula have leaf, anther, and filament characters which strongly suggest introgression between *D. angustata* and *D. triflora*. These were previously considered to be clinal variants, and formed the basis of the original treatment of *D. angustata* at subspecific rank. *Decaisnina angustata* is probably one of a few species of the genus which have differentiated, in isolation, on the northern Australian mainland following the arrival of an ancestral Malesian stock identical or close to *D. triflora*. Subsequent cyclic changes in sea level may have resulted in renewed contacts between *D. triflora* and *D. angustata* in northern Australia, leading to re-establishment of *D. triflora* in Arnhem Land, and to introgression between the two species.

Decaisnina angustata also very closely resembles *D. brittenii*, with which it is broadly sympatric. The two species appear indistinguishable in inflorescence and flower characters, both showing the same range of variation in dimensions, bract development, and coherence and colour of the petals. The differences in leaf shape, surface, and venation are relatively minor, and some intermediacy has been observed. However in their typical development the two entities are strikingly different, and show some difference in host preference. They are accordingly accepted as distinct species (see note under *D. brittenii*).

The area of *D. angustata* is extended by referral of specimens from Cape York Peninsula to the species (Fig. 3). Whilst these specimens agree with the *D. angustata*

morphotype, it is conceivable that introgression between *D. triflora* and *D. brittenii* could generate the same attribute states. The origin of *D. angustata* may indeed have been from such an interaction, and the species may in consequence be paraphyletic.

4. *Decaisnina biangulata* (W. Fitzg.) Barlow

Loranthus biangulatus W. Fitzg., J. Roy. Soc. W. Austral. 3 (1918) 136. — *Decaisnina biangulata* (W. Fitzg.) Barlow, Austral. J. Bot. 14 (1966) 433. — Type: *Fitzgerald 816* (lecto NSW), Western Australia, base of Mt Broome, v.1905.

For description and additional synonymy see Barlow, *Flora of Australia* 22 (1984) 79. *Decaisnina biangulata* can be identified by its combination of glaucousness, internodes strongly flattened, double-edged and dilated upwards, and triads with all flowers closely sessile. In other respects the species presents a relatively generalized facies for the genus. The flower colour is yellow to red in the lower part, green above and usually dark maroon or black at the tip.

The species occurs in a small area in the western Kimberley region of Western Australia (Fig. 1; 5 collections seen), usually along river banks, recorded as parasitic on *Lophostemon*, *Syzygium*, and *Tristania*. It is very distinctive in its pendulous habit and green, cladode-like stems, and represents one extreme of variation and adaptation in the genus. Its natural relationships appear to be with the other species of the monsoon belt of northern Australia (*D. angustata*, *D. brittenii*, *D. signata*), which have very similar inflorescence characters.

5. *Decaisnina brittenii* (Blakely) Barlow

Loranthus brittenii Blakely, Proc. Linn. Soc. New S. Wales 47 (1922) 393; 49 (1924) 92. — *Decaisnina brittenii* (Blakely) Barlow, Austral. J. Bot. 14 (1966) 433. — Type: *Banks & Solander s.n.* (holo BM; iso NSW), Queensland, Endeavour R., 1770.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 77. The description is amended as follows: *leaves* 3–15(–20) mm wide; *corolla* with petals coherent in the lower 0–1(–3) mm, *anther* 2.5–3.5(–4) mm long, mostly slightly longer than the free part of the filament, which is (1.5–)2–3(–4) mm long. *Decaisnina brittenii* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of isofacial linear to lanceolate leaves attenuate at the base to an obscure petiole, triads with all flowers closely sessile and central bract often as long as the ovary, corolla 16–24(–31) mm long, not inflated at the base, and anthers slightly longer than the free part of the filament. The flower colour is mostly described as red in the lower part, green or yellow above, and with one or two brown bands near the tip.

The species is distributed in northern Australia from Arnhem Land to Cape York Peninsula, at elevations from sea level to 500 m (Fig. 2; 30 collections seen). It occurs in monsoon and open woodlands, often in gallery communities, usually parasitic on *Melaleuca* and other Myrtaceae including *Syzygium* and *Tristania*, but also recorded on other hosts including *Barringtonia*, *Parinari* and *Terminalia*. It shows a close visual resemblance to its usual host, *Melaleuca*, in its narrow, pendulous leaves (Barlow & Wiens, 1977).

Decaisnina brittenii closely resembles *D. triflora*, differing in the very narrow pendulous leaves, the shorter corolla tube, and in the free part of the filament being slightly shorter rather than slightly longer than the anther. Some specimens have leaf and anther filament characters which strongly suggest introgression between the two species. *Decaisnina brittenii* is also very closely related to *D. angustata*, with which it is broadly sympatric. These two species share inflorescence and flower characters, showing virtually the same range of variation in dimensions, bract development, and coherence and colour of the petals. They differ in leaf shape, with *D. brittenii* having longer, pendulous, much narrower leaves. They also differ in general host preferences, although there is some overlap. For further discussion of relationships and biogeography, see under *D. angustata*.

There are two subspecies with clear ecogeographic separation, and with minor differences in leaf venation and texture and in dimensions of bracts.

6. *Decaisnina celebica* (Hemsley) Barlow, *comb. nov.*

Loranthus celebicus Hemsley, Kew Bull. (1896) 39. — *Amylothea celebica* (Hemsley) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Everett s.n.* (holo K), Southern Celebes, Bonthain Peak (Bantaeng), 7000–10000 ft (2000–3000 m), x.1895.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 242. The description is amended as follows: *inflorescence* axis 20–34 mm long, lacking triads in the lower (12–)16–24 mm but sometimes with a node in this part; *corolla* in mature bud 40–48 mm long, hardly inflated at the base. Apart from the long flowerless basal part of the inflorescence axis, *Decaisnina celebica* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of relatively small, weakly bifacial leaf laminae 4–8 cm long, attenuate at both ends, inflorescence with 3–5 pairs of triads crowded near the end of the axis, and corollas more than 40 mm long. The flower colour has been recorded as red in the lower part and yellow above.

Apparently *Decaisnina celebica* has a local occurrence on G. Bantaeng in Celebes (Fig. 1; 7 collections seen), recorded at elevations from 2000 to 2850 m. Other habitat details and hosts are unknown.

The species is probably related to the widespread *D. sumbawensis*, and may be a local differentiate of this stock, adapted to high elevations in Celebes. It differs from *D. sumbawensis* in its much longer flowers, generally smaller leaves, and in its much greater crowding of the triads near the tip of the inflorescence axis. In the latter character *D. celebica* is similar to *D. congesta* of northern Queensland, but the character is probably polyphyletic, and these two species may not be directly related.

7. *Decaisnina confertiflora* (Merrill) Barlow, *comb. nov.*

Loranthus confertiflorus Merrill, Philipp. J. Sci. C 13 (1918) 273. — *Amylothea confertiflora* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Wenzel 1249* (holo PNH, not seen), Philippines, Leyte, Tigbao, near Tacloban, 25.v.1915.

For description see Danser, Philipp. J. Sci. 58 (1935) 18. *Decaisnina confertiflora* has few specialized characters, and thus presents a relatively generalized facies for

the genus. The species can be identified by its combination of long, distinctly 4-angled stem internodes, oblong to broadly lanceolate, acuminate bifacial leaves 8–13 cm long, shortly and densely pubescent young inflorescences and flowers, and subsessile anthers. The flower colour is described as red.

The species is known only from the type specimen from Leyte, Philippines (Fig. 3). Habitat details and hosts are unknown.

The holotype (PNH) is no longer extant. No isotypes and no other collections consistent with the description have been located. It has therefore not been possible to confirm the diagnostic characters of the species. The detailed description given by Danser (1935) confirms Merrill's original diagnosis and indicates that the species is distinctive. The most similar species is probably *D. sumbawensis*, which differs in being mostly glabrous, lacking 4-angled stems and having the triads more uniformly distributed along the inflorescence axis. *Decaisnina confertiflora*, like *D. celebica*, may be a local differentiate of the widespread and polymorphic *D. sumbawensis*.

Specimens with distinctly and sharply quadrangular stems are common but not universal in another species, *D. holtrungii*. Whilst this character state is probably polyphyletic in the genus, it may not be a constant feature of the species in which it occurs. Similarly, there are some specimens of *D. sumbawensis* (including Philippine collections) which have pubescent inflorescences. *Decaisnina confertiflora* must therefore be treated as doubtful, perhaps not specifically distinct from *D. sumbawensis*.

8. *Decaisnina congesta* Barlow

Decaisnina congesta Barlow, *Brunonia* 5 (1983) 204. — Type: *Gray 1168* (holo QRS; iso CANB), Queensland, State Forest Reserve 607, Bridle Logging Area, 16° 59' S 145° 37' E, 1.xii.1978.

For description and synonymy see Barlow, *Flora of Australia* 22 (1984) 75. Apart from the relatively long flowerless basal part of the inflorescence axis, *Decaisnina congesta* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of distinctly petiolate, relatively small, weakly bifacial leaf laminae 5–8 cm long, obtuse to rounded with a small mucro at the apex, inflorescence with 1–3 pairs of triads crowded near the end of the axis, and corolla 23–30 mm long. The flower colour has been recorded as red in the lower part and green above.

Decaisnina congesta is distributed in New Guinea and Queensland, Australia (Fig. 4; 9 collections seen), recorded at elevations from sea level to 250 m in Queensland and at 1875 m in New Guinea. It occurs in open forests and rain forests, parasitic on various hosts; those recorded include *Alstonia*, *Engelhardtia*, and *Morus*.

The species is probably related to the more widespread *D. triflora*, with which it has an adjoining area, and may be a local differentiate of this stock. It differs from *D. triflora* in its greatly reduced inflorescence and weakly bifacial leaves. See notes under *D. celebica* on inflorescence structure and *D. pedicellata* on possible relationships.

Decaisnina congesta was previously thought to be endemic to Australia (Barlow, 1984), and the specimen from New Guinea represents a significant range extension. The range disjunction across Torres Strait suggests that the species may have differentiated in New Guinea and reached Australia as part of the floristic exchange result-

ing from Tertiary climatic cycles (see notes under *D. angustata* and *D. triflora*). Other loranth species with similar areas in New Guinea and north Queensland include *Amyema conspicuum*, *A. queenslandicum*, *Cecarria obtusifolia* and *Dendrophthoe falcata*.

9. *Decaisnina crassilimba* (Merrill) Barlow, *comb. nov.*

Loranthus crassilimbus Merrill, Philipp. J. Sci. C 13 (1918) 274. — *Amylothea crassilimba* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Ramos & Edaño BS 26409* (lecto US 1264936, see below), Philippines, Luzon, Nueva Ecija, Mt Umingan, 15.viii.1916.

For description see Danser, Philipp. J. Sci. 58 (1935) 20. *Decaisnina crassilimba* can be identified by its combination of robust habit, distinctly bifacial elliptic leaves with petioles 2–3 cm long, inflorescence with a basal involucre of scarious scales and the axis with several pairs of triads crowded along its length and strongly secund. The flower colour is mostly described as yellow, or red in the lower part and yellow or green above.

The species is endemic to the Philippines, recorded from Luzon and Panay (Fig. 2; 7 collections seen), at elevations from 300 to 1400 m. Habitat details are unknown.

Decaisnina crassilimba is one of a distinctive group of species, confined to the Philippines, which is characterized by an involucre of decussate scales at the base of the inflorescence axis. In other species of this group, such as *D. aherniana* and *D. viridis*, the inflorescence is relatively unspecialized, having triads with distinctly pedicellate lateral flowers, and lacking the spatial orientation of the flowers seen in most species of the genus. In this respect *D. crassilimba* has an intermediate position, with the lateral flowers of the triads very shortly pedicellate and the triads strongly secund, so that the inflorescence has the characteristic brush-like appearance of most species of the genus. For further discussion of the biogeography of the species see notes under *Decaisnina* and *D. aherniana*. For note on possible relationship with *D. revoluta*, see there.

The holotype of *L. crassilimbus* (PNH) is no longer extant. An isotype in US has been seen and identified as lectotype of the species name.

10. *Decaisnina cumingii* (Tieghem) Barlow, *comb. nov.*

Amylothea cumingii Tieghem, Bull. Soc. Bot. France 41 (1894) 264. — Type: *Cuming 1969* (?holo B, see below; iso L, 5 in P), Philippines, 'Manille'.

Loranthus mindanaensis Merrill, Philipp. J. Sci. 1, Suppl. (1906) 186. — Type: *Copeland 341* (lecto NY, see below), Philippines, Mindanao, Davao, iii.1904.

Loranthus secundiflorus var. *bolsteri* Elmer, Leaf. Philipp. Bot. 3 (1911) 1067. — Type: *Elmer 11701* (lecto L, see below), Philippines, Mindanao, Davao, Todaya, Mt Apo, ix.1909.

Loranthus merrillii Elmer, Leaf. Philipp. Bot. 3 (1911) 1068. — *Amylothea merrillii* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 301. — Type: *Elmer 10617* (lecto L, see below), Philippines, Mindanao, Davao, Todaya, Mt Apo, v.1909.

Loranthus aurantiacus Elmer, Leaf. Philipp. Bot. 6 (1913) 1967. — Type: *Elmer 13774* (lecto L, see below), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, ix.1912.

Loranthus palawanensis Merrill, Philipp. J. Sci. C 13 (1918) 279. — *Amylothea palawanensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Merrill BS 9248* (lecto L, see below), Philippines, Palawan, Taytay, v.1913.

Amylotheca breviflora Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 241. — Type: *Toxopeus* 428 (holo BO, not seen; iso L), Moluccas, Buru, Fakal, c. 1125 m, 28.viii.1921.

Doubtful names provisionally included here:

Loranthus hopeae Merrill, Philipp. J. Sci. C 9 (1914) 279. — *Amylotheca hopeae* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 301. — Type: *Foxworthy*, *Demesa* & *Villamil* FB 13297 (holo PNH, not seen), Philippines, Mindanao, Zamboanga, opposite Olutanga, 20 m.

Amylotheca apodotrias Danser, Philipp. J. Sci. 58 (1935) 8. — Type: *Clemens s.n.* (holo PNH, not seen), Philippines, Mindanao, Lanao, L Lanao, Camp Keithley.

Amylotheca tenuis Danser, Philipp. J. Sci. 58 (1935) 9. — Type: *Loher* 12393 (holo PNH, not seen), Philippines, Luzon, Rizal, Montalban.

For descriptions and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 5, 8, 9, 10, 11 under *Amylotheca cumingii*, *A. apodotrias*, *A. tenuis*, *A. merrillii* and *A. hopeae* respectively. The description is amended as follows: *leaves* usually attenuate or cuneate at the base to a petiole up to 15 mm long, less commonly truncate or slightly cordate at the base and more or less sessile, not or only very slightly bifacial; *inflorescence* triads sessile or on peduncles up to 4 mm long; *corolla* (11–)13–19(–21) mm long, usually dilated but not globular in the lower part; *anther* (1.5–)2.5–3(–4) mm long; free part of filament 0.2–0.4(–1.5) mm long. Apart from the anthers being sessile or on very short free filaments, *D. cumingii* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species is polymorphic, but can be identified by its combination of double-edged young stem internodes, relatively thin more or less isofacial leaves, short corolla mostly less than 20 mm long, and anthers commonly sessile or subsessile and always longer than the free part of the filament. The flower colour is mostly described as yellow, orange or red, often darker below than above.

Decaisnina cumingii is distributed in the Philippines, from Luzon to Mindanao, and in the Moluccas, from sea level to 2300 m elevation (Fig. 4; 26 collections seen). Habitat details are poorly known, but the species apparently occurs in humid forests, and has been recorded as parasitic on *Kibatalia* and *Shorea*.

The species is probably closely related to *D. zollingeri*, which is similar in vegetative and floral characters, and which has a generally parapatric area extending from the Vogelkop of New Guinea to the Lesser Sunda Islands, Kangean Archipelago, Celebes and Moluccas. The latter species differs from *D. cumingii* in its young stem internodes, which are more strongly flattened towards the apex and usually 4-ridged, with 2 ridges forming sharp edges and usually 2 forming crests on the flattened faces, its longer corollas 22–27 mm long, and in its longer free parts of the staminal filaments. The general similarity of the two species strongly suggests that they are the result of ecogeographic divergence from a common stock. *Decaisnina cumingii* is probably also related to the widespread *D. triflora*, with which it likewise has a contiguous area. *Decaisnina triflora* differs in its longer corollas which are less distinctly inflated at the base, and in its longer free parts of the staminal filaments.

Danser (1935) recognized *Amylotheca merrillii* and *A. hopeae* as species distinct from *A. cumingii*, and also described two new species, *A. apodotrias* and *A. tenuis*. These species were distinguished on the basis of corolla length, length of inflorescence parts, and differences in the leaf lamina base and petiole development. At the same time, Danser expressed serious doubts that any of these four entities would

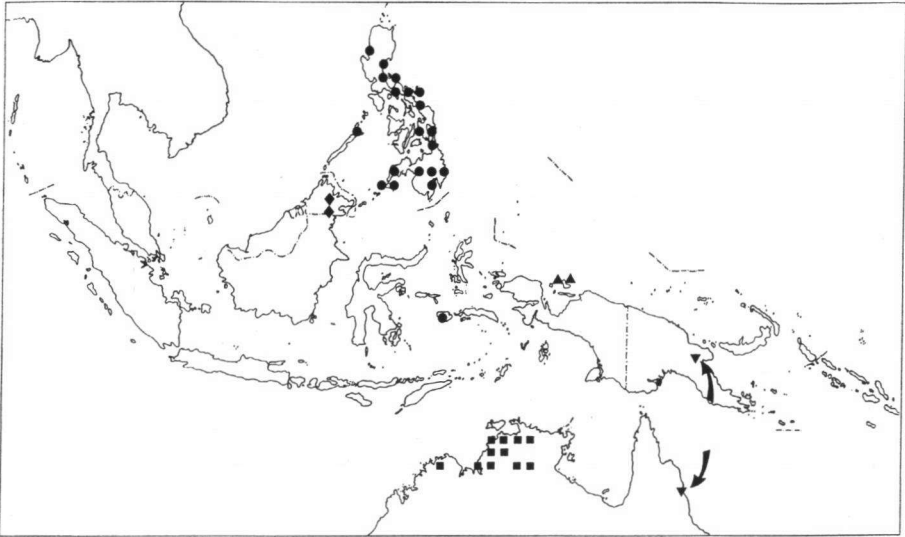


Fig. 4. Distributions of *Decaisnina* and *Lampas* species. Symbols show recorded occurrence in 1° grid cells. ▼ = *D. congesta* Barlow. ● = *D. cumingii* (Tieghem) Barlow. ▲ = *D. micranthes* (Danser) Barlow. ■ = *D. signata* (F. Mueller ex Bentham) Tieghem. ◆ = *L. elmeri* Danser.

eventually prove to be specifically distinct. Re-examination of the available materials indicate a continuous range of variation in corolla length (13–19 mm), inflorescence length (17–60 mm), length of the non-flowering base of the inflorescence axis (5–20 mm), and leaf base (cuneate to cordate, see below). These variations generally include the distinguishing features of these four entities, and they are therefore considered to be conspecific with *D. cumingii*.

In the cases of *A. apodotrias*, *A. hopeae* and *A. tenuis*, each species name was based on a single specimen which appears to be no longer extant. They are, therefore, more properly accorded doubtful status, although their conspecificity with *D. cumingii* is most likely.

The most strikingly variable character is the leaf base and petiole. Most specimens of *D. cumingii* have leaf laminae which are attenuate to shortly cuneate at the base, with a recognizable petiole up to 15 mm long. In a number of specimens from Mindanao the petioles are shorter and the leaves are sessile or entirely sessile. There is a correlated variation in the leaf base which becomes more truncate, and in a few cases is slightly cordate although not stem-clasping. Because the latter morphotype is not sharply distinct and has no other correlated differences, it presumably represents a local variant within the species. A similar range of variation occurs within *D. signata* in northern Australia, and sessile cordate leaves also occur in *D. amplexicaulis* and *D. miniata* in the Philippines. The condition is therefore a recurring adaptation in the genus, not necessarily indicative of specific status.

Danser (1935) considered the species to be endemic to the Philippines, but examination of the type specimen of *Amylothea breviflora* from Buru indicates that the latter entity is also conspecific. The Moluccan collection agrees with the Philippine materials of *D. cumingii* in all respects except that the anthers are relatively short (c. 1.5 mm) and approximately equal to the free part of the staminal filament.

Six isotypes of *L. cumingii* have been seen (5 in P, 1 in L). Danser (1935) indicated that an isotype in B bore an original label by van Tieghem, and it may therefore be the holotype. Many specimens from the tribe of Lorantheae to which *Decaisnina* belongs are still extant in B, and it is not therefore appropriate to select a lectotype.

The originals of the syntypes of *L. mindanaensis* (PNH) are no longer extant. No duplicates of one syntype (*Devore & Hoover 285*) have been seen. A duplicate of the other syntype (*Copeland 341*) in NY has been seen. It bears stems, attached and loose leaves, and a few loose flowers. It is selected as lectotype of the species name.

The holotypes of *L. secundiflorus* var. *bolsteri*, *L. merrillii*, *L. aurantiacus*, and *L. palawanensis* (PNH) are no longer extant. Isotypes of all four species names in L have been seen and respectively identified as lectotypes. Types of *L. hopeae*, *A. apodotrias*, and *A. tenuis* are also no longer extant (see above).

11. *Decaisnina djamuensis* (Krause) Barlow

Loranthus djamuensis Krause, Bot. Jahrb. 57 (1922) 478. — *Decaisnina djamuensis* (Krause) Barlow, Austral. J. Bot. 22 (1974) 536. — Type: *Schlechter 17319* (holo B; iso S), New Guinea, Djamu (Ramu) R, 600 m, 21.ii.1908.

For description and synonymy see Barlow, Austral. J. Bot. 22 (1974) 536. *Decaisnina djamuensis* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of scurfy brown internodes, distinctly petiolate, isofacial, powdery green leaves with the distinct brown midrib raised in the lower part, triads with lateral flowers shortly pedicellate and conspicuous rounded bracts, conspicuous calyx 1 mm long, and usually pale-coloured petals more than 15 mm long and separating to the base at anthesis. The flower colour has mostly been recorded as green, sometimes shading to yellow or red in the upper part, rarely red.

Decaisnina djamuensis is distributed in New Guinea (Fig. 6; 13 collections seen), recorded mostly in lowlands at elevations from sea level to 200 m but occasionally up to 1050 m. As a result of this study the known area of the species has been reduced to mainland New Guinea and Biak, the specimens from New Britain being transferred to *D. longipes*. Habitat details are poorly known; recorded hosts include *Anisoptera*, *Cinnamomum*, and *Eucalyptopsis*.

The species is distinctive in vegetative, inflorescence, and flower characters. It is probably related to *D. micranthes*, which occurs sympatrically in the Vogelkop area of western New Guinea, and which differs in having much smaller flowers more distantly spaced in the inflorescence. Wider relationships are not readily apparent. Diversity in *Decaisnina* is relatively high in western New Guinea, possibly reflecting differentiation and adaptation in immigrant stocks which have crossed Charles's Line. See under *D. longipes* for note on differences from that species.

12. *Decaisnina forsteriana* (J.A. Schultes & J. Schultes) Barlow

Loranthus forsterianus J.A. Schultes & J. Schultes, Syst. 7,2 (1830) 1612,1730. — *Decaisnina forsteriana* (J.A. Schultes & J. Schultes) Barlow in D.Walker (ed.), Bridge and Barrier, Austral. Nat. Univ. Publ. BG/3 (1972) 185. — Type: *Forster 76* (holo P), Tahiti.

For description and extensive synonymy see Barlow, Austral. J. Bot. 22 (1974) 537. *Decaisnina forsteriana* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of distinctly petiolate, thin, weakly bifacial leaves dull on both sides, triads with lateral flowers shortly pedicellate, corollas usually more than 35 mm long, and anthers with slender transverse septa which usually fracture at anthesis. The flower colour is predominantly bright red, often darker towards the tip, but predominantly yellow flowers are recorded from the Solomon Islands, Tonga and Samoa.

Decaisnina forsteriana is widely distributed in South Pacific islands from New Guinea (Louisiade Archipelago) eastwards to Tahiti and the Marquesas (Fig. 5; 54 collections seen), recorded at elevations from sea level to 1900 m but apparently most common in upland situations. The species is exceptional in the family for its wide distribution to oceanic islands. Additional collections seen in the present study have extended the known area of the species westwards from the Solomon Is to Misima I, Papua New Guinea. Habitat details are poorly known, although the species has been recorded in humid forests; it is recorded as parasitic on various hosts including *Diospyros*, *Ficus*, *Grewia*, *Homalanthus*, *Inocarpus*, *Metrosideros*, *Pittosporum*, and *Wikstroemia*.



Fig. 5. Distribution of *Decaisnina forsteriana* (J.A. Schultes & J. Schultes) Barlow; ● show recorded occurrence in 1° grid cells.

The affinities of *D. forsteriana* appear to be with the Australian and several New Guinean species with which it shares a non-inflated corolla base, relatively long corolla, and triads evenly spaced along the inflorescence axis. It is possibly closely related to *D. longipes* which also has long petioles and pedicellate lateral flowers in the triads. It differs from *D. longipes* in its smaller thinner leaves and finely transversely septate anthers.

13. *Decaisnina hollrungii* (Schumann) Barlow

Loranthus hollrungii Schumann in Schumann & Hollrung, Fl. Kaiser Wilh. Land (1889) 105. — *Decaisnina hollrungii* (Schumann) Barlow, Austral. J. Bot. 14 (1966) 434. — Type: *Hollrung 659* (holo B; iso K), New Guinea, Augustafluss, vii.1887.

For descriptions and extensive synonymy see Barlow, Austral. J. Bot. 22 (1974) 538; Flora of Australia 22 (1984) 75. *Decaisnina hollrungii* has few specialized characters and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of robust habit, stems often sharply 2- or 4-angled, distinctly petiolate bifacial leaves glossy on the upper surface and dull below, corolla mostly more than 30 mm long, not inflated at the base, and anthers equal to the free parts of the filaments. The flower colours are variable but most commonly red in the lower part and yellow and/or green above; sometimes the lower part of the corolla is yellow or green, but even then the corolla is usually 2-coloured.

Decaisnina hollrungii is widespread throughout the New Guinean mainland and extends to adjacent islands including Tanimbar and Kei (Moluccas), New Britain and New Ireland, several of the Solomon Islands, and to Cape York Peninsula, Queensland (Fig. 1; 179 collections examined), usually at elevations from sea level to 2000 m, but recorded as high as 2900 m. It is very common in rain forests, parasitic on a range of dicotyledonous hosts too numerous to itemize, but recorded frequently on *Ficus*.

The affinities of *D. hollrungii* appear to be with the other Australian and several New Guinean species with which it shares a non-inflated corolla base, relatively long corolla, and triads evenly spaced along the inflorescence axis. Its further affinities are possibly with *D. sumbawensis* from which it differs in being more robust, with more angular stems, generally larger leaves, and longer corollas not inflated at the base. *Decaisnina sumbawensis* has an area which straddles Charles's Line and is contiguous with that of *D. hollrungii*, thus indicating a possible origin of the latter species (see note under *D. sumbawensis*).

14. *Decaisnina longipes* Barlow, *spec. nov.*

Species nova *D. hollrungio* (Schumann) Barlow similis, sed foliis ellipticis vel fere orbicularibus vix bifacialibus, pedunculis triadorum longioribus, pedicellis florum lateralium longis, antheris multo longioribus quam partibus filamentorum liberis differt. — Holotypus: *Ridsdale NGF 30401* (holo L 148988), Papua New Guinea, Bismarck Archipelago, Western New Britain, Kilenge, 5° 25' S 148° 25' E, c. 200 ft (60 m), 14.xii.1966.

Glabrous. *Stems* robust; internodes slightly to distinctly angular and dilated towards the apex when young, soon becoming terete, 5–7 cm long. *Leaves* opposite; lamina elliptic to almost orbicular, 8–13 cm long, 4.5–9 cm wide, coriaceous, very weakly bifacial with the upper surface slightly darker and dull or slightly glossy, cuneate at the base to a winged petiole 25–40 mm long, usually undulate at the margin, rounded at the apex; venation pennate with the midrib raised below and other venation faintly visible on both sides. *Inflorescences* axillary, racemes of triads with the central flowers sessile and the lateral flowers pedicellate; axis soon becoming robust, 35–70 mm long, 1.5–3 mm thick, bearing 10–14 pairs of triads distributed along the entire length but tending to be aggregated in false whorls of 4; peduncles of the triads 5–10 mm long; pedicels of the lateral flowers 1.5–3 mm long; bracts spreading, obtuse or rounded, 1.5–2.5 mm wide and long. *Ovary* cylindrical, c. 3 mm long; calyx limb erect, truncate or very slightly toothed, 1–1.5 mm long. *Corolla* in the mature bud slender, 30–50 mm long, shortly rounded at the apex; petals reflexed at anthesis 8–10 mm below the apex, coherent as a slender tube in the lower 2–15 mm. *Anther* 4–8 mm long; free part of the filament c. 2 mm long. *Style* slender, gradually narrowed; stigma ellipsoid, slightly wider than the style. *Fruit* (probably immature) ellipsoid, c. 7 mm long, truncate at the apex and crowned by a style base 0.1–0.2 mm long.

Decaisnina longipes is distributed in northeastern New Guinea and the Bismarck Archipelago (Fig. 2; 4 collections seen), at low elevations from 60 to 700 m. Habitat details are poorly known; one collection is recorded from lowland hill forest, and there are no host records.

The species has few specialized characters, and thus presents a relatively generalized facies for the genus. It shares with *D. holrungii* its robust habit, angular young stems, long inflorescences, and long corollas with petals coherent into a short tube. However, it is otherwise quite distinctive, and there may not be a direct relationship between these two species. *Decaisnina longipes* can be identified by its combination of large rounded leaves slightly bifacial but more or less dull on both sides, petioles more than 25 mm long, long inflorescences with triads on long peduncles and often in loose groups of four, well-developed pedicels of the lateral flowers, petals remaining distinctly coherent in the lower part after anthesis, and long anthers much longer than the free parts of the filaments. The flower colour is recorded as red in the lower part and yellow above.

The two specimens from New Britain were previously referred to *D. djamuensis* (Barlow, 1974) which now appears to be restricted to the New Guinean mainland and Biak. *Decaisnina longipes* differs from *D. djamuensis* in most of the characters listed above. The specimen from Morobe District, Papua New Guinea, was previously referred to *D. triflora* (Barlow, 1974). Resolution of these misidentifications has clarified the circumscription and morphological boundaries of the species concerned, leaving each of them more homogeneous. *Decaisnina longipes* is presumably a young endemic which has differentiated *in situ*, probably from an ancestral stock common to other Papuan species as well (see note under *D. holrungii*).

The specific epithet alludes to the long petioles and peduncles of the triads, and particularly to the long pedicels of the lateral flowers of the triads.

Additional specimens examined: Millar NGF 22692 (L, LAE), Papua New Guinea, Morobe, Garaina, near Sopa, 2300 ft (700 m), 22.vii.1966; Henty & Frodin NGF

27353 (L, LAE), New Guinea, Bismarck Archipelago, New Britain, Kandrian, Wariai, 7 mi (11 km) SE of Benim, 5° 47' S 148° 57' E, 1000 ft (300 m), 23.iii.1966; *Croft LAE 65598* (L), New Guinea, Bismarck Archipelago, New Ireland, 5 km S of Logagon, 2° 57' S 151° 21' E, 600 m, 23.x.1974.

15. *Decaisnina micranthes* (Danser) Barlow

Amylotheca micranthes Danser, *Blumea* 2 (1936) 34. — *Decaisnina micranthes* (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 540. — Type: *de Bruyn 369* (lecto L 957.969-53, see below), New Guinea, Biak, Bosnek, c. 100 m, 2.ix.1915.

For description and synonymy see Barlow, *Austral. J. Bot.* 22 (1974) 540. Apart from its very small flowers with completely choripetalous corollas, *D. micranthes* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of distinctly petiolate, powdery green leaves dull on both sides, inflorescence axis 35–40 mm long with c. 5 evenly spaced pairs of triads, and very short corolla less than 10 mm long with petals eventually separating completely to the base. The flower colour has been recorded once, as light green.

Decaisnina micranthes is only known from the island of Biak, Vogelkop region, western New Guinea (Fig. 4; 4 collections examined), recorded at low elevations from sea level to 100 m. Habitat details are poorly known; recorded hosts include *Glochidion* and *Macaranga*.

The species is probably closely related to *D. cumingii*, which occurs allopatrically in the Moluccas and Philippines, and which also has angular young stems, isofacial leaves, and relatively small flowers. *Decaisnina micranthes* differs from *D. cumingii* in its inflorescence with more uniformly spaced triads, much shorter corollas not inflated at the base, and petals separating to the base at anthesis. The species is also possibly related to *D. djamuensis* (for notes on distinguishing characters and biogeography, see there).

The holotype of *Amylotheca micranthes* (B) is no longer extant. An isotype in L has been seen and identified as lectotype of the species name.

16. *Decaisnina miniata* (Danser) Barlow, *comb. nov.*

Loranthus miniatus Elmer, *Leafl. Philipp. Bot.* 6 (1913) 1966, nom. illeg., non S. Moore (1897). — *Amylotheca miniata* Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 301. — Type: *Elmer 13276* (lecto UC, see below; iso BO, L, NY, P, US), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, vii.1912.

For description see Danser, *Philipp. J. Sci.* 58 (1935) 15. Apart from the sessile leaves, *Decaisnina miniata* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of large, bifacial, somewhat glaucous leaves sessile and cordate at the base and acuminate at the apex, corolla c. 25 mm long with petals separating to 1 mm above the slightly inflated but not globular base, and subsessile anthers c. 3 mm long. The flower colour has been recorded as red, or red in the lower part, white around the neck, and mouse grey at the apex.

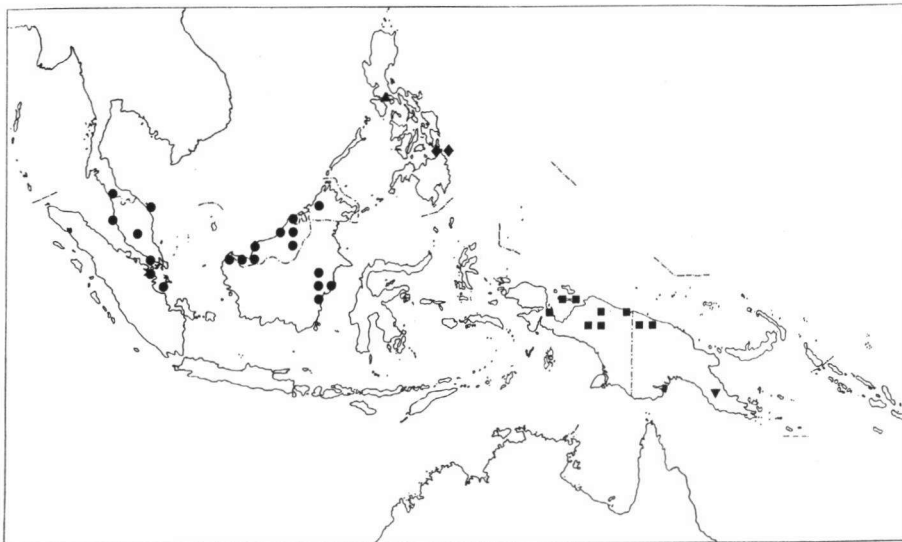


Fig. 6. Distributions of *Decaisnina*, *Cyne* and *Amylotheca* species. Symbols show recorded occurrence in 1° grid cells. ■ = *D. djamuensis* (Krause) Barlow. ◆ = *D. miniata* (Danser) Barlow. ▲ = *C. baetorta* Barlow. ▼ = *C. papuana* (Danser) Barlow. ● = *A. duhieana* (King) Danser.

Decaisnina miniata is endemic to the Philippines, recorded from Siargao and Mindanao (Fig. 6; 2 collections seen), at low elevations from sea level to 380 m. Habitat details and hosts are poorly known; the type was collected on a 'forested ridge', parasitic on *Canarium*.

The species is possibly related to the widespread and somewhat polymorphic *D. sumbawensis*, with which it shares its general leaf and floral characters and is sympatric in Mindanao. It differs from the latter species in its sessile cordate leaves and subsessile anthers. It is presumably a local endemic, differentiated *in situ* from an ancestral stock common to *D. sumbawensis*.

See note under *Decaisnina* on the occurrence of sessile cordate leaves in the genus. In the Philippines sessile cordate leaves also occur in *D. amplexicaulis* and rarely in *D. cumingii*. *Decaisnina miniata* differs from *D. cumingii* in having a more strongly bifacial leaf more strongly amplexicaul at the base, and in having much longer flowers. For differences from *D. amplexicaulis*, see note there.

The holotype of *Loranthus miniatus* Elmer (nom. illeg. = *Amylotheca miniata* Danser) (PNH) is no longer extant. An isotype in UC, bearing Elmer's original notes, has been seen and identified as lectotype of the species name, and other isotypes have been seen in BO, L, NY, P and US.

17. *Decaisnina ovatifolia* (Merrill) Barlow, *comb. nov.*

Loranthus ovatifolius Merrill, Philipp. J. Sci. C 3 (1908) 133. — *Amylotheca ovatifolia* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Clemens 1195* (lecto B, see below), Philippines, Mindanao, sea coast between Iligan and Initao, ix-x.1907.

For description see Danser, Philipp. J. Sci. 58 (1935) 22. *Decaisnina ovatifolia* can be identified by its combination of slender scandent habit, distinctly bifacial leaves acute and often acuminate at the apex, inflorescence with a basal involucre of decussate scales and short axis (c. 10 mm long) with c. 5 pairs of triads not secund at the base, and 5-merous corolla scarcely inflated in the lower part. The flower colour is described as red.

The species is endemic to the Philippines, recorded from Bilar and Mindanao, at elevations from sea level to 610 m (Fig. 7; 2 collections seen). Habitat details are unknown.

Decaisnina ovatifolia is one of a distinctive group of species, confined to the Philippines, which is characterized by an involucre of decussate scales at the base of the inflorescence axis. The inflorescence is relatively unspecialized, having triads with distinctly pedicellate lateral flowers, usually lacking the spatial orientation of the flowers seen in most species of the genus. The species group has presumably evolved *in situ*, and illustrates the important role of the Philippines as a centre of diversity of the genus. For further discussion of the biogeography of the genus see note under *Decaisnina* above.

Among the species of this group, *D. ovatifolia* is very closely related to the more widespread *D. aherniana* and is probably a local endemic with shared ancestry with the latter species. The two species are indistinguishable vegetatively. *Decaisnina ovatifolia* appears to differ from *D. aherniana* in having a distinctly shorter inflorescence with fewer pairs of crowded triads, and a generally smaller, 5-merous, red corolla which is scarcely inflated at the base. These differences indicate a shift from *D. aherniana* in pollinator preference.

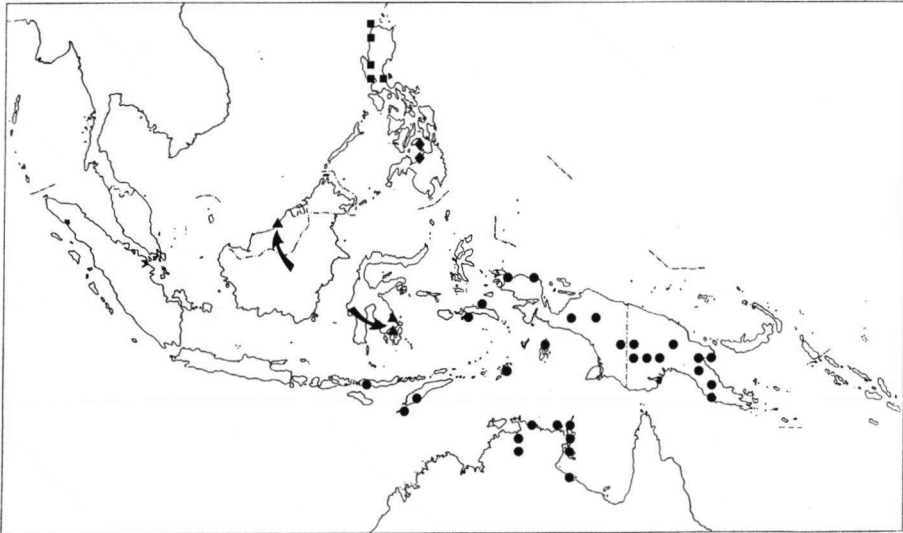


Fig. 7. Distributions of *Decaisnina* and *Lepeostegeres* species. Symbols show recorded occurrence in 1° grid cells. ◆ = *D. ovatifolia* (Merrill) Barlow. ● = *D. triflora* (Spanoghe) Tieghem. ■ = *D. viridis* (Merrill) Barlow. ▲ = *L. alveolatus* (Tieghem) Danser.

The holotype of *L. ovatifolius* (PNH) is no longer extant. An isotype in B has been located but not seen. The specimen has been annotated by Danser, as are the two other specimens seen in this study, and it is accordingly identified as lectotype of the species name.

18. *Decaisnina pedicellata* (Danser) Barlow

Amylotheca triflora var. *pedicellata* Danser, *Blumea* 3 (1938) 39. — *Decaisnina pedicellata* (Danser) Barlow, *Austral. J. Bot.* 22 (1974) 541. — Type: *Carr 12077* (holo L 936,105-256; iso CANB 59579), Papua, Koitaki, c. 1500 ft (450 m), 28.iv.1935.

For description see Barlow, *Austral. J. Bot.* 22 (1974) 541. *Decaisnina pedicellata* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified locally by its combination of terete stems, shortly and obscurely petiolate, somewhat falcate, isofacial, dull leaves with many distinct lateral veins close together, slender inflorescences with few pairs of triads and the lateral flowers of the triads pedicellate, and the anthers about one third as long as the free parts of the filaments. The flower colour has been recorded as pale pink or purplish, sometimes deeper crimson in the lower part.

Decaisnina pedicellata has a small area on the Sogeri Plateau in New Guinea (Fig. 8; 5 collections seen), recorded at elevations from 425 to 600 m. Habitat details are poorly known; the only recorded host is *Engelhardtia*.

The species is probably related to the more widespread *D. triflora* from which it differs in its leaf characters mentioned above, its slender shorter inflorescences, and the relatively longer free parts of the anther filaments. It is also similar to *D. congesta* of New Guinea and north Queensland, which may have a similar phyletic relationship with *D. triflora*. It shows a general resemblance to *D. congesta* in habit, but differs in its leaf and stamen characters, its inflorescence of more uniformly spaced triads, the pedicellate lateral flowers, and the flower colour. Both of these species may be young differentiates of *D. triflora* and are located just beyond the geographic limits of this more widespread and variable entity. See note under *D. triflora*.

19. *Decaisnina revoluta* (Merrill) Barlow, *comb. nov.*

Loranthus revolutus Merrill, *Philipp. J. Sci.* C 4 (1909) 142. — *Amylotheca revoluta* (Merrill) Danser, *Bull. Jard. Bot. Buitenzorg III*, 10 (1929) 302. — Type: *Ramos BS 4785* (lecto US 705956, here chosen, see below), Philippines, Luzon, Zambales, Mt Tapulao, 2100 m, xii.1907.

For description see Danser, *Philipp. J. Sci.* 58 (1935) 19. *Decaisnina revoluta* can be identified by its combination of distinctly bifacial elliptic leaves attenuate to a winged petiole c. 1 cm long, inflorescence with a basal involucre of scarios scales and the axis with 2–4 pairs of triads borne in the upper part, and with the lateral flowers shortly pedicellate. The flower colour is described as yellow in the lower part and red above.

The species is endemic to Luzon, Philippines (Fig. 3; 2 collections seen), apparently occurring in highlands and recorded at an elevation of 2100 m. Habitat details are unknown.

Decaisnina revoluta is one of a distinctive group of species, confined to the Philippines, which is characterized by an involucre of decussate scales at the base of the inflorescence axis. In other species of this group, such as *D. aherniana* and *D. viridis*, the inflorescence is relatively unspecialized, having triads with distinctly pedicellate lateral flowers, and lacking the spatial orientation of the flowers seen in most species of the genus. In this respect *D. revoluta* has an intermediate position, with the lateral flowers of the triads only very shortly pedicellate and the triads apparently secund, so that the inflorescence has the brush-like appearance of most species of the genus. *Decaisnina revoluta* shares these features with *D. crassilimba*, from which it differs in its more slender habit, generally smaller parts and inflorescences with fewer pairs of triads crowded near the apex of the axis. The two species are probably related, with *D. revoluta* being a local endemic adapted to higher elevations. For further discussion of the biogeography see notes under *Decaisnina* and *D. aherniana*.

In his original diagnosis of *L. revolutus*, Merrill (1909) appears to have cited two contemporary collections from the same locality, and they are therefore syntypes. The originals of both collections (PNH) are no longer extant. An isosytype of one collection, *Ramos BS 4785*, has been seen in US. It bears leaves, inflorescences, and flowers, and conforms with Merrill's original description. It is accordingly chosen as lectotype of the species name. No duplicates of the other sytype, *Curran & Merritt FB 8252*, have been located.

20. *Decaisnina signata* (F. Mueller ex Benth) Tieghem

Loranthus signatus F. Mueller ex Benth, Fl. Austral. 3 (1861) 392. — *Decaisnina signata* (F. Mueller ex Benth) Tieghem, Bull. Soc. Bot. France 42 (1895) 436. — Type: *F. Mueller s.n.* (lecto MEL), Northern Australia (Gregory Expedition), ix.1855.

For description and further synonymy see Barlow, *Flora of Australia* 22 (1984) 76. Apart from its leaves being sessile or nearly so, *Decaisnina signata* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of isofacial broadly lanceolate to nearly orbicular leaves truncate to cordate at the base and sessile or nearly so, triads with all flowers closely sessile and central bract often as long as the ovary, corolla 24–32 mm long, not inflated at the base, and anthers longer than the free part of the filament. The flower colour is mostly red in the lower part, green or yellow above, and with a brown band at the neck and another sometimes more diffuse one at the tip.

The species is distributed in tropical northern Australia (Fig. 4; 34 collections seen), in lowlands. It occurs predominantly in monsoon forests, but also in open woodlands, frequently parasitic on *Barringtonia*, *Buchanania*, *Ficus* and *Syzygium*, but also recorded on *Ixora*, *Mimosa*, *Parinari*, *Planchonia* and *Xanthostemon*.

Decaisnina signata is closely related to *D. angustata* with which it is largely sympatric. These two species share inflorescence and flower characters, showing virtually the same range of variation in dimensions, bract development, and coherence and colour of the petals. They also have similar habitats and host preferences. *Decaisnina signata* differs from *D. angustata* in the leaves, being truncate to cordate, sessile or nearly so, and usually of thinner texture, and in the slightly longer flowers. The two species have presumably differentiated from a common ancestor in the northern Aus-

tralian region. See notes on biogeography under *D. angustata* and on sessile cordate leaves under *D. cumingii* and genus *Decaisnina*.

There are two subspecies which are partly sympatric, but which differ in leaf structure and apparently to some degree in host preferences.

21. *Decaisnina stenopetala* (Oliver) Barlow

Loranthus stenopetalus Oliver, J. Linn. Soc. 15 (1877) 99. — *Decaisnina stenopetala* (Oliver) Barlow, Austral. J. Bot. 22 (1974) 543. — Type: *Riedel s.n.* (holo K, not seen), Celebes, Manada, Gorontalo.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 248. The description is amended as follows: *leaves* usually attenuate or cuneate at the base to a petiole up to 10 mm long, not or only very slightly bifacial, thin, often drying wrinkled and fragile. *Decaisnina stenopetala* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of slender habit, leaves thin, drying fragile and wrinkled, with the lamina not or only very slightly bifacial, attenuate at the base to a relatively long slender petiole and attenuate to acuminate at apex, dense inflorescence bearing triads along the entire length, and corolla 22–30 mm long with the base inflated prior to anthesis. The flower colour is mostly described as red in the lower part and yellow or green above, sometimes with a dark red band at the tip.

Decaisnina stenopetala is distributed from Celebes, Moluccas, and Lesser Sunda Islands (Sumba, Timor, Flores) to the Vogelkop region of western New Guinea (Fig. 3; 37 collections seen), mostly at low elevations from sea level to 500 m but recorded up to 1400 m. Danser (1931) considered the species to be confined to Celebes and Flores, and the wider area defined in the present study is partly the result of realignment of species morphological boundaries (see below). Habitat details and hosts are poorly known, but the species apparently occurs in disturbed and primary rain forests, and has been recorded as parasitic on *Aglaiia*, *Citrus*, *Euodia*, *Euphorbia*, *Ficus*, *Gnetum*, and *Weinmannia*.

The species is probably closely related to *D. sumbawensis* and *D. zollingeri*, with both of which it is geographically sympatric. This group of species presents considerable difficulty in taxonomic resolution. There is little variation in inflorescence and floral characters, but the strongly clustered patterns of variation in vegetative characters indicate that a number of taxa are involved. In view of the sympatry of these elements, it is concluded that they represent species which are closely related but are maintaining their integrity in nature. One of the three entities, *D. sumbawensis*, is distinctive in its relatively thick strongly bifacial leaves. Of the two which lack this character, *D. zollingeri* is distinct from *D. stenopetala* in its strongly angular stems and its glaucousness. The three species recognized on this basis all have high integrity with respect to geographic area and internal variation.

In resolving the species limits, a number of collections have been referred to taxa differently from their placement by Danser (1931) and Barlow (1974). In particular, specimens from western New Guinea, formerly referred by Barlow (1974) to *D. stenopetala*, have been found to be representative of all three species. See further notes under *D. sumbawensis* and *D. zollingeri*.

The inflation of the corolla base in *D. stenopetala* is not consistently visible in the specimens examined. The condition is presumably related to nectar presentation for pollinators, and may be transient, developing just prior to anthesis. When visible, the degree of expression in the specimens seen ranges from a weak ellipsoid dilation to a globular one strongly contracted distally.

22. *Decaisnina sumbawensis* (Tieghem) Barlow, *comb. nov.*

- Amylothea sumbawensis* Tieghem, Bull. Soc. Bot. France 41 (1894) 265. — Type: *Zollinger 3425* (holo P, not seen; iso L), Lesser Sunda Islands, Sumbawa.
- Loranthus bohollensis* Merrill, Philipp. J. Sci. C 4 (1909) 141. — *Amylothea bohollensis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *McGregor BS 1277* (lecto NY, see below; iso P, US), Philippines, Bohol, vii.1906.
- Loranthus formicarium* Elmer, Leafl. Philipp. Bot. 3 (1911) 1069; *Amylothea formicaria* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 301. — Type: *Elmer 11304* (lecto L, see below; iso BO, NY, US), Philippines, Mindanao, Davao, Todaya, Mt Apo, viii.1909.
- Loranthus agusanensis* Elmer, Leafl. Philipp. Bot. 6 (1913) 1962. — *Amylothea agusanensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 300. — Type: *Elmer 13405* (lecto L, see below), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, vii.1912.
- Loranthus terminaliflorus* Elmer, Leafl. Philipp. Bot. 6 (1913) 1970. — Type: *Elmer 14156* (lecto L, see below), Philippines, Mindanao, Agusan, Cabadbaran, Mt Urdaneta, near L Donao, 1500 m, x.1912.
- Amylothea parvifolia* Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 248. — *Decaisnina parvifolia* (Danser) Barlow, Austral. J. Bot. 22 (1974) 541. — Type: *Mayr 51* (lecto B), New Guinea, Arfak Mts, 1400 m, 30.v.1928.

For descriptions and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 12, 16, under *Amylothea bohollensis* and *A. formicaria*; Barlow, Austral. J. Bot. 22 (1974) 541, under *D. parvifolia*. The essential elements of an integrated description are as follows: Glabrous except for the inflorescence rarely sparsely pubescent. *Stem* internodes sometimes slightly angular when young, soon becoming terete. *Leaves* opposite; lamina narrowly elliptic or ovate to broadly ovate, (2-)5-14(-18) cm long, (1-)2-6(-7) cm wide, cuneate to truncate at the base to a petiole (2-)3-12 mm long, distinctly bifacial from an early stage, shining or often varnished above, dull below, usually acuminate but sometimes acute or in smaller leaves even rarely obtuse at the apex; midrib and lateral venation usually distinct on both sides. *Inflorescence* axillary; axis usually slender, (14-)20-40 mm long, bearing 4-6 pairs of secund triads uniformly spaced above a flowerless basal part 4-15 mm long; peduncles of the triads 1.5-3 mm long; triads with all flowers sessile or the lateral flowers on very short pedicels to 0.5 mm long. *Ovary* narrowly cylindrical or urceolate, 2-2.5 mm long; calyx limb c. 0.2 mm long, weakly toothed. *Corolla* in mature bud slender, 22-30 mm long, weakly inflated at the base, acute at the apex; petals coherent in the lower 1-3 mm after anthesis. *Anther* 2-3 mm long, usually slightly shorter than the free part of the filament. *Style* articulate c. 0.5 mm above the base; stigma globular, twice as wide as the style. *Fruit* ellipsoid, c. 8 mm long, crowned by the calyx limb.

Decaisnina sumbawensis has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of petiolate, distinctly bifacial leaves cuneate to truncate at the base, inflorescence of slender flowers in triads uniformly spaced along the axis, corolla 22-30 mm long

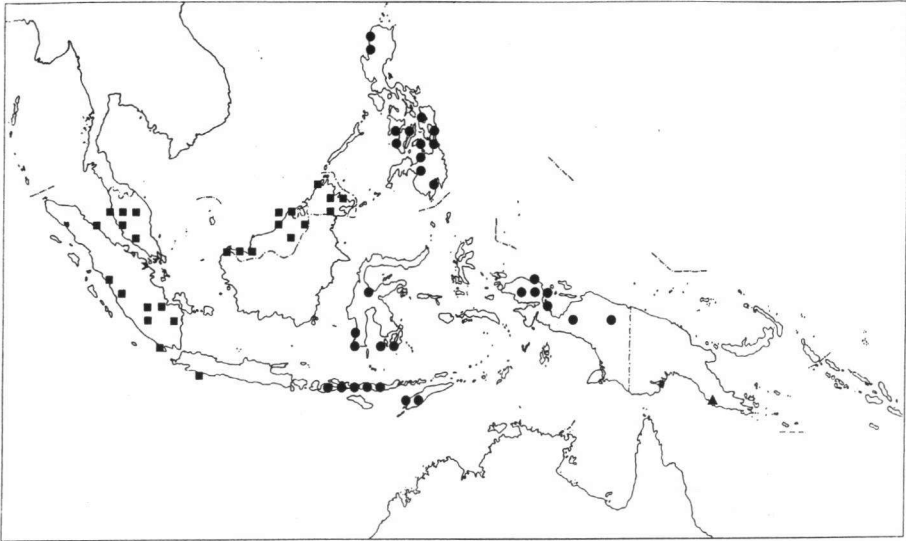


Fig. 8. Distributions of *Decaisnina* and *Loxanthera* species. Symbols show recorded occurrence in 1° grid cells. ▲ = *D. pedicellata* (Danser) Barlow. ● = *D. sumbawensis* (Tieghem) Barlow. ■ = *L. speciosa* Blume.

with a slight, transitory inflation at the base, and anther shorter than the free part of the filament. The flower colour is mostly described as various shades of red in the lower part and green or yellow above, sometimes with a purple band near the tip.

The species is widely distributed from the Philippines (Luzon to Mindanao) to Celebes, Lesser Sunda Islands (Sumbawa, Flores, Timor) and western New Guinea (Fig. 8; 44 collections seen), at a range of elevations from sea level to 2400 m. Habitat details are poorly known; the species probably occurs widely in primary rain forests, secondary vegetation, and agricultural lands, and has been recorded as parasitic on *Citrus*, *Coffea*, *Ficus*, and *Nothofagus*.

Decaisnina sumbawensis is very polymorphic, especially in its leaf characters. Leaf size ranges from small (c. 3 cm long) to relatively large (up to 18 cm long), but this variation may be related to the broad altitudinal range, with the smaller-leaved forms often recorded from the higher elevations. Similar patterns of variation occur in related species such as *D. hollrungii*. Specimens from the Philippines usually have leaf laminae more nearly truncate at the base than those from further south. The inflation of the corolla base is not consistently visible in the specimens examined, and may be transient, developing just prior to anthesis (see note under *D. stenopetala*).

Danser (1931, 1935) recognized *Amylothea boholensis*, *A. formicaria*, and *A. parvifolia* as species distinct from *A. triflora*, in which he included the type specimen of *A. sumbawensis*. The latter specimen differs from typical *D. triflora* in its distinctly bifacial acute to acuminate leaves and slightly inflated corolla base, and is not considered to be conspecific with *D. triflora*. On the other hand there appear to be no sharp

boundaries between *Amylotheca boholensis*, *A. formicaria*, and *A. parvifolia*, and they are probably local biotypes of a widespread species which has a broad ecological amplitude. The type of *A. sumbawensis* also belongs within this spectrum of continuous variation, and consequently provides the earliest available name for the more broadly circumscribed species accepted here.

Decaisnina sumbawensis is probably closely related to *D. stenopetala*, with which it is sympatric, and which has very similar inflorescence and flower characters. The latter species differs primarily in its thinner leaves which are not strongly bifacial. See note under *D. stenopetala*.

The species is probably also related to *D. hollrungii* of New Guinea and northern Australia. The latter species is also very polymorphic, and has an equally broad ecological amplitude. It differs from *D. sumbawensis* in being much more robust, with longer corollas not inflated at the base. The two species have parapatric areas, and may be successive derivatives of a stock which has crossed Charles's Line from the west.

The holotypes of *Loranthus agusanensis*, *L. boholensis*, *L. formicarium* and *L. terminaliflorus* (PNH) are no longer extant. An isotype of *L. agusanensis* in L has been seen and identified as lectotype of the species name. An isotype of *L. boholensis* in NY has been seen and identified as lectotype of the species name, and other isotypes have been seen in P and US. An isotype of *L. formicarium* in L has been seen and identified as lectotype of the species name, and other isotypes have been seen in BO, NY, and US. An isotype of *L. terminaliflorus* in L has been seen and identified as lectotype of the species name.

23. *Decaisnina triflora* (Spanoghe) Tieghem

Loranthus triflorus Spanoghe, Linnaea 15 (1841) 208. — *Decaisnina triflora* (Spanoghe) Tieghem, Bull. Soc. Bot. France 42 (1895) 436. — Type: *Spanoghe s.n.* (holo L 908,128-850; iso L), Timor.

Amylotheca petiolata Barlow, Proc. Linn. Soc. New S. Wales 87 (1962) 53. — *Decaisnina petiolata* (Barlow) Barlow, Austral. J. Bot. 14 (1966) 434, excluding subsp. *angustata* = *D. angustata*. — Type: *Specht 537* (holo BRI; iso AD, CANB, NSW, PERTH), Australia, Northern Territory, Bickerton I, South Bay, 13° 45' S 136° 06' E, 11.vi.1948.

For descriptions and synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 250; Barlow, Austral. J. Bot. 22 (1974) 544. Excluded are the names *Amylotheca sumbawensis*, *Elytranthe sumbawensis* and *Loranthus sumbawensis* (see under *D. sumbawensis*), and *Loranthus signatus* var. *petiolatus* (= *D. congesta*). *Decaisnina triflora* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of very slightly flattened young stem internodes soon becoming terete, relatively thick, petiolate, rounded leaves which are not bifacial, well developed inflorescence axes, corollas mostly 25–35 mm long (rarely shorter) and hardly dilated at the base, and free parts of the filaments at least as long as the anthers. Some specimens from the Lesser Sunda Islands (including the type) often have narrower leaves and shorter flowers than the Moluccan and New Guinean specimens, but narrow-leaved individuals also occur

sporadically in New Guinea and there is no sharp morphological boundary between the two forms. The flower colour is apparently variable between populations, being commonly red but ranging from dark crimson through orange and yellow to green, often grading to green or yellow above, and sometimes with dark crimson or brown bands at the neck and/or the tip.

Decaisnina triflora is distributed in the Lesser Sunda Islands (Flores, Timor, Roti), Moluccas, northern Australia, and throughout New Guinea (Fig. 7; 66 collections seen), at a range of elevations from sea level to 2300 m. In the Moluccas, the Lesser Sunda Islands, and Australia the species is apparently common at low elevations, but ranges up to 850 m, whilst in New Guinea most occurrences have been recorded between 950 and 2300 m. It occurs in rain forests, monsoon forests, and open woodlands, parasitic on a wide range of hosts including *Acacia*, *Alphitonia*, *Barringtonia*, *Buchanania*, *Castanopsis*, *Dillenia*, *Elaeocarpus*, *Engelhardtia*, *Ervatamia*, *Ficus*, *Glochidion*, *Lithocarpus*, *Neoscortechinia*, and a species of Euphorbiaceae.

In previous treatments of *D. triflora* by Danser (1931) and Barlow (1974) the species, as circumscribed, was heteromorphic. Because of its relatively generalized morphology within the genus, it became to some extent a reservoir to which a residue of difficult specimens was referred. In the present study some specimens previously referred to *D. triflora* have now been referred to *D. amplexicaulis*, *D. congesta*, *D. forsteriana*, *D. longipes*, *D. stenopetala* or *D. sumbawensis* (see there), in all cases clearly falling within the natural range of variation shown by these entities. As a consequence, *Decaisnina triflora sens. str.* becomes a more homogeneous entity with considerable geographic integrity.

In contrast, critical re-examination of the material of *D. petiolata* subsp. *petiolata* has shown that it cannot be maintained as specifically distinct from *D. triflora*. Accordingly, the geographic range of *D. triflora* is extended to northern Australia. The specimens formerly distinguished as *D. petiolata* subsp. *petiolata* often have glaucous leaves and pale papery bark, but similar texture occurs in some New Guinean specimens as well as in those from Timor. This feature is probably an adaptive response in those populations which are subject to the seasonal aridity of the monsoon belt. In other vegetative, inflorescence, and floral characters, the Australian specimens clearly fall within the range of variation of *D. triflora*. The other subspecies of *D. petiolata*, subsp. *angustata*, appears to be sufficiently distinct to be sustained as a separate species (see under *D. angustata*).

The affinities of *D. triflora* appear to be with the other Australian and several New Guinean species, with which it shares a non-inflated corolla base, relatively long corolla, and triads evenly spaced along the inflorescence axis. With an area which extends to the east from Charles's Line, across more than half of New Guinea, it was probably an early differentiate from the intrusive Malesian stock. At its eastern limit it is adjoined by two local species, *D. congesta* and *D. pedicellata*, which may be ecogeographic derivatives of the same ancestral stock (see notes under *D. congesta* and *D. pedicellata*). The further affinities of *D. triflora* are possibly with *D. stenopetala*, which has a contiguous area further to the northwest, and from which *D. triflora* differs in having thicker, less wrinkled leaves which are more rounded at the apex, and relatively longer corollas less inflated at the base.

24. *Decaisnina viridis* (Merrill) Barlow, *comb. nov.*

- Loranthus viridis* Merrill, Philipp. J. Sci. 1 Suppl. (1906) 189. — *Amylotheca viridis* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 303. — Type: *Borden FB 816* (lecto US 709241, see below; iso BO, NY), Philippines, Luzon, Bataan, Lamao R, Mt Mariveles, 600 m, vi.1904.
- Loranthus pentagonus* Merrill, Philipp. J. Sci. C 7 (1912) 80. — *Amylotheca pentagona* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Vanoverbergh 1254* (lecto P, see below; iso US), Philippines, Luzon, Bontoc, Bauco, 1650 m, 26.viii.1914.
- Loranthus pachycladus* Merrill, Philipp. J. Sci. C 13 (1918) 1918. — Type: *Ramos BS 27323* (lecto P, see below; iso L, NY), Philippines, Luzon, Ilocos Norte, Burgos, 44 m, ii-iii.1917.

For descriptions see Danser, Philipp. J. Sci. 58 (1935) 27, 29, under *Amylotheca viridis* and *A. pentagona*. *Decaisnina viridis* can be identified by its combination of robust habit, thick, angular internodes, distinctly bifacial petiolate leaves acute and often acuminate at the apex, inflorescence with a basal involucre of decussate scales and thick axis with several pairs of triads usually subumbellate and not secund, and thick 6-merous corolla 30–45 mm long and inflated to more than 5 mm wide in the lower part. The flower colour is mostly described as yellow or pale green.

The species is endemic to Luzon, Philippines (Fig. 7; 9 collections seen), mostly at low elevations but reaching 1650 m. Habitat details are poorly known; the species has been recorded from gallery forest along streams but there are no host records.

Decaisnina viridis is one of a distinctive group of species, confined to the Philippines, which is characterized by an involucre of decussate scales at the base of the inflorescence axis. The inflorescence is relatively unspecialized, having triads with distinctly pedicellate lateral flowers, and lacking the spatial orientation of the flowers seen in most species of the genus. The species group has presumably evolved *in situ*, and illustrates the important role of the Philippines as a centre of diversity of the genus. For further discussion of the biogeography of the genus see note under *Decaisnina* above.

Danser (1935) maintained *Amylotheca viridis* and *A. pentagona* as distinct species, citing differences in inflorescence structure and phyllotaxy. He described the inflorescence of *A. viridis* as umbellate and that of *A. pentagona* as racemose. In *A. viridis* the insertion of the triads is racemose, although often strongly subumbellate, and *A. pentagona* simply represents an individual collection in which the inflorescence is a more normally developed raceme. The latter collection, from the highest elevation recorded for the species, may show reversion to a plesiomorphic inflorescence state. The leaves in the type specimen of *L. pentagonus* are more scattered than usual for the species, resulting in a more irregularly angled stem. In all other respects the specimens are closely similar, and they are therefore treated as conspecific.

In his original diagnosis of *L. viridis*, Merrill (1909) cited four collections which are, therefore, syntypes. The originals of all four collections (PNH) are no longer extant. Isosyntypes of two collections, *Borden FB 816* and *FB 2938*, have been seen. A specimen of *Borden FB 816* (US 709241) bears leaves, inflorescences, and flowers and conforms with Merrill's original description, and, accordingly, is chosen as lectotype of the species name. Duplicates in BO and NY have been seen. Duplicates of the syntype *Borden FB 2938* in BO, P and UC have been seen. No duplicates of the other two syntypes, *Borden FB 1814* and *Cuming 1953*, have been located.

The holotypes of *L. pentagonus* and *L. pachycladus* (PNH) are no longer extant. An isotype of *L. pentagonus* in P has been seen and identified as lectotype of the species name, and another isotype in US has been seen. An isotype of *L. pachycladus* in P has been seen and identified as lectotype of the species name, and other isotypes in L and NY have been seen.

25. *Decaisnina zollingeri* (Tieghem) Barlow, *comb. nov.*

Amylotheca zollingeri Tieghem, Bull. Soc. Bot. France 41 (1894) 264. — Type: *Zollinger s.n.* (holo P; iso L), Celebes, Macassar.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 252. Apart from the strongly angular stems, *Decaisnina zollingeri* has few specialized characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of characters of the stem internodes, which are buff-coloured and terete when older, with slightly enlarged nodes, but dark or greenish when younger, flattened towards the apex and usually 4-ridged, with 2 ridges forming sharp edges and usually 2 forming crests on the flattened faces; the leaves, which are usually very weakly bifacial but dull on both sides and truncate or contracted at base with a short petiole 2–4(–10) mm long; and the corollas, which are 22–27 mm long and usually shortly inflated at the base prior to anthesis. The inflation of the corolla base in *D. zollingeri* is not consistently visible in the specimens examined (see note under *D. stenopetala*). The flower colour is described as green or yellow, sometimes with red in the lower part.

Decaisnina zollingeri is distributed widely in southeastern Malesia, from Java (Kangean Archipelago) to Celebes, Moluccas, Lesser Sunda Is (Alor) and western New

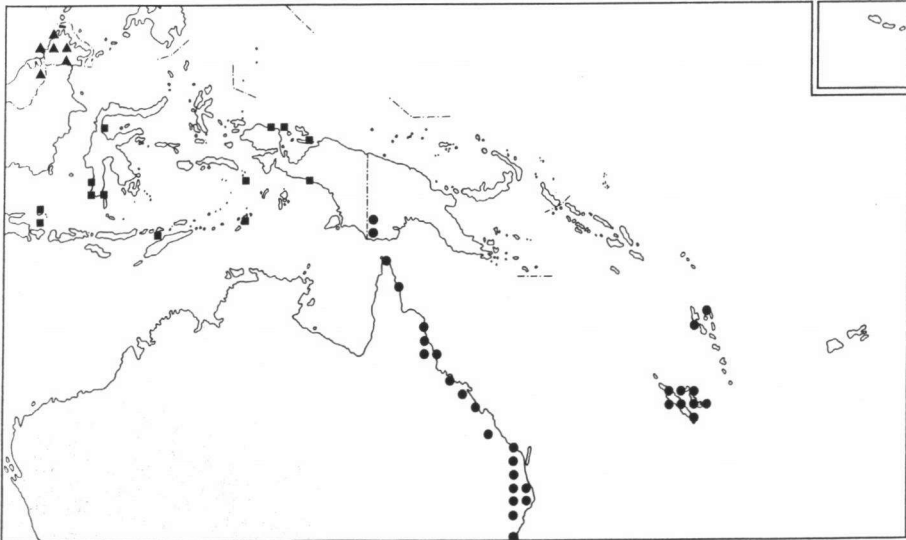


Fig. 9. Distributions of *Decaisnina*, *Amylotheca* and *Lepeostegeres* species. Symbols show recorded occurrence in 1° grid cells. ■ = *D. zollingeri* (Tieghem) Barlow. ● = *A. dictyophleba* (F. Mueller) Tieghem. ▲ = *L. centiflorus* (Stapf) Tieghem.

Guinea (Fig. 9; 16 collections seen), at low elevations from sea level to 620 m. Additional collections seen in the present study have extended the known range to the Lesser Sunda Islands and to western New Guinea. Habitat details are poorly known; the species has once been recorded as parasitic on *Albizia*.

The species is probably closely related to *D. stenopetala* and *D. sumbawensis*, with both of which it is geographically sympatric. The three species share very similar inflorescence and flower characters (for differences see note under *D. stenopetala*). *Decaisnina zollingeri* is possibly also related to *D. cumingii*, with which it is approximately parapatric (for similarities and differences see note under *D. cumingii*). Having an arc-like area which straddles Charles's Line, *D. zollingeri* occupies a geophysically turbulent part of the Malesian region in which there has been much recent change in landform (Audley-Charles, 1981). If *D. zollingeri* has originated *in situ*, it is possibly a relatively young species.

In resolving the species limits, a number of collections have been referred to taxa differently from their placement by Danser (1931) and Barlow (1974). In revising New Guinean taxa, I suggested that *D. zollingeri* was conspecific with *D. stenopetala* (Barlow, 1974), but the additional collections seen in the present study have confirmed the status of the two as distinct but probably closely related species. Specimens from western New Guinea formerly referred by me to *D. stenopetala* have been found variously to be representative of *D. stenopetala*, *D. sumbawensis* or *D. zollingeri*.

2. CYNE

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

Tetradyas Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 361. — Type: *T. perfoliata* Danser.

For descriptions and synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 361, under *Tetradyas*; Philipp. J. Sci. 58 (1935) 33, under *Cyne*; Barlow, Austral. J. Bot. 22 (1974) 551, under *Tetradyas*. The descriptions referred to above are amended as follows: *Inflorescences* developing successively in the leaf axils or depressions at the stem nodes, sessile or almost so, a very contracted or capitate raceme of one or more decussate pairs of triads or rarely dyads, developing beneath the stem periderm which forms a blister-like operculum which falls in one piece or ruptures as the flowers expand; triads and individual flowers sessile or with minute peduncles and pedicels, these sometimes developing only in fruit; bracts single under each flower and together forming an involucre under each triad. *Corolla* 6-merous; petals separating at anthesis but coherent into a short tube at the base. *Anthers* basifixed, sessile.

A genus of 6 species distributed in the Philippines, the Moluccas, and New Guinea, at elevations ranging from sea level to subalpine.

Diagnostic features

The infrafamilial classification of *Cyne* and the generic group to which it belongs is outlined above. For identification at the generic level the readily observable morphological characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Cyne* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into racemose conflorescences, but with a very contracted axis. The least specialized inflorescences are very short racemes with only one or two pairs of triads on very short peduncles, whilst the most extreme are sessile heads forming in depressions in the stem. There is no involucre of imbricate bracts which encloses the entire inflorescence, as in *Lepeostegeres*, and the primary diagnostic character for the genus is the operculum, developed from the stem periderm, which covers the young inflorescence. As the inflorescence expands the operculum is displaced or irregularly split.

The flowers of *Cyne* are hermaphrodite, 6-merous, regular and apparently similar to those of *Decaisnina*, being almost choripetalous and usually coherent at the base into a short tube. The epipetalous stamens have basifixed immobile introrse anthers which are sessile on the petals. The style is usually articulate just above the base.

In describing the genus, Danser (1929; 1933b) treated the capitate, sessile or subsessile inflorescence with an operculum as a single diagnostic state. The other species now included in *Cyne* show a clear transition to *Decaisnina* in inflorescence structure, although still having the unique operculum, which is probably of monophyletic origin. The diagnostic character which is assigned to *Cyne* in this treatment is therefore the presence of the operculum, and the genus includes species which show a series of stages in the condensation of the inflorescence to a capitulum.

Generic relationships

Cyne is apparently very closely related to the larger genus *Decaisnina* (see above), which is probably the least specialized in the group. The major difference is in the inflorescence features described above. Although the very contracted inflorescence develops under an operculum, species such as *C. baetorta*, *C. papuana*, and *C. monotrias* show a sequence of inflorescence reduction derived from the expanded raceme of triads typical of *Decaisnina*.

Biogeographic history

For a general outline of the history of the decaisninoid genera, see notes in the introduction and under *Decaisnina*. *Cyne* is sympatric with *Decaisnina* and, like *Decaisnina*, occurs on both sides of Charles's Line. The genus presumably originated in eastern Malesia, and was represented in the intrusive Malesian stocks which penetrated New Guinea. Most of the species have very small areas, and appear to be highly specialized young endemics, although their combined distribution extending on both sides of Charles's Line indicates a significant period of differentiation and dispersal.

KEY TO THE SPECIES

- 1a. Leaves completely sessile 2
- b. Leaves obscurely to distinctly petiolate 3
- 2a. Leaves of each pair united at the margins into a cup (New Guinea)
 - 5. *C. perfoliata*
- b. Leaves of each pair not united at the margins (New Guinea) . . 4. *C. papuana*

- 3a. Inflorescence a sessile head of usually 3 sessile pairs of triads 4
- b. Inflorescence a contracted raceme with an axis 1–4 mm long and usually 1 or 2 pairs of triads 5
- 4a. Young internodes quadrangular; leaves shortly acuminate at the apex (Philippines) 6. **C. quadriangula**
- b. Young internodes terete; leaves obtuse or rounded at the apex (Philippines) **2. C. banahaensis**
- 5a. Inflorescence axis 3–4 mm long; triads pedunculate; lateral flowers shortly pedicellate (Philippines) **1. C. baetorta**
- b. Inflorescence axis c. 1 mm long; triads and lateral flowers sessile (Moluccas) **3. C. monotrias**

1. *Cyne baetorta* Barlow, *spec. nov.*

Species nova *C. papuanae* (Danser) Barlow affinis, sed caulibus teretibus, foliis petiolatis, partibus inflorescentiae minus reductis differt. — Holotypus: *Coode 5651* (L 987.111-434), Philippines, Mindoro, N coast, Suban R. headwaters inland from San Teodoro, 1100–1200 m, 1.v.1986.

Glabrous. *Stem internodes* rather robust; terete, 1–5 cm long, with leafy shoots apparently arising from an involucre-like periderm layer. *Leaves* opposite; lamina elliptic, 5–7 cm long, 3.5–5 cm wide, rather thickly coriaceous, red above, pale green-brown below, when dry darker above than below but dull on both sides, cuneate to shortly attenuate at the base into a winged petiole 4–7 mm long, rounded or obtuse at the apex; venation pennate, obscure except for the dark brown midrib raised below in the lower half. *Inflorescences* few in hollows at the nodes, arising through a periderm layer which remains as a basal involucre, each a very short raceme of triads; axis robust, 3–4 mm long, bearing 2 (rarely 3) pairs of triads; peduncles of the triads spreading or deflexed, c. 2 mm long, c. 1 mm thick; lateral flowers of the triads on pedicels up to 0.5 mm long; bracts not seen. *Flowers* not seen. *Fruit* (probably immature) ellipsoid, c. 5 mm long, truncate at the apex and crowned by a style base c. 0.3 mm long.

Cyne baetorta is known only from the type collection from the uplands of Mindoro (Fig. 6). Habitat details and hosts are unknown.

The species is similar to *C. papuana* and *C. monotrias* in having inflorescences which are greatly reduced racemes of triads, so that the flowers are borne close to the stem nodes and are protected in the axils or in hollows during early development. The inflorescence of *C. baetorta* is less reduced than that of the other two species, and the basic structure of a raceme of triads is clearly identifiable. *Cyne baetorta* differs from *C. papuana* in having petiolate leaves as well as the slightly less reduced inflorescence, and from *C. monotrias* in having pedunculate triads with shortly pedicellate lateral flowers, as well as the much less reduced inflorescence. Even though the available specimen is fruiting, it appears to represent a species distinct from these two. See discussion above on the relationship of *Cyne* with *Decaisnina*, and further note under *C. monotrias*.

The specific epithet is derived from the Latin *baeta* ('tent of skin') and *ortus* ('risen from'), and alludes to the emergence of the shoots and inflorescences from an involucre-like periderm layer.

2. *Cyne banahaensis* (Elmer) Danser

Loranthus banahaensis Elmer, Leafl. Philipp. Bot. 1 (1908) 288. — *Cyne banahaensis* (Elmer) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 306. — Type: *Elmer 9115* (lecto L, see below; iso BO, NY, U not seen), Philippines, Luzon, Tayabas, Lucban, Mt Banahao, 740 m, v.1907.

Loranthus capituliferus Merrill, Philipp. J. Sci. C 7 (1912) 264. — *Cyne capitulifera* (Merrill) Danser, Rec. Trav. Bot. Néerl. 30 (1933) 466. — Type: *Merrill BS 8270* (holo PNH, not seen; iso B, not seen), Philippines, Zamboanga, Sax R, mountains behind San Ramon, 1100 m.

Loranthus alternifolius Merrill, Philipp. J. Sci. C 9 (1914) 283. — *Cyne alternifolia* (Merrill) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 306. — Type: *Foxworthy, Demesa & Villamil FB 13295* (holo PNH, not seen; iso B, not seen), Philippines, Zamboanga, opposite Olutanga I, 30 m.

For descriptions and additional synonymy see Danser, Philipp. J. Sci. 58 (1935) 33, 35, 36, under *C. banahaensis*, *C. alternifolia* and *C. capitulifera*. *Cyne banahaensis* can be identified by its combination of young stems terete, leaves attenuate at the base to a weakly defined petiole and obtuse and rounded at the apex, inflorescence of usually 6 sessile capitate triads, corolla 13–20 mm long, and sessile anthers. The flower colour is described as yellow, or yellow in the lower part and red above.

The species is distributed in the Philippines, recorded from Luzon, Samar, and Mindanao (Fig. 10; 10 collections seen), at elevations from sea level to 1100 m. Habitat details and hosts are unknown.

Cyne banahaensis is apparently one of the more specialized species in this small genus. This is consistent with a longer history of development on the Malesian side of Charles's Line, where the genus probably originated.

Danser (1935) distinguished *C. banahaensis*, *C. alternifolia*, and *C. capitulifera* on minor differences in robustness and corolla length, but did not succeed in generating

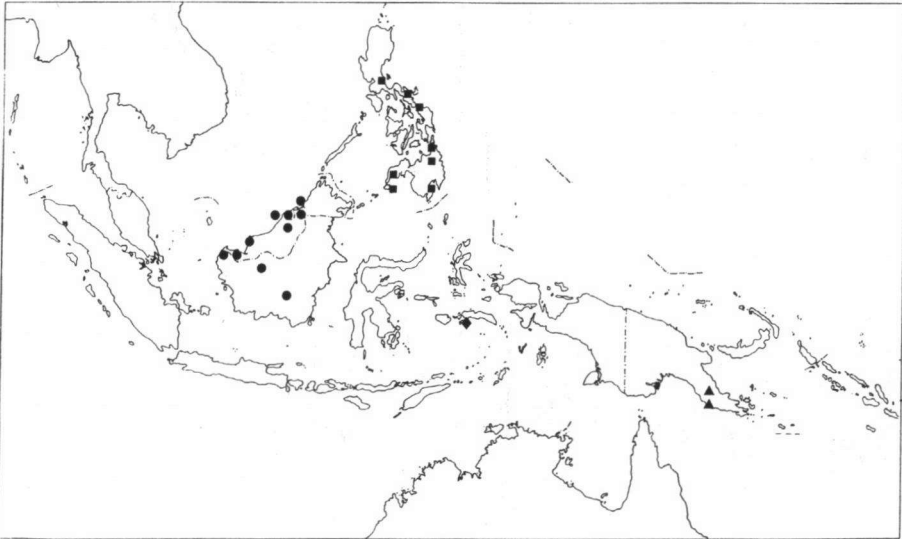


Fig. 10. Distributions of *Cyne* and *Lepeostegeres* species. Symbols show recorded occurrence in 1° grid cells. ■ = *C. banahaensis* (Elmer) Danser. ◆ = *C. monotrias* Barlow. ▲ = *C. perfoliata* (Danser) Barlow. ● = *L. bahajensis* (Korthals) Miquel.

a complete key to all three species. Although type materials of *L. alternifolius* and *L. capituliferus* are apparently no longer extant, specimens determined by Danser as *C. alternifolia* have been seen, and *C. capitulifera* is more or less intermediate between the other two entities. The materials now available indicate a continuous range of variation in these characters, and even when they are treated as conspecific the resultant species is not very polymorphic.

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

3. *Cyne monotrias* Barlow, *spec. nov.*

Species nova *C. papuanae* (Danser) Barlow affinis, sed caulibus teretibus, foliis petiolatis, partibus inflorescentiae magis reductis, triatibus sessilibus differt. — Holotypus: *Eyma* 2655 (L 953.223-396), Moluccas, Ceram, W, Manoesa, Rembatoe, Honitoe, 25-26.i.1938.

Glabrous. *Stems* slender; internodes dilated and weakly angular towards the apex, 4-6 cm long. *Leaves* opposite; lamina elliptic, 4.5-6 cm long, 2.5-3 cm wide, thin, dull on both sides with the upper side darker, cuneate at the base grading into a winged petiole 8-12 mm long, obtuse or shortly rounded at the apex; venation pennate with the midrib and lateral veins obscure above and distinct below. *Inflorescences* few in hollows at the nodes, apparently covered during early development by a periderm layer which may remain as a basal involucre after rupture, very short racemes of triads; axis c. 1 mm long, bearing 1 (rarely 2) sessile triads with all flowers sessile; bracts rounded, c. 1 mm long, forming an involucre below each triad. *Corolla* in the mature bud c. 13 mm long, weakly inflated just above the base to 1 mm wide, narrowed above; petals separating at anthesis to the inflated part. Other floral parts not seen. *Fruit* ellipsoid, c. 7 mm long, truncate at apex and crowned by a style base c. 0.5 mm long.

Cyne monotrias is known only from the rather fragmentary type collection from Ceram (Fig. 10). It bears two attached infructescences and a few detached flower and fruit fragments. Habitat details are poorly known; the host is recorded as being a species of Euphorbiaceae. The flowers were described as dirty yellow and the fruits red.

The species is similar to *C. papuana* and *C. baetorta* in having inflorescences which are greatly reduced racemes of triads, so that the flowers are borne close to the stem nodes and are protected in the axils or in hollows during early development. The inflorescence of *C. monotrias* is more reduced than that of these other two species, at most consisting of a single pair of triads but apparently often with only one triad of the pair developed. The basic inflorescence structure of a raceme of triads is therefore somewhat obscure, the flowers/fruits appearing as sessile groups of 3-6 in hollows at the nodes. Even though the available specimen is somewhat fragmentary, these features indicate that it represents a distinct species.

As discussed above, the inflorescence development in *C. baetorta*, *C. papuana* and *C. monotrias* suggests that there may be a close phyletic link between *Decaisnina* and *Cyne*. These species illustrate an ordered sequence of inflorescence reduction and protection, from the expanded inflorescence of *Decaisnina*. This is one of several analogous trends towards enclosure of young flowers in Malesian loranth.

The specific epithet is derived from the Greek *monos* ('solitary') and *trias* ('triad'), and alludes to the usual state of development of the inflorescence.

4. *Cyne papuana* (Danser) Barlow, *comb. nov.*

Amylothea papuana Danser, Blumea 3 (1938) 38. — *Decaisnina papuana* (Danser) Barlow, Austral. J. Bot. 22 (1974) 540. — Type: Carr 15502 (holo L 936.295-302; iso CANB 64659, K), Papua, Isuarava, c. 4500 ft (1375 m), 10.ii.1936.

For description see Barlow, Austral. J. Bot. 22 (1974) 540 under *Decaisnina papuana*. *Cyne papuana* can be identified by its combination of young internodes dilated upwards and double-edged, leaves sessile but not cordate at the base and not united in pairs at the margins, and very short inflorescence axis 2–4 mm long bearing only 1 or 2 pairs of triads. The flowers are described as pale greyish olive in the lower part and crimson above.

Cyne papuana is known only from the type collection from New Guinea (Fig. 6), recorded at an elevation of 1375 m. Habitat details are unknown.

The species is similar to *C. baetorta* and *C. monotriasis* in having inflorescences which are greatly reduced racemes of triads, so that the flowers are borne close to the stem nodes and are protected in the axils or in hollows during early development. The inflorescence of *C. papuana* is intermediate between these other two species in degree of reduction, and the basic structure of a raceme of triads is clearly identifiable. *Cyne papuana* differs from both species in its sessile leaves rounded or abruptly cuneate at the base, from *C. baetorta* also in having slightly more reduced inflorescences, and from *C. monotriasis* also in having pedunculate triads with very shortly pedicellate lateral flowers, and a much less reduced inflorescence. These three species show possible links to the genus *Decaisnina* (see notes under *Decaisnina*, *Cyne* and *C. monotriasis*).

In the available material it is not possible to confirm the actual presence of an operculum covering the young inflorescence. However the species is so similar in its vegetative and inflorescence characters to the other species of *Cyne* that it is considered to be congeneric with them. The inflorescences are present in distinct stem hollows which are bordered by erose flaps of cortical tissue, and it is highly likely that an operculum is indeed present.

5. *Cyne perfoliata* (Danser) Barlow, *comb. nov.*

Tetradyas perfoliata Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 362. — Type: Forbes 299 (holo BM; iso MEL), New Guinea, Papua, Sogeri region, 960 m, 28.x.1885.

For descriptions see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 362; Barlow, Austral. J. Bot. 22 (1974) 552 under *Tetradyas perfoliata*. *Cyne perfoliata* can be identified by its unique character of opposite sessile leaves, those of each pair fused at the margins in the lower 1.5–2 cm into a sheath which completely encircles the stem and encloses the inflorescences. The flower colour is described as pale flesh coloured with darker nerves.

The species is distributed in eastern New Guinea (Fig. 10; 2 collections seen), at elevations of 960 and 1500 m. Habitat details and hosts are unknown.

Cyne perfoliata is very poorly known. Because of the very limited materials available, interpretation of the inflorescence structure has been difficult, and open flowers have not been seen. Danser (1931) interpreted the stem internodes as inflorescence peduncles, and the fused leaves as a floral involucre, and therefore failed to recognize

the likely derivation of the inflorescence. Examination of the available material shows no reason for regarding these parts as other than vegetative. Danser also failed to notice an apparent operculum lining the base of the leaf in the axil. The inflorescence is therefore revealed to be a capitate, almost sessile group of triads and dyads in racemose arrangement, developing under an operculum, and the species is appropriately referred to the genus *Cyne*.

Cyne perfoliata is presumably a specialized derivative of the intrusive *Cyne* stock which has established on the eastern side of Charles's Line.

6. *Cyne quadriangula* Danser

Cyne quadriangula Danser, Philipp. J. Sci. 58 (1935) 38. — Type: *Ramos & Pascasio BS 35119* (holo PNH, not seen), Philippines, Mindanao, Surigao, Bucas Grande I, low altitude.

For description see Danser, Philipp. J. Sci. 58 (1935) 38. *Cyne quadriangula* can be identified by its combination of young stems quadrangular and shiny, and leaves shortly acuminate but finally obtuse at the apex. Open flowers are unknown, although the flower colour is described as chocolate.

The species is known only from the type specimen from Bucas Grande I, Mindanao, Philippines (Fig. 11). Habitat details and hosts are unknown.

The holotype (PNH) is apparently not extant, and no isotypes or other specimens referable to this species name have been seen. Whilst the species must be treated as doubtful in this conspectus, the characters noted by Danser (1935) appear to indicate a distinct species. If so, it is probably a local derivative closely related to *C. banahaensis*, with which it shares common ancestry.

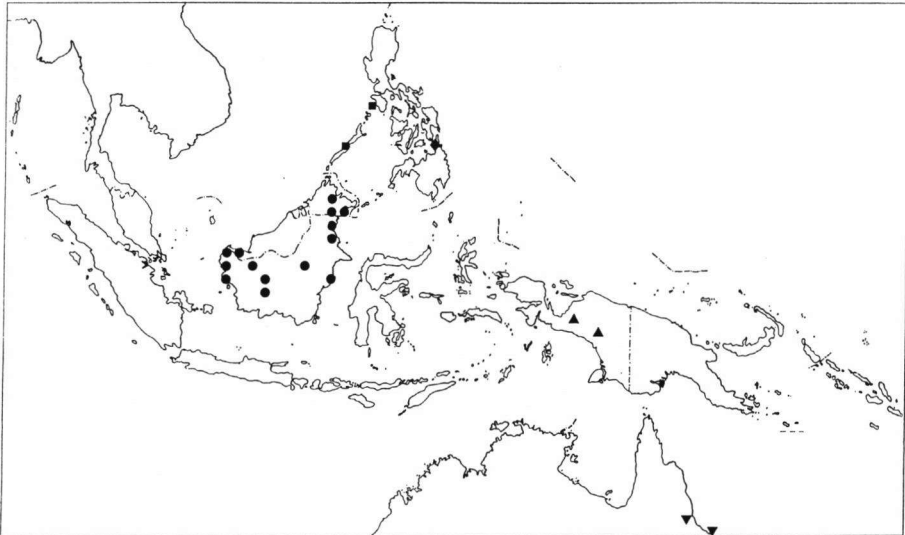


Fig. 11. Distributions of *Cyne*, *Amylotheca* and *Lepeostegeres* species. Symbols show recorded occurrence in 1° grid cells. ◆ = *C. quadriangula* Danser, ▲ = *A. acuminatifolia* Barlow, ▼ = *A. subumbellata* Barlow, ■ = *L. acutibracteus* Danser, ● = *L. lancifolius* (Tieghem) Danser.

3. LAMPAS

Lampas Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 291, 320. — Type: *L. elmeri* Danser.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 256. The description is amended as follows: *inflorescence* a subumbellate, subcapitate raceme of spirally arranged triads crowded towards the apex of the axis and subtended by an involucre formed from the enlarged central bracts of the outermost triads.

A monotypic genus confined to Borneo.

Diagnostic features

The infrafamilial classification of *Lampas* and the generic group to which it belongs is outlined above. For identification at the generic level the readily observable morphological characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Lampas* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, axillary racemes of triads crowded into a tight spiral towards the apex of the axis. The bracts are decurrent to the bases of the peduncles of the triads, those of the outer (lowermost) triads being longer and wider, with margins free from the peduncles and together forming a short imbricate involucre subtending the flowers.

The flowers of *Lampas* are hermaphrodite, 6-merous, regular, and gamopetalous to above the middle. The epipetalous stamens have basifixed immobile introrse anthers with simple filaments, the free parts of which are shorter than the anthers. The style is probably articulate above the base.

Generic relationships

Lampas is apparently related to the larger genus *Decaisnina*, which is probably the least specialized in the group. One difference is in the corolla, which is essentially choripetalous in *Decaisnina*, although usually with the petals coherent at the base into a short tube, and gamopetalous to above the middle in *Lampas*. Another difference is in the inflorescence specialization, which shows a tendency common in Malesian loranthids, namely for the inflorescence to be capitate and enclosed by an involucre. In the case of *Lampas* this specialization is only weakly developed. Both capitate inflorescences and gamopetalous corollas are probably of multiple derivation in the decaisninoid genera, and direct relationships between *Lampas* and genera such as *Amylothea* or *Lepeostegeres* may not exist.

Biogeographic history

For a general outline of the history of the decaisninoid genera, see note under *Decaisnina*. *Lampas* is probably a local endemic which diverged relatively early within the group, and which may now be relictual.

1. *Lampas elmeri* Danser

[*Loranthus elmeri* Merrill, Univ. Calif. Publ. Bot. 15 (1929) 53, non Merrill (1914)] — *Lampas elmeri* Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 320. — Type: *Elmer 20664* (holo BO, not seen; iso L), Borneo, Elphinstone, Tawao, x.1922–iii.1923.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 257. *Lampas elmeri* can be identified by its combination of quaternate phyllotaxy, large leaves distinctly petiolate, inflorescence characters as described above, thick inflorescence axis c. 35 mm long, and corolla 55–75 mm long. The flower colour is described as red, or red in the lower part and yellowish green or yellowish white above.

The species occurs in a small area in northern Borneo (Fig. 4; 4 collections seen), recorded at elevations of 100 and 700 m. Habit details are poorly known; the species has been recorded once as parasitic on a species of Dilleniaceae. For further notes see under genus *Lampas*.

4. AMYLOTHECA

Amylotheca Tieghem, Bull. Soc. Bot. France 41 (1895) 261. — Type: *A. dictyophleba* (F. Mueller) Tieghem.

For descriptions and synonymy see Barlow, Austral. J. Bot. 22 (1974) 545; Flora of Australia 22 (1984) 73. Danser (1931) included *Decaisnina* in *Amylotheca*, which was therefore more broadly circumscribed than in this treatment. The descriptions referred to above are amended as follows: triads with central flowers sessile or pedicellate.

A genus of 4 species distributed from Malaya and Thailand eastwards and southwards to Sumatra, Borneo, New Guinea, Australia, New Caledonia, and the New Hebrides. Except for the localized *A. subumbellata* the species are apparently allopatric, so there is no significant centre of species richness for the genus (but see note under *A. duthieana*).

The species are found principally in rain forests, but may occur in open tropical woodlands. They may be common in lowland forests, but extend to montane forests at 2850 m in New Guinea. Attachment to the host is exclusively through secondary haustoria on extensive epicortical runners. Leaf architecture is not very variable, ranging from a common simple bifacial pattern to thick or thin isofacial forms, always decussate and with pennate venation. There is some variation in inflorescence and flower structure and, together with vegetative characters, this forms the basis for species distinction. Host specificity is generally low.

Diagnostic features

The infrafamilial classification of *Amylotheca* and the generic group to which it belongs are outlined above. For identification at the generic level the readily observable morphological characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Amylotheca* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, and the plesiomorphic state for the genus is an axillary raceme of uniformly spaced opposite pairs of triads. Simpler inflorescences are derived by reduction, and occur primarily as infraspecific rather than interspecific variations. The inflorescence is often subumbellate, and the triads may be reduced to single flowers so that the inflorescence may appear to be a simple raceme or even a 2-flowered simple umbel.

The flowers of *Amylotheca* are hermaphrodite, 6-merous, regular, and gamopetalous to the middle or higher, with the corolla tube often inflated at anthesis. The epi-

petalous stamens have basifixed immobile introrse anthers with simple filaments, the free parts of which are about as long as the anthers. The style is usually articulate above the base, leaving a distinct nipple on the fruit.

Generic relationships

Amylotheca is apparently closely related to the larger genus *Decaisnina*, which is probably the least specialized in the group. The major difference is in the corolla, which is essentially choripetalous in *Decaisnina*, although usually with the petals coherent at the base into a short tube, and distinctly gamopetalous to the middle or higher in *Amylotheca*. The anthers in *Amylotheca* are usually rounded or truncate at the apex, whilst those of *Decaisnina* are commonly attenuate and acute. *Amylotheca* is probably closest to Philippine species such as *D. viridis* and *D. crassilimba*, in which the inflorescence is not secund. Danser (1929; 1931; 1933a; 1935; 1936) consistently treated *Amylotheca* and *Decaisnina* as congeneric, citing these Philippine species as a link which obviated generic distinction. The lack of other apomorphic characters in *Amylotheca* confirms the close relationship, but the consistency of the gamopetalous corolla suggests that *Amylotheca* is a monophyletic group which diverged early with a different pollination syndrome.

Biogeographic history

For a general outline of the history of the decaisninoid genera, see note under *Decaisnina*. Like *Decaisnina*, *Amylotheca* occurs widely on both sides of Charles's Line, although three of the four species are on the Australo/Papuan side. The genus was presumably represented in the intrusive Malesian stocks which penetrated New Guinea and northern Australia, and underwent some differentiation and speciation in the process. Being basically a lowland genus, it has reached New Caledonia and nearby islands, probably from New Guinea at times of lowered sea level. The taxonomic difficulties in the genus derive entirely from the resultant disjunctions in species areas.

KEY TO THE SPECIES

- 1a. Leaves more or less glaucous; lamina truncate or shortly cuneate at the base into a sharply defined dark coloured petiole more than 10 mm long; style articulate 0–0.5 mm above the base (Thailand, Malaya, Singapore, Sumatra, Borneo)
 3. **A. duthieana**
- b. Leaves not glaucous; lamina attenuate at the base into an obscure winged petiole less than 10 mm long; style articulate 2–3 mm above the base 2
- 2a. Leaves linear to narrowly lanceolate, less than 2 cm wide, dull on both sides; corolla up to 34 mm long (Australia) 4. **A. subumbellata**
- b. Leaves lanceolate to broadly elliptic, more than 2 cm wide, weakly to strongly bifacial and shiny above and dull below; corolla mostly more than 34 mm long . . . 3
- 3a. Leaves mostly acuminate and acute at the apex, 12–20 cm long (New Guinea)
 1. **A. acuminatifolia**
- b. Leaves mostly rounded, rarely acute at the apex, 5–14 cm long (New Guinea, Australia, New Caledonia, New Hebrides) 2. **A. dictyophleba**

1. *Amylotheca acuminatifolia* Barlow

Amylotheca acuminatifolia Barlow, Austral. J. Bot. 22 (1974) 545. — Type: *Eyma* 4888 (holo L 952.286-562), New Guinea, Wissel Lakes region, Bivak Prauw between L Tigi and L Enarotali, 1650–1750 m, 19–23.iv. 1939.

For description see Barlow, Austral. J. Bot. 22 (1974) 545. *Amylotheca acuminatifolia* can be identified by its combination of robust habit, large leaves attenuate at the base to an obscure winged petiole and usually acuminate at the apex to a drip-tip, and robust corolla 45–65 mm long. The flower colour is red in the lower part and yellow above.

The species occurs in a small area in western New Guinea (Fig. 11; 5 collections seen), recorded at elevations from 1650 to 2850 m. Other habitat details and hosts are unknown. Its natural relationship appears to be with the widespread *A. dictyophleba*, which has an allopatric distribution, occurring in New Guinea only in the Papuan lowlands. It differs from *A. dictyophleba* in its larger more acuminate leaves and robust inflorescence and flowers, and may be a local differentiate adapted to everwet highlands in New Guinea.

2. *Amylotheca dictyophleba* (F. Mueller) Tieghem

Loranthus dictyophlebus F. Mueller, Rept. Burdekin Exped. (1860) 14. — *Amylotheca dictyophleba* (F. Mueller) Tieghem, Bull. Soc. Bot. France 41 (1894) 262. — Type: *Beckler s.n.* (lecto MEL, Barlow 1966; iso NSW), Australia, New South Wales, Hastings R.

Aciella pyramidata Tieghem, Bull. Soc. Bot. France 41 (1894) 436. — *Amylotheca pyramidata* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 302. — Type: *Pancher* 623 (lecto P, Barlow 1974), New Caledonia, Isle of Pines.

Elytranthe banksiana Guillaumin, J. Arnold Arbor. 13 (1932) 88. — *Lysiana banksiana* (Guillaumin) Danser, Rec. Trav. Bot. Néerl. 31 (1934) 227. — *Amylotheca banksiana* (Guillaumin) Barlow, Austral. J. Bot. 22 (1974) 546. — Type: *Kajewski* 453 (holo NY; iso BRI, K, S), New Hebrides, Banks Group, Vanua Lava, 300 m, 10.vii.1928.

For descriptions and extensive further synonymy see Danser, Rec. Trav. Bot. Néerl. 31 (1934) 227, under *Lysiana banksiana*; Bull. Jard. Bot. Buitenzorg III, 14 (1936) 81, 83, under *A. dictyophleba* and *A. pyramidata*; Barlow, Austral. J. Bot. 22 (1974) 546, 547, under *A. banksiana*, *A. dictyophleba* and *A. pyramidata*; Flora of Australia 22 (1984) 73. The species description is amended as follows: *Shrub* to 2 m in diameter, glabrous. *Leaves* decussate; lamina lanceolate to elliptic or very broadly ovate, 5–14 cm long, 1.5–12 cm wide, usually shining or rarely dull above, dull below, shortly cuneate to almost truncate at the base to an obscure winged petiole 2–8 mm long, obtuse or rounded or less frequently acute at the apex; venation pennate with reticulate veins usually distinct on both sides. *Inflorescences* 1–4 in the axils; axis 3–12(–28) mm long, bearing 1–6 decussate, more or less subumbellate pairs of triads or single flowers; triads with the central flowers sessile and lateral flowers pedicellate or sometimes sessile; peduncles of the triads or single flowers 3–7(–10) mm long; pedicels of the lateral flowers of the triads (when present) 2–4 mm long; bracts triangular, acute or obtuse, spreading, 1–1.5 mm long. *Ovary* narrowly campanulate or cylindrical, 2.5–5 mm long; calyx limb 0.3–0.5(–0.8) mm long. *Corolla*

in the mature bud (28–)35–60 mm long, slightly to strongly inflated at the base, weakly clavate, acute or obtuse or rarely rounded; petals 6, united to about the middle. *Anther* (3–)5–8 mm long, about equal to the free part of the filament. *Style* articulate 1–3 mm above the base. *Fruit* ellipsoid to almost globular, 9–12 mm long.

Amylotheca dictyophleba is recorded from southern New Guinea, eastern Australia, New Caledonia (including Isle of Pines and Loyalty Is), and the New Hebrides (Fig. 9; 200 collections seen), mostly at elevations from sea level to 1000 m but recorded up to 1500 m. The species occurs mostly in primary and secondary rain forest, with very low host specificity, recorded as parasitic on a range of hosts too numerous to itemize here.

The species can be identified by its combination of relatively thin bifacial leaves recurved at the margins and not acuminate at the apex, obscure winged petioles, slender inflorescence parts, and relatively thin corolla mostly 35–60 mm long. The corolla colours are variable, but are commonly red, orange, or yellow, usually paler and commonly yellow or green above, and often becoming darker after anthesis.

Previously (Barlow, 1974) I followed Danser (1936) in accepting *A. banksiana*, *A. dictyophleba*, and *A. pyramidata* as distinct species, although with some reservation. Review of the additional materials available from New Caledonia and New Hebrides shows that these species cannot be maintained as distinct. In vegetative characters they present a relatively homogeneous continuum. The same applies to the floral characters, although there is a tendency for the island populations (New Caledonia and New Hebrides) to have larger flowers than the mainland ones (Australia and New Guinea). Except for the more southerly populations in Australia there is a common tendency for reduction of inflorescence components, especially of triads to single flowers (Barlow, 1974), and the simple umbels thought to be diagnostic of *A. banksiana* in the New Hebrides also occur frequently in New Caledonia and northern Australia. For brief notes on the presumed polarity of these inflorescence character states, see under *Diagnostic features* in the introductory statements.

Amylotheca dictyophleba is apparently a derivative of an intrusive Malesian stock (Barlow, 1990) which became widely established in the Papuan region, and *A. acuminatifolia* and *A. subumbellata* are probably local differentiates from this complex (see notes there). For note on species disjunctions, see under *A. duthieana*.

3. *Amylotheca duthieana* (King) Danser

Loranthus duthieanus King, J. As. Soc. Bengal 56 (1888) 94. — *Amylotheca duthieana* (King) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 301. — Type: *Scortechini s.n.* (holo ?CAL, not seen; iso BM, K, S, not seen), Perak.

Amylotheca borneana Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 240. — Type: *Jaheri 1262* (holo BO, not seen; iso L), Borneo, Boekit Liang, Karing di bawah [Exp. Nieuwenhuis, 1896–1897].

For descriptions and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 240, 244, under *A. borneana* and *A. duthieana*. *Amylotheca duthieana* can be identified by its combination of robust habit, thickly coriaceous glaucous elliptic to nearly orbicular leaves truncate or shortly cuneate at the base to a distinct dark-

coloured petiole, robust inflorescence parts, corolla 50–70 mm long with petal segments spirally curled after anthesis, and style articulate very close to the base. The flower colour is described as bright shades of red, usually dark purple or brown or even black at the apex.

The species is distributed from the southeast Asian mainland (peninsular Thailand, Malaya) to Singapore, Sumatra, and Borneo (Fig. 6; 21 collections seen), at elevations from sea level to 700 m. Habitat details are poorly known, but the species occurs in humid forests, and has been frequently recorded as parasitic on *Shorea* and also on *Dipterocarpus*, *Gonystylus*, and *Seraya*.

Within the genus, *Amylotheca duthieana* is distinctive in the characters mentioned above, and especially in the articulation of the style very close to the base. Van Tieghem (1895) erected for the species a separate genus, *Arculus*, on the basis of this difference. The differences from the other species of *Amylotheca* are correlated with a significant disjunction from Borneo across Charles's Line to New Guinea. However, the species share a suite of attributes, including general habitat preference, inflorescence structure, and actinomorphic gamopetalous corollas, which suggest that it is monophyletic. The disjunction in the range may reflect the extinction of the genus from areas of seasonal aridity and open forests, as they expanded in Quaternary times. In this respect, the limited diversification in Papuaia may represent a secondary event.

Danser (1935) distinguished *Amylotheca borneana* and *A. duthieana* on minor leaf and inflorescence characters and on flower length. The materials now available indicate a continuous range of variation in leaf lamina length (up to 14 cm), inflorescence axis length (3–20 mm), number of pairs of triads (1–5), and corolla length (50–70 mm). The materials are therefore treated as conspecific.

4. *Amylotheca subumbellata* Barlow

Amylotheca subumbellata Barlow, Austral. J. Bot. 14 (1966) 439. — Type: *Barlow 123* (holo BRI; iso BRIU), Australia, Queensland, Mueller Creek, 11.viii.1960.

For description see Barlow, Austral. J. Bot. 14 (1966) 439; Flora of Australia 22 (1984) 74. *Amylotheca subumbellata* can be identified by its combination of slender habit, linear to narrowly lanceolate leaves mostly less than 1 cm wide and attenuate at the base without a distinct petiole, and thin corolla 27–34 mm long. The flower colour is yellow, or red in the lower part and yellow above.

The species occurs in a small area in northeastern Australia (Fig. 11; 4 collections seen), recorded at elevations from sea level to 600 m, in vine forests and open humid woodlands, recorded as parasitic on *Archirhodomymrus*, *Casuarina*, and *Grevillea*. Its very slender leaves may represent an adaptive convergence with its most common host, *Grevillea chrysodendron* R.Br. (Barlow & Wiens, 1977). Its natural relationships appear to be with the widespread *A. dictyophleba*, with which it is parapatric, its area coinciding with an apparent disjunction in the range of the latter species. It differs from *A. dictyophleba* in its more slender leaves and slightly shorter flowers, and may be a local differentiate primarily adapted to open woodlands.

5. LOXANTHERA

Loxanthera Blume in J.A. Schultes & J. Schultes, Syst. 7, 2 (1830) 1612, 1730. — Type: *L. speciosa* Blume.

For description see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 254. The description is amended as follows: *anther* immobile, introrse, with an extension from the base which is free from the filament so that the filament appears dorsifixed.

A monotypic genus occurring in Malaya, Sumatra, Borneo, and Java.

Diagnostic features

The infrafamilial classification of *Loxanthera* and the generic group to which it belongs is outlined above. For identification at the generic level the readily observable morphologic characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Loxanthera* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, axillary racemes of a few uniformly spaced opposite pairs of triads.

The flowers of *Loxanthera* are large, robust, hermaphrodite, 6-merous, regular and gamopetalous to above the middle. The epipetalous stamens have immobile introrse anthers which appear to be dorsifixed, but the morphology of the filament/connective suggests that the anther is prolonged downwards from its base.

Generic relationships

Loxanthera shares a number of characters with *Amylothea*, particularly the inflorescence structure and gamopetalous corolla. These two genera, along with *Lampas*, may form a natural group, especially as they all occur in northwestern Malesia. However, the gamopetalous corolla is possibly an apomorphy of multiple derivation in the decaisninoid genera, so that the relationship may not be direct (see note under *Lampas*).

Dorsifixed versatile anthers occur in a number of apparently primitive and relictual Lorantheae, and may represent a plesiomorphic state for the family (Barlow & Wiens, 1973). However, the dorsifixed anthers of *Loxanthera* appear to represent a derived state, modified from the simple, basifixed immobile anthers common to most loranthe genera. The staminal filament is broadly continuous with the connective, which extends at the back of the anther for its full length, and the anther is quite immobile. The filament appears to join the anther at right angles about one fourth of the distance from the anther base. However, the lower part of the anther is probably a lobe which extends the anther downwards. This apparent reversal in anther attachment is probably part of the bird pollination syndrome in *Loxanthera*, associated with its exceptionally large robust tubular flowers.

Biogeographic history

For a general outline of the history of the decaisninoid genera, see note under *Decaisnina*. *Loxanthera* is presumably a local endemic of relatively recent origin.

1. *Loxanthera speciosa* Blume

Loxanthera speciosa Blume in J.A. Schultes & J. Schultes, Syst. 7, 2 (Oct.–Dec. 1830) 1612, 1649, 1730. — *Loranthus loxantherus* DC., Prod. 4 (Sep. 1830) 316. — [*Loxanthera loxanthera* (DC.) Danser, Verh. Akad. Wet. Amst. Afd. Natuurk. 29 sect. 2 (1933) 90, nom. inval.]. — Type: *Blume s.n.* (probably collected by Reinwardt) (holo L 908.127-858; probable iso L 908.127-899), Java.

For description and synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 254. *Loxanthera speciosa* can be identified by its combination of inflorescence of 1–3 pairs of opposite triads with all flowers pedicellate, robust corolla up to 140 mm long, and characteristic anthers as described above. The flower colour is described as pink or red, sometimes black at the apex.

The species occurs widely in Malaya, Sumatra, Borneo, and Java (Fig. 8; 24 collections seen), recorded at elevations from sea level to 1600 m. Habit details are poorly known, although the species probably occurs in rain forests. The only recorded host is *Ficus*. For further notes see under genus *Loxanthera*.

6. LEPEOSTEGERES

Lepeostegeres Blume in J.A. Schultes & J. Schultes, Syst. 7, 2 (1830) 1611, 1731. — Type: *L. gemmiflorus* Blume.

For descriptions and synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 258; Philipp. J. Sci. 58 (1935) 30; Barlow, Austral. J. Bot. 22 (1974) 550.

A genus of 9 species distributed from Malaya, Sumatra, Borneo, Celebes, and Philippines eastwards to New Guinea. The major centre of species richness and diversity is Borneo (see below).

The species are found in a range of habitats from lowland rain forests to montane and subalpine forests up to 2800 m. Leaf architecture is not very variable, always decussate, usually simple and bifacial, and with pennate venation. The inflorescence architecture is similarly very homogeneous, and most variation is in dimensions of inflorescence and flower parts.

Diagnostic features

The infrafamilial classification of *Lepeostegeres* and the generic group to which it belongs is outlined above. For identification at the generic level the readily observable morphological characters are derived from inflorescence and flower structure.

The basic inflorescence unit (uniflorescence) in *Lepeostegeres* is a simple dichasium (triad) with a simple bract subtending each flower. The triads are aggregated into conflorescences, and the characteristic state for the genus is an axillary raceme of 6–12 opposite pairs of triads which are crowded into a dense capitulum on the flattened apex of a contracted axis. The capitulum is subtended by a series of enlarged, decussate, imbricate, rigid bracts, which tightly enclose the young flowers during development, and usually contribute to the visual presentation of the flowers after anthesis.

The flowers of *Lepeostegeres* are hermaphrodite, 6-merous, regular, and gamopetalous to near the middle. The epipetalous stamens have basifixed immobile introrse anthers with simple filaments which vary considerably in length between species. The process of anthesis is unusual and characteristic of the genus, with the corolla lobes becoming S-shaped at their point of reflexion prior to their separation from each other, and usually separating downwards before the lobes finally split apart at the apex. The style is usually articulate above the base, leaving a distinct nipple on the fruit.

The genus most confused with *Lepeostegeres* is *Lepidaria*. Both genera have capitate inflorescences of similar appearance, with the flowers subtended by enlarged, rigid, imbricate, decussate bracts. The similarity is most probably the result of a striking convergence, and the affinities of *Lepidaria* are probably with the elytranthoid genera discussed in the introduction. In *Lepidaria* the flowers are single rather than in triads, and each flower is subtended by one of the involucre bracts and also by two smaller but nevertheless enlarged concave bracteoles. In *Lepidaria* there are usually 4–6 and normally no more than 12 flowers in the head, whereas in *Lepeostegeres* there are rarely as few as 8 and mostly more than 12.

Danser (1931) gave some emphasis to the 'apical spot' as a diagnostic character at species level. The apical spot, when present, is a scaly or differentially coloured mark on the outside of the involucre bract, near the apex. In the materials studied the apical spot has been found to be variable in expression and shape. Sometimes it appears as a medial band widening upwards. It is unreliable as a diagnostic character and has not been used in this treatment.

Generic relationships

Lepeostegeres ranks second among the decaisninoid genera in size, and therefore represents a distinct evolutionary pulse. Its capitate inflorescence subtended by a well-developed involucre is clearly a derived state, probably as an adaptation for protection and presentation of the flowers (see note under *Decaisnina*). Other genera with capitate inflorescences (such as *Lepidaria* and *Thaumasianthes*) have different inflorescence architecture, and there has been considerable convergence with respect to this state (see above). *Lepeostegeres* may be as close phylogenetically to *Decaisnina* or *Amylothea* as it is to any of the other capitate genera.

Biogeographic history

For a general outline of the history of the decaisninoid genera, see note under *Decaisnina*. With its strong centre of diversity in Borneo, and limited representation in adjoining areas, *Lepeostegeres* has most probably originated in western Malesia, and undergone considerable differentiation prior to the establishment of Charles's Line (Barlow, 1990). Representation of the genus to the east of Charles's Line by a solitary species in New Guinea indicates a very limited representation in the intrusive Malesian stocks which penetrated New Guinea. In this respect the genus shows a close parallel to *Macrosolen* (Barlow, 1990).

KEY TO THE SPECIES

- 1a. Involucral bracts acute, sagittate (Philippines) **1. *L. acutibracteus***
- b. Involucral bracts obtuse to rounded, not sagittate **2**
- 2a. Involucral bracts deciduous after anthesis **3**
- b. Involucral bracts persistent **4**
- 3a. Flowers and fruits sessile (New Guinea) **7. *L. deciduus***
- b. Flowers pedicellate, the pedicels elongating under the fruits (Philippines)
6. *L. congestiflorus*
- 4a. Leaves long-acuminate and acute at the apex **5**
- b. Leaves acute to rounded at the apex, but not long-acuminate **6**
- 5a. Young internodes strongly quadrangular; corolla lobes reflexed at 4/5 the corolla height; free part of filament less than 10 mm long (Borneo) **9. *L. lancifolius***
- b. Young internodes terete; corolla lobes reflexed at 1/2 to 3/5 the corolla height; free part of the filament more than 10 mm long (Borneo) . . **3. *L. bahajensis***
- 6a. Involucre more than 60 mm long; corolla more than 80 mm long (Malaya, Sumatra, Borneo) **4. *L. beccarii***
- b. Involucre less than 40 mm long; corolla less than 80 mm long **7**
- 7a. Involucral bracts broad, spreading after anthesis; flowers in the inflorescence more than 30 (Borneo) **5. *L. centiflorus***
- b. Involucral bracts narrow, remaining appressed after anthesis; flowers in the inflorescence fewer than 25 **8**
- 8a. Anther 1.5–2 mm long, shorter than the free part of the filament (Java)
8. *L. gemmiflorus*
- b. Anther 4–6 mm long, longer than the free part of the filament (Borneo, Celebes) **2. *L. alveolatus***

1. *Lepeostegeres acutibracteus* Danser

Lepeostegeres acutibracteus Danser, *Blumea* 2 (1936) 57. — Type: *Ramos BS 41187* (holo P, not seen), Philippines, Busuanga I, ix.1922.

For description see Danser, *Blumea* 2 (1936) 57. The description is amended as follows: *leaf lamina* 5–18 cm long, 2–7 cm wide; *corolla* 21–45 mm long, gamopetalous in the lower 9–18 mm; *anther* 1–3 mm long; free part of filament 0.75–2 mm long. *Lepeostegeres acutibracteus* can be identified by its combination of leaves mostly acute but hardly acuminate, inner involucral bracts keeled, acuminate and sagittate, flowers in the inflorescence few (12–15), and anthers and free filaments short. The flower colour is variously described as red, primrose yellow, or red then purple in the lower part and green above.

The species is known only from Palawan Province, Philippines (Fig. 11; 3 collections seen), from sea level to 660 m. Habitat details and hosts are unknown.

Lepeostegeres acutibracteus is probably a young local endemic species. It is very distinctive in its sagittate bracts. In the figure captions with the original diagnosis, Danser referred to involucral bracts ‘fallen off’, and it is therefore possible that the bracts are deciduous as in *L. congestiflorus* and *L. deciduus*.

2. *Lepeostegeres alveolatus* (Tieghem) Danser

Stegastrum alveolatum Tieghem, Bull. Soc. Bot. France 42 (1895) 447. — *Lepeostegeres alveolatus* (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 320. — Type: *Beccari 53* (holo P, not seen), Celebes, Lepo-lepo near Kendari.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 260. The description is amended as follows: *leaf* lamina 3–10 cm long, 1.5–8 cm wide, cuneate at the base to a petiole 8–16 mm long. The species can be identified by its combination of leaves hardly bifacial and rounded at the apex, short involucre up to 30 mm long, flowers in the inflorescence few (8–18), corolla relatively short (28–33 mm), and anthers sessile on free filaments up to 1 mm long. The flower colour is mostly described as red, once as greenish yellow.

The species is distributed in Borneo and Celebes (Fig. 7; 1 collection seen), at elevations from sea level to 1100 m. Habitat details and hosts are unknown apart from one record as parasitic on mangroves.

Lepeostegeres alveolatus is poorly known. It is very similar to the Philippine *L. congestiflorus* in several characters, and the two may be closely related. The specimen from Borneo here placed in *L. alveolatus* may be a morphological and geographical link between the two species, and additional materials will be needed to resolve their status. In specimens with young inflorescences only, it is not possible to establish whether the involucre bracts are deciduous or persistent (see note under *L. acutibracteus*).

3. *Lepeostegeres bahajensis* (Korthals) Miquel

Loranthus bahajensis Korthals, Verh. Bat. Genootsch. 17 (1839) 285. — *Lepeostegeres bahajensis* (Korthals) Miquel, Fl. Ind. Bat. 1, 1 (1856) 833. — Type: *Korthals s.n.* (holo L 908.127-460; iso 4 in L), Borneo, southern, Bahai 'Mons Bahaya'.

Lepeostegeres filamentosus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 265. — Type: *Haviland 536* (lecto K, see below; iso SAR, not seen), Borneo, Brunei, Trusan R.

Lepeostegeres inconspicuus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 269. — Type: *Haviland 482* (holo K; iso SAR, not seen), Borneo, Sarawak, 5 miles (8 km) from Kuching.

Lepeostegeres parviflorus Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 271. — Type: *Moulton 6658* (holo S, not seen; iso K), Borneo, Sarawak, Upper Baram, G. Semabok, 4000 ft (1200 m).

For descriptions and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 262, 265, 269, 271, under *L. bahaiensis*, *L. filamentosus*, *L. inconspicuus*, and *L. parviflorus* respectively. The essential elements of an integrated description are as follows: Glabrous. *Stem* internodes sometimes slightly dilated and angular towards the apex when young, soon becoming terete. *Leaves* opposite; lamina narrowly ovate to ovate, (4–)6–10(–15) cm long, (1.5–)2–4.5(–7) cm wide, truncate at the base to a distinct petiole (6–)10–18 mm long, bifacial but dull on both sides, acuminate and acute at the apex; midrib distinct on both sides and raised below; other venation obscure. *Inflorescence* axillary; axis (5–)6–8 mm long, obconical at the apex and dilated to a receptacle 5–8 mm wide; involucre bracts in 5–8 pairs, the longest inner ones narrowly spatulate, (20–)25–40(–50) mm long, remaining appressed around the flowers after anthesis; flowers in 3 or 4 decussate triads, all with pedicels c. 0.5 mm long. *Ovary* campanulate, angular by mutual pressure, 2–2.5 mm

long; calyx limb c. 0.5–1 mm long, weakly toothed. *Corolla* in mature bud slender, (30–)40–60 mm long, very slightly inflated at the base, obtuse at the apex, at anthesis gamopetalous to near the middle; petals reflexed at 0.5–0.7 their length, the lobes often coherent. *Anther* (4–)4.5–7.5 mm long; free part of the filament erect, (10–)11–18(–22) mm long. *Stigma* ellipsoid, hardly wider than the style.

Except for the unusually long, erect, free anther filaments (see below), *Lepeostegeres bahajensis* has few singular characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of young stems terete, leaves lanceolate-ovate and long acuminate at the apex, flowers in the inflorescence relatively few (c. 20), corolla with lobes reflexed just above the top of the tube at half to two thirds the corolla length, and free parts of the staminal filaments very long and erect. The corolla lobes often tend to cohere after anthesis, with one deeper split in the tube almost to the base, so that the flower appears zygomorphic. The involucre colour is described as various shades of red, and the flower colour is described as yellow, pink, or green, sometimes paler above.

The species is endemic to Borneo (Fig. 10; 27 collections seen), occurring predominantly in lowlands at elevations from sea level to 300 m but recorded up to 1200 m. Habitat details are poorly known; the species presumably occurs in rain forests, and has been recorded as parasitic on *Eugenia* (*Syzygium*) and *Gaertnera*.

Being endemic to Borneo, *L. bahajensis* is broadly sympatric with a number of other species at the centre of diversity of the genus. It is presumably a local differentiate, and its floral morphology may indicate specialization for a particular guild of pollinators.

Danser (1935) accepted *L. bahajensis* as a poorly known species, but at the same time described *L. filamentosus*, *L. inconspicuus*, and *L. parviflorus*, all from Borneo, as new. The materials now available indicate a continuous range of variation in the characters used by Danser to distinguish these species, and even when they are treated as conspecific the resultant species is not very polymorphic. Like many robust loranth, herbarium specimens of *Lepeostegeres* taken from old or young growth, or from juvenile or adult plants, may appear very different. The problems are compounded to some extent by a range of corolla lengths which is wider than in most loranth species.

In describing *L. filamentosus*, Danser (1931) cited 5 collections, which are therefore syntypes. Of these, the collection used for illustration, *Haviland 536*, is chosen as lectotype of the species name.

4. *Lepeostegeres beccarii* (King) Gamble

Loranthus beccarii King, J. As. Soc. Beng. 56, 2 (1888) 98. — *Lepeostegeres beccarii* (King) Gamble, J. As. Soc. Beng. 75 (1914) 381. — Type: *King's Collector 7956* (syn L, see below), Malaya, Perak, 300–800 ft (90–250 m), viii.1886; *Beccari PB 1171* (syn K, see below), Borneo, Sarawak, Kuching, 1865–1868.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 262. The description is amended as follows: *leaf* lamina weakly bifacial, dull on both sides. Apart from the exceptionally long involucre and corolla (see below), *Lepeostegeres beccarii* has few singular characters, and thus presents a rela-

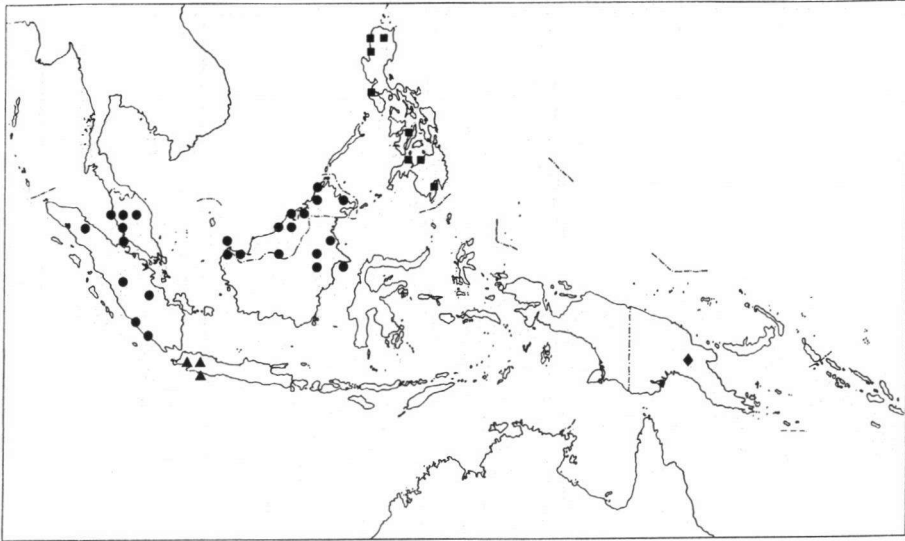


Fig. 12. Distributions of *Lepeostegeres* species. Symbols show recorded occurrence in 1° grid cells. ● = *L. beccarii* (King) Gamble. ■ = *L. congestiflorus* (Merrill) Merrill. ◆ = *L. deciduus* Barlow. ▲ = *L. gemmiflorus* (Blume) Blume.

tively generalized facies for the genus. The species can be identified by its combination of leaves scarcely bifacial and mostly obtuse at the apex, involucre 65–90 mm long, flowers in the inflorescence relatively few (18–24), corolla long (90–120 mm), and anthers about twice as long as the free part of the filament. The involucre colour is described as various shades of red, and the flower colour is mostly described as red, sometimes with green above, and sometimes yellow green.

The species is distributed in Malaya, Sumatra, and Borneo (Fig. 12; 32 collections seen), at elevations from sea level to 2150 m. Habitat details are poorly known; the species apparently occurs in rain forests and has been recorded as parasitic on *Kayu*, *Schima*, *Symplocos*, and *Vernonia*.

In Borneo *L. beccarii* is sympatric with a number of other species at the centre of diversity of the genus. It is presumably a local differentiate, and its very long flowers may indicate specialization for a particular guild of pollinators. In Borneo exceptionally long flowers occur in a number of loranth genera, also including *Amylotheca*, *Lepidaria*, *Loxanthera*, *Macrosolen*, and notably *Trithecanthera*. The wider distribution of *Lepeostegeres beccarii* to Malaya and Sumatra suggests that it may be older than most of its Bornean sympatriates.

In the original diagnosis King (1888) cited four collections [*Scortechini 1208*; *King's Coll. 7956*; *King's Coll. (Kunstler) 5793*; *Beccari 1171*] which are therefore syntypes. Although specimens of all four collections are extant, only two have been seen in this study, and a lectotype is accordingly not chosen.

5. *Lepeostegeres centiflorus* (Stapf) Tieghem

Loranthus centiflorus Stapf, Trans. Linn. Soc. Bot. 4 (1894) 222. — *Lepeostegeres centiflorus* (Stapf) Tieghem, Compt. Rend. Acad. Sci. Paris 153 (1911) 1197. — Type: *Haviland 1247* (holo K; iso SAR, not seen), Borneo, Brit. N Borneo, Mt Kinabalu, 6500 ft (2000 m).

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 264. The description is amended as follows: *leaf* lamina (9–)14–18 cm long, (4–)5–8.5 cm wide; *inflorescence* involucre 25–40 mm long, spreading at anthesis, *corolla* 30–75 mm long, the tube 8–17 mm long; *anther* 3–6 mm long. The species can be identified by its combination of leaves weakly bifacial and mostly acute but not acuminate at the apex, involucre 25–45 mm long and spreading open to 30–70 mm wide at anthesis, flowers in the inflorescence numerous (30–50), and anthers much longer than the free part of the filament. The involucre colour is described as green with red midveins, and the flower colour is mostly described as pink or red, sometimes yellow above, and occasionally greenish yellow.

The species is endemic to Borneo (Fig. 9; 26 collection seen), with a relatively small area in the northeast of the island, mostly at elevations from 500 to 1700 m, but apparently also occurring down to sea level. Habitat details are poorly known; the species apparently occurs in rain forests, and has been recorded as parasitic once on *Dryobalanops*.

In Borneo *L. centiflorus* is sympatric with a number of other species at the centre of diversity of the genus. It is presumably a local differentiate, and its distinctive, open involucre may indicate specialization for a particular guild of pollinators. Although there are very few careful records, it is possible that the species of the genus may differ in involucre colour, and this may be part of the species' pollination syndromes.

6. *Lepeostegeres congestiflorus* (Merrill) Merrill

Loranthus congestiflorus Merrill, Philipp. J. Sci. C 4 (1909) 147. — *Lepeostegeres congestiflorus* (Merrill) Merrill, Enum. Philipp. Fl. Plants 2 (1923) 101. — Type: *Curran FB 5037* (lecto US 709699, see below), Philippines, Luzon, Benguet, summit of Mt Tonglon.

For description see Danser, Philipp. J. Sci. 58 (1935) 31. The description is amended as follows: *stamens*: free part of filament variable, 1–5 mm long. The species can be identified by its combination of leaves bifacial, dull on both sides, grey-green above and pale brown below and rounded at the apex, involucre c. 25 mm long with bracts deciduous at anthesis, and flowers in the inflorescence 18–30. Involucre colour has not been recorded, but the flower colour is described as yellow or greenish yellow, sometimes red at the base.

The species is distributed in the Philippines (Fig. 12; 10 collections seen), mostly in highlands at elevations from 2000 to 2800 m, but recorded down to 1650 m. Habitat details are otherwise unknown.

Lepeostegeres congestiflorus is probably related to the New Guinean *L. deciduus* with which it shares the apparently derived character state of involucre bracts deciduous after anthesis. It differs from *L. deciduus* in having leaves bifacial, pedicellate flowers, more involucre bracts, and a shorter corolla. See note under *L. deciduus*.

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

7. *Lepeostegeres deciduus* Barlow

Lepeostegeres deciduus Barlow, Austral. J. Bot. 22 (1974) 550. — Type: *Brass* 31467 (holo L 961. 149-196; iso CANB, K), New Guinea, Mt Michael, NE slopes, 2000 m, 9.ix.1959.

For description see Barlow, Austral. J. Bot. 22 (1974) 550. The species can be identified by its combination of leaves dull on both sides and not bifacial, involucre c. 20 mm long with bracts deciduous at anthesis, and flowers in the inflorescence c. 20 and completely sessile. Involucre colour has not been recorded, but the flower colour is described as yellowish brown.

The species is distributed in New Guinea (Fig. 12; 8 collections seen), with a very small area in the Eastern Highlands, mostly at elevations from 1500 to 2000 m, but recorded down to 1036 m. Habitat details are poorly known, but the species apparently occurs in rain forests, and has been recorded as parasitic on *Castanopsis*.

Lepeostegeres deciduus is probably related to the Philippine *L. congestiflorus* with which it shares the apparently derived character state of involucre bracts deciduous after anthesis (for differences from this species, see under *L. congestiflorus*). The species shows a major geographical disjunction from the other species of the genus, occurring to the east of Charles's line. It is presumably a specialized derivative in New Guinea of an intrusive Malesian stock, having a similar migration pattern to the related *Decaisnina*, *Amylothea*, and *Cyne*.

8. *Lepeostegeres gemmiflorus* (Blume) Blume

Loranthus gemmiflorus Blume, Verh. Bat. Genootsch. 9 (1823) 187. — *Lepeostegeres gemmiflorus* (Blume) Blume in J.A. Schultes & J. Schultes, Syst. 7, 2 (1830) 1611. — Type: *Blume s.n.* (holo L, 5 sheets of apparently original material), Java, Kapala, Tjibodes.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 266. The description is amended as follows: *anther* 1.5–2 mm long; free part of staminal filament variable, 2–5 mm long. *Lepeostegeres gemmiflorus* has few singular characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of quadrangular young internodes, leaves rounded or obtuse at the apex, involucre 14–20 mm long with bracts persistent, closely appressed and keeled, flowers in the inflorescence relatively few (12–24), and anthers 1.5–2 mm long. Involucre colour has not been recorded, but the flower colour is variously described as red, orange, or yellow, sometimes greenish yellow above and/or crimson at the tip.

The species is distributed in western Java (Fig. 12; 30 collections seen), at elevations from 200 to 1600 m. Habitat details are poorly known, but the species has been recorded as parasitic on *Erythrina*, *Ficus*, and *Ixora*.

Lepeostegeres gemmiflorus shows a geographical disjunction from its congeners, and is the only species of the genus in Java. It is presumably a local endemic, but its lack of apomorphic characters suggests that it is not of recent establishment.

9. *Lepeostegeres lancifolius* (Tieghem) Danser

Stegastrum lancifolium Tieghem, Bull. Soc. Bot. France 42 (1895) 447. — *Lepeostegeres lancifolius* (-ceif-) (Tieghem) Danser, Bull. Jard. Bot. Buitenzorg III, 10 (1929) 321. — Type: *Beccari 537* (holo P, not seen; iso K), Borneo, Sarawak, Kuching.

For description and additional synonymy see Danser, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 269. The description is amended as follows: *leaf* lamina bifacial, 9–25 cm long, 3–12 cm wide; *inflorescence* involucre (22–)25–45(–55) mm long; *corolla* (42–)50–75(–100) mm long. Except for the stem features (see below), *Lepeostegeres lancifolius* has few singular characters, and thus presents a relatively generalized facies for the genus. The species can be identified by its combination of young internodes long, straight and distinctly quadrangular, leaves relatively large, bifacial, acuminate and acute at the apex, flowers in the inflorescence relatively few (12–24), and relatively long involucre and corolla (see above). The involucre colour is described as red, and the flower colour is mostly described as red, rarely orange or green, sometimes with yellow green above and then sometimes red at the tip.

The species is endemic to Borneo (Fig. 11; 22 collections seen), at low elevations from sea level to 400 m. Habitat details are poorly known; the species apparently occurs in rain forests and has been recorded once as parasitic on *Koompassia*.

Occurring in Borneo, *L. lancifolius* is sympatric with a number of other species at the centre of diversity of the genus. It is presumably a local differentiate, and its relatively long flowers may indicate specialization for a particular guild of pollinators (see note under *L. beccarii*). *Lepeostegeres lancifolius* is probably closely related to *L. beccarii* which has a greater altitudinal range but nevertheless appears to be quite sympatric in the north Bornean lowlands. *Lepeostegeres beccarii* differs from *L. lancifolius* in having stems which are more transiently quadrangular, leaves which are only weakly bifacial and not acuminate, longer involucres and flowers, and anthers longer than the free part of the filament. Most of the available specimens are easily segregated into one or other of the two species entities, supporting their recognition as distinct. A few specimens are more or less intermediate with respect to leaf apex, leaf thickness and involucre dimensions, possibly indicating limited gene flow between the species.

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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, 1936). Each entry is referred by code to a genus and species respectively, as numbered in this treatment. New species and combinations are printed in **bold**, synonyms are given in *italics*.

<i>Aciella pyramidata</i> Tieghem 4.02	(<i>Amylotheca</i>)
<i>Amylotheca acuminatifolia</i> Barlow 4.01	<i>amplexicaulis</i> Danser 1.02
<i>agusanensis</i> (Elmer) Danser 1.22	<i>apodotrias</i> Danser 1.10
<i>aherniana</i> (Merrill) Danser 1.01	<i>banksiana</i> (Guillaumin) Barlow 4.02

(Amylothea)

- boholensis* (Merrill) Danser 1.22
borneana Danser 4.03
breviflora Danser 1.10
celebica (Hemsley) Danser 1.06
confertiflora (Merrill) Danser 1.07
cordilimba (Merrill) Danser 1.01
crassilimba (Merrill) Danser 1.09
cumingii Tieghem 1.10
dictyophleba (F. Mueller) Tieghem 4.02
duthieana (King) Danser 4.03
formicaria (Elmer) Danser 1.22
hopeae (Merrill) Danser 1.10
merrillii (Elmer) Danser 1.10
micranthes Danser 1.15
miniata Danser 1.16
ovatifolia (Merrill) Danser 1.17
palawanensis (Merrill) Danser 1.10
papuana Danser 2.04
parvifolia Danser 1.22
pentagona (Merrill) Danser 1.24
petiolata Barlow 1.23
pyramidata (Tieghem) Danser 4.02
revoluta (Merrill) Danser 1.19
saccata (Elmer) Danser 1.01
subumbellata Barlow 4.04
sumbawensis Tieghem 1.22
tenuis Danser 1.10
triflora var. *pedicellata* Danser 1.18
viridis (Merrill) Danser 1.24
zollingeri Tieghem 1.25
Cyne alternifolia (Merrill) Danser 2.02
baetorta Barlow 2.01
banahaensis (Elmer) Danser 2.02
capitulifera (Merrill) Danser 2.02
monotrias Barlow 2.03
papuana (Danser) Barlow 2.04
perfoliata (Danser) Barlow 2.05
quadriangula Danser 2.06
Decaisnina aherniana (Merrill) Barlow 1.01
amplexicaulis (Danser) Barlow 1.02
angustata (Barlow) Barlow 1.03
biangulata (W. Fitzg.) Barlow 1.04
brittenii (Blakely) Barlow 1.05
celebica (Hemsley) Barlow 1.06
confertiflora (Merrill) Barlow 1.07
congesta Barlow 1.08
crassilimba (Merrill) Barlow 1.09
cumingii (Tieghem) Barlow 1.10
djamuensis (Krause) Barlow 1.11
forsteriana (J. A. Schultes & J. Schultes) Barlow 1.12
glauca Tieghem 1.23

(Decaisnina)

- hollrungii* (K. Schumann) Barlow 1.13
longipes Barlow 1.14
micranthes (Danser) Barlow 1.15
miniata (Danser) Barlow 1.16
ovatifolia (Merrill) Barlow 1.17
papuana (Danser) Barlow 2.04
parvifolia (Danser) Barlow 1.22
pedicellata (Danser) Barlow 1.18
petiolata (Barlow) Barlow 1.23
 subsp. *angustata* Barlow 1.03
revoluta (Merrill) Barlow 1.19
signata (F. Mueller ex Bentham) Tieghem 1.20
stenopetala (Oliver) Barlow 1.21
sumbawensis (Tieghem) Barlow 1.22
triflora (Spanoghe) Tieghem 1.23
viridis (Merrill) Barlow 1.24
zollingeri (Tieghem) Barlow 1.25
Elytranthe banksiana Guillaumin 4.02
Lampas elmeri Danser 3.01
Lepeostegeres acutibracteus Danser 6.01
alveolatus (Tieghem) Danser 6.02
bahajensis (Korthals) Miquel 6.03
beccarii (King) Gamble 6.04
centiflorus (Stapf) Tieghem 6.05
congestiflorus (Merrill) Merrill 6.06
deciduus Barlow 6.07
filamentosus Danser 6.03
gemmiflorus (Blume) Blume 6.08
inconspicuus Danser 6.03
lancifolius (Tieghem) Danser 6.09
parviflorus Danser 6.03
Loranthus agusanensis Elmer 1.22
ahernianus Merrill 1.01
alternifolius Merrill 2.02
aurantiacus Elmer 1.10
bahajensis Korthals 6.03
banahaensis Elmer 2.02
beccarii King 6.04
biangulatus W. Fitzg. 1.04
boholensis Merrill 1.22
brittenii Blakely 1.05
capituliferus Merrill 2.02
celebicus Hemsley 1.06
centiflorus Stapf 6.05
confertiflorus Merrill 1.07
congestiflorus Merrill 6.06
cordilimbus Merrill 1.01
crassilimbus Merrill 1.09
dictyophlebus F. Mueller 4.02
djamuensis Krause 1.11
duthieanus King 4.03

(Loranthus)

- elmeri* Merrill 3.01
formicarium Elmer 1.22
forsterianus J.A. Schultes & J. Schultes
 1.12
geminiflorus Blume 6.08
holtrungii Schumann 1.13
hopeae Merrill 1.10
loxantherus DC. 5.01
lucidus Merrill 1.01
merrillii Elmer 1.10
mindanaensis Merrill 1.10
miniatus Elmer 1.16
ovatifolius Merrill 1.17
pachycladus Merrill 1.24
palawanensis Merrill 1.10

(Loranthus)

- pentagonus* Merrill 1.24
revolutus Merrill 1.19
saccatus Elmer 1.01
secundiflorus var. *bolsteri* Elmer 1.10
signatus F. Mueller ex Bentham 1.20
stenopetalus Oliver 1.21
terminaliflorus Elmer 1.22
triflorus Spanoghe 1.23
viridis Merrill 1.24
Loxanthera loxanthera (DC.) Danser 5.01
speciosa Blume 5.01
Lysiana banksiana (Guillaumin) Danser 4.02
Stegastrum alveolatum Tieghem 6.02
lancifolium Tieghem 6.09
Tetradyas perfoliata Danser 2.05